

# 9 | TECHNICAL RESOLUTION

# 9.1 | URBAN & ARCHITECTURAL CONCEPT

## 9.1.1 | PERMANENT ELEMENTS

[concrete] which should remain despite the future of the scheme. Service: ablutions, water tanks points, furnace landmarks, water drainage, solar panels.

## 9.1.2 | LIGHTER STEEL STRUCTURE

bolted for their potential disassembly and reassembly + precast infill elements which can also be re appropriated.

## 9.1.3 STEREOTOMIC [CONCEAL] TO TECTONIC [REVEAL]

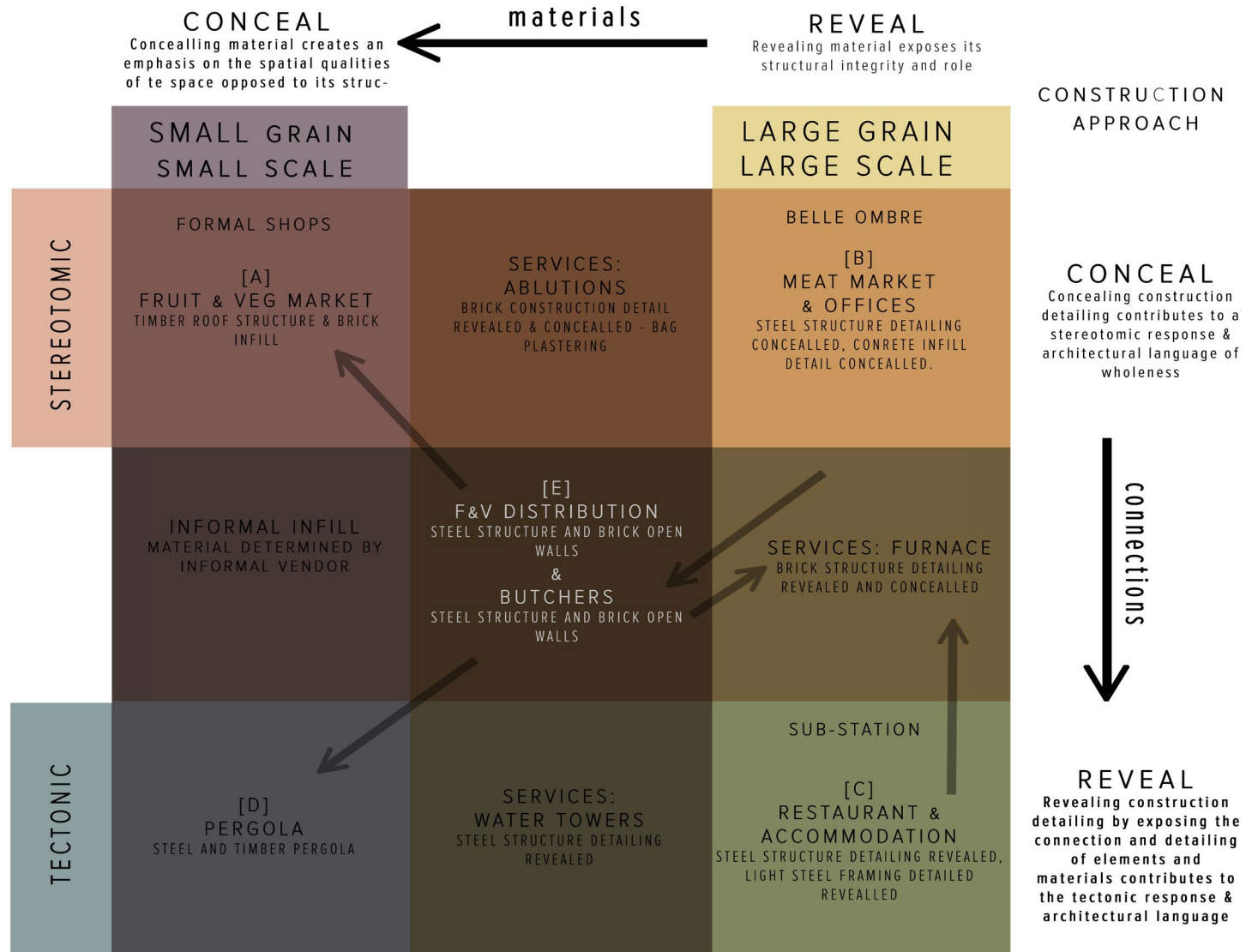


Figure 9.1. Table illustrating urban & architectural concept (Author, 2015)

# 9.2 | STRUCTURE

## 9.3.1 | PRIMARY & SECONDARY

PRIMARY > Urban: Concrete ground defining

SECONDARY > Structure: Steel (+ pergola?)

QUATERNARY > Programmes: Butchery, meat market, restaurant: cooking & eating, fruit & vegetable market, fruit & vegetable distribution, recycling.

PRIMARY > Services: Masonry permanent elements

TERTIARY > Infill: Wall, roof, pergola

### URBAN > CONCRETE

Terracing at public seating & to deal with site slope;  
Concrete footings & planters: ground defining elements & structural support for secondary structure.



### SERVICES > MASONRY

Ablutions as universal programme necessity;  
Furnaces as landmarks



### SECONDARY ELEMENT

STRUCTURAL STEEL supported by urban defining elements;  
ROOF SHEETING for shelter and water collection



### TERTIARY ELEMENTS

INFILL > PRECAST CONCRETE for stereotomic conditions & LIGHT WEIGHT STEEL for tectonic conditions



Figure 9.2. Primary & secondary structure (Author, 2015)

## 9.3 | SUSTAINABILITY & NATURAL SYSTEMS

### 9.3.1 | WATER CATCHMENT

### 9.3.2 | WATER HEATING

### 9.3.3 | THERMAL HEATING

### 9.3.4 | NATURAL VENTILATION

### 9.3.4 | NATURAL VENTILATION & NATURAL LIGHT

### 9.3.5 | DISASSEMBLED STEEL STRUCTURE

### 9.3.1 | WATER CATCHMENT

Water catchment from roofs, through filtration system and into underground water storage tanks. From there it is pumped back up to jojo tanks ready for use.

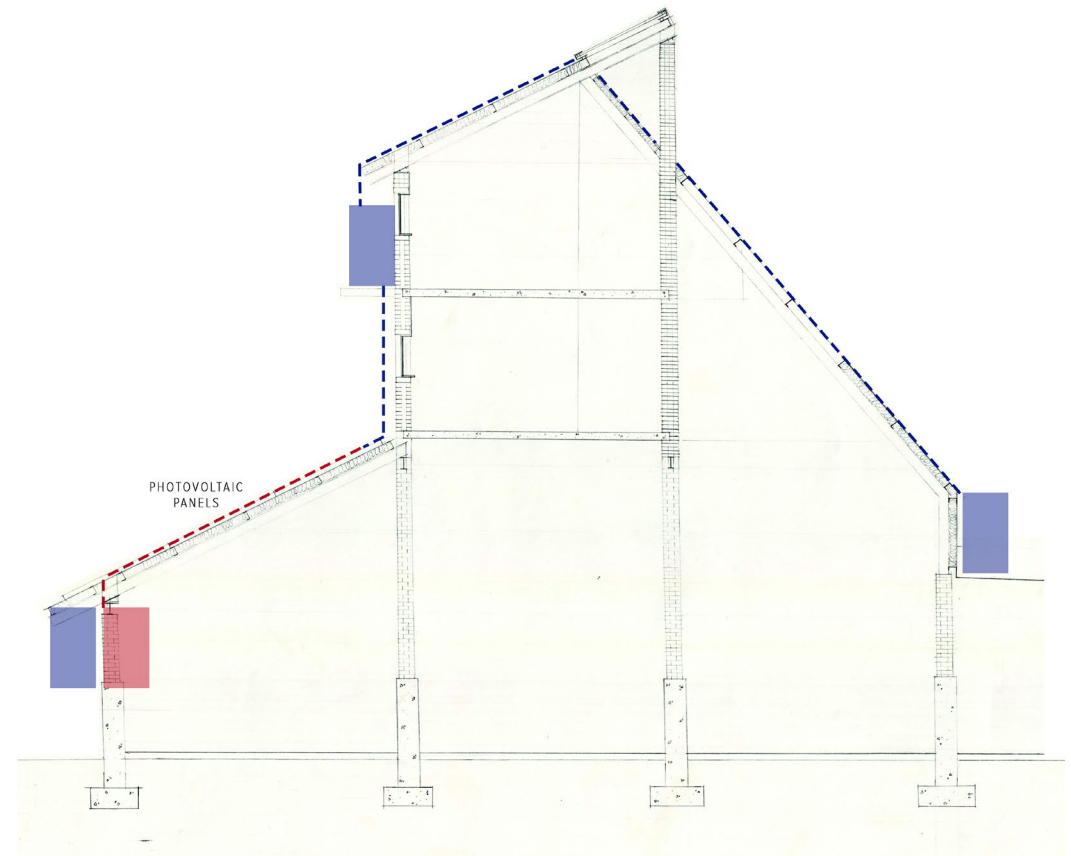


Figure 9.3. Water catchment (Author, 2015)

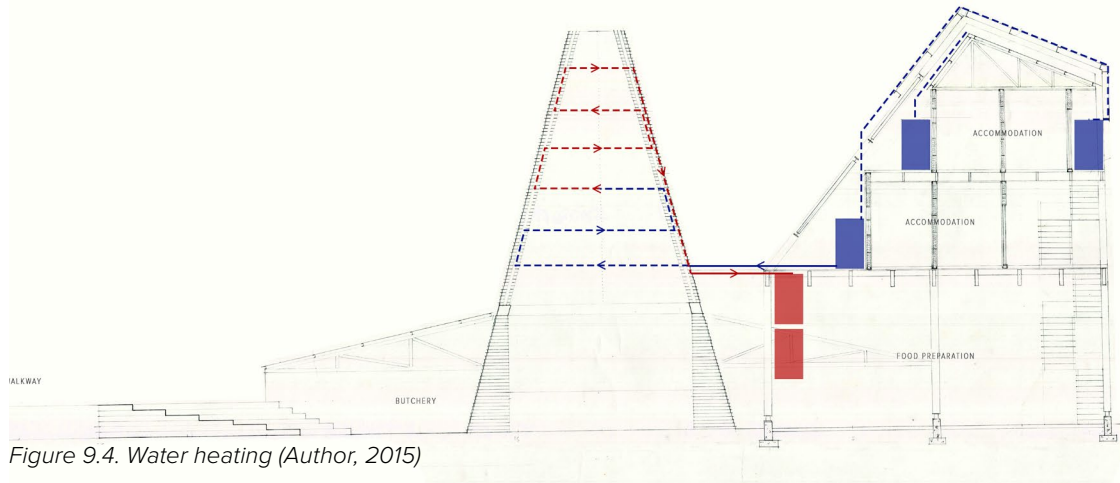


Figure 9.4. Water heating (Author, 2015)

### 9.3.2 | WATER HEATING

Water stored in jojo tanks is pumped through copper coils which are heated by the fire of the braai areas and hot water is stored in insulated tanks. This hot water is used in the restaurant for cooking as well as for cleaning of outdoor areas.

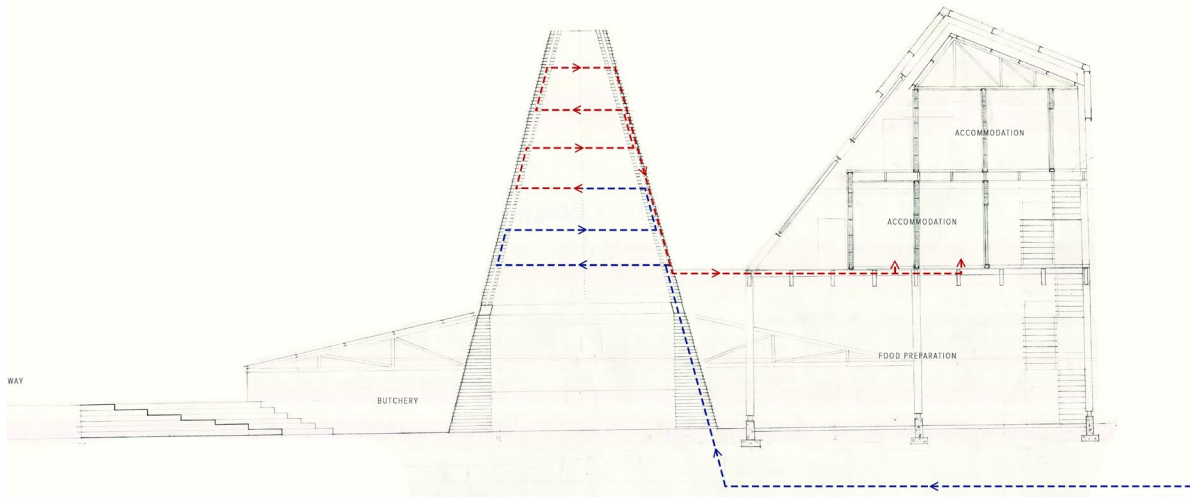


Figure 9.5. Thermal heating (Author, 2015)

### 9.3.3 | THERMAL HEATING

Clean air bought in from geopipes is heated by the furnace and used to warm accommodation spaces when required via adjustable ducts.

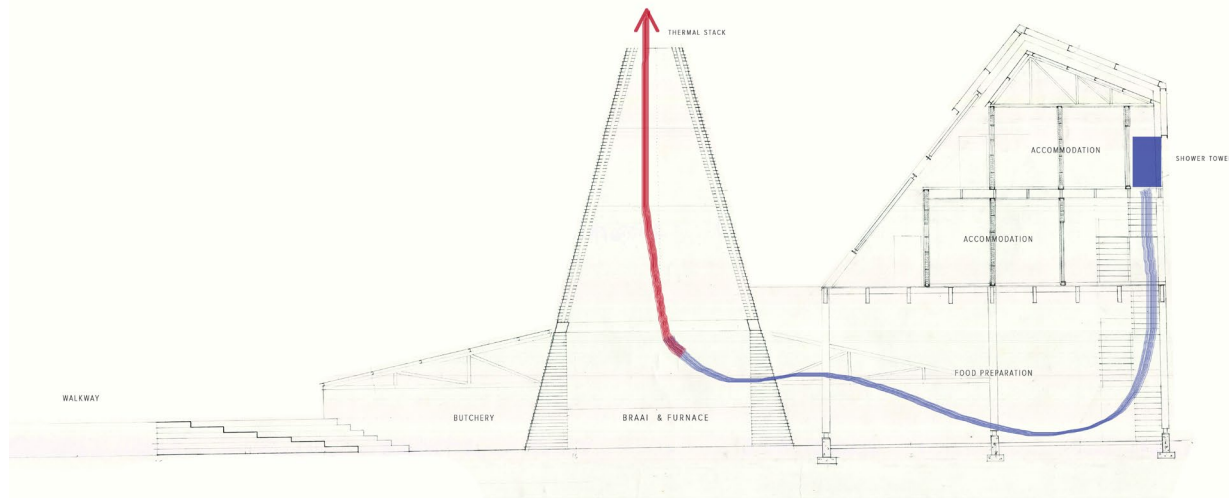


Figure 9.6. Natural ventilation (Author, 2015)

### 9.3.4 | NATURAL VENTILATION

Cool air drops from the shower tower and is drawn up the furnace chimney creating natural ventilation.

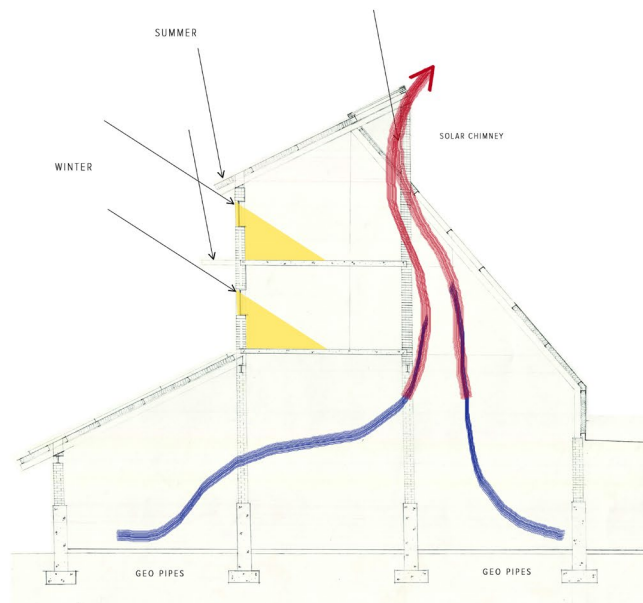


Figure 9.7. Natural ventilation & natural light (Author, 2015)

### 9.3.4 | NATURAL VENTILATION & NATURAL LIGHT

A solar chimney ensures ventilation of meat market. Natural northern light is optimised for office spaces.

