This chapter focuses on the main design generators and substantiates the decision-making process within the theoretical, practical and historical contexts of the dissertation.

Chapter 7 - Design Development

Figure 7.1 Weathered surfaces on Magazine Hill (Author, 2011)

Figure 7.2 Stained wall in existing Flame Tracer building (Author, 2011)

7.1 Background

In Chapter 7 the proposed brass foundry on Magazine Hill is explained within the parameters of 7 main design generators that influenced the process of decision-making throughout the developmental stages of the design progression. The generators address design concerns regarding the theoretical premise, building programme, commemorative aspects, environmental aspects, heritage legislation, site-based influences and architectural experience.

7.2 Theoretical premise

Within the context of Magazine Hill, this dissertation explores an architecture of alter egos, where multiple identities and layered memories define spaces that are simultaneously physical and metaphysical. The physical character of space present in the decayed fabric of Magazine Hill relates to the experience of abandoned space, the weathered building elements, ruination and the smell of decay that only manifests with the passing of time. The physical character of space on Magazine Hill thus relates to experiential time that focuses on the experience of the present, therefore weathered space is left unaltered in the design.

Its alter ego, the metaphysical character of space present on the site, relates to the historic activities that accompany a time frame passed, where the memory of past activities and use is constantly provoked through experience. This character of space thus responds to referential time, where physical attributes of weathered space refers to previous use and historic occupancy. It is within the alter egos of space where the architectural experiences of the site and the brass foundry are explored.

The weathering of architectural materiality implies that buildings take on the qualities of place and events, whether it be stains and residual deposits brought on by the rightful claims of nature, or bullet holes and explosion damage caused by historical events. In both mentioned cases the process of decay unfolds a narrative that strengthens the building's existence and persistence in time. This dissertation's design resolution is thus focused on the idea that ruination can inform creation, and emphasises the fact that the death of one building element can lead to the revelation of another.

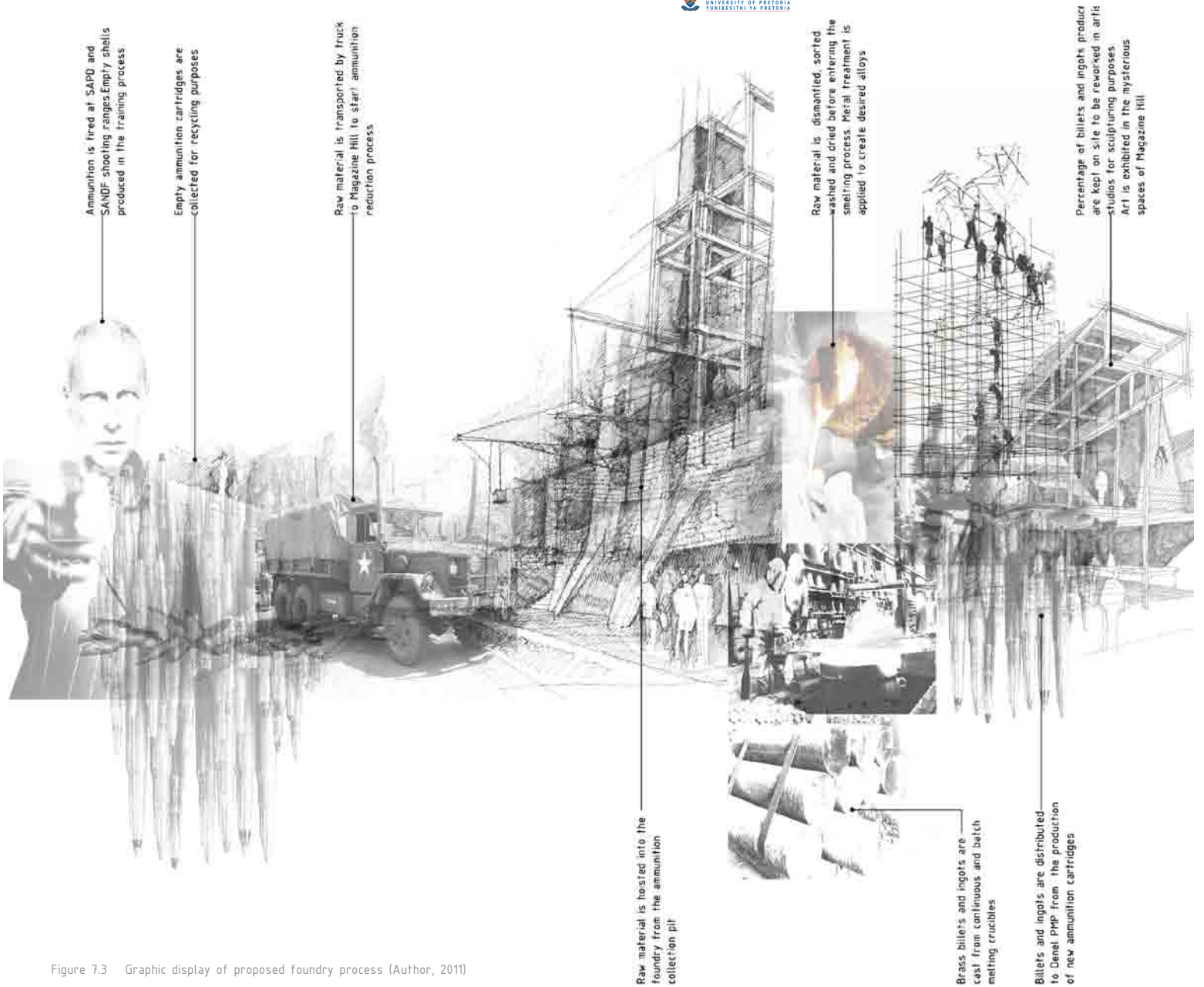


Figure 7.3 Graphic display of proposed foundry process (Author, 2011)

7.3 Foundry process

7.3.1 Brief process outline

The design of the brass foundry integrates an industrial process of ammunition reduction with an experiential route that unveils the rich history of ammunition production on Magazine Hill. The experiential quality of this journey is governed by a series of foundry processes that are revealed along the route as the visitor progresses through the site. It is within this subtle integration of site and programme that the past, present and future of Magazine Hill can be experienced and imagined.

The foundry process functions within 2 different procedures, with each process requiring diverse spatial needs in terms of lighting, volume, services and materiality. The first main process is accommodated in a furnace tower which extends from the existing ammunition bunker. It is in this industrial space where the ammunition cartridges are reduced to billets and ingots, the raw format of non-ferrous metals. After the end product has been produced, the raw material is stored and distributed to Denel PMP, while the second foundry procedure reworks remaining material on site in a series of new artist studios.

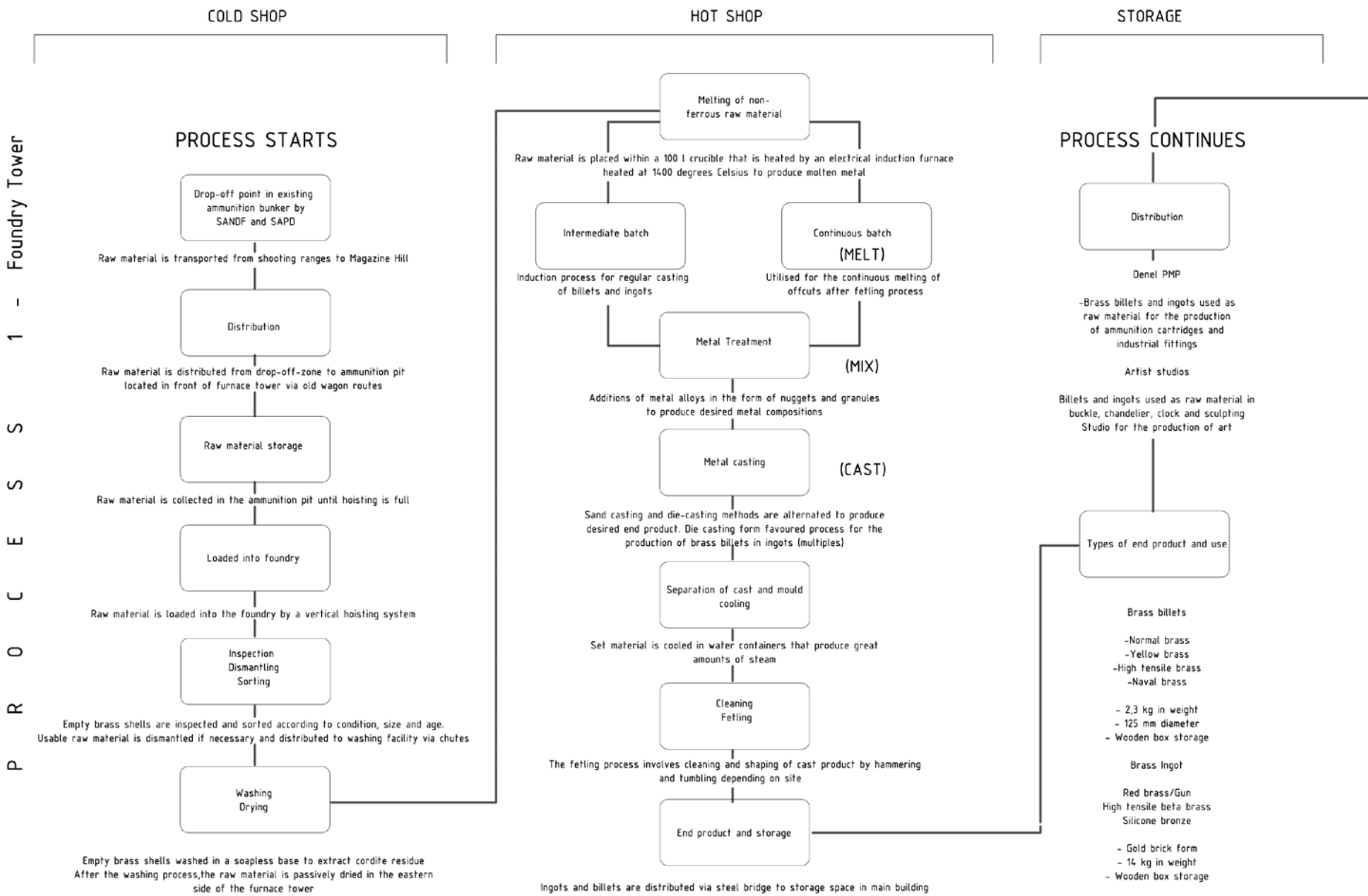
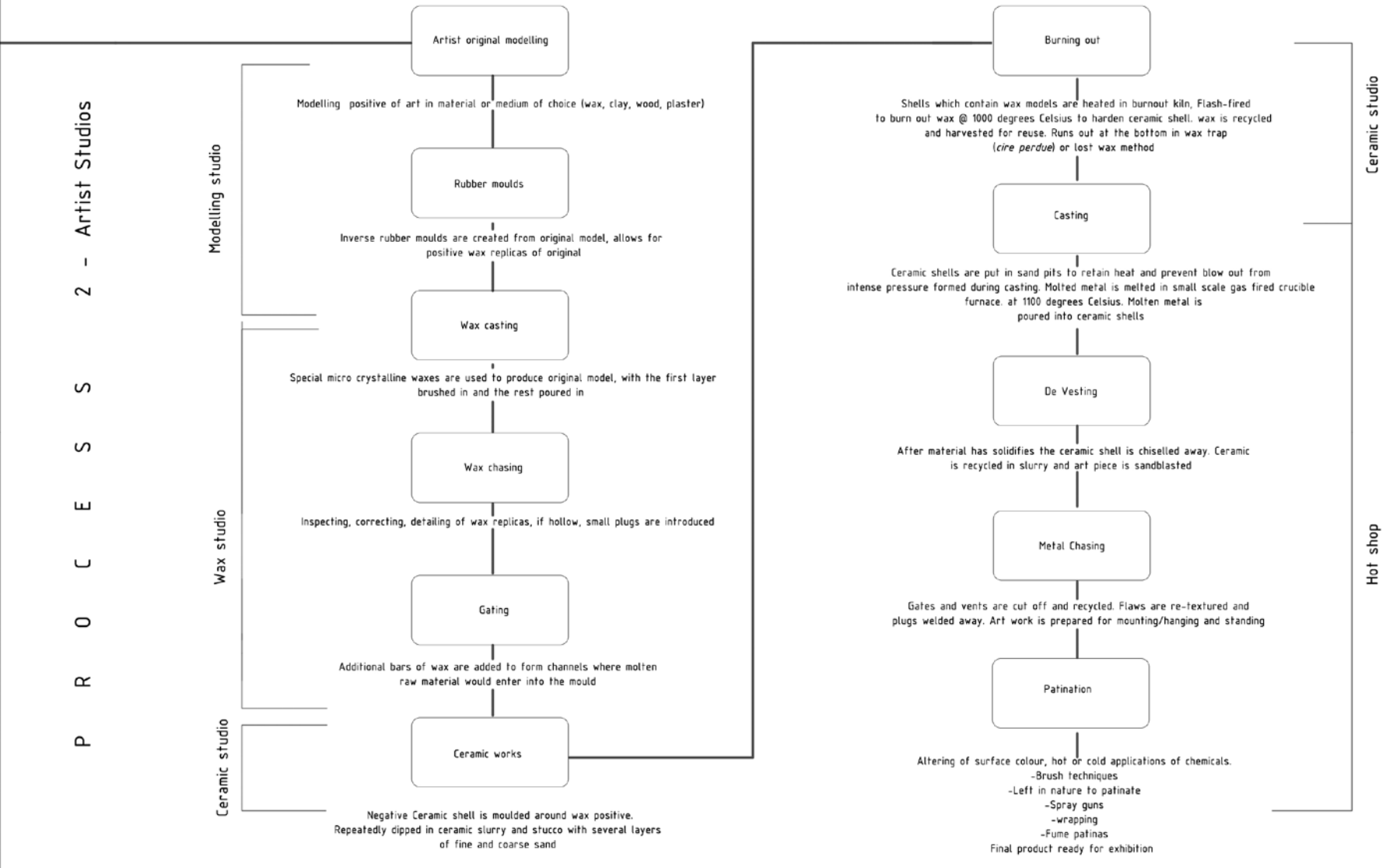


Figure 7.4: Technical display of proposed foundry process (Author, 2011)

