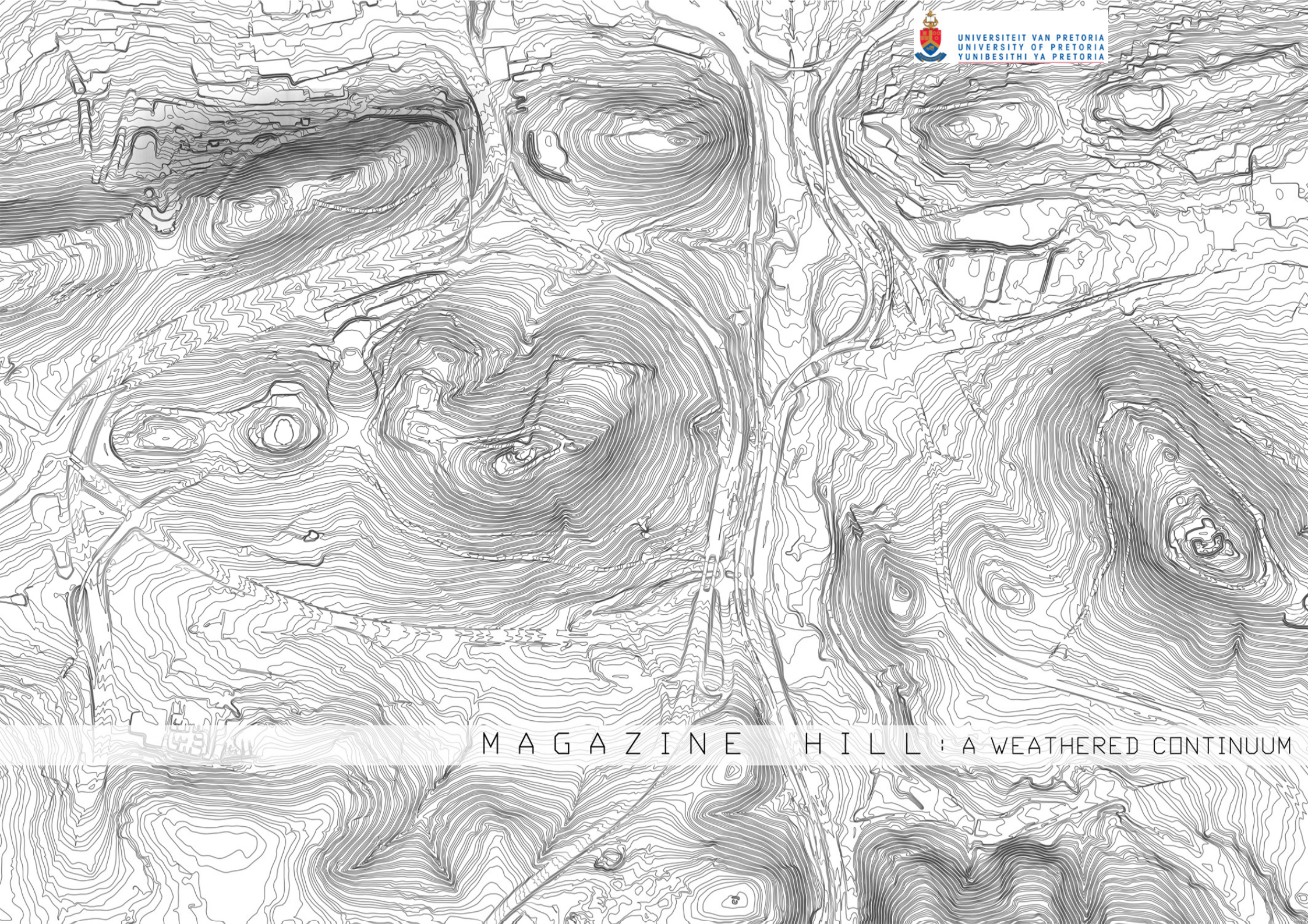
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MAGAZINE HILL: A WEATHERED CONTINUUM

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Submitted in partial fulfilment of the requirements for the degree of
Magister of Architecture, MArch(Prof),
to the Faculty of Engineering, Built Environment and Information Technology.

University of Pretoria
2011

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Study Leader: Rudolf van Rensburg

by Cliff Gouws

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I love the magic of TNT. How eloquently it speaks! Its resounding rumble, its clap, its quack is scarcely less deep than the passionate moan of the Earth herself. A well-timed series of detonations is like a choir of quakes. For all its fluent resonance, a bomb says only one word – "surprise!" – and then applauds itself. I love a breeze perfumed with the devil smell of powder. I love the way that architecture , under the impetus of dynamite, dissolves almost in slow motion, crumbling delicately, shedding bricks like feathers, corners melting, grim facades breaking into grins, supports shrugging and calling it a day, tons of totalitarian dreck washing away in a wake of a circular tsunami of air. I love that precious portion of a second when window glass becomes elastic and bulges out like bubbelgum before popping. I love public buildings made public at last, doors flung open to the citizens, to the creatures, to the universe. Baby come on in! And I love the final snuff of smoke.

(Robbins, 1980:78)

Hierdie verhandeling is gegrond op 'n proses van versoening, 'n persoonlike worsteling om die verhouding tussen teenoorgesteldes te begryp. Hierdie verbintenis tussen teenoorgesteldes word verken op die terrein van argitektuur en tyd, wat verder fokus op argitektuur se potensiaal om aan te pas met die verloop van tyd, deur die proses van verwering. Hierdie studie word dus geanker in die hoofdoel om argitektuur te verenig met die deurlopendheid van tyd.

Die projek plaas kontemporêre herdenkingsargitektuur in die kollig, waar kritiek gelewer word op die statiese herdenking van erfenis, deur die tipologieë van museums en herdenkings. Hierdie tipologieë verander dikwels in statiese monumente, waar die hedendaagse toepaslikheid bevraagteken kan word. Die argitektoniese reaksie van hierdie verhandeling is dus gefokus op herdenking deur alledaagse gebruik.

Die voorgestelde historiese terrein, Magasynheuwel, vorm 'n omvattende samestelling van verskillende lae van tyd en invloed. Hierdie geheimsinnige, verlate en geïsoleerde terrein bevat 2 ammunisiemagasyne, 5 bomkelders, en ammunisiefabrieke, waar die strukture 'n era van onrus in Suid-Afrika voorstel. In 1945 het die misterieuse ontploffing van die Rooi Magasyn 'n letsel gelaat op Magasynheuwel, wat gelei het tot 'n vroeë dood vir die aktiwiteite op die terrein. Hierdie gebeurtenis het argitektuur vasgevang in tyd en verlatenheid.

Die voorgestelde program vorm deel van die konseptuele uitgangspunt van bemiddeling, 'n vereniging tussen teenoorgesteldes, vasgevang in beide Magasynheuwel en in die Suid-Afrikaanse konteks. 'n Koper Smeltery word voorgestel wat gebruikte ammunisiedoppies herwin, om metaal kunstenaars en 'n publieke dimensie deel te maak van Magasynheuwel. Waar ammunisie geproduseer was, word dit nou gereduseer. Hierdie program kan 'n bemiddeling bewerkstellig tussen die publiek en die weermag, wat die verskillende lae van die verlede ontblood, deur middel van 'n verbintenis tussen tyd en argitektuur.

Abstract

This dissertation is rooted within a process of unification, a personal struggle to understand the fragile relationship that exists between architecture and time. The project focuses on architecture's potential to adapt according to the passage of time, through the process of aging and weathering. This study is founded in the aim to re-establish a connection between the continuum of time and architecture.

The project places contemporary commemorative architecture under the limelight, criticising the static notion of heritage commemoration through the typologies of museums and memorials. These typologies often evolve into static monuments, where the relevance to contemporary society can be questioned. The architectural response of this dissertation is thus focused on commemoration through everyday use.

The proposed historical site (Magazine Hill) forms a comprehensive construct of different layers of time and influence. This mysterious, abandoned and isolated site consists of two ammunition magazines, five bomb shelters and ammunition factories, all structures that represent an era of unrest in South Africa. In 1945 a mysterious explosion of the Central Magazine scarred the face of Magazine Hill, leading the activities on the site to an early death, trapping architecture in time and abandonment.

The proposed programme forms part of the conceptual premise of mediation, unifying different opposites inherent in both Magazine Hill and the South African context. A brass foundry is proposed to recycle the spent ammunition shells of the South African National Defence Force (SANDF), thereby introducing brass artists as a public interface to Magazine Hill. Where ammunition was once produced, ammunition is now reduced. This programme could form mediation between the public and the military; exposing different layers of the past by reinstating a connection between architecture and time.

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This chapter focuses on the conceptual and practical problem statement of the dissertation in terms of the South African context. The proposed site, background and methodology is briefly presented to contextualise the research questions and dissertation aims.

Chapter 1 – Introduction

1

Figure 1.4: Painting depicting the collaboration of time and architecture (He, 2009: 5)

Figure 1.5: Contemporary injections in historical ruins – juxtaposed thoughts? (He, 2009: 6)

1.1 Introduction

Time and place can be positioned as two interdependent realities that coexist, bearing universal evidence of each other's existence. On the one hand, time engraves the scars of age in all available materials offered by an object, and is responsible for the accumulation of history (both natural and cultural) on a specific surface. On the other hand, place forms the evidential platform that bears witness to all events that accompanied a time frame passed, therefore time and place forms interrelated functions of each other.

Although these two universal entities, time and place, do not stand in direct opposition to each other, the realm of architecture (place) has occasionally opposed the continuum of time and change. This statement is supported by numerous examples throughout history: Ancient Mesopotamian and Greek construction theory relates to the monumental, to create a permanent, static object that transcends time without adaptation. These monuments portray man's ideal to have control over nature, change and ultimately time. By analysing Le Corbusier's 1920's modern photography, architecture is always photographed to capture a specific moment, creating scenes frozen in time – a still life. In the photography of Villa Stein-de Monzie, Garches (1926-1928) by Le Corbusier, only space is photographed, no action or individual utilising space is portrayed. It could be argued that the Modern Movement's obsession with still photography represents a desire to capture the moment of architectural completion, rather than portraying architecture's transformation through use, that ultimately re-establishes architecture's connection to the continuum of time. (Leatherbarrow & Mostafavi, 1993: 83)

As architecture enters the realm of aging, the process of ruination accompanies a building's transformation. Gary He argues that ruins are the physical documentation of a transformative process that has a strong reference to time and past time, which serve as evidence of origin and lineage – an inheritance of knowledge uncovered and preserved (He, 2009: 03). The process of weathering and ruination places emphasis on architecture's inherent mortality: the fact that all built form, regardless of size and permanence, will eventually become ruins. This reality reinforces architecture's inability to resist change and, ultimately, time.

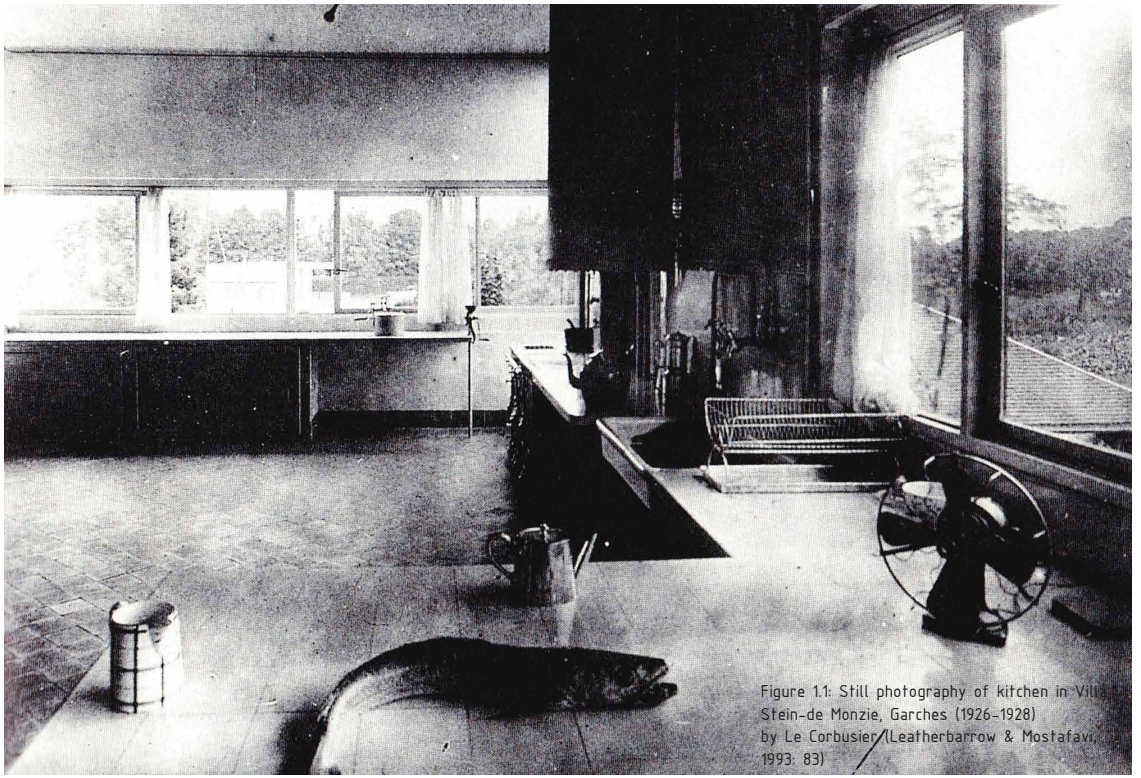
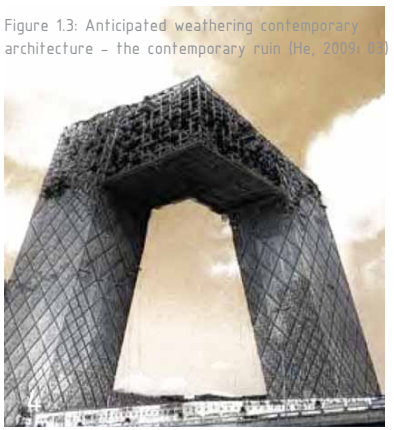


Figure 1.1: Still photography of kitchen in Villa Stein-de Monzie, Garches (1926-1928) by Le Corbusier (Leatherbarrow & Mostafavi, 1993: 83)

Figure 1.2: Rendering of anticipated weathering of the Gugenheim Museum (He, 2009: 03)

Figure 1.3: Anticipated weathering contemporary architecture – the contemporary ruin (He, 2009: 03)



This dissertation investigates architecture's persistence in time, focusing on the preservation and commemoration of heritage significant ruins through the process of adaptation and addition. It further explores architecture's ability to change according to the passage of time, where the processes of weathering and ruination shapes architecture's creation and establish an interaction with the continuum of time.

1.2 Proposed context – Magazine Hill as a weathered continuum

The proposed site is identified on an isolated, historical site in Pretoria – Magazine Hill (*Magasynheuwel*) located in the military precinct, south of the Pretoria Correctional Services. The site was utilised for the production and storage of military ammunition from the 1890's up to 1960. This was also the first site in South Africa where military-industrialism was formalised for ammunition production, which provided 45% of ammunition used by the Allied Forces in the Second World War (DENEL, 2011). The variety in historical events and nationalities of the different site developers, led to an immense diversity of building typologies and construction methods on site. Not only is the site the accumulation point of Boer, British and Black, but also the geological meeting place where dolomite and quartzite share the geological construct of the site (Swart, 2011: 4). All opposites are present – natural, social and architectural.

A mysterious explosion of the Central Magazine (*Sentraalmagazynhad*) in 1945, led to massive destruction in Pretoria where damages were reported as far as Church Street (Panagos, 2006: 5). This intense explosion left a physical scar in the hill, which is the only remaining witness of the tragic event. Currently, parts of Magazine Hill are still strewn with live ammunition and unexploded ordnance that reappears with each rain season (personal communication with Du Plessis, 14 November 2010). There is an inherent tension locked within the site, hidden in mystery and untold stories. In the author's opinion, the isolation of the site forms part of a negative mental construct relating to the site's history – a sense to forget the tragic past. It is as if the site doesn't want to be found, remaining imprisoned in its own misery.

Figure 1.6: Interior view of submerged bunker space on Magazine Hill (Author, 2010)

Figure 1.7: Locality plan of Magazine Hill in relation to prominent sites (Author, 2011)

1.3 Problem Statement – Background and Context

The progressive time line through architecture in South Africa, with all pervasive influences and negative historical events, has led to the birth of mutated South African heritage spaces (De la Porte, 2010). One of these mutations of space can be defined as weathered space, which, according to Penelope Haralambidou and Michael Tate (2009:8), is space where the patina of time creates effects of erasure and mysterious spaces, where diverse interpretations are produced by missing links. Weathered space is usually accompanied by a severe state of decay and ruination because of long-term dereliction. Military architecture in Gauteng forms good examples of weathered space, for their intended purpose and remote character contribute to their irrelevance in contemporary society. The first universal problem that this dissertation thus addresses, is the activation of memory that is isolated from everyday use.

Architecture and objects of historical value in the inner city are maintained and appropriated because of their frequent interaction with the public realm, therefore their heritage are protected and kept alive. The proposed site, Magazine Hill, forms part of the peripheral exclusion of military architecture in Pretoria. Not only is the site segregated from the active realm of the city, but also from the military precinct on which Magazine Hill is located. It finds itself in isolation, further reducing the interaction between the military and public realms. The secure character of the precinct has led to the dereliction of more than half of the buildings on Magazine Hill, for it is argued that its secretive and haunting history should be forgotten by the citizens of Pretoria (Personal communication with Du Plessis, 2010).

Figure 1.8: Interior view of Wonderboom Fort (Author, 2011)

Figure 1.9: The abandoned ruins of West Fort (Author, 2011)

Figure 1.10: The Green Magazine on Magazine Hill (Author, 2011)

The second universal problem places commemorative architecture under the limelight, criticising the exploitation of emotional content to theme museums and monuments in contemporary South African heritage design. Contemporary commemorative architecture often transforms history into static pieces of design in the form of museums and memorials, creating a static sense of commemoration. These interpretations of heritage form frozen objects in time, objects which realtes only to the past or specific events, and form no interactive dialogue with the present. In this sense, commemorative architecture does not address contextual change, for it is trapped in the time frame it memorialises. Good examples are Red Location, Constitution Court and the Craddock Four Memorial. The Apartheid museum, Johannesburg (2003-2005) by Gapp Architects, Mashabane Rose Architects, forms another example of this criterium of commemorative architecture, where emotional content is exploited to enrich spatial experience through the imbalances and impurities of Apartheid.

All mentioned heritage sites or contemporary architecture produced from the heritage context, are placed on the pedestal of time, with ownership not belonging to civil society, unable to interact or formulate a dialogue with time. This approach to contemporary heritage design has encapsulated our historical sites and transformed them into isolated monuments in time, further extending the privatisation of heritage space. The resolution of this argument has the potential to question the current typology of commemorative architecture that can re-establish the connection between memory and civil society.

Figure 1.11: The Apartheid museum, Johannesburg, South Africa (Kemp, 2009)

Figure 1.12: Augmented South African heritage space, Constitution Court (Hill, 2009)

The last main problem that this dissertation addresses is the perception of architectural ageing. The process of weathering and decay in architecture are being considered as a negative impact of time on built form, connecting architecture to its finality or death (Pallasmaa, 2000: 34). Throughout historical architectural thought, the process of ageing has always been fought against, in an attempt to transcend structure and surface through time. The author states that this inevitable process of weathering reveals the intrinsic layers of time, by acknowledging its passage. Secondly, the incorporation of weathering into design (to design for the anticipation of material change and deterioration through time) has the potential to extend South African building life spans, not only physically but also conceptually. In the context of Pretoria, weathered space is under utilised, nevertheless locked down and concealed behind privatised fences, unable to tell the stories of the past.

Figure 1.13: Interior view of submerged bunker space on Magazine Hill (Author, 2010)

1.4 Research questions

The research questions that arise from the problem statement and background of the dissertation are listed as follows:

·How can contemporary commemorative architecture be challenged to form a new typology that acknowledges contextual change?

·How can isolated, locked and separated memory be brought to the fore without physically connecting?

·How can the inevitable process of weathering be utilised in design, to prolong building life spans and re-connect architecture to the continuum of time?

·How can architecture mediate between opposites (present, past and future, military and public, past and new ways of thought)?

1.5 Architectural Problem

The architectural problem in terms of spatial understanding and experience focuses on the shortcomings of the museum typology. The main architectural intervention will focus on the exhibition and commemoration of history without exhibiting memory in glass boxes, but rather commemorate through everyday use, discovery and interpretation. The second architectural problem that this dissertation addresses lies in the exhibition of a historical object /space through adaptation and active everyday use.

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1.6.1 Practical aims:

Memory:
This first aim concentrates on the establishment of a connection between the lost memory/history of Magazine Hill and the public realm. This connection will not necessarily be physical, for the isolated, secretive and mysterious character of Magazine Hill should fully be respected and preserved.

Mediation:
The second aim focuses on forming a platform for mediation between the military and the public realm, for the role of the military has changed considerably after The Second World War and the Apartheid regime. This will also mediate between old and new thought patterns. Magazine Hill also lies on the threshold between the military precinct and natural edge of Pretoria's southern border. This statement does not propose that security boundaries between the inner city and the military precinct should be compromised, but rather that a supportive interaction between the opposite entities should be established. This interaction should focus on public military arms exhibitions, South African National Defence Force (SANDF) displays, auctions, and military music events.

Support:
This aim is focused on the future projections of the SANDF for the military precinct. The Department of Defence has recently assigned the Military Integrated Environmental Management or "Operation Green Soldier" programme to the SANDF, which involves new sustainable management strategies for military activities and recycling in South Africa (Godschalk & Ferreira, 2010: 2). The proposed programme could support and be closely connected to this strategy.

1.6.2 Theoretical aims:

Challenge:
The fourth objective aims at challenging the current typology of commemorative architecture. This aim will address the static memorialisation of heritage and aspire to re-establish the connection between architecture and the dimension of time. The presentation and experience of heritage through a museum typology and commemorative architecture will be challenged.

Anticipate:
The final aim of this dissertation challenges the design methodology regarding weathering and aging in architecture. The process of decay, which has throughout the ages been considered as a negative impact on architecture, will be investigated in order to implement the anticipation of weathering into the initial design phase, in order to reintroduce architecture into the continuum of change.

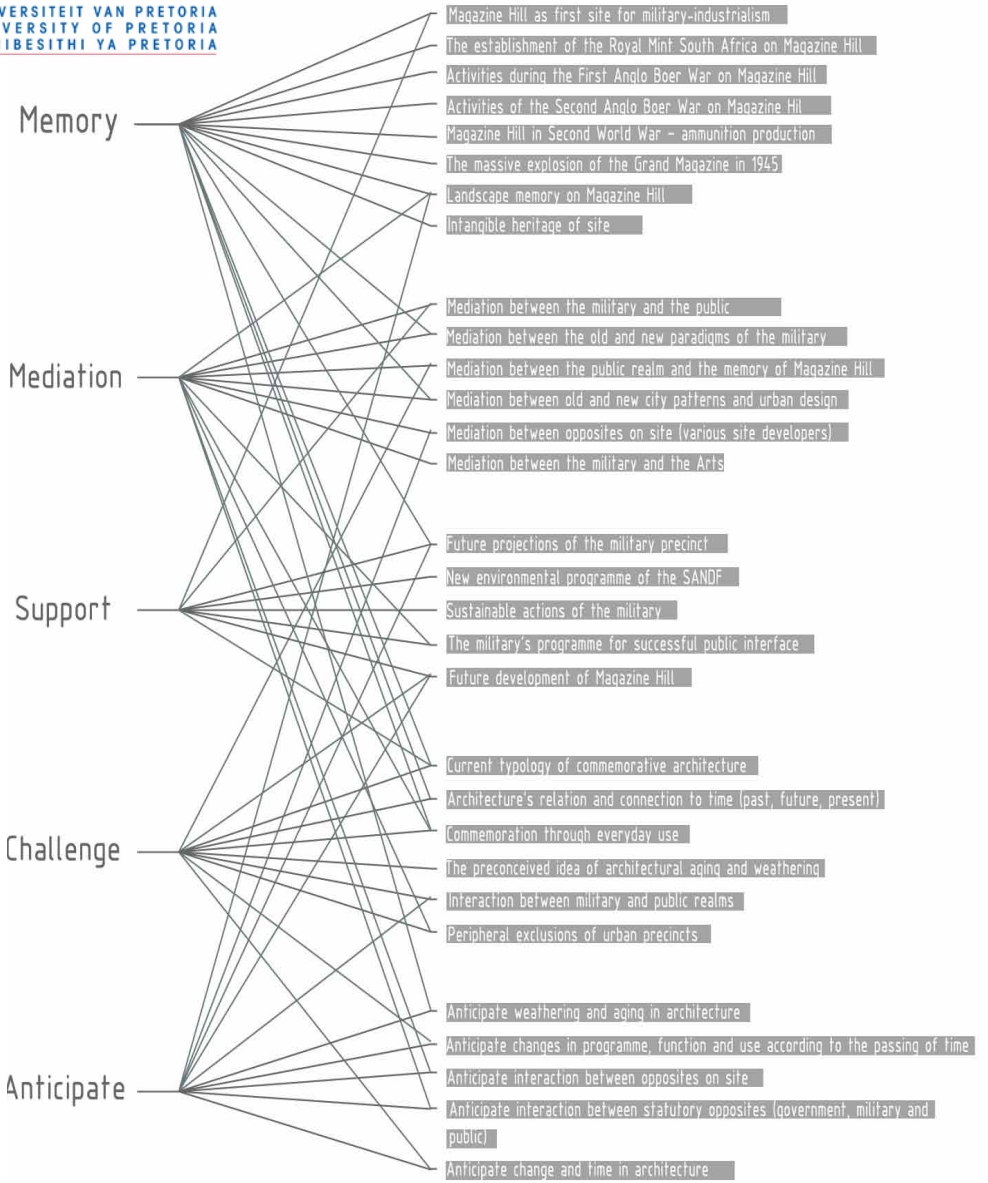

Figure 1.14: Summary of dissertation aims (Author, 2011)

Figure 1.15: The derelict sub station of Magazine Hill (Author, 2011)

The second chapter concentrates on the historical influence of Magazine Hill. The heritage significance is contextualised within the Anglo Boer Wars, Fortification plans and military-industrialism realm of South African history. The proposed programme is then explained as a response to the heritage significance and main argument.

Chapter 2 - History and Project Response

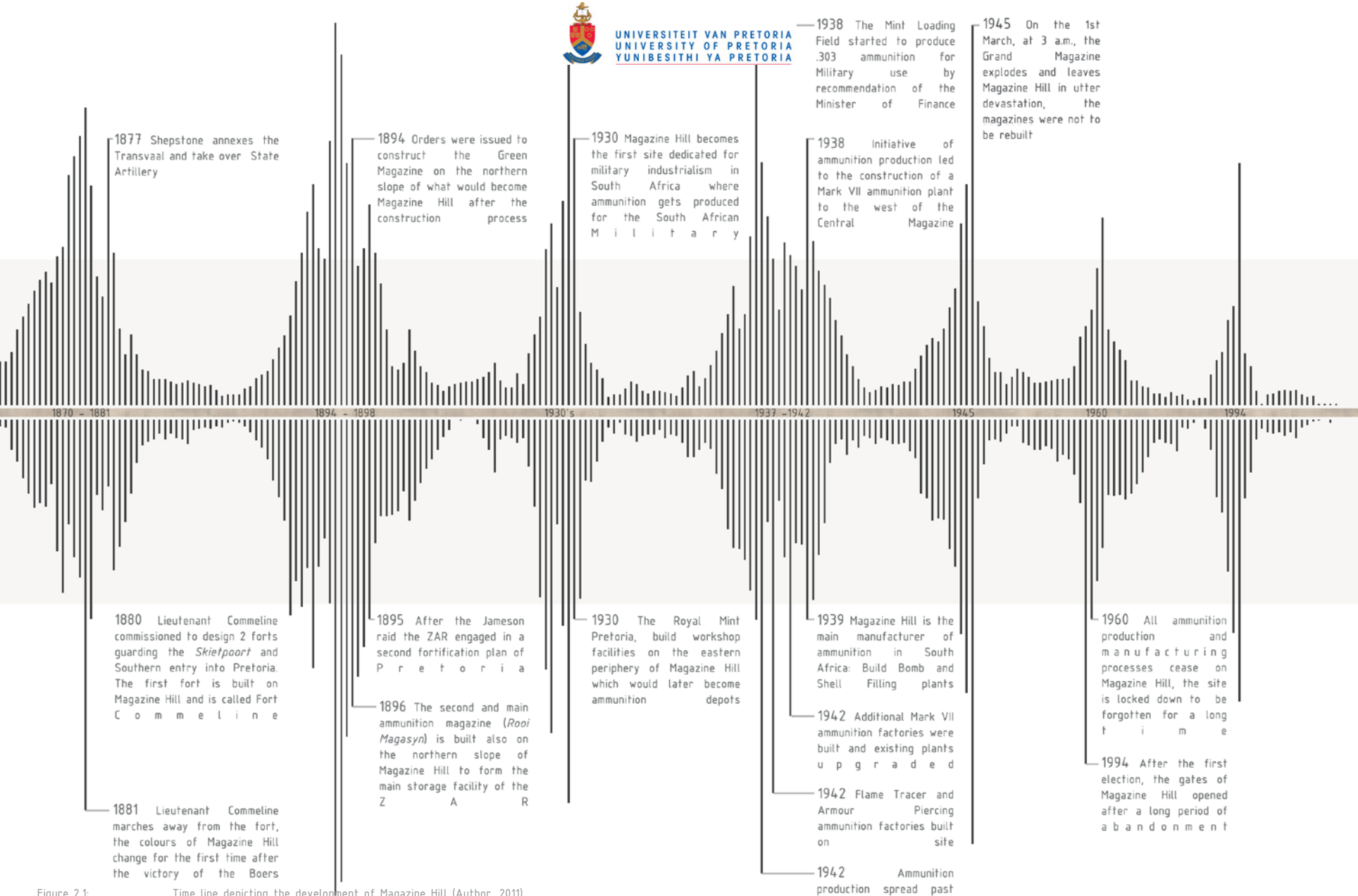

Figure 2.1: Time line depicting the development of Magazine Hill (Author, 2011)

2.1 Magazine Hill in relation to the First Anglo Boer War (1880-1881)

After the battle at Bronkhorstspruit in 1880, the British commanders initiated the first fortification plan for Pretoria. Colonel Gildea of the 21st Regiment, the Royal Highland Fusiliers, gave orders to the Royal Engineer, Lieutenant Commeline to build 2 fortifications to protect Pretoria against Boer invasions from the south. The first stronghold would be the first structure of the fortification plan and be labelled as the first building on Magazine Hill. (Du Toit Spies, 1955: 73-74)

Lieutenant Commeline named the first fort, located on Magazine Hill, after himself and the second he named Fort Tullichewan, which was situated on the present day Salvokop. These 2 strongholds would guard *Skietpoort* (the valley between Magazine and Monument Hill) and protect Pretoria against invasions from Heidelberg and the Potchefstroom area. Both forts were constructed from refined rock and fieldworks that were barricaded by packed sandbags with provided loopholes for gunfire (Panagos, 2000: 2). An additional *checaux de fries* or protective thorn bush barrier was also implemented around the whole structure to repel infantry breaching the perimeters of the hill (Panagos, 2000: 2-4).

After many unsuccessful negotiations between the Boers and Gladstone's British Government, the Boers launched an assault on the British forces and reclaimed the Transvaal in 1881, after the celebrated victories at Bronkhorstspruit and Majuba. Not one shot was fired from Fort Commeline, for the stronghold was not involved in any military activities or invasions. After the first Anglo Boer War, Lieutenant Commeline marched away from Magazine Hill, and for the first time, the colour of the reigning flag changed, which would drive Pretoria's first fort to dereliction for many years. The first structure on Magazine Hill was thus constructed to defend Pretoria against the Boer. (Panagos, 2000: 2-5)

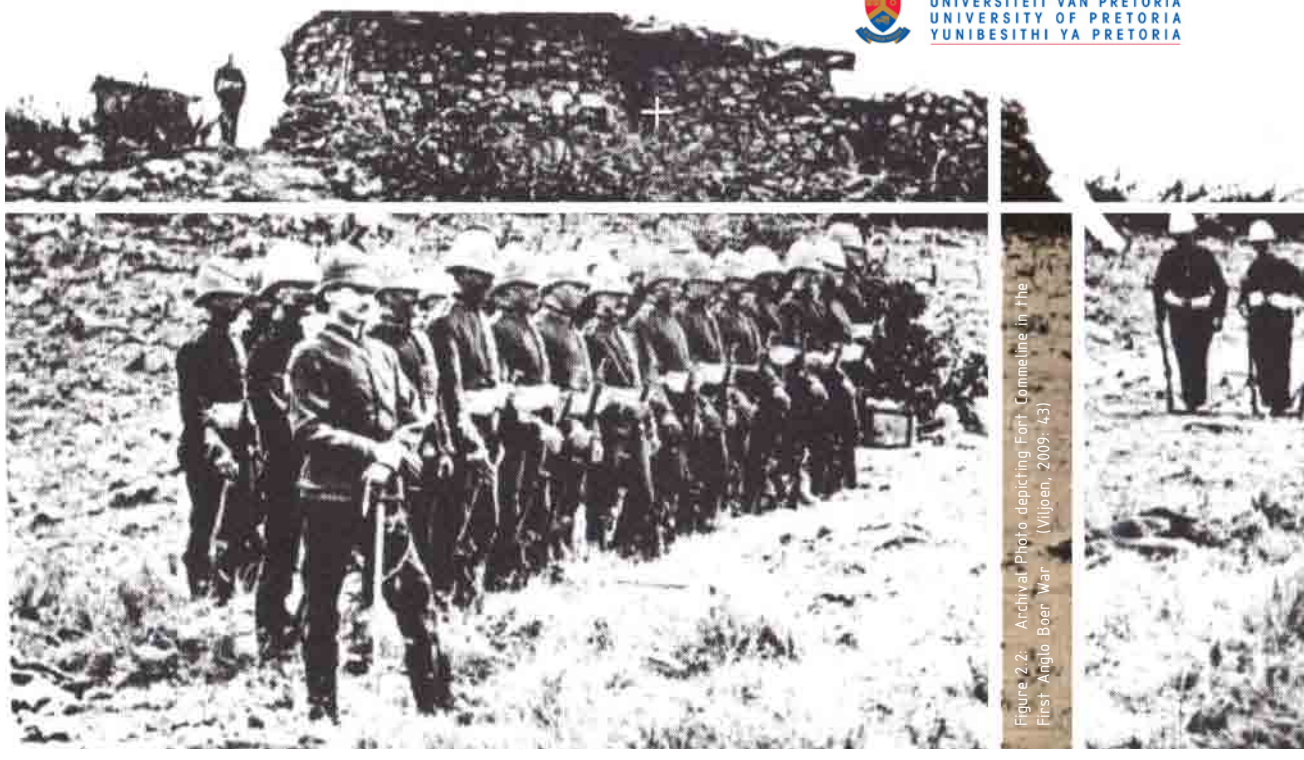

Figure 2.2: Archival Photo depicting Fort Commeline in the First Anglo Boer War (Viljoen, 2009: 43)

Figure 2.3: Remains of Fort Commeline (Author, 2010)

Figure 2.4: Stone wall of Fort Commeline on Magazine Hill (Author, 2010)

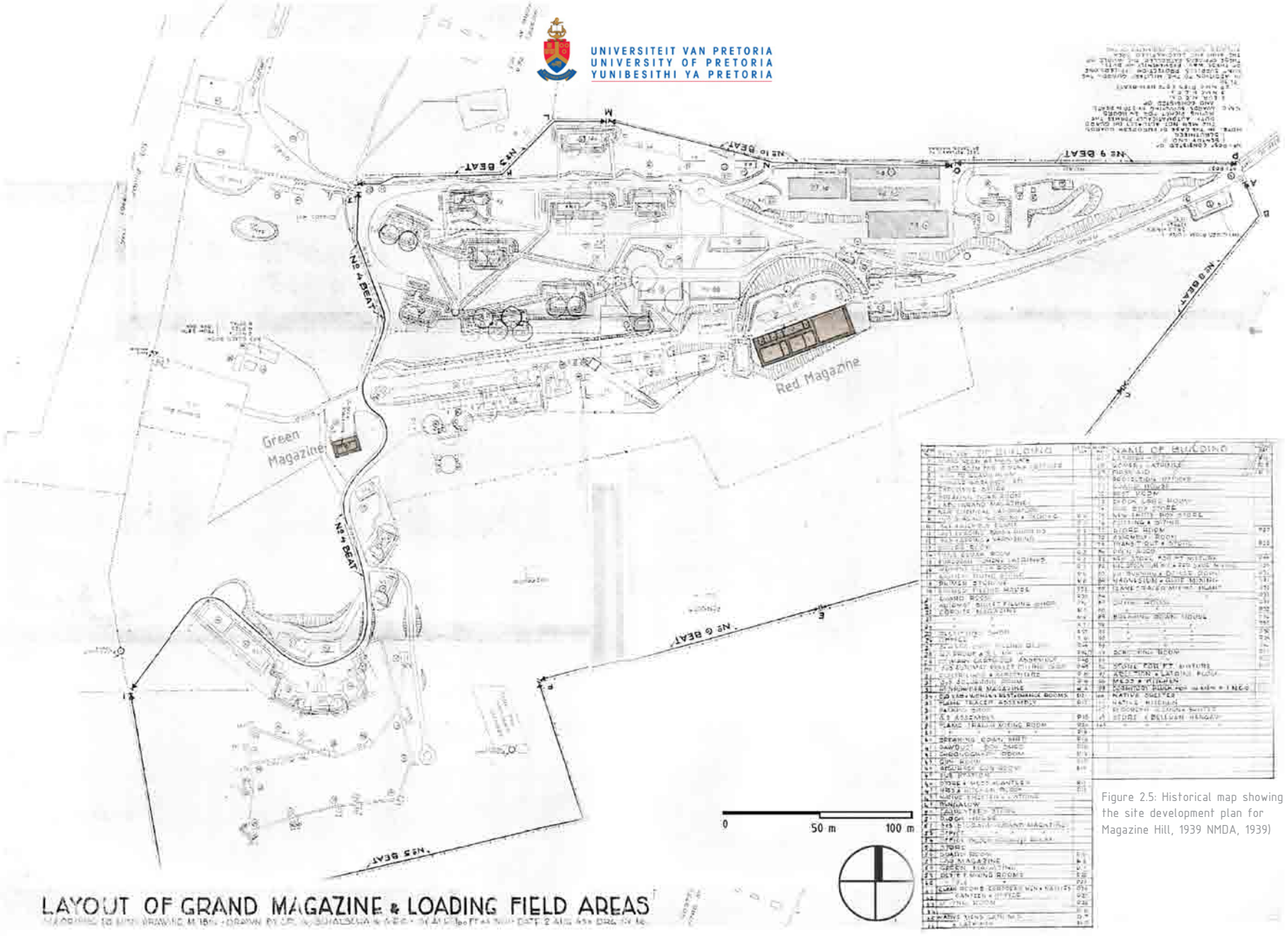

Figure 2.5: Historical map showing the site development plan for Magazine Hill, 1939 NMDA, 1939)

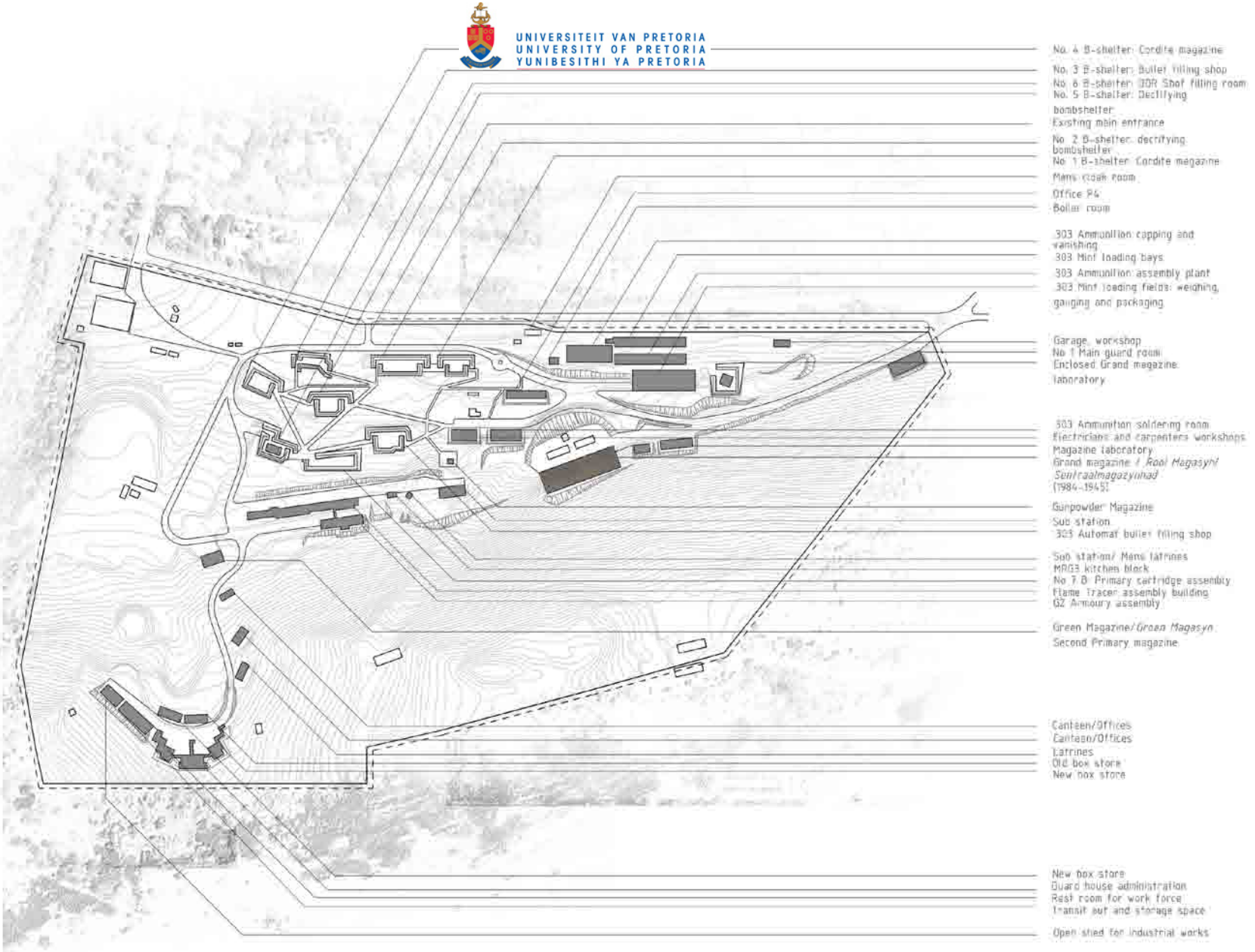

Figure 2.6: Map of Magazine Hill depicting the different buildings and functions on site, 1939 (Author, 2011)

2.2 Magazine Hill in relation to the Second Anglo Boer War (1898-1898)

Two years prior to the Second Anglo Boer War (1896-1898), the Government of the ZAR, under leadership of President Paul Kruger, commanded that more ammunition and armaments should be acquired for the defensive force of Pretoria (Swart, 2000: 5). In 1894 orders were issued to build an ammunition magazine on the northern slopes of what would become *Magasynheuwel* (Magazine Hill) after the construction (Panagos, 2000: 3). This ammunition magazine was called the *Groen Magasyn* (Green Magazine) and is still in very good condition today. The construction of the Green magazine was very similar to that of the forts which would be constructed in the next 2 years as a second fortification plan of Pretoria (NMDA, 1945: 7). It was after the Jameson raid in 1895 that the ZAR Government engaged in a second fortification plan, which included the construction of Fort Schanskop, Fort Klapperkop, Fort Wonderboompoort and Fort Daspoortrand, also known as West Fort.

The second fortification plan also affected the development of Magazine Hill, for a second ammunition magazine was built 1896, also on the northern slopes of Magazine Hill. This larger magazine was named *Sentraalmagazynhad* (Central Magazine) or where refered to as the *Rooi Magasyn* (Red Magazine), which was used for the storage of gunpowder, cordite and dry gun cotton primers, but mainly for the storage of small and large artillery ammunition shells (NMDA, 1945: 9). The new magazine would become the primary storage facility and was therefore referred to as Central Magazine. This new partly underground ammunition magazine was constructed some distance to the west of the Green Magazine, to avoid damage of both structures if a sabotage attempt was launched (Panagos, 2000: 5).

Figure 2.7: Plan of Magazine, 1894 (NMDA, 1894)

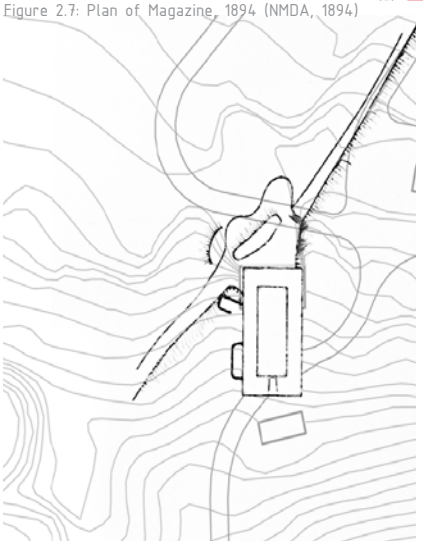

Figure 2.8: Central magazine during construction, 1984 (SANMMH)

Figure 2.9: Green Magazine with 7 state artillery cannons in front (Author, 2010)

Although a lack of construction drawings of both the Green and Central Magazines halted the investigation of the structures, a clear description of the of buildings was provided through an investigative report by the Chief Inspector of Explosions on the 17th of September, 1945.

According to the Chief Inspector (1945: 7), the same construction methods were used for the Green and Central Magazines. Both structures were built into the rocky hill which left only the north facade exposed. The outer stone walls of the Central Magazine had a thickness of 1 metre and acted as retaining walls, backing the compacted solid ground on the other side of the walls. The 1,2 metre thick northern stone facade contained several steel doors that were framed in brick and led into the storage compartments. Ventilation and circulation passages were also introduced into the Grand Magazine. Within the structure, cement and stone walls divided the interior of the magazine into 11 different compartments for storage, with a floor to ceiling height of 3.6 metre (NMDA, 1945: 7).

According to the Chief Inspector (1945: 8) the composite roof of the Central Magazine consisted of a series of different structural elements. Steel stanchions built into the solid walls carried steel girders which again carried cross girders. The voids between the latter supported corrugated iron sheets at the base and was filled with breeze concrete, where the roof proper was a concrete slab topped with a few feet of compacted soil. This construction method veiled the magazines and through using the hill as a protective barrier, maximum security could be obtained (NMDA, 1945: 7–9).

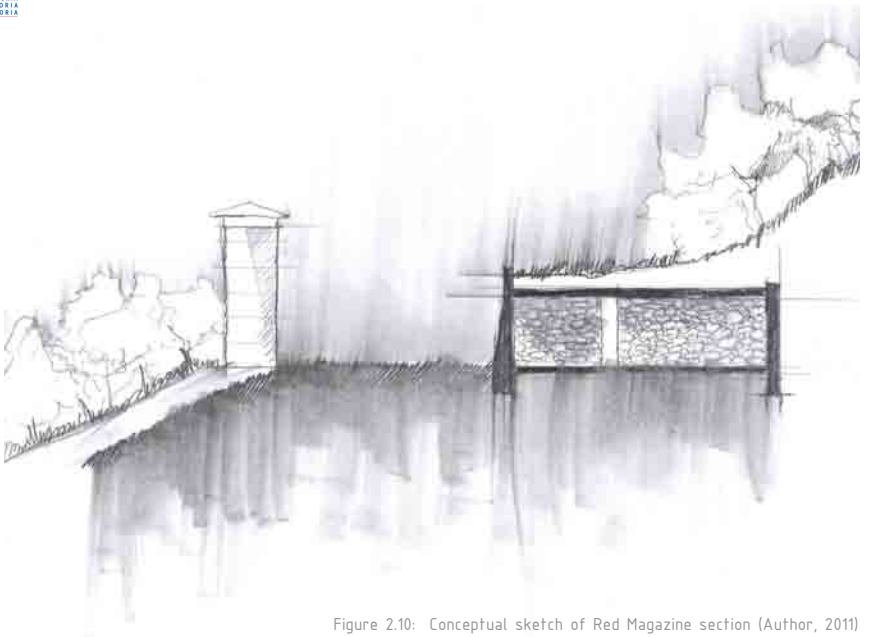

Figure 2.10: Conceptual sketch of Red Magazine section (Author, 2011)

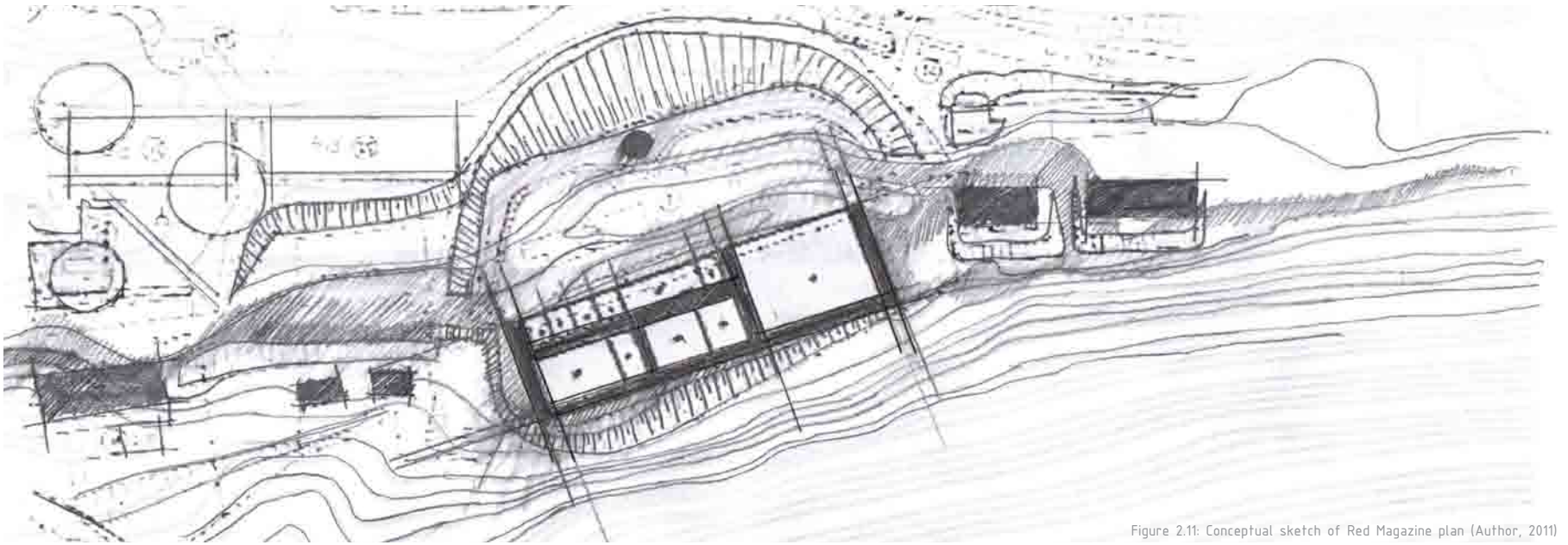

Figure 2.11: Conceptual sketch of Red Magazine plan (Author, 2011)

2.3 Magazine Hill in relation to the history of ammunition production in South Africa (1930-2011)

The South African arms industry originated in the late 1930's with the appointment of an Advisory Committee on Defence Force Requirements to explore the potential of military-industrialism in the country (Gutteridge, 1994: 50). Magazine hill was appointed as the first site in South Africa where military-industrialism would be formalised. In the early 1930's the Royal Mint Pretoria built workshop facilities on the eastern periphery of Magazine Hill, and it was not long before the Royal Mint approached the Minister of Finance with a recommendation that ammunition could be produced in the Mint facilities on the site. In 1938 the Mint Loading Fields on Magazine Hill started to produce .303 ammunition for military use (SAMint, 2011). This event played a considerable role in the development of Magazine Hill as a site for production.