## 9.4 | MATERIALITY

	Responds to	Programme	Materiality	Colour	Type	Connection
Small scale, fine grain stereotomic	Historical fabric	Fruit & Veg Market	Brick, bagged plastered	Red face brick with bag plaster concealing joints but revealing brick slightly	What bond ? Different to that of existing	Concealed by plaster – stereotomic
		Ablutions	Exposed brick	Red face brick	What bond ? Different to that of existing	Connections –revealed as in existing urban fabric
Large scale, large grain stereotomic	Belle Ombre	Meat market	Steel	Exposed steel expressing structural quality	Structural members: I beams and H beams	Connections concealed – stereotomic
		Offices	Concrete	Exposed concrete	Precast	Smoothed concrete concealing joints- stereotomic
Small scale tectonic		Pergola	Light steel members	Paint the members, start to conceal the materiality	Non-structural: C-channels and Angles	Connections revealed and concealed – stereotomic to tectonic
Large scale, tectonic	Sub-station	Restaurant	Steel	Exposed steel expressing structural quality	Structural members: I beams and H beams	Connections revealed – tectonic language
		Accommodation	Light weight steel	Exposed steel and panels	Pre-cast light weight steel members	Revealed connections - tectonic
Middle condition between: Stereotomic & tectonic; Fine grain & large grain; Small scale & Large scale	New architectural intervention as mediation point	Fruit and vegetable distribution	Steel (& timber: two materials showing the transition from stereotomic to tectonic)	Exposed steel expressing structural quality	Structural members: I beams and H beams	Revealed
			Timber	Exposed	Used as cladding	Revealed
		Butchery	Masonry walls responding to existing fabric	Red face brick	What bond ? Different to that of existing	Revealed - tectonic
			Light steel members & timber: two materials showing the transition from stereotomic to tectonic	Steel member exposed but concealed by timber in some instances	Non-structural: C-channels and Angles	Concealed - stereotomic

Figure 9.8. Table illustrating materiality (Author, 2015)

# CONCEPTUAL & TECHNICAL APPROACH MATERIALS

# CONSTRUCTION

REVEAL

CONCEAL

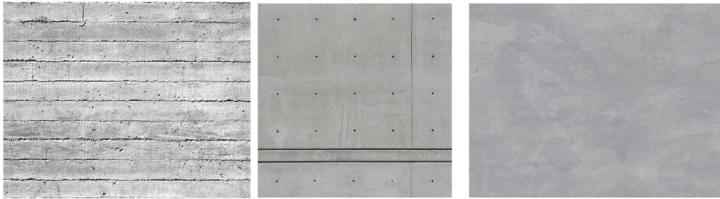
TECTONIC

STEREOTOMIC

[A] MASONRY



[B] CONCRETE



[C] STEEL



[E] MASONRY/  
CONCRETE/STEEL

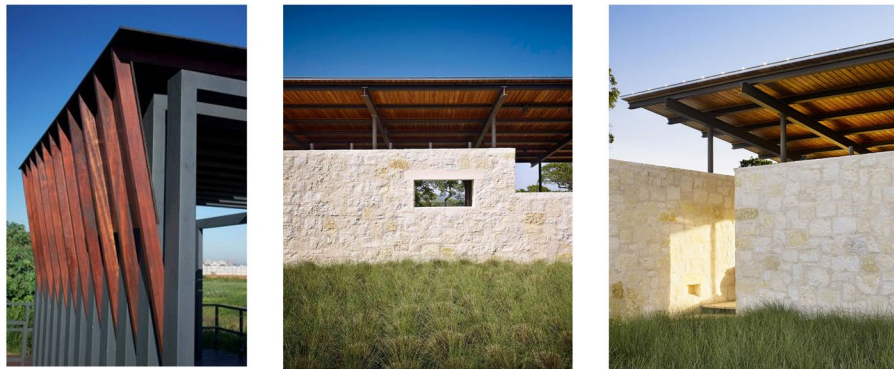


Figure 9.10. Conceptual & technical approach  
(Author, 2015)



# 9.6 | CONSTRUCTION

CONCEAL

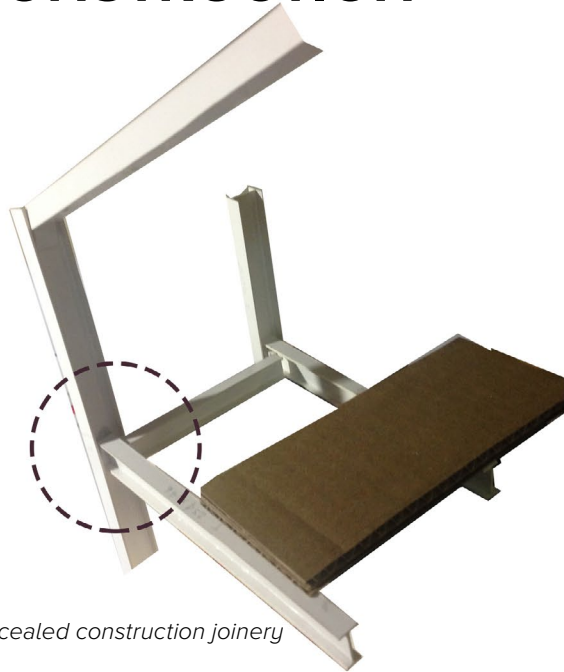


Figure 9.11. Concealed construction joinery (Author, 2015)

REVEAL



Figure 9.15. Revealed construction joinery (Author, 2015)

column - footing

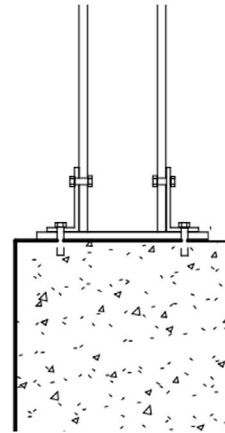


Figure 9.12. Concealed construction footing detail (Author, 2015)

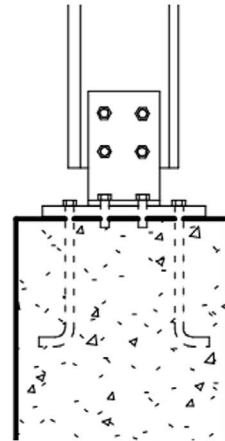


Figure 9.16. Revealed construction footing detail (Author, 2015)

column - beam

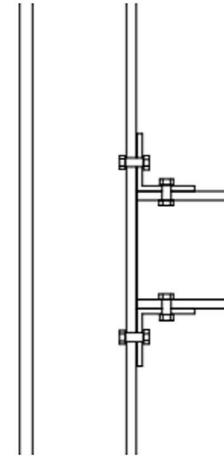


Figure 9.13. Concealed construction column detail (Author, 2015)

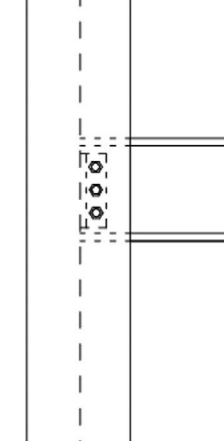


Figure 9.17. Revealed construction column detail (Author, 2015)

beam - beam

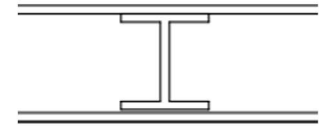


Figure 9.14. Concealed construction beam detail (Author, 2015)

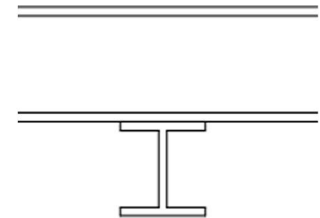
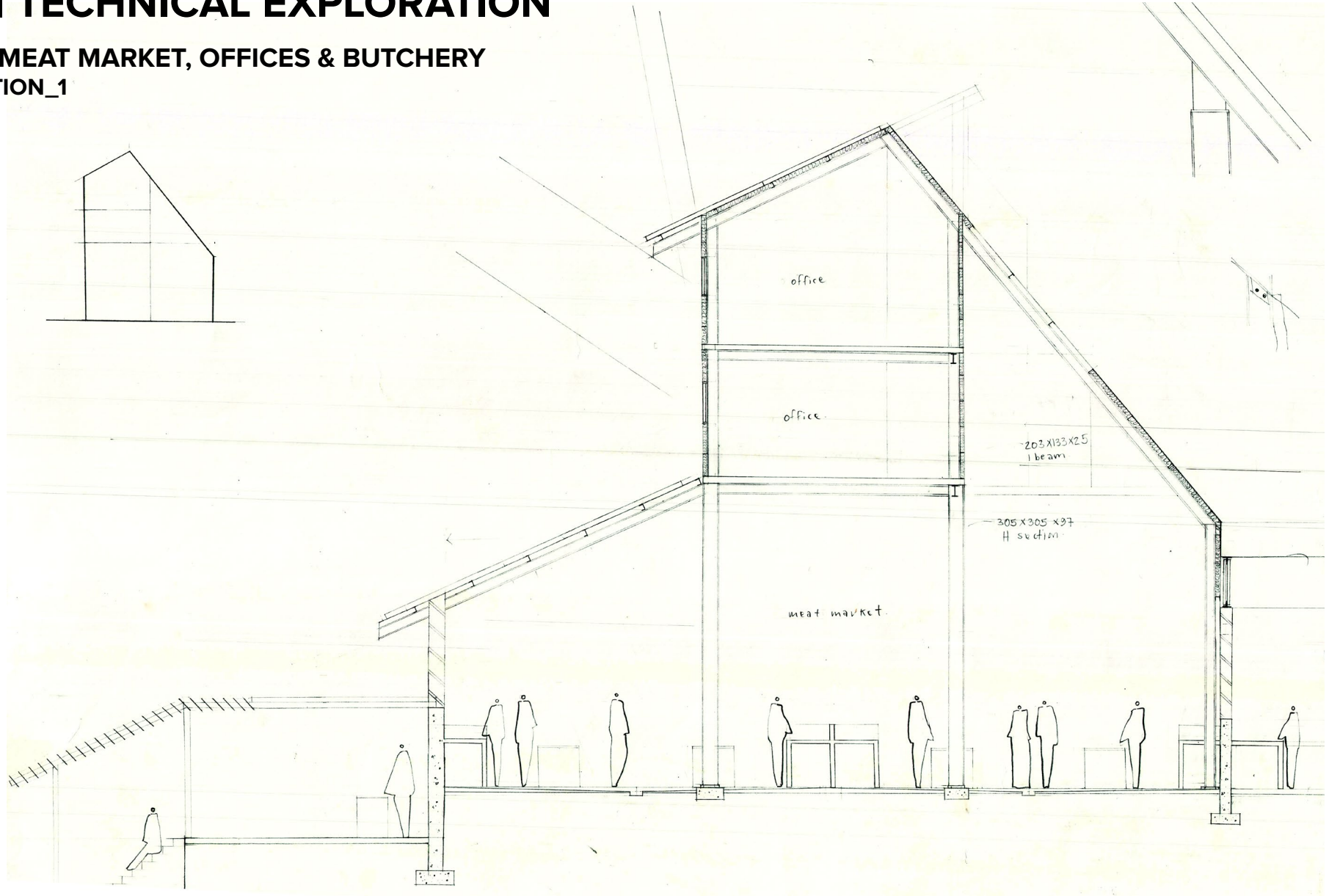


Figure 9.18. Revealed construction beam detail (Author, 2015)