P R O C E S S 2 - Artist Studios



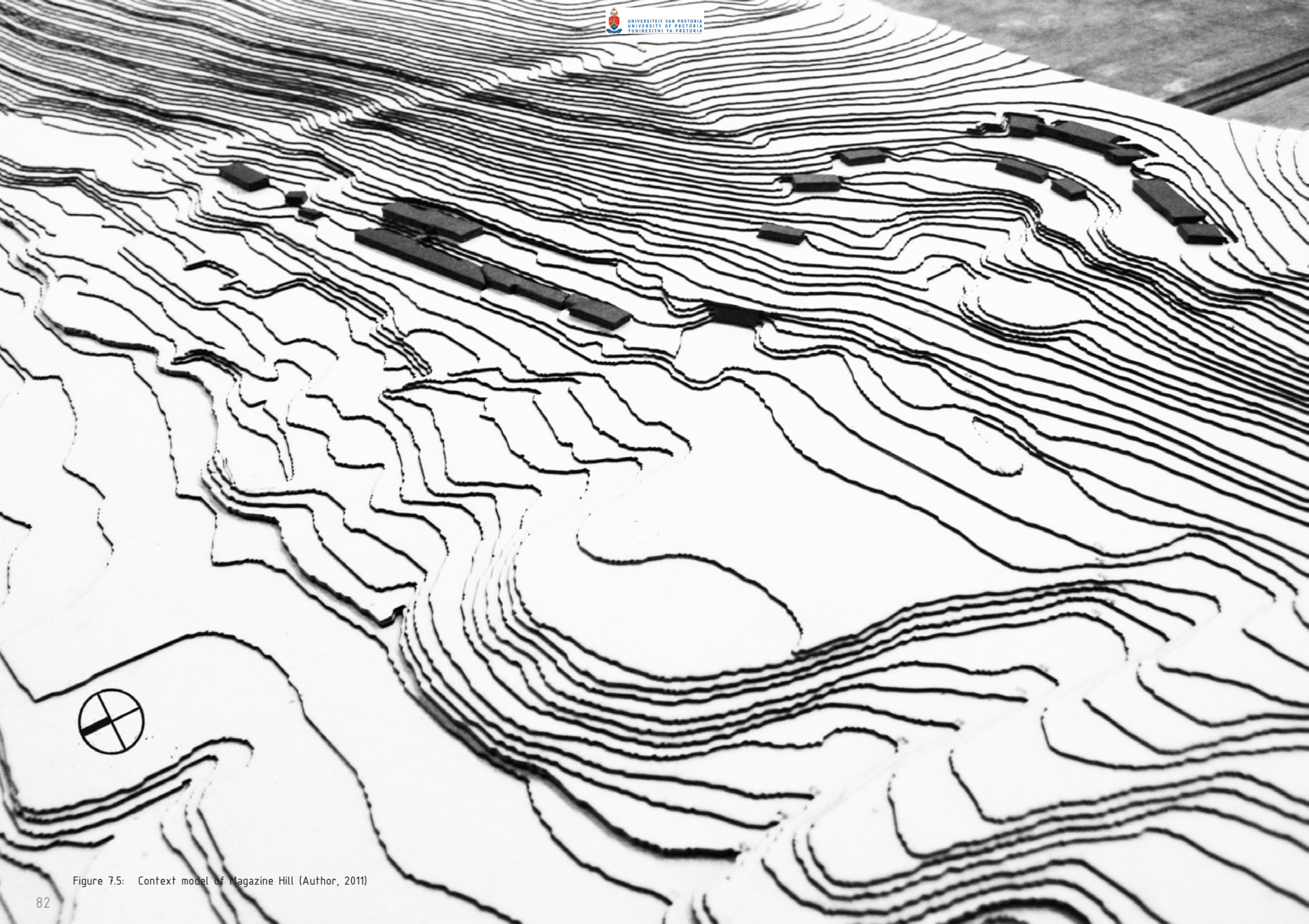


Figure 7.5: Context model of Magazine Hill (Author, 2011)

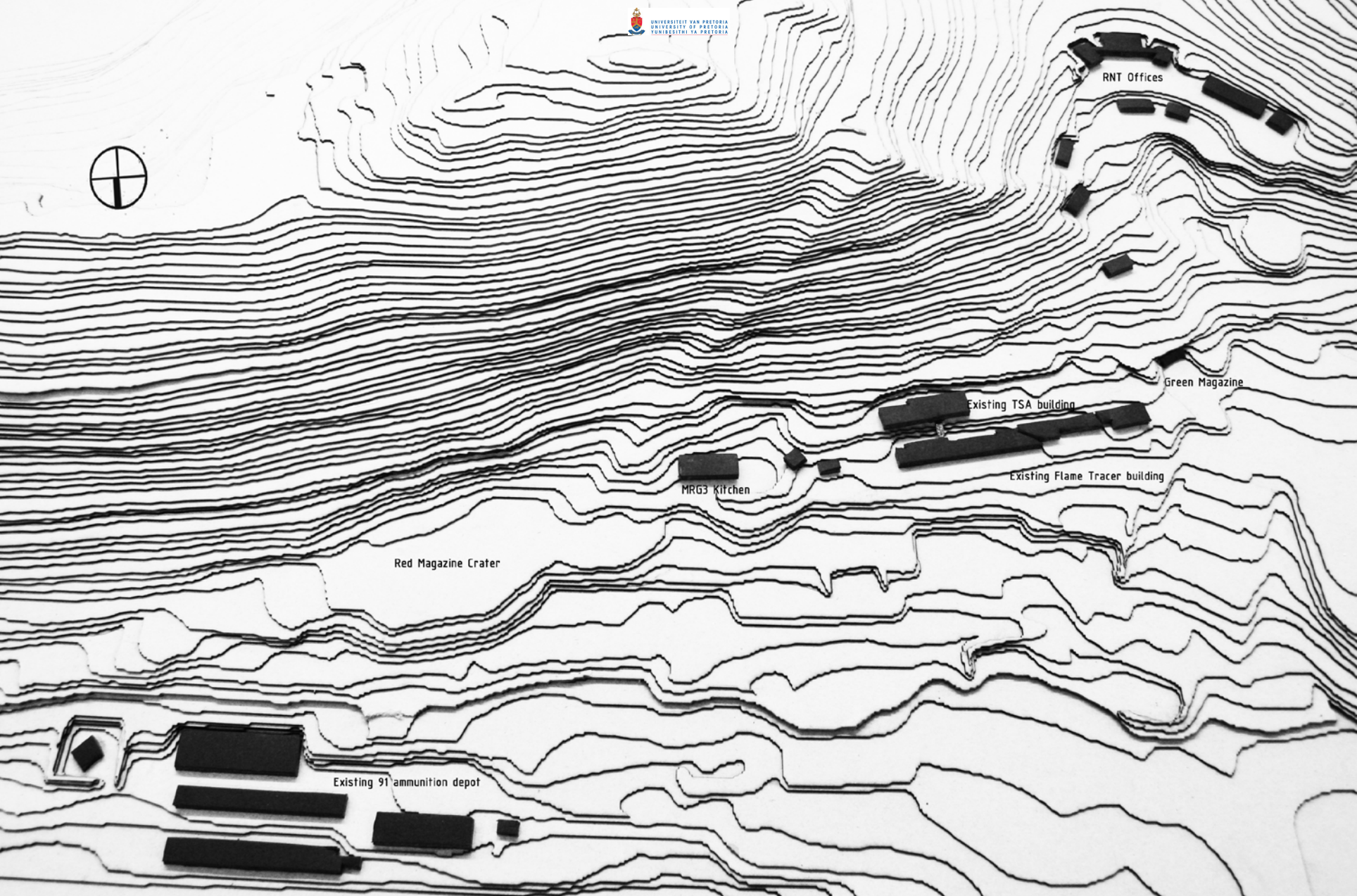


Figure 7.6: Context model of Magazine Hill (Author, 2011)

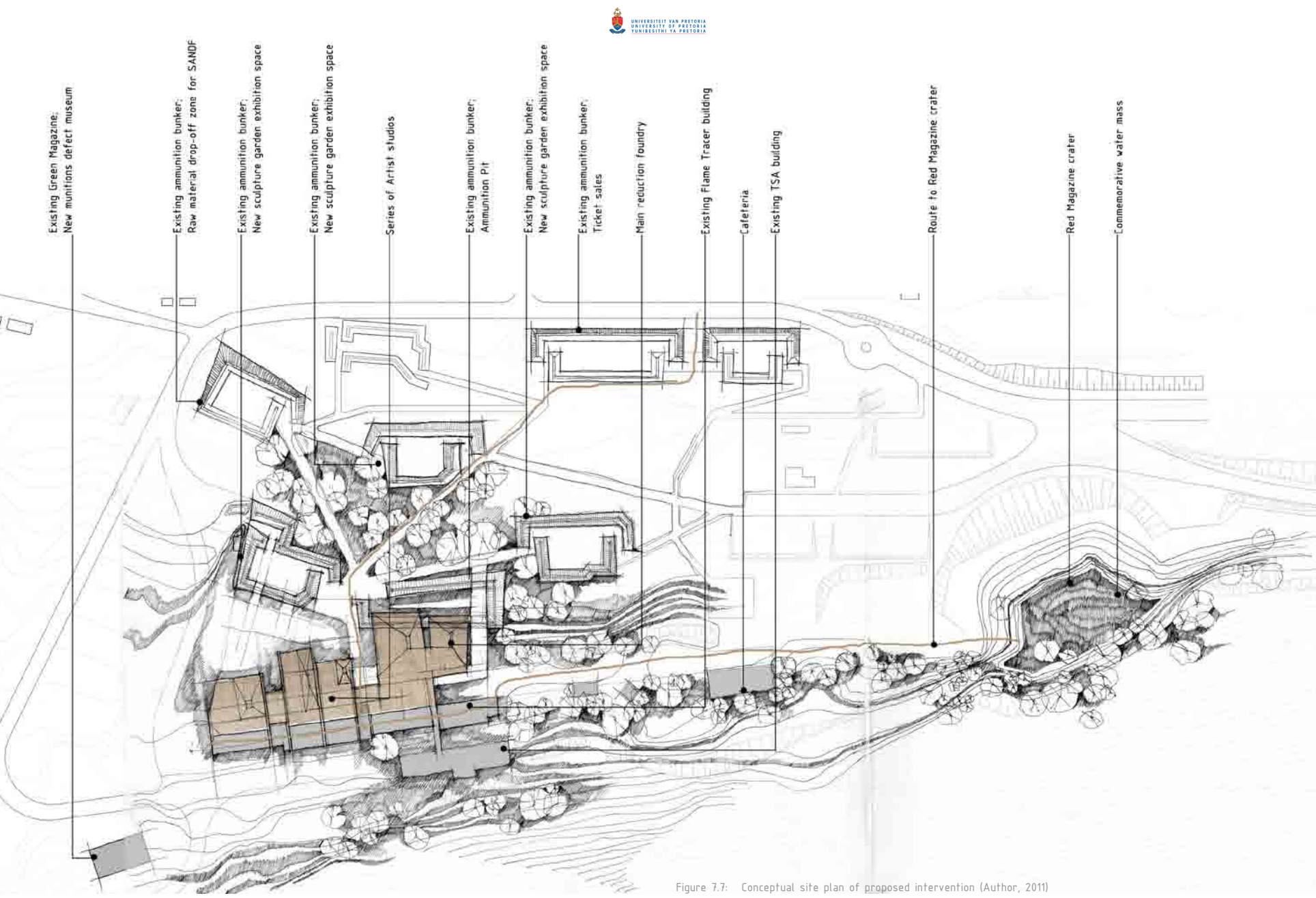


Figure 7.7: Conceptual site plan of proposed intervention (Author, 2011)

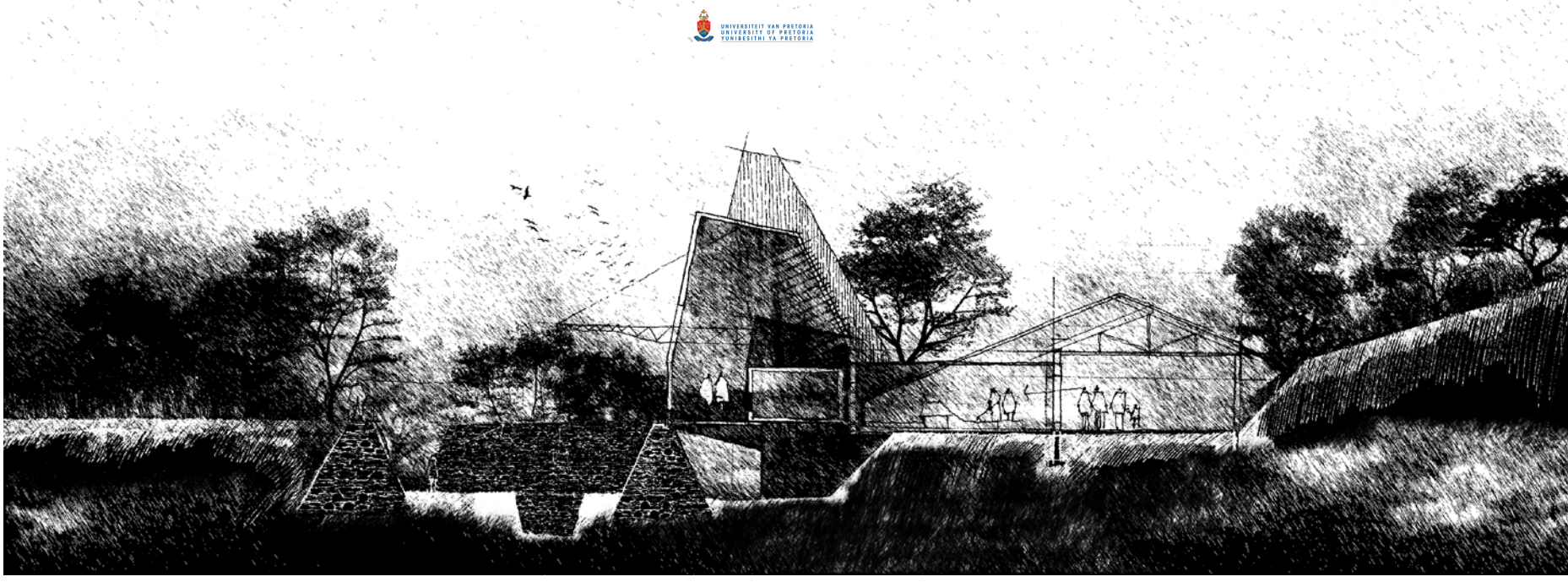
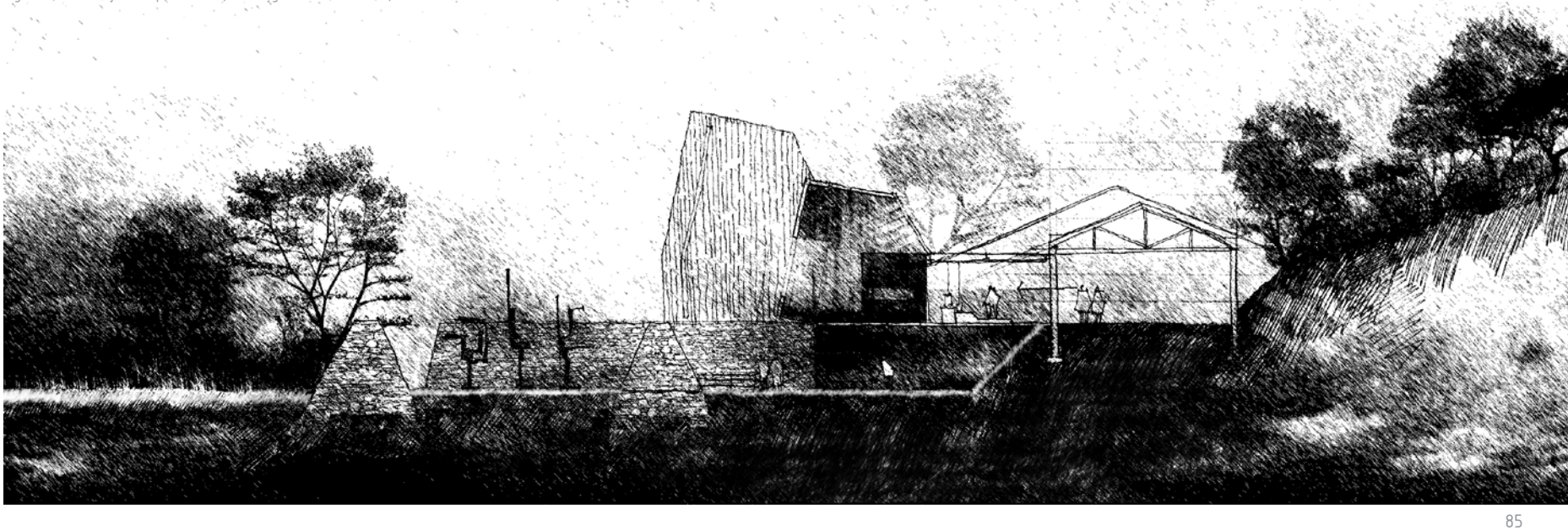