The initiative of ammunition production on the site led to the construction of a .303 Mark VII ammunition plant in 1938. This plant was the first structure built to the west of the Grand Magazine on the site. By the beginning of 1939 Magazine Hill was the main manufacturer of ammunition in South Africa (NMDA, 1945: 2). In the same year, bomb and shell filling plants were also built on Magazine Hill and was put into operation one year later. With the outbreak of the Second World War, howitzer shells, 18 and 25 pounder shell cases, primers and detonators were also produced on the site (DENEL, 2010). To accommodate the new production lines and products, the activities of ammunition production spread past the borders of Magazine Hill. Numerous factories were built including ammunition depots in Kimberley, Ladysmith, Johannesburg and Pretoria West, which later became the Armscore industry (Gutteridge, 1994: 55). In 1942 the main bomb and shell filling plant moved to Lenz, and with additions and alterations to the existing empty plant, the building was converted into an additional .303 Mark VII ammunition factory. The original .303 ammunition depot that was constructed in 1938, converted to a flame tracer and armour piercing ammunition factory at the end of 1942 (NMDA, 1945: 7).

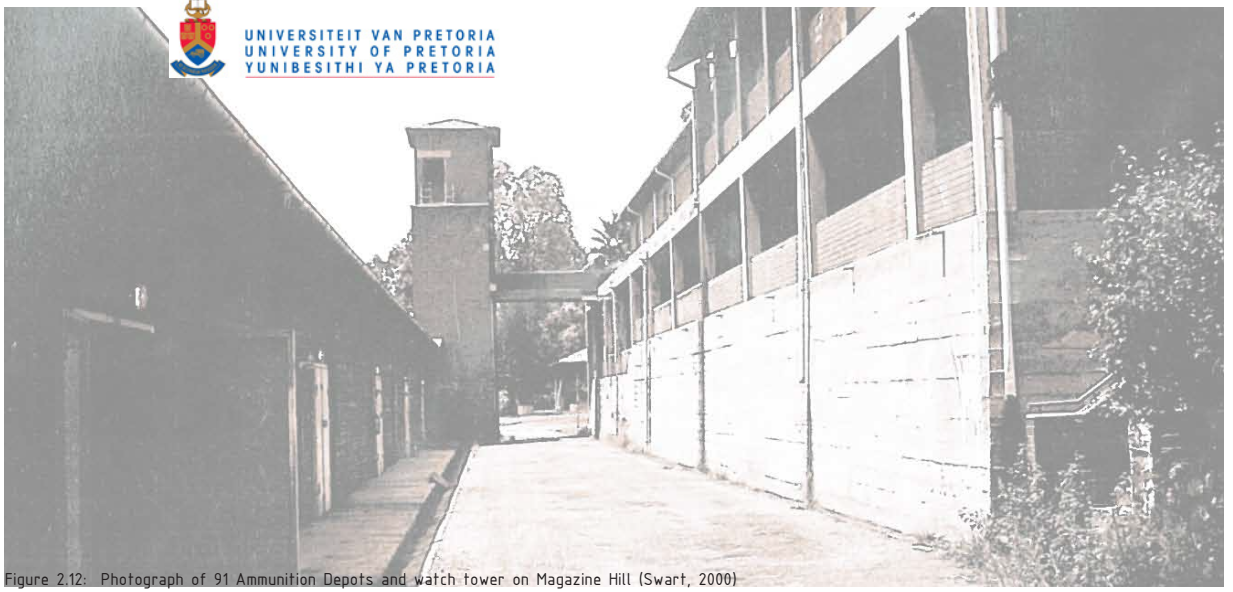

Figure 2.12: Photograph of 91 Ammunition Depots and watch tower on Magazine Hill (Swart, 2000)

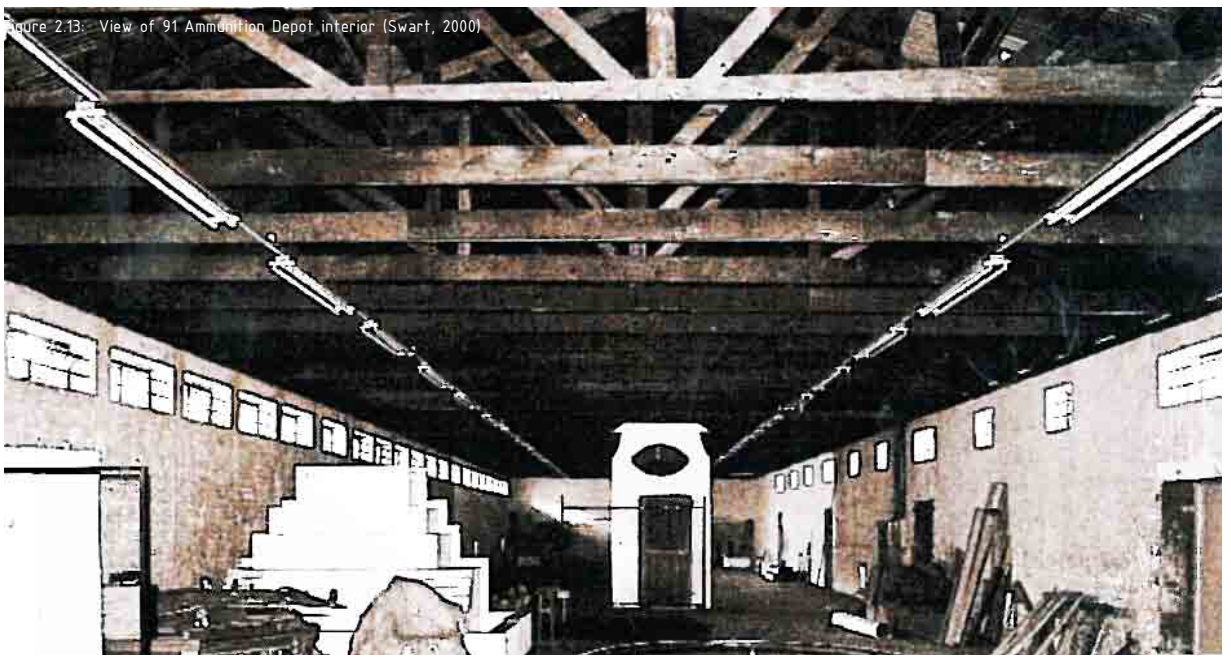

Figure 2.13: View of 91 Ammunition Depot interior (Swart, 2000)

Just as Magazine Hill achieved its highest rate of ammunition production, the Explosive Division of the Department of Commerce and Industries started to question the safety, standards and regulations of the manufacturing process on site. In 1943 it was concluded that site had been developed outside the regulations of the Explosion Act of 1937, for the distance between structures that was dedicated for production fell outside of the regulations, as well as the amount of explosives that was handled in each building. This posed a threat to the production tempo and at the end of 1943 the Mint loading ammunition depots, which at this stage had been operated by military personnel, had to be de-militarised. It was concluded that the production would be limited in order to get Magazine Hill back into the Explosives regulations, therefore ammunition production continued, only this time supervised by the Explosives Division (NMDA, 1945: 2-4).

In 1945 the Government established the Council for Scientific and Industrial Research (CSIR), which focused on the industrial potential in South Africa. Shortly afterwards the Board of Defence Resources and the Munitions Production Office was founded in 1949 and 1951 respectively.

After the United Nations (UN) restricted the sales of ammunitions and arms to South Africa, the National Party (NP) established Armscore under the Armaments Development and Production Act (no 57). By the end of 1960 all ammunition production on Magazine Hill had ceased. By 1980, Armscore was considered to be the central manufacturer of arms and ammunition in South Africa. By April, 1992, a restructuring of Armscore gave birth to Denel Pretoria Metal Pressings (Denel PMP) that functions as an independent weapon and ammunition manufacturing company. Today Denel PMP is considered as the leader of ammunition production in South Africa, and forms part of a global exporting industry (Gutteridge, 1994: 50-64).

Figure 2.14: Mortar shells exhibited on Magazine Hill (Author, 2011)

Figure 2.15: Munition Defects stored at Magazine Hill. (Author, 2011)

Figure 2.16: Magazine Hill after the explosion, 1 March 1945 (NMDA, 1945: 781003142)

2.4 The mysterious Explosion of the Central magazine

At about 6.20 a.m. on the 1st of March, I received a telephone message from Mr. Zeppenfeld, Director-Manager of the South African Mint, Munitions Section, to the effect that there had been a serious explosion in the vicinity of the Mint Loading Field and Grand Magazine, but as explosions were still occurring, the seat of the original explosion and the extent of the damage could not be determined at that time.

I arrived at the Loading Field at about 9.30 a.m. and found a scene of devastation.
(NMDA, 1945: 1).

Figure 2.17: Devastation at the Mint Loading field on Magazine Hill after the explosion (NMDA, 1945: 781003169)

TRAGEDY AT PRETORIA MAGAZINE: 120 STILL NOT ACCOUNTED FOR

THIRTY-FOUR PERSONS KNOWN TO HAVE BEEN KILLED

DEBRIS SEARCHED FOR UNEXPLODED BOMBS

ABOUT 20 EUROPEANS and 100 natives are still unaccounted for after the explosion at the main Army Magazine in the loading field behind the Central Prison near Pretoria yesterday, in which 34 persons are so far known to have been killed and 83 badly injured. This is disclosed by a further check-up of the number of employees who went on shift last night.

Brigadier H. B. Klopper, O.C. Voortrekkerhoogte Command, is in charge of the work of clearing the debris. This is expected to take some days. Squads of sappers are searching the debris for unexploded bombs and ammunition.

An initial inquiry into the disaster will be held by the Chief Inspector of Explosives. Meanwhile an official report, compiled by technical officers from G.H.Q. and the director and staff of the Pretoria Mint, is being forwarded to the Prime Minister. Every possibility is being fully investigated, but it is stated that it may be difficult to establish the cause of the explosion.

LIST OF DEAD AND INJURED IN EXPLOSION

Figure 2.18: Newspaper article explaining the tragic event on 3 March, 1945 (NMDA, 1945)

Figure 2.19: The 91 Ammunition depot after the explosion (NMDA, 1945: 781003160)

Figure 2.20: Remnants of the Red Magazine foundations (NMDA, 1945: 781003162)

Figure 2.21: The crater in the hill where the Red Magazine used to be (NMDA, 1945: 781003163)

Figure 2.22: Chief of explosive's casualty report (NMDA, 1945, 7)

GRAND MAGAZINE EXPLOSION VICTIMS.

EUROPEANS.

Name.	Sex.	Age.	Where Killed.
BOOYSEN, J. J.	Male	19	Soldering Room p9
BRANDTZEG, D.C.E.	"	19	Soldering Room p9
DE VRY, M.J.C. (Miss)	Female	18	Booker (Cap & Var.) pl.
DE WAAL, M.L. (Mrs)	"	43	Capping & Varnishing pl.
DUNCAN, R.W.C.	Male	40	Soldering Room p9
HEENTJE, M.S.(Miss)	Female	17	Loading Section p2
LE GRANGE, J.(Sister) (Mrs.)	"	34	Near First Aid Room.
LEWIS, M.D.(Mrs)	"	40	Composite Room p3
PRINSLOO, M.G.A. M. (Mrs.)	"	54	Composite Room p3
SCHOOMBIE, A.L.R. (Miss)	"	34	Loading Section p2
VAN LOM, J.M. (Miss)	"	19	(Worked at Loading Field but killed at 68 Prison Reserve).
VAN NIEKERK, C.D.(Mrs)	"	50	Composite Room p3
VAN NIEKERK, J.E. M. (Mrs)	"	33	Capping & Varnishing pl.
VILJOEN, J.N.P.	Male	7	Prison Reserve.
VISAGIE, C.S. (Miss)	Female	36	Capping & Varnishing pl.
VISSER, J.S.E. (Miss)	"	27	Loading Section p2.

NATIVES.

NATHLOUO, J.	Male	15	(Worked at Loading Field but killed at 58 Prison Reserve.)
LUBBSI, G.	"	25	R.M.C. Guard.
MOTSEKI, G.M.	"	35	Soldering Room p9
MAHASELLA, J.	"	36	Capping & Varnishing pl.
MAPOSA, J.	"	30	Composite Room p3
MARAKE, L.	"	20	Packing Room p4
MASHLANGU, K.	"	35	?
MATHELA, B.	"	21	?
MATSEPANE, W.	"	26	Soldering Room p9
MKABINDA, S.	"	28	?
MONGWE, M.	"	26	Soldering Room p9
MOSEDI, A.	"	28	Soldering Room p9
MAJULEKA, T.	"	35	Capping & Varnishing pl
NZAZI, S.	"	24	Soldering Room p9
RAMETSI, W.	"	23	Packing Room p4.
SEDIBA, J.	"	26	Packing Room p4.
SEGOBE, J.	"	25	Soldering Room p9

At 3 a.m. on the 1st of March, 1945, the legacy of Magazine Hill changed forever. A mysterious explosion of the Grand Magazine led the entire site in total desolation. According to the Chief Director of Explosives (1945: 1), the site was unrecognisable directly after the tragic event. Buildings were found burnt out, other still burning and some structures were completely flattened by the tremendous force of the blast. The concrete roof with several feet of compacted soil on top was blown into the sky together with all live ammunition shells and cartridges that were stored in the magazine (Panagos, 2000: 5). Damages were reported as far as Church Street, where small remnants of the magazine were found throughout the southern part of the city (Du Toit Spies, 1955: 78).

Several buildings outside the borders of Magazine Hill were affected and damaged by the massive explosion. Photographs taken during the examination of the explosion show a steel beam, weighing 600 kg, that crashed into the Second World War medical stores, located more than 750 metres away from the explosion site. A roof girder was found next to Fort Commeline on top of the hill, a vast distance from the point of detonation (Panagos, 2000: 6). The detonator magazine to the west of the explosion was wrecked and covered with a thick layer of debris and pieces of rock, some boulders weighing up to 8 tons. Offices and stores to the east of the magazine had disappeared completely, so too a block house on the northern mound and a building at the western gate (NMDA, 1945: 1–20).

Sadly, 34 people died on Magazine Hill that night, while 231 persons suffered injuries as a result of the explosion. The Mint loading Field suffered the greatest damage because of its close proximity to the Central Magazine. 11 Females lost their lives in these buildings while working shifts, filling .303 rifle cartridges with cordite (Panagos, 2000: 7). The cause of the explosion still remains a mystery till this day, while a sabotage strategy executed by the Ossewa Brandwag forms the Chief Director's personal conclusion.

A labour force of 200 people was appointed to clear the site after the explosion, where manual labour continued for 1 week before a vehicular team could also join the clearing team. The Chief Director stated that the task at hand proved to be very dangerous, for the whole site was strewn with unexploded ordnance. For a period of 40 hours after the accident, explosions and fires still combusted among the scattered debris, seriously injuring 2 more people (NMDA, 1945: 6). Magazine Hill was cleared in 7 months. Today the site stands in isolation, severe dereliction and weathering accompanies the ammunition factories. The Grand Magazine has been reduced to a scar in the landscape, a 60 by 70 foot crater in the hill.

Figure 2.23: Universal beam found 750 metre away from the explosion site, 1945 (NMDA, 1945: 781003172)

Figure 2.24: Bent structural member of the Grand Magazine found on site, 1945 (NMDA, 1945: 781003166)

2.5 An architectural response – proposed programme

The proposed programme does not only form part of the practical intervention on the site, but also the theoretical premise. The injection of the most suitable building programme on the historical layers of Magazine Hill will become a crucial factor in the future development of the site. Another aspect that also needs to be considered is the future projections of the military precinct and the proposed strategies of the SANDF. In response to the historical influence of Magazine Hill as a productive site, a Brass Foundry that recycles spent ammunition shells produced by the SANDF, the South African Police Force (SAPD) and the general public is proposed.

2.6 Programme background

Denel Pretoria Metal Pressings, the masters of ammunition art, originated from the ammunition manufacturing industry on Magazine Hill. This company is located in Pretoria West, not far from its origin, and functions as an independent branch of Armscore. Denel PMP is considered the leading ammunition manufacturer in the country and produces over a 100 million rounds of ammunition per year, of which 95% is utilised by the SANDF in military and police training (Denel, 2010: 40-43). In the South African context the average household expenditure on ammunition is R4.86, while the total expenditure on ammunition and arms production exceeded R47 billion between 1999 and 2000 (Statistics SA, 2000). These statistics clearly illustrate the amount of spent brass shells being produced by the defence institutions and private sector in South Africa each year.

The future projections of the South African Military is considered as a guideline for development. The SANDF increased their request for ammunition to a R 160 million over the last year (Denel, 2010: 43). Large financial sums have also been set aside for new military indoor shooting facilities in Pretoria, and the upgrading of existing shooting facilities in the military precinct (Engelbrecht, 2010: 1). The Department of Defence has recently assigned the Military Integrated Environmental Management or "Operation Green Soldier" programme to the SANDF, which involves new sustainable management strategies for military activities and recycling in South Africa (Godschalk & Ferreira, 2010: 2)

Up to 1995 The Department of Defence (DoD) engaged in deep sea dumping of obsolete ammunition. The sites included 2 main dumping areas from the coast of Natal and Cape Town, at 4000 metre depth. According to the DoD, the term obsolete ammunition includes remnants of used ammunition (empty bullet shells), unserviceable ammunition, unexploded ordnance and unused ammunition. After the Environmental Framework had been implemented in 1995, all deep sea dumping activities ceased at once (Godschalk & Ferreira, 2010: 2).

Figure 2.25: Conceptual drawing of the brass furnaces and artist studios (Author, 2011)

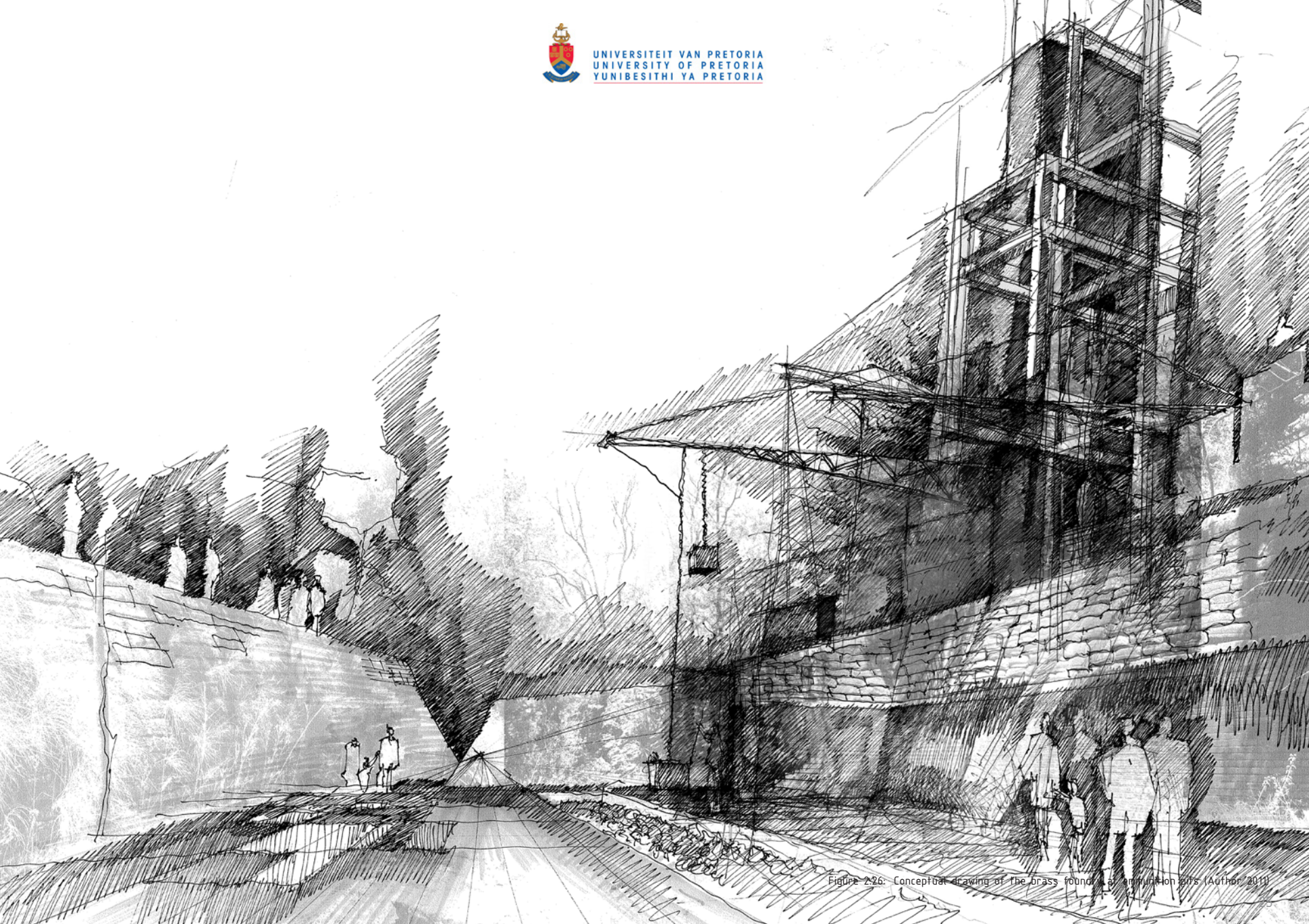

Figure 2.26: Conceptual drawing of the brass foundry at ammunition plots (Author, 2011)

2.7 Programme process

The process would start at the training facilities and the shooting ranges of the SAPD and SANDF. The site of Magazine Hill is ideally located on the edge of the 2 precincts, therefore the foundry would cater directly for the 2 institutions, depending on their waste as the primary resource. Shooting ranges in close proximity to Magazine Hill include SAAA Shooting Range, SAHARA Shooting Facility, S.W.A.T National Firearms and Shooting Facilities, and Proshot Indoor Shooting Range. Not all spent brass shells are recycled directly after use, for this depends on the condition of the shell after it has been fired. Empty brass shells are also reloaded, but after 2-3 rounds of use, the shell enters the recycling/smelting process (Denel, 2010: 37). The public would also be considered as a secondary resource, where empty brass shells could be handed in at the foundry for a financial incentive.

The proposed brass foundry would consist of a primary and a series of smaller scale furnaces that melt the spent shells to produce brass billets. These billets are the raw format of brass that could be distributed to Denel PMP for the production of ammunition shells, but will also be reused on site by local brass artists. The programme would also involve a series of smaller scale artist foundries that produce brass sculpture, instruments, installation and urban art. The public realm would then be able to experience the whole process of ammunition reduction within the historical context of ammunition production.

2.8 Practical implementation of program

1. The foundry would form part of the environmental framework of the SANDF.
2. The derelict and unutilised site of Magazine Hill would be re-appropriated in its historical context of ammunition production.
3. The act of recycling would re-establish the Military into the environmental realm.
4. To promote skill transfer among local artists and encourage interaction between artists and the public.

2.9 Conceptual implementation of program

1. The programme can set up mediation between the public and the Military.
2. The programme can also mediate between old and new ways of thought, ammunition production versus ammunition reduction
3. The mysterious and secretive history of Magazine Hill would be presented through a new programme, where commemoration would occur through everyday use, not encapsulated in a monument or museum, frozen in time.
4. The new programme would be a direct link to the previous function of the site, responding to the historical function and heritage of Magazine Hill.

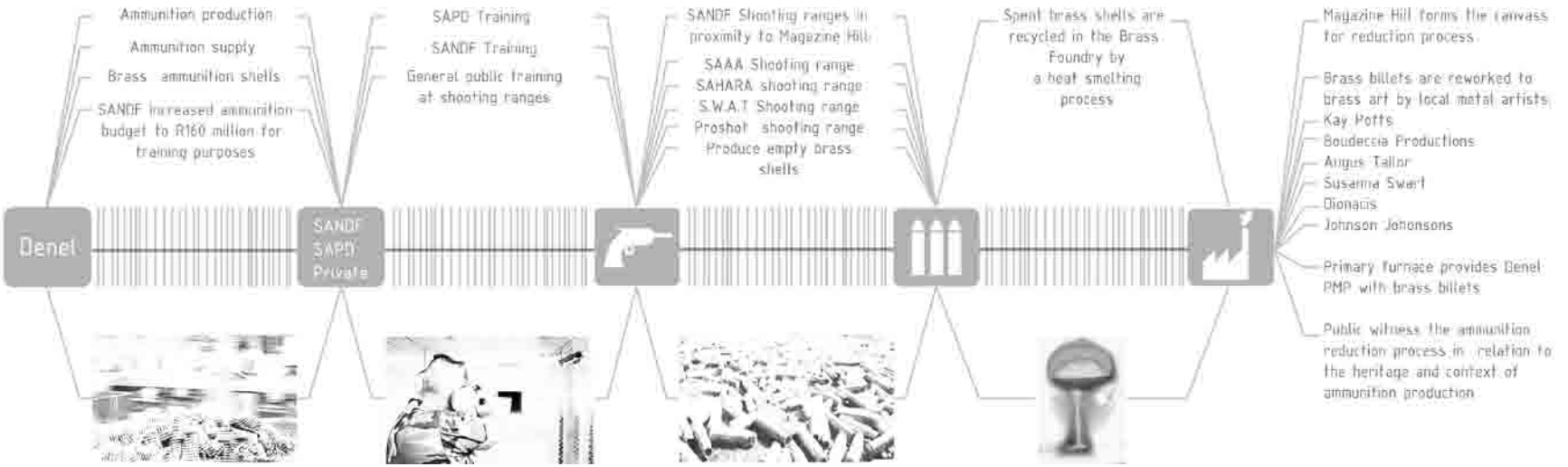

Figure 2.27: Program process diagram (Author, 2011)

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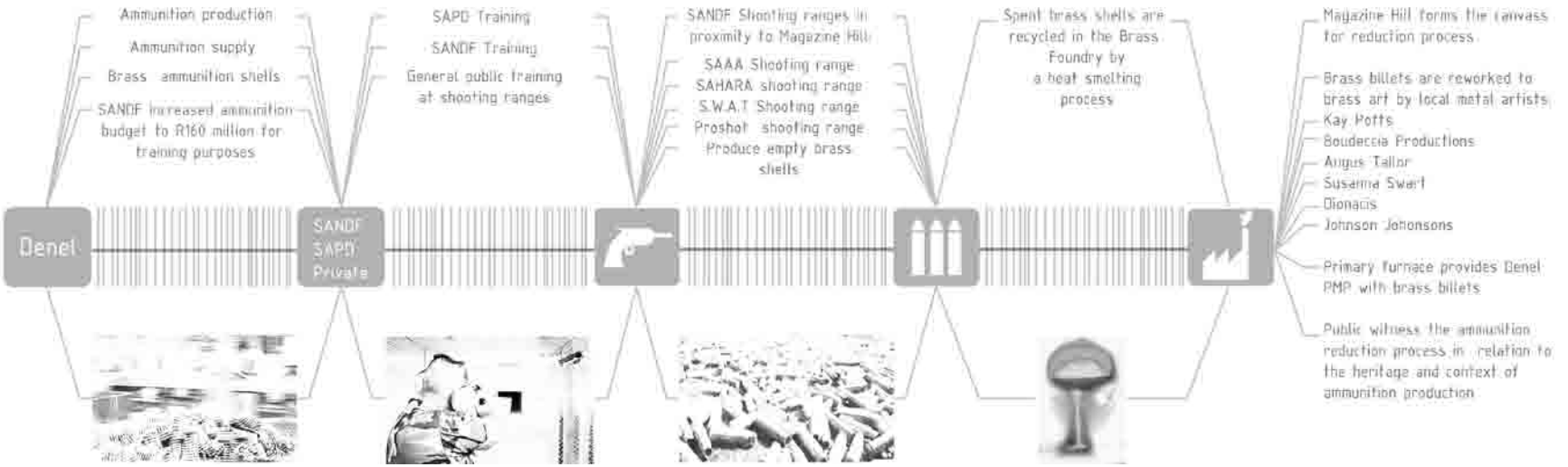


Figure 2.27: Program process diagram (Author, 2011)

2.10 Client

Two major clients are identified in terms of project feasibility. The first client is Denel Pretoria Metal Pressings in association with Armscore that initiates a brass foundry on Magazine Hill to form a secondary ammunition reduction unit. This programme would provide them with raw material and initiate an interface between the company and the public, through incorporating local artists and public activity. The second potential client could be the SANDF that starts a brass foundry for both institutional and public use as part of an interactive programme that strengthens the public-military interaction. This project could also form part of the new environmental framework, Operation Green Soldier.

Figure 2.28: Military, Client and Public interrelationship in proposed design scheme (Author, 2011)

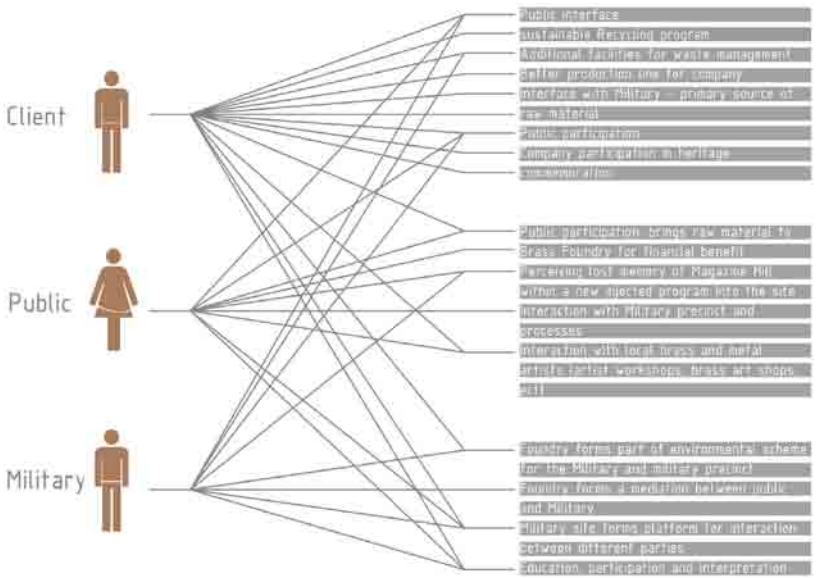


Figure 2.29: Interaction diagram of proposed brass foundry (Author, 2011)

The third chapter focuses on the theoretical premise in relation to a journey/route through Magazine Hill that was undertaken by the author in 2010. This approach brings the theoretical discourse in direct dialogue with the contextual realm.

Chapter 3 – Theoretical Discourse

3

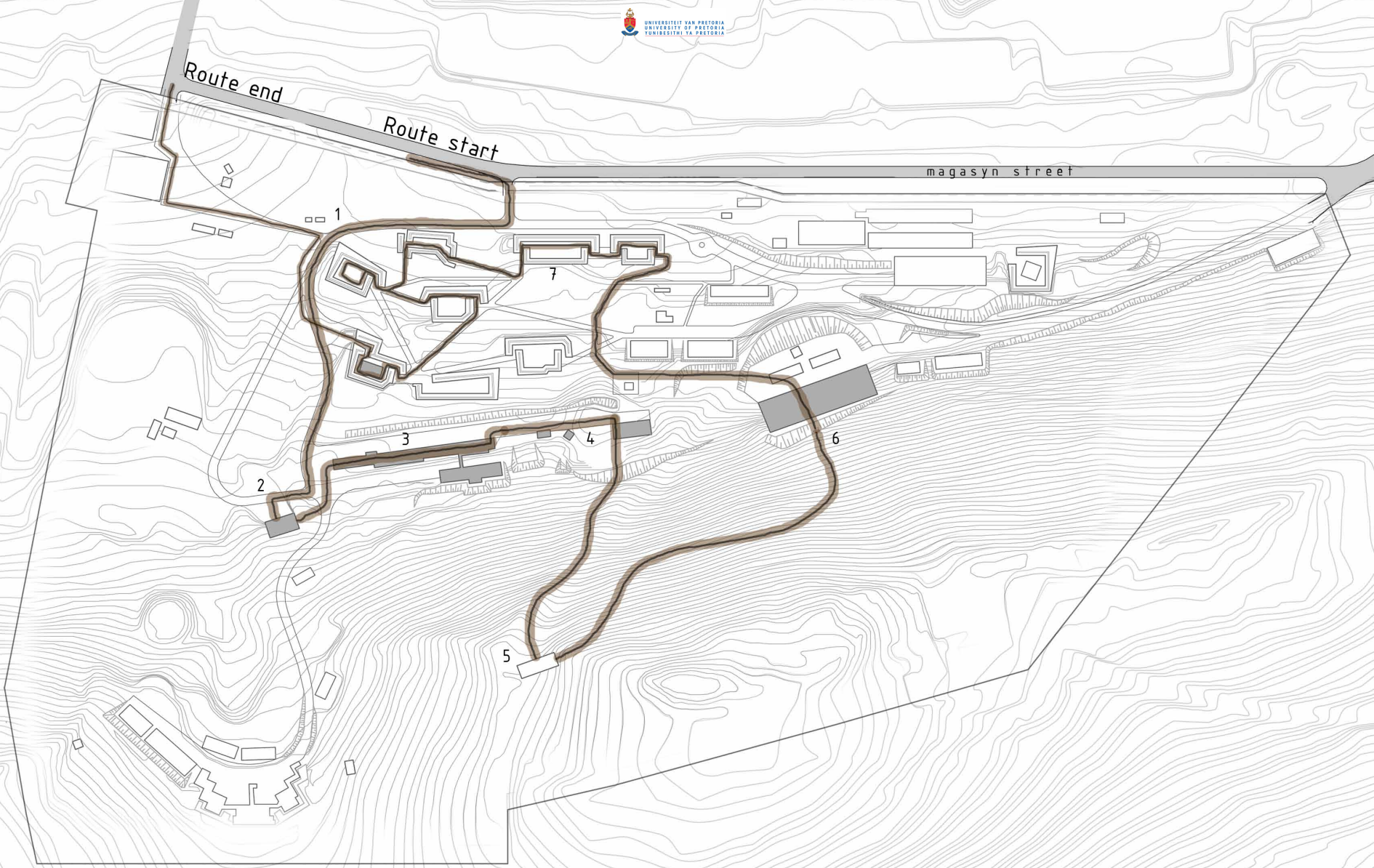


Figure 3.1: Theoretical Route through Magazine Hill (Author, 2011)

route part 1:
architecture and time

Theoretical Discourse

The theoretical premise is explained by means of a route, a single journey through the realm of the forgotten, a journey undertaken at the end of 2010 through the abandoned site of Magazine Hill. This expedition led to the discovery of spaces and artefacts frozen in time, haunted by a tragic event that concluded the finality of its existence.

In this expedition a number of theoretical discourses are explored in relation to the site. By this means, a clear connection can be drawn between the theory and the proposed context. Throughout this chapter, theories are explored within 2 major theoretical themes. The first theme investigates architecture's relationship with time, and the second premise examines the concept of weathering in architecture.

Upon arrival, a spirit of isolation was immediately sensed. For more than a 100 years the site functioned in secret remoteness, for it was the terrain's duty to remain veiled. After the explosion, when all activity abandoned the site, Magazine Hill got trapped in a single moment in time, for it was the activity of ammunition production that kept the site alive. As time passed, the architecture became archaic, because of the fact that the fabric represents a single time frame, a time of intense military activity and war, when unrest reigned in South Africa.

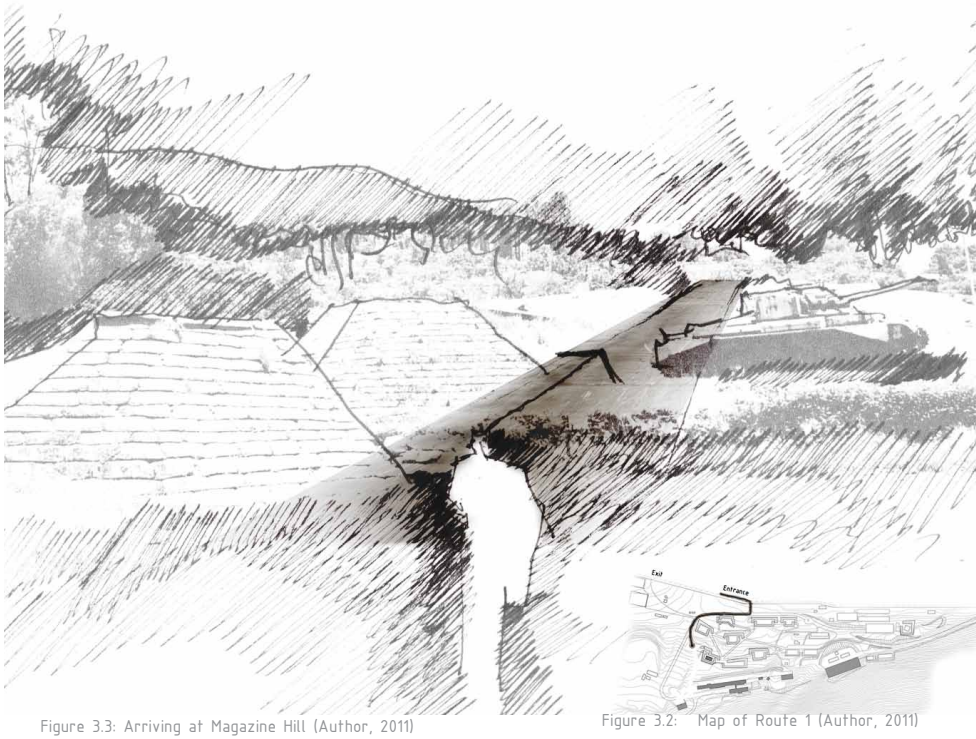


Figure 3.3: Arriving at Magazine Hill (Author, 2011)

Figure 3.2: Map of Route 1 (Author, 2011)

Throughout the history of architecture the different perceptions and interpretations of time have influenced the progression in architectural thought. By studying the transformation of historical churches, from the rectangular early Christian basilica of Old St. Peter's to the central-plan church of San Vitale, it is eminent that the perception of time shifted from a linear sense of progression through time, to a cyclical sense where circular structures symbolise the infinity of time (Flemming, 2005: 129). Karsten Harries describes architecture's relation to time as an age-old "terror of time", where in ancient times memorials and shrines of massive scale were constructed to address the concept of immortality (structure transcending though time), or in industrialism, where the machine was invented to save time (Field, 2009: 9).

This relationship between architecture and time became a conceptual focal point of the Modern movement. In the Modern Era, architecture has become a symbol of the present, rejecting the tradition of the neoclassical. In a sense, architecture failed to recognise its own mortality (Field, 2009: 19). This abandonment of the historical influence separated architecture from its evolutionary state and its potential to build on a previous frame of reference. This drastic paradigm shift is aimed at creating collective architectural solutions for all countries and climates with one preset rule for functionality and aesthetic value. With the rejection of the past, architecture became a static, frozen object, commemorating only the present, with no actual reference to the past or future. The static character of Modern architecture in the continuum of time relates back to the stagnant quality of Magazine Hill's architectural heritage, frozen in a singular time frame.

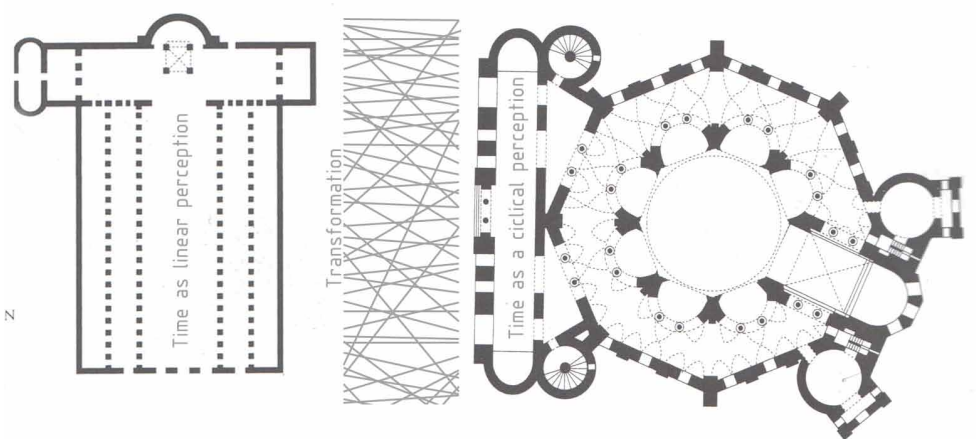


Figure 3.4: Perceptual change of time (Flemming, 2005: 125, 128, edited by Author, 2011)

route part 2:
Matter and time

As one ascend up the hill of the main ring road, the site opens up to reveal the Green Magazine, an impenetrable piece of military architecture built into the hill, exposing only the defensive stone wall that forms the entrance to the structure.

According to Juhani Pallasmaa (2000: 13) building materials/ matter also exist in strong relation to time. Each set piece of material type in the embedded fabric of architecture speaks of different geological origins, presenting its characteristics in structural support or aesthetic function. Pallasmaa (2000: 14) states that stone speaks of stability, symbolising a durable state of permanence or transcendence through time.

route part 3:
Referential and Experiential time

Directly to the east of the Green Magazine, the dust road leads to the Flame Tracer building, where armour piercing ammunition was produced in 1942 (NMDA, 1945: 2). The roof has not been repaired after the massive explosion, while sun rays penetrate the structure through the deteriorated roof beams, illuminating the weathered walls. Afrikaans descriptions on the interior surfaces guide one through the length of the building, presenting the historic method of ammunition production. The experience of the Flame Tracer Building relates both to the present (the sensory experience of the mysterious abandoned space) and to the past (the process of ammunition production). The progression through these consecutive spaces enables one to perceive time on different levels.

Enric Miralles (2011: 21) stated that successful commemorative architecture, addressing the continuum of time, functions on 2 different layers of time. The first layer is experiential time that is directly related to the present. This layer is governed by movement and route, while further enriched by sensory experience. The second layer consists of referential time, where experience evokes memories and time frames past (Makenzie, 2011: 17-24). According to Miralles (2011: 23) it is in the referential layer where the individual can escape from reality to memory.

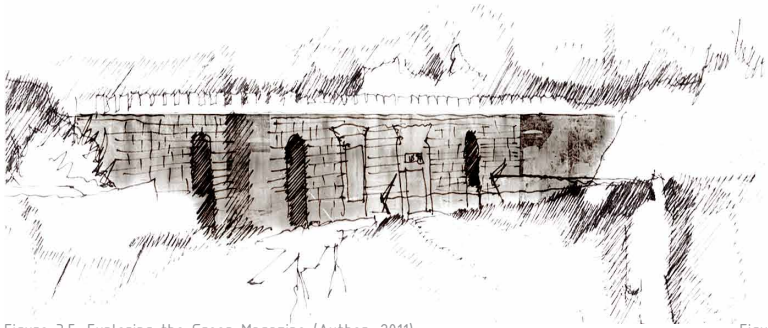


Figure 3.5: Exploring the Green Magazine (Author, 2011)

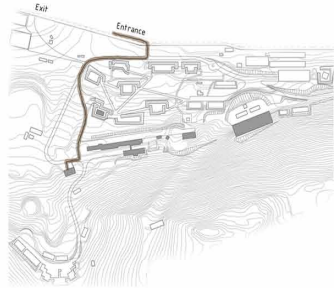


Figure 3.6: Map of route 2 (Author, 2011)

Figure 3.7: Referential and experiential time in the existing Flame Tracer building (Author,2011)

Upon exiting the Flame Tracer building, the dirt road continues east, passing exposed foundations of completely destroyed buildings and staircases that lead into the veld on the hill. These paths had failed to be remembered, for they lead into the unknown. The road ends at the old MRG3 Kitchen building where a large boulder had crashed through the northern wall. Again different temporal layers of time are present through the experience of the interior.

Luke Filed explains that in order to become aware of the passage/movement of time, one must engage with the 7 temporal layers or perceptions of time (Field,2009: 47). The first layer deals with the event, the single moment of action experienced in isolation or through interaction with other individuals. This first layer is temporal and time is reduced to seconds and minutes.

The second layer addresses daily cycles, which is the first layer where the movement of time is observed through variances in light quality (movement of sun and shadow) and temperature (morning to evening). According to Field (2009: 51), technology is separating architecture from this temporal layer, by introducing mechanised space that regulates thermal comfort in terms of temperature, ventilation and light qualities. This temporal layer functions within a daily basis, therefore time is reduced to hours and days (Illus. 30). The third layer acknowledges seasonal cycles, where time can be read by looking at the length of the light ray against the wall, and the time of year by observing the angle of the ray (Field, 2009: 54-55). Magazine Hill is in a strong relationship with the seasonal temporal layer, for each rain season reveals mortar shells and unexploded ordnance that have been veiled under layers of soil and grass (Fig. 16). This places the site in a dialogue with the seasonal dimension in the continuum of time. The fourth and final layer that is applicable to the passage of time on Magazine Hill, is the temporal layer of generations. In this layer time is reduced to years, where the different influences of different generations become eminent by studying the composition of architectural fabric (Field, 2009: 54-55). This stratum of time is embedded in the framework of the site and presented through the development of the terrain (Illus. 31). By studying this layer, one becomes aware that Magazine Hill was the cross point of Boer, British and Black, each adding its own addendum to the ominous presence of the site.

Figure 3.9: Magazine Hill in relation to the daily passage of time, shadow lines depict daily time (Author, 2011)

Figure 3.10: Magazine Hill in relation to the passage of generations, different construction methods for different site developers (Author, 2011)

From the MRG3 building the journey continued to the peak of Magazine Hill, where only the ruins of Fort Commeline bore testimony to all the events that formed the history of the site.

Figure 3.11: Fort Commeline ruins (Auhtor, 2011)

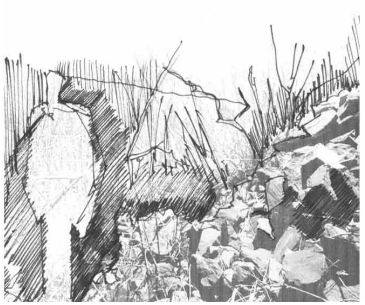
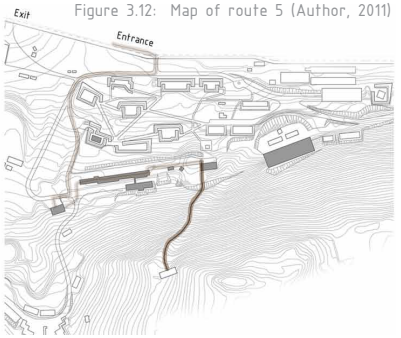


Figure 3.12: Map of route 5 (Author, 2011)



The sense of dereliction and ruination of the structure places strict emphasis on the abandonment of military formations throughout the world, for their inherent characteristic of tension and war makes them irrelevant in contemporary society. Still, their durability of architectural fabric lets them transcend through time. The Shivering Sands Army Fort Towers, located along the Thames River in England also form part of this realm of dereliction, despite its strong relation to heritage and significance relating to the Second World War. The towers were designed by Guy Maunsell to withstand German assaults along the river, protecting the United Kingdom's capital at all costs. After the British forces abandoned the towers in 1958, this naval site also got trapped in a single moment in time, similar to the structures on Magazine Hill .

Why does abandoned architecture have the same smell of death everywhere? Is it because the smell we sense is in fact one created through our eyes? (Pallasmaa, 1986: 453)

In the Geometry of Feeling (Pallasmaa, 1986: 452), an article that studies the phenomenology of architecture, Juhani Pallasmaa states that architecture exists in a secondary realm that is separated from the everyday. This realm includes the emotional forces of ruination and abandoned architecture that evokes the imaginary. The primary feelings of architecture create effect and ambiance that transcends into the metaphysical realm, re-establishing architecture's connection to the dimension of time. These primary feelings of architecture are also greatly influenced by multi-sensory experience (Pallasmaa, 1986:p448-453). By making sensory experience part of the interpretation of architecture, not only the realm of the imaginary is entered, but also the realm of time. By experiencing the texture of weathered space and smelling the decay of fabric, the dimension of time is breached as one relates back to the history of the structure by means of referential experience. The atmosphere of abandoned architecture is thus a function of both referential and sensory experience.

Figure 3.13: The Shivering Sand Army Fort Towers in the Thames river, 1943 (Gutteridge, 1994)

Figure 3.14: Aerial view looking down at the defence towers (1943) (Gutteridge, 1994)

route part 6:
Phenomenon of landscape

From the summit of Magazine Hill one descends through the thicket of Lantana plants, discovering mortar shells, bent structural beams and remnants of what used to be the Central Magazine. Further down the mound the route stops above a crater in the hill, a hole in the landscape where the Red Magazine exploded. Throughout time, the landscape had been inhabited, formalised and scarred, but still functions according to the intangible laws of nature. Since the tragic event in 1945, Magazine Hill is still in a process of natural healing. Each rain season uncovers unexploded ordnance on the hilltop above the crater, which is then removed by explosive specialists (personal communication Du Plessis, 19 November 2010). When the next rain season manifests, undiscovered ammunition is again concealed to be exposed and removed in the next natural cycle. In this sense the landscape consists of different layers of information and artefacts that are found to be trapped in a conceptual continuum of revealing and concealing.

The Norwegian architectural theorist, Christian Norberg-Shulz (1976: 414) states that the landscape consists of many layers of phenomena that exist in relation to other layers, ultimately creating 'place'. The landscape can thus be considered as a comprehensive phenomenon or construct. By understanding the arrangement of the different phenomena, one is able to determine environmental quality and spatial atmosphere in relation to time and historical events (Norberg-Shulz, 1976: 414). In essence Norberg-Shulz is analysing the genius loci (spirit/character) of place, through understanding the structure and arrangement of the different phenomena (temporal layers).