# 9.7 | TECHNICAL EXPLORATION

## 9.7.1 | MEAT MARKET, OFFICES & BUTCHERY ITERATION\_1



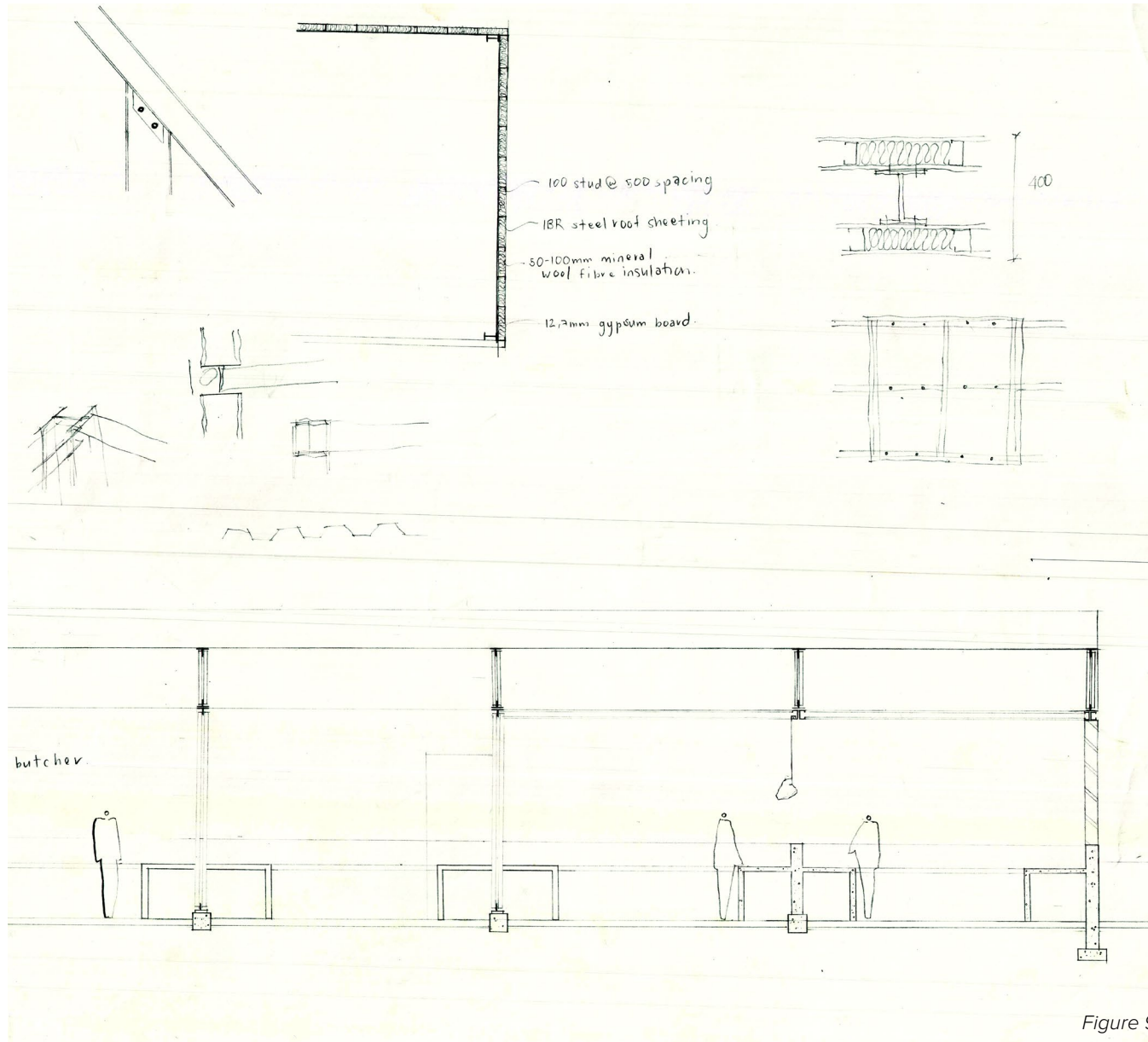


Figure 9.19. Meat market, offices & butchery: Iteration\_1

# 9.7.1 | MEAT MARKET & OFFICES ITERATION\_2

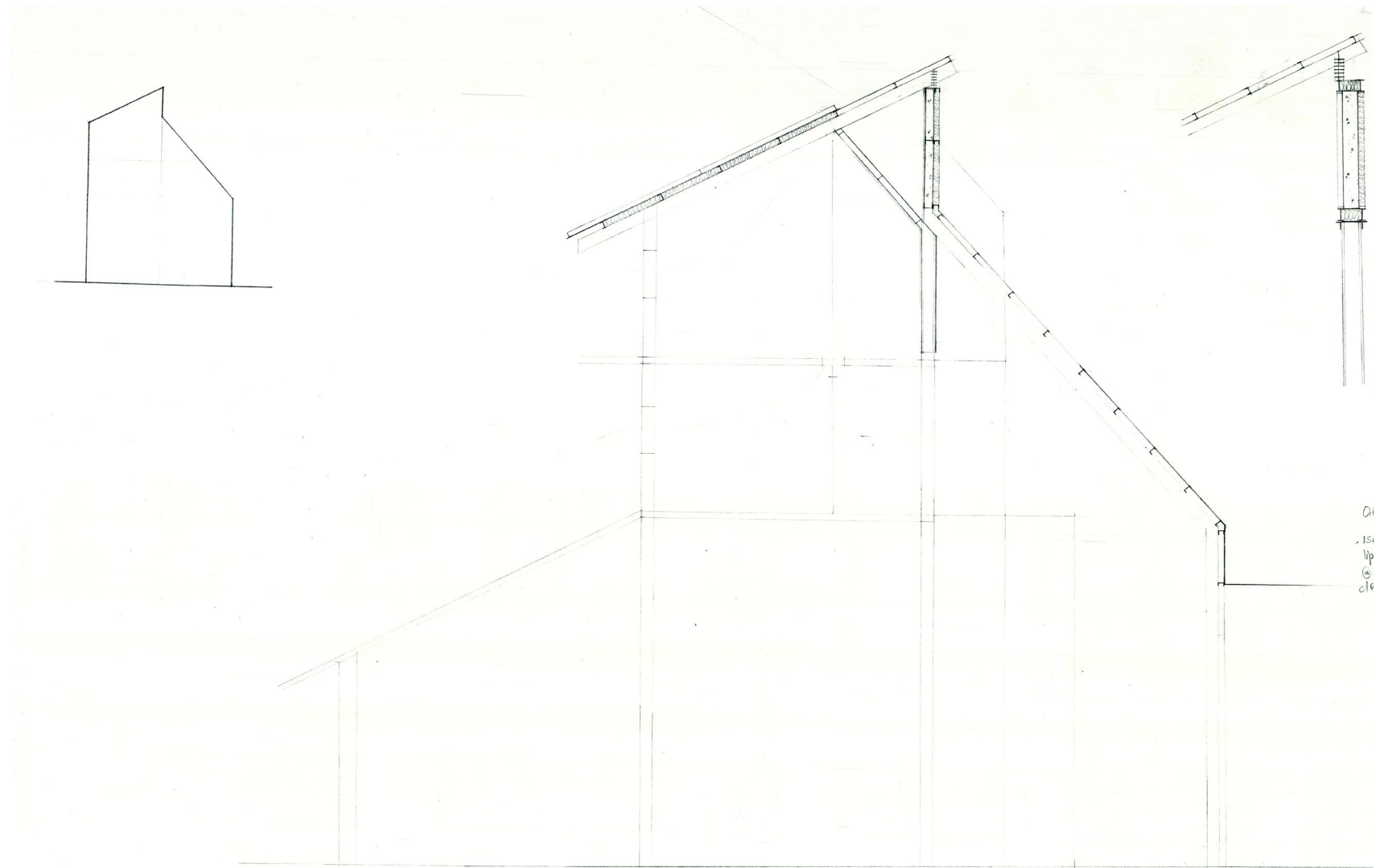


Figure 9.20. Meat market & offices: Iteration\_2

ITERATION\_3

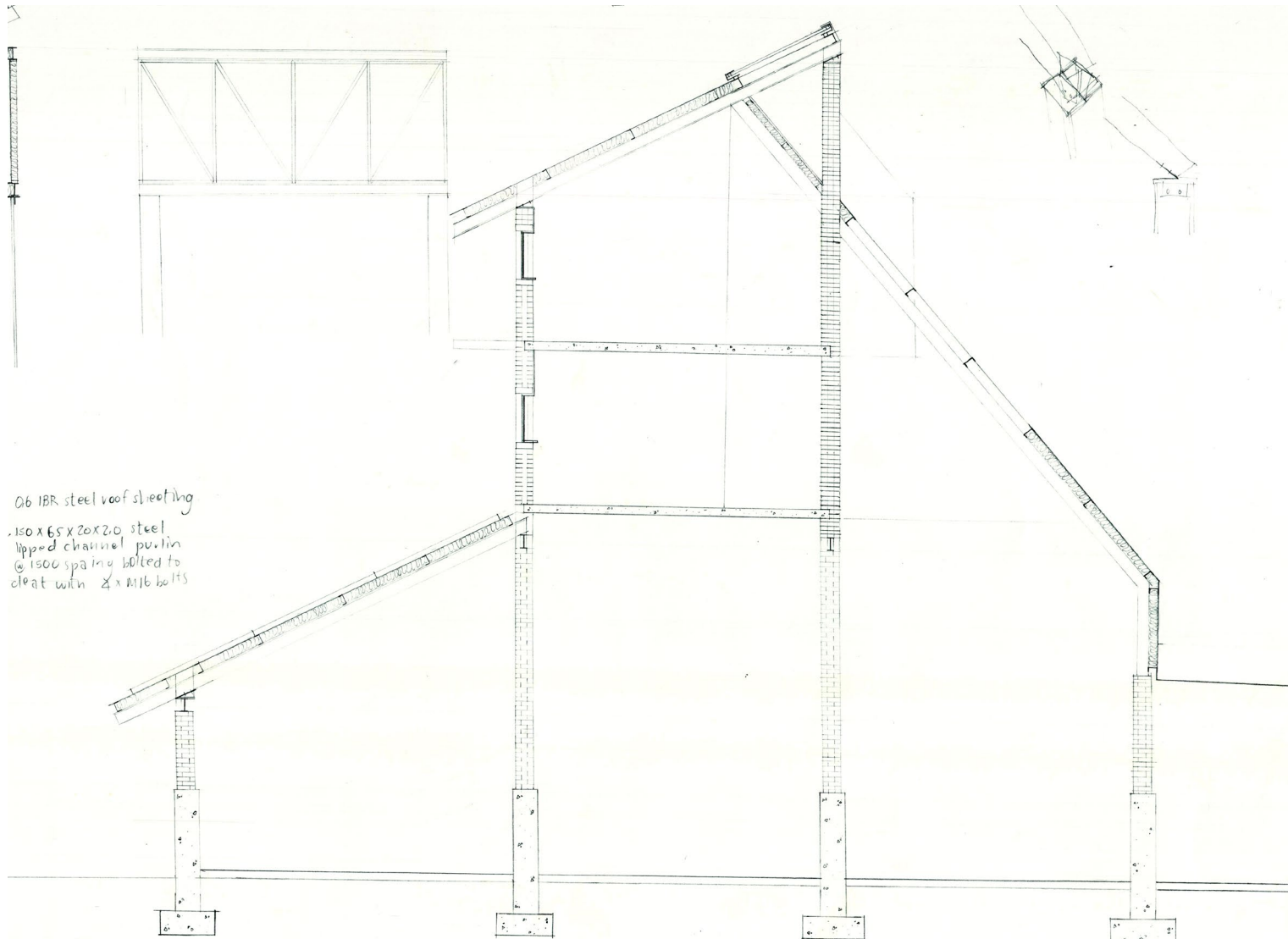


Figure 9.21. Meat market & offices: Iteration\_3

# 9.7.2 | MEAT MARKET & OFFICES ITERATION\_4

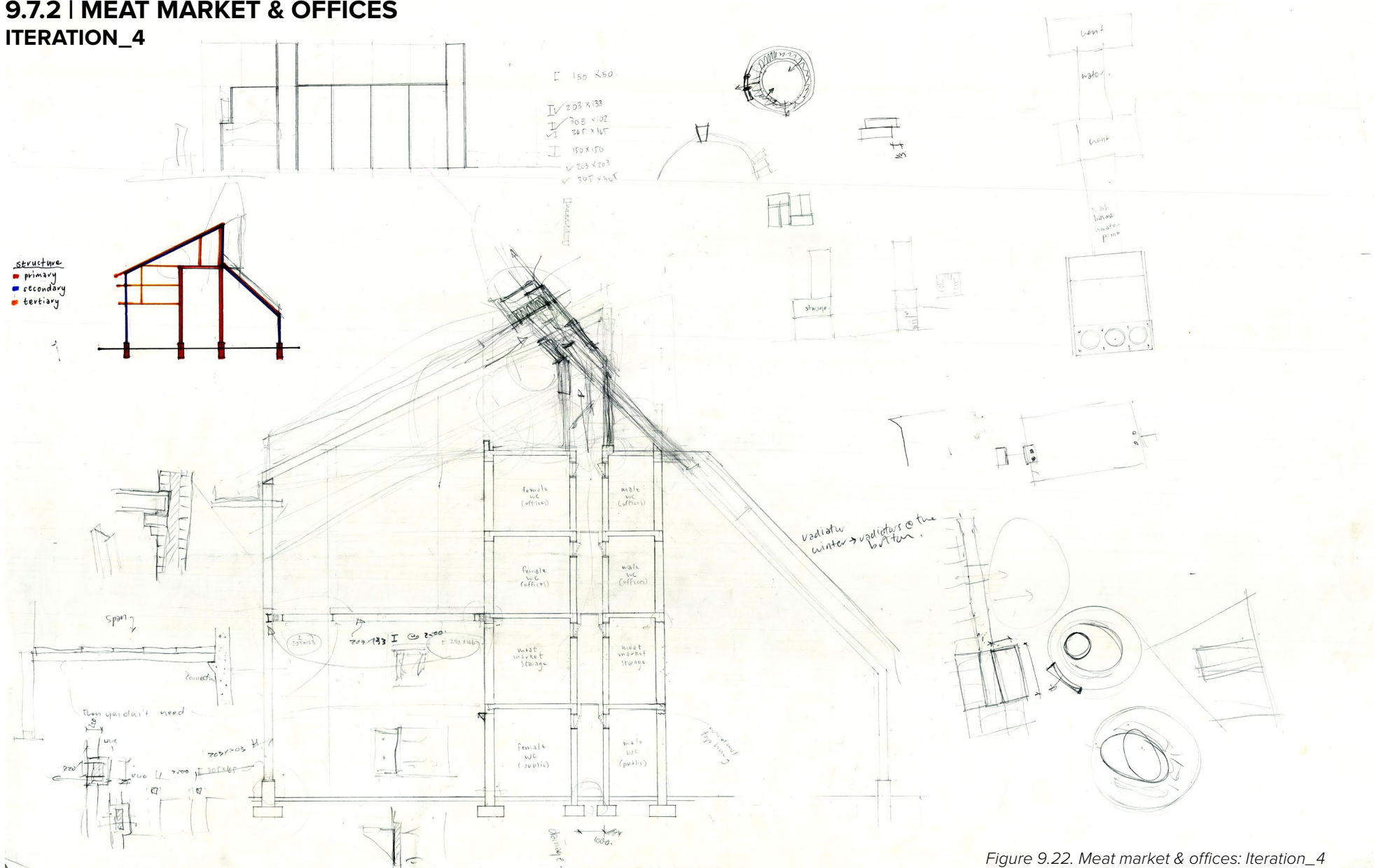


Figure 9.22. Meat market & offices: Iteration\_4

### 9.7.3 | FURNACE & ACCOMMODATION ITERATION\_1

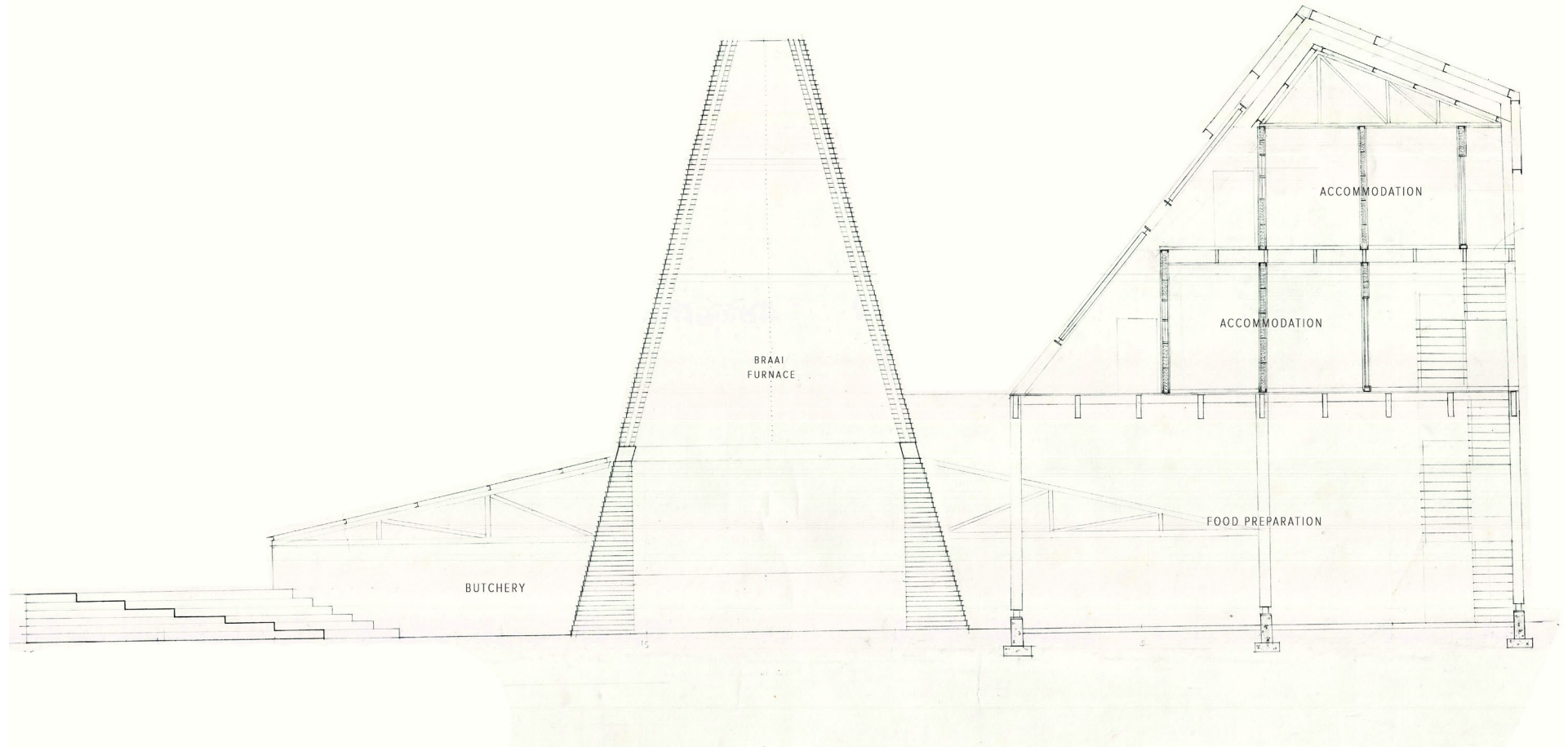
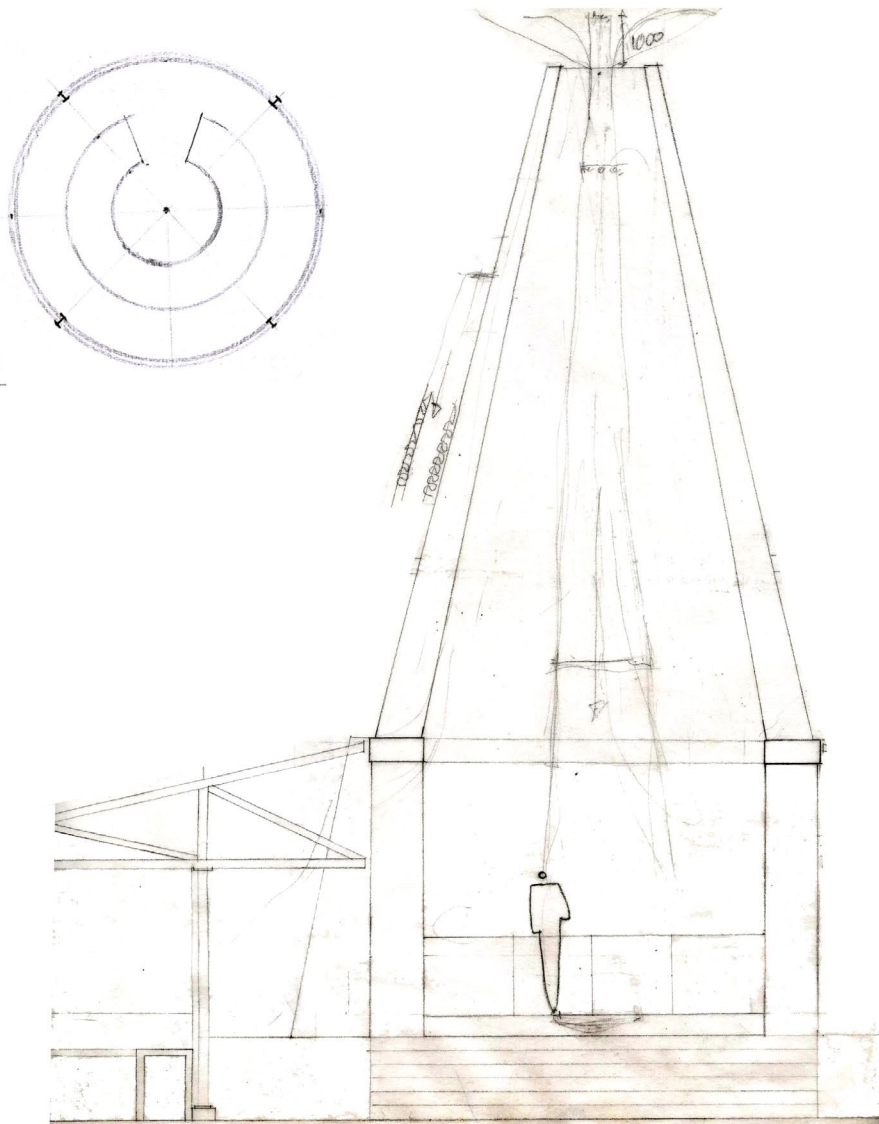


Figure 9.23. Furnace & accommodation: Iteration\_1

## 9.7.2 | THE FURNACE

1



### Central braai area

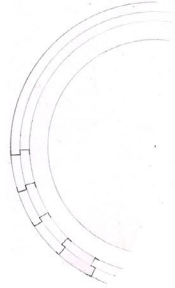
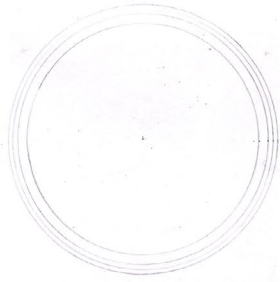
Cylindrical shape:  
a) encourages sociable braaing  
activity of cookers  
b) Structurally ...

Large chimney:  
a) as landmark  
b) to ensure effective removal  
of smoke

Figure 9.24. Furnce: Iteration\_1



2



### Ventilation

Using the heat generated by the fire chimney to ventilate surrounding spaces

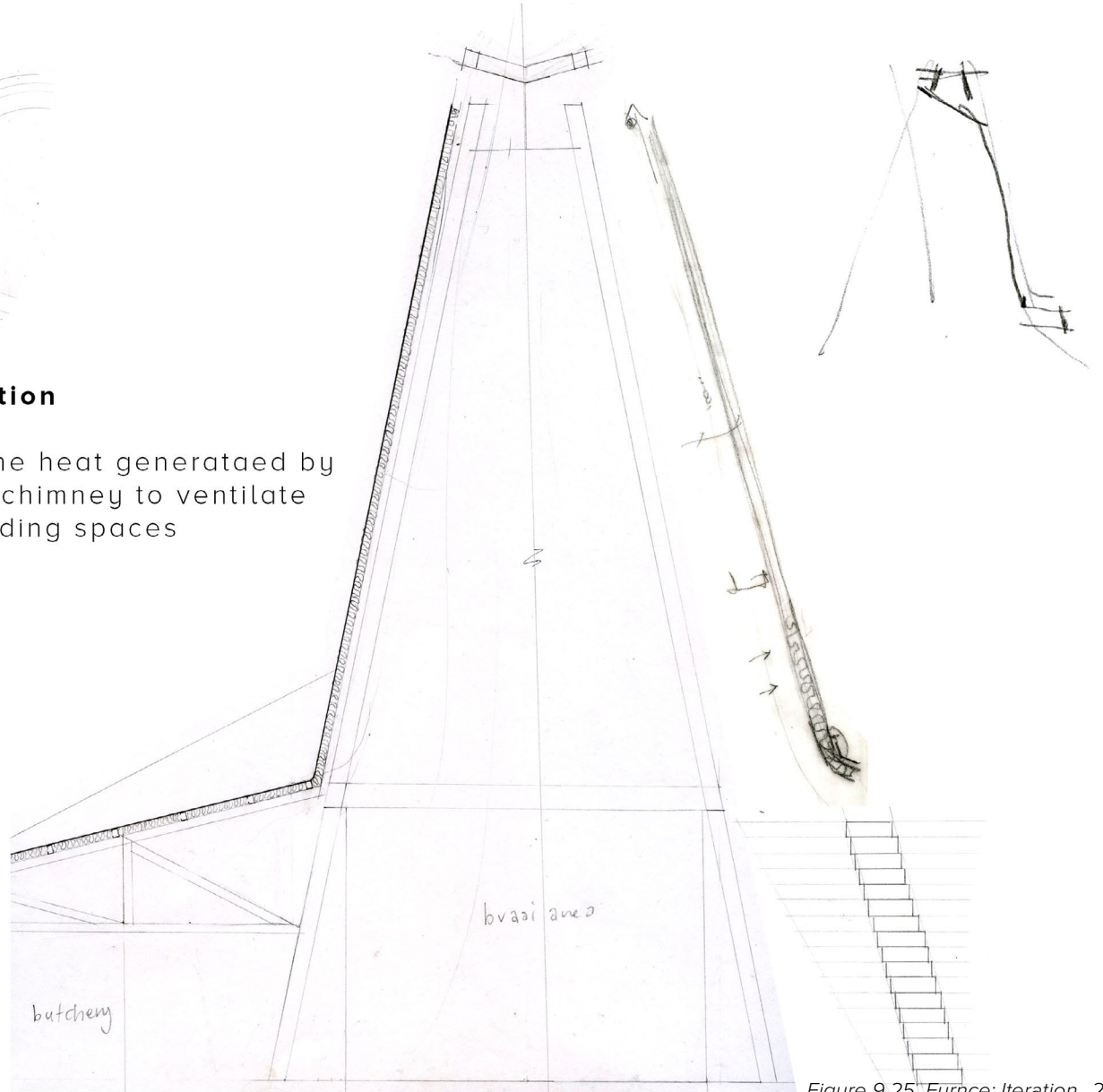
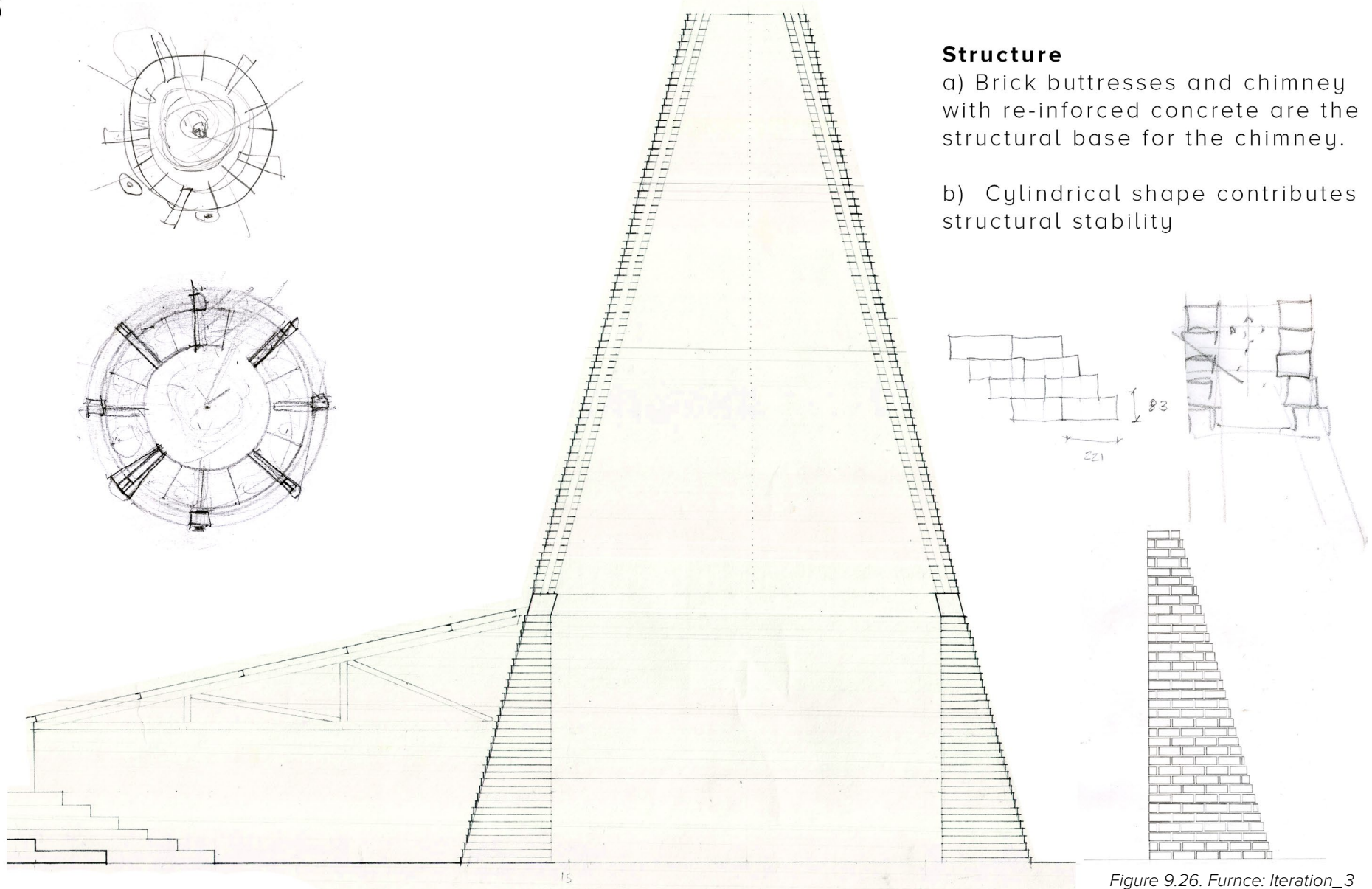