Figure 7.8: Early conceptual work, building sections (Author, 2011)



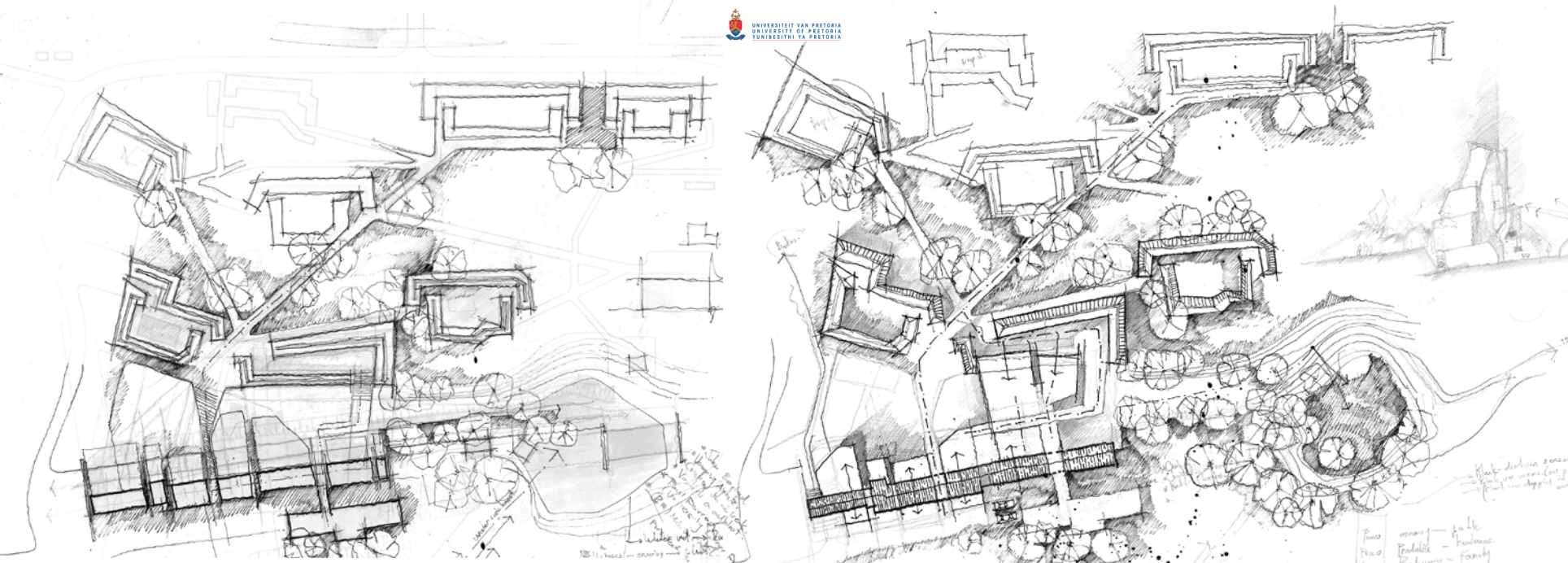
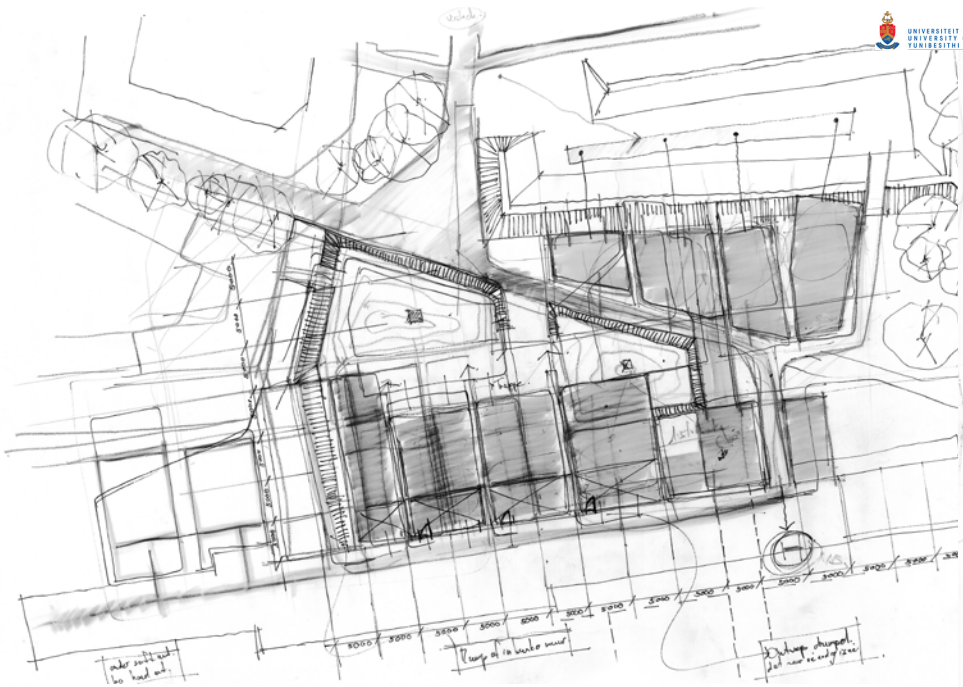
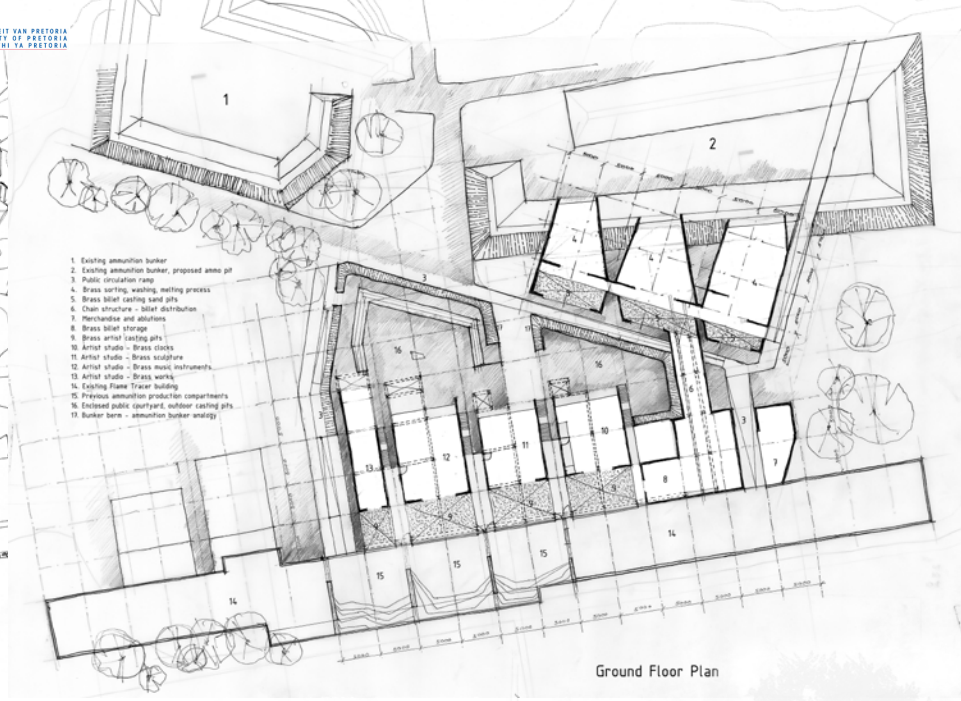


Figure 7.9: Concept drawings showing the development of the building plan (Author, 2011)





Ground Floor Plan

7.4 Site generators

From the initial developmental stage of Magazine Hill (Fort Commeline, 1881) the site had been designed to function as a secretive entity within the natural hilltop landscape. In 1894 when the underground ammunition magazines were constructed on site as part of the second fortification plan for Pretoria, the same concept of veiled architecture concluded a new typology for hidden military infrastructure. The design of the ammunition bunkers with internal production facilities followed the same construction methodology after Magazine Hill was labelled as one of the first sites for military industrialism in the country. This inherent typology of built form on Magazine Hill forms a conceptual platform for space that reveals and space that conceals.

Throughout the design of the route through the site and foundry, this concept of revealing and concealing space is utilised to enrich spatial experience. The old wagon routes that form circulation platforms between the exhibition bunkers define concealing space, while the interiors of the bunkers themselves identify revealed space, revealing exhibited sculptures. The different foundry processes are also experienced to be revealed and concealed along the route through the foundry. This journey through the site strengthens the visitor's interpretation of the hilltop landscape, complying with the third principle of the Ename Charter which states that a connection should be established between users and the site for individual interpretation (ICOMOS, 2005)

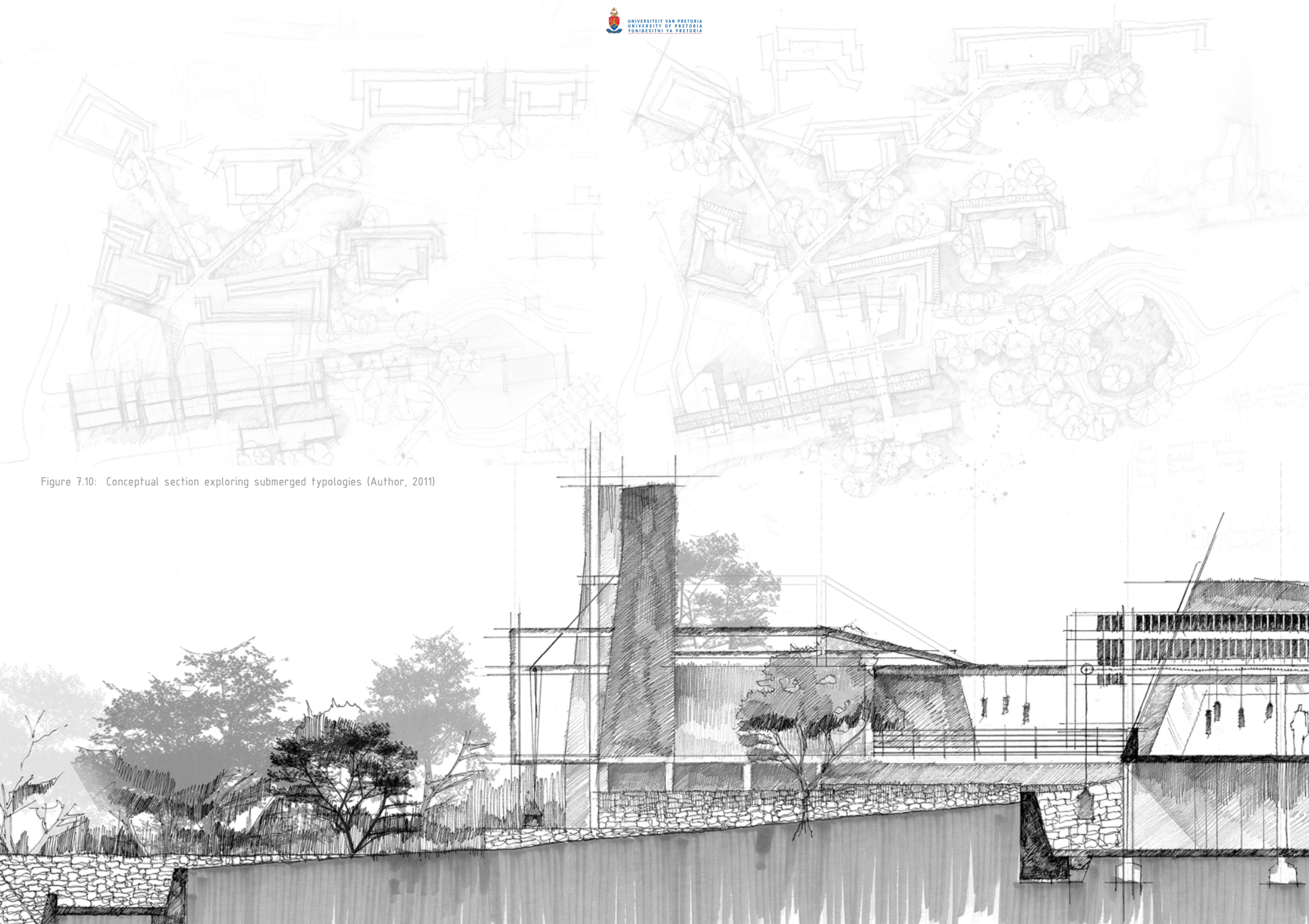
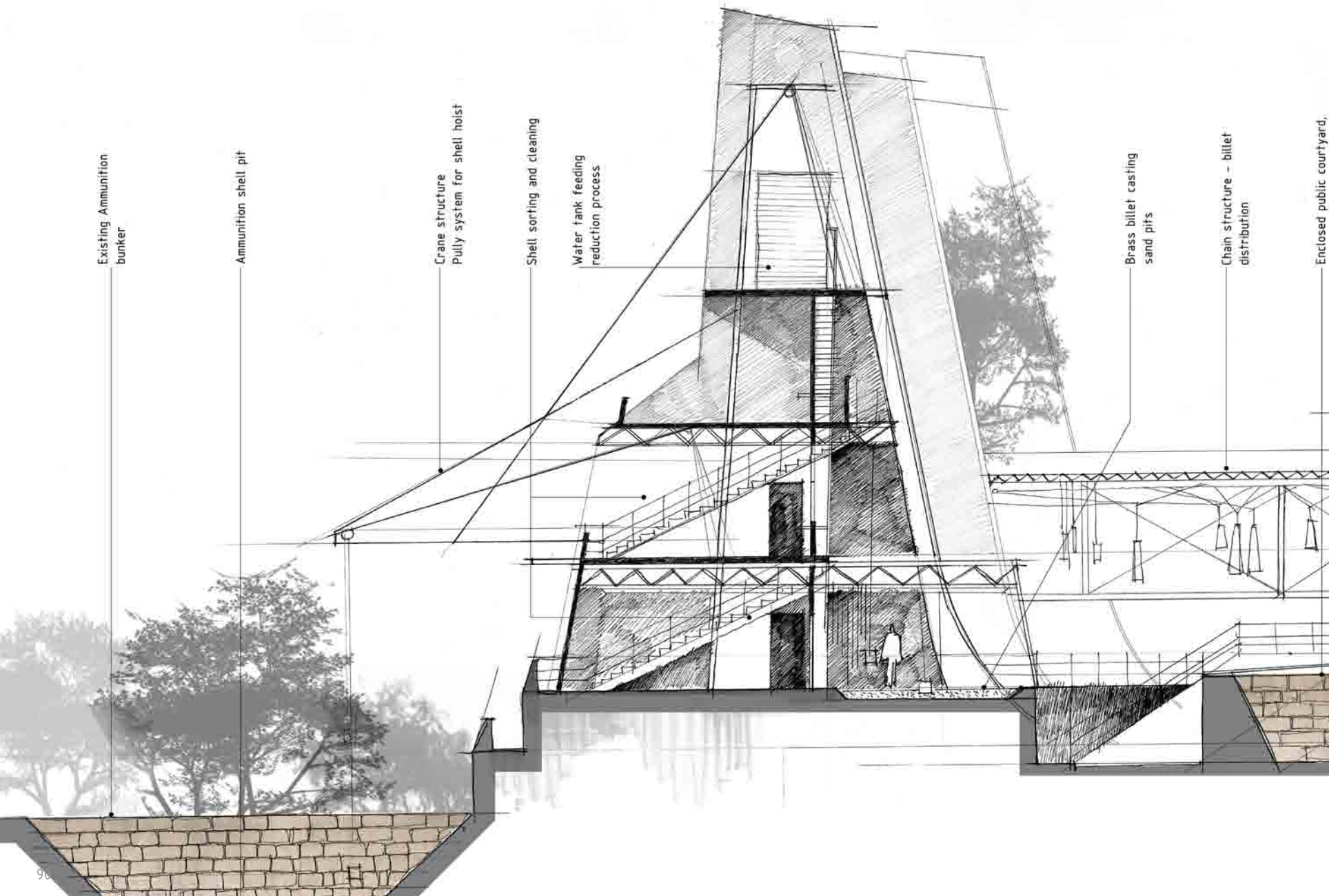