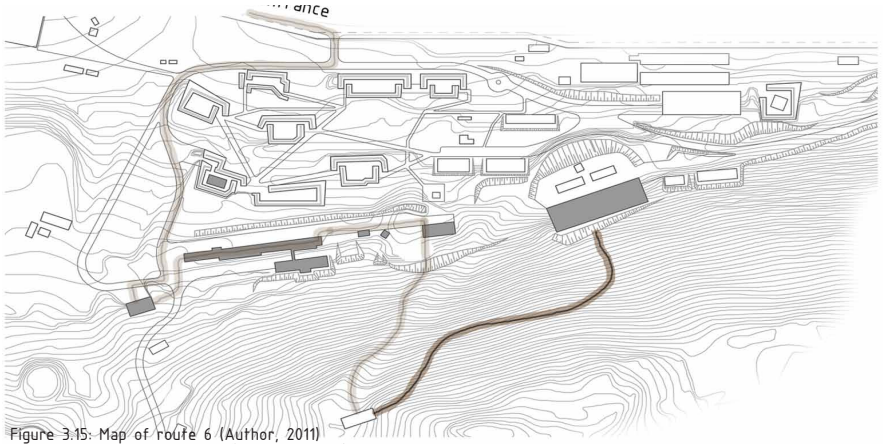


Figure 3.15: Map of route 6 (Author, 2011)

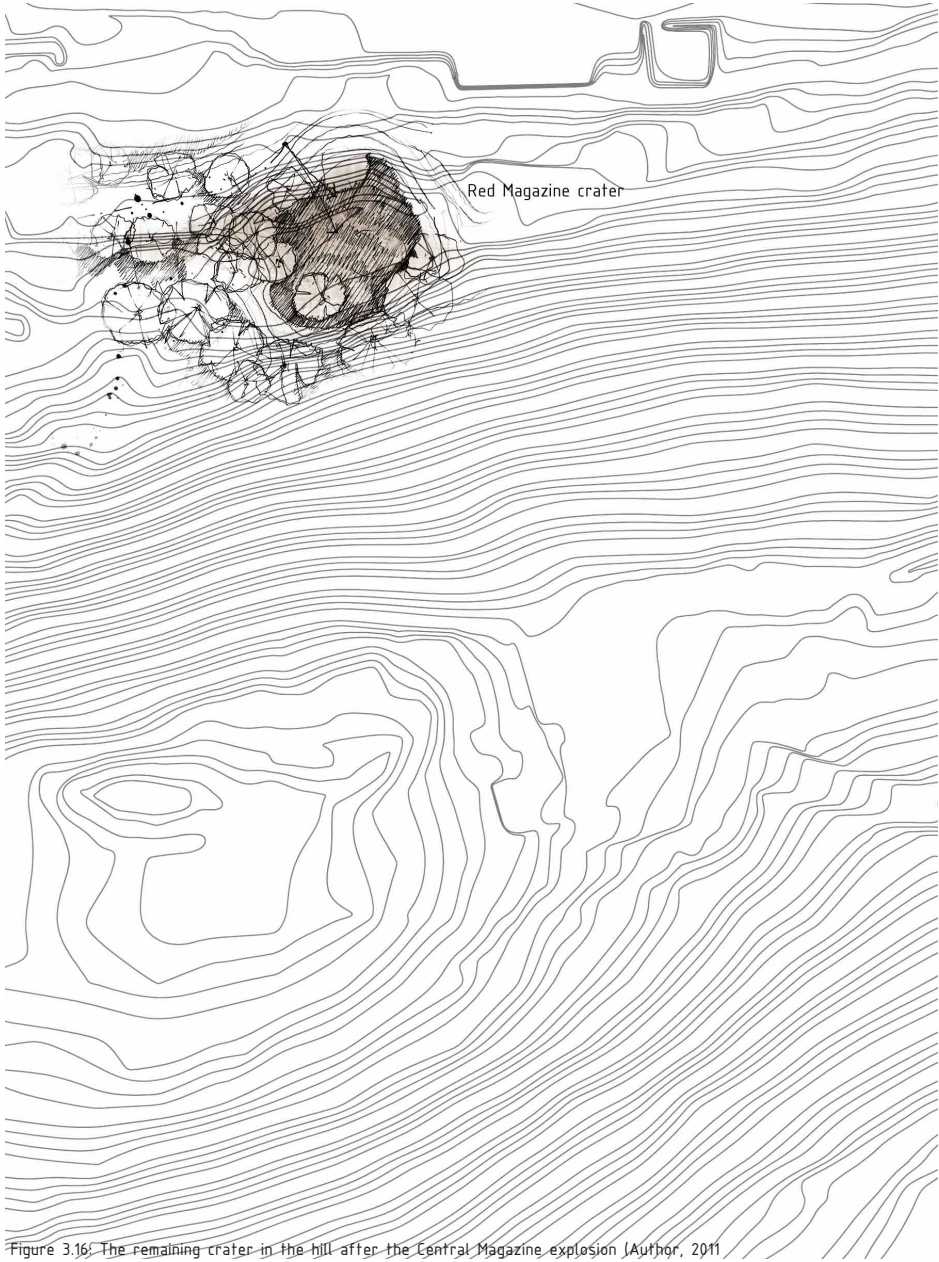


Figure 3.16: The remaining crater in the hill after the Central Magazine explosion (Author, 2011

route part 7:
The forces behind ruination

From the crater the journey through Magazine Hill continued to the ammunition bunkers, where the bomb and shell filling facilities were located, hidden within the landscape. The route forms a labyrinth, a series of wagon roads that open up into hidden, submerged spaces. From within the sunken rooms the overhanging trees form a natural canopy that defines the space vertically. The steriotomic character of the ammunition bunkers speak of a permanent language, transcendence, and immortality. On the other hand, severe weathering accompanies these structures, exposing the porosity of the stone. This aspect symbolises a duality and contradicts the concept of the structure's immortality. The passing of time is thus presented through the process of weathering and decay, confirming the structure's existence in the continuum of time.

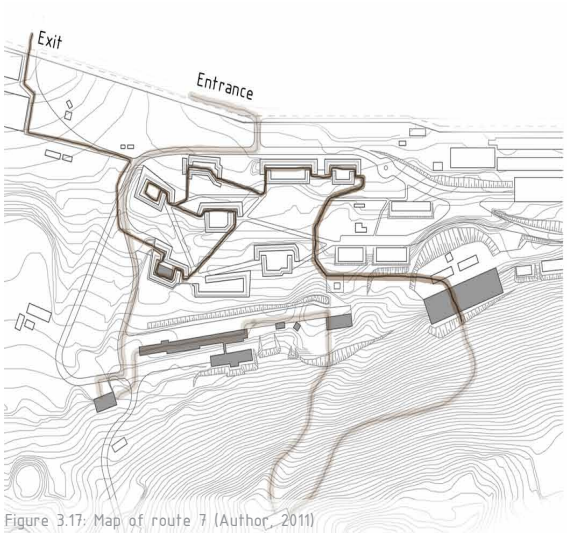


Figure 3.17: Map of route 7 (Author, 2011)

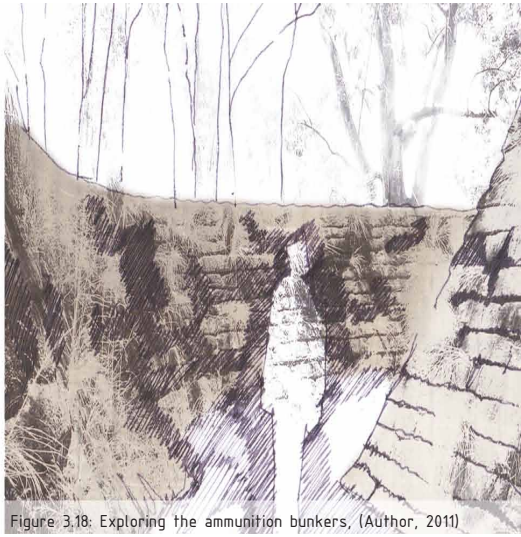


Figure 3.18: Exploring the ammunition bunkers, (Author, 2011)

The rrosion of a surface through weathering exposes newer surfaces of the same material in its depth, at once the erasure of one surface and the revelation of another. Exposure also involves sedimentation and the gathering of residual deposits, the combination of which –subtraction and addition– is a testimony to the time of the building. In this sense architectural duration implies a past that is caught up in the present and anticipates the future (Leatherbarrow & Mostafavi, 1993: 64)

Throughout the history of architecture, the process of weathering has been considered to have a negative impact on design. This statement is supported by the early Modern's ideal with whiteness, which Le Corbusier referred to as The Law of Ripolin (Leatherbarrow & Mostafavi, 1993: 72). This law was grounded in 2 main arguments. The first debate critiques the idea of the house as a museum that accumulates dead objects. The second argument comments on the physical accumulation of residual deposits, brought on by the process of weathering (Leatherbarrow & Mostafavi, 1993: 72–74). Although Le Corbusier rejected the possibilities of architecture persisting in time through the process of aging, Venetian architects designed for the anticipation of weathering. The Pallazzo Ducale, Venice (1340–1419) by Filippo Calendario proved that weathering can productively transform a structure over time. In the tectonic resolution of Pallazo Ducale's building facades, imbedded gutters around openings allow rainwater to stain the white Venetian finish. In this case the whitewash was invented to create simultaneity of light and shadow (Leatherbarrow & Mostafavi, 1993: 39)


Figure 3.19: Pallazo Ducale, Venice (1340–1419) by Filippo Calendario displaying design anticipating weathering (Leatherbarrow & Mostafavi, 1993: 40)

Mostafavi and Leatherbarrow's theoretical discourse is also present in the De Bjienkorf Department Store, Rotterdam (1955-1957) by Marcel Breuer. Carlo Scarpa's Brion-Vega Cemetery, San Vito di Altivole (1970-1981) is another example where the building anticipates the change of materiality in the continuum of time (Leatherbarrow & Mostafavi, 1993: 98). Tectonic resolution includes the addition of slits and cuts into flat facades, where the weathering and staining of architectural surface conclude the finishing detail of the building. Scarpa's window details for the Banca Popolare in Verona, also express the relationship between time and decay by embedding rain water drips that promote water staining into the building facade, to showcase the effect of time on architectural surface.

The processes of weathering and decay of built fabric form an evidential platform that proves the fact that architecture persists in time. Enric Miralles further states that the passing of time further enriches sensory experience of space, through the process of weathering (Makenzie, 2011: 17-24). This statement presents the fact that weathering reconnects architecture to a temporal dimension, as well as the continuum of time. In this sense, age related deterioration confronts architecture with its mortality and the necessity of change.

This relationship between architecture and time stresses architecture's dependency on time. The one cannot exist without the recognition of the other. Hapticity and Time (2000:76), an article by Juhani Pallasmaa concentrates on the fact that contemporary architecture has lost the connection with the ephemeral dimension of time. David Leatherbarrow also comments on this statement, by proclaiming that contemporary architecture is disregarding the passage of time by not incorporating the transformation of architectural materiality, into the design process.

In the Past is a Foreign Country (Loventhal, 1985:84), the author proclaims that history is the vessel for understanding the present. To expand on this theoretical assertion, one can state that the past and the present are separated in time but unified through weathered space. Therefore decay in architecture can breach the time divide, addressing both experiential and referential time. Furthermore, by incorporating the anticipation of weathering into design, the limited life spans of contemporary architecture can be addressed in a tectonic sense.

The Greek term, *techne,* does not refer to art or craftsmanship, but to make something appear within what is present (Heidiger, 1997) . The historical layers of Magazine Hill will in the same sense be explored and unravelled through time, exposing different layers of significance within the present fabric. One architectural intervention cannot present and preserve all inherent phenomena, but can take the first drastic step to initiate a dialogue with the intrinsic memory of Magazine Hill. As the journey comes to an end, and one leaves the last submerged bunker, the realisation occurs that memory has just been experienced, on a multi-sensory level, evoking the imaginary, relating to both experiential and referential time.

In construing an architectural project, the introduction and consideration of the time of weathering brings the project closer to a condition of actually based on its potential transformations through time...weathering brings the virtual future of a building into dialogue with its actual present, as both are entangled in its past. (Leatherbarrow & Mostafavi, 1993: 112)

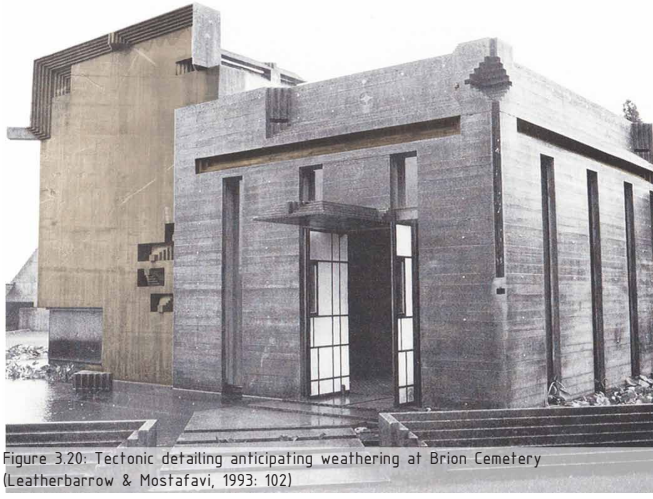
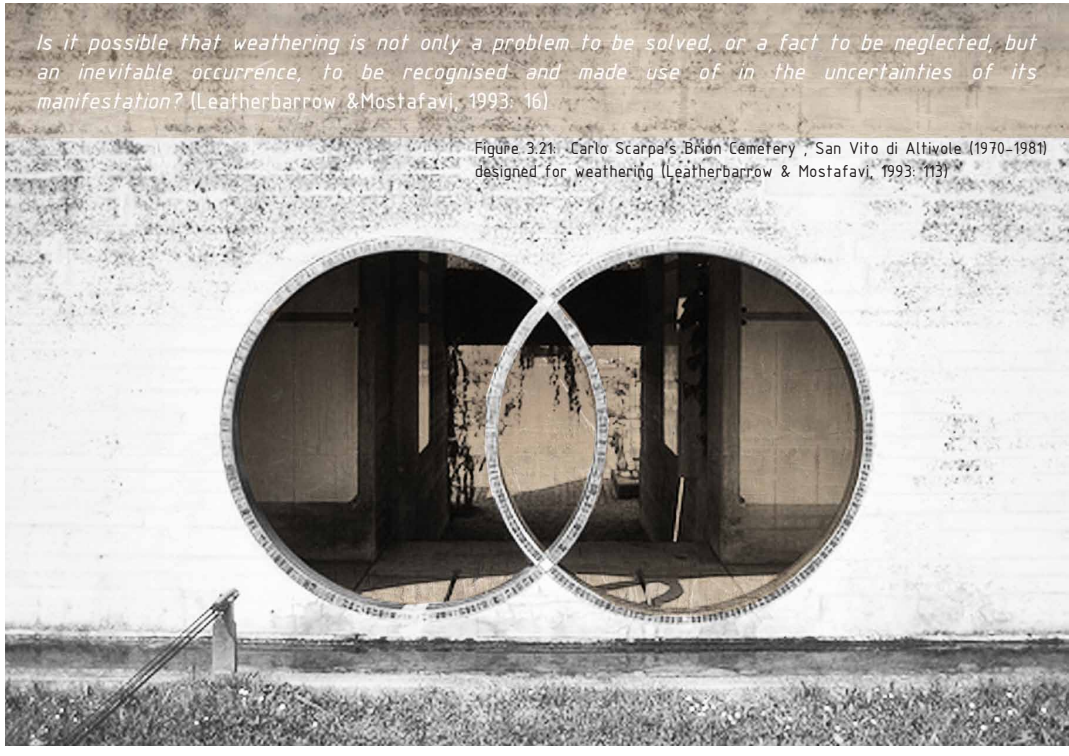


Figure 3.20: Tectonic detailing anticipating weathering at Brion Cemetery (Leatherbarrow & Mostafavi, 1993: 102)

Is it possible that weathering is not only a problem to be solved, or a fact to be neglected, but an inevitable occurrence, to be recognised and made use of in the uncertainties of its manifestation? (Leatherbarrow &Mostafavi, 1993: 16)

Figure 3.21: Carlo Scarpa's Brion Cemetery , San Vito di Altivole (1970-1981) designed for weathering (Leatherbarrow & Mostafavi, 1993: 113)



Chapter 4 focuses on the analysis of 3 major scales of intervention: urban, precinct and site scales. The analysis studies include physical and conceptual content that can be considered as being potential design generators

Chapter 4 - Context and Site Analysis

4

Church Square, the historical centre of Pretoria containing the origin of the cardo and decomanic, the roman ordering system for city building. This public core acts as a consolidation mark for the future development of the city, and also forms one of the main platforms of pedestrian activity in the inner city.

The NZASM railway initiative that was launched in 1892 in order to connect Pretoria with Delgoa Bay. The railway tracks are laid according to the topography of the terrain and thus form a divide between the natural slope of the hill and the dense fabric of Pretoria West. This also can be seen as the main cause of the peripheral exclusion of the Military Precinct.

The Military Precinct and old Military reserve of Pretoria. This Precinct forms part of southern peripheral exclusion of the city, separated from the inner city via the railway tracks.

This precinct consist of the administration headquarters for the South African National Defence Force.

Freedom Park
As Magazine Hill forms the western part of the southern gateway into Pretoria, Freedom Park constitutes the eastern part of the gateway, framing the southern entry into the city.

Magazine Hill
This hill forms the proposed site for intervention and is located to the south of Pretoria Correctional Services. The site is also located within the historical Military Reserve for Pretoria representing an era of unrest in South Africa in the form of a series of ammunition bunkers, ammunition factories and ammunition magazines.

Fort Schanskop
This fort forms part of the second fortification plan of Pretoria and was one of a series of fortification built on the ridges protecting the southern entry and gateway into Pretoria.

0 0.5 km 1 km

Figure 4.1: Magazine Hill and military precinct locality map (Author, 2011)

4.1 Background and Delimitations

For the purpose of this dissertation, Magazine Hill will be studied in relation to other historical and military sites of significance situated in the southern natural landscape of Pretoria, also concentrating on the site's relation to the military precinct in which it is located.

4.2 Macro analysis

4.2.1 Urban Analysis: Magazine Hill as a continuation of the monumental landscape

Magazine Hill forms part of a series of military and historical sites of significance, all terrains burrowed and hidden within the Groenkloof Nature Reserve region. These sites are divided into 2 main categories of cultural significance, the first being military heritage sites (Fort Commeline, Fort Tulleciwach, Fort Klapperkop, Fort Schanskop and Magazine Hill). The second category of cultural significant sites is defined as terrains or structures acting as commemorative constructs (The Voortrekker Monument, Freedom Park and Air Force Memorial). The design of all mentioned structures of significance (except the Voortrekker Monument and Air Force Memorial) can be considered as a direct interpretation of function and context, for all structures are designed for secrecy, veiled within the hills of the monumental landscape, augmenting the hilltops and following the natural edges of the hills. The pure scale and topographical character of the natural landscape had been utilised as a platform for a concealed typology of hilltop architecture, guarding the southern passageway (*Skietpoort*) into Pretoria.

Magazine Hill demonstrates the same obscure typology of architecture, veiled within the hill, establishing a connection between the proposed site and surrounding historical terrains, a connection visible in both time and place.

Figure 4.2: Magazine Hill context map (Author, 2011)

Figure 4.3: Zoning analysis
(Author, 2011)

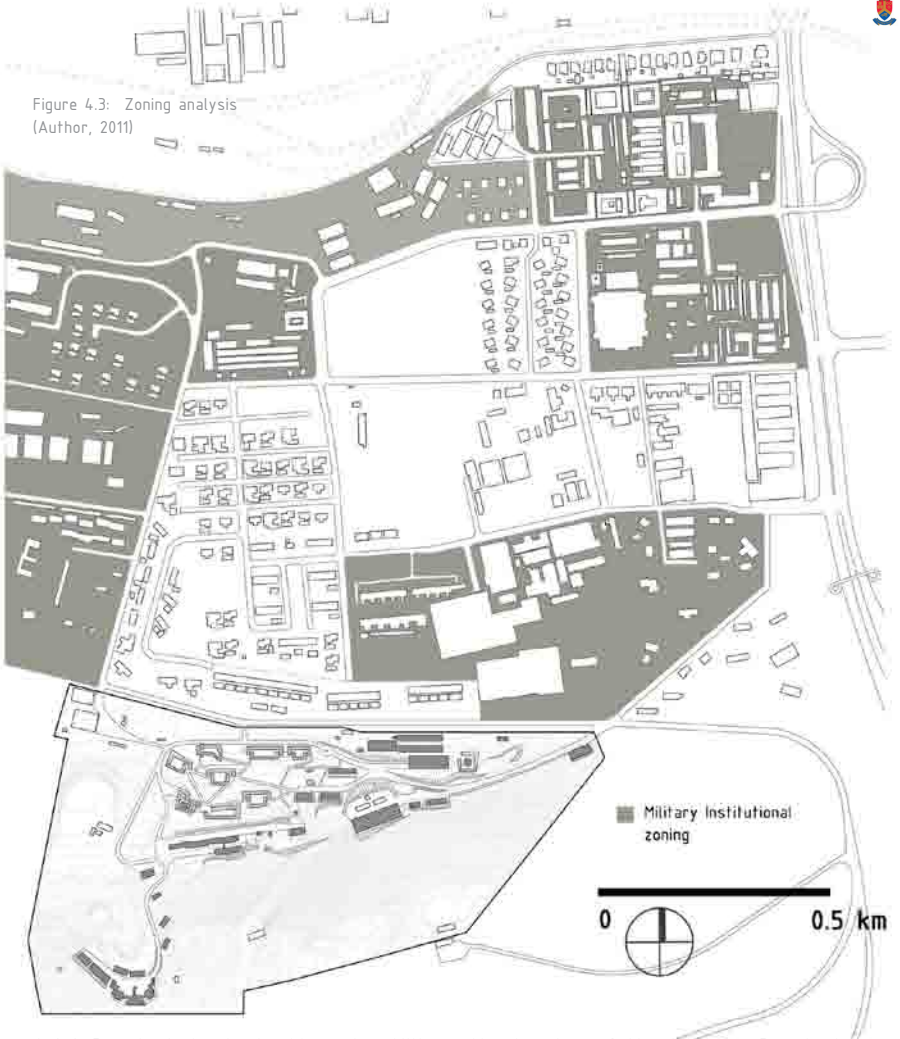
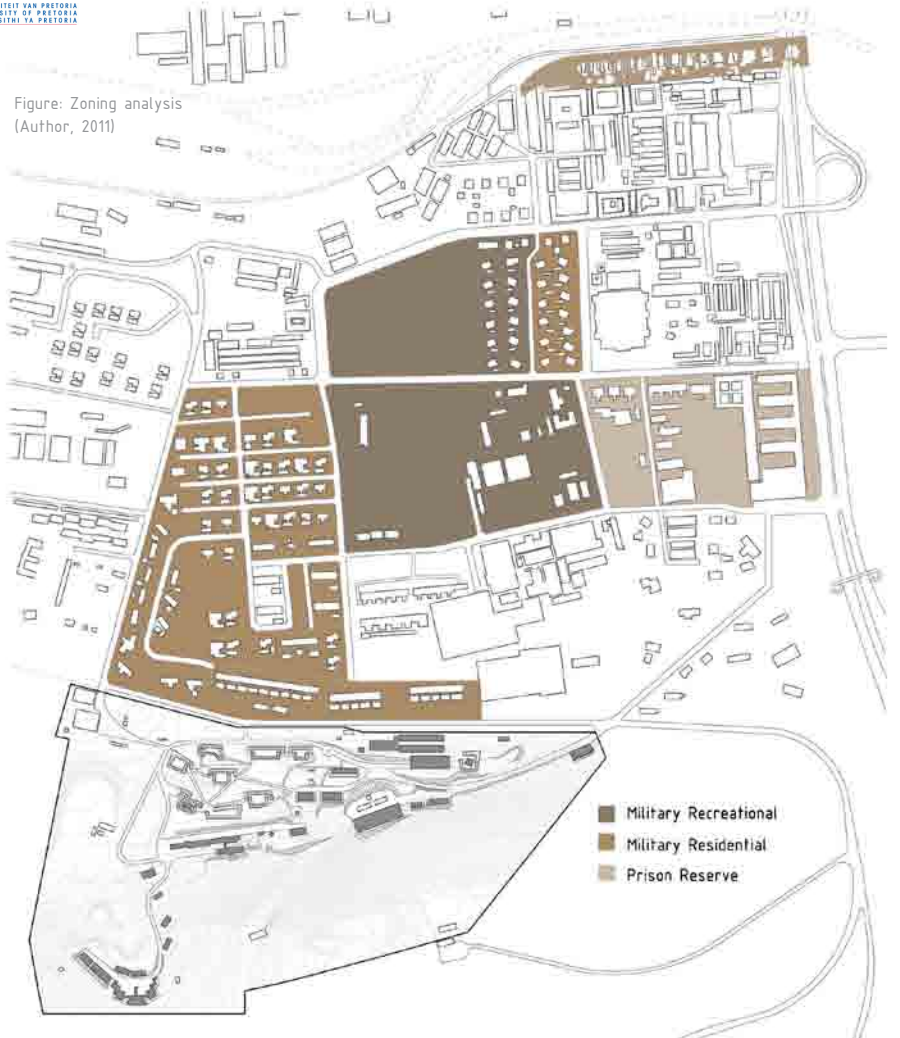


Figure: Zoning analysis
(Author, 2011)



4.2.2 Precinct Analysis: Magazine Hill as the border of the Military Precinct

SANDF institutional buildings form the majority of the precinct's built fabric and consist of military training facilities, parade grounds, indoor shooting ranges, SANDF Headquarters, vehicle repairs, health depots, military-industrial facilities and a number of private military workshops. The western part of the Institutional zone includes barracks and brigade housing that share the border with the Weskoppies Mental Institution and the SAP Precinct to the west of the Military Reserve. The Prison Reserve forms the only institutional zone that falls outside military occupation.

Zoning analysis:

Recreational areas dedicated for Military use only, form a public network within the residential zones which houses military brigades, battalions and regiments. The recreational military grounds form the centre of the Precinct and functions according to activities between the brigades and regiments in the residential zones. These grounds have the potential to establish a platform for the conceptual mediation between the military and the Public in the forms of military exhibitions, auctions, music events etc.. Currently, the grounds are only utilised for intermittent sport events and military gatherings.

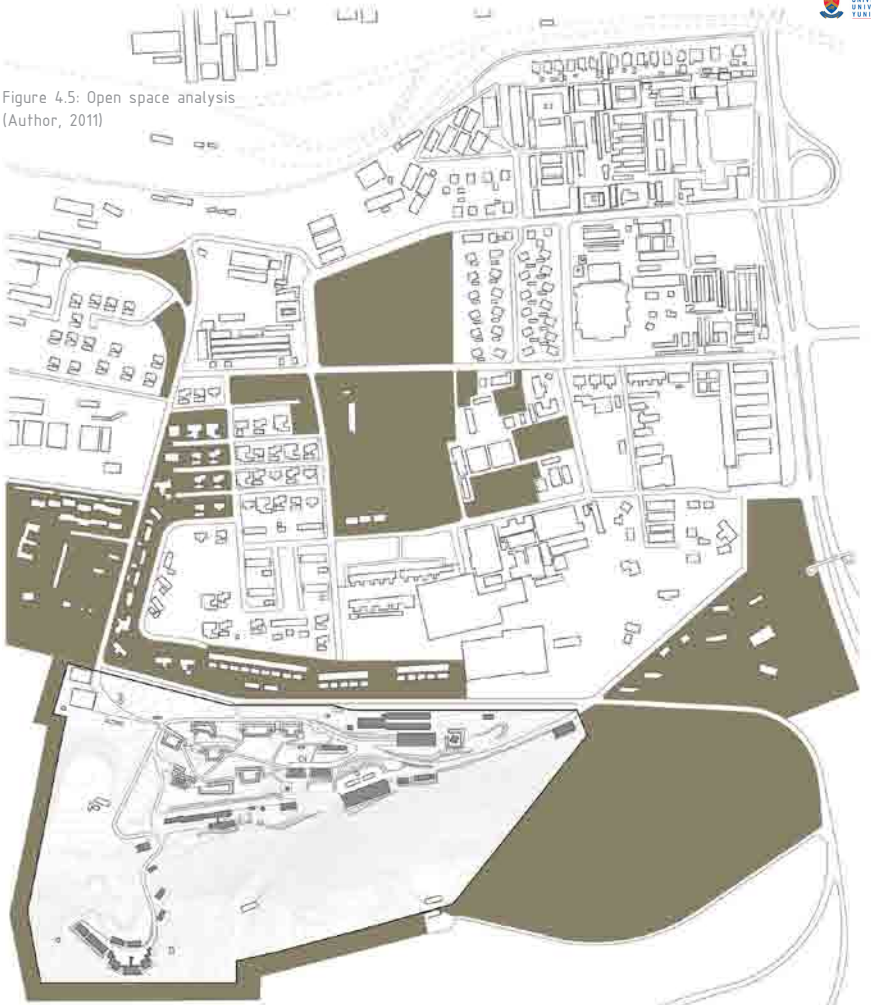


Figure 4.5: Open space analysis
(Author, 2011)

Figure 4.6: Corridor development
(Author, 2011)

Open/Soft space analysis:

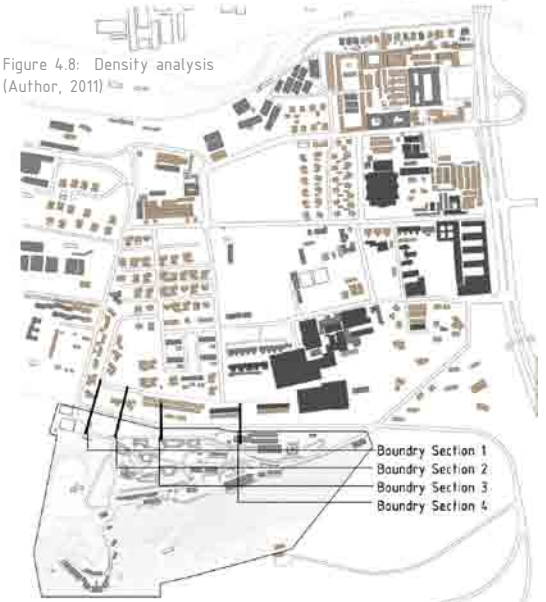
The Residential zones in the military precinct are set within an open space network, consisting of low density single family houses. Recreational grounds are also included in the open/soft space network, including a variety of sports fields and grass surfaces. As one moves to the south in the precinct, open and soft space becomes more abundant towards Magazine Hill. The site is located on the threshold where the precinct meets the Groenkloof Game Reserve to the south, containing a dichotomy of manmade structures within the natural realm on the hill. Magazine Hill thus forms the meeting place of hard space (military infrastructure) and soft space (natural hill landscape).

Possible Corridor Development:

The introduction of a road hierarchy network in the precinct could enable development to occur in a formal fashion, addressing density and organisational issues. The main arterial road, Dequar Road, has the potential to function as the main possible corridor for development. These corridors can connect open public spaces that will enable the recreation nodes to function as a green and circulation network.

Figure 4.7: Transportation structure (Author, 2011)

Figure 4.8: Density analysis (Author, 2011)



Transportation Structure:

This Precinct is served by 2 main modes of transport, vehicular and railway infrastructure. The first transport node is the NZASM train station that is located in Artillery Street on the northern border of the precinct. This transport node is mainly focused on the distribution of military hardware, serving the industrial sector of the precinct. Currently, the railway infrastructure acts as a barrier between the precinct and the inner city, reinforcing the peripheral exclusion of the Military Reserve. The road structure in the precinct is set out without a definite road hierarchy that promotes mass development, thus low density settlement accompanies the area. Dequar road forms the main arterial road that connects the precinct with the inner city of Pretoria.

Density and Fabric analysis:

The northern sector of the precinct is defined by a denser urban fabric, the Military Administration Sector. Density, both institutional and residential, declines as one moves south to Magazine Hill. The south eastern part of the precinct is the least dense and starts to contravene borders with the Groenkloof Game Reserve. The precinct consists mainly of 1-4 storey buildings.

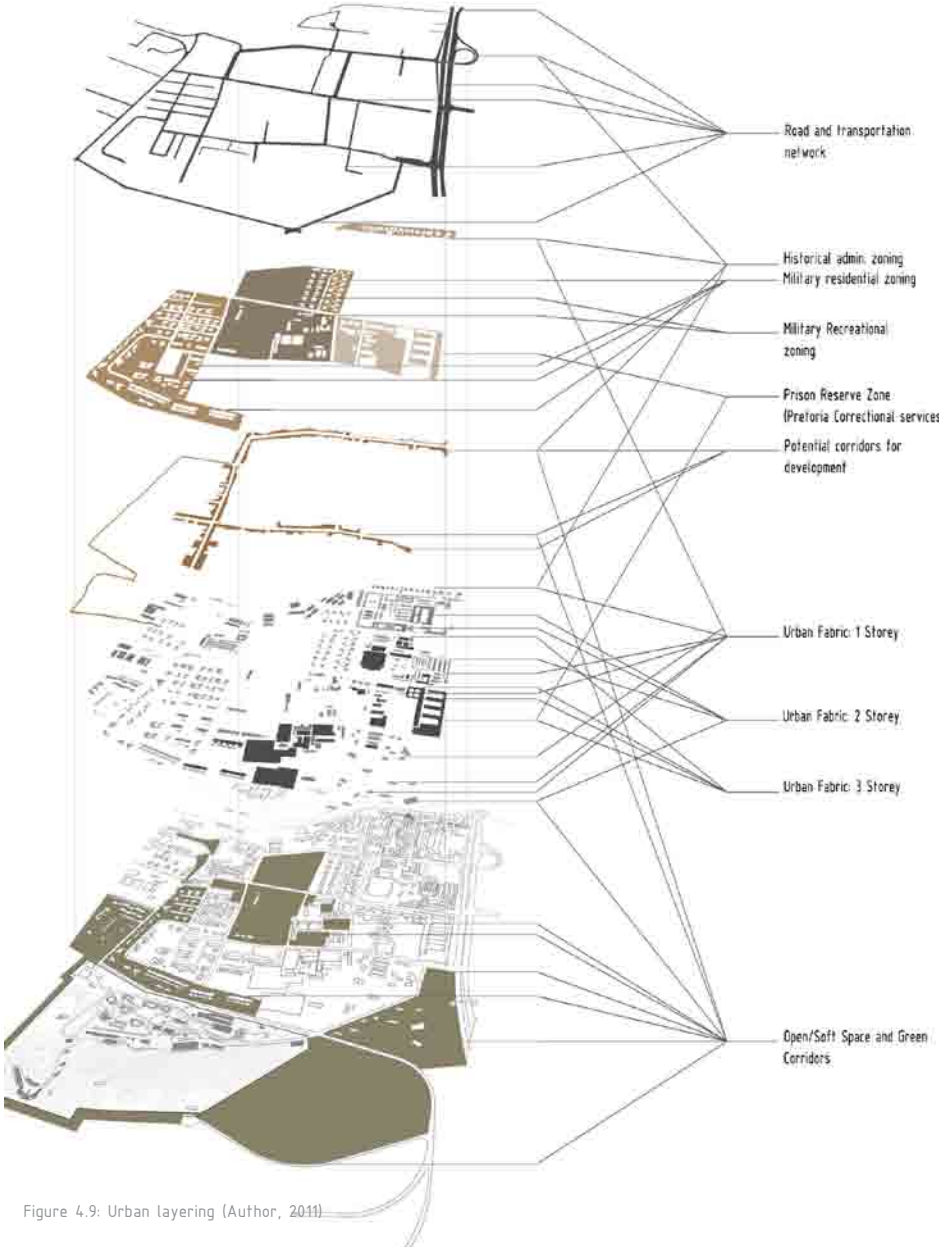


Figure 4.9: Urban layering (Author, 2011)

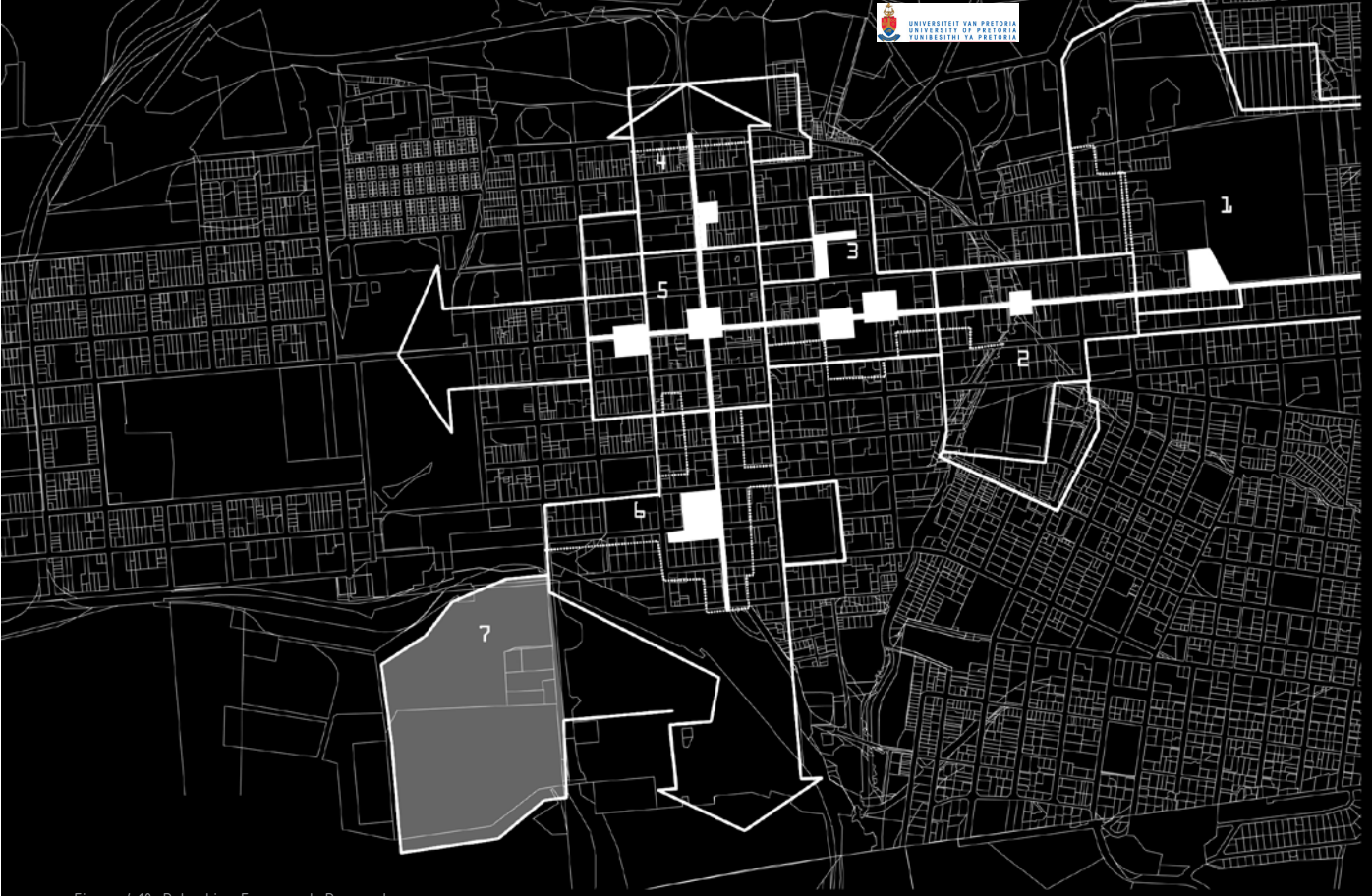


Figure 4.10: Rekgabisa Framework Proposal
(TCT, 2006. Edited by Author)

4.2.3 Existing Spatial development framework – ReKgabisa Tshwane Framework

The Rekgabise Tshwane Framework was developed in 2006 with the main objective focused at reinstating the National Government within the city centre of Pretoria. The proposal concentrates on the development of the 2 main corridors of the Pretoria city centre (Cardo and Decomanis Maximus), in order to promote a safe public network with accessibility to government departments, with each public node serving a different governmental division (The City of Tshwane, 2006). The Rekgabisa framework focuses on Salvokop and the Military Reserve, depicting the precincts as possible nodes for development. 2 Parade grounds are proposed along Potgieter Street linking up with a covered boulevard/parking structure in Dequar Road. No densification programme is introduced within the existing military residential zones. The heritage of Magazine Hill is not only compromised by large scale housing and governmental development, but also not recognised in the future development strategy for the site or precinct.

Main objectives of Rekgabisa framework:

·Linking of symbolic or heritage sites
·Creating an infrastructural spine that promotes private development
·Creating a public space network between precincts linking government departments
·Linking of symbolic or heritage sites
·Providing commercial opportunity
·Promote cultural and heritage programs linked to tourism
·Creating a visual link between Salvokop and union buildings
(The City of Tshwane, 2006)

Shortcomings of Rekgabisa Framework:

·Insufficient densification programme for military precinct
·Insufficient housing provision as per military brigade and regiment structures
·The lack of heritage recognition (Magazine Hill) for future development programmes
Placing military parade grounds outside brigade and regiment residential zones
·The lack of a connection between Magazine Hill and the surrounding sites and monuments of heritage significance.
·Insufficient provision for controlled, occasional military and public interaction.

4.3 Micro Analysis

4.3.1 Photographic site study

This study is concluded in order to establish a visual understanding of both the architectural and natural characteristics of Magazine Hill. The weathered state of the remaining structures emphasises the large scale abandonment of the site after the mysterious explosion in 1945. Magazine Hill is now friends only to the foes of the past, trapped within time and desolation.

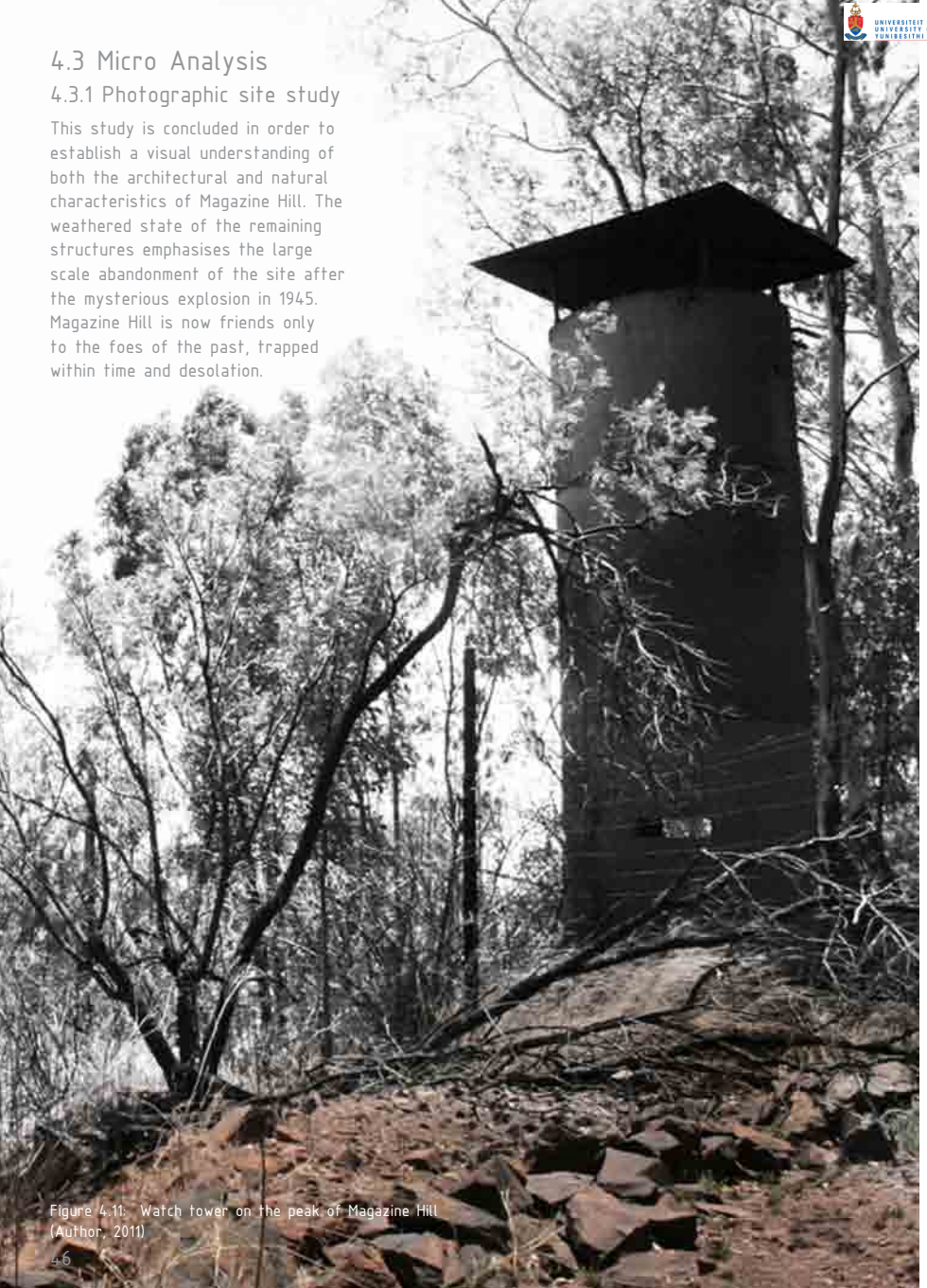


Figure 4.11: Watch tower on the peak of Magazine Hill
(Author, 2011)

Figure 4.12: Flame Tracer build
(Author, 2011)

Figure 4.13: Overgrown staircase leading into the hill (Author, 2011)

Figure 4.14: Empty mortar shells at Magazine Hill (Author, 2010)

Figure 4.15: Existing ammunition bunker, submerged within the landscape (Author, 2011)

Figure 4.16: Ammunition bunker (Author, 2010)

Figure 4.17: Green Magazine entrance (Author, 2011)

Figure 4.18: The MRG3 kitchen building (Author, 2011)

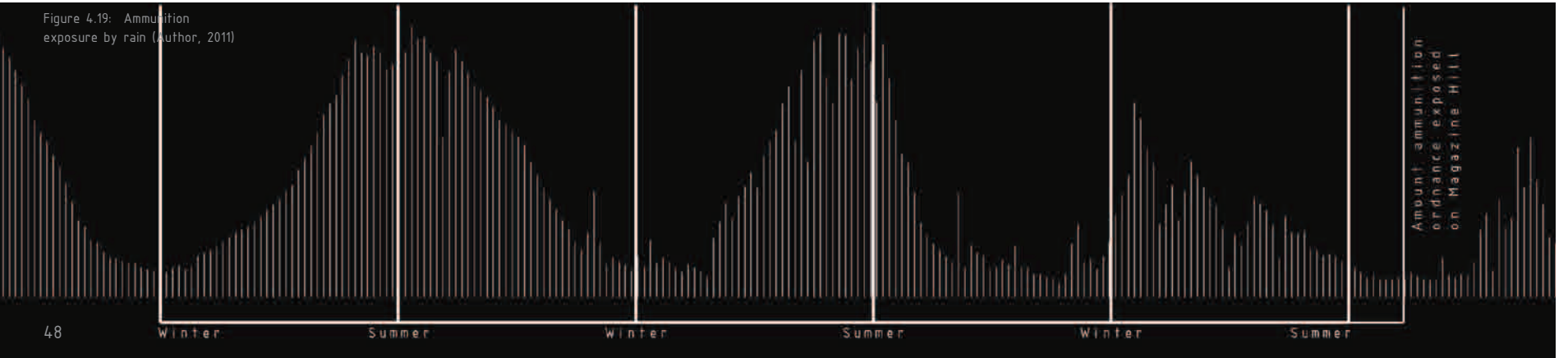
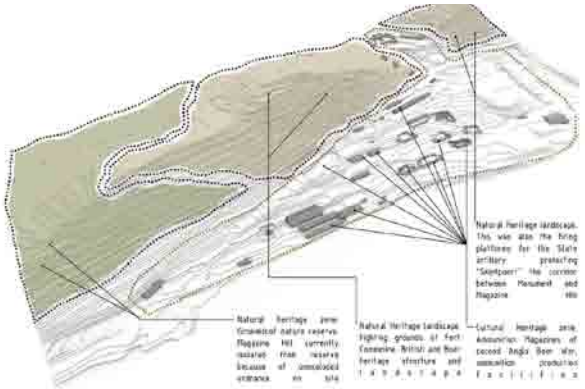
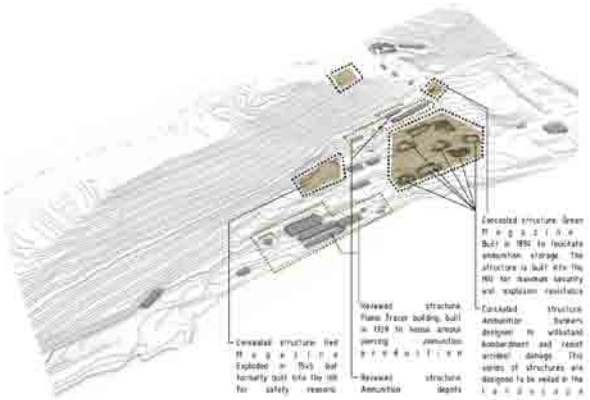
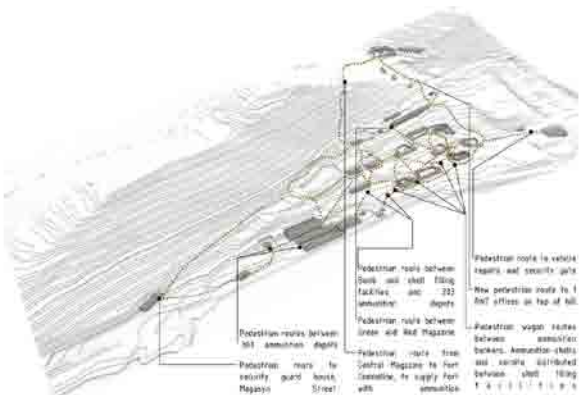


Figure 4.19: Ammunition exposure by rain (Author, 2011)







4.3.2 Seasonal site study – ammunition exposure by rain

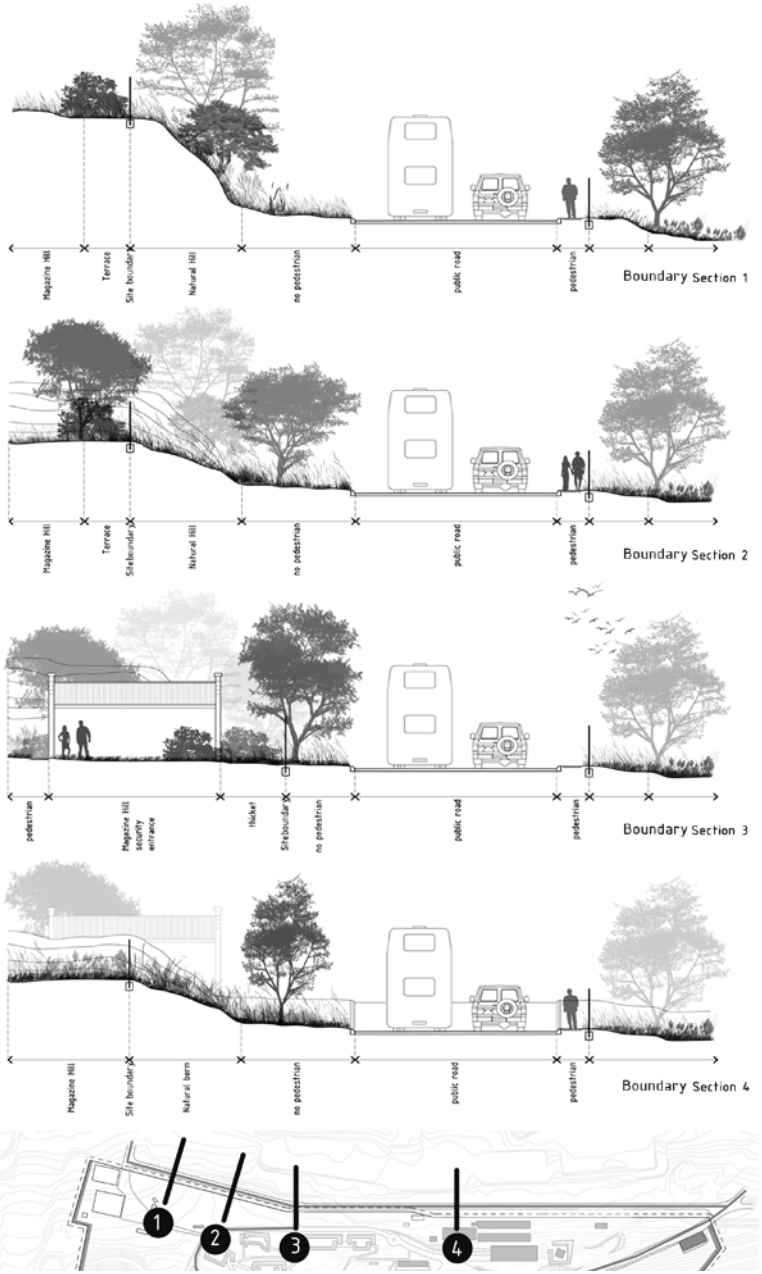
The steep hill above the crater of the Red Magazine is considered as possibly dangerous, for unexploded ordnance and remnants of live ammunition are still extracted from the fields on the hill at the end of each rain season (Du Plessis, 2010). This phenomenon accentuates the natural healing process of the landscape, with time being the primary healer. (Figure: xx)

4.3.3 Site boundary analysis

The northern site boundary of Magazine hill is separated from the street front by a natural ground berm, concealing the classified content of Magazine Hill (Figure: xx). This natural element contributes to the secretive character of the site, while at the same time limiting interaction with Magasyn Street. The vertical height of the berm varies across the northern border of the site, allowing controlled access at strategic points.