Figure 9.25. Furnce: Iteration\_2

3



**Structure**

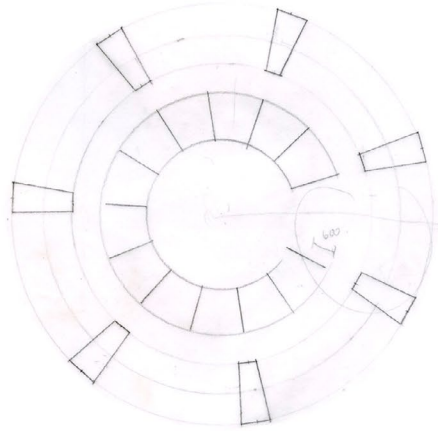
a) Brick buttresses and chimney with re-inforced concrete are the structural base for the chimney.

b) Cylindrical shape contributes structural stability

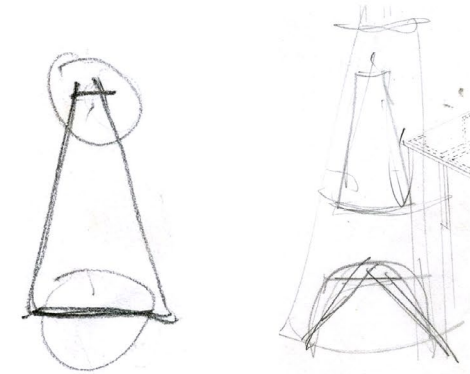
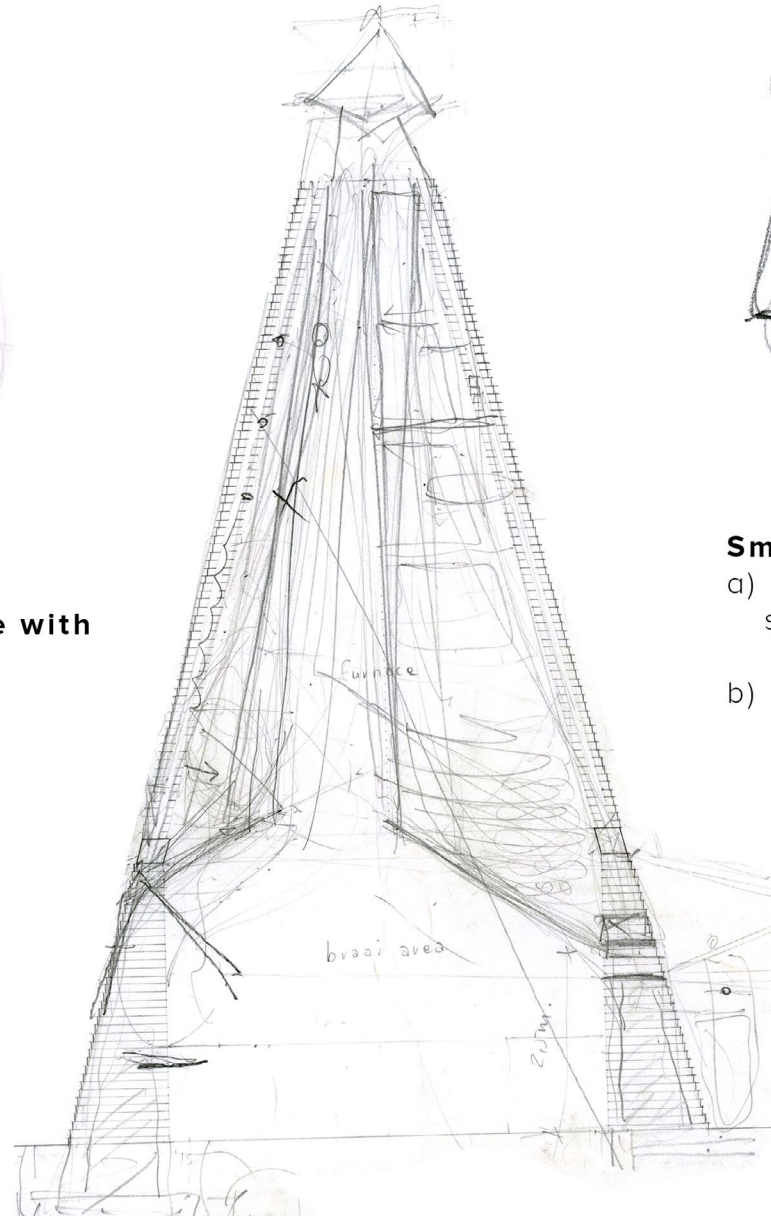
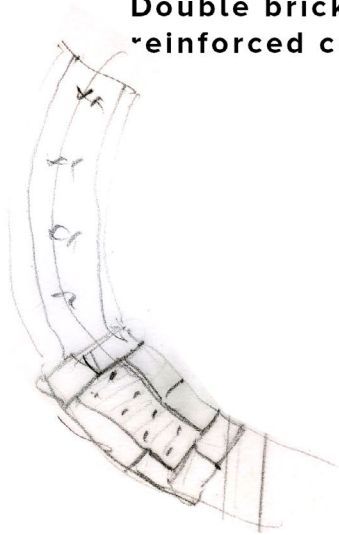
Figure 9.26. Furnce: Iteration\_3

4

to



**Double brick course with reinforced concrete**

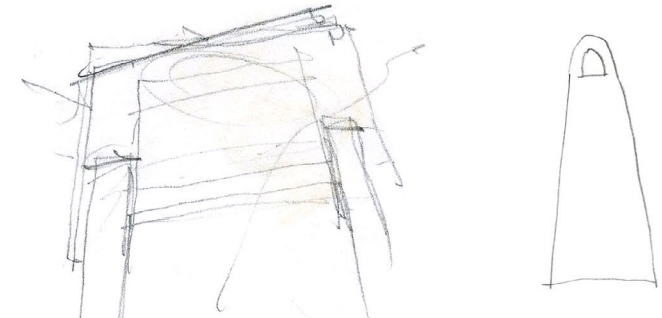
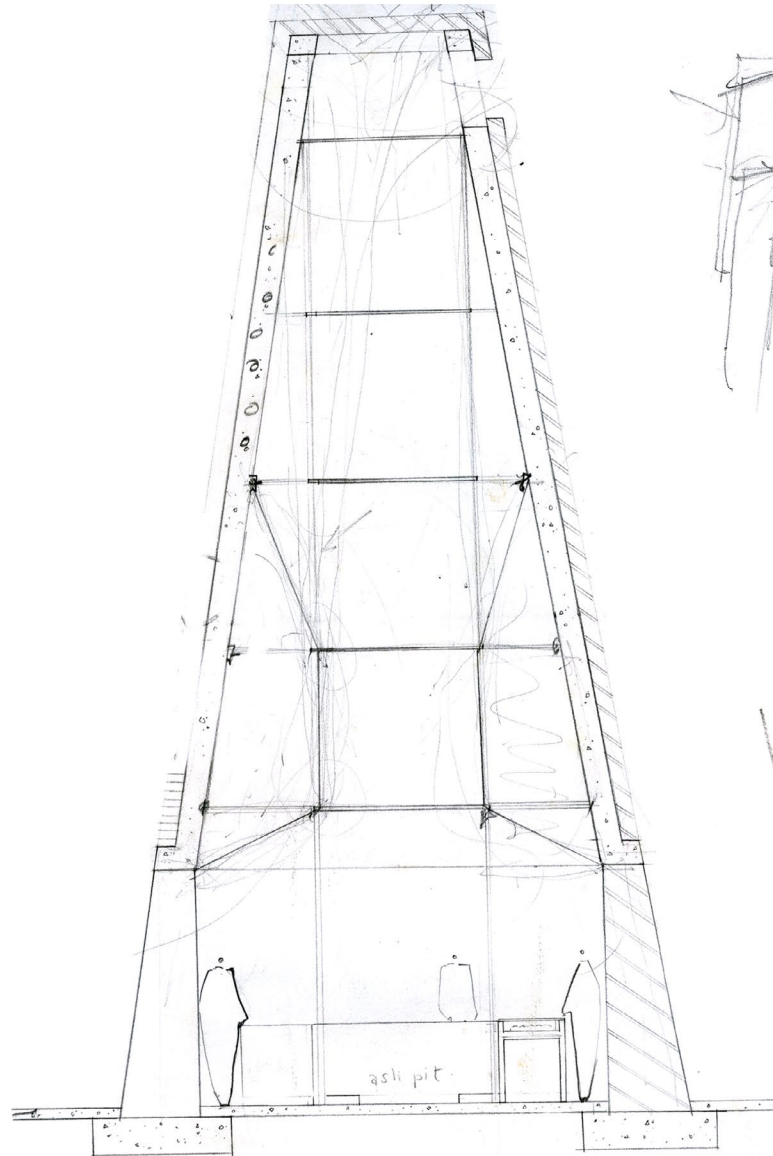
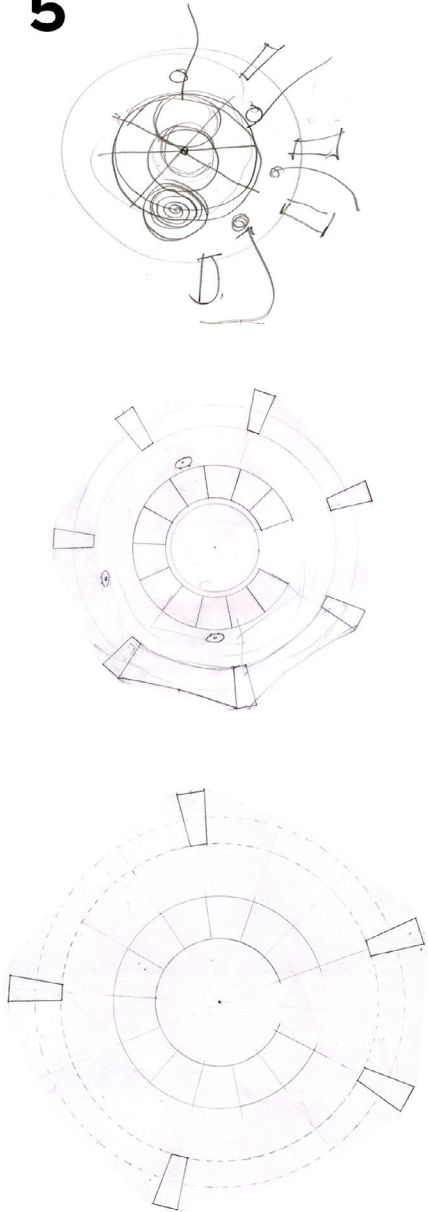


**Smoke chimney design**

- a) Creates an overhead cooking shelf
- b) Ensures effective smoke removal by creating the venturi effect

Figure 9.27. Furnce: Iteration\_4

5



**Steel capping**

a) attaches to brick chimney providing protection from rain

b) contributes to the venturi effect by creating pressure difference.

**Pre-cast cylindrical concrete form**

a) Brick shelf concols concrete materiality

b) Complicated concrete form

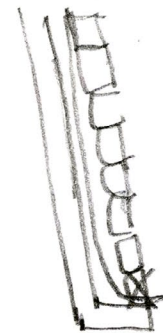


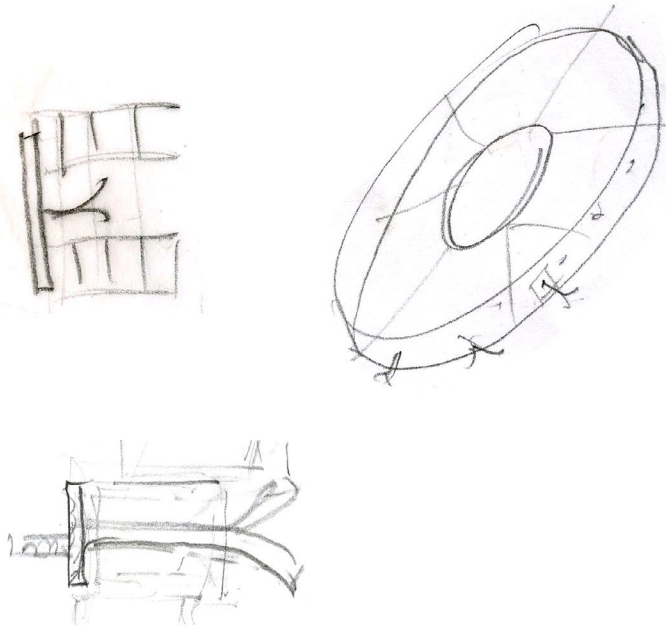
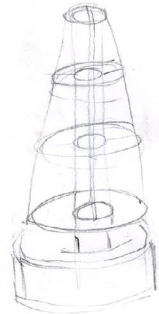
Figure 9.28. Furnce: Iteration\_5

6

**Steel chimney frame**

a) Provides frame on which steel chimney sheeting is attached - sheet material easily cleaned.

b) Copper pipes heat up in the fire and steel frame creates space within the chimney for hot water geyser storage.



7

**Corbelled brick**

a) assists chimney shape for venturi effect

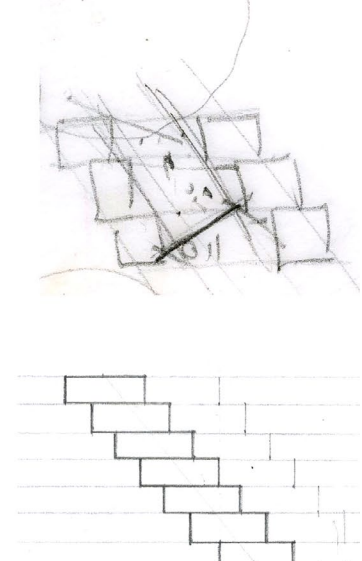
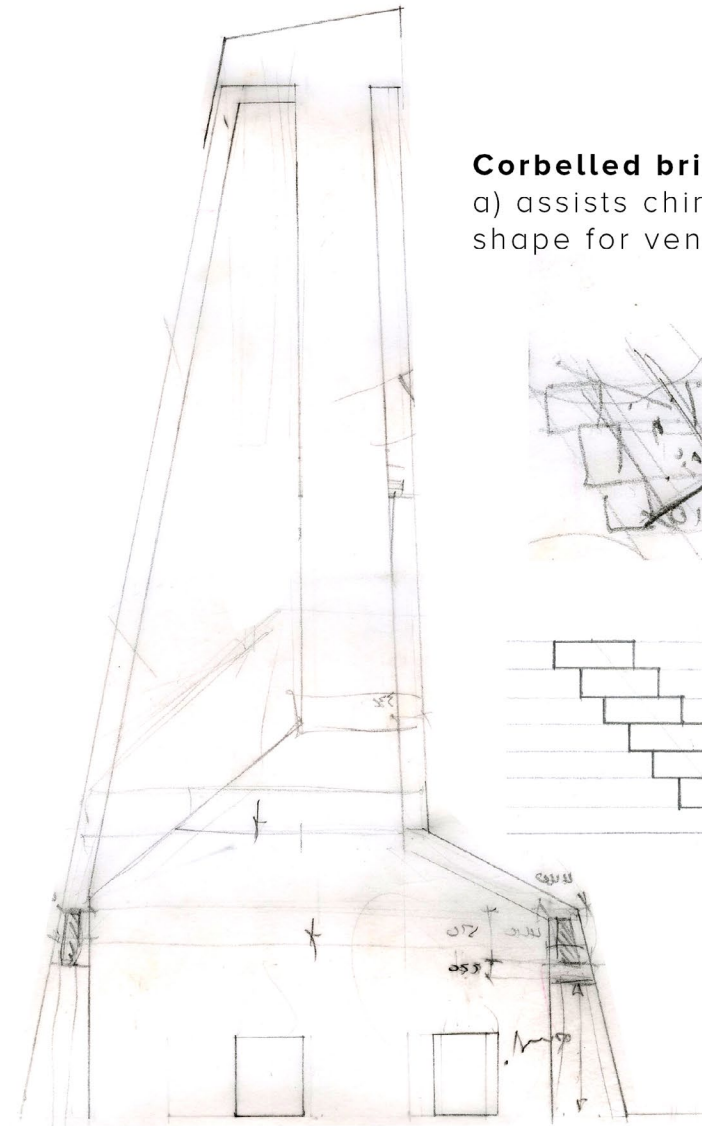