Figure 7.10: Conceptual section exploring submerged typologies (Author, 2011)


Existing Ammunition bunker
Ammunition shell pit
Crane structure
Pully system for shell hoist
Shell sorting and cleaning
Water tank feeding reduction process
Brass billet casting sand pits
Chain structure - billet distribution
Enclosed public courtyard,

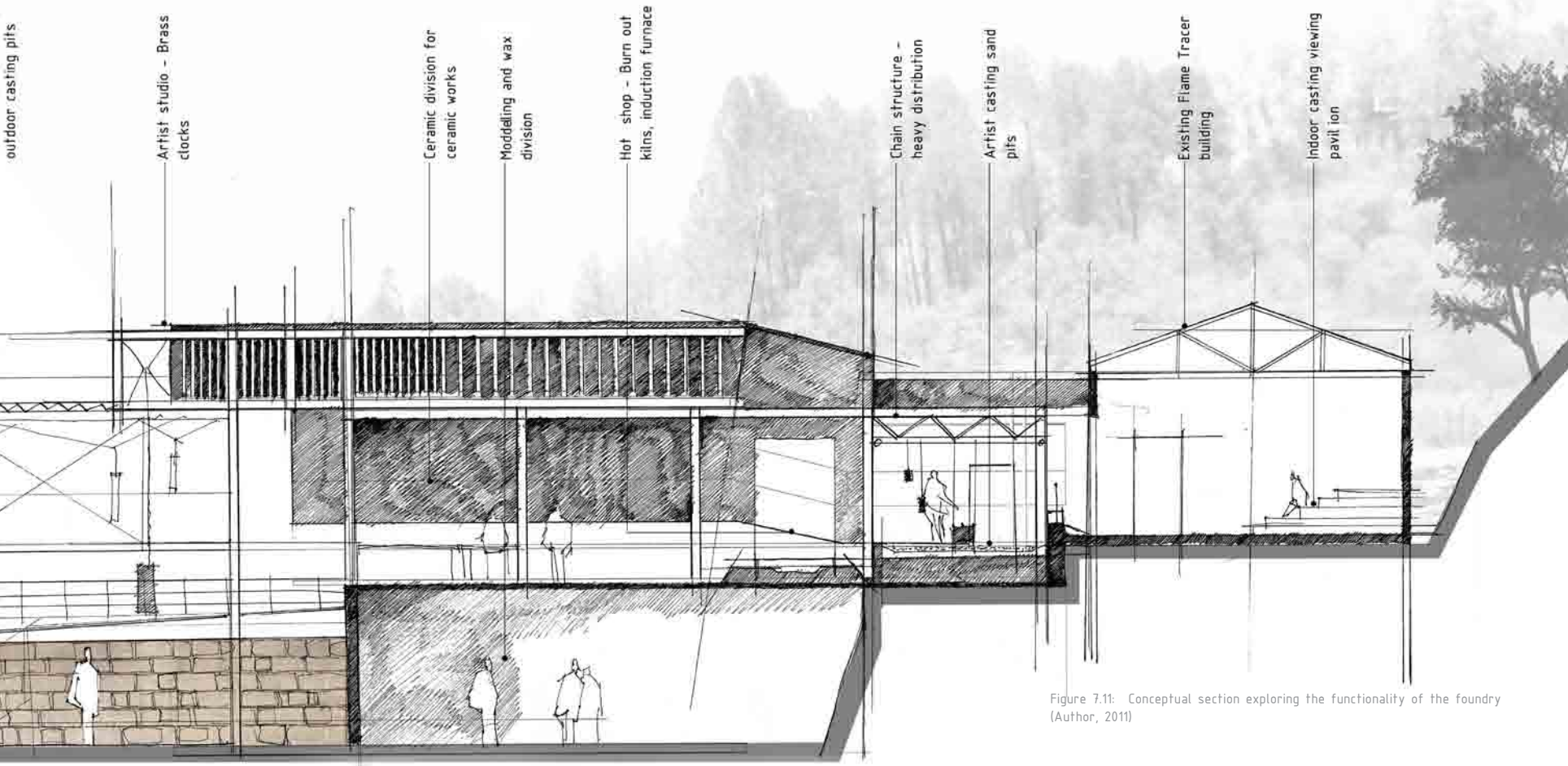


Figure 7.11: Conceptual section exploring the functionality of the foundry (Author, 2011)

Figure 7.12: Concept model of brass foundry (Author, 2011)

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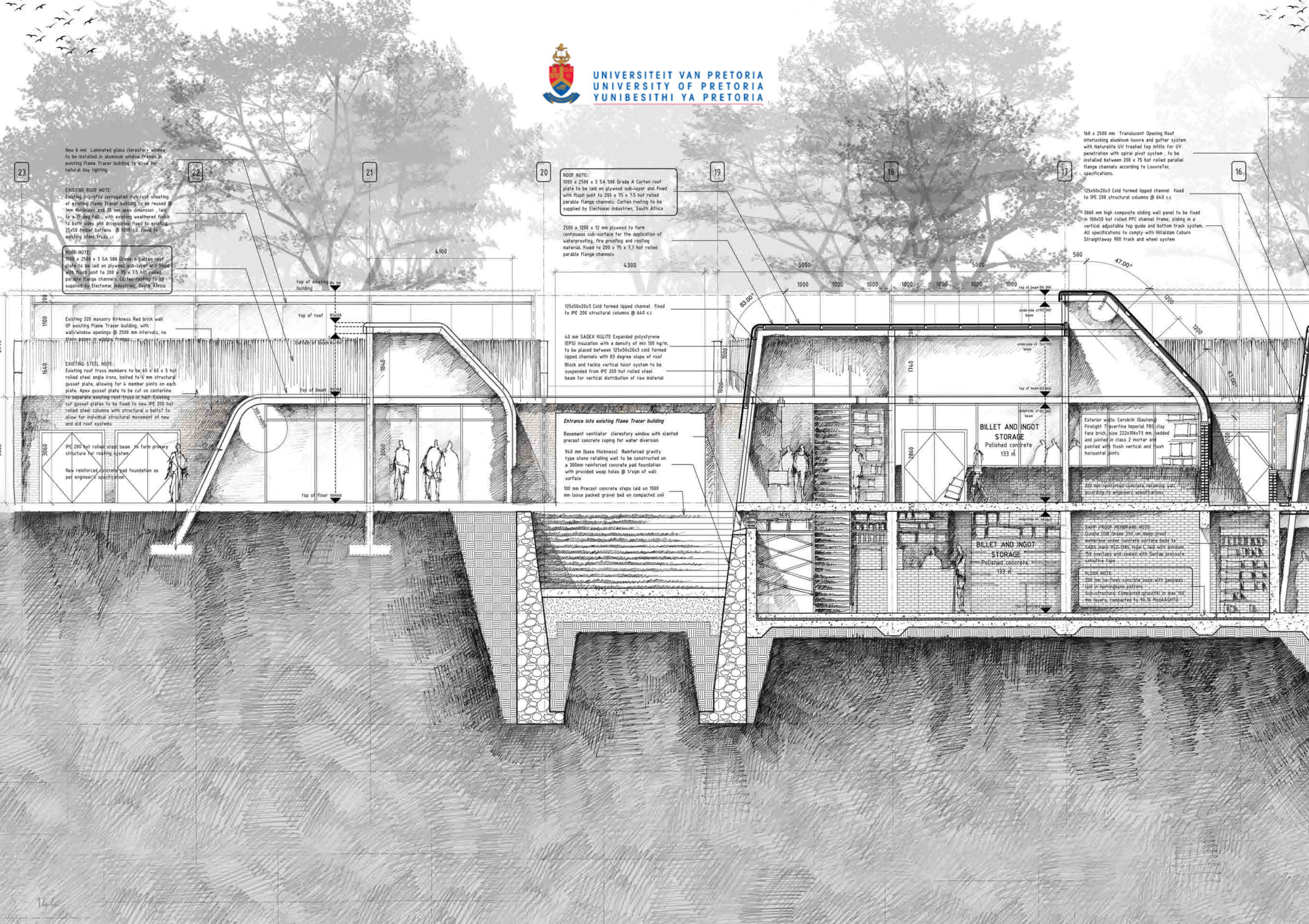