This page:

(top left) : Figure 4.20: Heritage zone analysis (Author, 2011)
(middle left) : Figure 4.21: Revealed and concealed analysis (Author, 2011)
(bottom left) : Figure 21b: Pedestrian corridors on Magazine Hill (Author, 2011)
(right) Figure 4.22: Magazine hill edge condition analysis (Author, 2011)



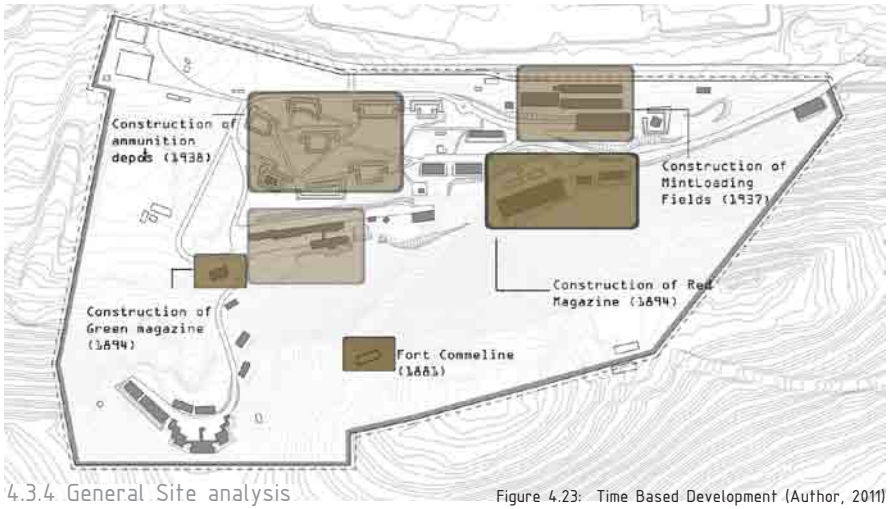


Figure 4.23: Time Based Development (Author, 2011)

4.3.4 General Site analysis

Magazine Hill developed according to a number of different political, social and urban events which were governed by different leaders and government rulers. It is a site that forms an evidential platform for a time line of South African history, the different political leaders, eras and thought patterns that stretch from the First World War up to the First Election in 1994. As South Africa developed, Magazine Hill developed.

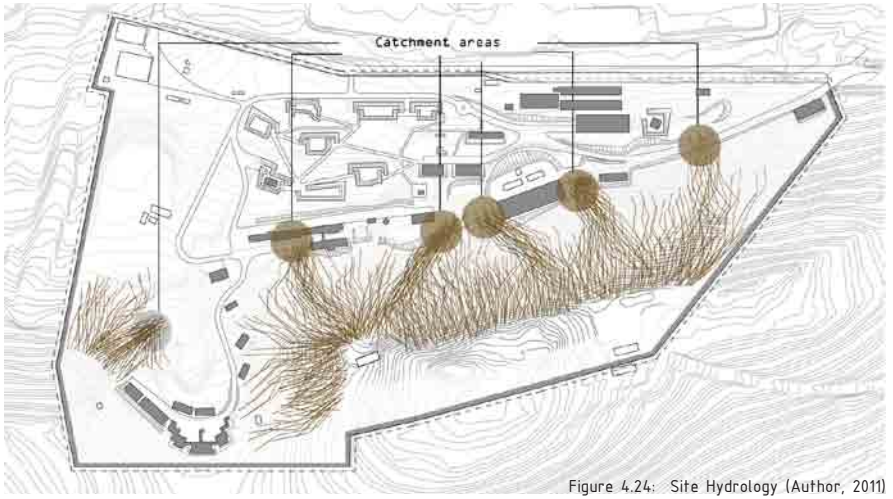


Figure 4.24: Site Hydrology (Author, 2011)

Magazine Hill is located on a hilltop, therefore hydrological activity becomes a major design generator. Site hydrology formed part of the initial design of Magazine hill, locating catchment areas on strategic point on the lower part of the site, where water could be reused in the ammunition production process. Through studying the vegetation density on site, it becomes clear that the Central Magazine crater currently acts as a natural accumulation point for runoff water, for it is the most vegetated part on the hill.

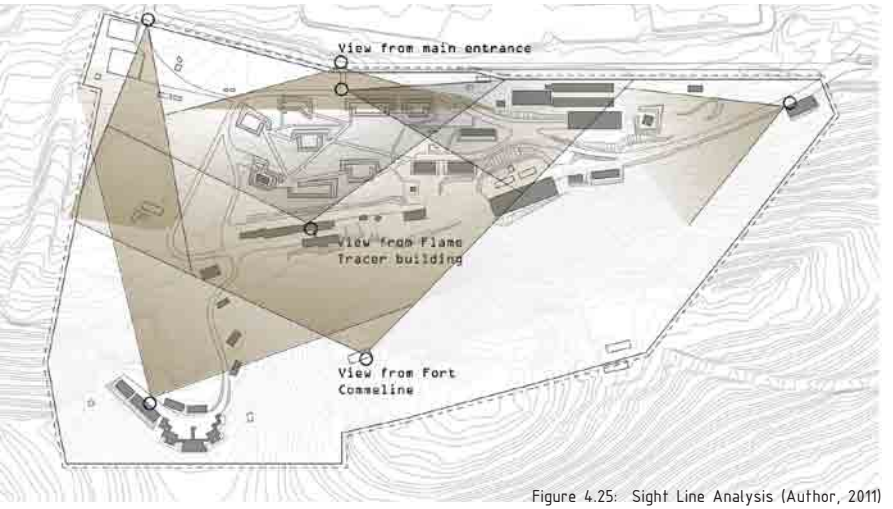


Figure 4.25: Sight Line Analysis (Author, 2011)

The topography of Magazine Hill allows for different visual experiences, with sight lines changing constantly, revealing different parts and mysterious structures as one progresses through the site. The veiled character of the site places emphasis on the sight line studies, where different parts of Magazine Hill can be revealed from strategic anchor points within the site.

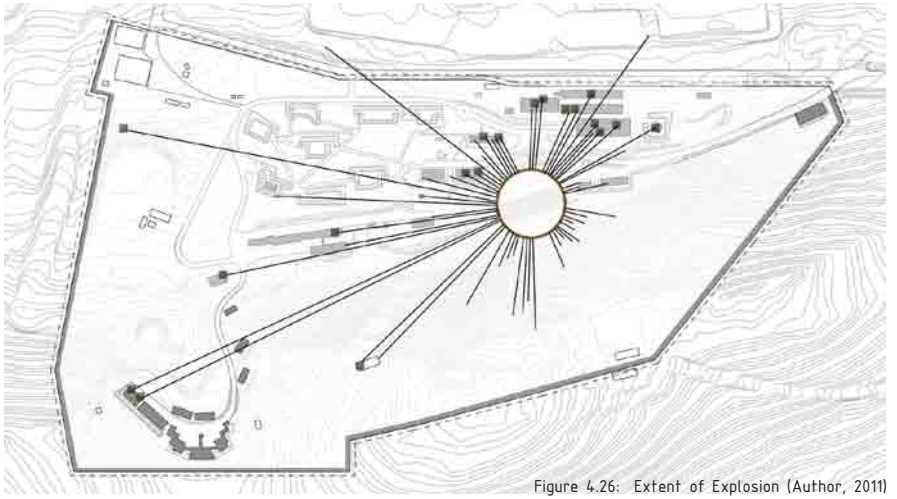


Figure 4.26: Extent of Explosion (Author, 2011)

The mysterious explosion of the Red/Central Magazine in 1945 led to massive destruction on Magazine Hill. Damages were reported as far as Church Street (Du Toit Spies, 1955: 78). According to The Royal Mint, 146 casualties were reported: 34 people died on direct impact and 234 people were injured (Panagos, 2000: 7). This study depicts the damage (both architectural damage and casualties) on Magazine Hill as a direct result of the explosion.

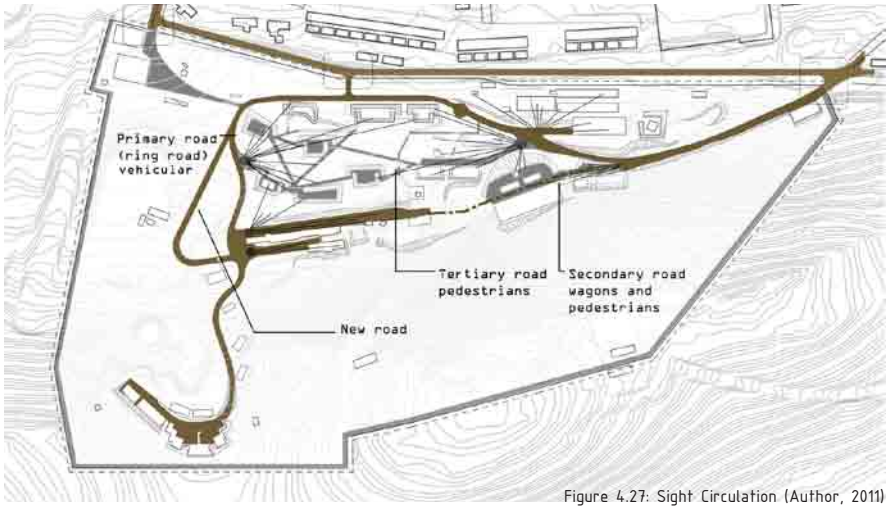


Figure 4.27: Sight Circulation (Author, 2011)

Primary roads form a ring road system around important zones on Magazine Hill. These roads cater for vehicular traffic while secondary and tertiary roads provide movement platforms between primary roads, catering for pedestrians and ammunition wagons (historical use). The entire site can thus be accessed from strategic points on the primary ring road.

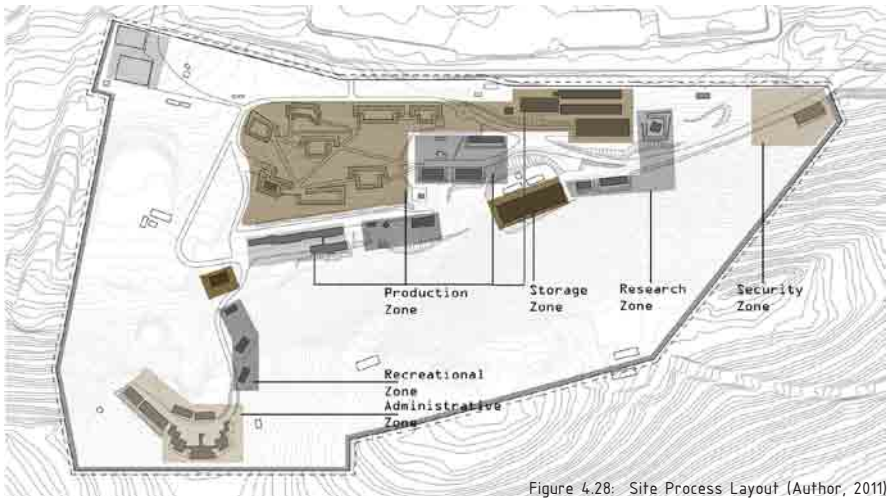


Figure 4.28: Site Process Layout (Author, 2011)

This study can be seen as an additional layer to the site circulation study. Magazine Hill is divided into 4 different process sectors. The first zone is the Production Zone, where ammunition was produced from the early 1930's. The second zone is the Storage Zone where ammunition was stored as from 1894, while the third and fourth zones still function as the administration and recreational zones. The security zones on the 2 extremities of the site form the last sectors of the site, limiting public access to Magazine Hill.

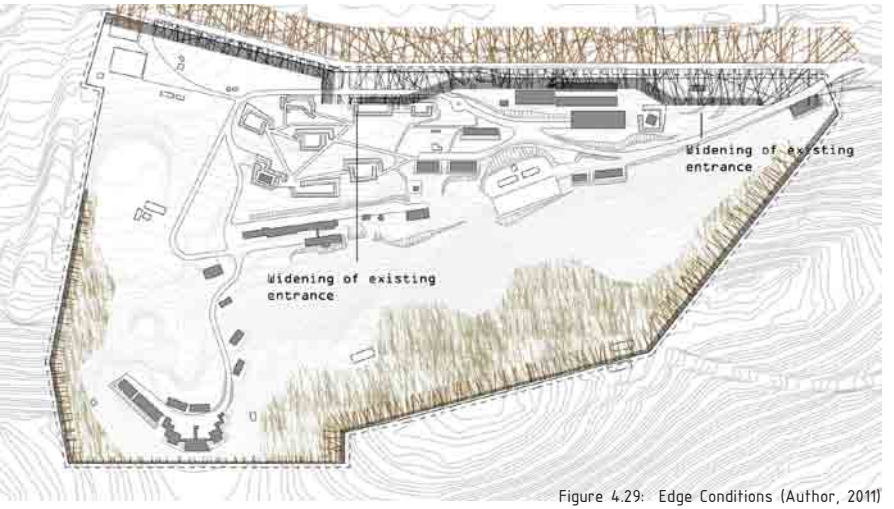


Figure 4.29: Edge Conditions (Author, 2011)

Because of the privatised character of the site, the northern edge condition is defined by a berm forming a permanent barrier. The northern perimeter street level is thus lower than the site boundary which results in a lack of site-street interaction. The eastern and southern edges are fenced off from the Groenkloof National Reserve to protect wildlife from unexploded ordnance still present on Magazine Hill after the explosion.

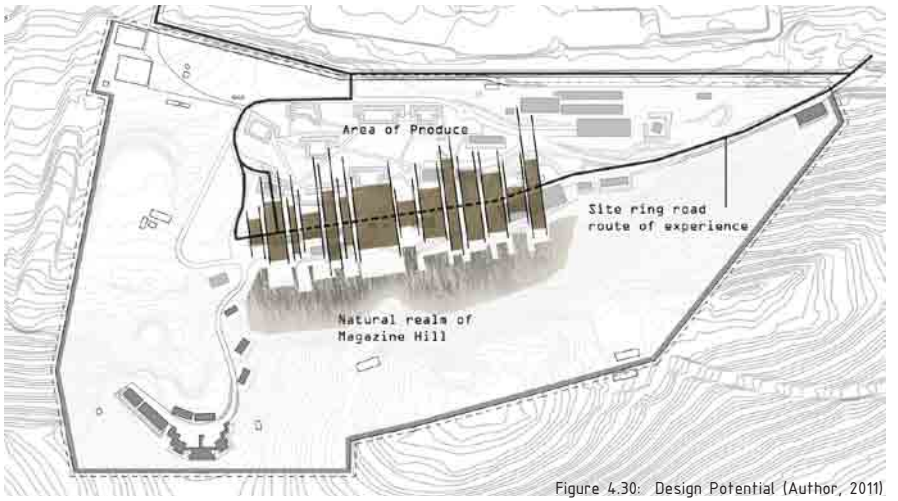


Figure 4.30: Design Potential (Author, 2011)

Taking the original 1945 circulation network into consideration, the ring road around the ammunition production zones allows for interaction with the natural hill of the site (south), as well as the heritage of ammunition production to the north. This corridor is situated on the threshold between Nature an Man, between production and storage, stretching across the entire site, allowing for interaction with all existing structures.

Chapter 5 discusses the design response in relation to the previous analytical chapter. The 3 major scales of framework interventions are presented and discussed within the context of Magazine Hill

Chapter 5 - Proposed Frameworks

5

Figure 5.1 Weather balloon from hilltop monuments (Author, 2017)

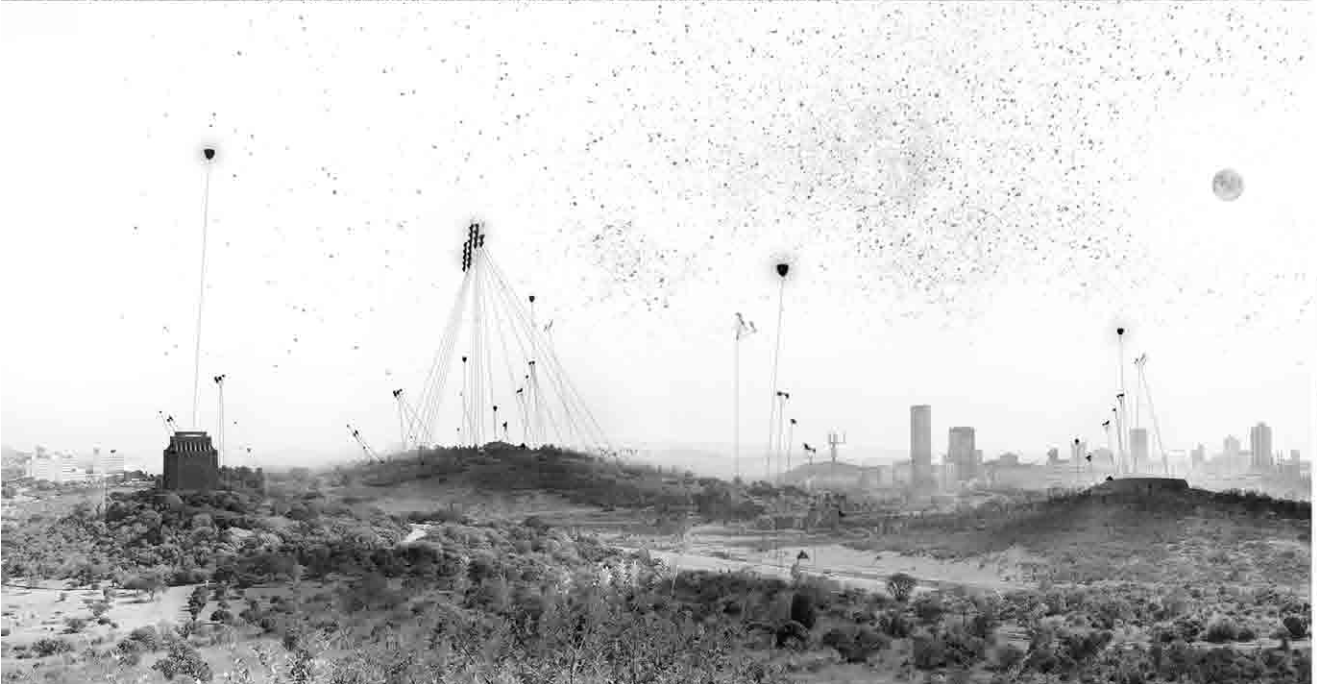
5.1 Background

The proposed framework focuses on 3 major scales of intervention: the urban framework (the monumental landscape), the precinct framework (Military Reserve) and the site framework (Magazine Hill). Each framework will be separately discussed for the purpose of the dissertation.

5.2 Proposed Urban Framework

The proposed urban framework concentrates on the vast indigenous landscape where Monument Hill, Magazine Hill and the Groenkloof Nature Reserve meet. This hilltop landscape contains numerous South African military monuments as well as commemorative architectural memorials. In the urban framework, a series of weather balloons are proposed that rise once a month at night times from all monuments located on the hills, connecting the historical sites by forming light beacons over the dark landscape. This activity does not only highlight the position of Magazine Hill in relation to the other hilltop monuments, but also connects the project back to the daily cycles of time; the weather balloons rise via hot air at dusk, and as dawn approaches the balloons descend back to ground because of heat loss, thus emphasising the cyclical dimension of time. Lastly, the number of balloons rising at Magazine Hill also relate to the number of casualties that was reported after the explosion of the Central Magazine in 1945, subsequently commemorating the tragic event.

Figure 5.2: Weather balloons illuminating the night sky (Author, 2011)



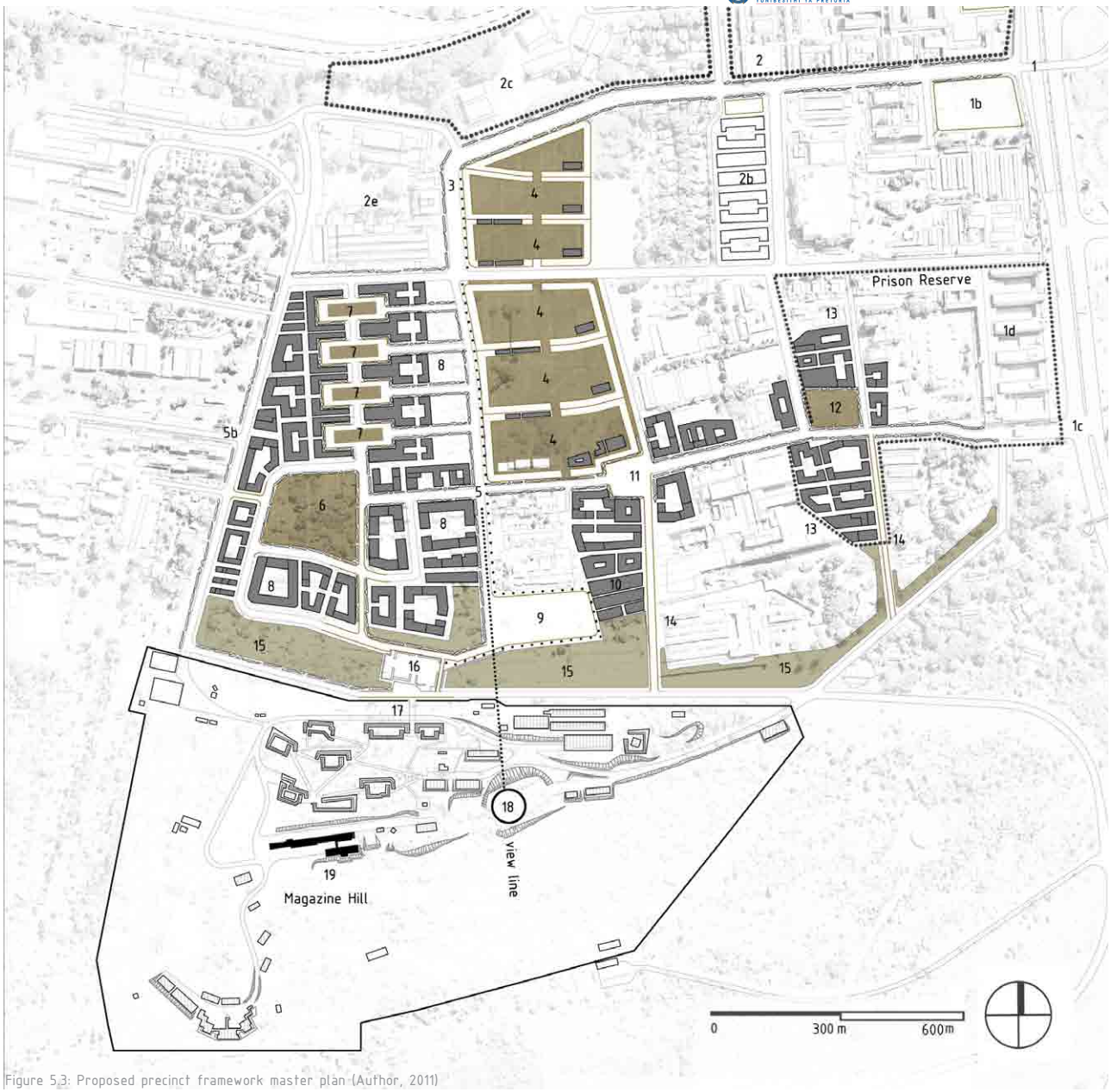


Figure 5.3: Proposed precinct framework master plan (Author, 2011)

5.3 Proposed Precinct Framework

1: Existing entrance into military precinct (Dequar Road)
1b: Existing open space, proposed Rekgabisa parade grounds
1c: New proposed entrance into precinct (Klawer Street)
1d: Pretoria Correctional Services
2: Existing SA Army Administration Headquarters
2b: Proposed Indoor shooting facilities (SANDF projections)
2c: Military vehicle repairs
2d: SA Army Health Depot
3: Proposed main road into precinct (Dequar road)
4: Existing military recreational grounds, proposed parade ground network
5: View of Red Magazine Crater on Magazine Hill from Dequar road, light avenue guiding visitors to Magazine Hill
5b: Existing Magasyn Street, alternative route to Magazine Hill, tree lane as urban guide to Magazine Hill
6: Existing open space, proposed parade ground network
7: Proposed smaller formation parade ground network
8: Military formation and brigade residential zone (high density)
9: Proposed parade ground network
10: New proposed military institutional buildings (high density)
11: Proposed multifunctional intersection/parade space
12: Proposed parade ground network for Prison Reserve
13: New proposed prison administration buildings
14: New access road to Magasyn Street
15: Urban Agricultural belt serving prison and Military Reserve
16: Magazine Hill Parking structure, serving both Magazine Hill and military precinct
17: Entrance into Magazine Hill opposite parking structure in agricultural belt
18: Red Magazine crater on Magazine Hill, visible from Dequar Road
19: Existing Flame Tracer Building, proposed site for brass foundry

Figure 5.4: Proposed parade ground network (Author, 2011)

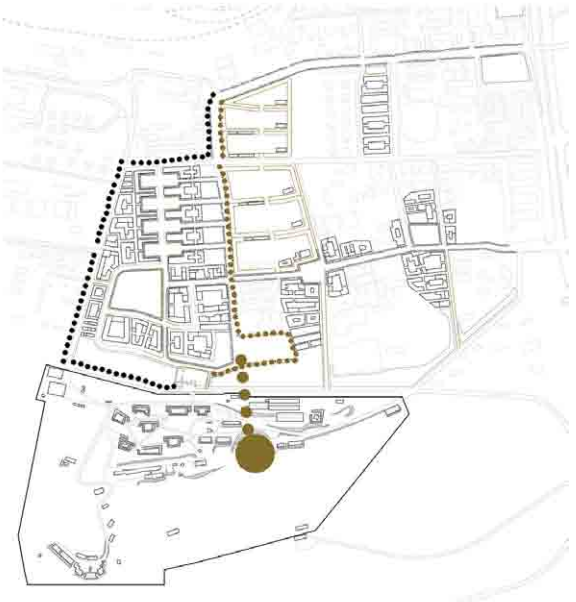


Figure 5.5: Proposed urban guides (Author, 2011)

5.3.1 Parade Ground Network

The parade ground network forms part of the future development projections of the military precinct, as well as the conceptual premise of mediation between the military and the public. Each regiment or military brigade functions around a parade ground where training, drills and parades take place. This network is thus laid out according to the residential zones where soldiers are housed. When public military events such as parades, music festivals, exhibitions and auctions take place, the parade ground network acts as a series of public spaces that facilitate the different events. The parade ground network forms a multifunctional platform, serving both the public during military events, and the SANDF in military training.

5.3.2 Precinct guides

The main arterial route and access road to the precinct, Dequar Road, is laid out perpendicularly to Magazine Hill, with its street view framing the crater of the Red Magazine on the hill. This view to the south forms a metaphysical link between Magazine Hill and the military precinct. A light avenue (existing Dequar Road) that serves as an urban guiding system, leading the visitor to the hidden parking structure of the site is proposed. An existing additional route, Magasyn Street, to access the parking structure from the west is also proposed. This alternative route is specifically vegetated, serving as the second urban guide to the site. No new routes leading directly to Magazine Hill are proposed, for the site has a secretive character that needs to be protected.

Figure 5.6: View of parade ground (Author, 2011)

Figure 5.7: View of Red Magazine from Dequar Street (Author,

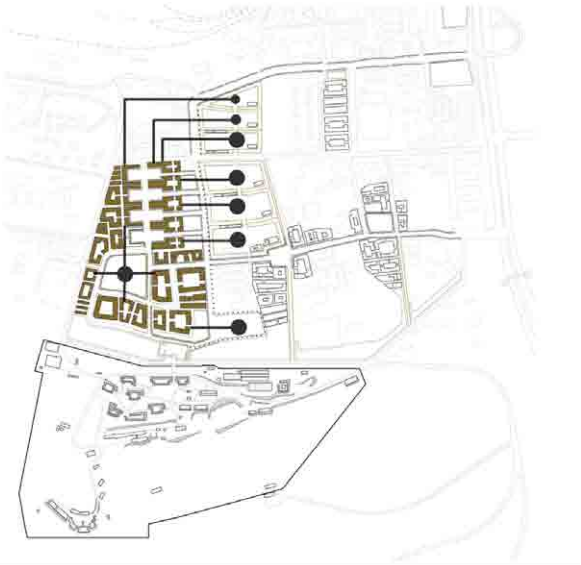


Figure 5.8: Proposed housing sector (Author, 2011)

Figure 5.9: Proposed Urban agricultural belt (Author, 2011

5.3.3 Precinct housing strategy

The low density of the current housing typology in the precinct serves a small percentage of military personnel that enters the precinct on a daily basis. This military area accommodates the headquarters and training facilities for more than 20 brigades and regiments, where insufficient housing typologies only caters for higher ranked personnel. A new densified typology is proposed to accommodate all regiments and brigades around a series of proposed parade grounds.

5.2.4 Urban agriculture

This proposed open space provides ground for peri-urban agriculture, serving the military regiments in the residential sector to the north and the Prison Reserve to the east. Additionally, this urban element provides a buffer between the built fabric of the proposed precinct framework and Magazine Hill, respecting the isolated character of the site both visually and physically. The agricultural grounds are maintained by military personnel as well as the Prison Reserve inmates. and Correctional staff.

Figure 5.10: Proposed housing typology (Author, 2011)

Figure 5.11: Proposed urban agricultural buffer (Author, 2011)

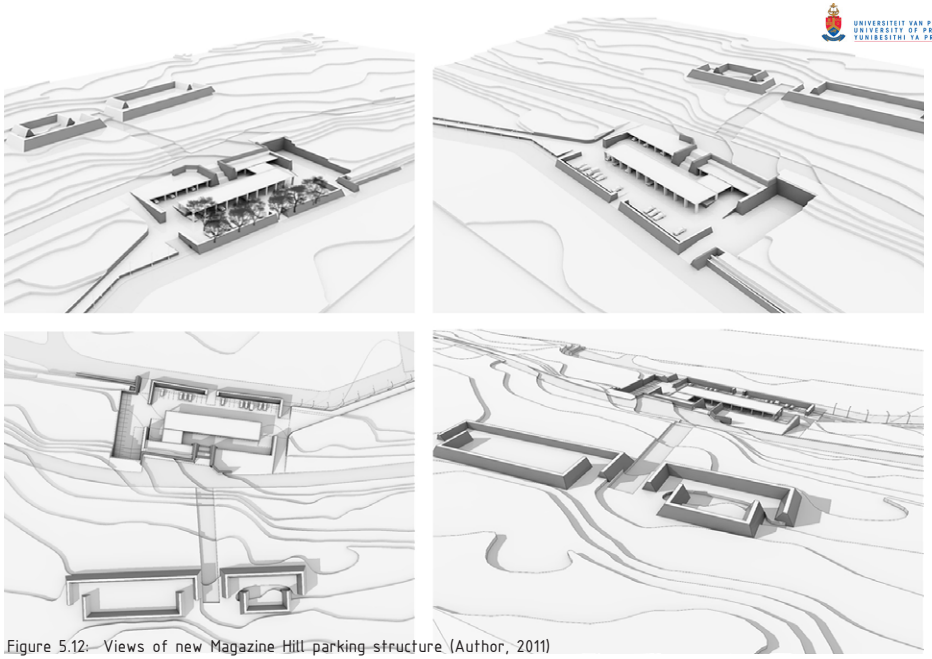


Figure 5.12: Views of new Magazine Hill parking structure (Author, 2011)

Figure 5.14: North eastern view of parking structure (Author, 2011)

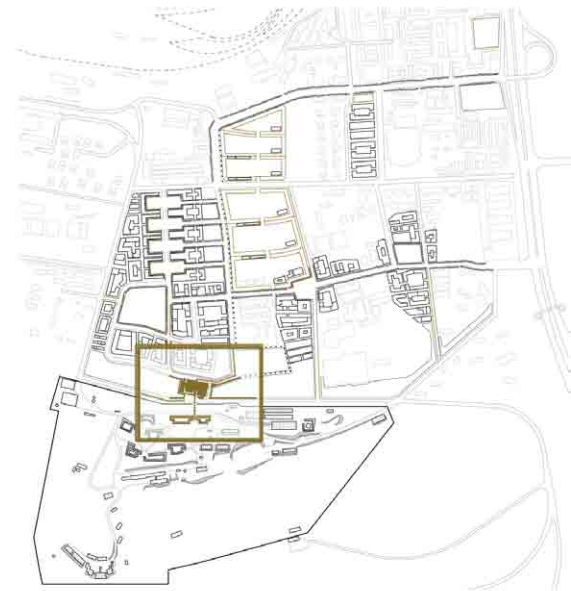


Figure 5.13: Magazine Hill parking structure (Author, 2011)

5.3.5 Magazine Hill Parking structure

The proposed parking structure for Magazine Hill forms a prelude to the site by introducing similar design intentions, material use and spatial qualities of the ammunition bunkers on site. This parcade becomes an analogy for the ammunition bunkers, with both structures veiled within the landscape. The design of the submerged parking is also aimed at forming a noise barrier between vehicular activity and the experience on site. The parking structure is situated within the urban agricultural buffer to serve both Magazine Hill and the military precinct, forming the end destination where the light and tree avenues meet as urban guides to the site. It is from the submerged parking bunker that the visitor crosses Magazine Street and enters Magazine Hill.

Figure 5.15: North western view of parking structure (Author, 2011)

5.4 Proposed Site framework

5.4.1 Background and site users

Magazine Hill can be considered a unique architectural remnant, not to be categorised under the rest of Pretoria's military ruins, for a number of characteristics set it apart from any other typology of military architecture. In contrast to the Forts of the second fortification plan for Pretoria, Magazine Hill is not designed as a single post for military retaliation, but rather an intrinsic military-industrial process. It is in this complexity where the true essence of the site lies. This aspect also entails a great challenge to introduce Magazine Hill back into the public realm, for all initial concepts inherent in the site design should also inform the overlaid design intentions for the future projection of the site.

The site framework is laid out with the SANDF still retaining ownership of Magazine Hill, therefore both public and military use are proposed, where a process of interaction is now possible. In essence, Magazine Hill forms a platform for the SA Army to stimulate a public relation, at the hand of industrial recycling and art. It is also now possible for industrial suppliers of the SANDF like Denel PMP to benefit from this public interface, thus forming the main client of the proposed brass foundry on Magazine Hill.

In the proposed site framework, 4 main users access and utilise the site on a daily basis. The military forms the entity, entering the site at the controlled access point located at the eastern part of Magazine Hill. The 91 ammunition depots buildings are adaptively reused for the Graphic Design and Visual Arts department of the SA Army, while the new public character of Magazine Hill brings great exposure for the specific military department in the form of public exhibitions and installation art presented on Magazine Hill. Private parking and accommodation is also provided at the 91 ammunition depot buildings for military use only.

The second proposed private user of Magazine Hill is the SANDF trucks accessing the western entrance of the site, providing the spent ammunition shells and raw material for the brass foundry. The north western ammunition bunker is dedicated as a drop-off zone for the ammunition shells, where the brass material is distributed to the ammunition pit in front of the foundry. The western entrance is also used as a private access point for the 3rd private user, the artist and foundry worker. The fourth site user, the visitor, accesses the site from the main entrance located between 2 ammunition bunkers at the northern edge of Magazine Hill. As one enters the site, a journey of discovery is embarked upon.

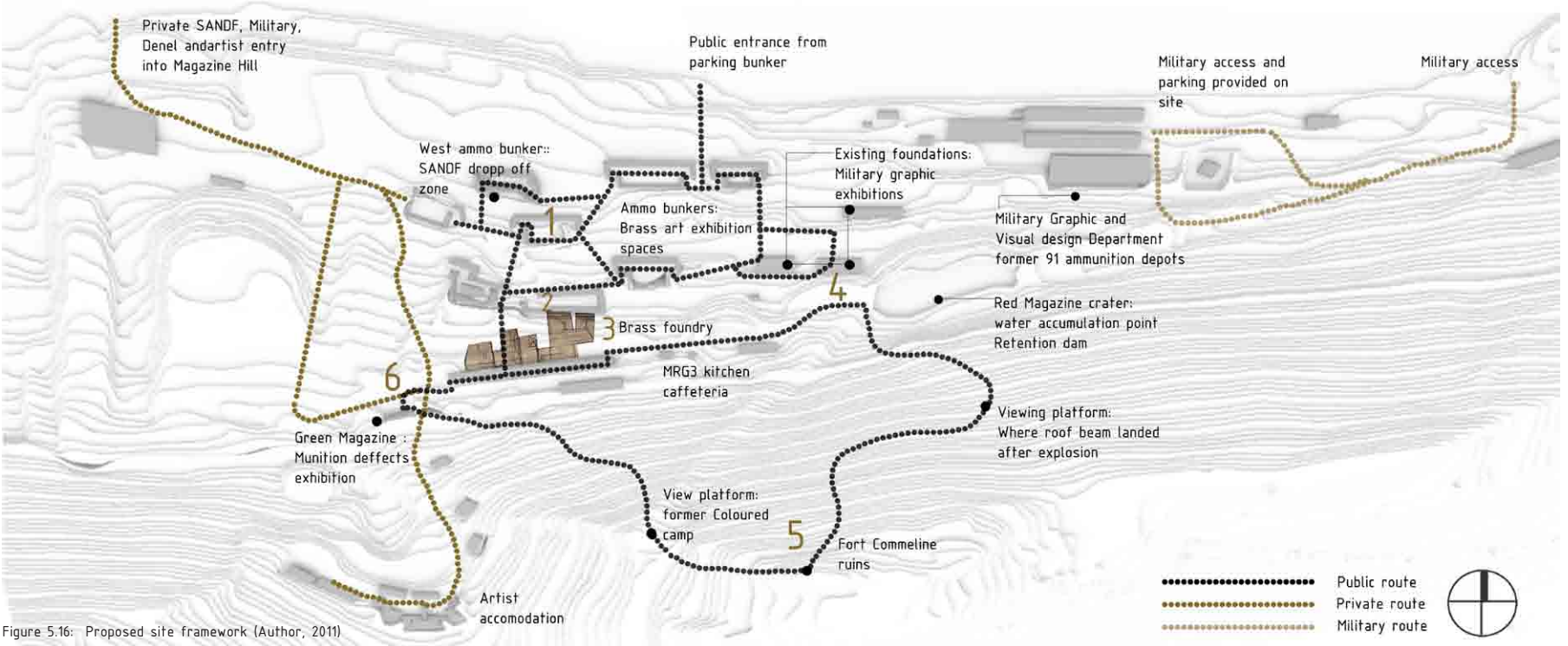


Figure 5.16: Proposed site framework (Author, 2011)

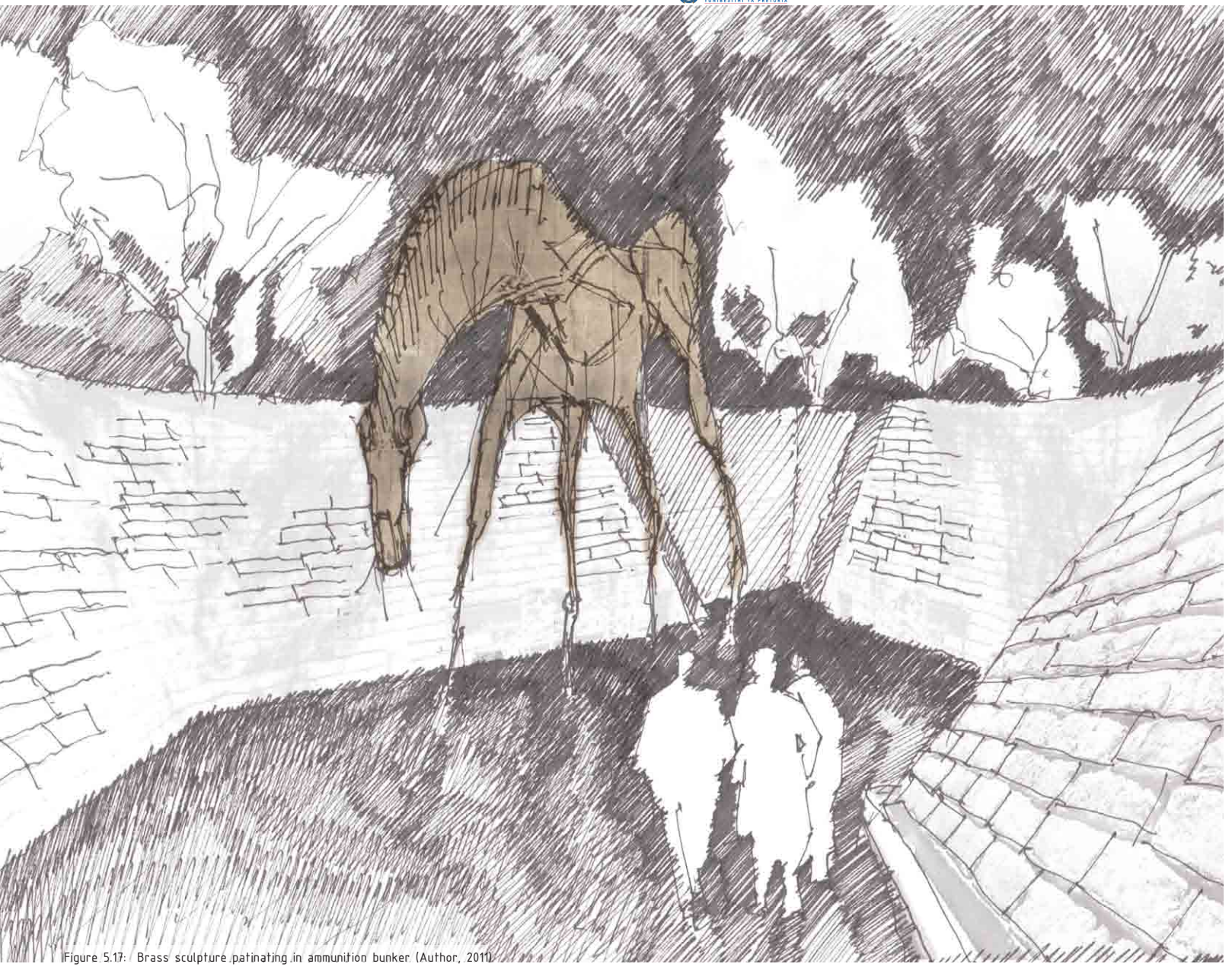


Figure 5.17: Brass sculpture patinating in ammunition bunker (Author, 2011)

5.4.2 The route through Magazine Hill

The route through the site is laid out according to the conceptual premise of revealing and concealing, where different unique spaces and architectural artefacts are discovered as one progresses through the site. Not only is the spatial architectural experience based on revealing and concealing, but also the experience of the ammunition reduction process in the brass foundry. The visitor would enter Magazine Hill from the main entrance leading directly into the labyrinth of concealed ammunition bunkers. From this point all bunkers are explored, for some ammunition bunkers now serve as space for temporary installation art exhibitions. Other bunkers are designated for brass and bronze patination, where the art pieces are left in an outdoor space (ammunition bunker) to weather and enhance surface deterioration. **(1 on map)**

The labyrinth of discovered spaces ends at the main ammunition bunker that is located in front of the brass foundry. The floor surface of this bunker forms an ammunition pit where operated foundry cranes hoist the empty shells into the adjacent furnace towers. The visual perception of the ammunition reduction process is enriched by sensory experience, noticing the sound of industrial cranes and falling ammunition shells. (2 on map)

The route continues into the brass foundry where the empty ammunition casings are washed, sorted and melted according to alloy composition and content. Ammunition reduction in the form of brass castings are observed as one progresses through the weathered interior of the existing Flame Tracer building, a structure that once represented ammunition production. A series of artist studios are crossed along the length of the Flame Tracer building, where smaller brass works are presented by various types of artists. The sensory experience of the foundry ends in an enclosed courtyard where brass fine arts and sculpting practices conclude the ammunition reduction process, leaving the visitor at the foot of an unknown route, leading into the undiscovered remnant of Magazine Hill. (3 on map)

Figure 5.18: Ammunition pit with foundry cranes loading the shells into the furnace tower (Author, 2011)

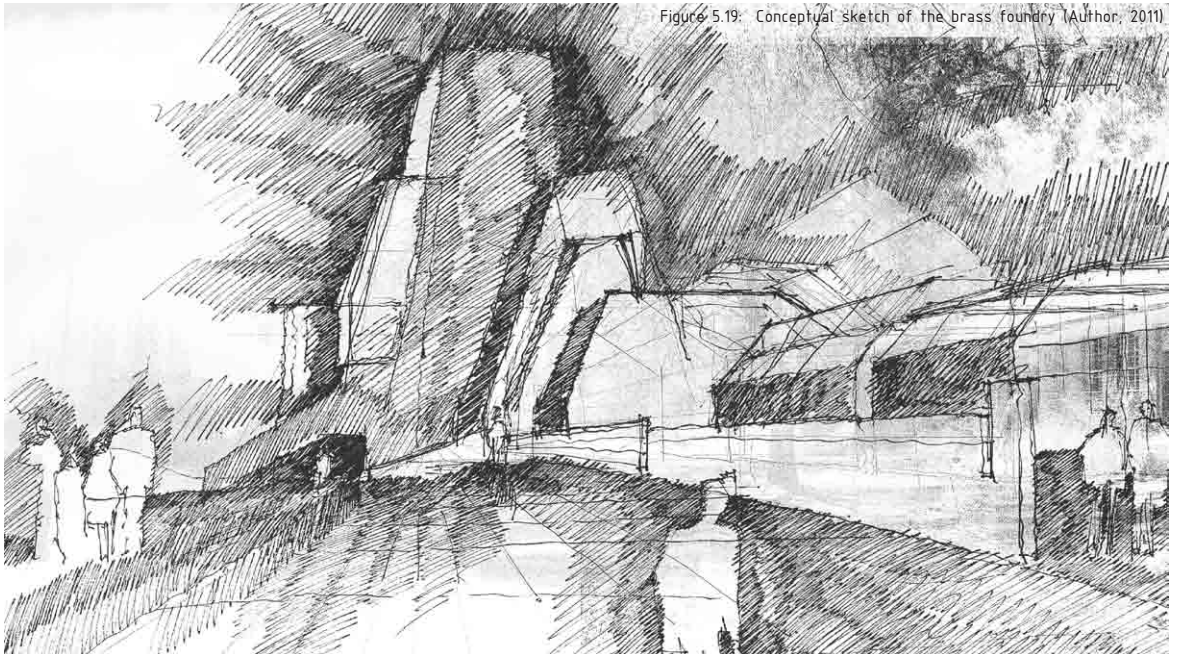


Figure 5.19: Conceptual sketch of the brass foundry (Author, 2011)

As the visitor leaves the brass foundry the route continues east towards the Red Magazine crater, passing the MRG3 kitchen building that served the employees of Magazine Hill from the late 1930's. This building is remodelled as a cafeteria, acting as a hiatus, in the journey through the site. The Red Magazine crater is now formalised as a catchment area, harvesting all runoff rainwater from the steep hill in order to be reused in the brass foundry. Where the explosion represented a process of dispersion, is it now utilised as a point for natural accumulation. 34 brass measuring rods rise from the water, commemorating the casualties reported after the explosion in 1945. (4 on map)

From the crater the route progresses south up the hill into the natural realm of Magazine Hill. Viewing platforms are strategically located at anchor points on the hill, showcasing distributed explosion debris along the route. As one reaches the summit of the hill, the forgotten ruins of Fort Commeline is explored, forming the highest viewing platform on Magazine Hill. As the route descends down the northern slope of the hill, the former Coloured camp is passed, serving as the last viewing platform on the hill. At the base of the hill the route concludes at the existing Green Magazine, now utilised as the Munitions Defects Museum, showcasing the Apartheid government's dismantled nuclear weapons among other temporary exhibitions. From the Green Magazine, individuals can disperse for further exploration. 5 and 6 on map)

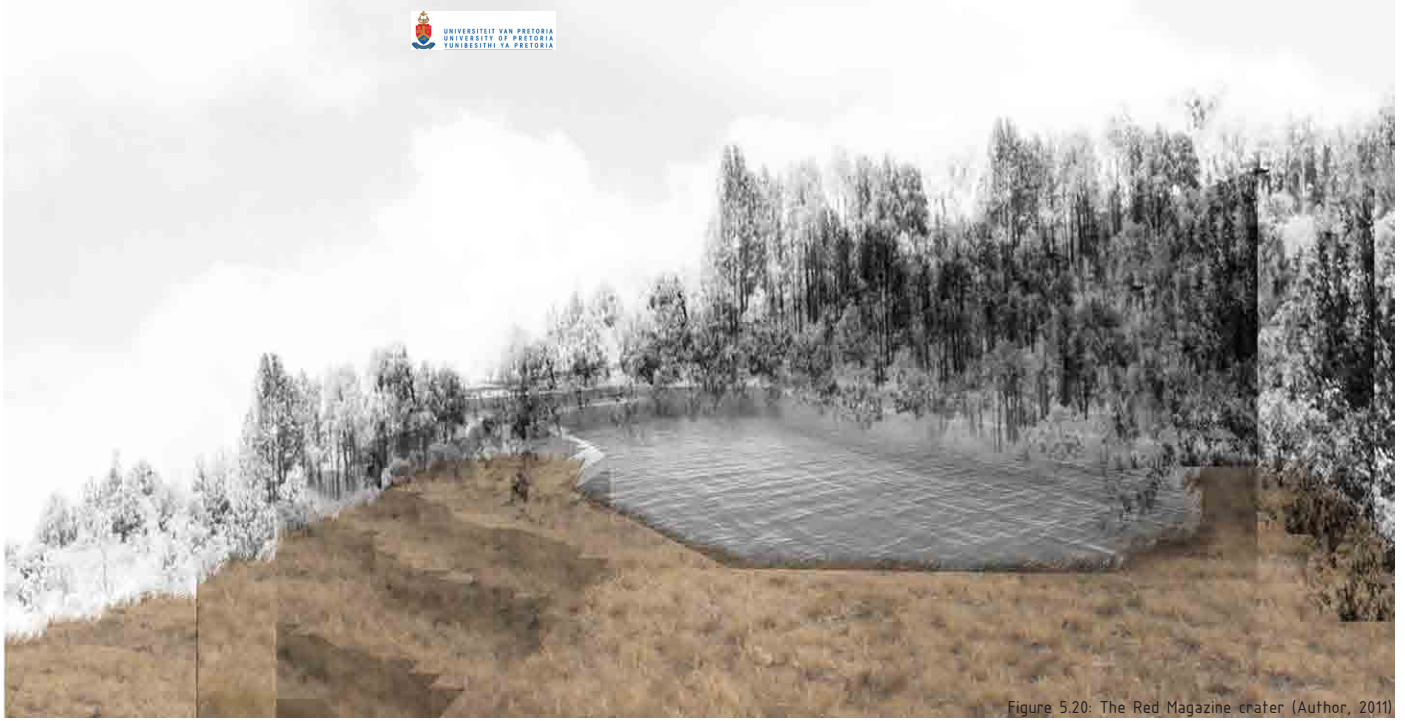


Figure 5.20: The Red Magazine crater (Author, 2011)

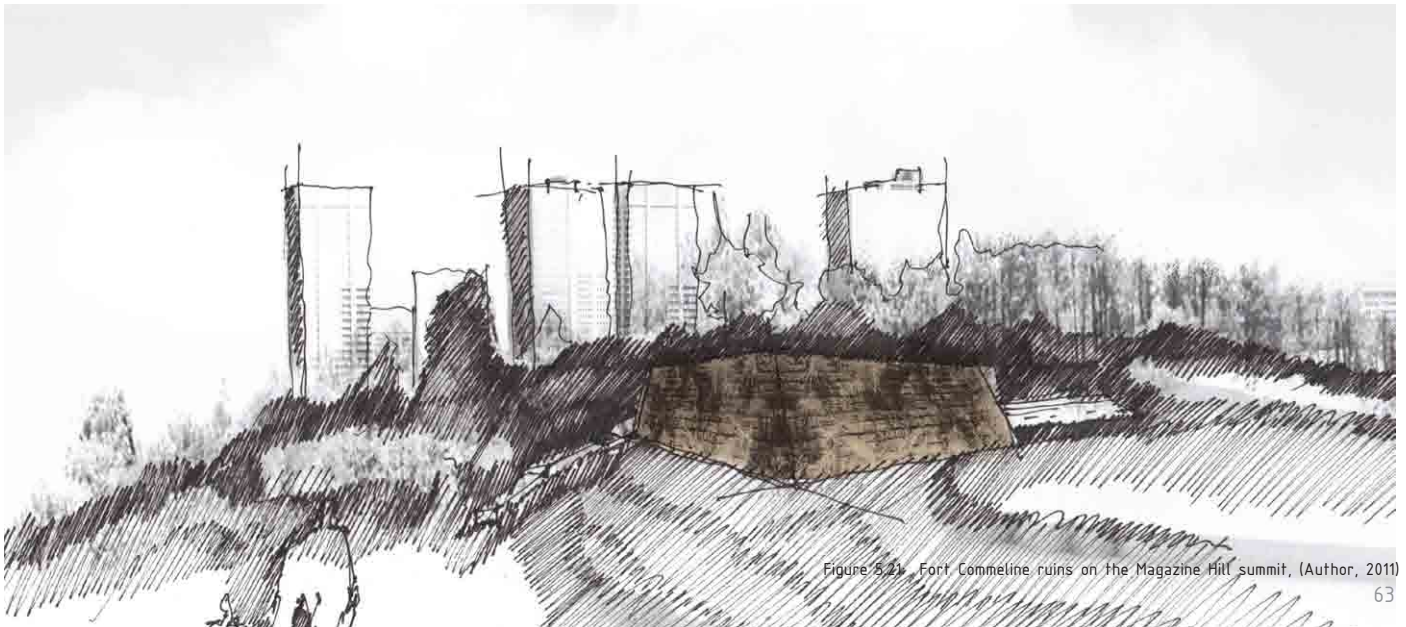


Figure 5.21: Fort Commeline ruins on the Magazine Hill summit, (Author, 2011)

Chapter 6 focuses on three categories of precedent studies: Theory related precedents, programme related precedents and commemorative related precedents. Each study is discussed in relation to the proposed design on Magazine Hill.