Figure 9.29. Furnce: Iteration\_6 & 7

8

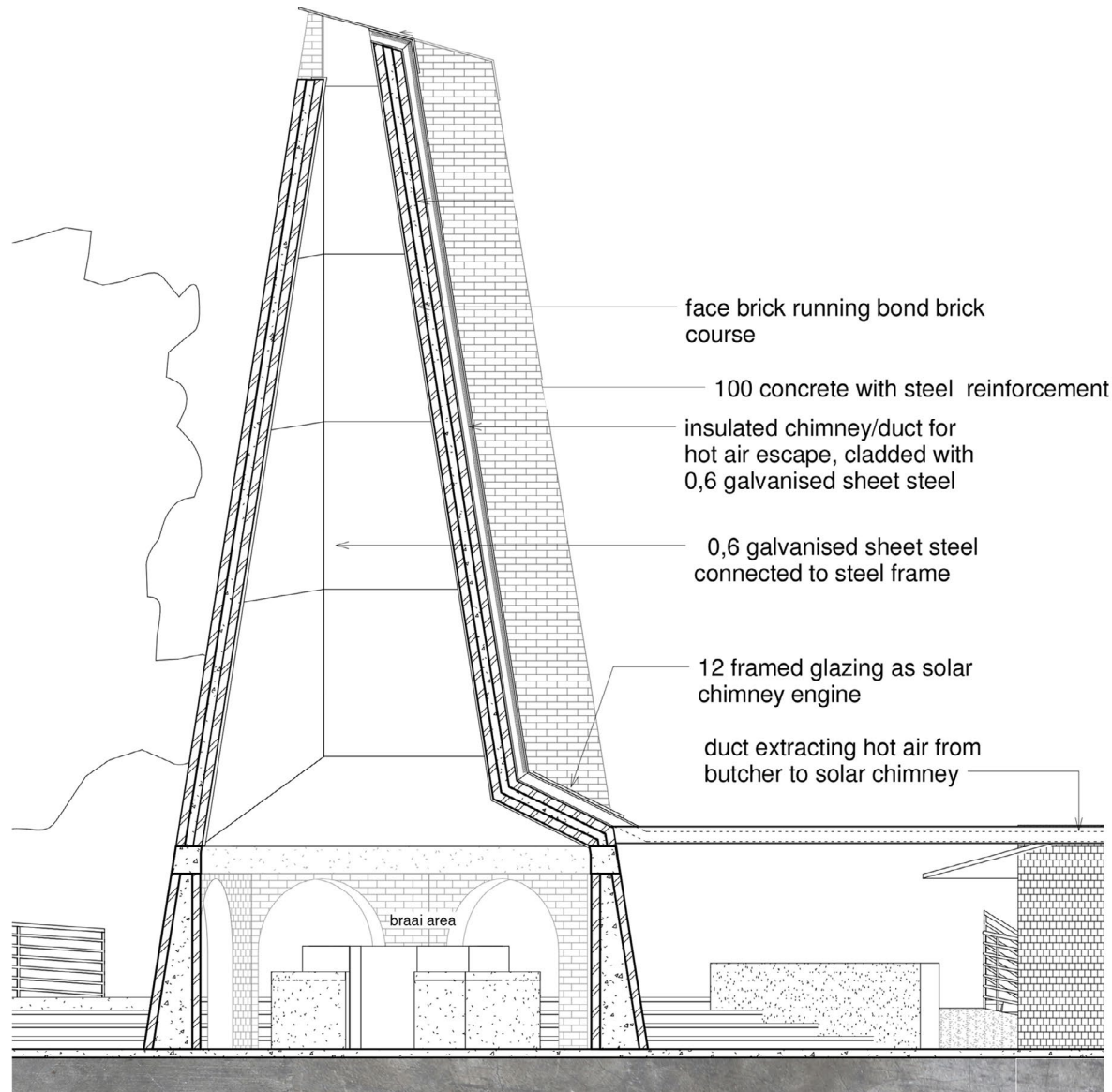


Figure 9.30. Furnce: Iteration\_8

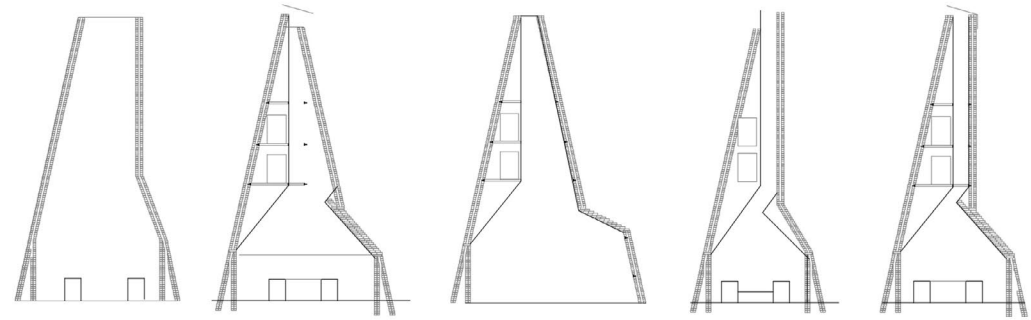
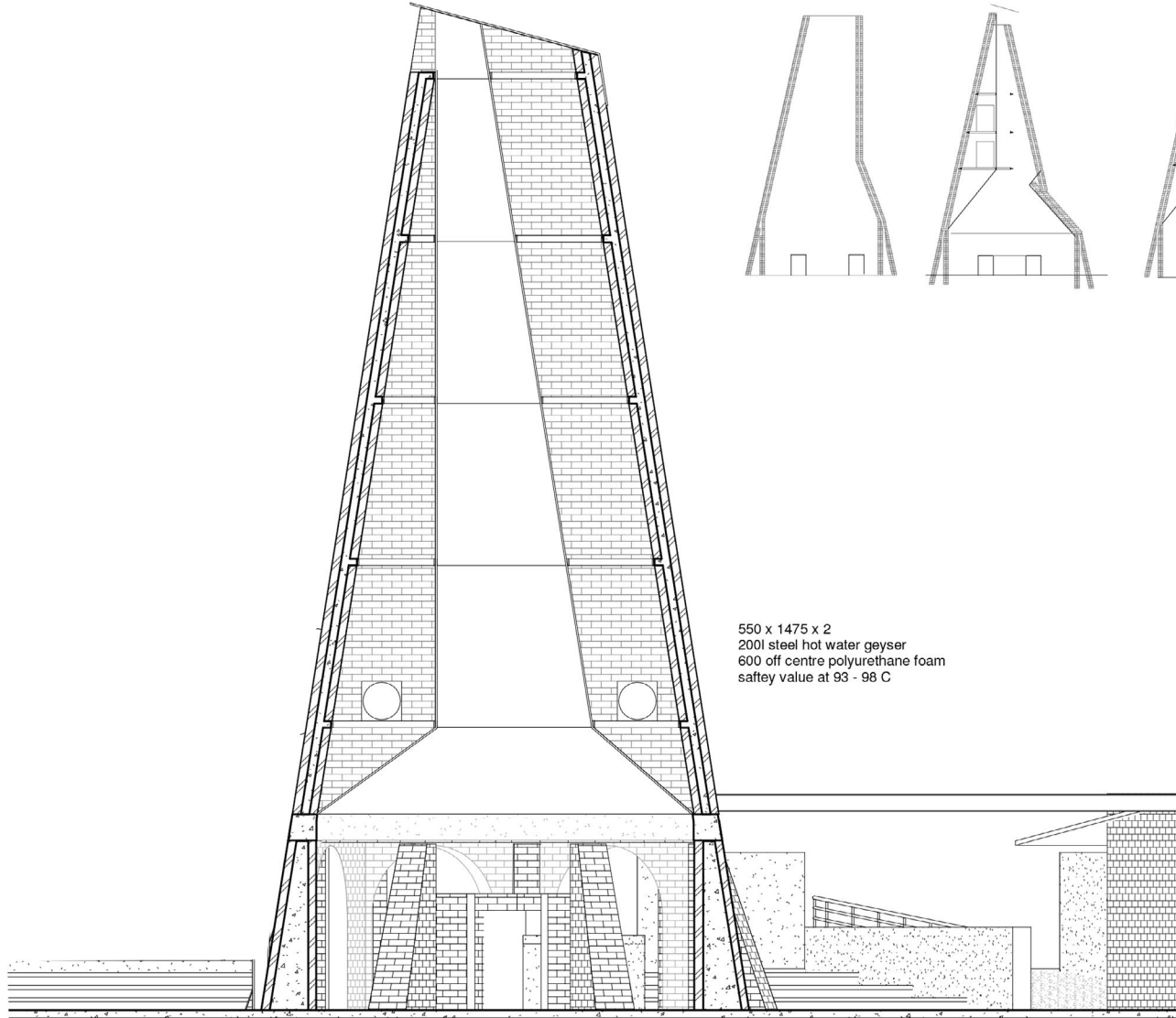
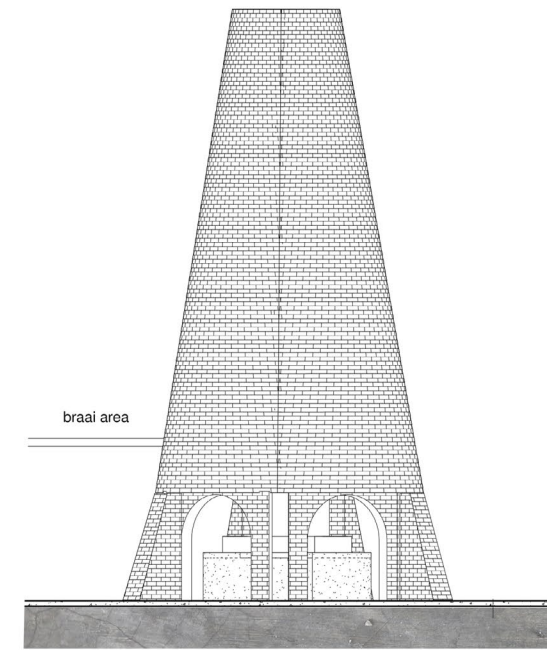


Figure 9.32. Furnce iterations



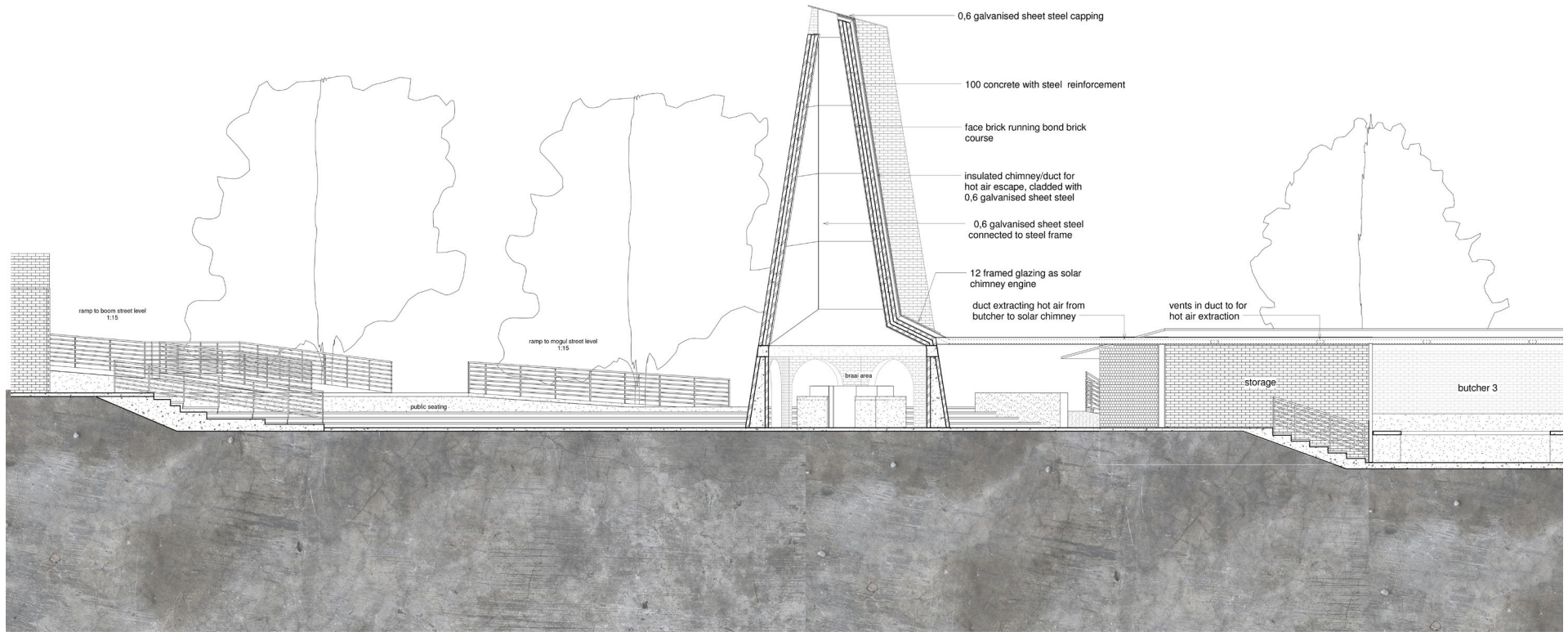
550 x 1475 x 2  
200l steel hot water geyser  
600 off centre polyurethane foam  
saftey value at 93 - 98 C