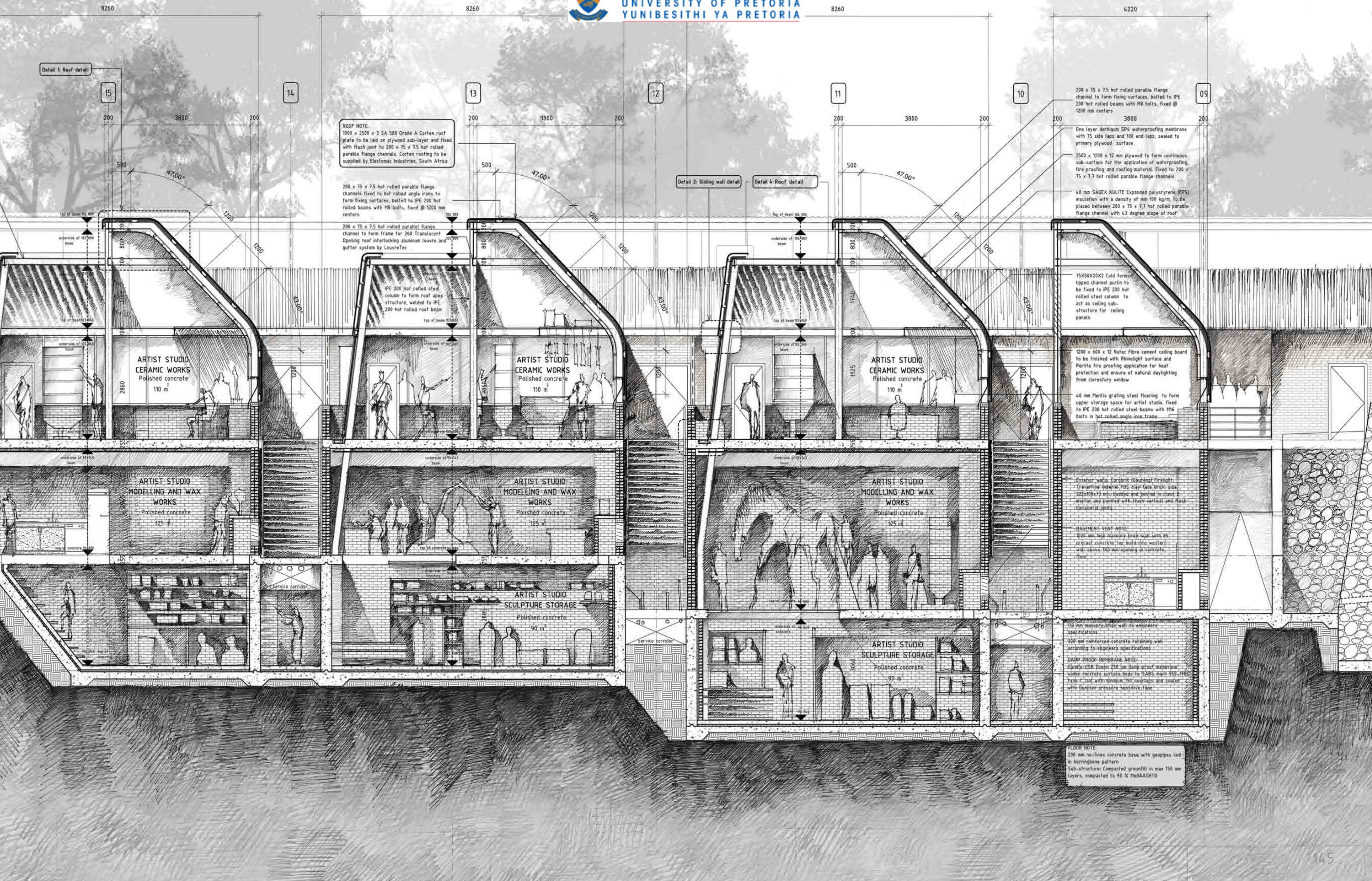

8260
8260
8260
4220
Detail 1: Roof detail
15
14
13
12
11
10
09
200
3800
200
500
47,00°
1200
43,00°
ROOF NOTE:
1000 x 2500 x 3 SA 588 Grade A Corten roof plate to be laid on plywood sub-layer and fixed with flush joint to 200 x 75 x 7.5 hot rolled parable flange channels. Corten roofing to be supplied by Electomac Industries, South Africa
200 x 75 x 7.5 hot rolled parable flange channels fixed to hot rolled angle irons to form fixing surfaces, bolted to IPE 200 hot rolled beams with M8 bolts, fixed @ 1200 mm centers
200 x 75 x 7,5 hot rolled parallel flange channel to form frame for 260 Translucent Opening roof interlocking aluminum louvre and gutter system by LouvreTec
IPE 200 Hot rolled steel column to form roof apex structure, welded to IPE 200 hot rolled roof beam
Detail 2: Sliding wall detail
Detail 4: Roof detail
200 x 75 x 7.5 hot rolled parable flange channel to form fixing surfaces, bolted to IPE 200 hot rolled beams with M8 bolts, fixed @ 1200 mm centers
One layer derbigum SP4 waterproofing membrane with 75 side laps and 100 end laps, sealed to primary plywood surface
2500 x 1200 x 12 mm plywood to form continuous sub-surface for the application of waterproofing, fire proofing and roofing material. Fixed to 200 x 75 x 7,7 hot rolled parable flange channels
40 mm SAGEX KULITE Expanded polystyrene (EPS) insulation with a density of min 100 kg/m, to be placed between 200 x 75 x 7,7 hot rolled parable flange channel with 43 degree slope of roof
75X50X20X2 Cold formed lipped channel purlin to be fixed to IPE 200 hot rolled steel column to act as ceiling sub-structure for ceiling panels
1200 x 600 x 12 Nutec Fibre cement ceiling board to be finished with Rhinolight surface and Perlite fire proofing application for heat protection and ensure of natural daylighting from clerestory window
40 mm Mentis grating steel flooring to form upper storage space for artist studio, fixed to IPE 200 hot rolled steel beams with M16 bolts in hot rolled angle iron frame
ARTIST STUDIO
CERAMIC WORKS
Polished concrete
110 m²
ARTIST STUDIO
MODELLING AND WAX
WORKS
Polished concrete
125 m²
ARTIST STUDIO
SCULPTURE STORAGE
Polished concrete
90 m²
service corridor
FLOOR NOTE:
200 mm no-fines concrete base with geopipes laid in herringbone pattern
Sub-structure: Compacted grounfill in max 150 mm layers, compacted to 90 % ModAASHTO

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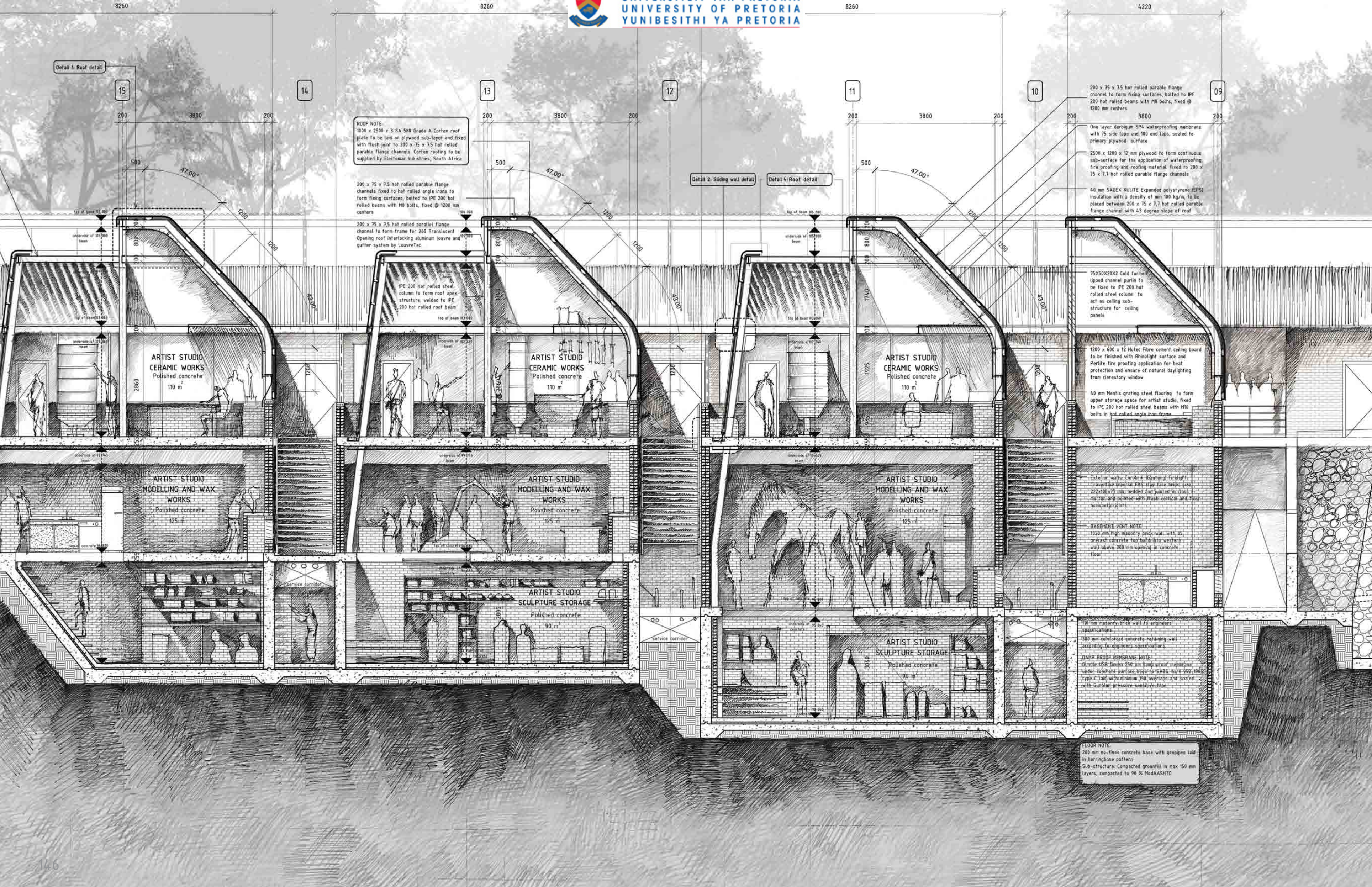

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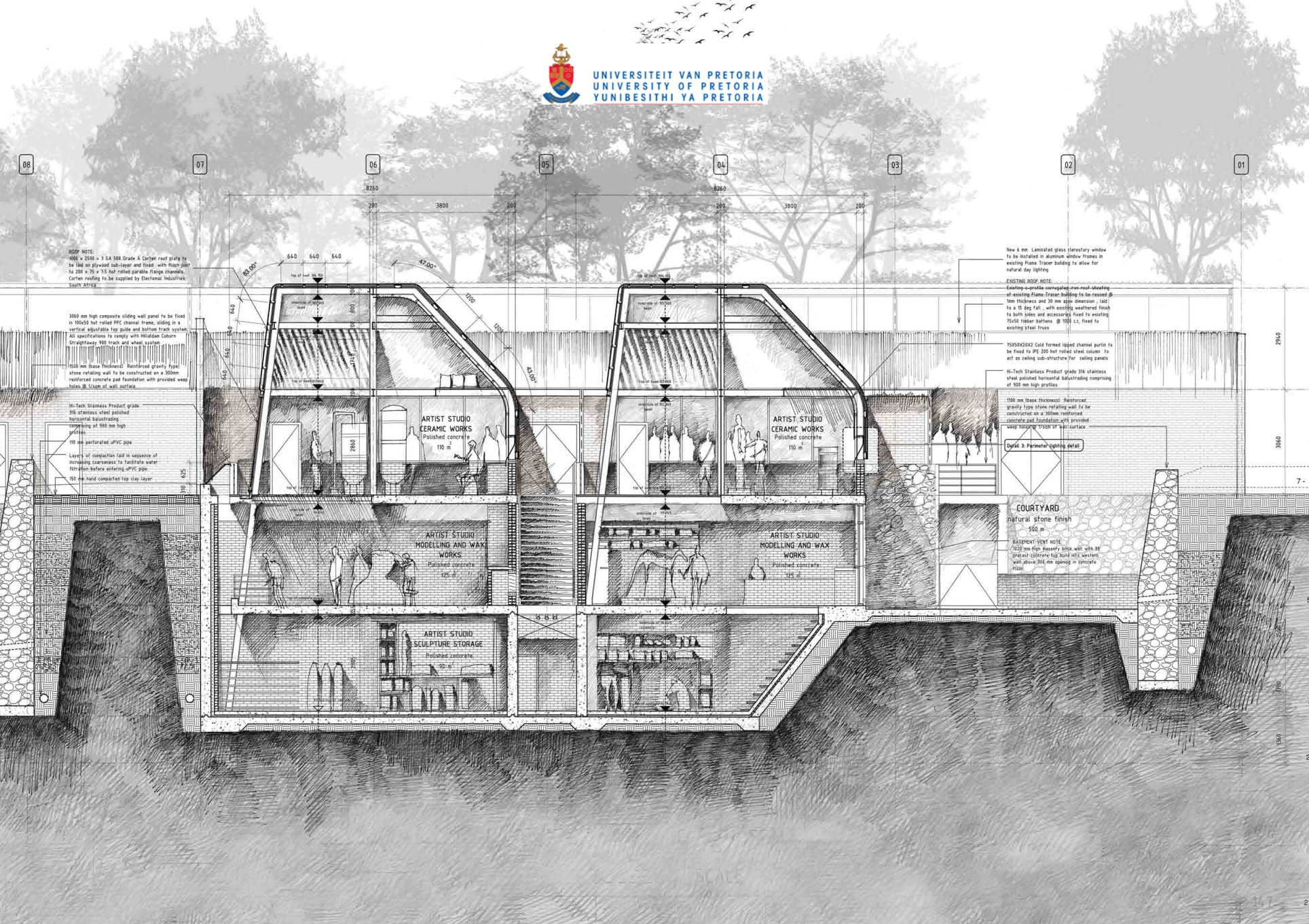
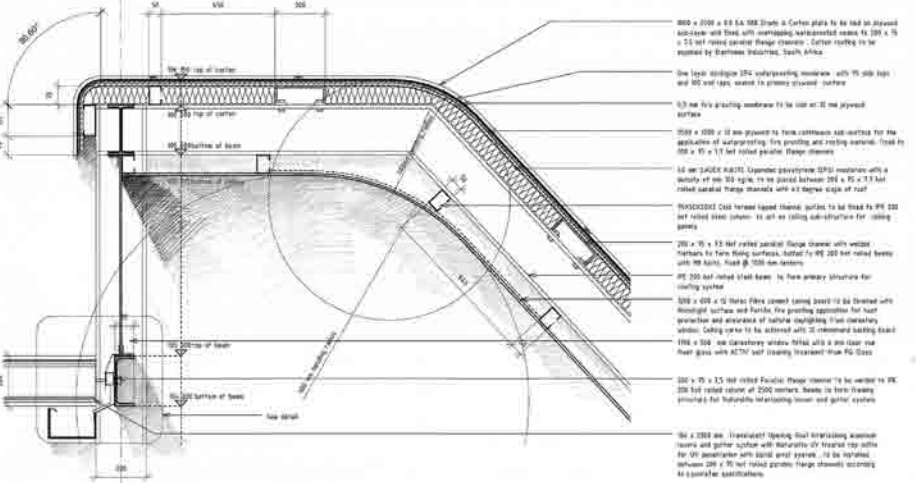
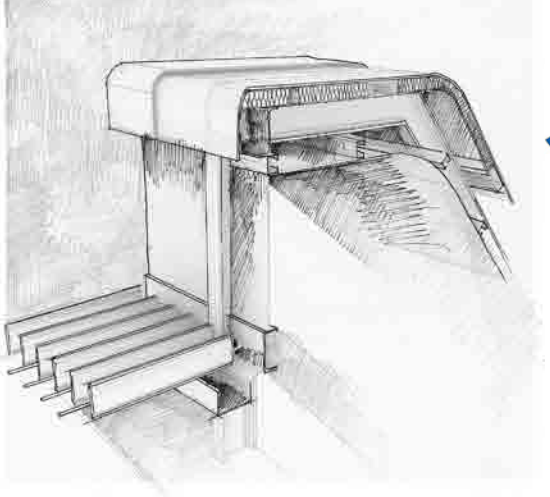
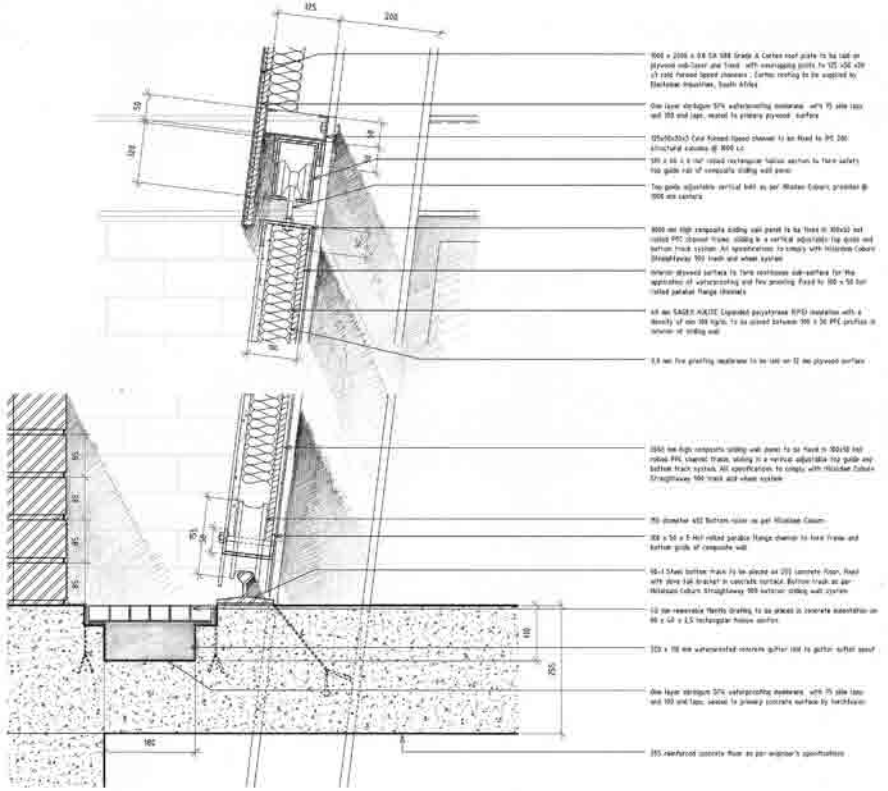
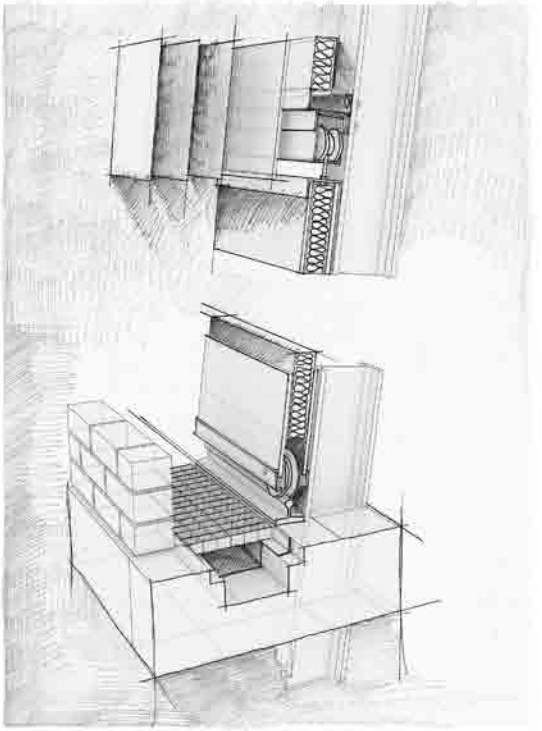