Chapter 6 – Precedent studies

6

Figure 6.1: The route through Ingualada Cemetery (JMT, 2009)

Figure 6.2: Ingualada Cemetery circulation space (JMT, 2009)

6.1 Theoretical Precedent Studies

6.1.1 Ingualada Cemetery, Barcelona Spain, 1994, architect: Enric Miralles

Miralles formalised a unique approach towards the theoretical concept of an architecture of time, in which architecture becomes the machine that collects the physical manifestation of time. Miralles also explored architecture's potential to form a continuity in time through the temporal experience of space, placing emphasis on both the instant and memories evoked in the past (MAKENZIE, McMurray & Quiros, 2011).

In the Ingualada Cemetery, the experience of the different layers of time is designed around a long route through a landscape of memories, similar to the experiential route cutting through Magazine Hill. Meaningful places are passed in the journey, referring to time frames past. As the visitor experiences the space, referential qualities integrate the past and the present. As for Magazine Hill, the Ingualada Cemetery is designed for the discovery of space through movement, revealing different spaces and referential triggers along the route. It is only through movement that discovery can take place *(ibid)*. Experiential quality varies between different space along the route, where framed views, floor textures and light qualities enforce perceptual feelings like loneliness, privacy and calmness.

The Ingualada Cemetery also challenges architecture's persistence in time, by acknowledging the passage of time through material deterioration, surface staining, and projected vegetation growth. It is only through this approach that the fragile relationship between architecture and the continuum of time can be restored.

The actual experience of a space linked to a previous reference of meaning is what produces new discoveries. Experiential time is complimented by referential time, becoming one through the present journey. – Enric Miralles (McKenzie etc. al, 2011)

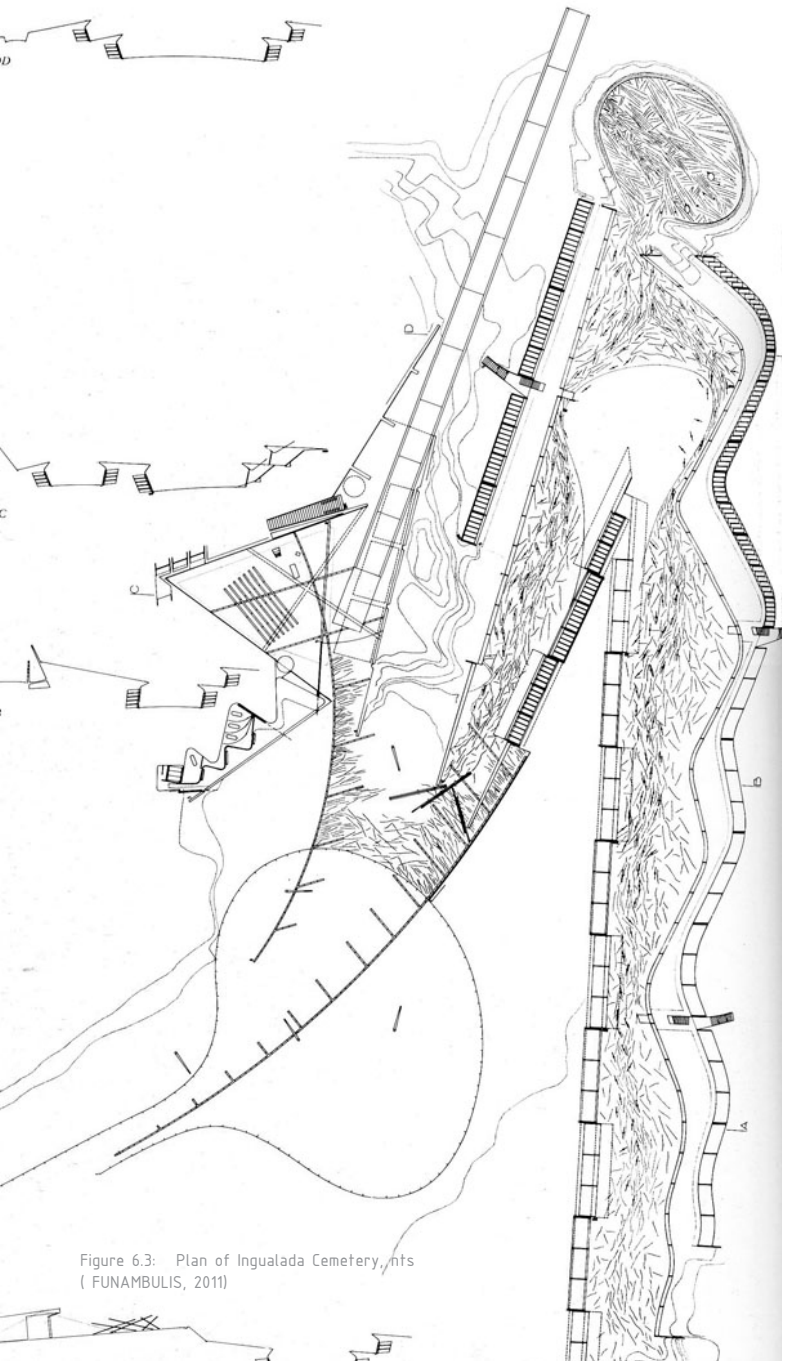


Figure 6.3: Plan of Ingualada Cemetery, nts
(FUNAMBULIS, 2011)

Figure 6.4: Interior play with light and shadow (JMT, 2009)

Figure 6.5: Ingualada Cemetery entrance (JMT, 2009)

6.1.2 Time, Transformation and contemporary Architectural ruin on the Golden Coast, (B.Arch Thesis, 2009) Gary He, Cornell University College of Architecture, Art, and Planning

This thesis was completed in 2009 and challenges the static notion of architectural permanency within a contemporary context of change. The author argues that architecture must not only admit its own vulnerabilities and susceptibilities to time and change, but recognise that it can take advantage of the nature of transformation to inform its creation and its interaction with not just the contemporary condition but a future one – to develop new roles and create new meanings for itself and its context (He 2009: 01). Like the proposed foundry on Magazine Hill, this project exists to seek out an architectural typology of change, where the deterioration of site and material, the adaptation of meaning and the passage of time speak of a continuum, directing the system of change.

The project site is identified at the derelict seacoast fortifications of California's western coast line that served as a first line of national defence in the Second World War. The site consists of a series of circular concrete bankers that formed retaliation platforms for naval invasion, which is set out to assure efficient attacking radii across the channel. A series of various programs are proposed for the different bunkers, forming a greater visitor's centre.

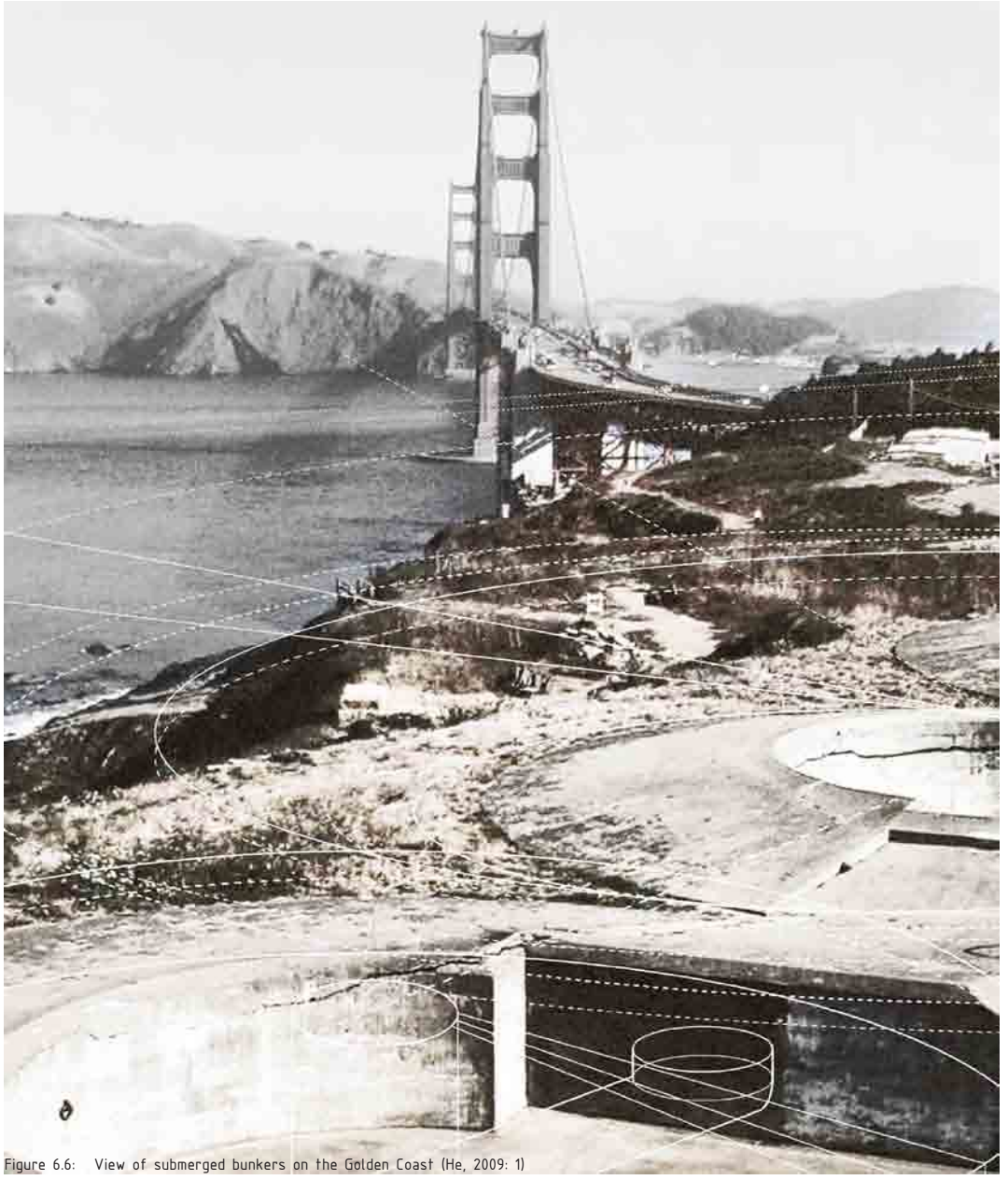


Figure 6.6: View of submerged bunkers on the Golden Coast (He, 2009: 1)

The architectural design is mainly focused on the concealed bunkers depicting the different layers of historical influence, thus concentrating on the passage of time as a main design concept. Building transformation is realised through the use of various materials with different durabilities and weathering characteristics, allowing for tectonic adaptation controlled by the passage of time. The proposal reduces the concrete bunkers to gallery space that introduce a public interaction with the derelict structure. The tower is designed according the cosmological characteristics of the site, sensitising man not to himself but to his existence in a larger sense. A rich play with light and shadow (the tower's shadow lining up with the bunker's oculus at noon each day) also connects the project to the temporal dimension of time.

Like the proposal on Magazine Hill, the project deals with multiple stages of ruination and provides examples on the injection of contemporary programmes in historical ruins, while establishing a strong theoretical premise regarding the continuum of time.

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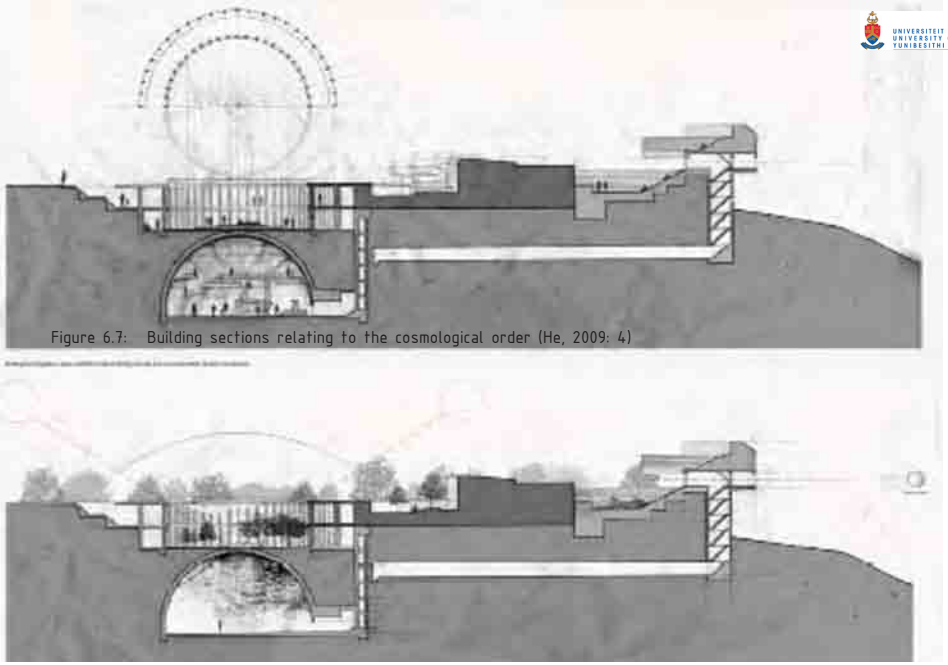


Figure 6.7: Building sections relating to the cosmological order (He, 2009: 4)

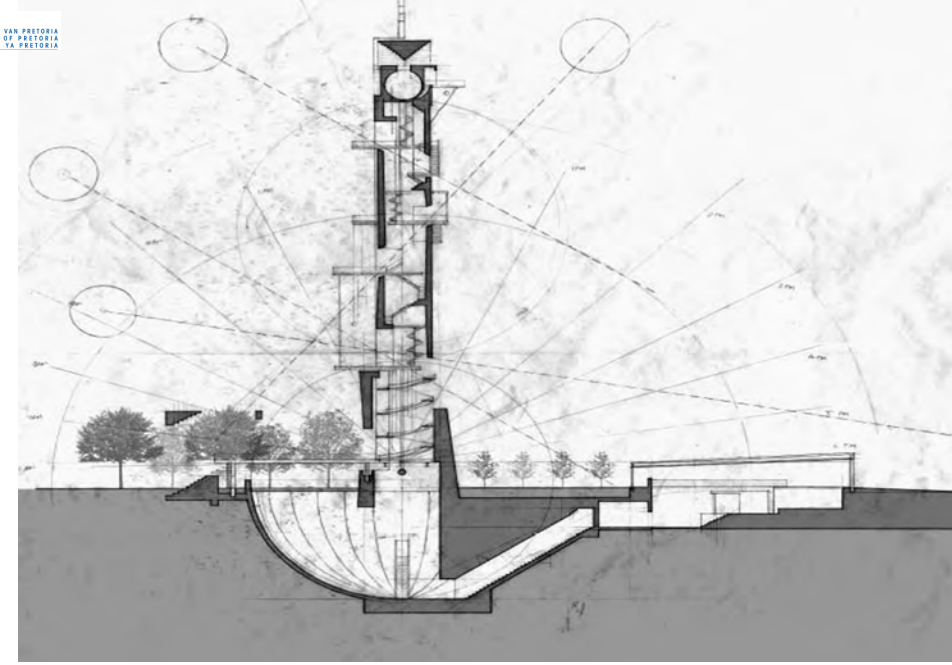


Figure 6.8: Proposed building plan interacting with existing bunkers (He, 2009: 7)

6.2 Commemorative precedent study

6.2.1 New England Holocaust Memorial, Boston USA, architect: Stanley Saitowitz, 1995

Also known as the Boston Memorial, the structure commemorates the tragic deaths of six million Jews during the Second World War. The design introduces a public route that progresses through 6 glass towers reaching a vertical height of 54 feet (SAITOWITZ, 2009). A numerical aesthetic feature of 6 million numbers are engraved on the steel-framed towers, commemorating the number of Jewish fatalities reported in WW2. This design element forms a symbolic reference to the Nazi tattoos inflicted on all prisoners awaiting execution, as the visitor passes through the towers, they too are tattooed via the shadows cast from the numbers on the glass (IBOSTON, 2011).

Saitowitz's design introduces a commemorative construct to an existing public route, thus engaging with a mundane pathway by adding an additional layer to the urban fabric. The success of this structure lies in the location, for it does not form an end destination where structure becomes static, but rather forms part of the activity spines of the city, changing if it must. Like the proposal on magazine Hill, commemoration takes place on a daily basis when the visitor is on his way to work or the train station. In this design, heritage remembrance is not reduced to a static monument where the relevance can be questioned in contemporary society, but rather forms part of the mechanics of urban activity. As the shadow tattoos are cast upon visitors, commemoration becomes participative, thus heritage comes alive.

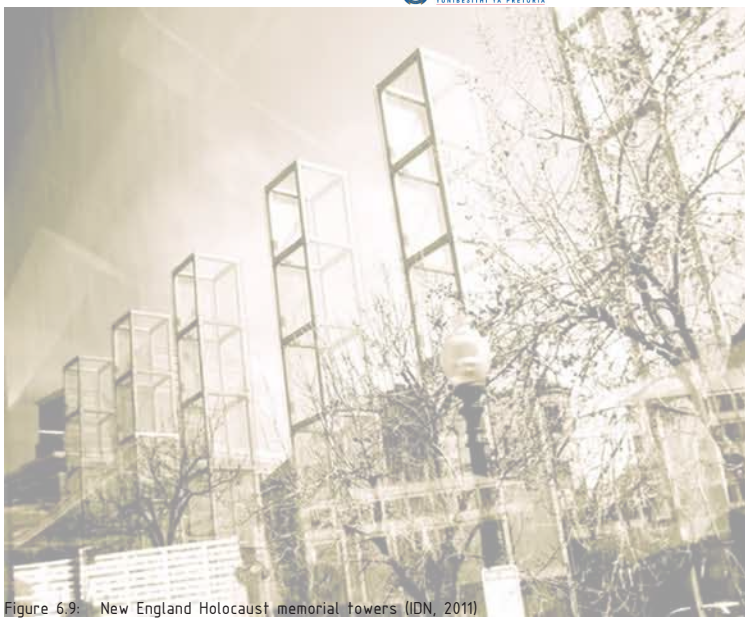


Figure 6.9: New England Holocaust memorial towers (IDN, 2011)

Figure 6.10: Interior tower view I(DN, 2011 edited by Author, 2011)

Figure 6.11: Vapour commemoration feature (IDN, 2011)

6.2.2 Freedom Park, Pretoria South Africa, architects: Gapp Architects and Urban Designers; MMA Architects; Mashabane Rose Architects in Joint Venture, 2003 –

The design of Freedom Park integrates landscape and architecture as a collective construct, which commemorates South Africa's historical events and icons that contributed to the freedom of the country (City of Tshwane, 2011). Like Magazine Hill, the act of commemoration occurs along a route through the landscape that narrates stories of the past, creating various anchor points of meaning in the natural landscape. This route that cuts through the hilltop landscape of Salvokop connects numerous memorials that exist in the form of stone beacons (Isivivane), walls with engraved names (S'khumbuto), galleries (S'khumbuto), pathways (Mveledzo), viewing platforms (Uitspanplek), and exhibition spaces (Hapo), all commemorating different aspects of the struggle for freedom (*ibid*).

Contrasting the Holocaust Memorial in Boston that is integrated with the urban fabric, Freedom Park functions as an isolated entity within the context of Pretoria. Because of its remote character, the concept of everyday commemoration through experience is underutilised, since the site only provides a series of static memorials that is active over weekends and holidays. In this instance, commemoration is encapsulated in stagnant monuments that lose its relevance in contemporary society. Heritage experiences should not only be reserved for tourism purposes, but should inform the experience of the everyday, and allow for adaptation with the passage of time. The commemoration of Magazine Hill is thus aimed at providing historical insight through the experience of a new function (ammunition reduction) that is inspired by the old (ammunition production), linking heritage not only to the past, but to the present and future.

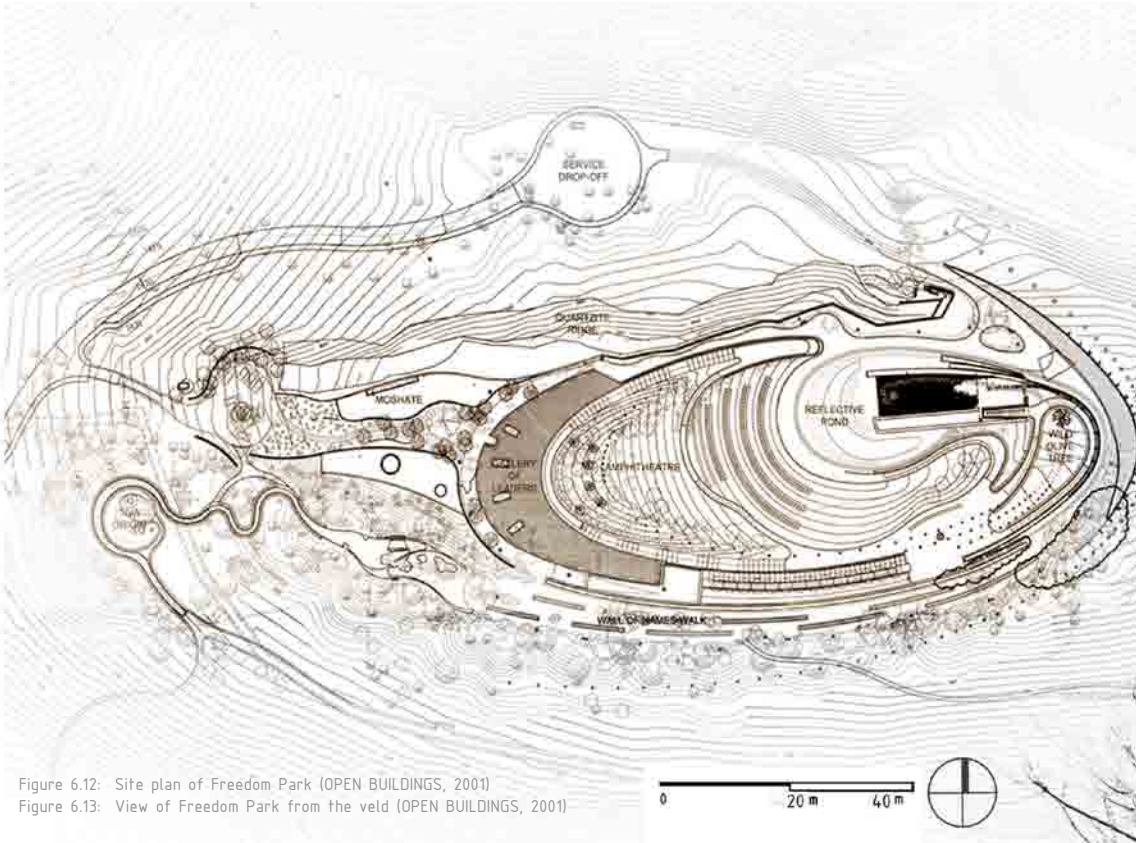


Figure 6.12: Site plan of Freedom Park (OPEN BUILDINGS, 2001)
Figure 6.13: View of Freedom Park from the veld (OPEN BUILDINGS, 2001)

Figure 6.14: Gas/oil fired smelting crucible furnace (Author, 2011)

Figure 6.15: Boudeccia Productions ceramic studio (Author, 2011)

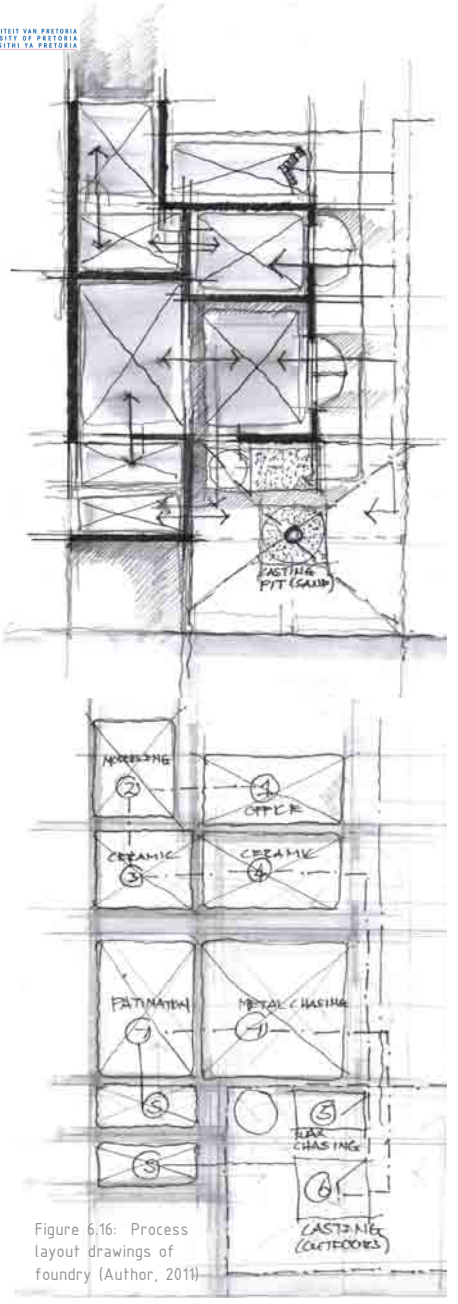


Figure 6.16: Process layout drawings of foundry (Author, 2011)

6.3 Foundry precedent studies

6.3.1 Boudeccia Productions Foundry, Pretoria, South Africa

This artist foundry was founded by the American sculptor Kay Potts in 1991, forming one of leading production studios in the bronze and brass sculpture arenas. Her work reflects a strong fascination with architectural structure and human perception, pushing the boundaries of experimental art.

The Boudeccia Productions Foundry is compartmentalised according the linear process of fine arts production. This particular foundry specialises in smaller scale artworks, thus requiring less workable space. Foundry operations are divided in 12 major processes that are performed in 4 open-plan studios. The first studio caters for original art modelling, rubber casting and wax casting, while the second studio provides for ceramic works and wax chasing. The 3th studio forms an open warehouse for wax burning, metal casting and stripping, while the last studio is designated for patination and fine detail works.

The main spatial concept derived from the study shows that the architecture follows the process of art production, for spatial requirements differ for the various studios in terms of light quality, surface, volume, texture and safety. It is not the process that adapts to space, but rather space that is augmented to fit the process. This precedent study illustrates the interrelation between art production and foundry space.

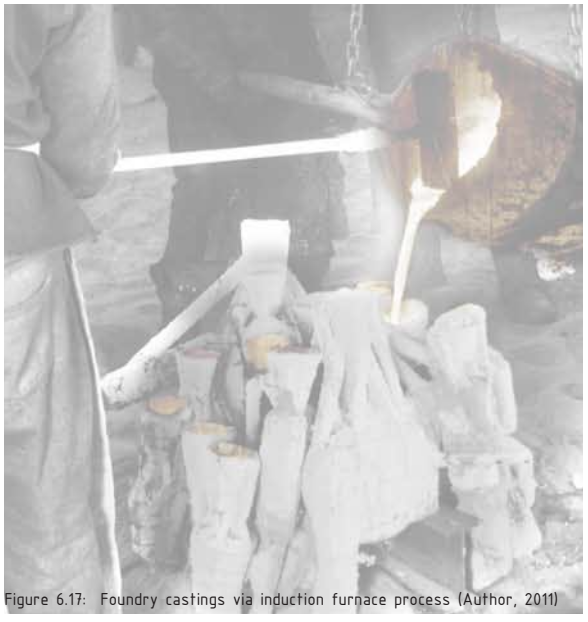
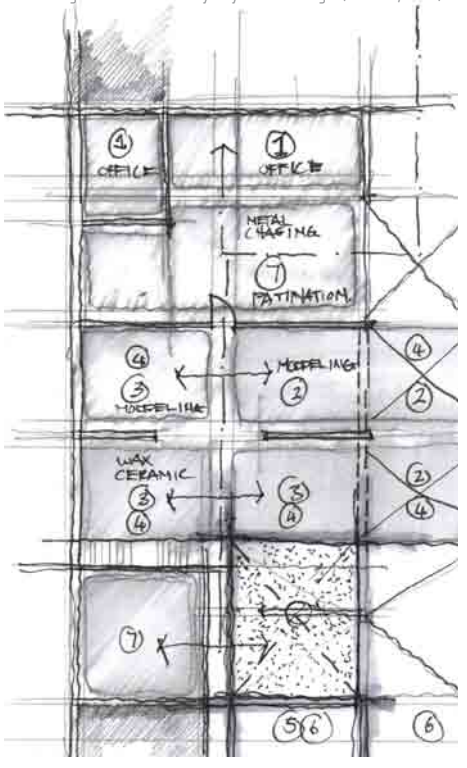


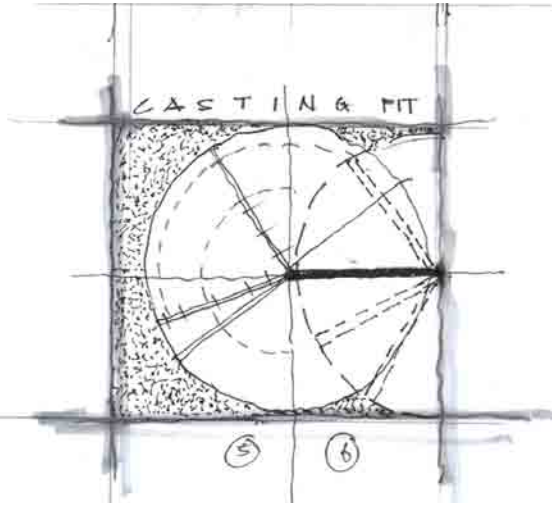
Figure 6.17: Foundry castings via induction furnace process (Author, 2011)

Figure 6.18: Stone sculpture by Angus Taylor (Author, 2011)

Figure 6.19: Shed foundry typology (Author, 2011)

Figure 6.20: Foundry layout drawings (Author, 2011)





6.3.2 Angus Taylor Artist Foundry, Pretoria, South Africa

The artist, Angus Taylor specialises in larger sculpture works, utilising various cast metals and raw materials for the production of local art. The studio and foundry are defined by a shed typology that allows for spatial adjustment according to production needs. Large sliding doors accommodate the distribution of art components between the different levels of sculpture production.

Contrasting the Boudeccia Productions Foundry, Taylor's workspace functions as an open-plan studio, eliminating distribution complications and cleaning difficulties. The casting pit is located indoors under a large floor to ceiling height, where castings are operated with a structural beam and suspended block and tackle hoisting system. This casting technique allows for a circular casting radius, where heavy melting crucibles are suspended from structural work.

By studying this technical precedent, it was concluded that the open-plan shed typology functions well within all specialised requirements of sculpture production.

Figure 6.21: Sculpture types by Angus Taylor that would could produced on Magazine Hill (Freschi, 2009)

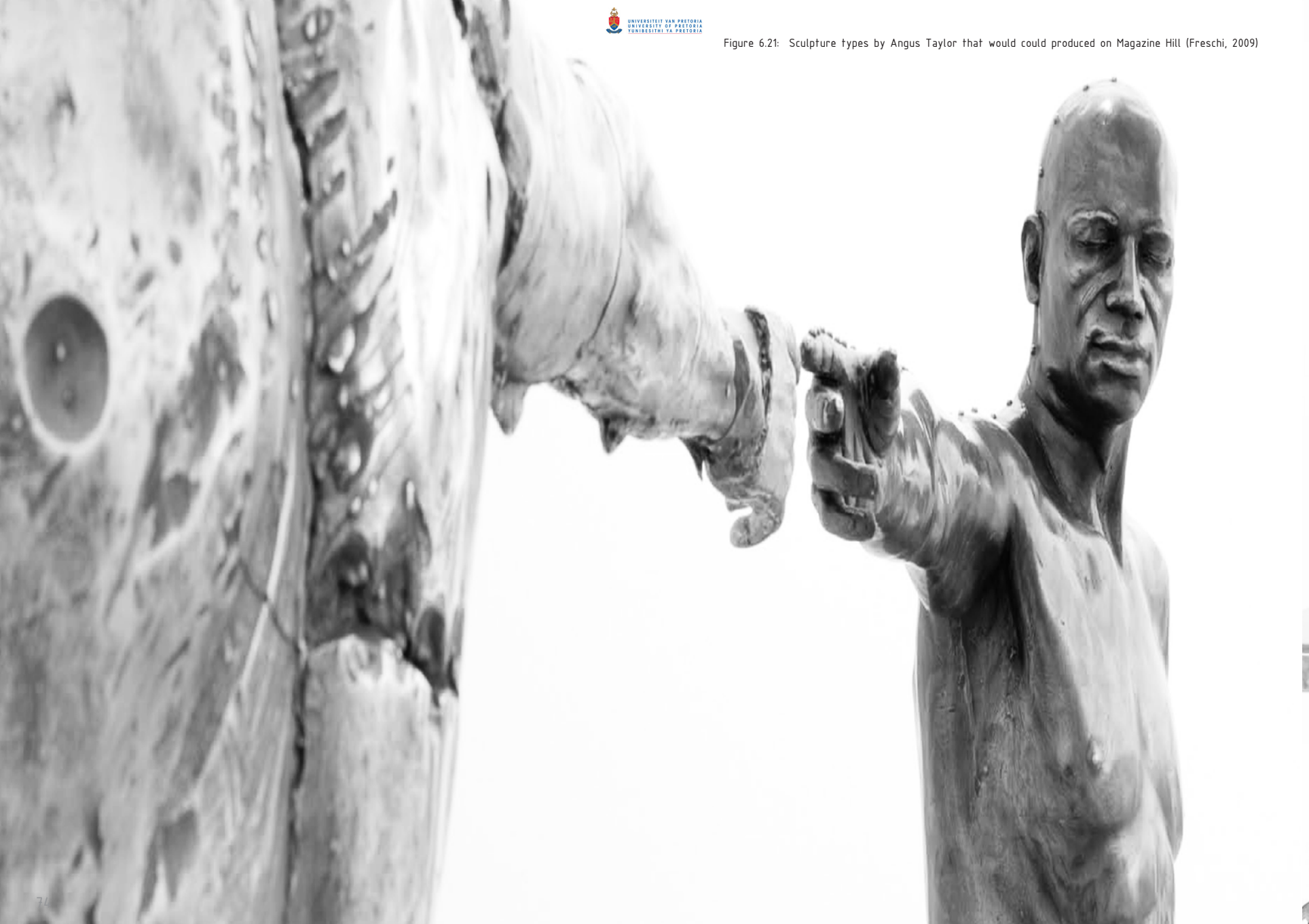
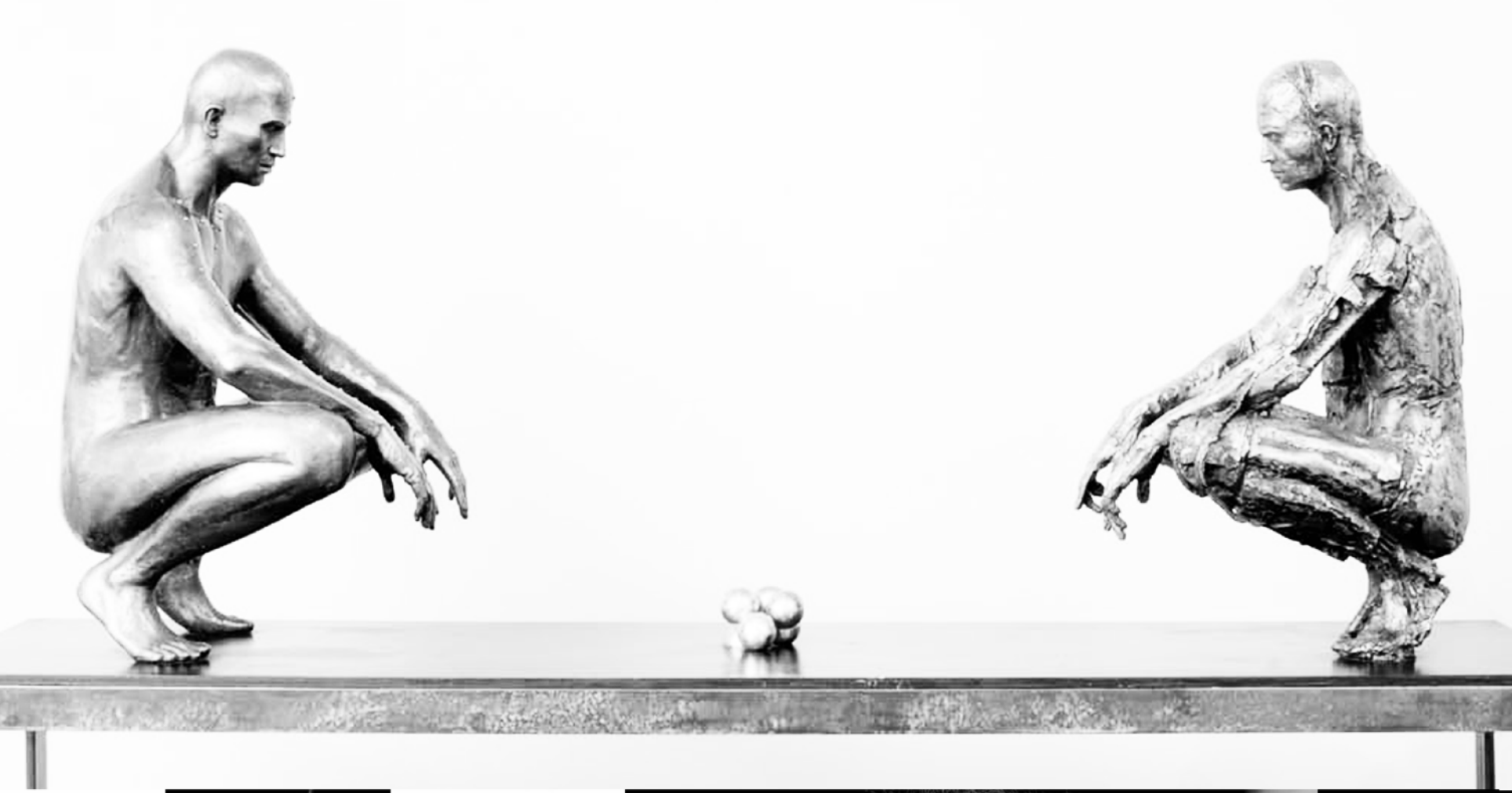


Figure 6.22: Sculptures types by Angus Taylor that would could produced on Magazine Hill (Freschi, 2009)



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.

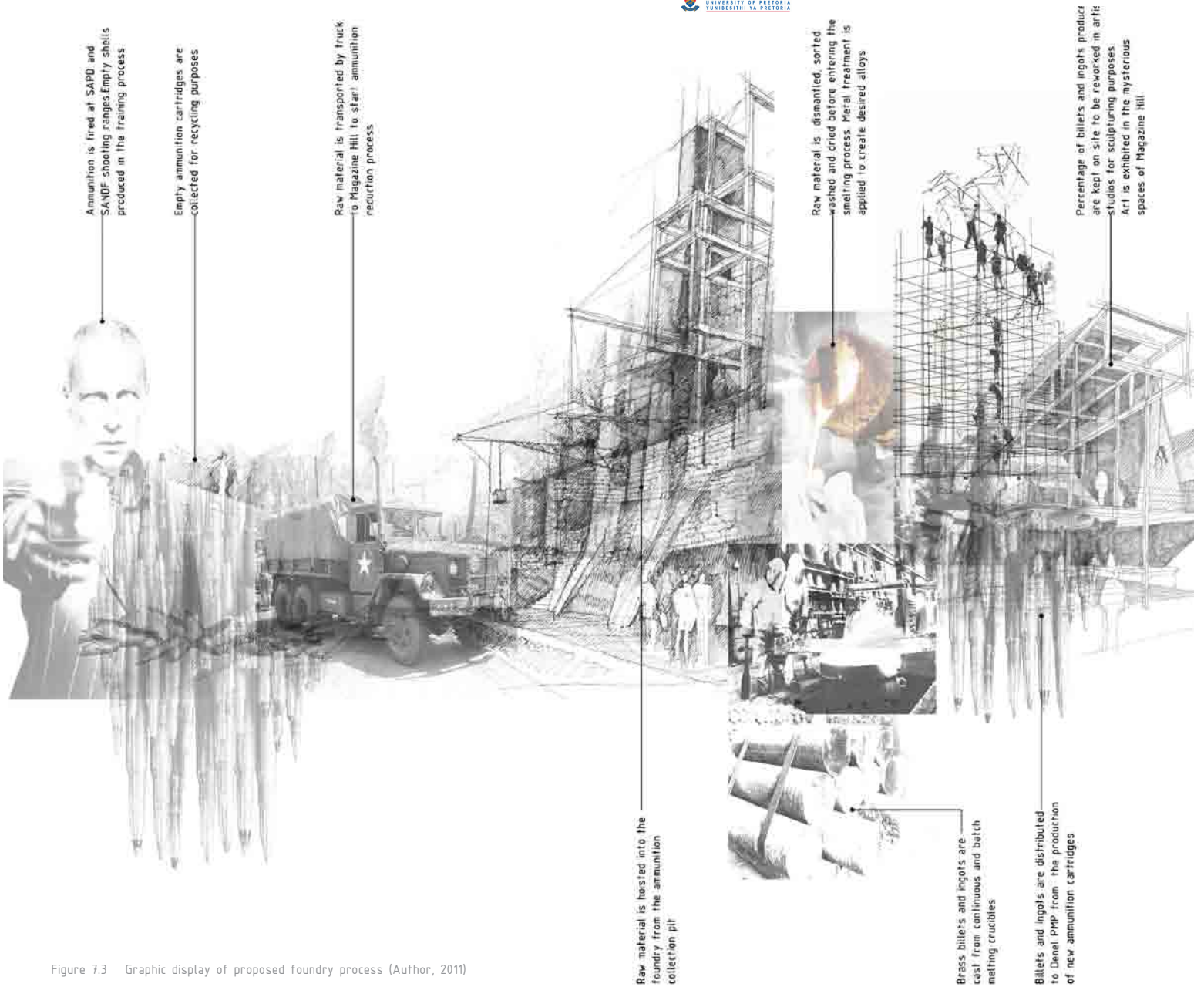


Figure 7.3 Graphic display of proposed foundry process (Author, 2011)

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.

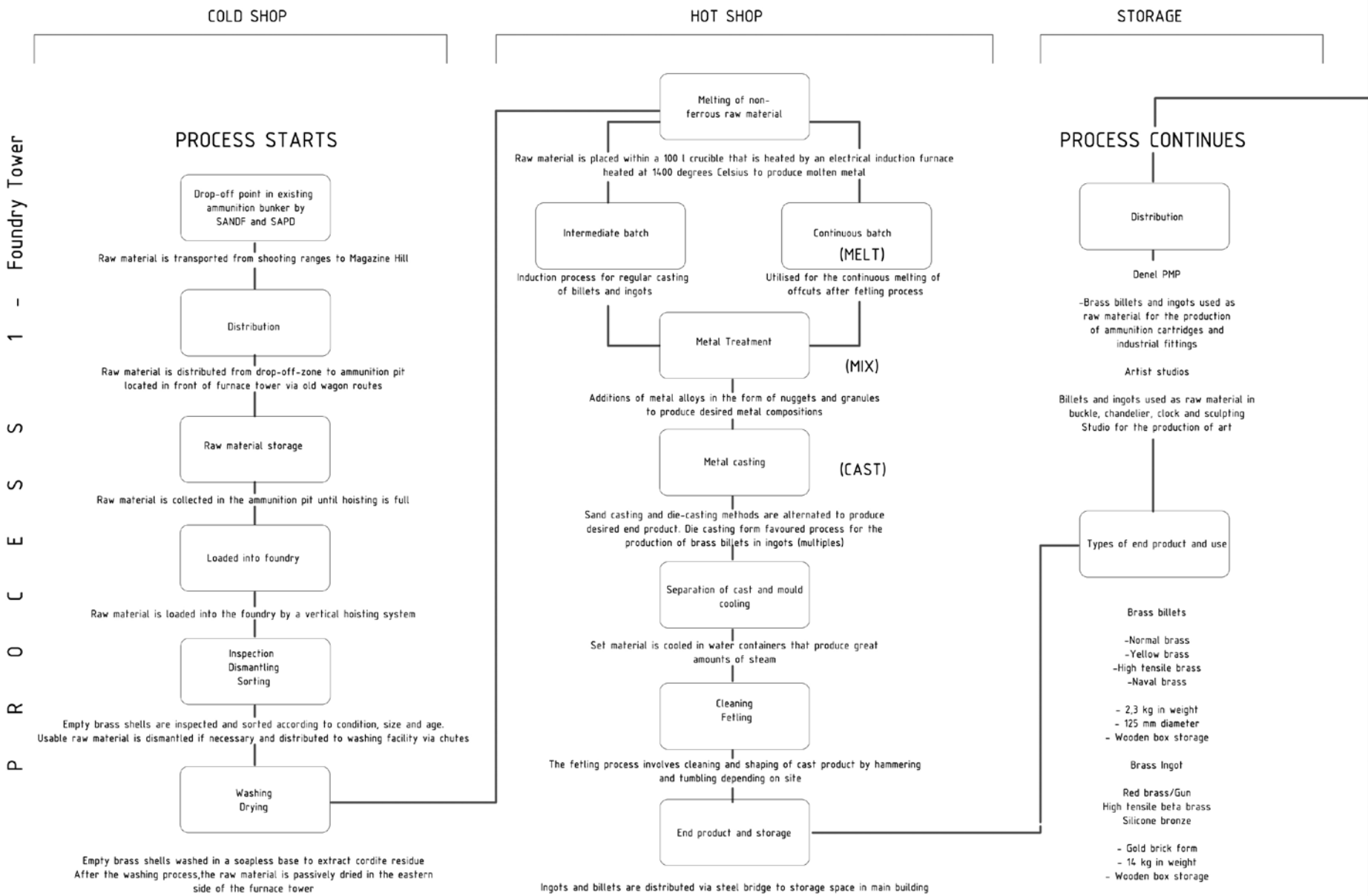
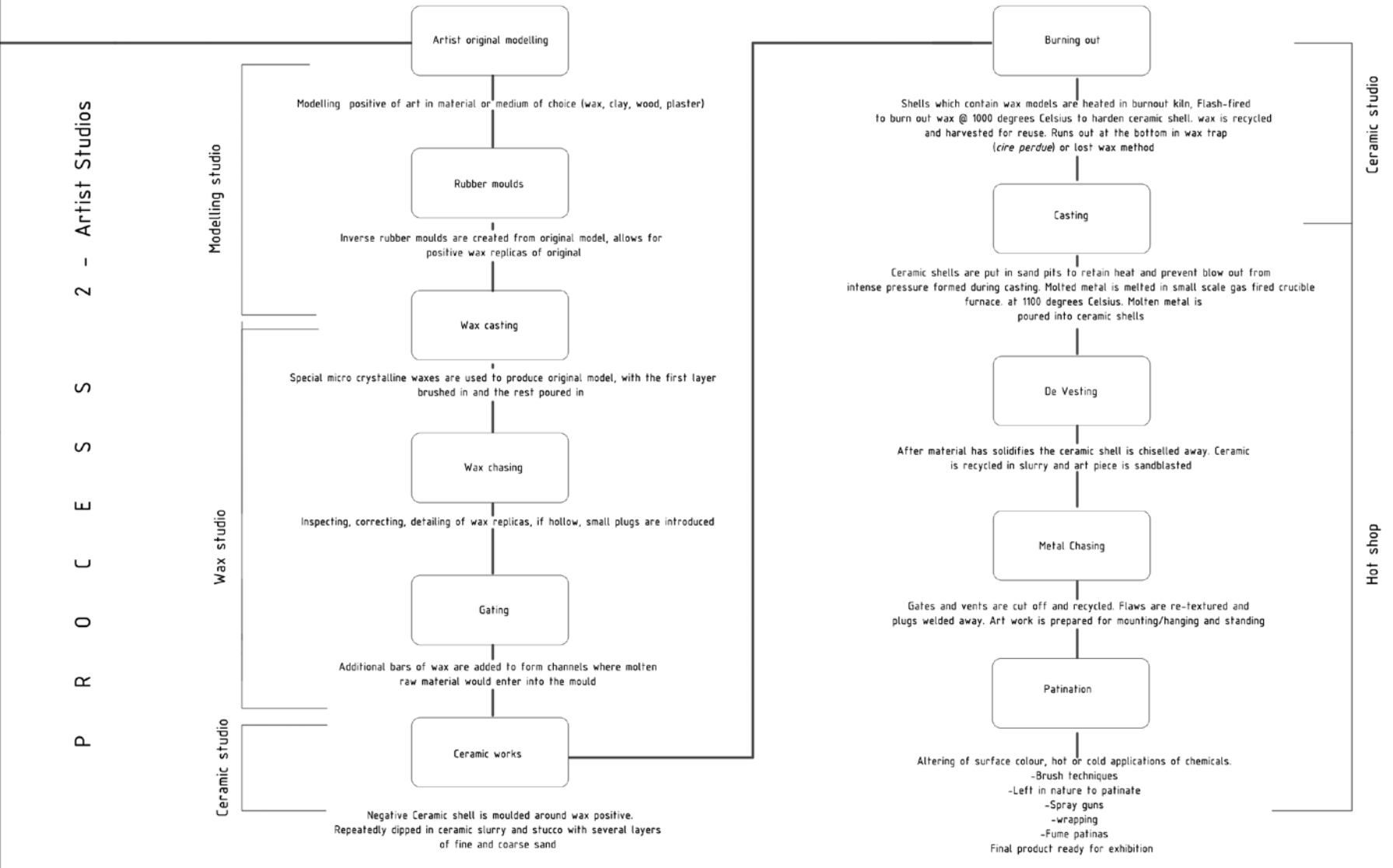


Figure 7.4: Technical display of proposed foundry process (Author, 2011)