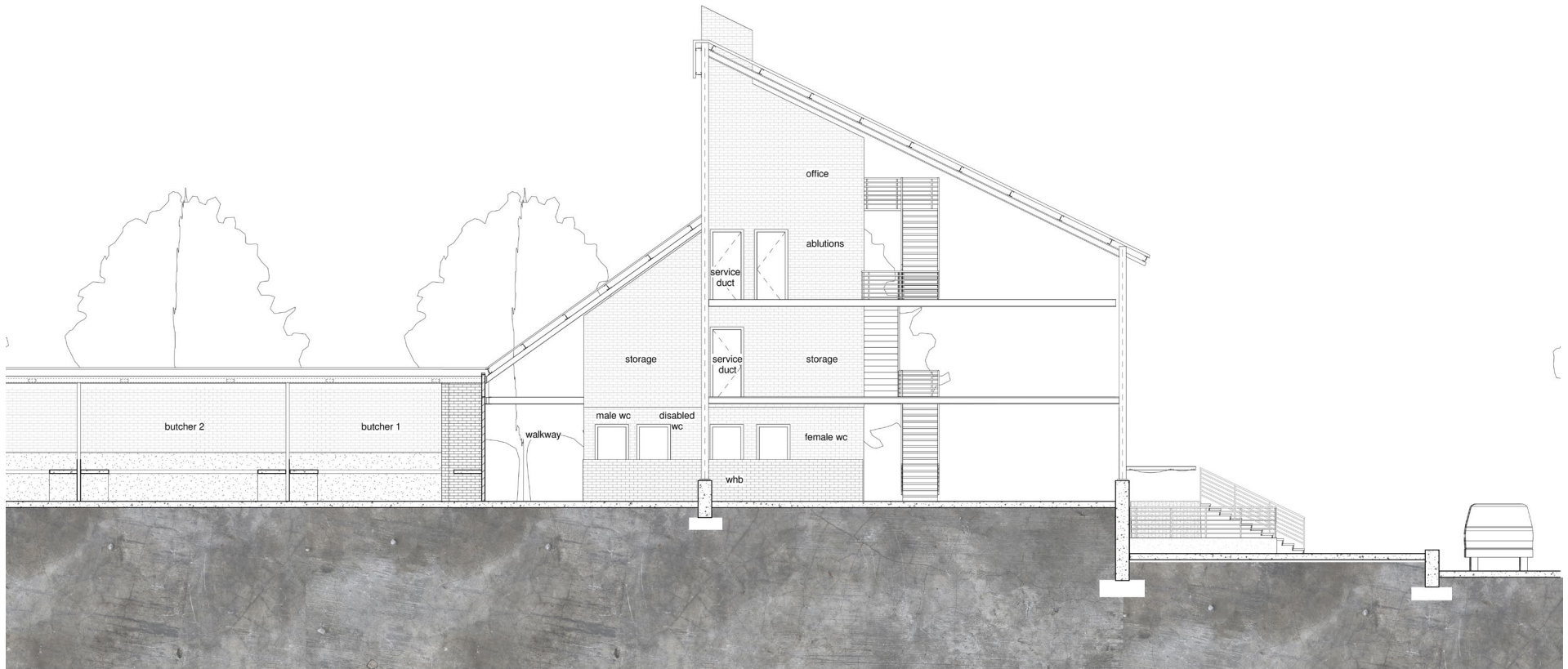
braai area

Figure 9.33. Furnce elevation

Figure 9.31. Furnce: Iteration\_Chimney

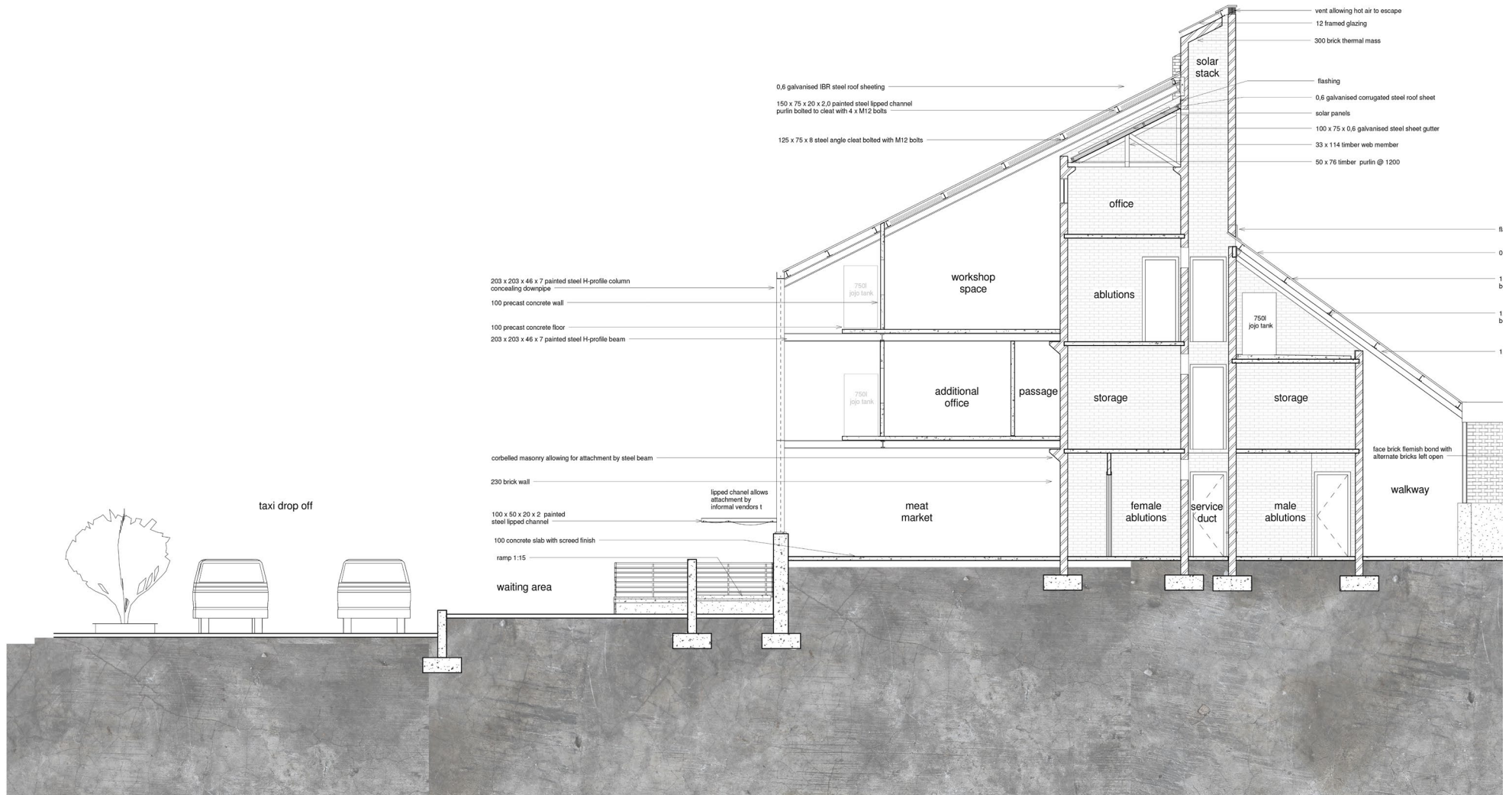


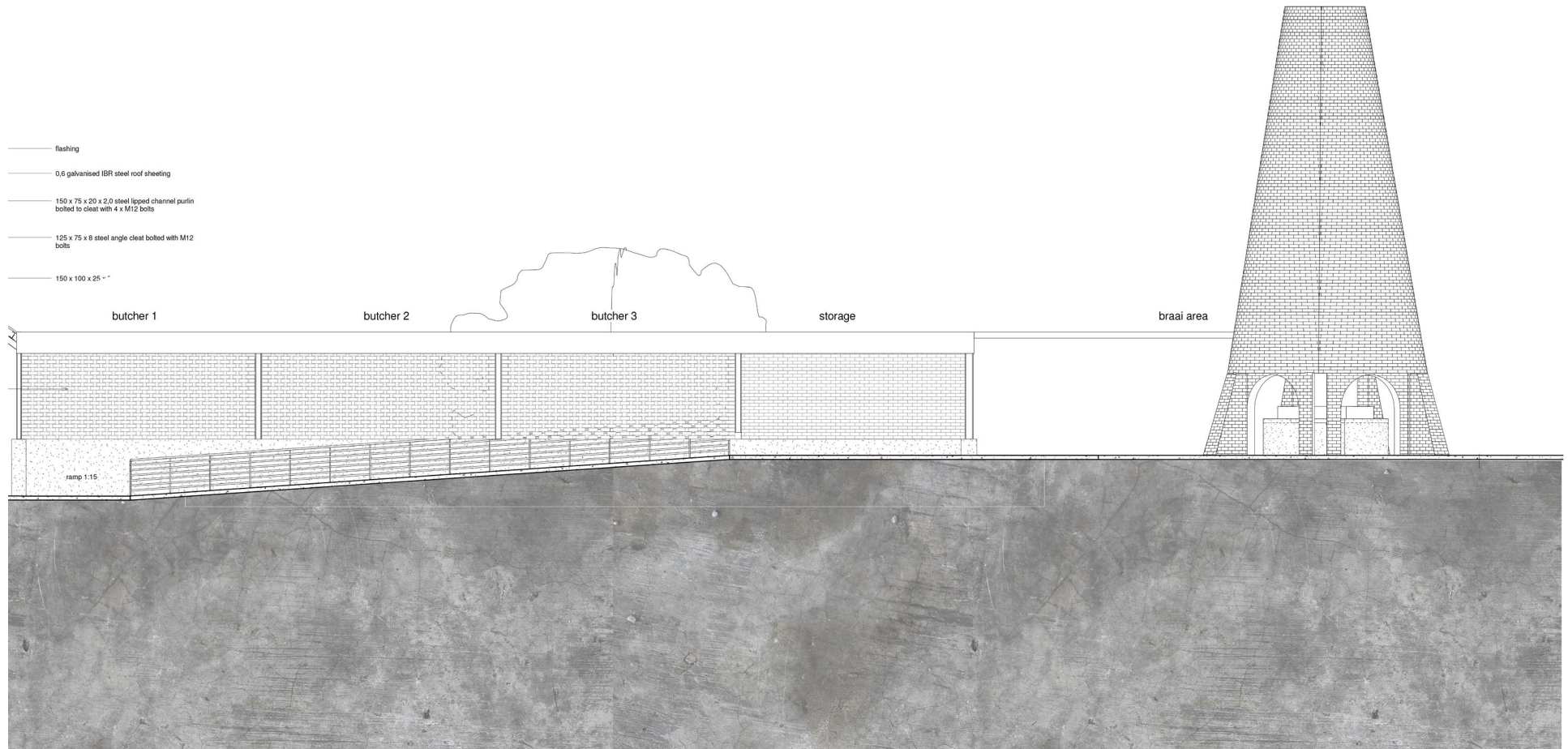




SECTION B-B  
1:50

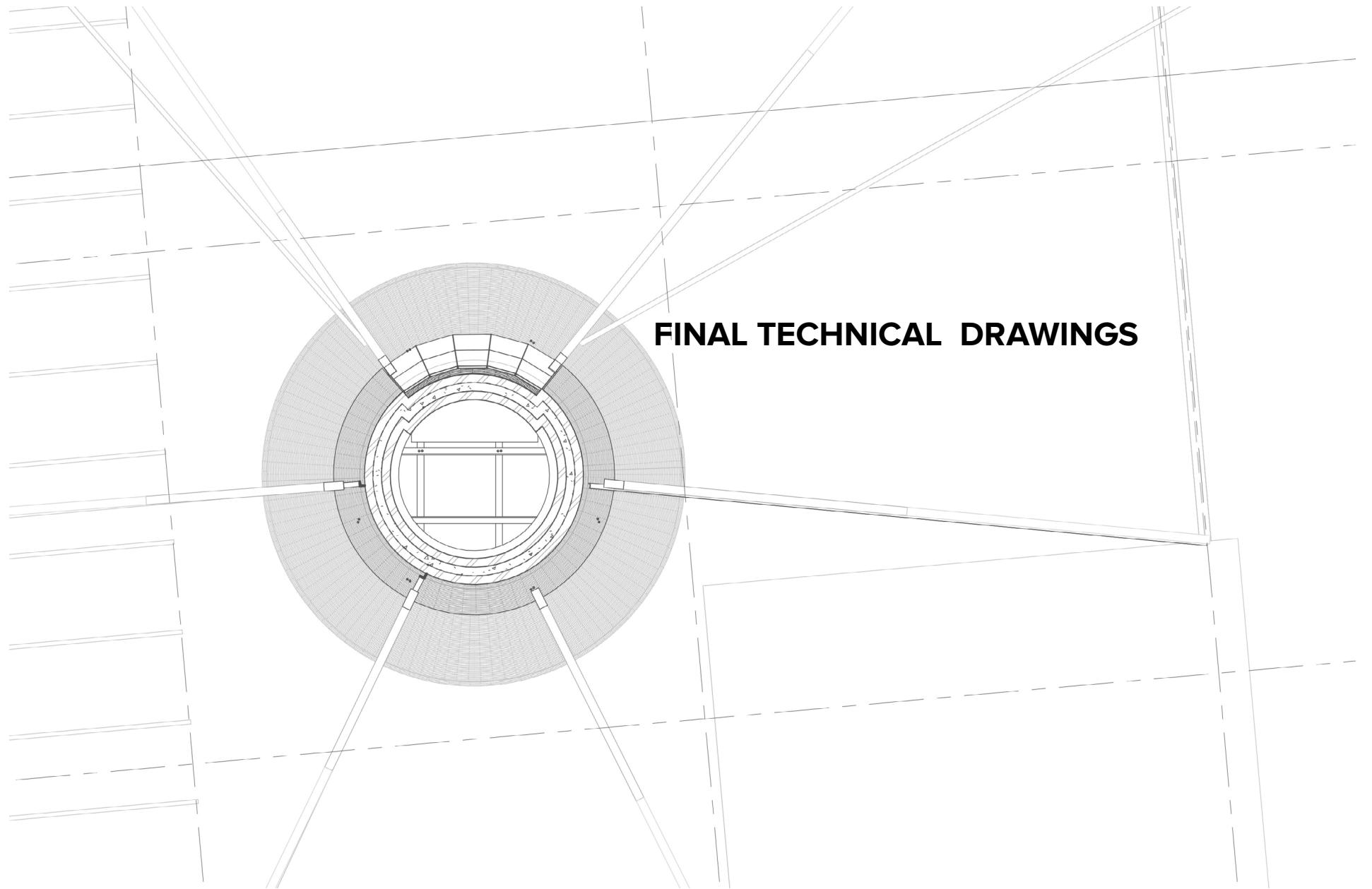
Figure 9.34. Section: furnace, butchery, meat market





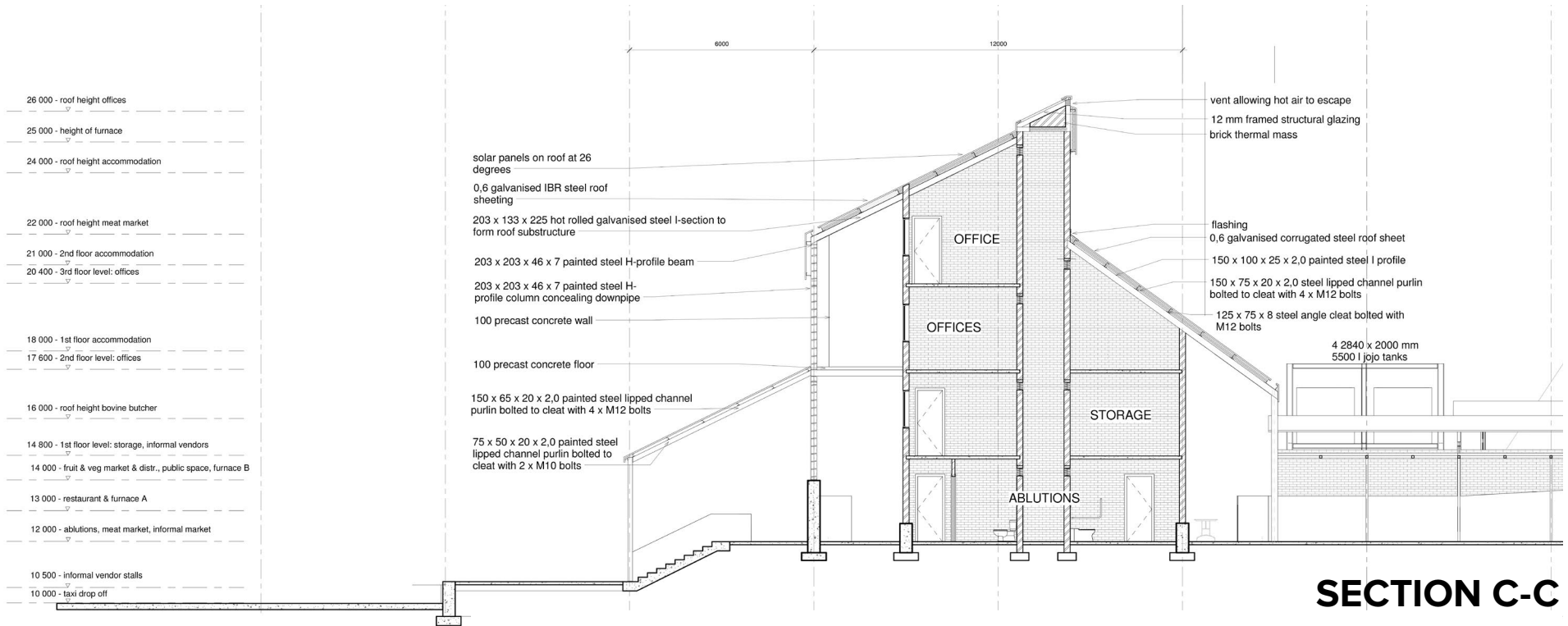
SECTION A-A  
1:50

Figure 9.35. Section: taxi stop, offices, informal market



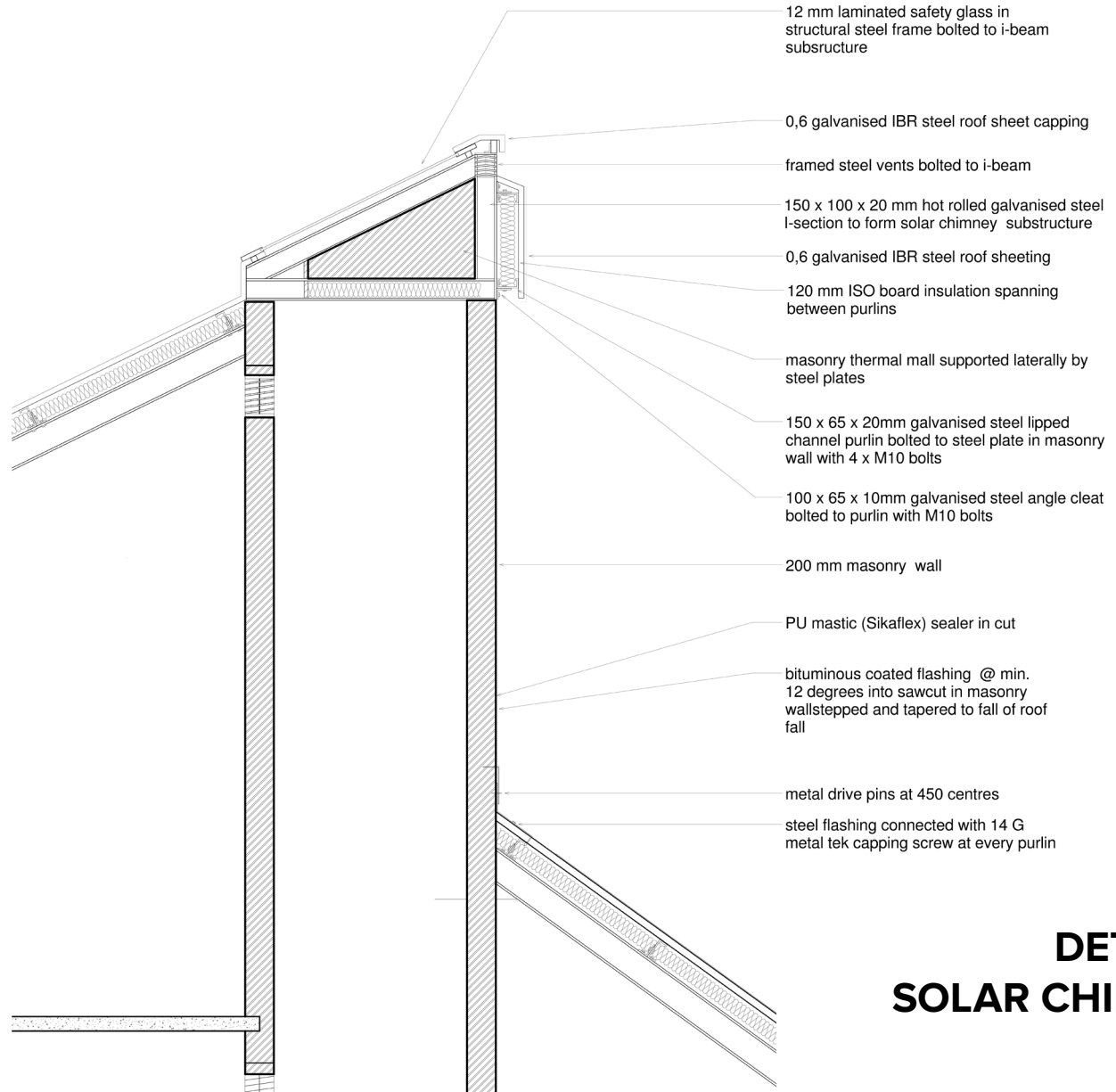


**TECH PLAN**  
**1:100**



- 26 000 - roof height offices
- 25 000 - height of furnace
- 24 000 - roof height accommodation
- 22 000 - roof height meat market
- 21 000 - 2nd floor accommodation
- 20 400 - 3rd floor level: offices
- 18 000 - 1st floor accommodation
- 17 600 - 2nd floor level: offices
- 16 000 - roof height bovine butcher
- 14 800 - 1st floor level: storage, informal vendors
- 14 000 - fruit & veg market & distr., public space, furnace B
- 13 000 - restaurant & furnace A
- 12 000 - ablutions, meat market, informal market
- 10 500 - informal vendor stalls
- 10 000 - taxi drop off

**SECTION C-C  
OFFICES  
1:50**



**DETAIL A**  
**SOLAR CHIMNEY**  
**1:10**

0,6 galvanised IBR steel roof sheeting @ min 5 pitch laid on saturated felt underlay on plywood sublayer seam claped @ 610 centres with 30 x 0.6 stainless steel

120 mm ISO board insulation spanning between purlins

150 x 65 x 20mm galvanised steel lipped channel purlin bolted to cleat with 4 x M10 bolts

Asphalt saturated felt underlay with 65mm sidelaps and 150mm endlaps fixed to plywood with steel nails @ max 300mm centre

16mm plywood

300 x 150 purpose made galvanised steel gutter laid to fall to 80 o/ galvanised mild steel rainwater downpipe

100 x 65 x 10mm galvanised steel angle cleat welded to gutter & bolted to steel frame with M10 bolts

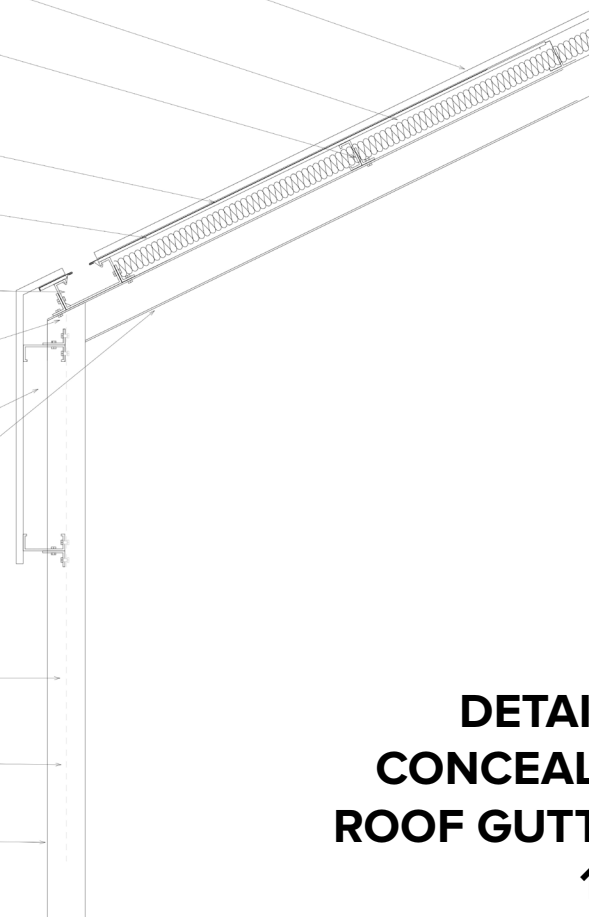
225 x 100 x 20 x 2mm galvanised steel lipped channel girt bolted to cleat with 4 x M10 bolts

203 x 133 x 25 hot rolled galvanised steel I-section to form roof substructure

80mm o/ x 3mm mild steel rainwater downpipe

Mild steel bracket bolted to 5mm flat bar with M6 bolts

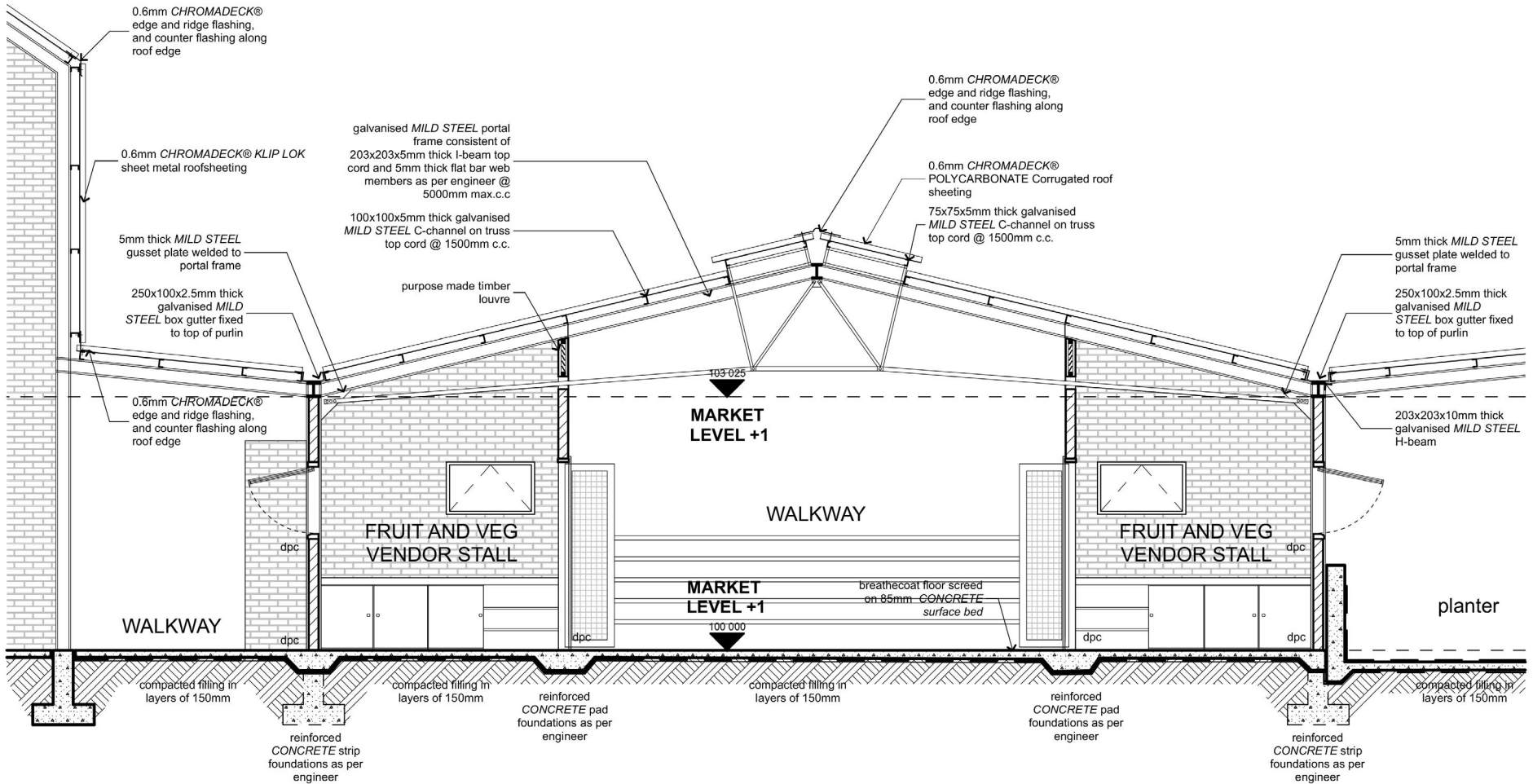
203 x 203 x 20? hot rolled galvanised steel H-profile column