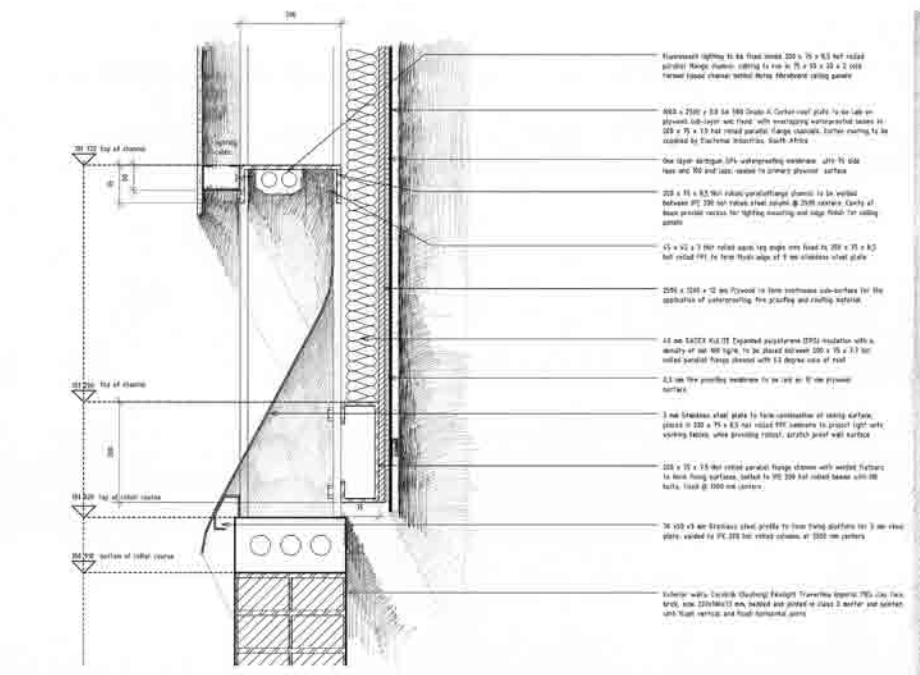


D E T A I L 1 : ROOF DETAIL SCALE: 1 : 10

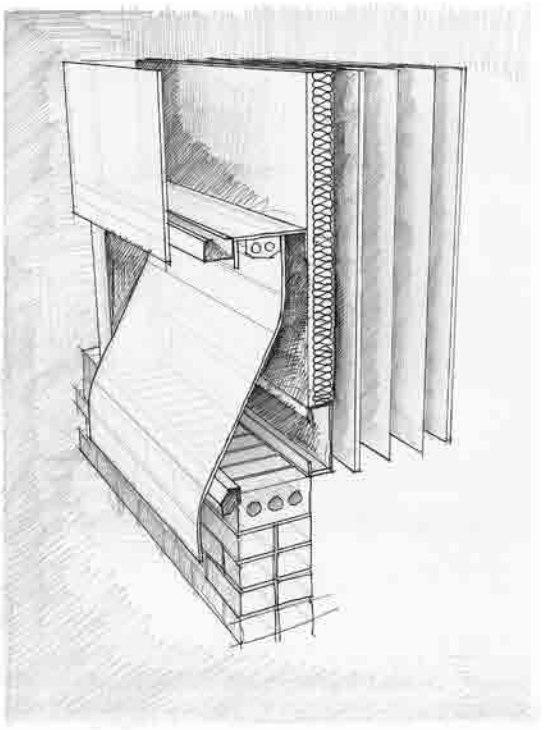


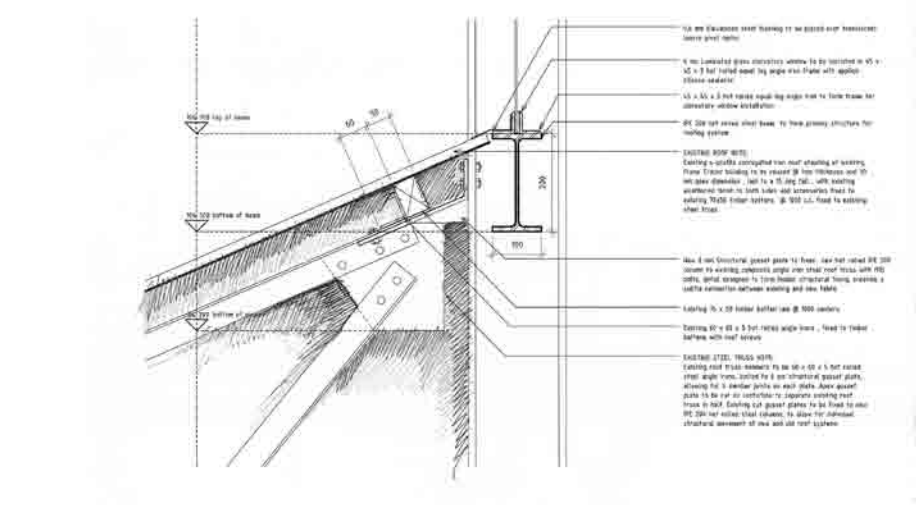


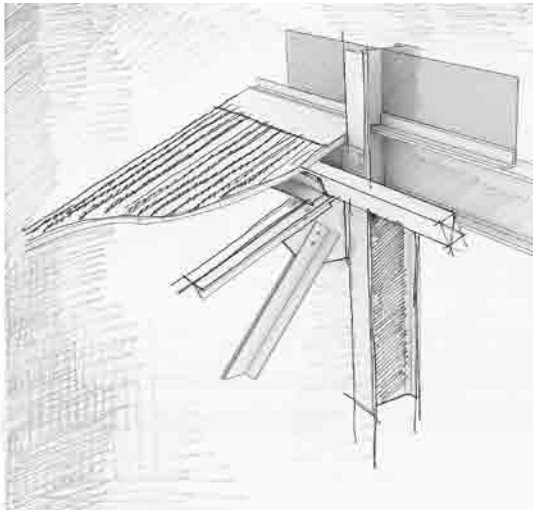
D E T A I L 2 : SLIDING WALL DETAIL SCALE: 1 : 5