P R O C E S S 2 - Artist Studios



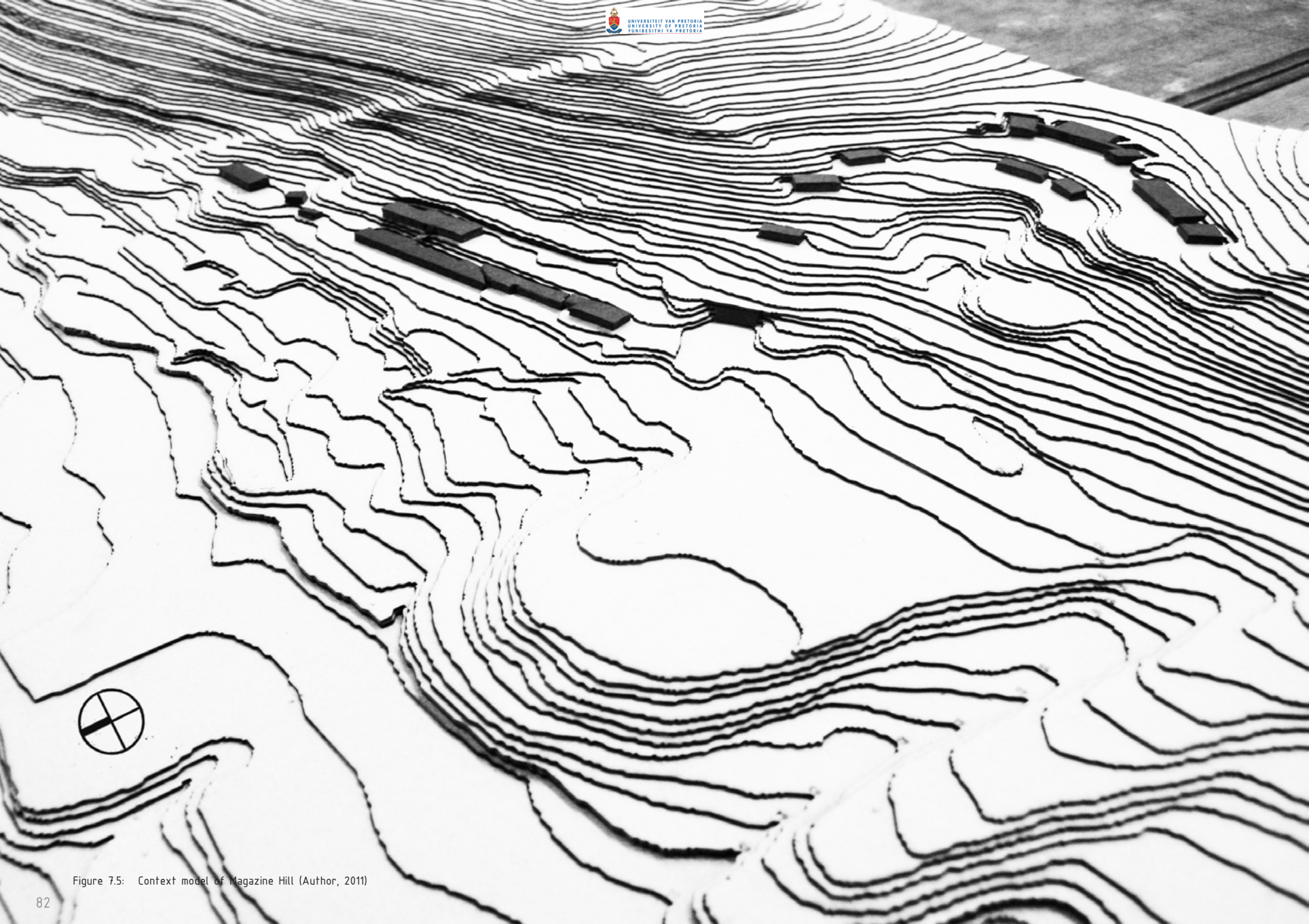


Figure 7.5: Context model of Magazine Hill (Author, 2011)

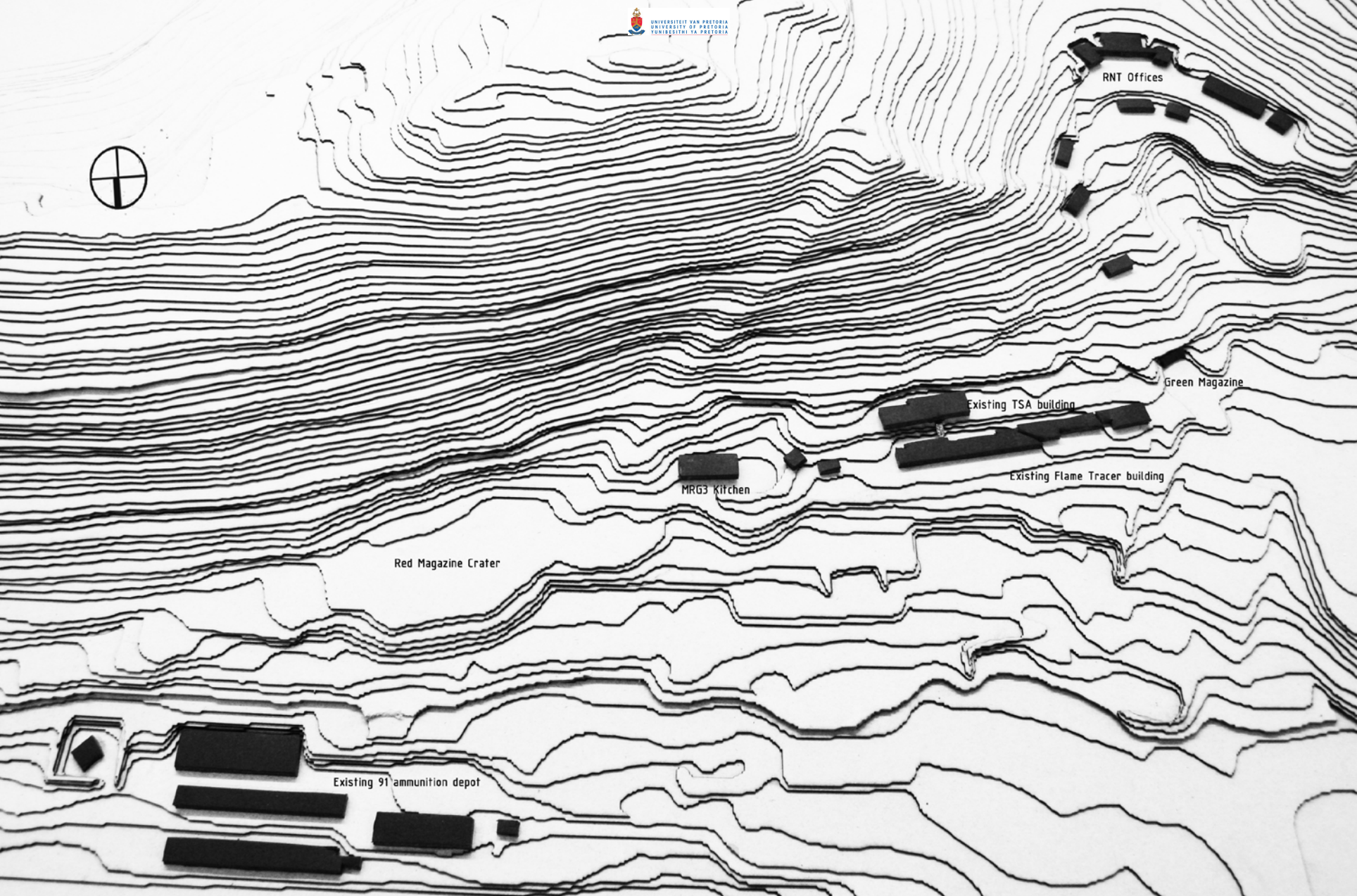


Figure 7.6: Context model of Magazine Hill (Author, 2011)

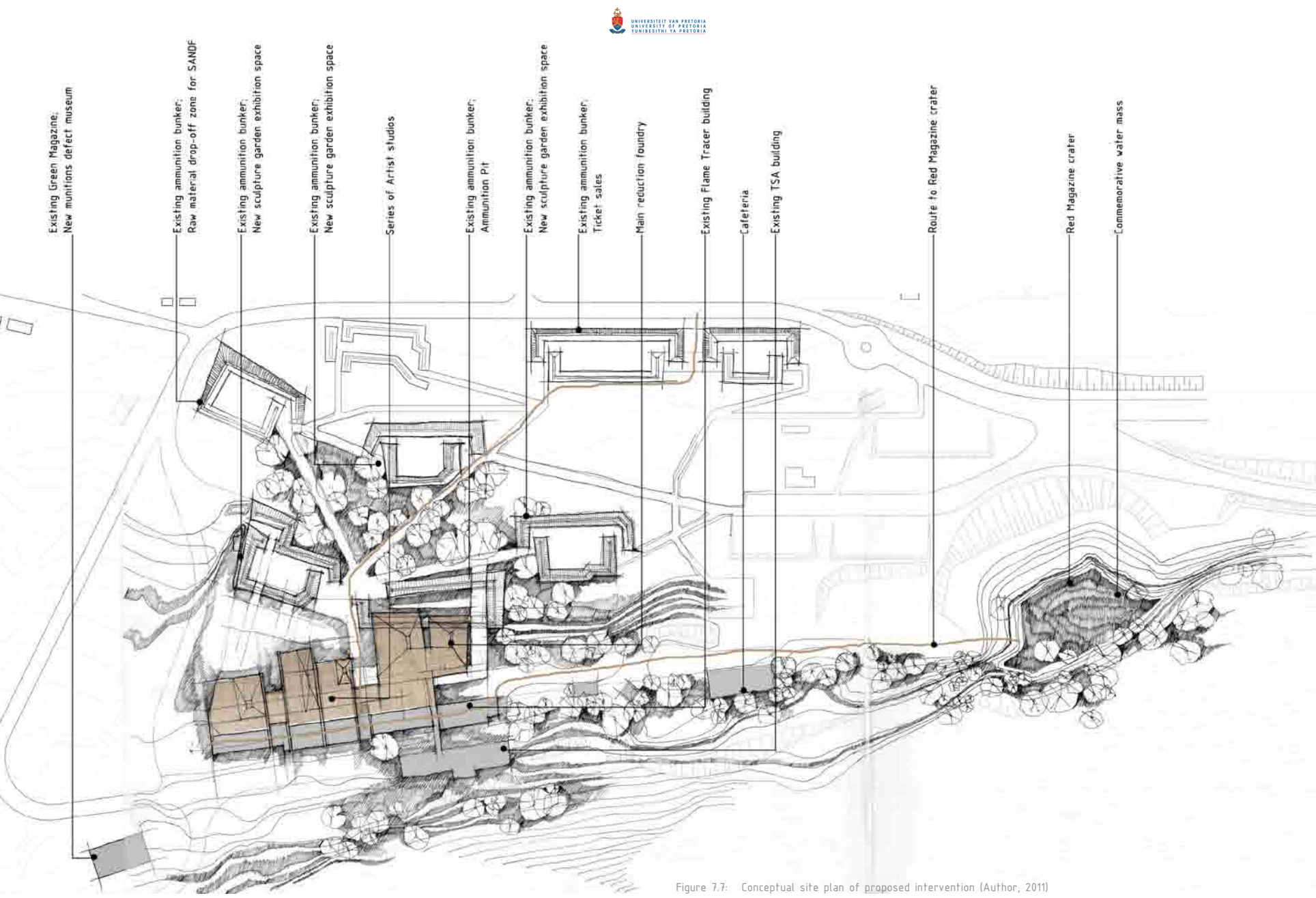


Figure 7.7: Conceptual site plan of proposed intervention (Author, 2011)

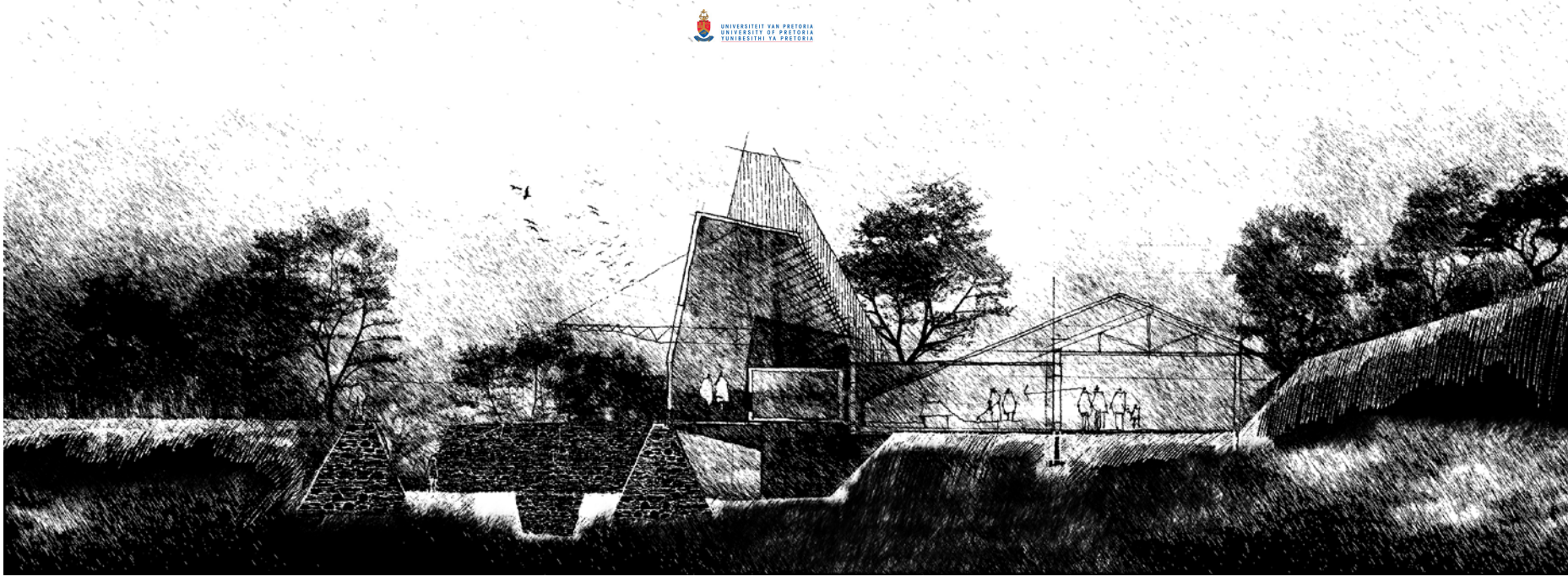
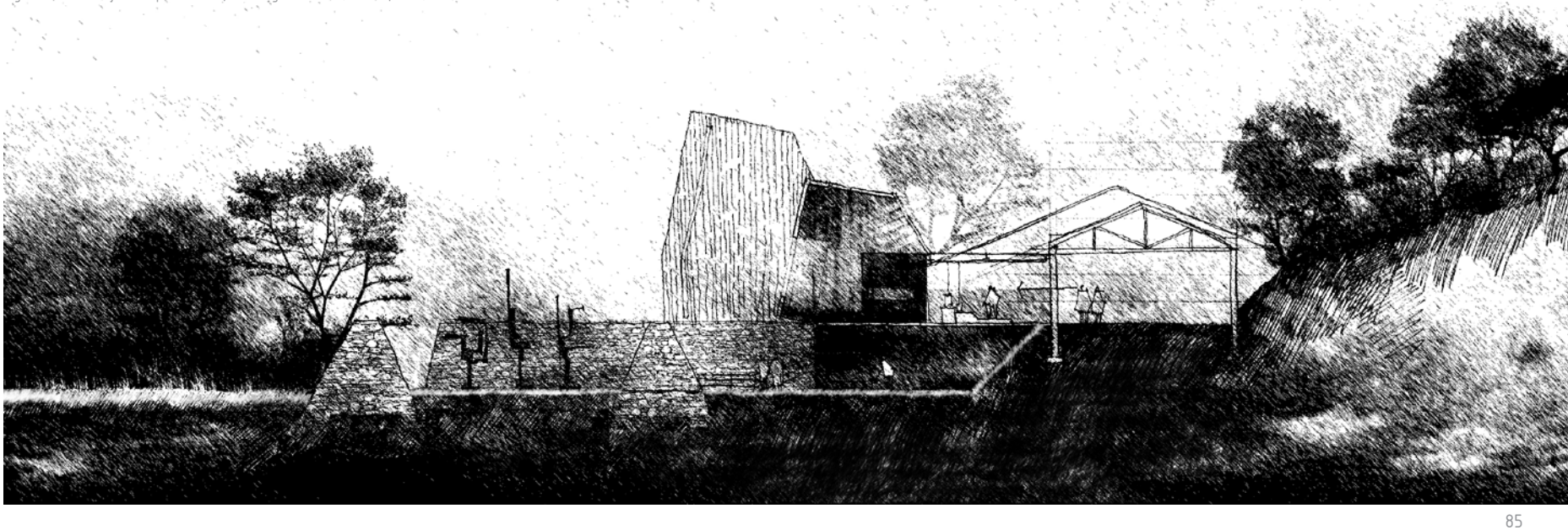


Figure 7.8: Early conceptual work, building sections (Author, 2011)



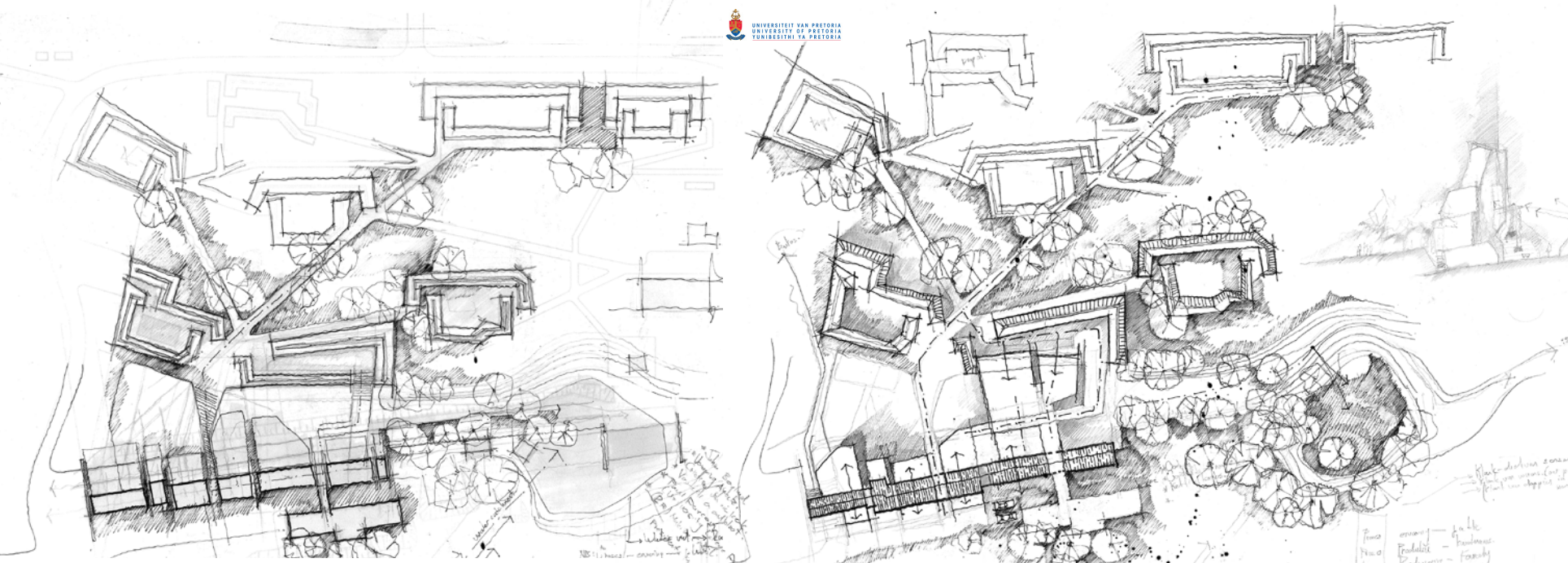
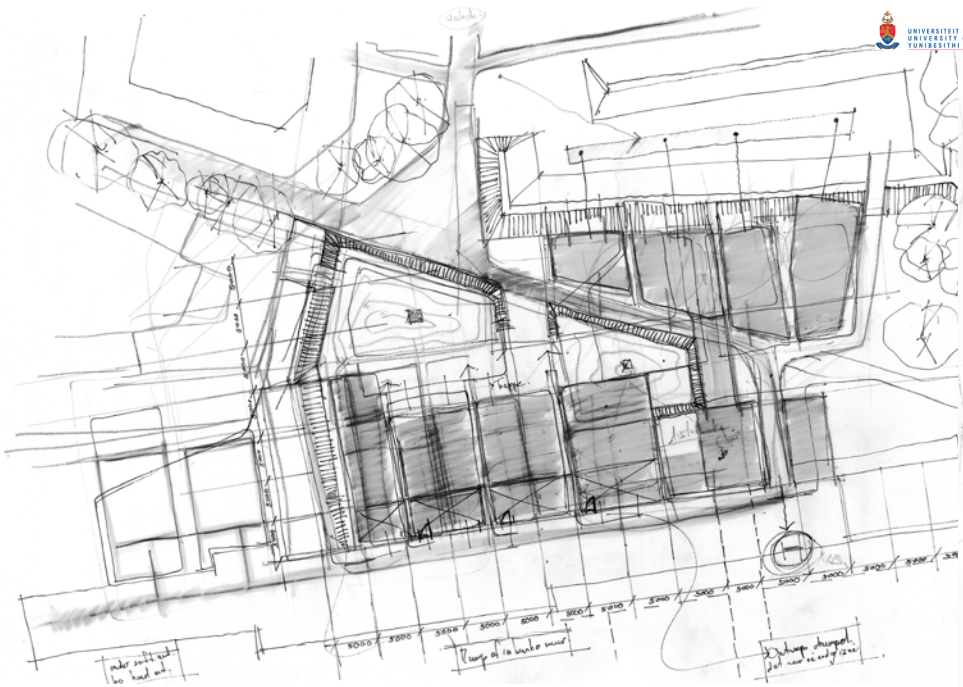
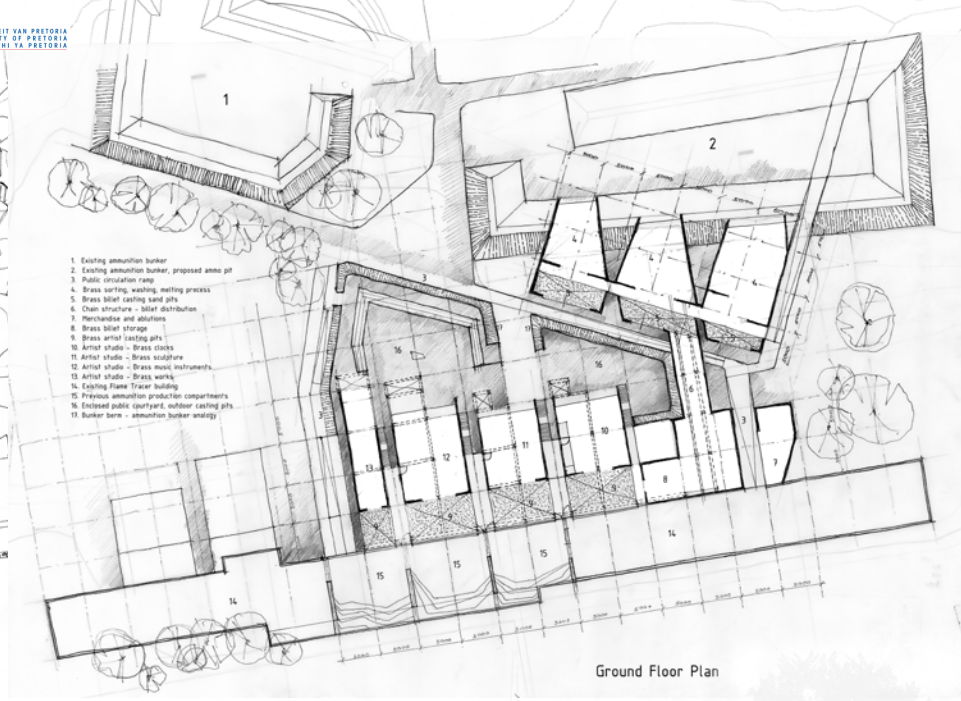


Figure 7.9: Concept drawings showing the development of the building plan (Author, 2011)





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)

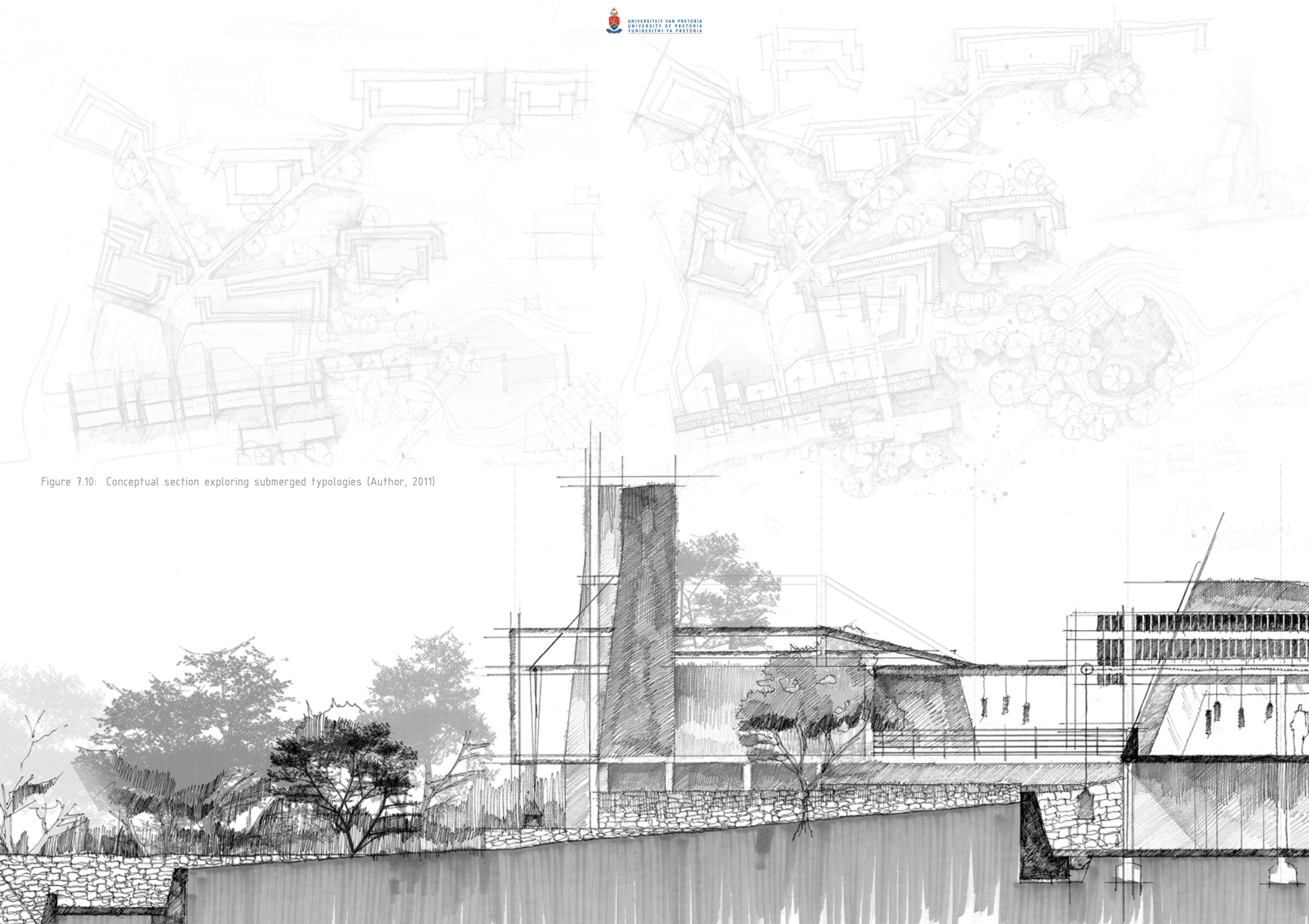
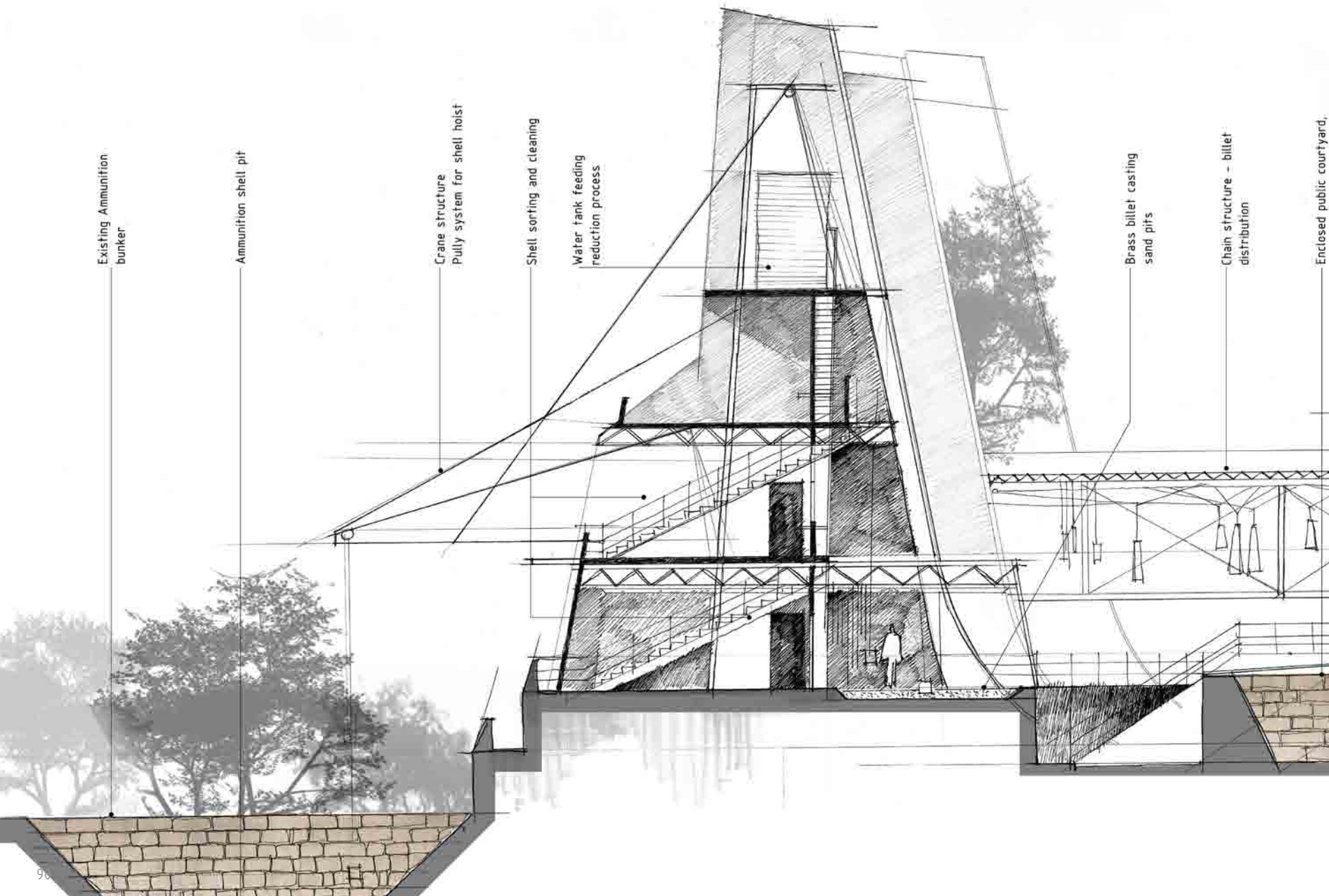


Figure 7.10: Conceptual section exploring submerged typologies (Author, 2011)


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,

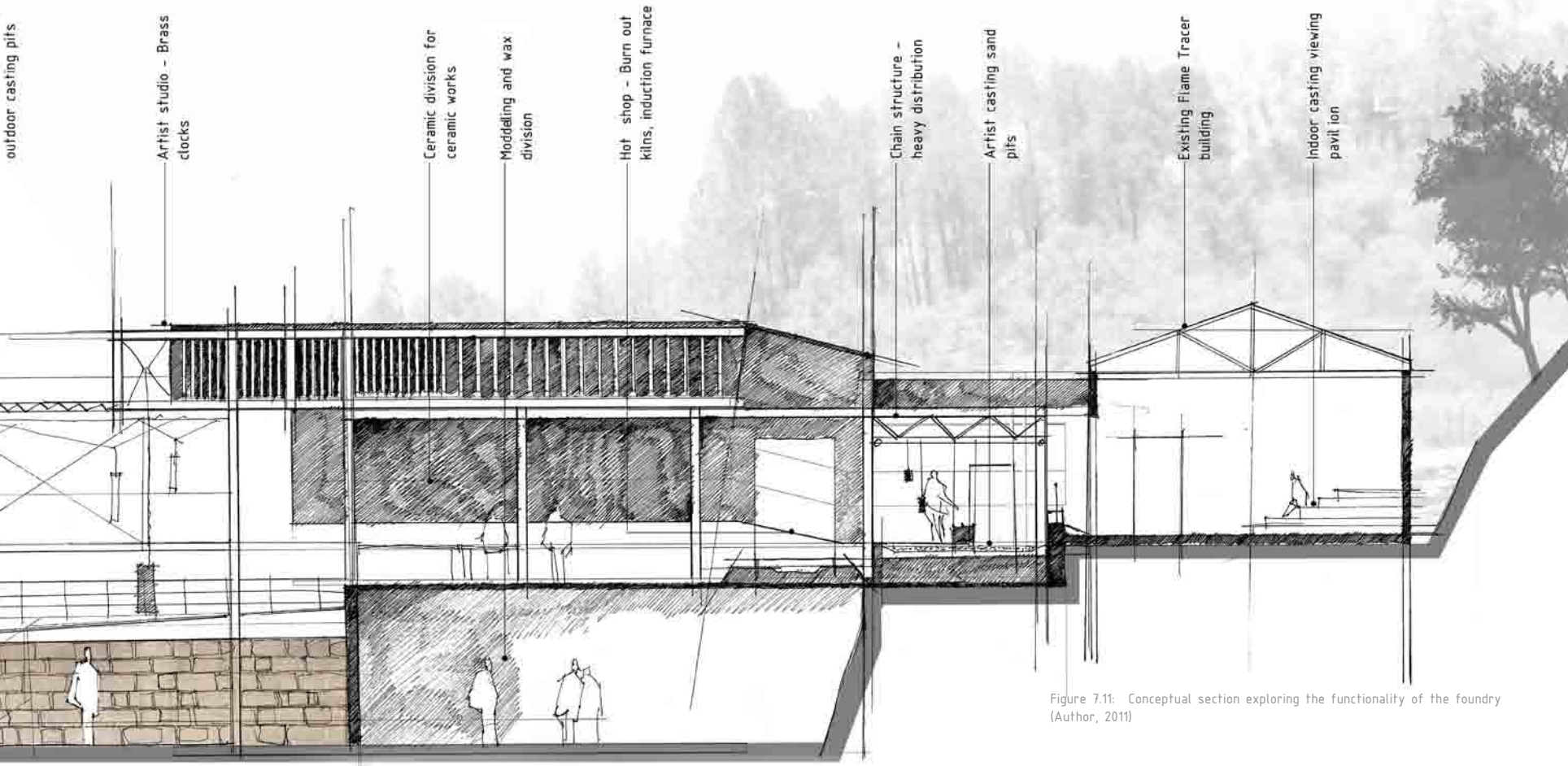


Figure 7.11: Conceptual section exploring the functionality of the foundry (Author, 2011)

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

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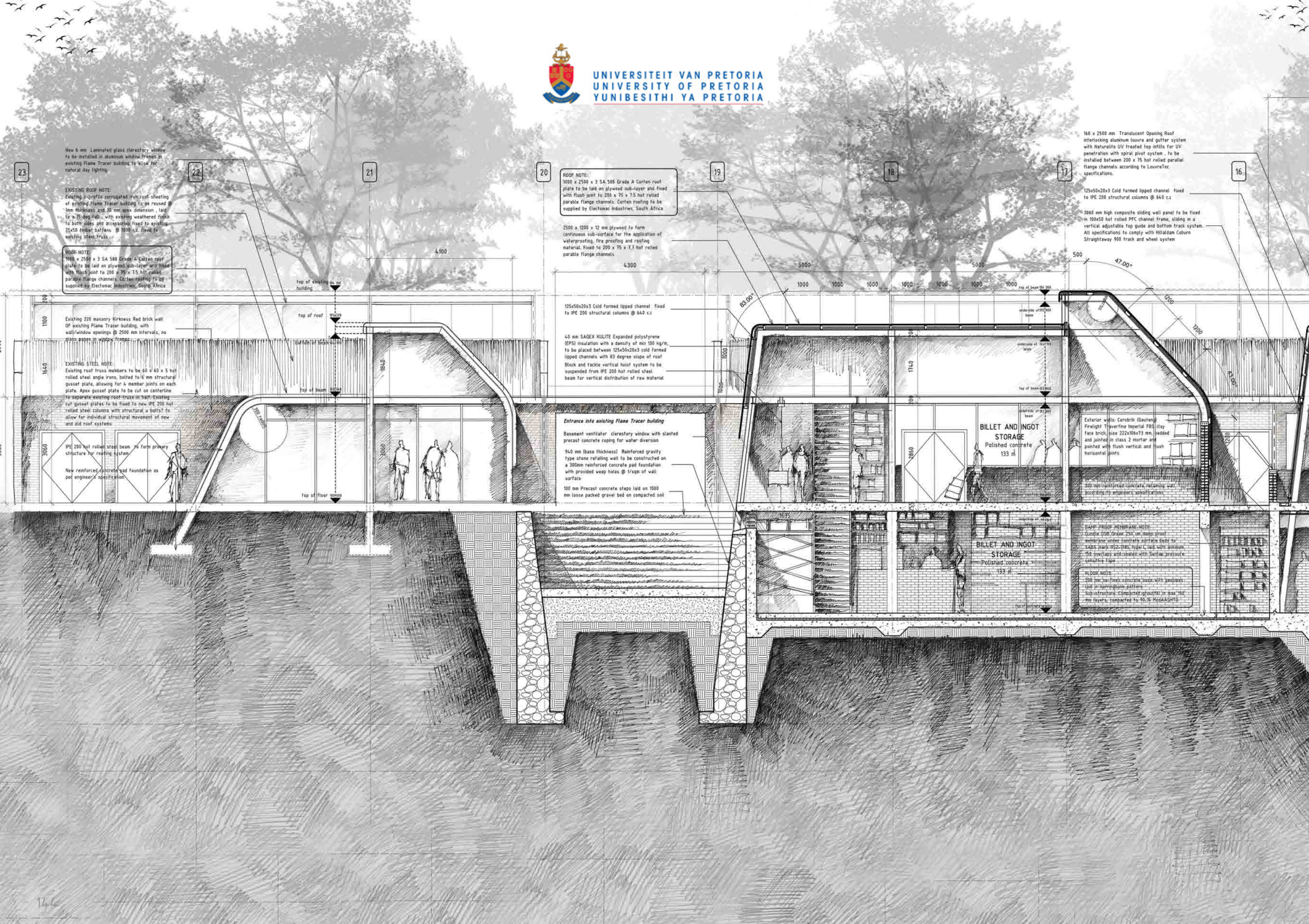

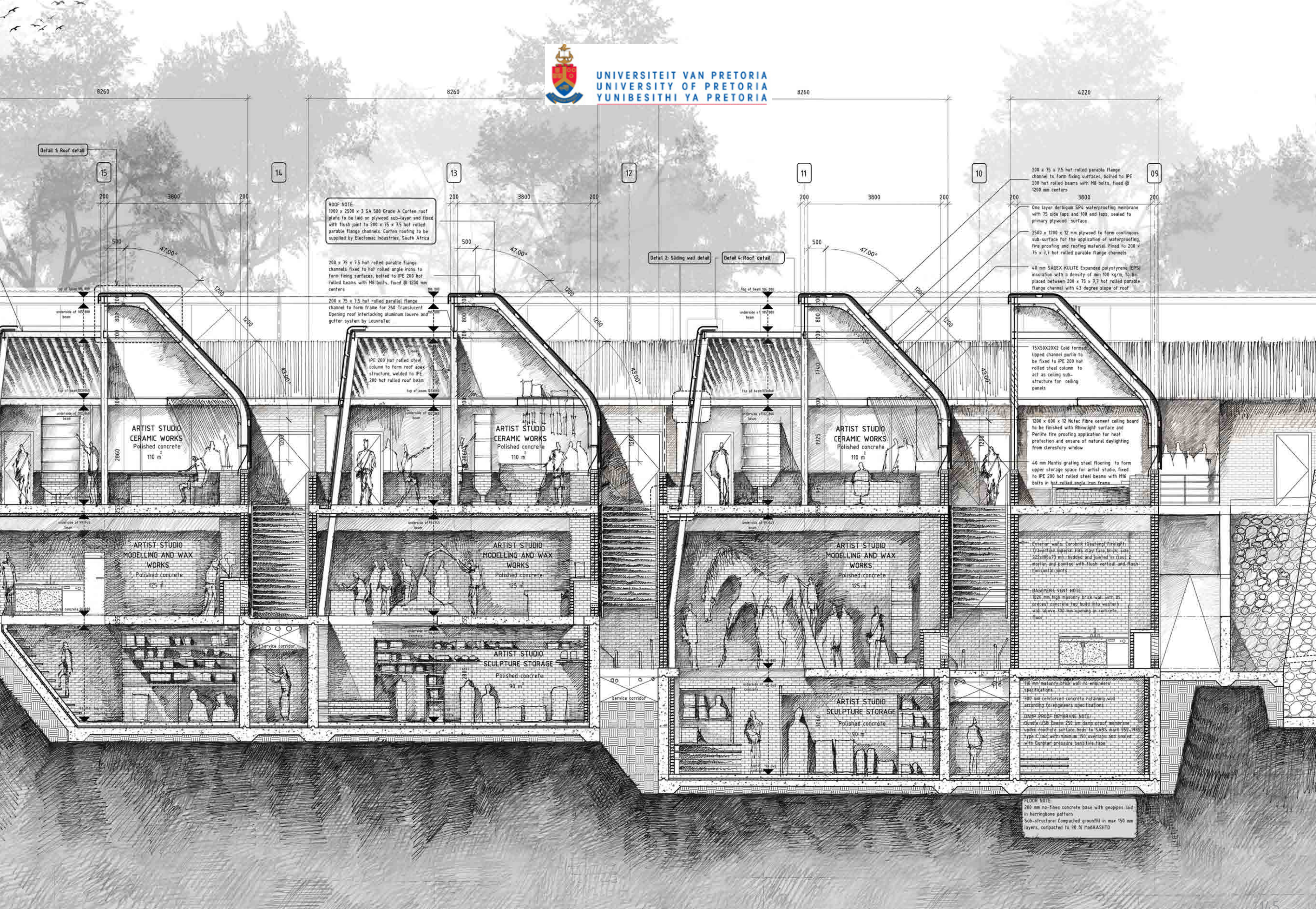

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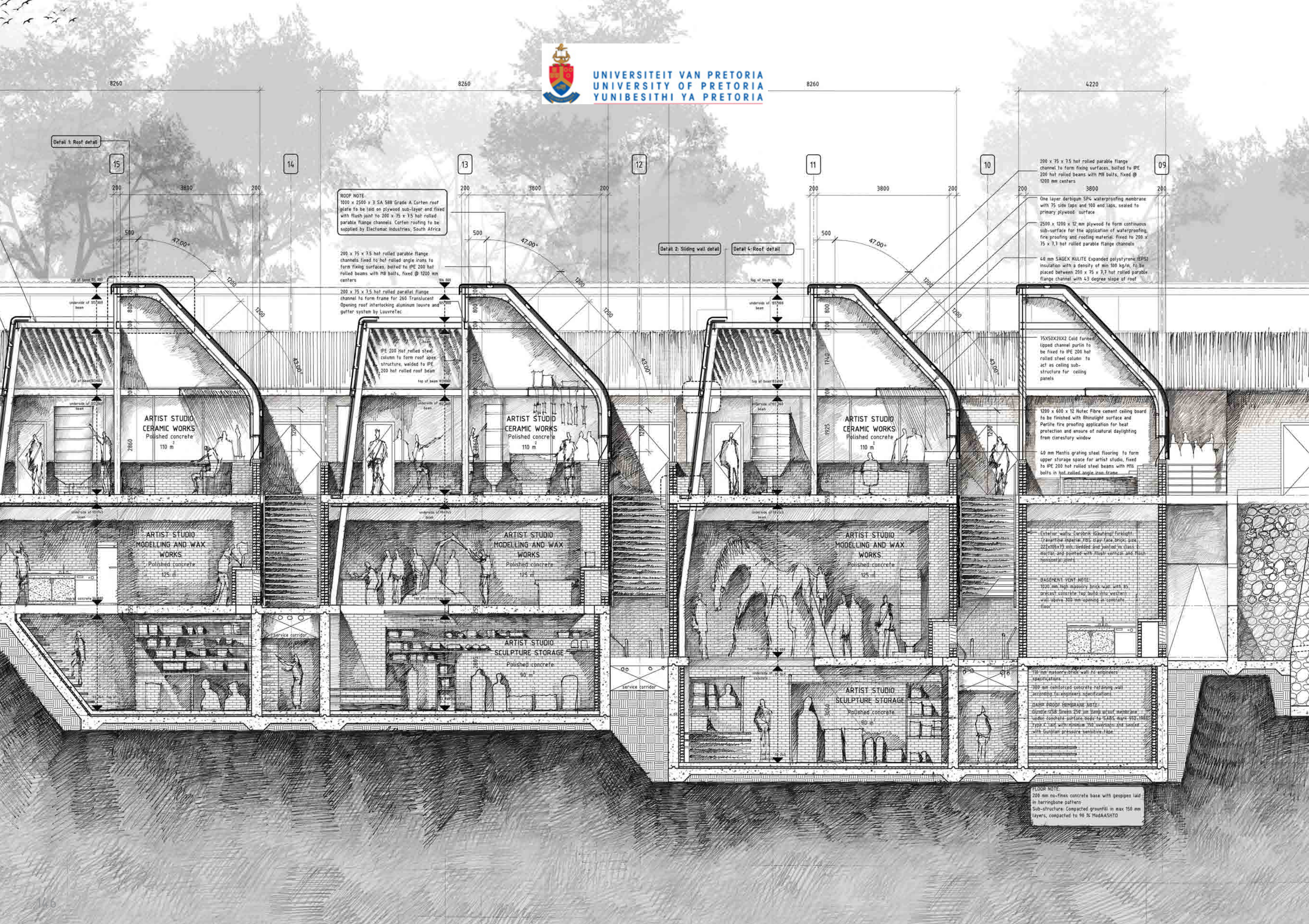

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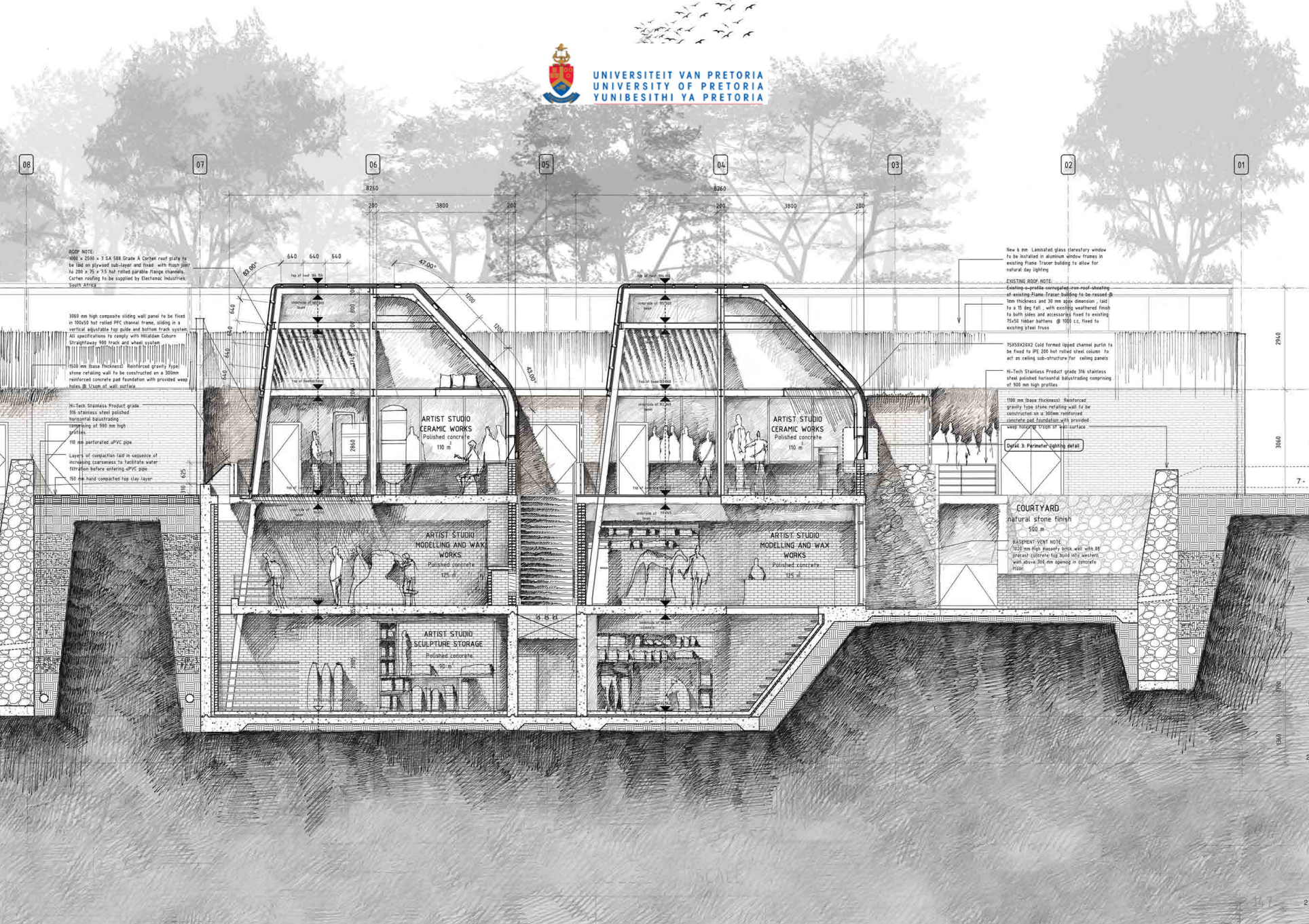
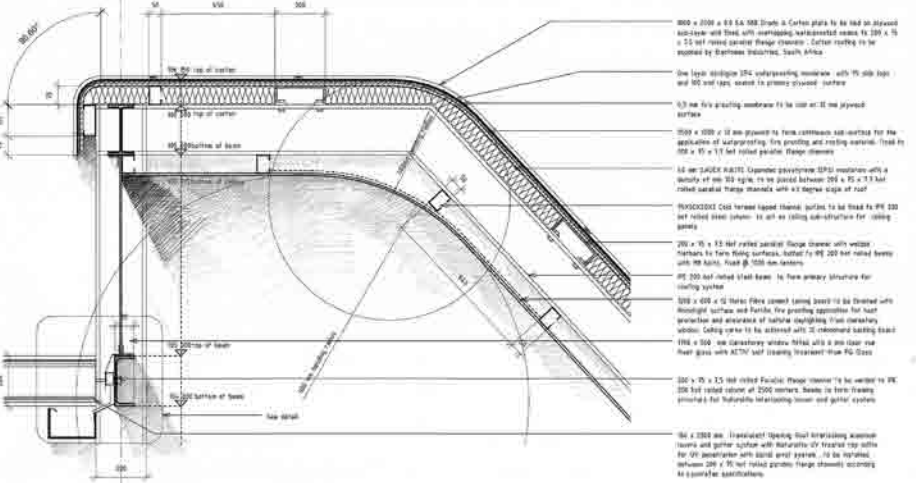
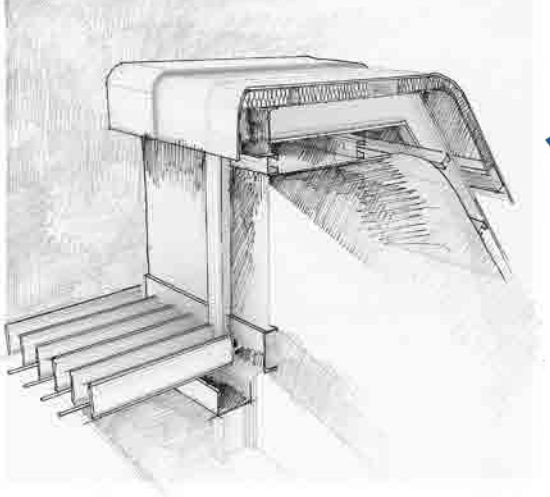
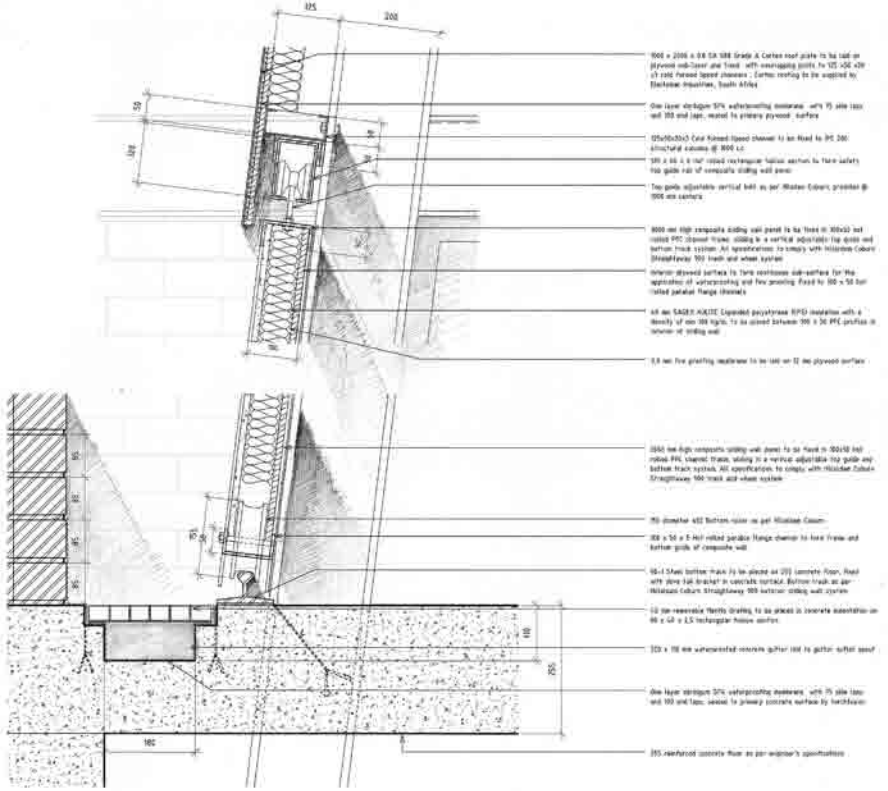
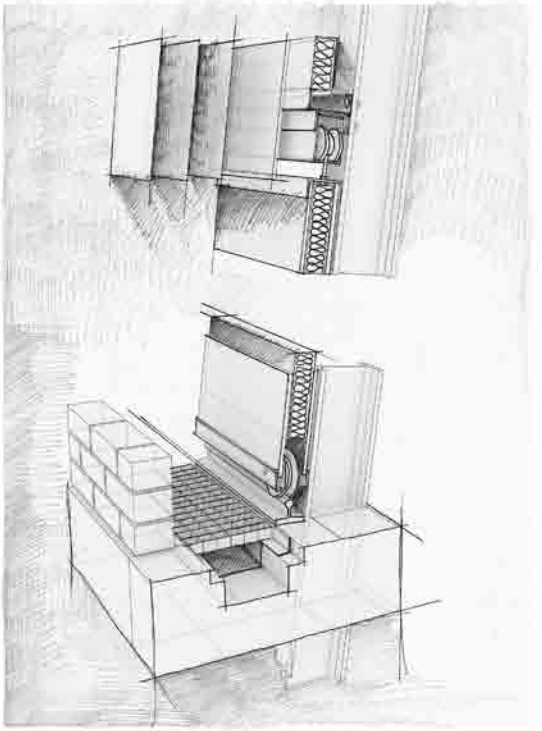