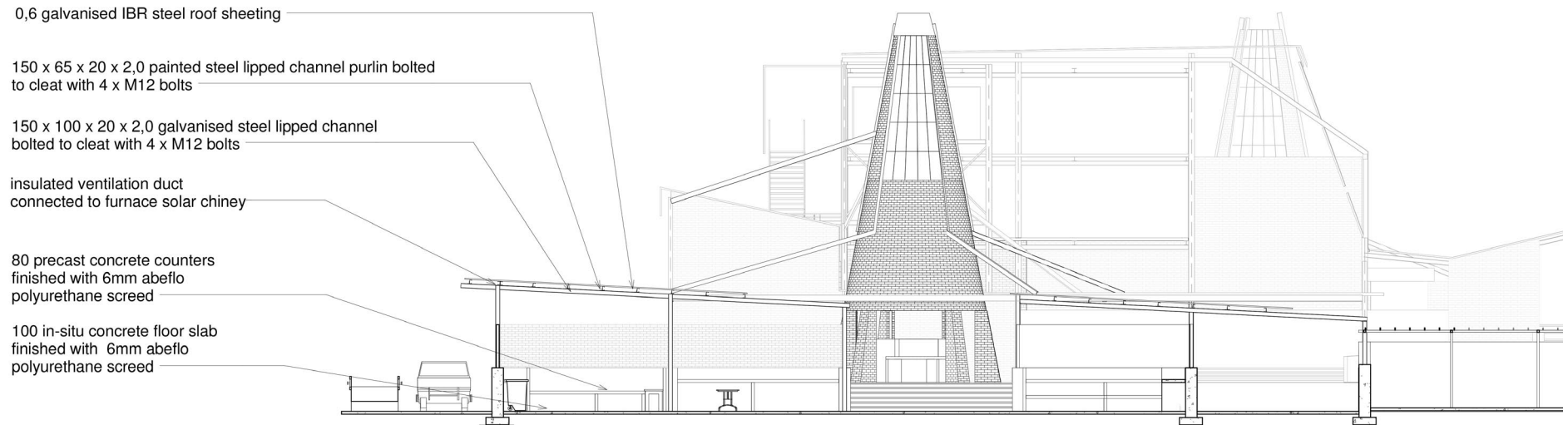
## DETAIL B CONCEALED ROOF GUTTER 1:10



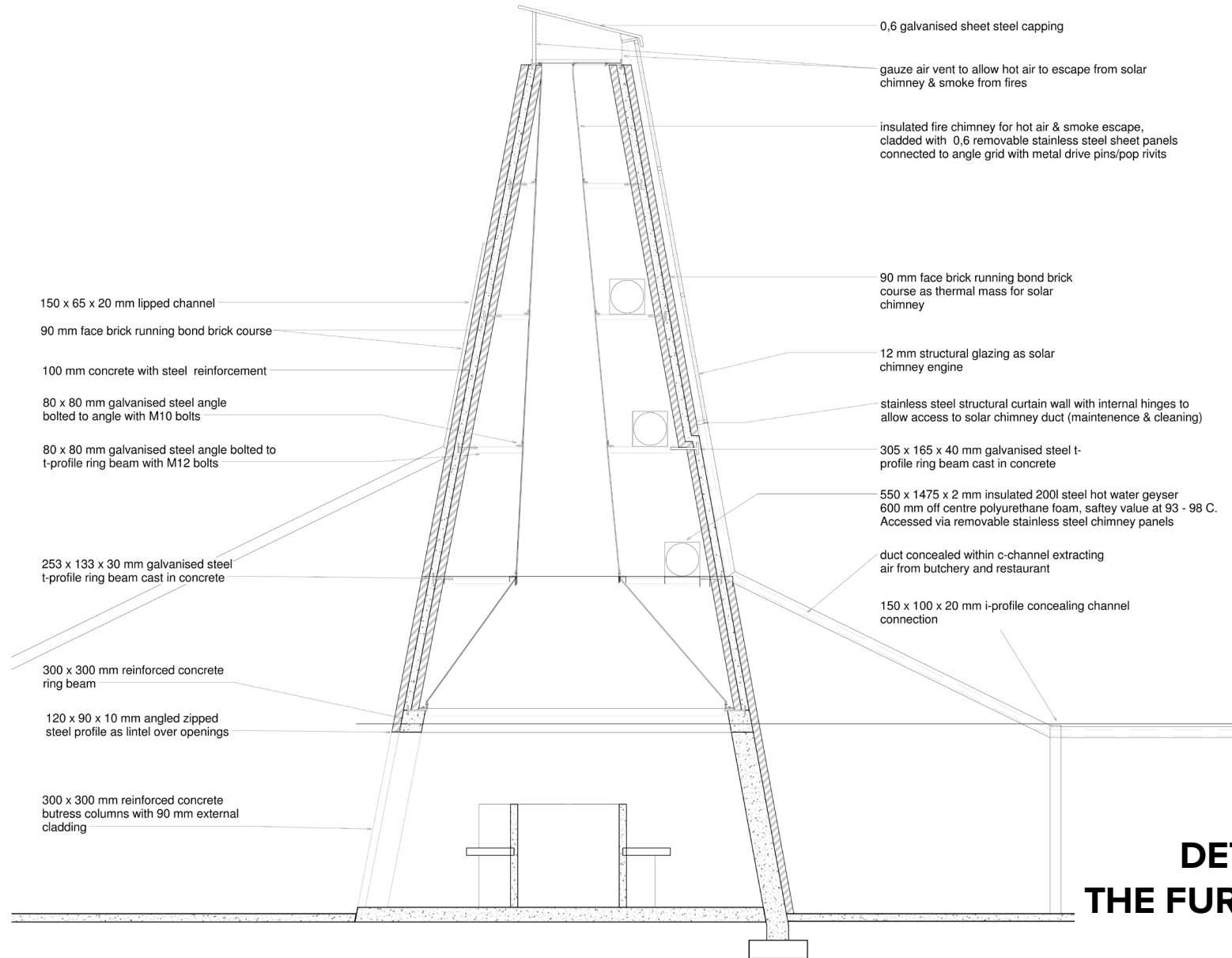




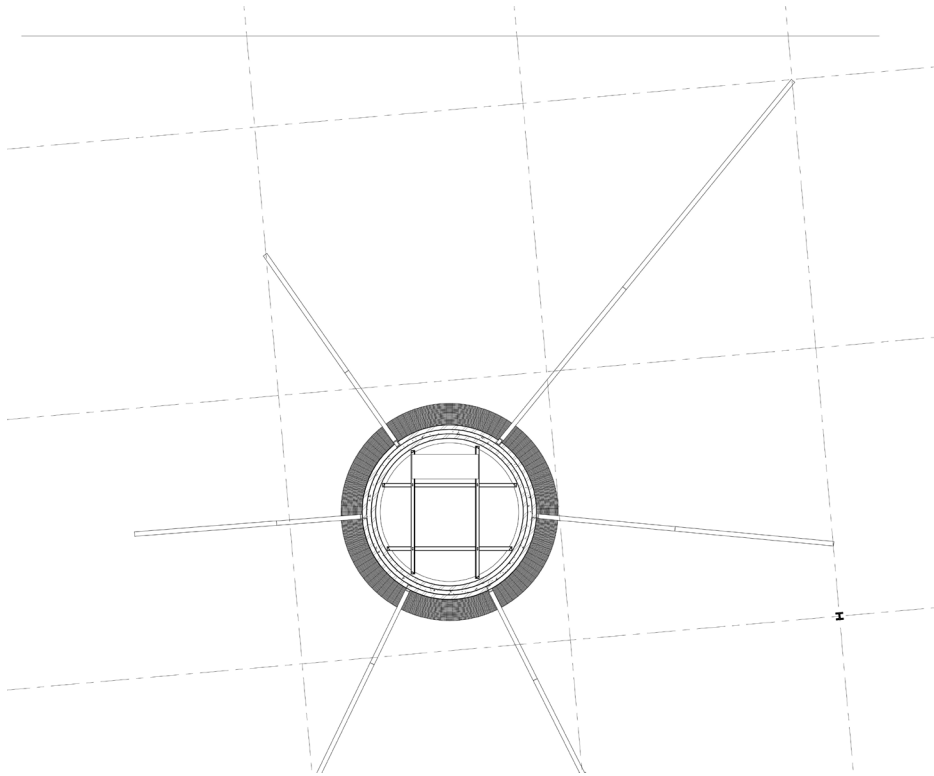
## SECTION E-E FRUIT & VEG MARKET 1:50



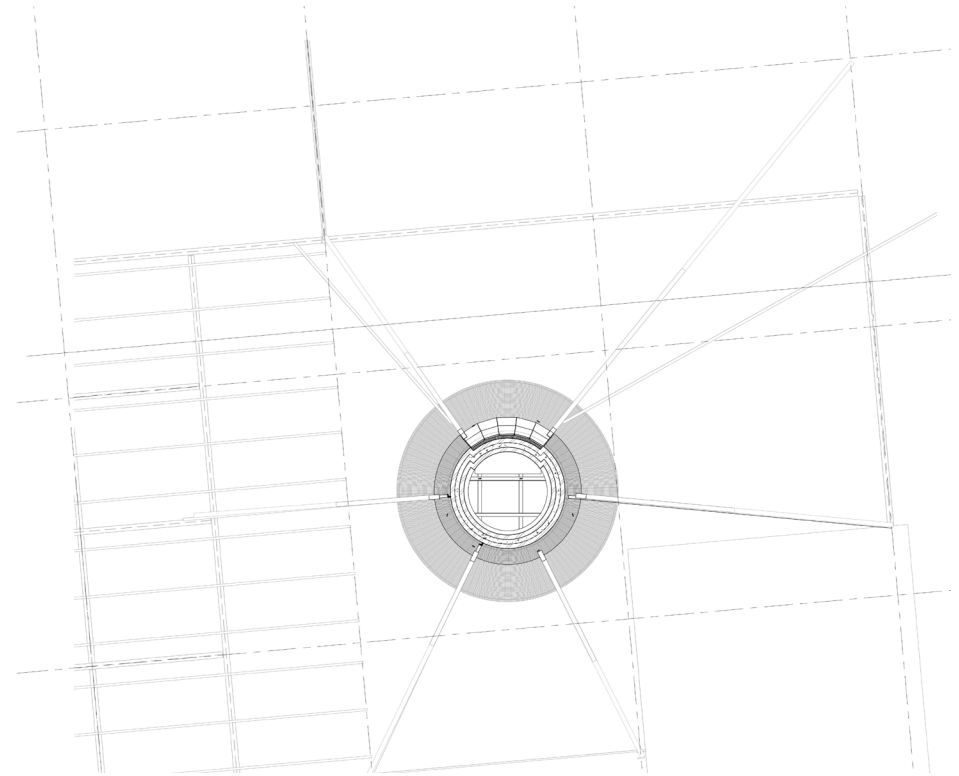
**SECTION F-F**  
**BOVINE BUTCHERIES**  
**1:100**



**DETAIL C**  
**THE FURNACE**  
**1:20**

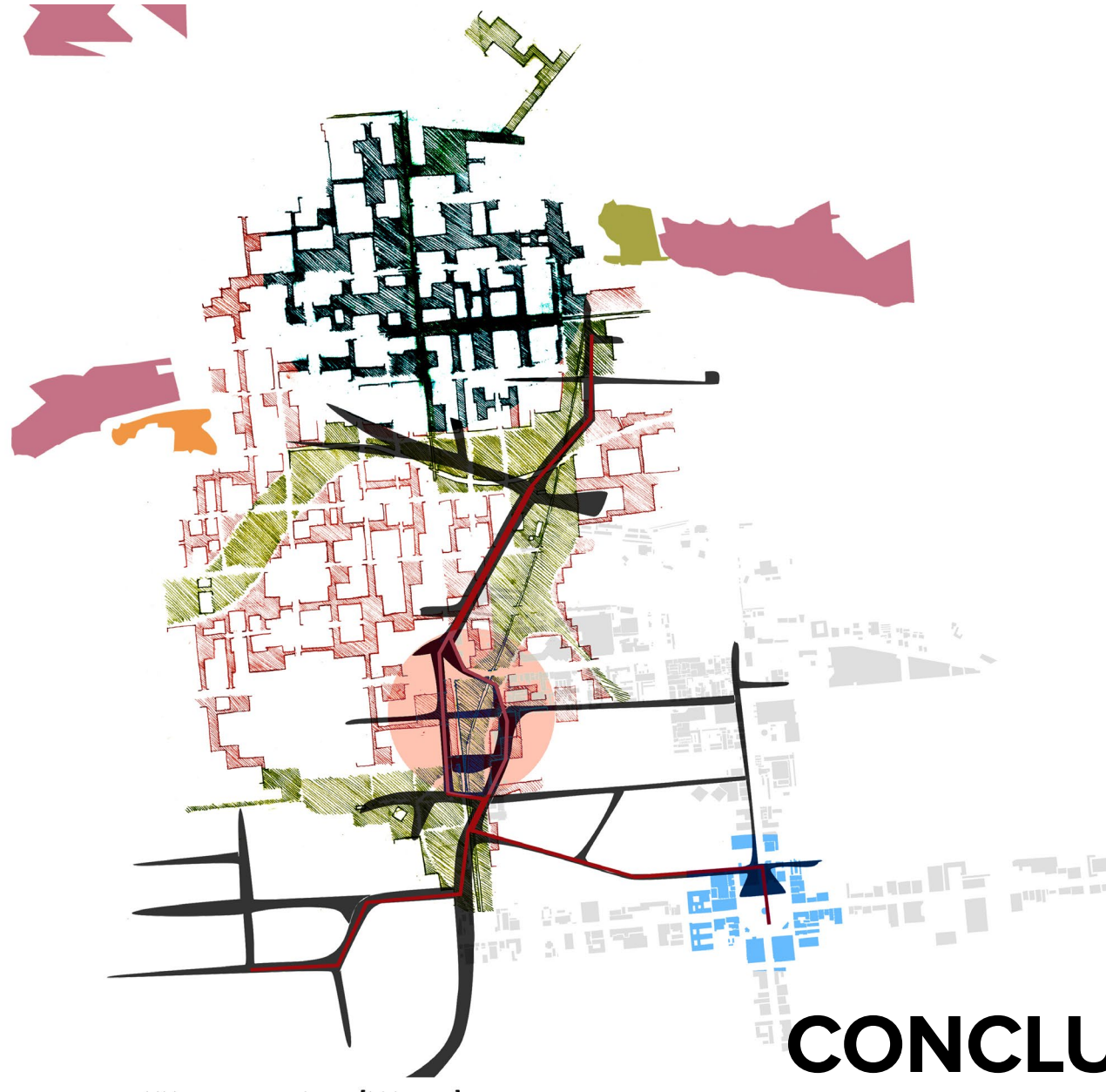


**DETAIL D**  
**CHIMNEY:**  
**LEVEL 17 600**  
**1:20**



**DETAIL E**  
**CHIMNEY:**  
**LEVEL 20 800**  
**1:20**





**CONCLUSION**

## PROJECT SUMMARY

Marabastad is dominated by formal and informal networks of trade and transport. Infrastructural support of existing informal activities and networks within Marabastad has, however, been largely neglected with its informality being too prolific to address. This has in turn hindered the economic and social establishment and growth of Marabastad.

Informality is so often seen to hinder the development of the formal, when in actual fact it has the potential to inform appropriate programme and architectural language.

The architectural design investigates the need for an opportunistic and responsive approach which adopts indigenous strategies while taking into account existing circumstances (Rustagi, 2014).

The intention of the dissertation is to explore resilience in architecture able to withstand change by critically observing the informal. There is value in the critical observation of informally developed systems as these remain adaptable and maintain a high degree of self-organisation.

Tension between formal and informal have developed where informal seeks to adapt while formal remains static. The informal should not be romanticised - it remains a necessity and not a choice, however, by discovering patterns in informal activities and understanding what works and why, successful formal space can be created through architectural intervention. Resolving urban issues of inaccessibility, poor infrastructure and urban decay within Marabastad and the city of Tshwane will aid in creating inclusive environments - preventing growing inequalities of access to economic and social opportunity.

In alignment with the urban vision, the dissertation identifies social and economic opportunity within the informality of Marabastad and explores how these can inform a programme that is catalytic within its environment - characterising Marabastad as an anchor point within the city opposed to a transitory place and therefore enabling its resilience.

The site is located along 11th Street, south of Belle Ombre Metro Station and East of the sub-station.

Lack of infrastructure on site for the informal bovine butchery and informal meat market resulted in unhygienic food preparation conditions. The programme rehouses and provides infrastructure for these existing economic activities while also incorporating a social platform through the design of the braai areas. The large scale of the braai chimneys become new landmarks within Marabastad, enabling a greater sense of legibility within the urban fabric.

The site becomes a point of convergence where the architecture responds to the large scale, stereotomic language of the Belle Ombre Metro Station, the large scale tectonic language of the sub-station as well as the small scale fine grain of Marabastad's heritage fabric.

## PROJECT CONCLUSION

The design is an enquiry into how formal architectural intervention can assist in and promote the socio-economic development and growth of informal activity, opposed to hinder it.

The programme responds directly to the existing activities on site by providing



appropriate infrastructure that enables socio-economic establishment and growth of these activities, while also anticipating future infrastructural needs of the site. Pedestrian movement is an important design informant on site and the design intervention is located on site to accommodate faster pedestrian movement in the morning from North to South and slower pedestrian movement in the afternoon from South to North. Private programmes are placed on the East of the site further away from the public realm, while programmes which required public exposure and interaction are placed along public walkways and public spaces.

An important aspect of the design exploration is the provision of space which is able to constantly adapt to facilitate the needs of varying activities and site requirements. Providing infrastructure which allows for the adaptability and self organisation of the space enables the site's resilience. With this in mind the construction of the site happened in phases, along a scale of permanent to temporary and adaptable to programme specific:

1. The concrete urban defining

elements which deal with the 4m site slope define various levels on the site by providing designated public walkways and stairs and ramps to each level. Regardless of future activities on site, the site slope will have been dealt with.

2. The provision of services and landmarks. Extension of the existing ablutions on the South of the site as well as the introduction of a new ablution block on the North ensures sufficient ablutions to accommodate the high pedestrian traffic as well as the site activities. The provision of new urban landmarks through the construction of the 2 brick braais and chimneys enable greater legibility within Marabastad by defining designated public space.