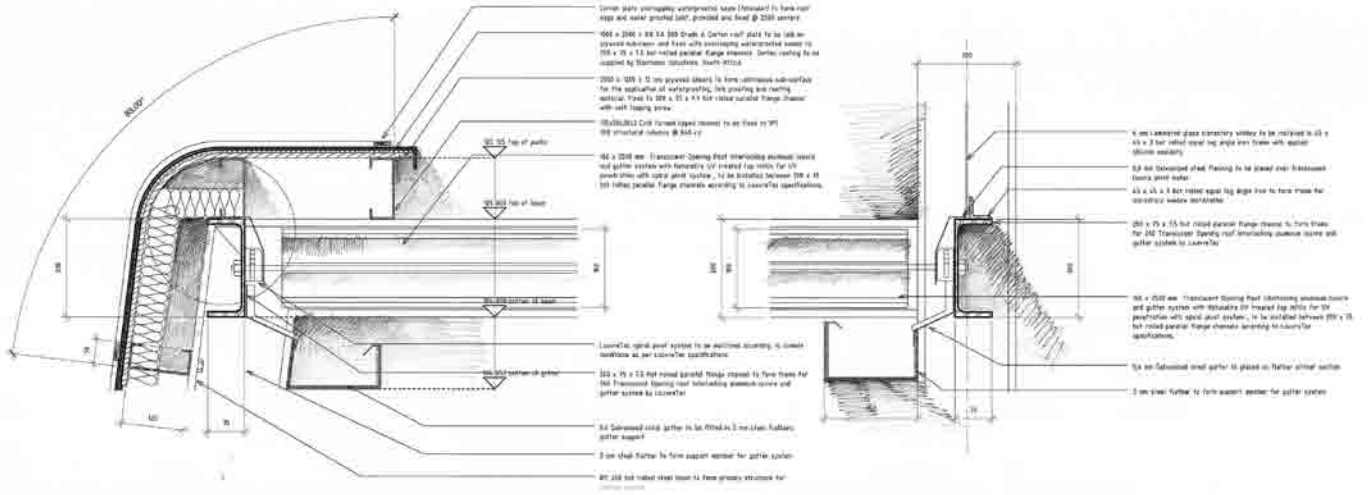


DETAIL 3: PERIMETER LIGHTING DETAIL SCALE: 1 : 5

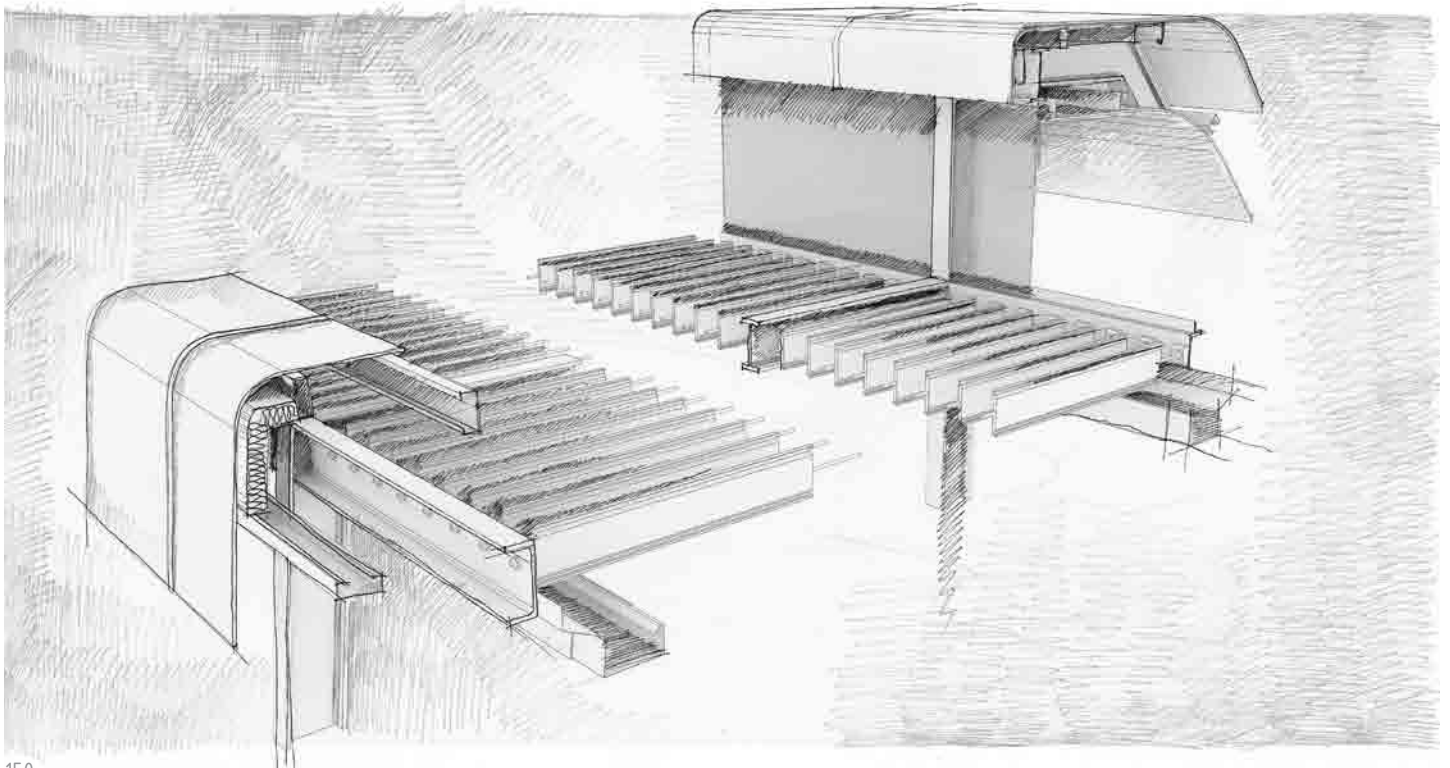




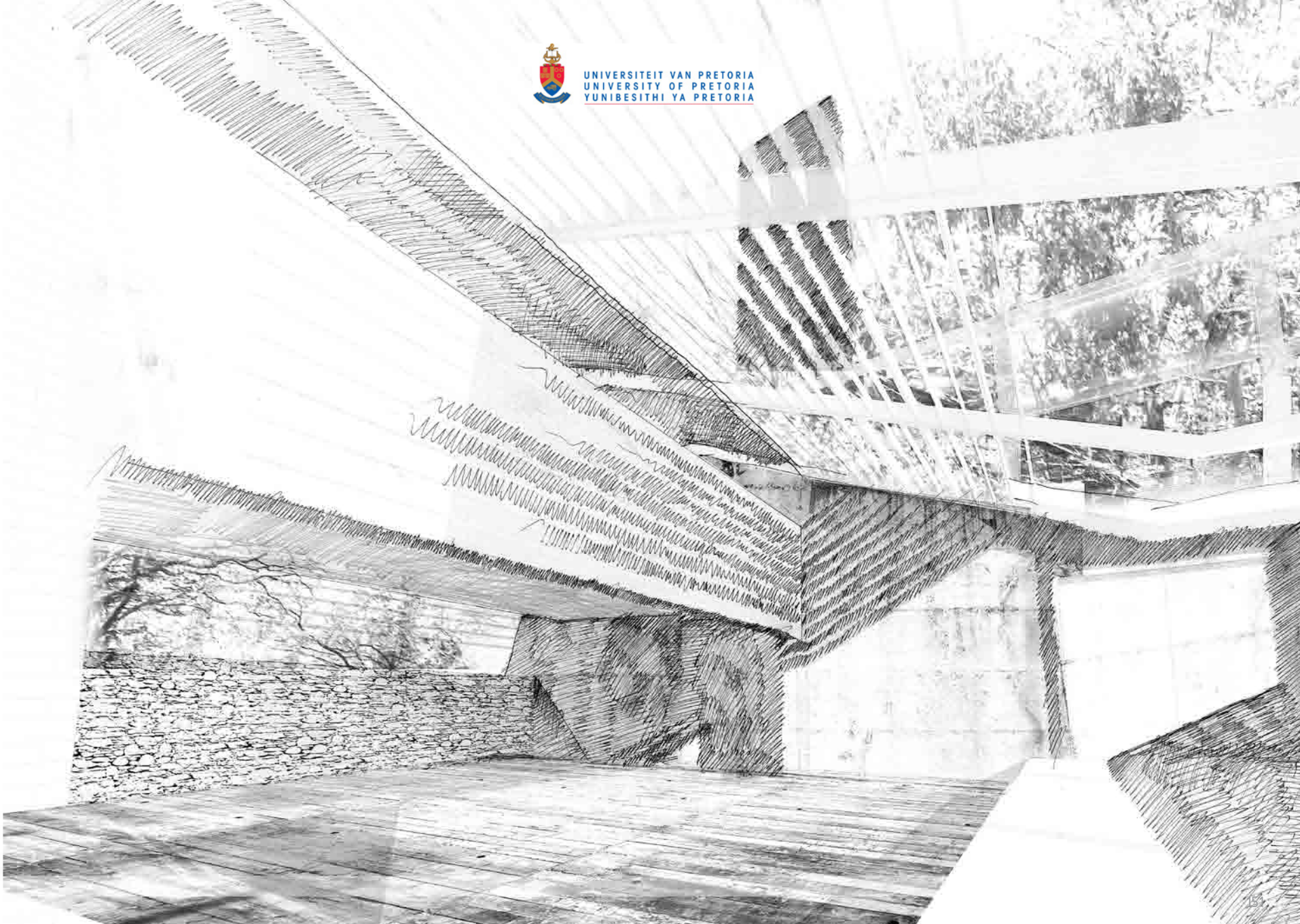




D E T A I L 4 : ROOF DETAIL SCALE: 1 : 5



D E T A I L 4 : ROOF AXONOMETRIC DETAIL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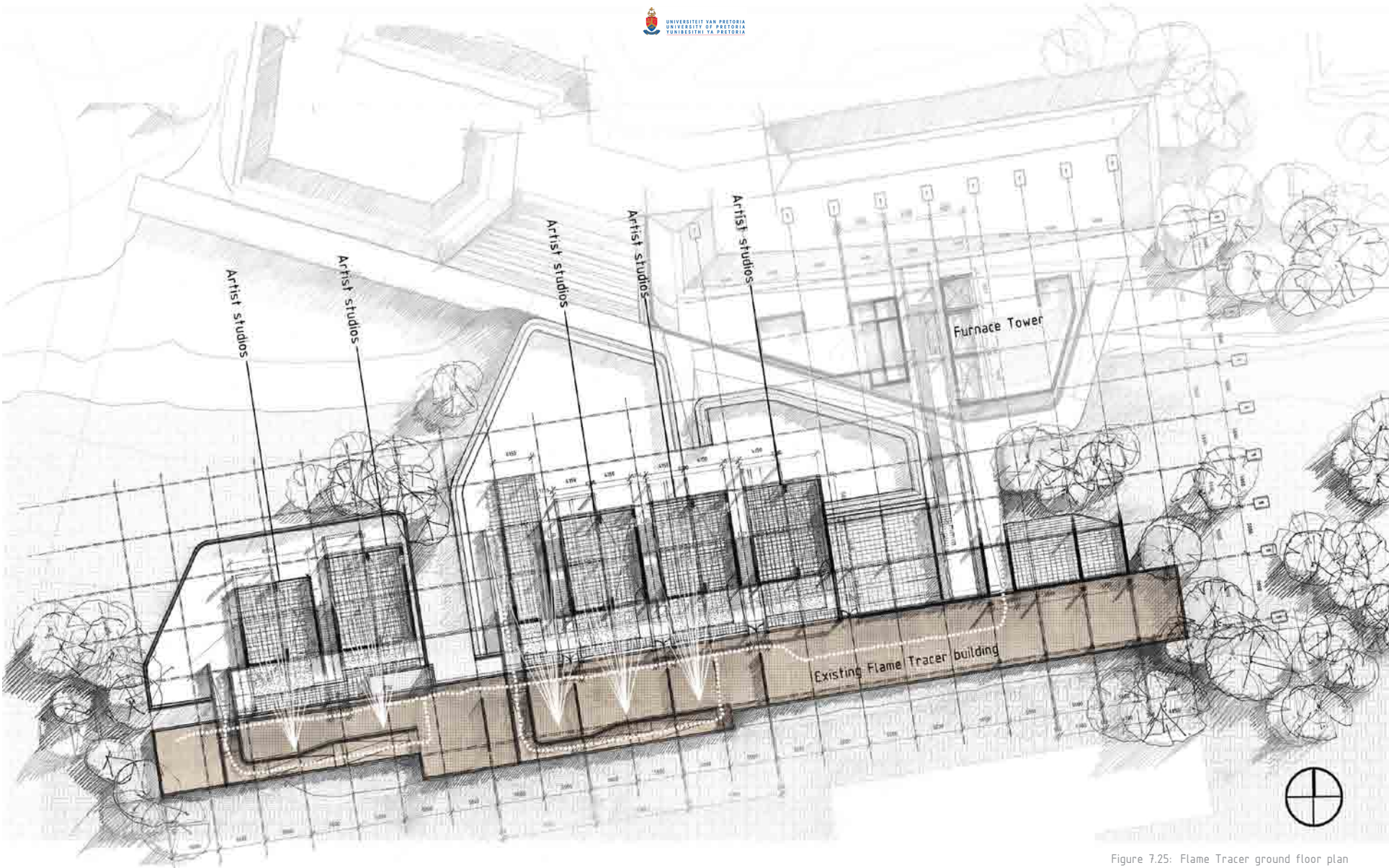


Figure 7.25: Flame Tracer ground floor plan showing artist studio additions, nts (Author, 2011).

Figure 7.26: Exploded view showing interventions in existing building (Author, 2011)

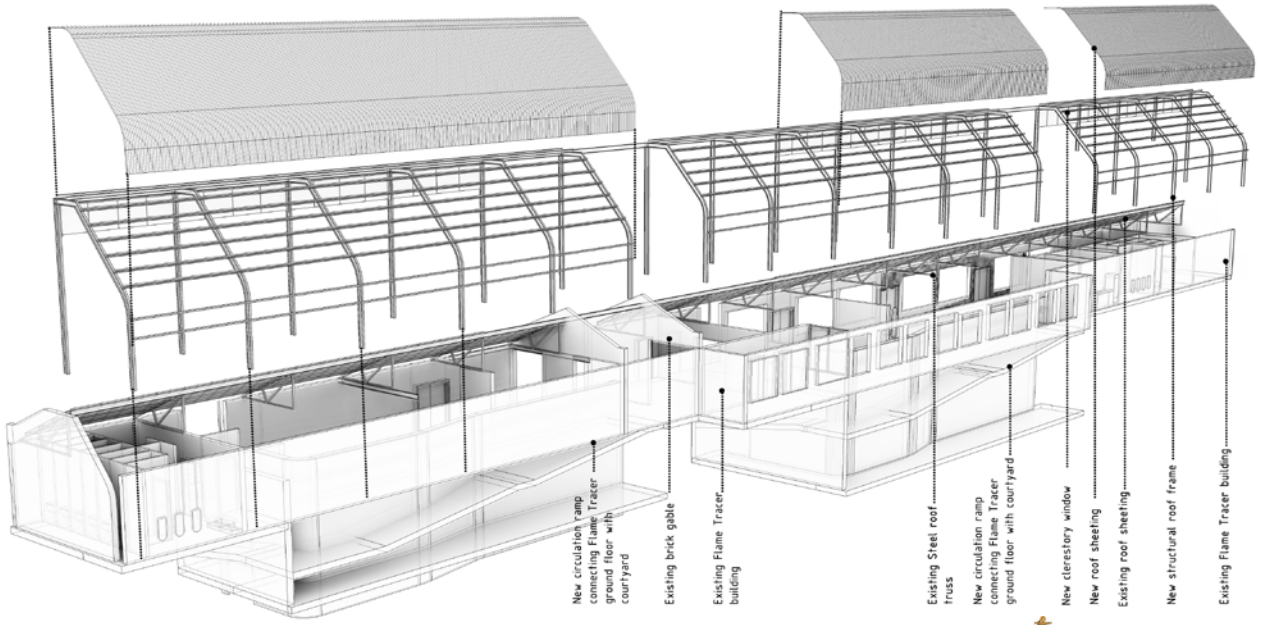
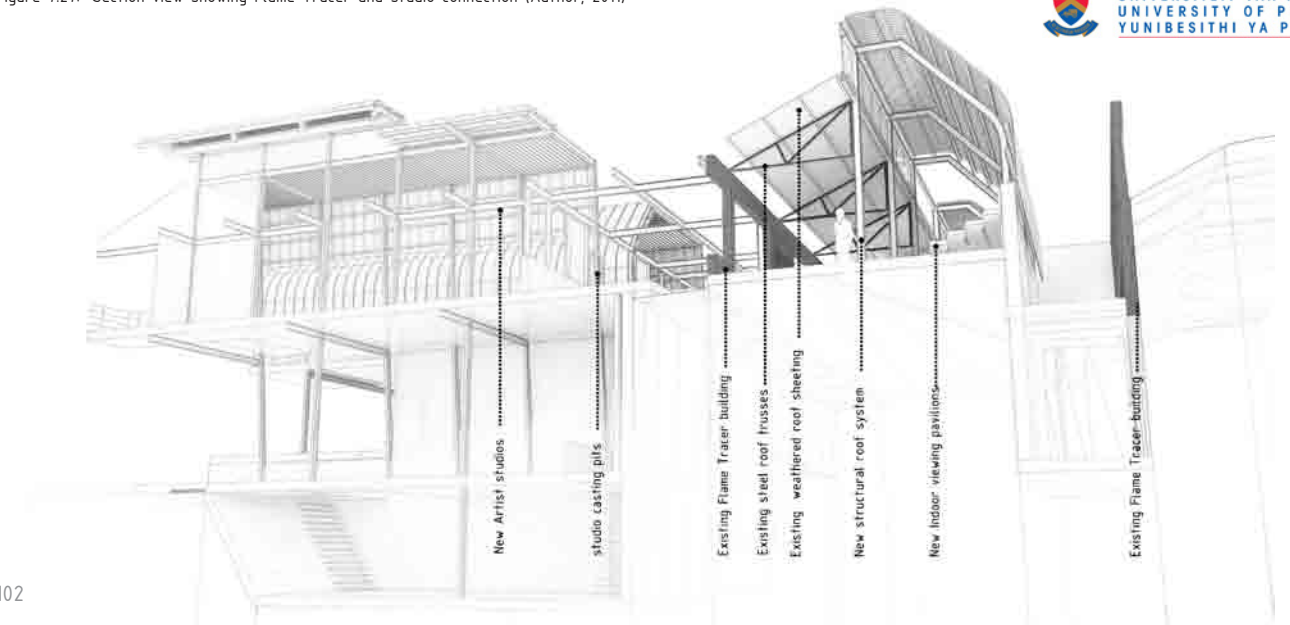


Figure 7.27: Section view showing Flame Tracer and studio connection (Author, 2011)



This design element allows the visitor to experience the art of ammunition reduction within the context of ammunition production, commemorating the large scale production lines of Magazine hill. The act of commemoration is thus focused on the interpretation of old (ammunition production) and new (ammunition reduction) processes as an ongoing activity, as stipulated in Principle 1 of the Ename Charter (ICOMOS, 2005). Again commemorative design is not encapsulated within a static memorial or monument, but rather experienced as an active construct that does not only relate to the past, but also the future of Magazine Hill.

The weathered state of the building is left unaltered, while allowing the process of ruination to continue with the passing of time. This design approach stresses the mortality of architecture and distinguishes clearly between old and new fabric. A new roof structure is introduced that alternates in covered and uncovered spaces, changing spatial experience in terms of volume, light quality and views as the visitor progresses through the Flame Tracer building. Minimal disturbances in the existing fabric, with the exception of the new roof resolving spatial requirements, comply with Article 28 of the Burra Charter, stating that additions should have the potential to sustainably add knowledge or spatial value to the existing (ICOMOS, 1999). Pockets of viewing spaces are injected into the different building compartments, creating a series of architectural experiences that strengthen the interpretation of both the existing and the contemporary (Ename Charter, Principle 1 – Access and understanding). It is within the Flame Tracer building where one escapes from reality to memory.