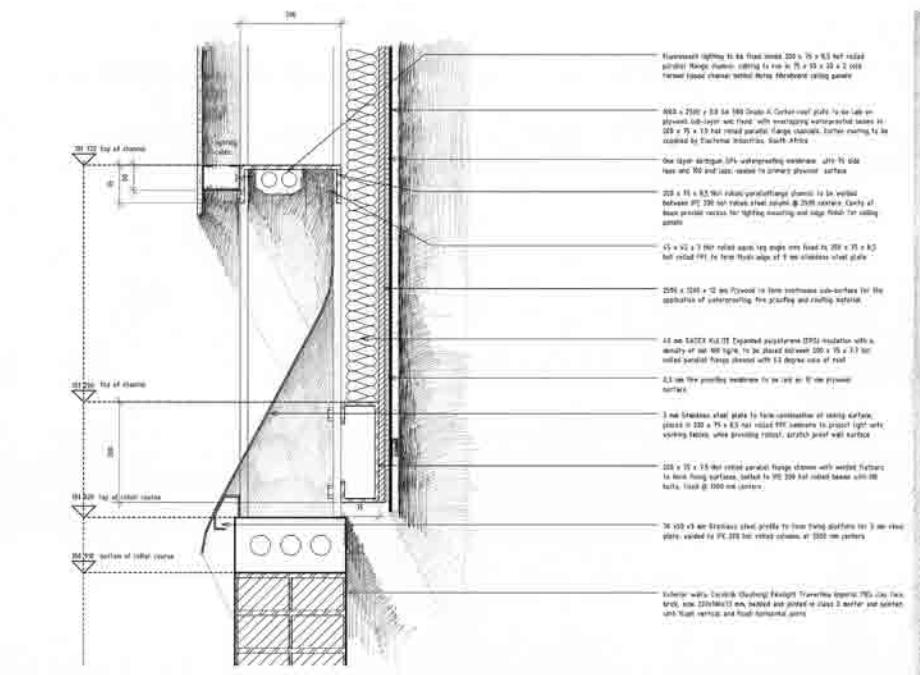


D E T A I L 1 : ROOF DETAIL SCALE: 1 : 10

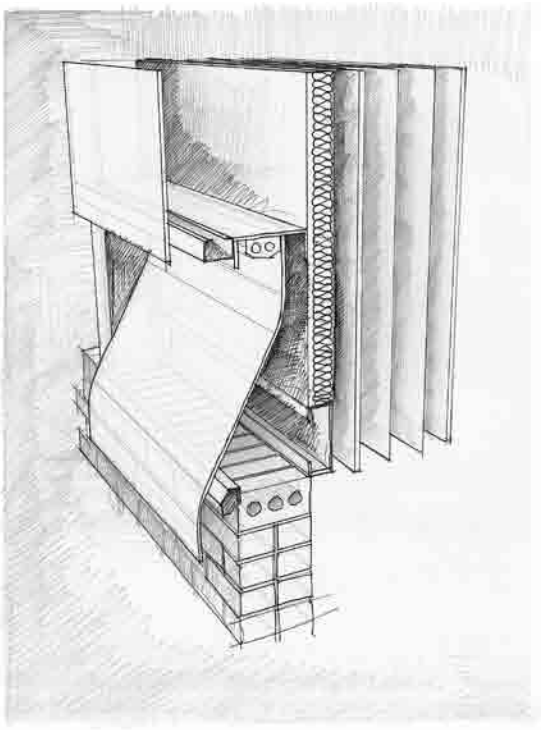


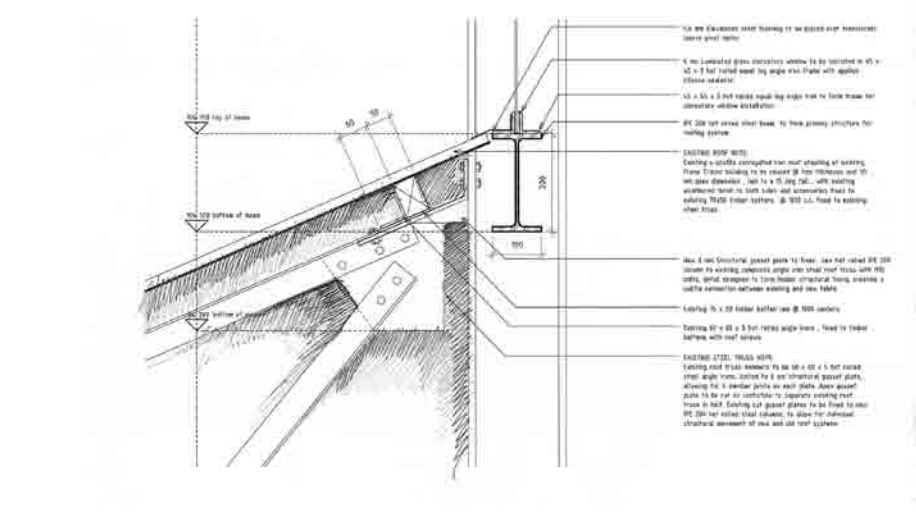


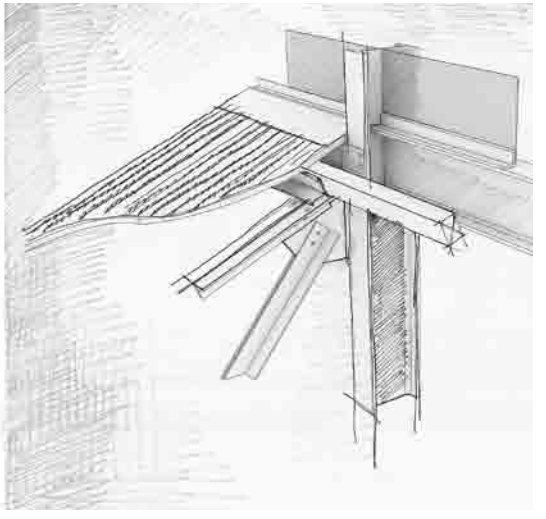
D E T A I L 2 : SLIDING WALL DETAIL SCALE: 1 : 5

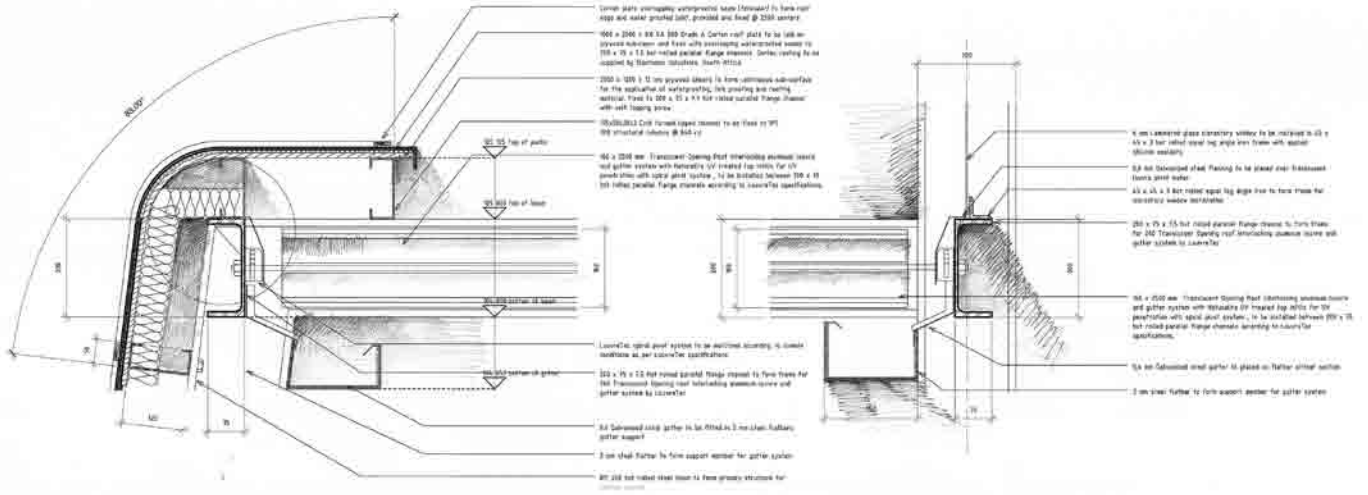


DETAIL 3: PERIMETER LIGHTING DETAIL SCALE: 1 : 5

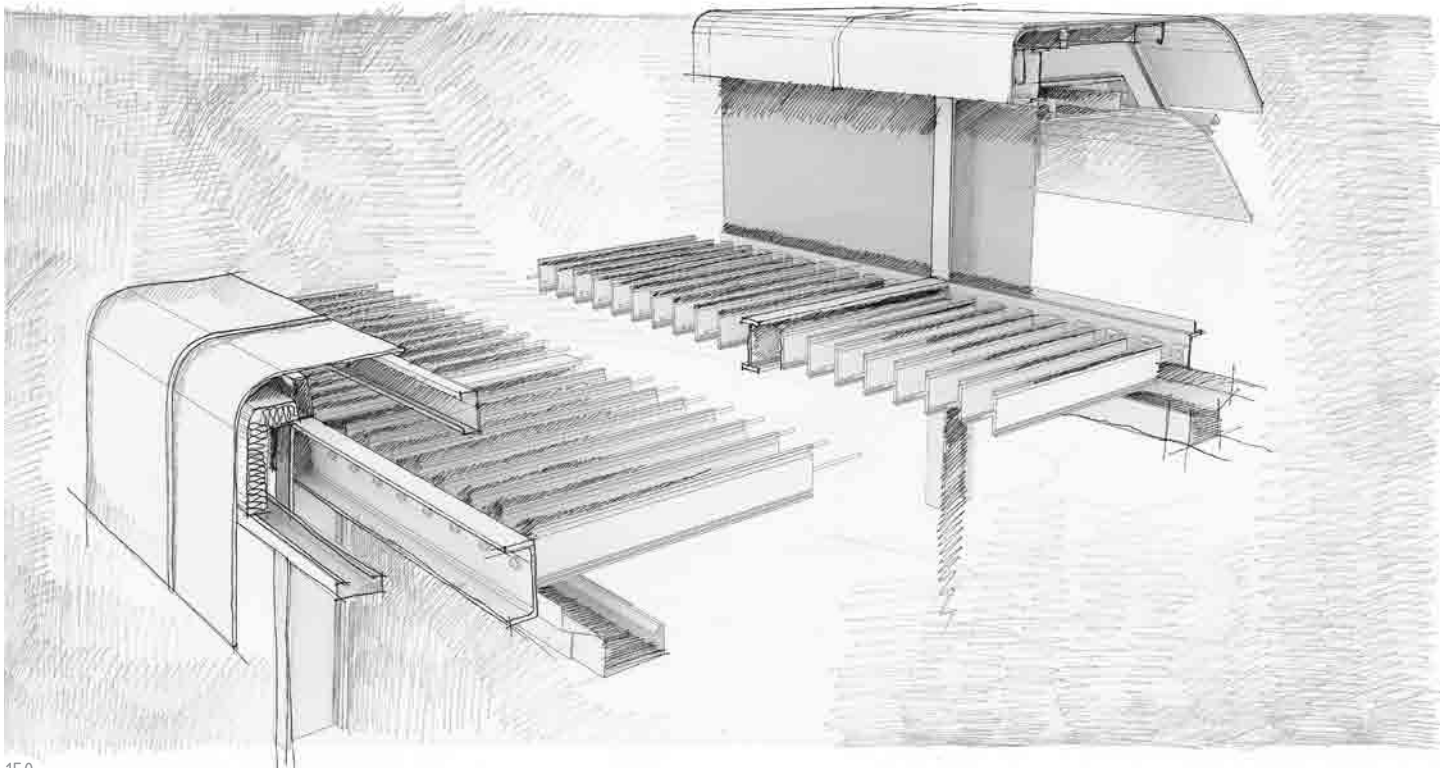




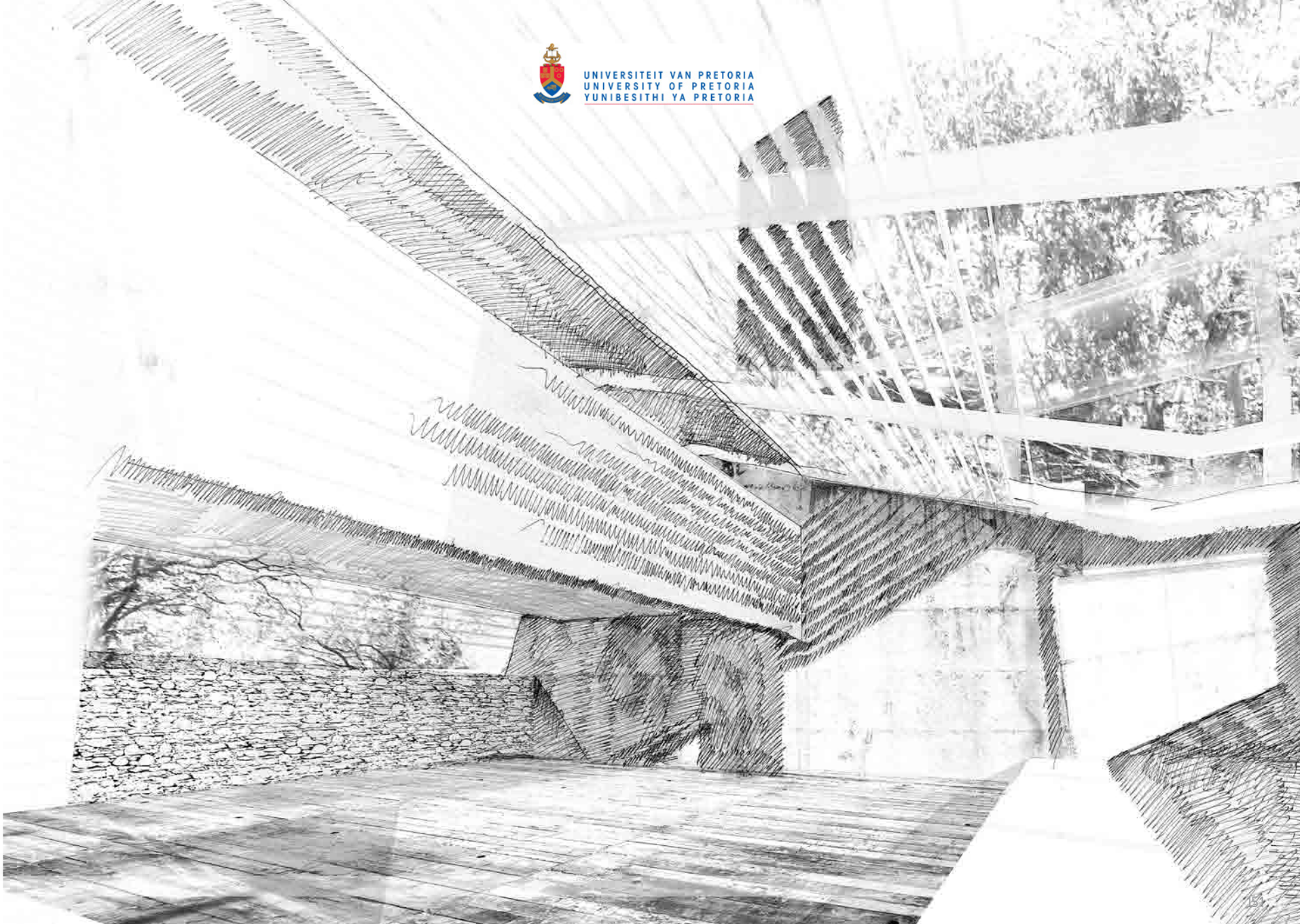




D E T A I L 4 : ROOF DETAIL SCALE: 1 : 5



D E T A I L 4 : ROOF AXONOMETRIC DETAIL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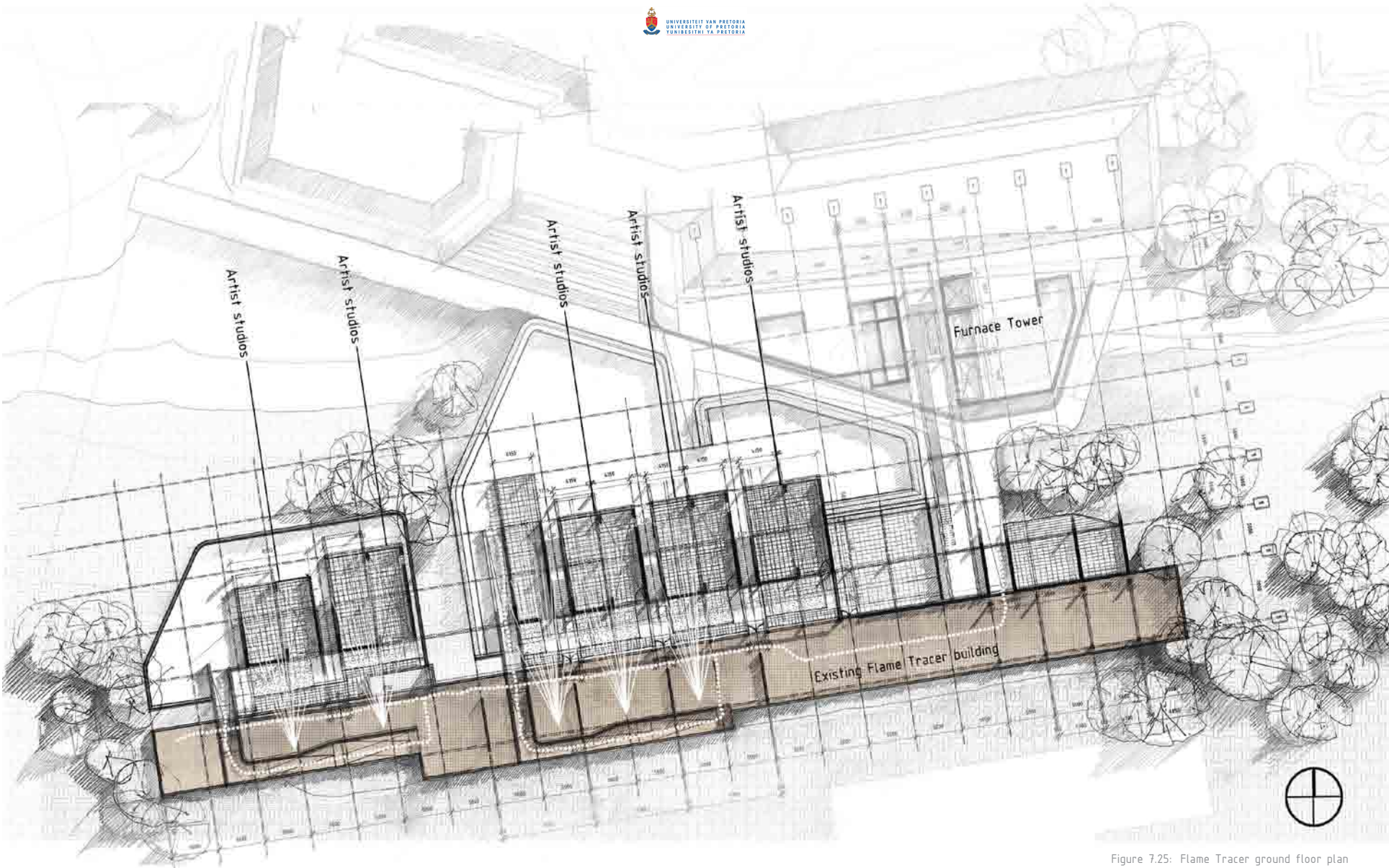


Figure 7.25: Flame Tracer ground floor plan showing artist studio additions, nts (Author, 2011).

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

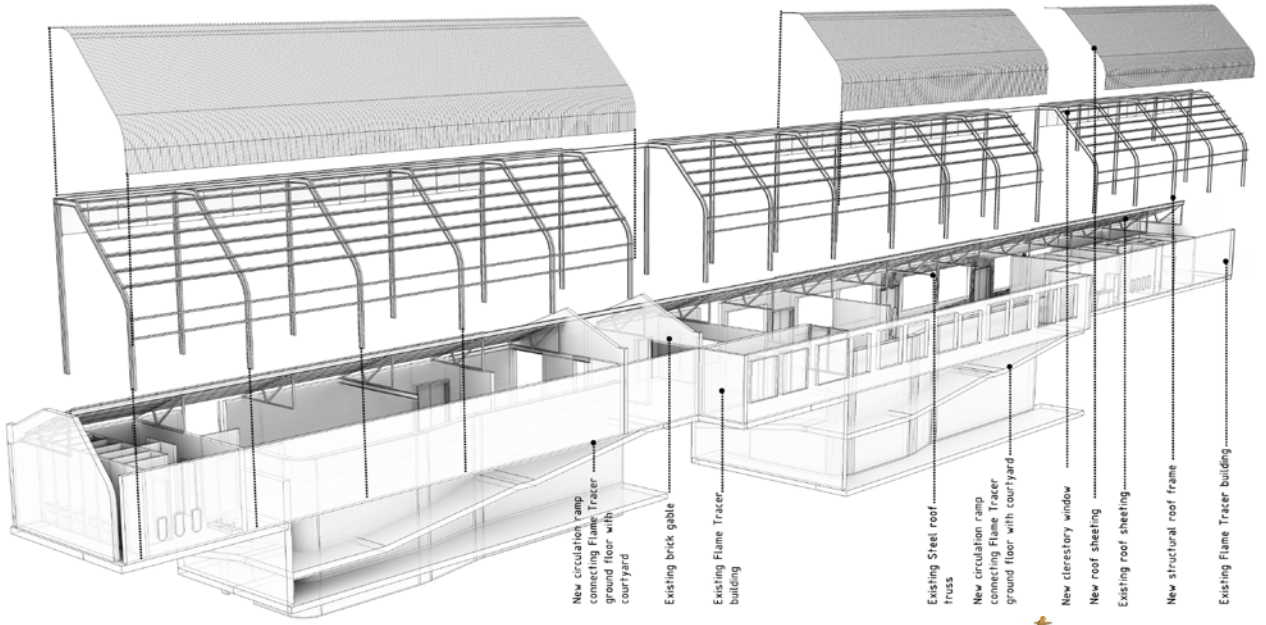
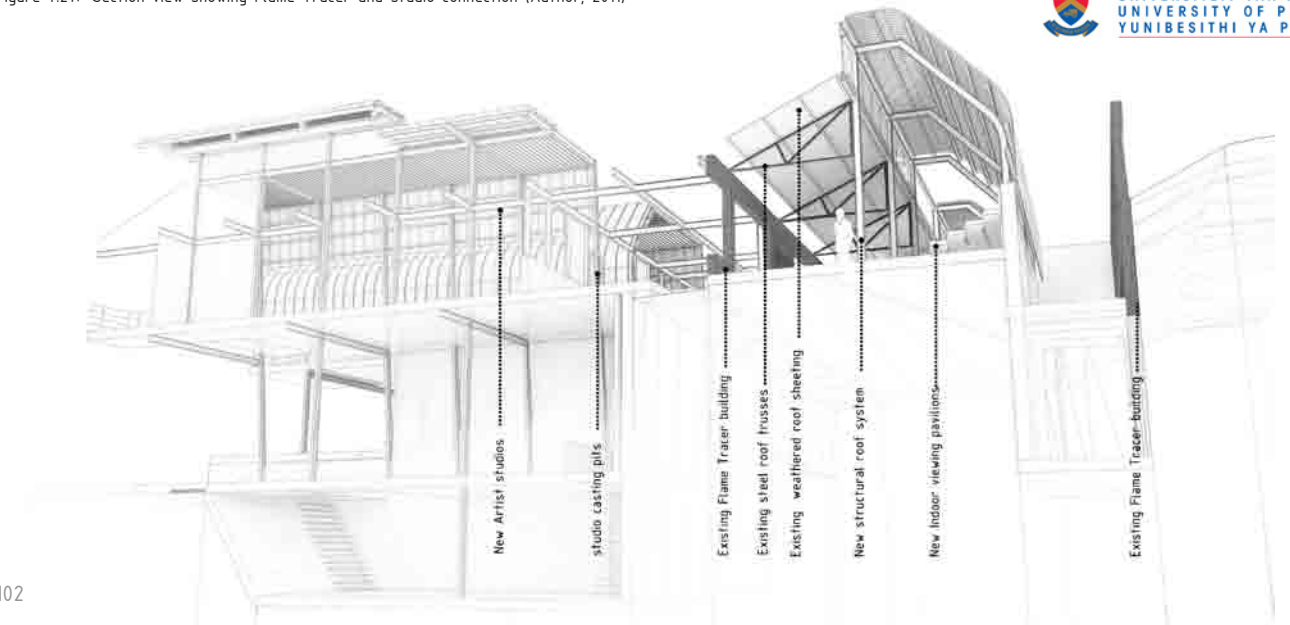


Figure 7.27: Section view showing Flame Tracer and studio connection (Author, 2011)



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.

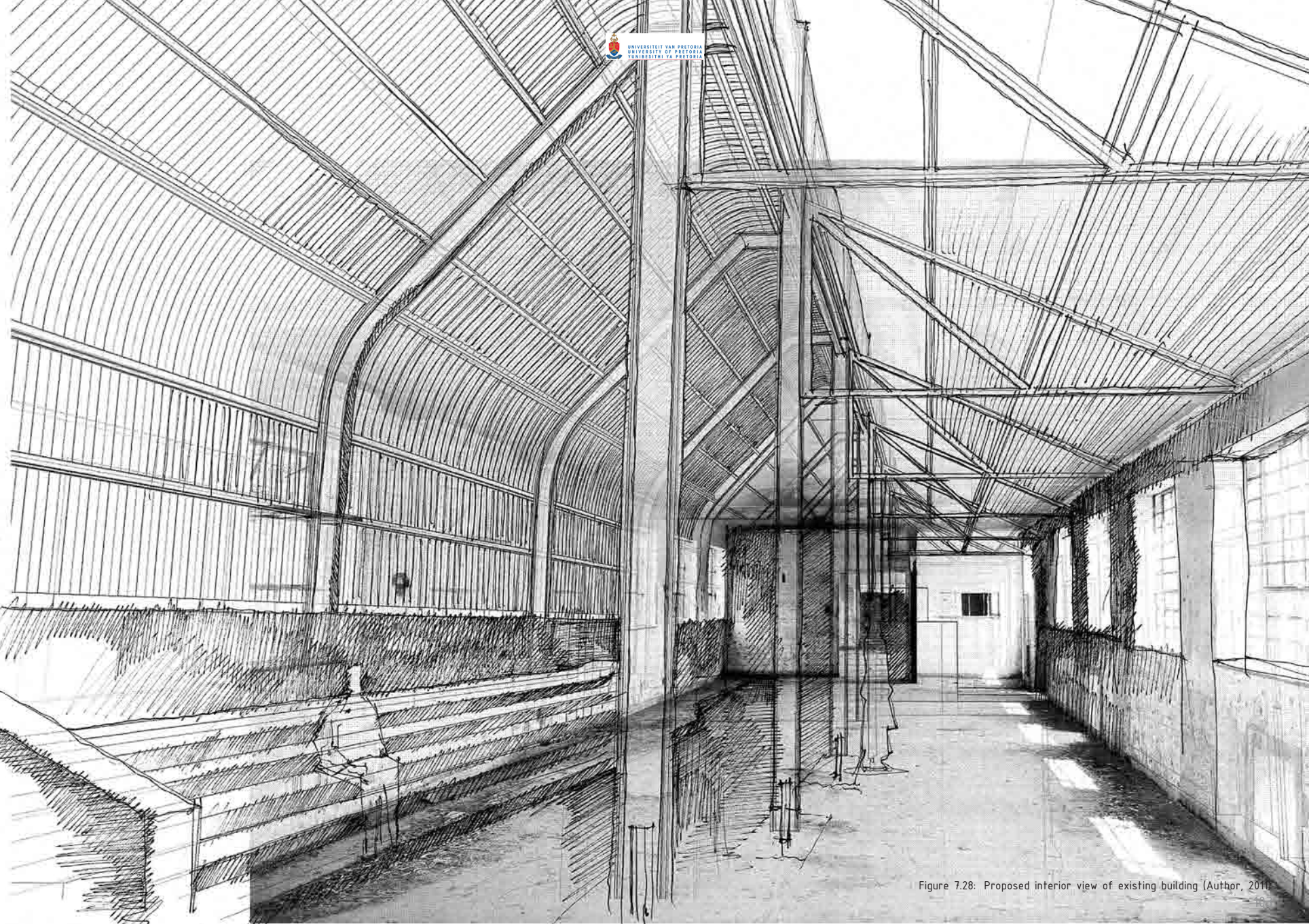


Figure 7.28: Proposed interior view of existing building (Author, 2011)

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.

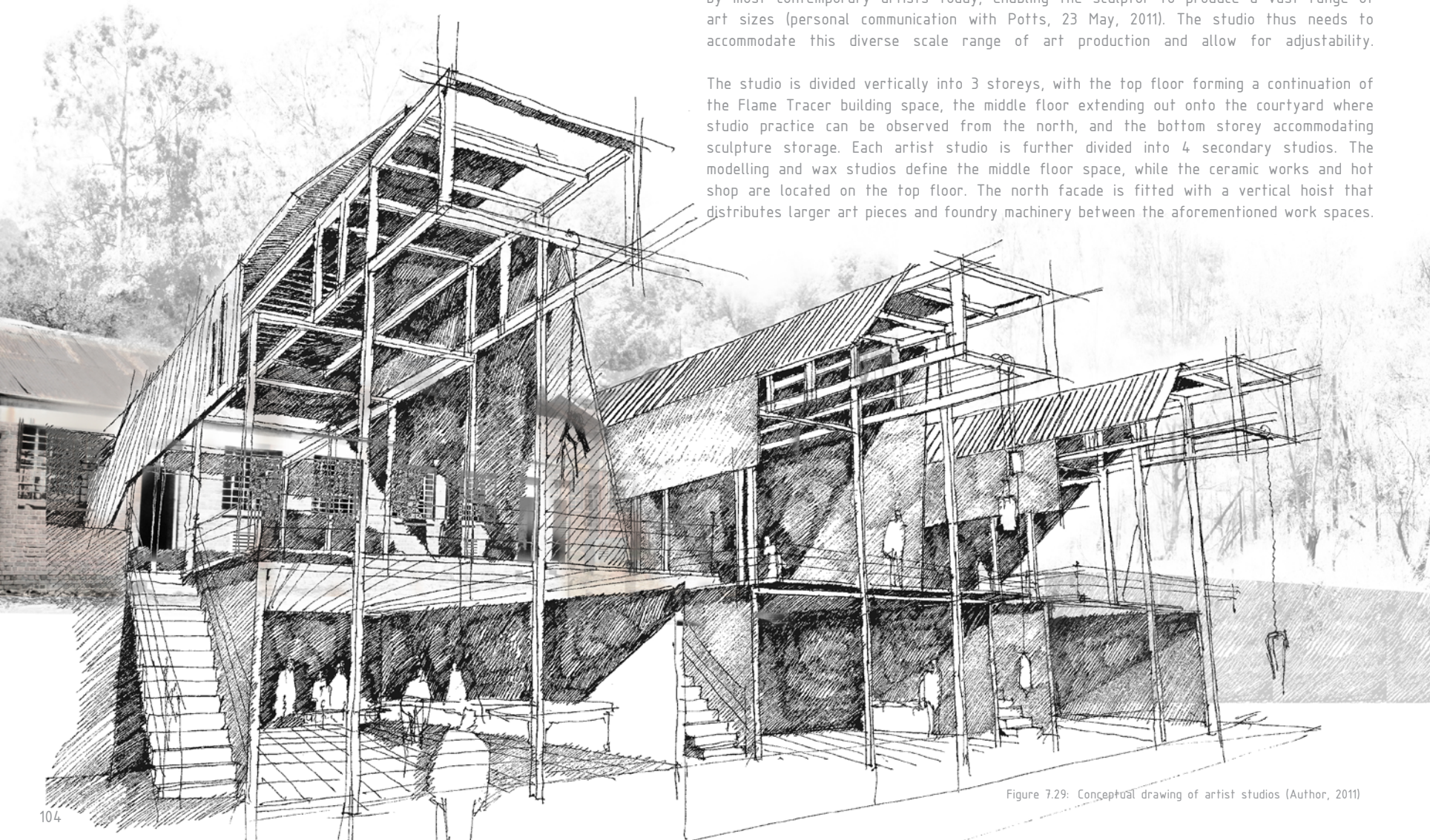


Figure 7.29: Conceptual drawing of artist studios (Author, 2011)

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.

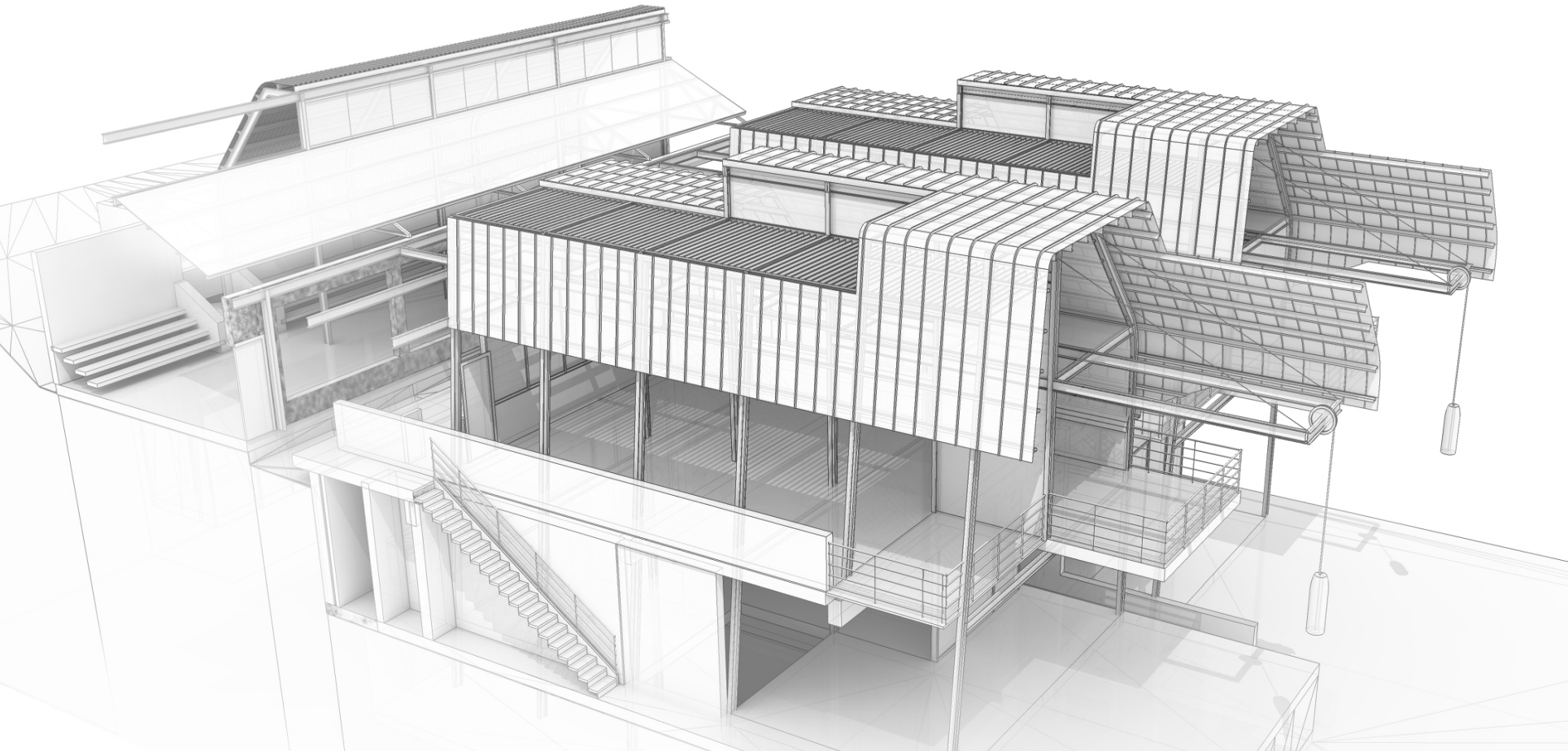


Figure 7.31: View of artist studios projecting into the new courtyards (Author, 2011)

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)

Chapter 8 focuses on the technical resolusion of the theoretical and programatic requirentments within the historical context on Magazine Hill

Figure 8.1: Bunker view showing the stereotomic character of existing fabric (Author, 2011)

8.1 Structural tectonic

The structural investigation of the proposed foundry focuses on the theoretical premise of Gottfired Semper (1803–1879) that explores the tectonic relationship of architectural materiality. In his Die Vier Elemente der Baukunst (Four Elements of Architecture), the German architect argues that architectural composition can be divided into two opposite material procedures: the stereotomic that relates to solidity, and the tectonic that defines dematerialisation (1995:3). Kenneth Frampton (1990: 518) states that these inherent opposites in architectural materiality forms cosmological opposites of each other, where the stereotomic mass symbolises earth, while the tectonic forms an analogy for the sky. It is argued that the transition from the materiality of the stereotomic, to the immateriality of the tectonic, constitutes the basic poetics and essence of construction (ibid).

As previously discussed in chapter 7, the veiled military architectural aesthetic present on Magazine Hill relates to the stereotomic, a structural typology of stone and concrete, submerged into the hilltop landscape. It is within this theoretical premise that the relationship between existing and proposed fabric is technically explored and resolved in the historical context of Magazine Hill.

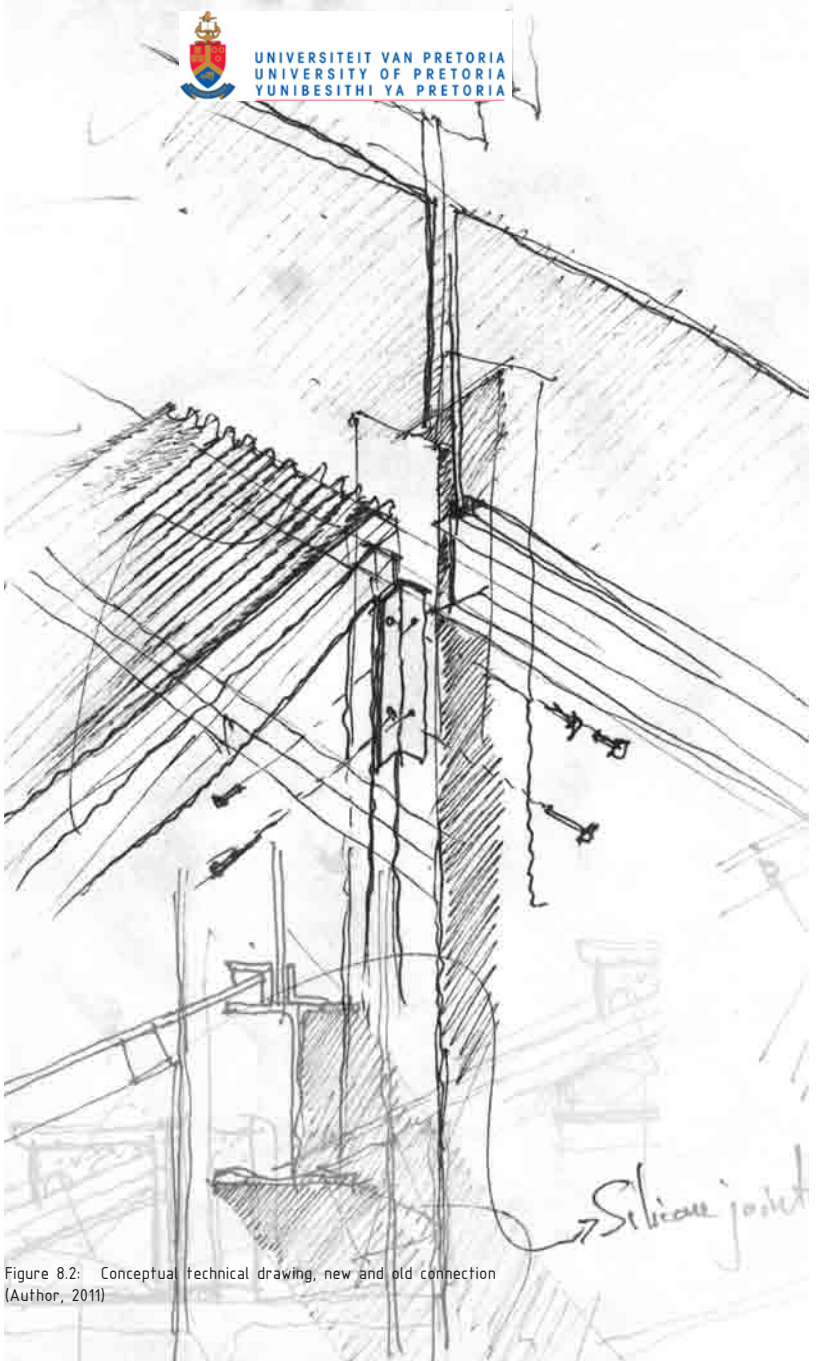


Figure 8.2: Conceptual technical drawing, new and old connection (Author, 2011)

8.2 Technical concept

The technical investigation explores two main structural concepts, where the first deals with the stereotomic and tectonic poetics of architecture. The proposed fabric is expressed through the use of several analogies for the existing typology on Magazine Hill. All existing materiality on site is caught in a timeless play of revealing and concealing, where the submerged military typology produces secretive and mysterious spaces that appear haunted. Because of the character of the submerged typology with its intimate relation to the landscape, all existing architecture is defined by stereotomic mass. The existing stereotomic relates to that which belongs to the site. The proposed foundry addresses the same gravitational qualities that function within a submerged landscape. New build fabric forms submerged bunker analogies that weave together existing stereotomic elements with new tectonic fabric. This technical concept guides all interventions in the sensitive context of Magazine Hill.

The second structural concept is grounded within the theoretical argument of architecture's persistence and existence in time, through the process of ruination and weathering. Proposed materiality and detailing is resolved to anticipate the inevitable process of deterioration. This structural concept integrates existing ruination with accelerated weathering of contemporary fabric, strengthening old and new building materials' existence in time. As the inevitable process of ruination dissolves the proposed tectonic building elements over time, the stereotomic elements persists as scars in the landscape of Magazine hill, forming an addendum to the existing submerged bunker spaces.

Figure 8.3: Locality plan, not to scale (nts) (Author, 2011)

8.3 Circulation

The proposed building functions as a superimposed node on the site, weaving together existing and new circulation routes through Magazine Hill. The existing wagon routes which formed distribution platforms between production lines in the submerged bunkers, now serve as pedestrian routes that guide the visitor through the series of exhibition bunkers. It is within this integration of existing and new circulation routes that the history of ammunition production on Magazine Hill is experienced and commemorated in the new context of ammunition reduction. The previous use of the site is therefore celebrated through the reuse of existing circulation corridors.

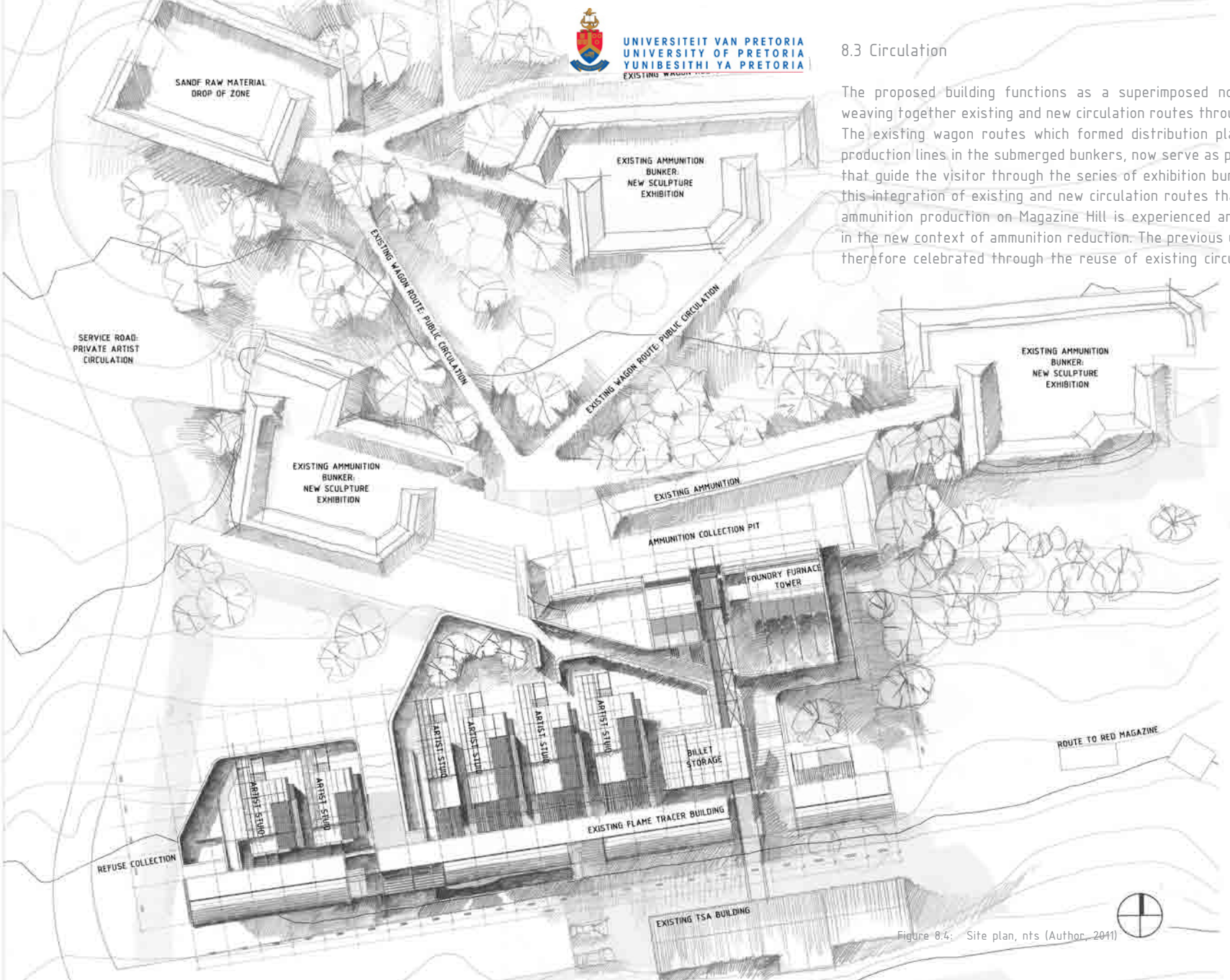


Figure 8.4: Site plan, nts (Author, 2011)

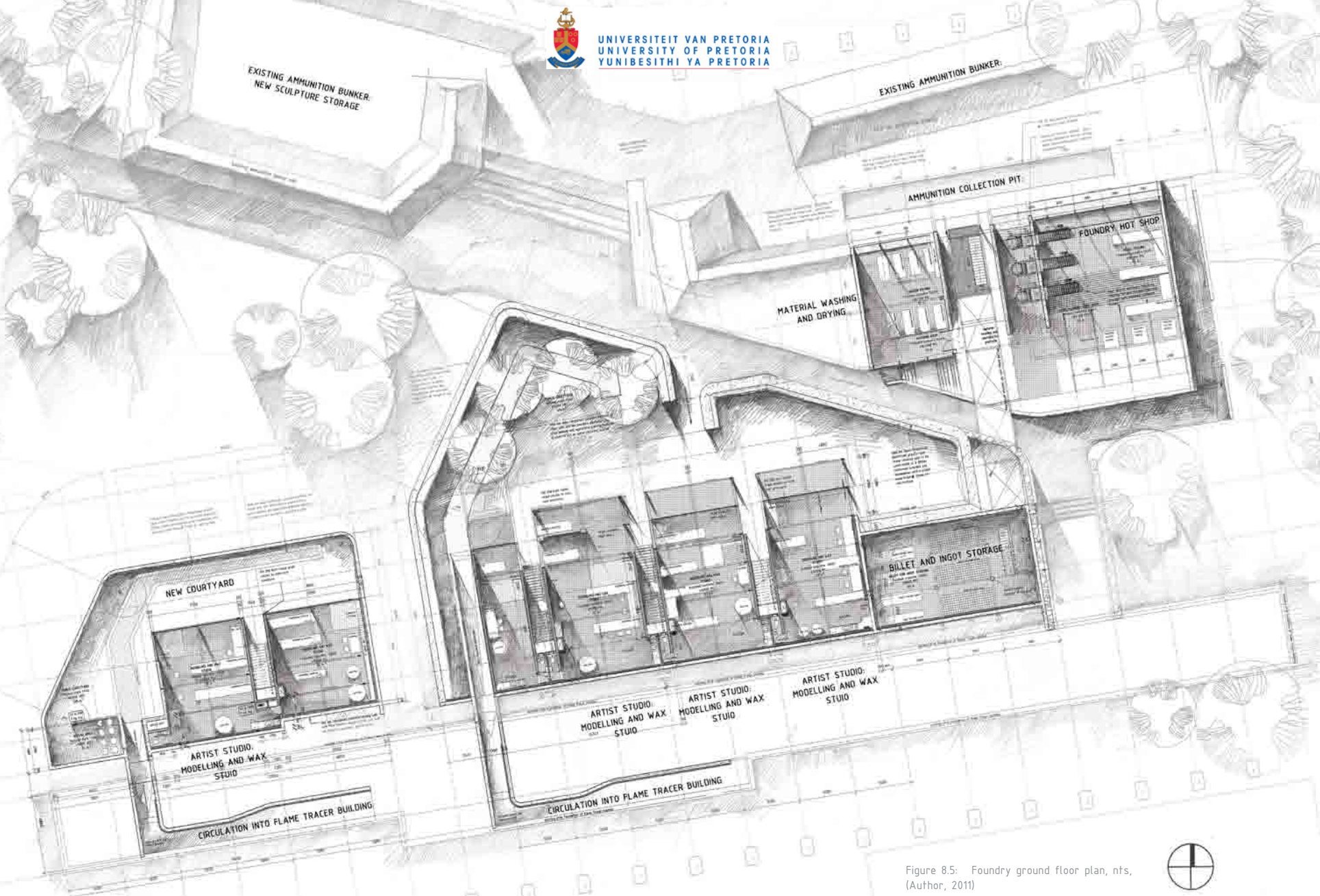


Figure 8.5: Foundry ground floor plan, nts, (Author, 2011)

Figure 8.6: Foundry first floor plan, nts (Author, 2011)

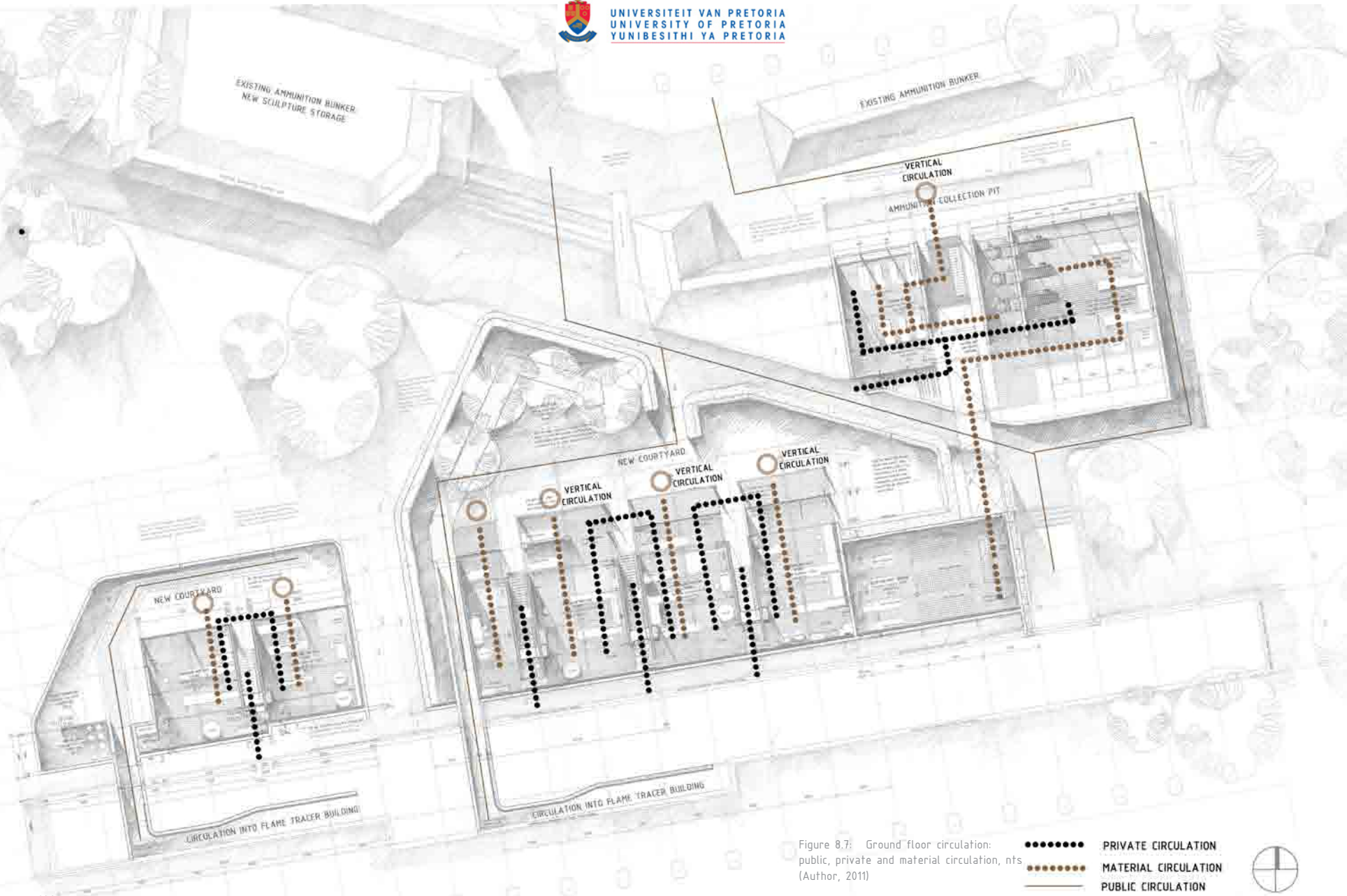


Figure 8.7: Ground floor circulation: public, private and material circulation, nts (Author, 2011)

In the design, public circulation is not reduced to a set of predetermined routes, but is rather open for individual exploration and discovery. The visitor could either enter the foundry from the new courtyard spaces at the artist studios, or enter through the submerged tunnel at the main foundry tower. In both cases the order of foundry experiences function as a linear process. In the existing Flame Tracer building the public circulation route is set out in accordance with safety concerns, fire regulations and experiential quality.