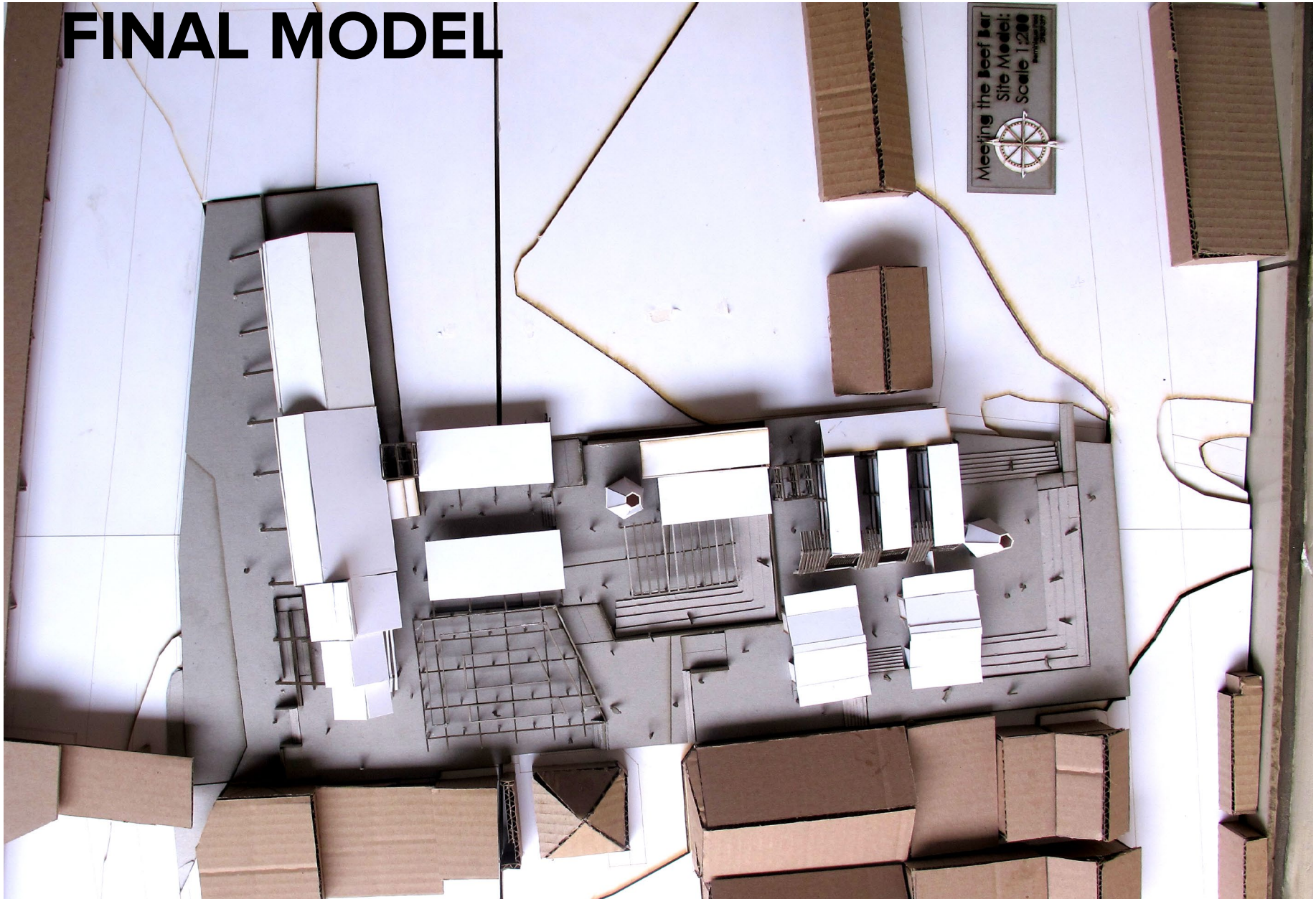
3. Construction of the steel structure and roof. The structural frame responds to the large grain of Belle Ombre, however, still allows for the fine grain condition by enabling self organisation and adaptability of informality.

4. The infill of the steel structure. This phase is most adaptable, with the design of the infill left flexible and changeable according to specific site and programmatic needs.

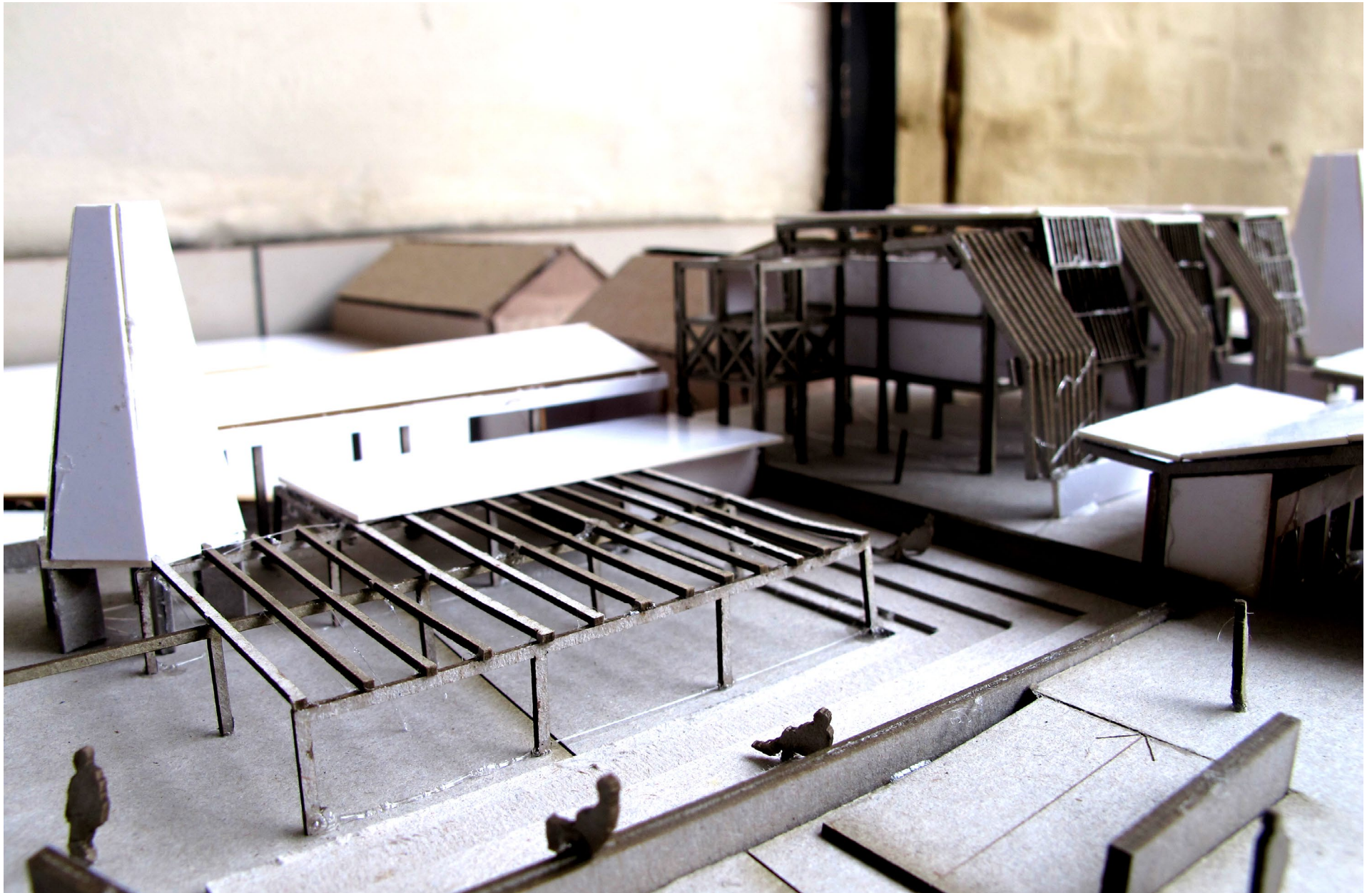
The design intervention responds to the varying scale of surrounding buildings and mediates the contrast between Belle Ombre Metro Station, the city and the small scale of Marabastad fine urban fabric. The design intervention also responds to the contrast in architectural language between the stereotomic Belle Ombre Metro Station and the tectonic sub-station. The architectural design intervention morphs from stereotomic to tectonic. The stereotomic response of the architectural intervention on the North of the site, conceals materiality and construction joinery while expresses a skeletal and tectonic language along the South-East of the site by exposing materials and construction methodology.

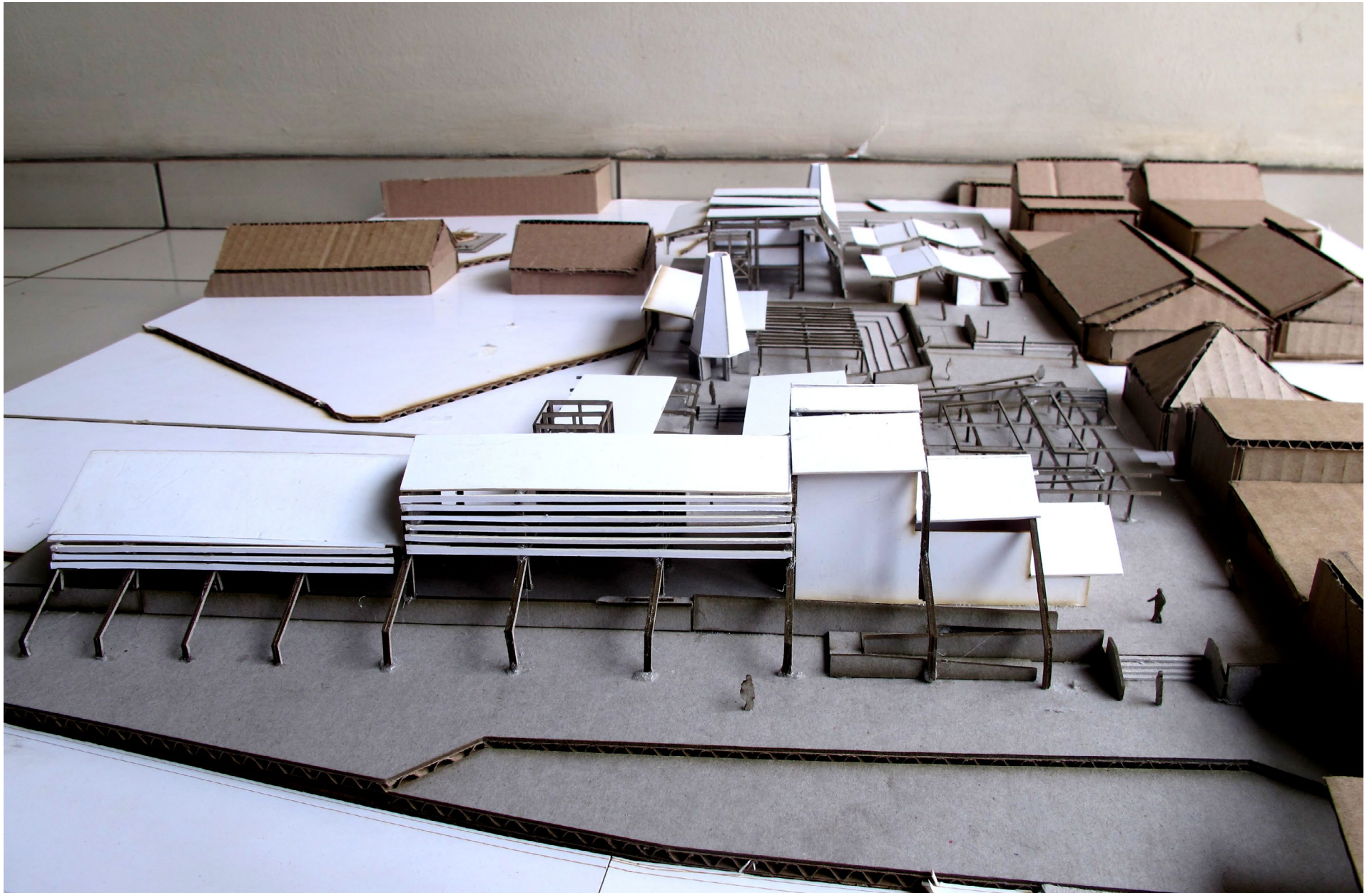
The awareness of allowing space and place to be resilient by enabling change and adaptability in the future, offers endless possibility of what architecture should and could be. The simple provision of urban defining elements and core infrastructural elements allow for endless architectural solutions and re-configurations of space in time as the key to understanding informality and facilitating and providing for it.

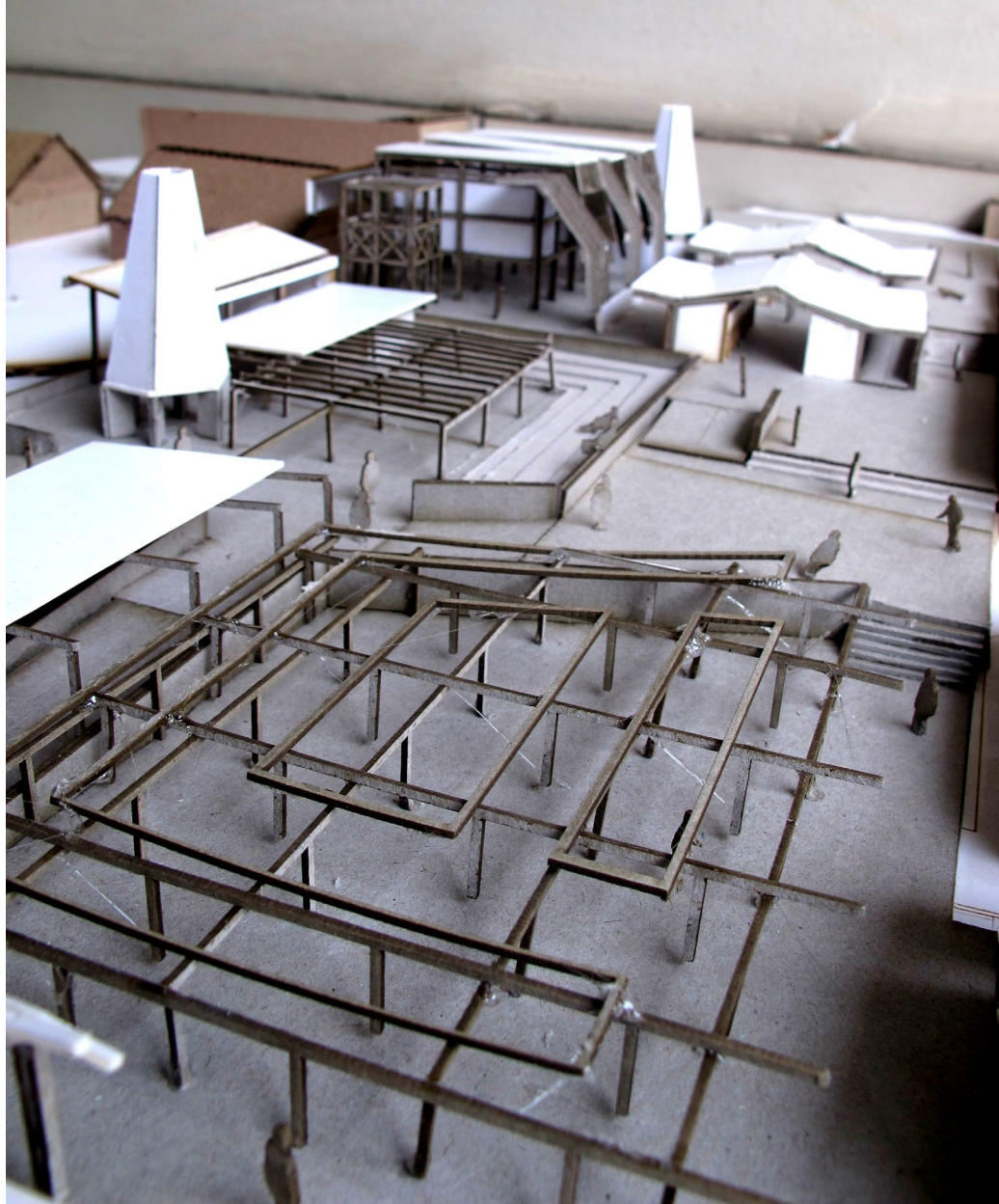
# FINAL MODEL

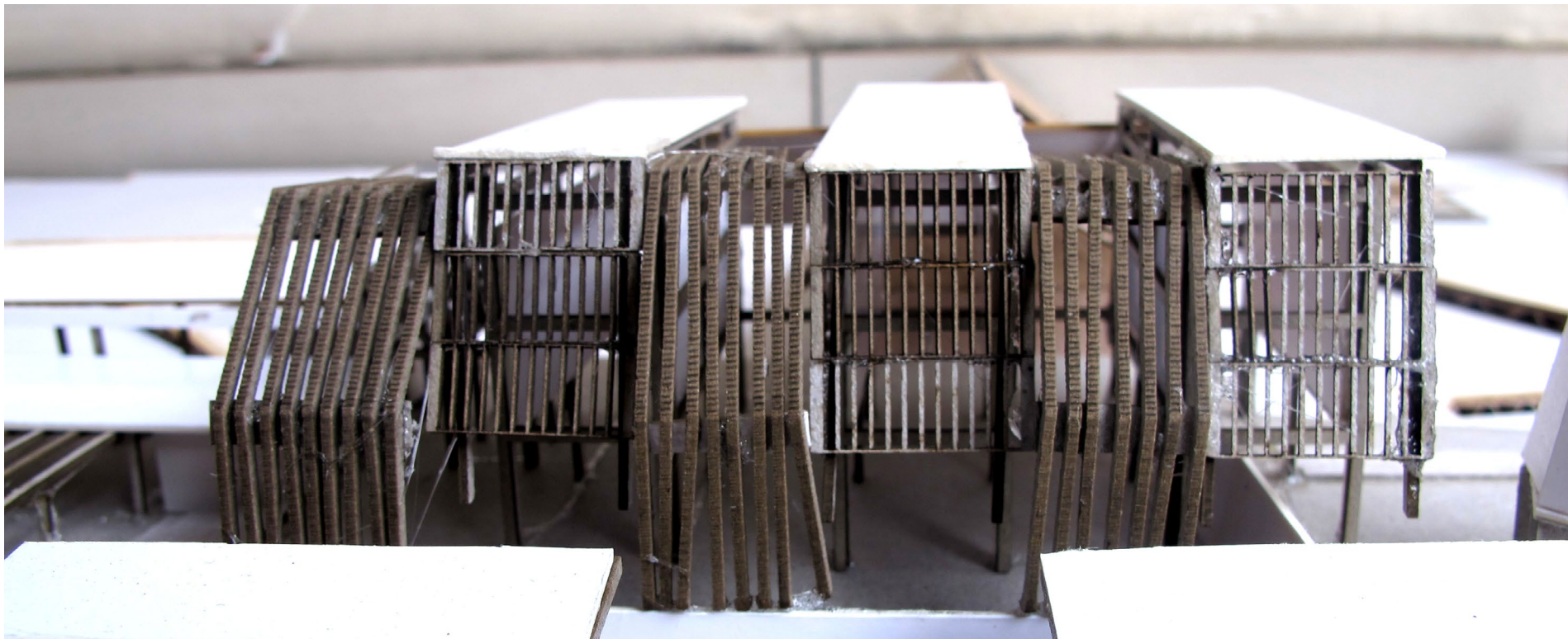












**LA FIN!**