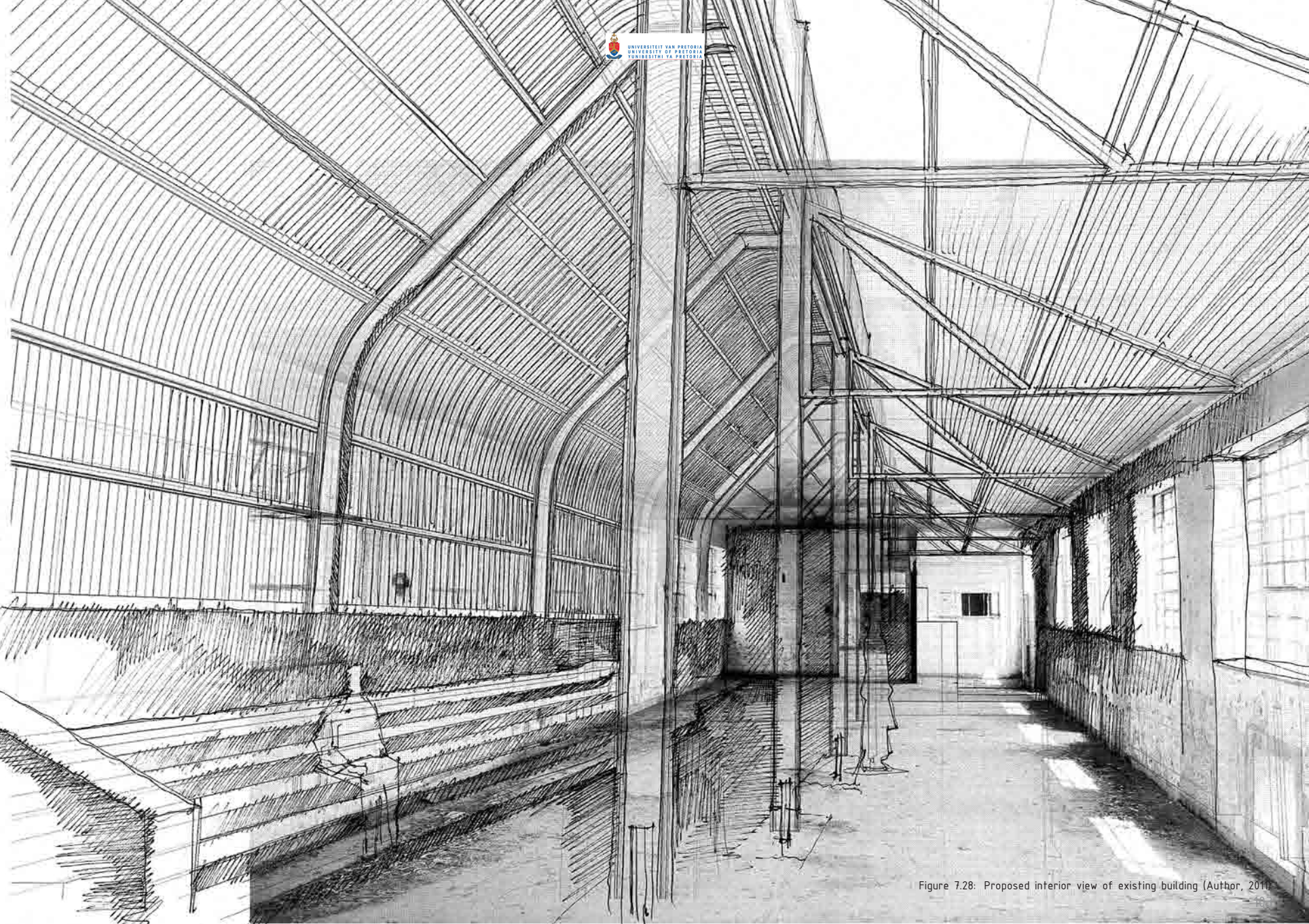


Figure 7.28: Proposed interior view of existing building (Author, 2011)

Forming a spatial extension of the Flame Tracer building, the artist studios are designed according to the "cire perdue" or lost wax method of sculpture production that was used by bronze artists in ancient Rome (CPA, 2011). This methodology is still practiced by most contemporary artists today, enabling the sculptor to produce a vast range of art sizes (personal communication with Potts, 23 May, 2011). The studio thus needs to accommodate this diverse scale range of art production and allow for adjustability.

The studio is divided vertically into 3 storeys, with the top floor forming a continuation of the Flame Tracer building space, the middle floor extending out onto the courtyard where studio practice can be observed from the north, and the bottom storey accommodating sculpture storage. Each artist studio is further divided into 4 secondary studios. The modelling and wax studios define the middle floor space, while the ceramic works and hot shop are located on the top floor. The north facade is fitted with a vertical hoist that distributes larger art pieces and foundry machinery between the aforementioned work spaces.

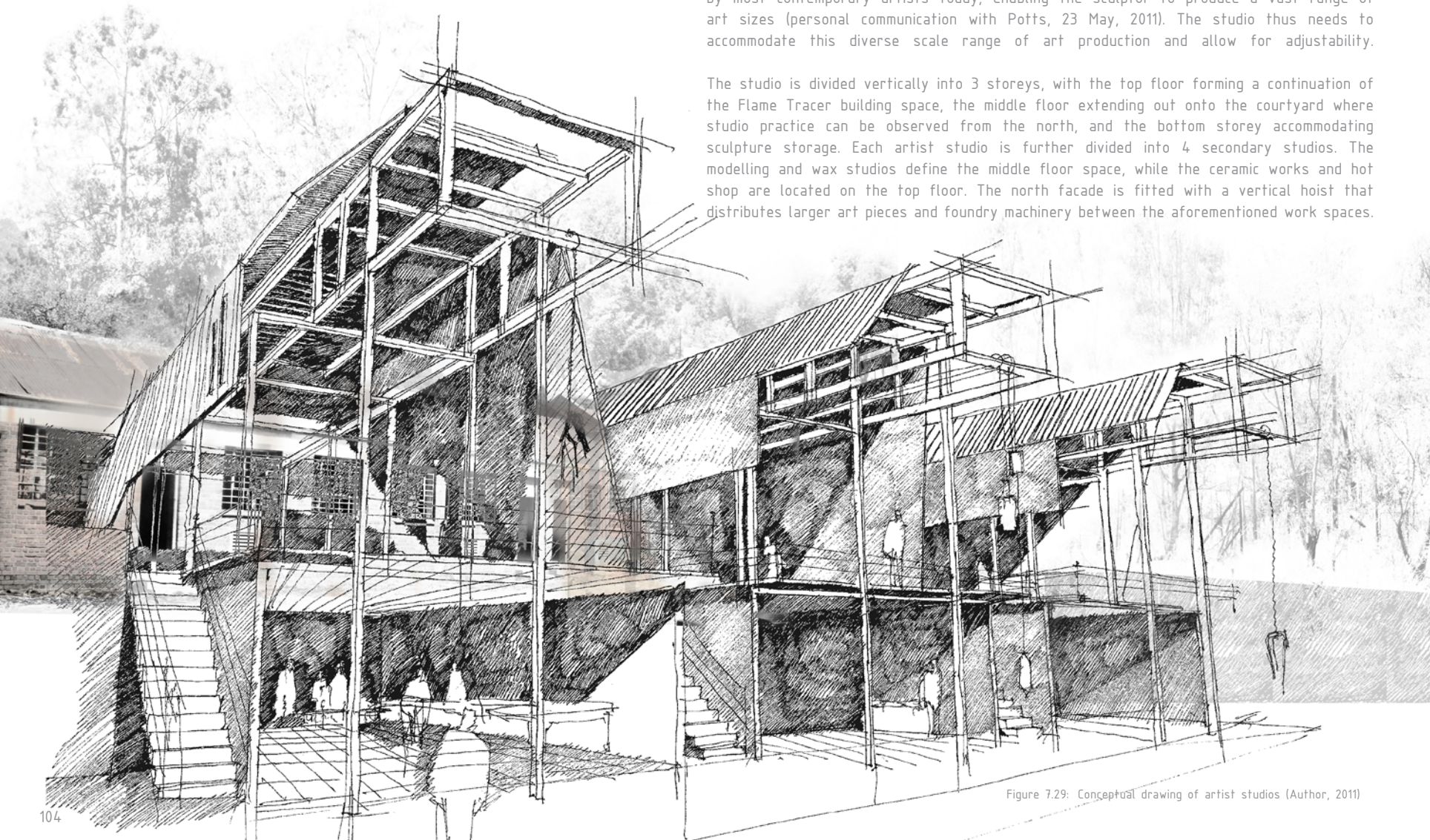


Figure 7.29: Conceptual drawing of artist studios (Author, 2011)

Figure 7.30: Layout drawing of artist studio (Author, 2011)

The western facade is defined by a steriotomic edge that blocks western solar penetration, while the eastern facade forms an adjustable typology that alternates according to user needs. Adjustable flooring further allows for vertical modification of space to accommodate bigger foundry machinery, stretching the concept of workspace adaptability. The artist studios thus function as permanent exhibitions in the new courtyard space that capitalise on the future projections of Magazine Hill, enforcing the statement that ruination can inform creation.

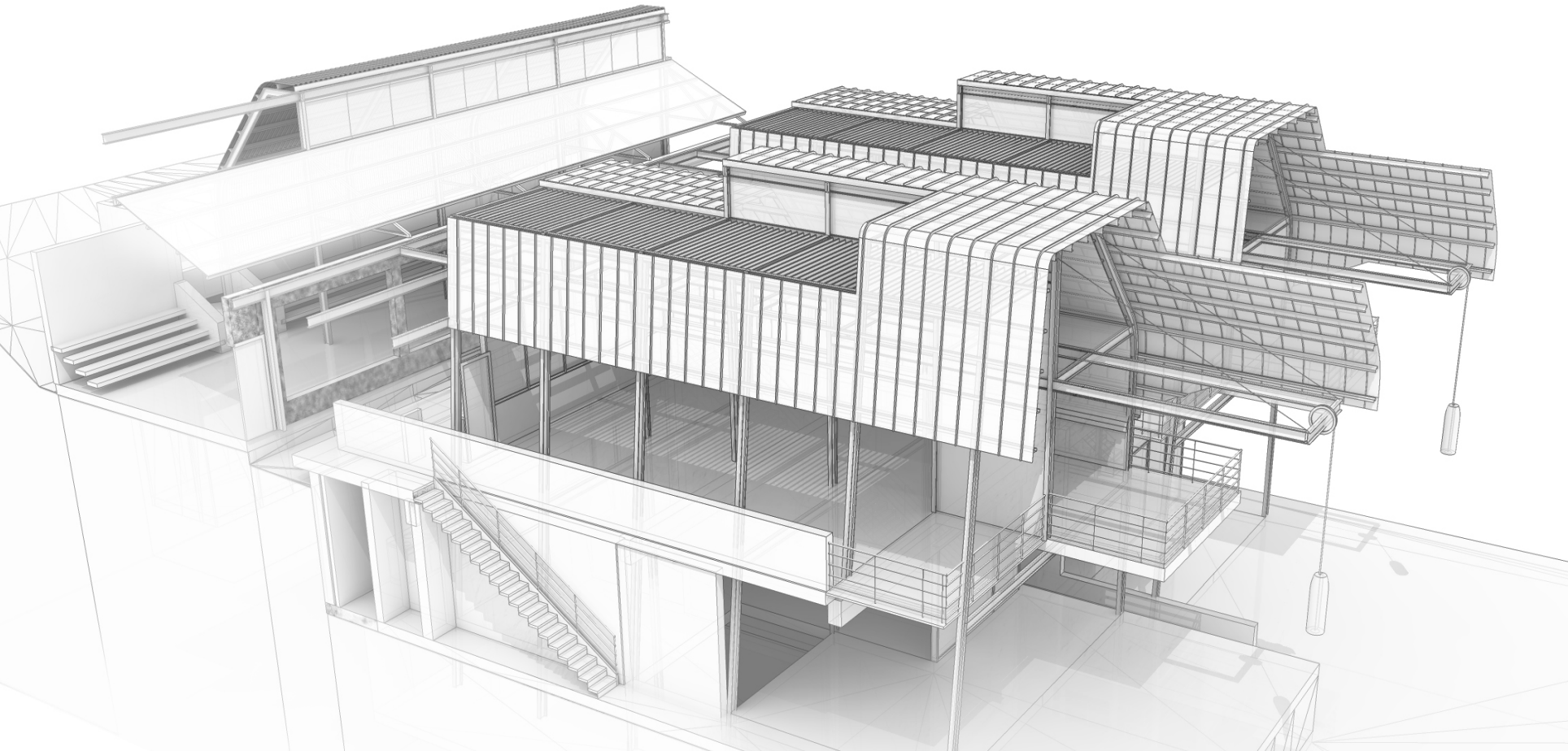


Figure 7.31: View of artist studios projecting into the new courtyards (Author, 2011)

7.5 Summary of Environmental considerations (Is discussed in detail in chapt

7.5.1 Social sustainability

1. The building programme specialises in a reduction process of obsolete ammunition, forming a catalyst in the SANDF environmental programme called Green Soldiering. The proposed foundry forms an environmental statement of the SA Army.
2. Brass ingots and billets are produced from recycled ammunition cartridges and distributed to Denel PMP for ammunition production. A portion of raw material is kept on site for the production of art, thus forming a horizontal integration programme that contributes to social sustainability among local artists.
3 The foundry creates work opportunities for prison inmates and the SA army, thus contributing to a skill transfer process.
4 The foundry is dependent on the public as a tertiary source of raw material, thereby providing the public with a financial incentive and awareness of recyclability potential.
5. An agricultural belt is proposed in the urban precinct

7.5.2 Environmental sustainability

5. The topography of Magazine Hill is utilised to harvest rainwater in the Red Magazine crater, forming both a commemoration pool and water body to supply buildings with water for foundry use and sanitation purposes.
6 A water harvesting strategy that harvests water from washing and cleaning tables and sends grey water through a biofilter pit for secondary use is implemented in the furnace tower.
7 The existing massive bunker wall in the furnace tower is converted into a trombe wall system that ventilates the storage basement and provides a hot air system to dry washed ammunition cartridges.
8 Passive ventilation systems in the tower hot shop are developed as a commemorative steam feature in the design.
9. The series of artist studios are orientated north for maximum daylighting illumination and sufficient thermal comfort control.
10. Sliding eastern wall panelling provides the artist studios with adjustable options, optimising passive ventilation, natural daylighting illumination, and extending spatial qualities beyond the limited workshop space.
11. An interlocking louvred roof system allows studio workers to ventilate hot shops vertically, control natural light quality for working purposes and allow for rain water penetration if open studio space needs to be cleaned.
12. Sufficient insulation is provided in roof structures that are exposed to direct solar radiation, strengthening thermal comfort in studio spaces.
13. Water harvesting strategies in artist studio space is defined by sloping floors diverting water flow to catchment areas in the public courtyard where bio filter pits purify grey water for foundry use.
14. Dual flush sanitation systems are stalled, with CFL and LED lighting panels utilised for lighting strategies in studio ablutions and kitchenettes. Sufficient daylighting illumination allows for lighting systems to be active only at night.

Conceptual sketch of artist studio louvre roof (Author, 2011)