Private circulation on site is also incorporated into the design by means of privatised bridges and corridors. The artists' and foundry workers' circulation routes function in accordance to foundry processes, material distribution and handling. Private vehicular access is provided at the eastern and western perimeters of Magazine Hill, serving the artists and the military respectively.

The third main circulation consideration deals with the distribution of raw material on site. The military would enter Magazine Hill at the western gate, disposing all raw material at a drop of zone provided in the western submerged ammunition bunker. From this point, raw material (empty ammunition cartridges) is distributed via the existing wagon routes that now serve as a public circulation platform. In this instance, the integration of public and material circulation strengthens experiential quality in terms of sensory experience (sound of empty cartridges dumped in bunker and visually distributed through the site).

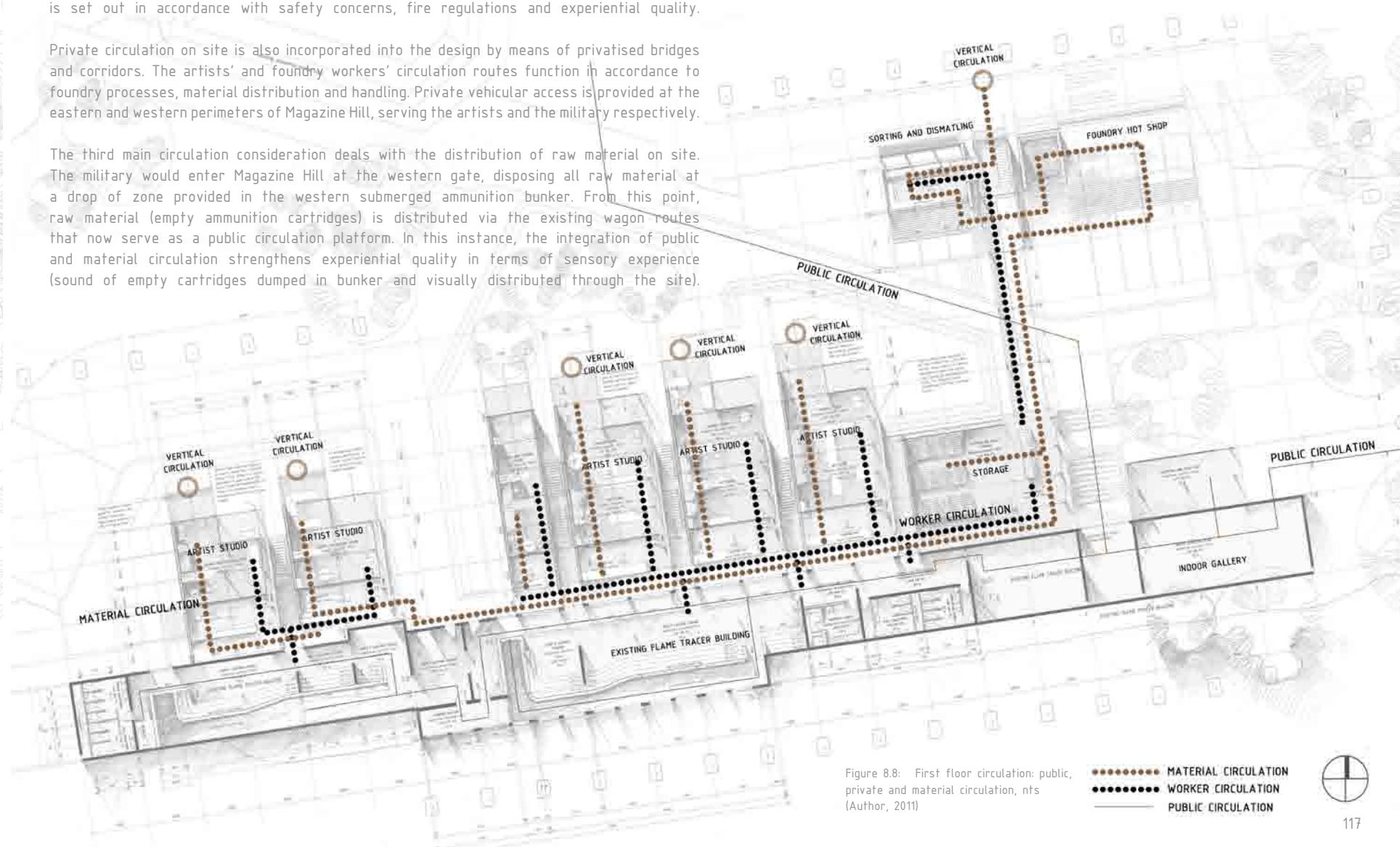
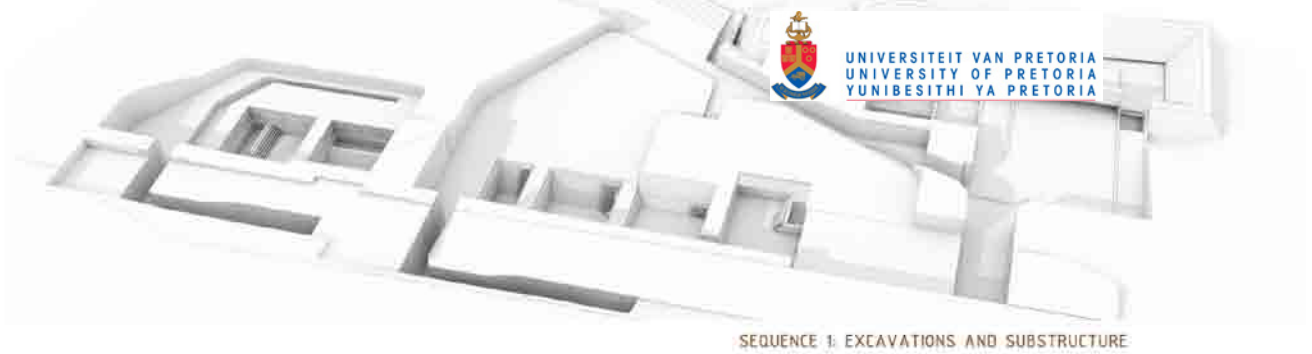
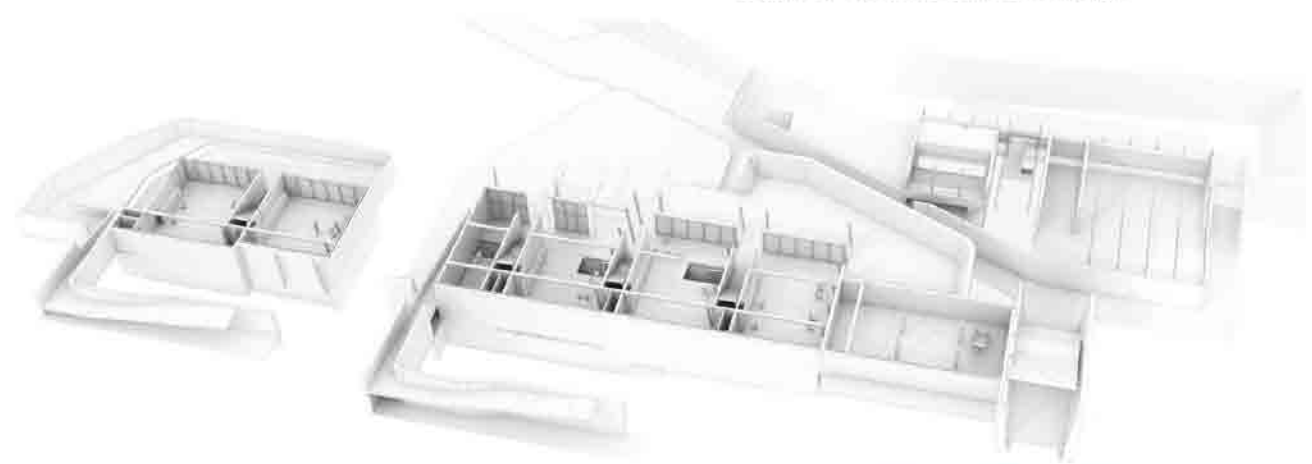


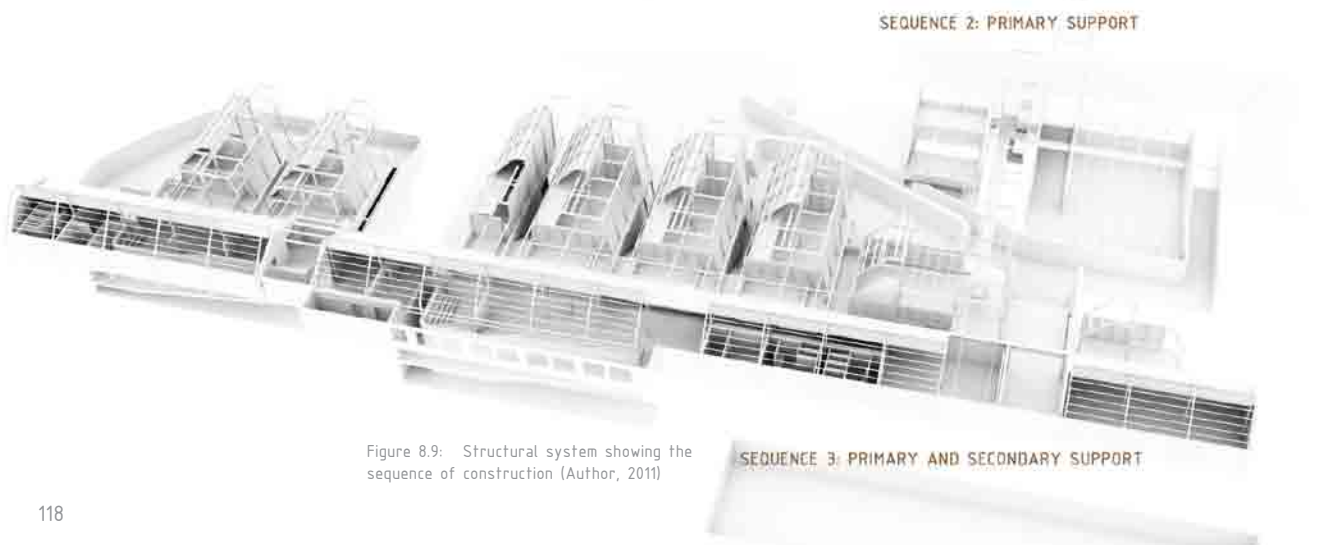
Figure 8.8: First floor circulation: public, private and material circulation, nts (Author, 2011)



SEQUENCE 1: EXCAVATIONS AND SUBSTRUCTURE



SEQUENCE 2: PRIMARY SUPPORT



SEQUENCE 3: PRIMARY AND SECONDARY SUPPORT

Figure 8.9: Structural system showing the sequence of construction (Author, 2011)

8.4 Structural systems

The structural system of the proposed intervention is discussed as three interdependent structural entities that constitute the building syntax, namely substructure, superstructure and layered skins.

8.4.1 Substructure

This construction element does not only support the lateral imposed loads of the superstructure, but also serves as the main connection platform between the existing submerged bunker spaces, the foundry and the existing Flame Tracer building floor level. The slope of Magazine Hill introduces great level differences between existing structures, allowing for a 3 meter change in level between the 2 reused buildings in the design. This topographic disruption is bridged by the foundry courtyard substructure, which acts as the first vertical threshold against the slope. The substructure excavation allows for the alignment of workable levels between the reused bunker and the existing Flame Tracer building, by introducing a series of reinforced concrete ramps and precast concrete stairs into the substructure. These circulation platforms in the new excavation also serve as outdoor storm water channels that distribute excess runoff over a large area on the site. The stereotomic quality of the new substructure forms an analogy of the existing construction typology, allowing for structural integration between the stereotomic existing and the new tectonic artist studios which is perceived as hovering over the stereotomic courtyard. The sub structure forms the support frame for the artist studios, providing the different work spaces with a continuous basement for sculpture storage. The northern slanted basement wall consist of hand packed precast interlocking concrete block that is laid on a slanted angle of retention to allow for larger sculptures to slide into basement storage.

8.4.2 Superstructure

This structural system consists of primary and secondary support frames, which form the fixing platforms for non structural cladding systems, wall systems and roofing structures. The superstructure serves as the tectonic transformation of the stereotomic substructure, which suggests new structural addendums to the existing fabric. The primary structure comprises of an IPE 200 hot rolled steel column and beam system that translates into the substructure. Structural IPE 200 profiles in the artist studios are bent off site @ 43 degree angles to form a curved interior space in the top part of the studio. The primary structure therefore creates augmented interior space that mimics confined military space on Magazine Hill.

The secondary support frames comprise of 125x50x20x3 cold formed lipped channels and 200x75x20x3 hot rolled parallel flange channels depending on the roof span and overhang. This support system allows for the fixing of ceiling panels that define interior space of artist studios, fluorescent lighting fixtures and composite sliding wall panelling that optimises adaptability of work space. The secondary support frames further provide a fixing platform for the 12mm plywood roofing substructure that is fixed at 2500 mm centers. The plywood sub structure provides a flush surface for waterproofing, fire proofing and application of curved roofing material.

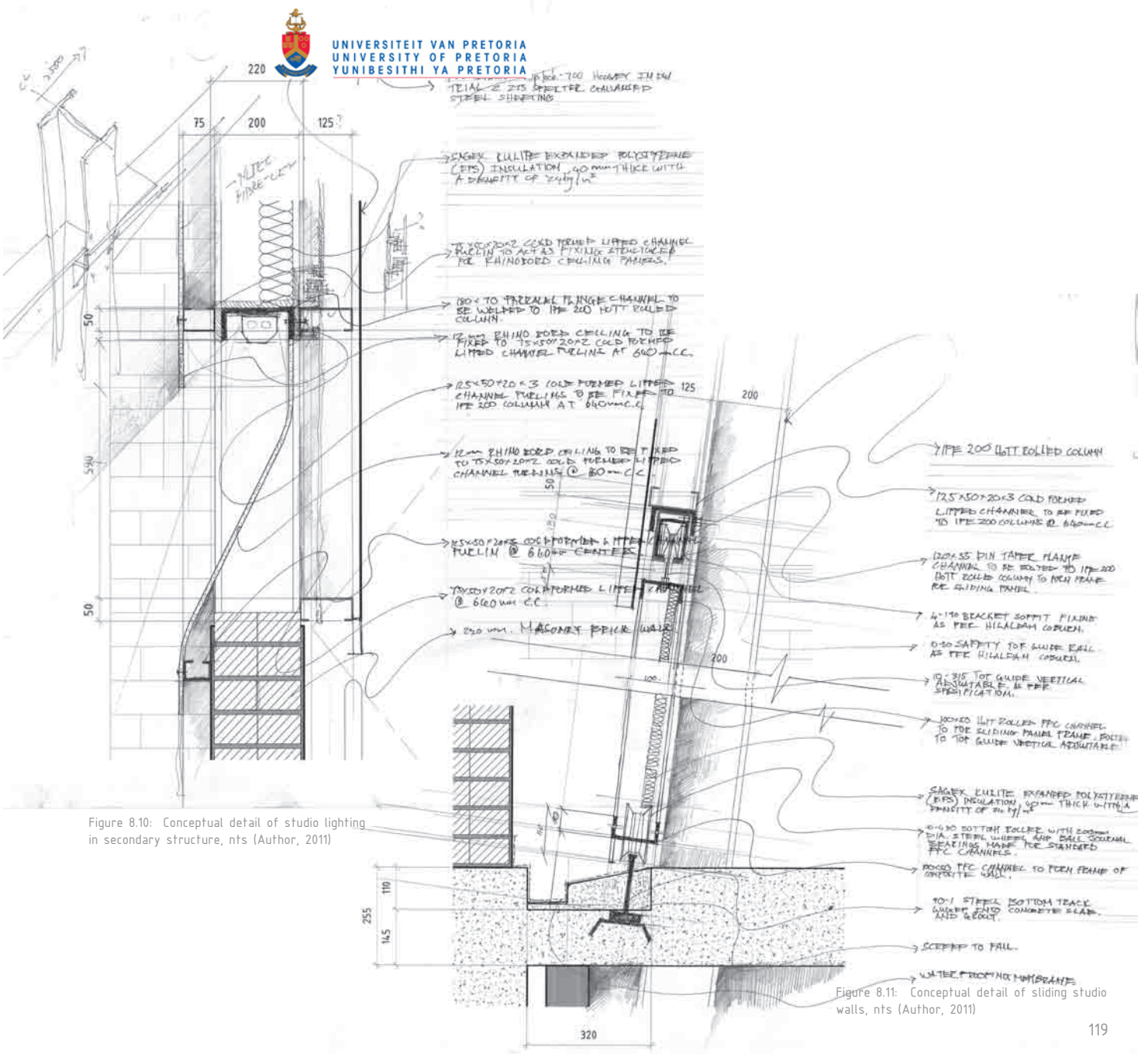


Figure 8.10: Conceptual detail of studio lighting in secondary structure, nts (Author, 2011)

Figure 8.11: Conceptual detail of sliding studio walls, nts (Author, 2011)

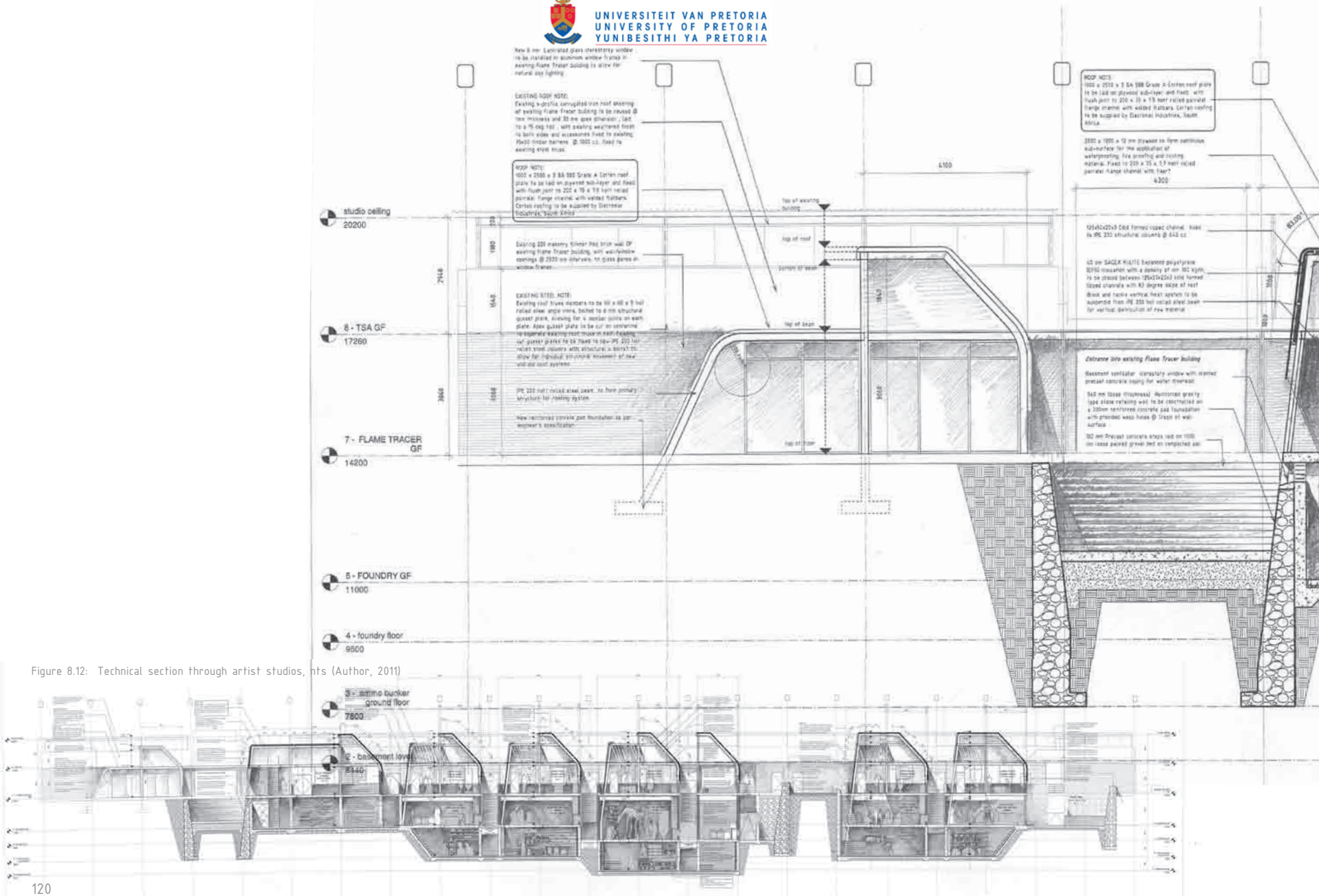
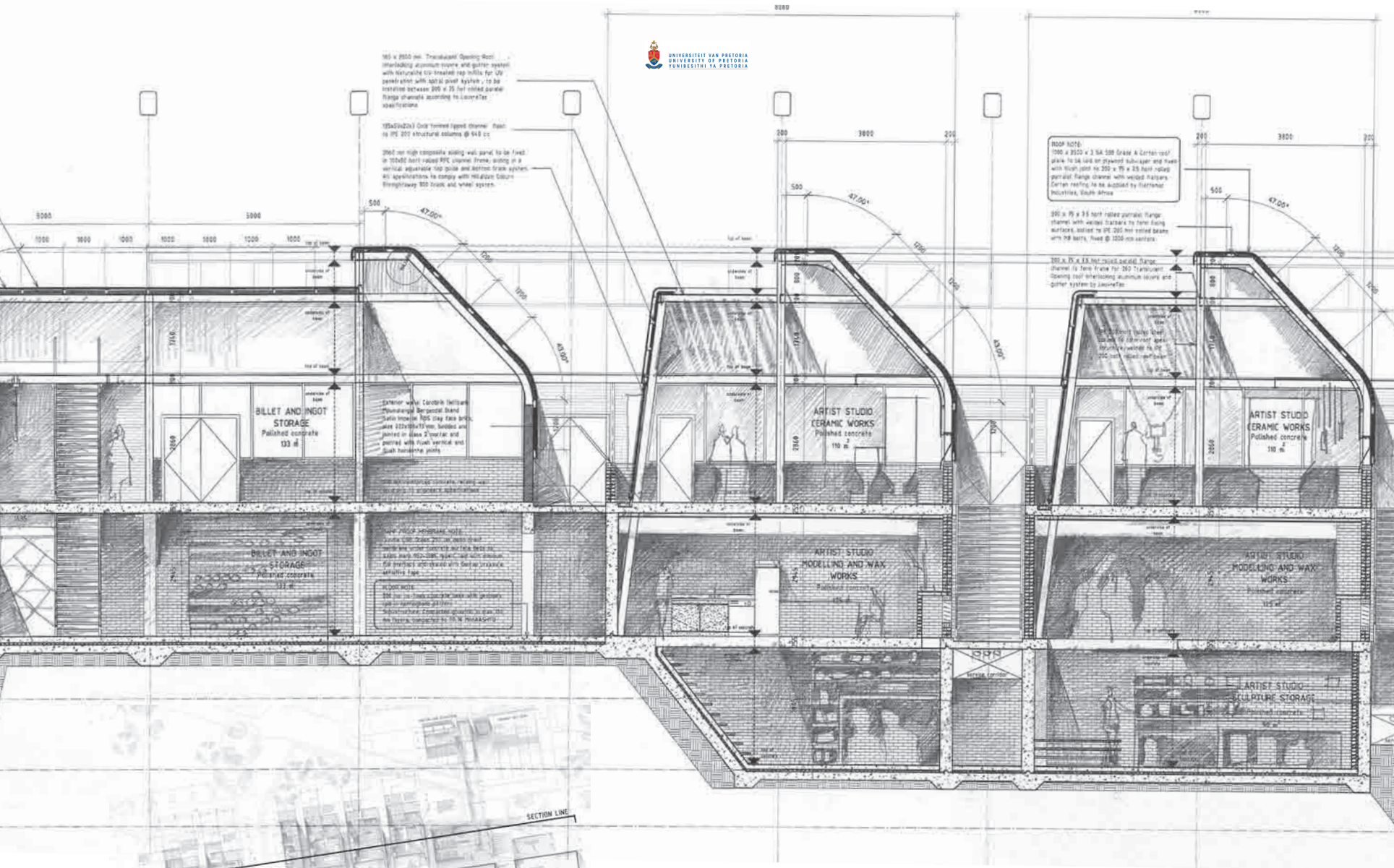
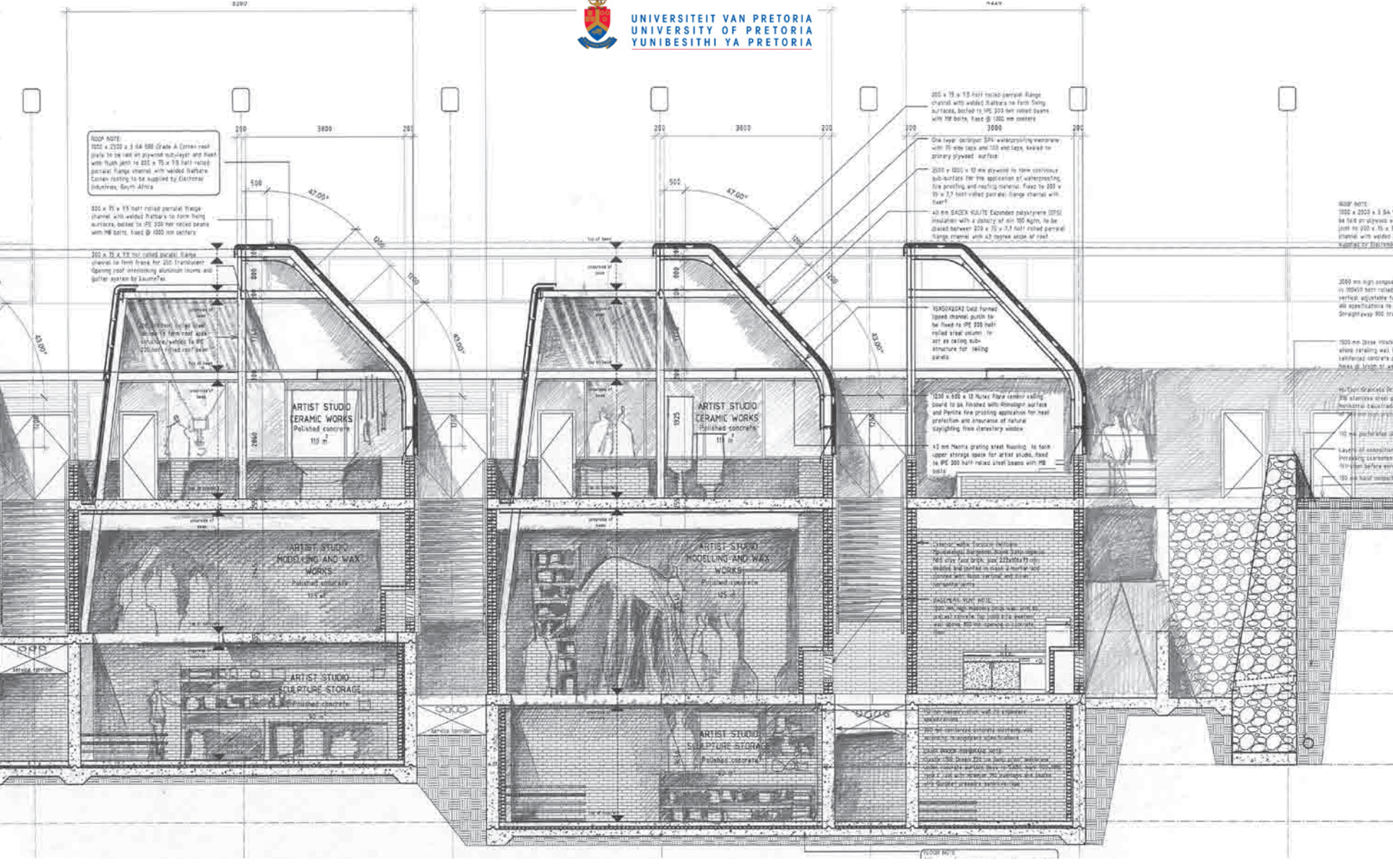
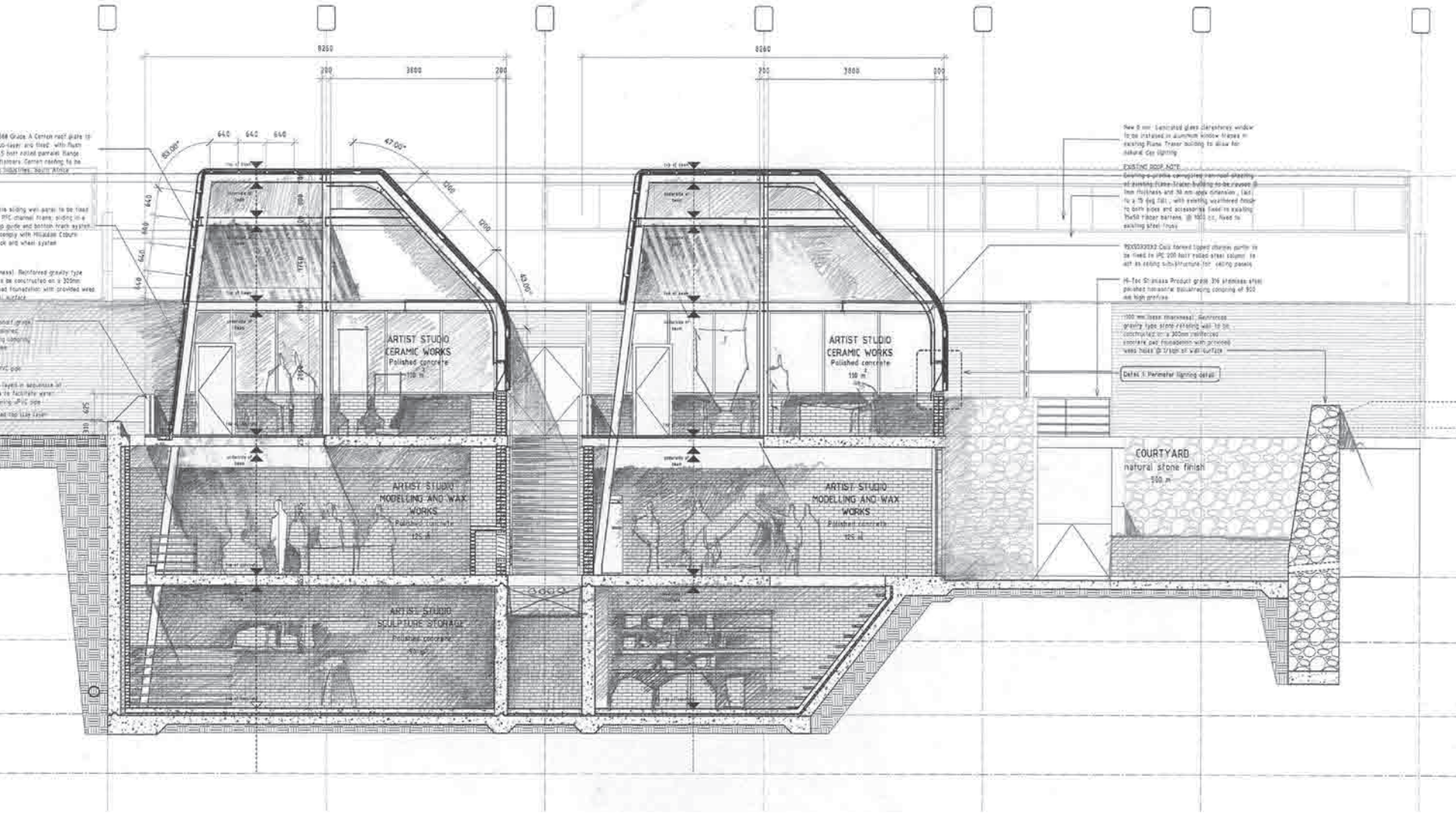


Figure 8.12: Technical section through artist studios, hts (Author, 2011)


BILLET AND INGOT STORAGE
Polished concrete
133 m²
BILLET AND INGOT STORAGE
Polished concrete
331 m²
ARTIST STUDIO CERAMIC WORKS
Polished concrete
110 m²
ARTIST STUDIO MODELLING AND WAX WORKS
Polished concrete
ARTIST STUDIO CERAMIC WORKS
Polished concrete
110 m²
ARTIST STUDIO MODELLING AND WAX WORKS
Polished concrete
ARTIST STUDIO SCULPTURE STORAGE
Polished concrete
ROOF NOTE:
1080 x 8550 x 2.5A 300 Grade A Corten roof plate to be laid on plywood sub-layer and fixed with flush joint to 200 x 75 x 3.5 hot rolled parallel flange channel with welded mallpers. Corten roofing to be supplied by Hartenaar Industries, South Africa
200 x 75 x 3.5 hot rolled parallel flange channel with welded mallpers to form facing surfaces, bolted to IPE 200 hot rolled beams with M8 bolts, fixed @ 1200 mm centers
200 x 75 x 3.5 hot rolled parallel flange channel to form frame for 350 Translucent Opening roof interlocking aluminium louvre and gutter system by LouvreTec
SECTION LINE


ROOF NOTE:
1200 x 2500 x 3 BA 688 Grade A Corten roof plate to be laid on plywood sub-layer and fixed with flush joint to 200 x 75 x 9,5 hot rolled parallel flange channel with welded flatbars Corten roofing to be supplied by Electrotar Industries, South Africa
200 x 75 x 9,5 hot rolled parallel flange channel with welded flatbars to form fixing surfaces, bolted to IPE 200 hot rolled beams with M8 bolts, fixed @ 1000 mm centers
300 x 75 x 9,5 hot rolled parallel flange channel to form frame for 250 Translucent Opening roof interlocking aluminium louvre and gutter system by Laurmet as
ARTIST STUDIO CERAMIC WORKS Polished concrete 110 m²
ARTIST STUDIO MODELLING AND WAX WORKS Polished concrete 115 m²
ARTIST STUDIO SCULPTURE STORAGE Polished concrete
Service corridor
200 x 75 x 9,5 hot rolled parallel flange channel with welded flatbars to form fixing surfaces, bolted to IPE 300 hot rolled beams with M8 bolts, fixed @ 1000 mm centers
One layer derbigum SP4 waterproofing membrane with 75 mm laps and 100 end laps, sealed to primary plywood surface
2500 x 1000 x 12 mm plywood to form continous sub-surface for the application of waterproofing, fire proofing and roofing material. Fixed to 200 x 75 x 7,7 hot rolled parallel flange channel with fixer
40 mm SASEX KULITE Expanded polystyrene (EPS) insulation with a density of min 150 kg/m, to be placed between 200 x 75 x 7,7 hot rolled parallel flange channel with a3 narrow side of roof
YSKOR/ZORX 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 Pentire fire proofing application for heat protection and assurance of natural daylighting from clerestory window
43 mm Mannis grating steel flooring to form upper storage space for artist studio. Fixed to IPE 300 hot rolled steel beams with M8 bolts
43.00°
47.00°
500
1200
3000
3800
200


9250
200
3800
200
9280
200
3800
200
640
640
640
45.00°
47.00°
3500
1700
43.00°
ARTIST STUDIO
CERAMIC WORKS
Polished concrete
150 m²
ARTIST STUDIO
CERAMIC WORKS
Polished concrete
150 m²
ARTIST STUDIO
MODELLING AND WAX
WORKS
Polished concrete
150 m²
ARTIST STUDIO
MODELLING AND WAX
WORKS
Polished concrete
150 m²
ARTIST STUDIO
SCULPTURE STORAGE
Polished concrete
COURTYARD
natural stone finish
550 m
Detail 1: Perimeter lighting detail

The structural aesthetic on Magazine Hill combines a series of building materials. For the purpose of the dissertation, it was not only important to study the composition and arrangement of existing materiality on site, but also the weathered state of building elements that contribute to the mysterious and abandoned quality of the terrain. In the opinion of the author all new proposed building materials should not compromise the unique deteriorated state of the site, but rather enhance this quality, expressing architecture's mortality through the process of ageing. The use of contemporary materials is therefore specified to form analogies of deteriorated fabric, where structural detailing is executed to promote weathering and staining of contemporary materials. By implementing this technical concept, the new foundry does not only commemorate the history and past of Magazine Hill, but also the site's inherent physical qualities of the present.

Proposed brickwork in the use of the super- and substructure had to comply with existing Kirkness and red brickwork aesthetic of Magazine Hill, therefore a Firelight Travertine Imperial FBX brick by Corobrik is specified. This face brick is manufactured in Gauteng, therefore minimising transportation costs of material distribution. The Firelight Travertine brick has a slight efflorescence rating which means that a white crystallised deposit occurs on the surface of the brick as water evaporates and the salt is trapped in the brick pores (Corobrik, 2011). This quality of the brick implies that the Travertine is semi porous, therefore the material can absorb the oxidation deposits of the weathering steel roof, promoting staining and weathering of the new foundry building.

The existing ammunition bunkers consist of 3 m high hardened cement bags that form slanted retaining walls, which is hand packed on a mortar less natural stone core. These stereotomic walls define the submerged bunker space in the natural landscape. New landscaping walls are constructed from loose packed natural stone, therefore forming an analogy of the existing bunkers walls. Proposed reinforced gravity type retaining walls define the new courtyard, further incorporating the existing structural syntax.

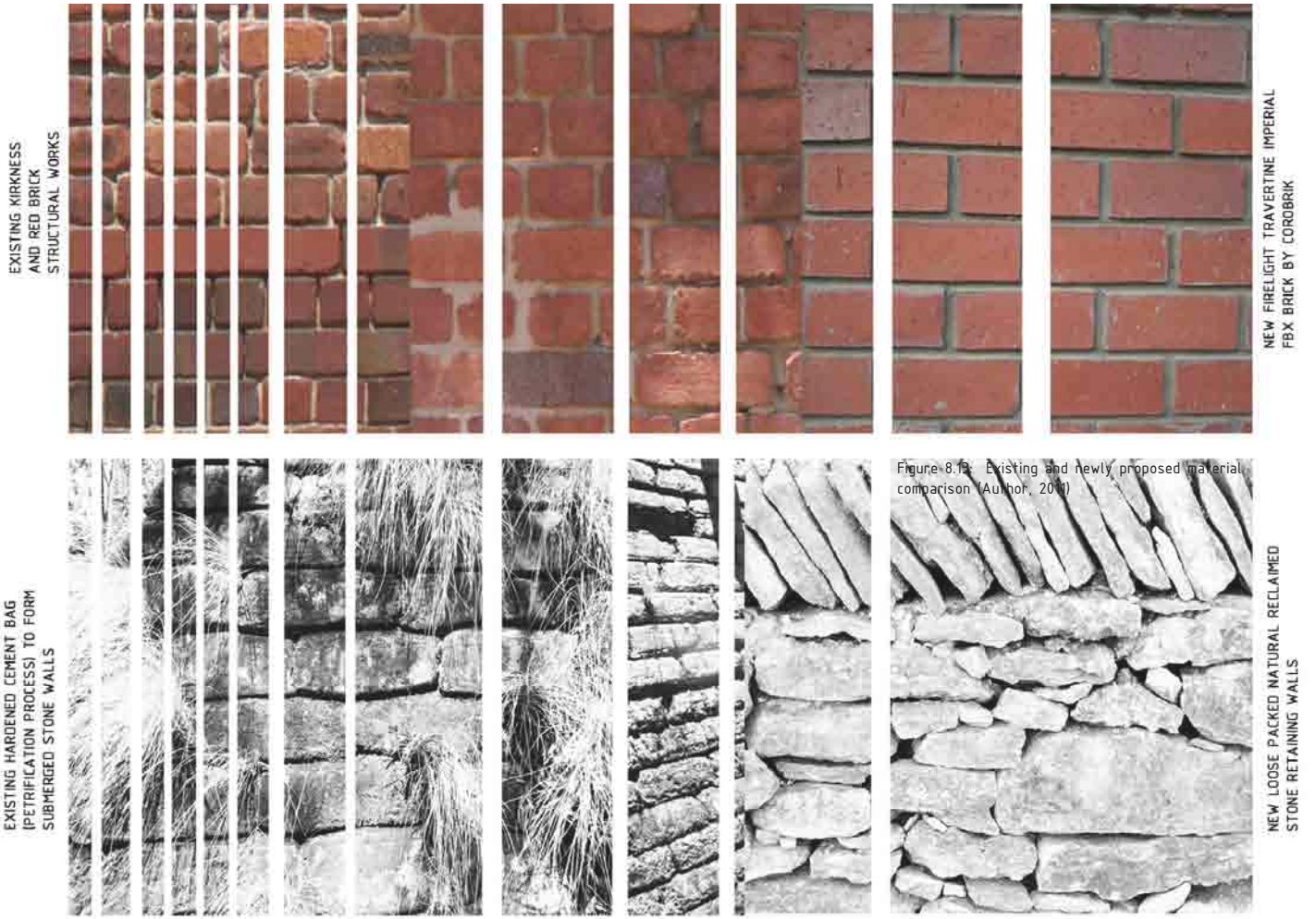


Figure 8.12: Existing and newly proposed material comparison (Author, 2011)

The existing Flame Tracer building roofing system consists of s-profile corrugated iron roof sheeting, laid to a 15 degree fall, fixed to 75x50 timber battens. This building is to be reused in the foundry design as public circulation space, where artist metal castings can be viewed from a confined existing space. The corrugated iron sheets are severely weathered, with oxidised deposits covering the exterior surface. A 3mm SA 588 grade A corten steel roofing system is proposed to be installed on the adjacent artist studios, symbolising an extension of the existing weathered roof. The weathering steel produces an oxidised deposit that stains the porous substructure, creating the illusion of a building bleeding into the landscape.

Many existing buildings on Magazine Hill, including parts of the Flame Tracer building, are in a critical condition due to the removal of the roofing material. This aspect results in exposed roof trusses that cast deep shadows into interior spaces. This interior light quality of existing buildings on site is translated into the design by means of a translucent roofing system, defining studio and foundry spaces vertically. The Translucent Opening Roof interlocking aluminium louvre and gutter system with Naturelite UV treated top infills is proposed to be fixed to the primary support frames. When closed, the roof forms a weatherproof surface, while allowing for light penetration through the Naturelite panels (LouvreTec: 2010). This design element integrates existing and new spatial and light qualities while adhering to programmatic requirements

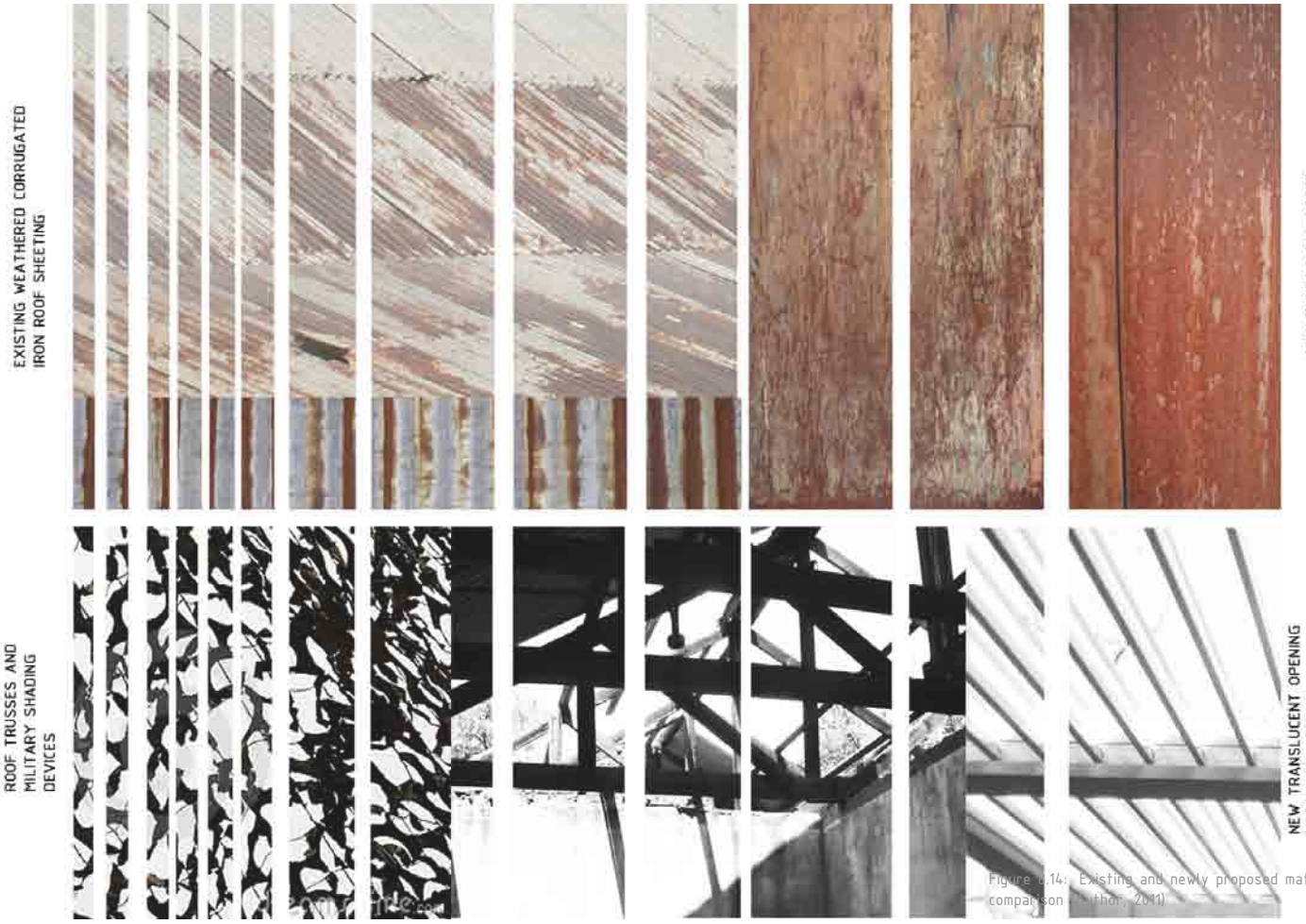


Figure 4.14: Existing and newly proposed material comparison (Author, 2011)

8.6 Building components and systems

8.6.1 The furnace tower

Water management

As mentioned in Chapter 7, the foundry tower process incorporates the sorting, dismantling, washing, drying, melting and casting foundry procedures. All mentioned processes functions as separate systems that form integrated water harvesting, heat transfer and ventilation strategies. The first recycling system focuses on water management, where the spent ammunition cartridges are washed in soap less water to dispose of cordite remnants in casing cavities. A series of washing tables also serve as drying baths as bottom plugs are removed for water drainage. These multi functional tables alternate between washing and drying processes within the production period of 60 minutes, based on the processing time of the melting furnaces.

As the plugs are removed, water accumulates down a screed to fall into a grey water storage tank, located in the basement. From this point grey water is distributed through a biofliter system located in the existing ammunition bunker, which comprises of natural boulders and nitrate absorbing hydrological vegetation. As water filters through the system, rising water levels trigger the submersible pump to distribute recycled water to the storage tank located on the stair apex. Water is recycled three times before it is utilised for secondary purposes on site. Recycled water is only utilised for washing and sanitary purposes.

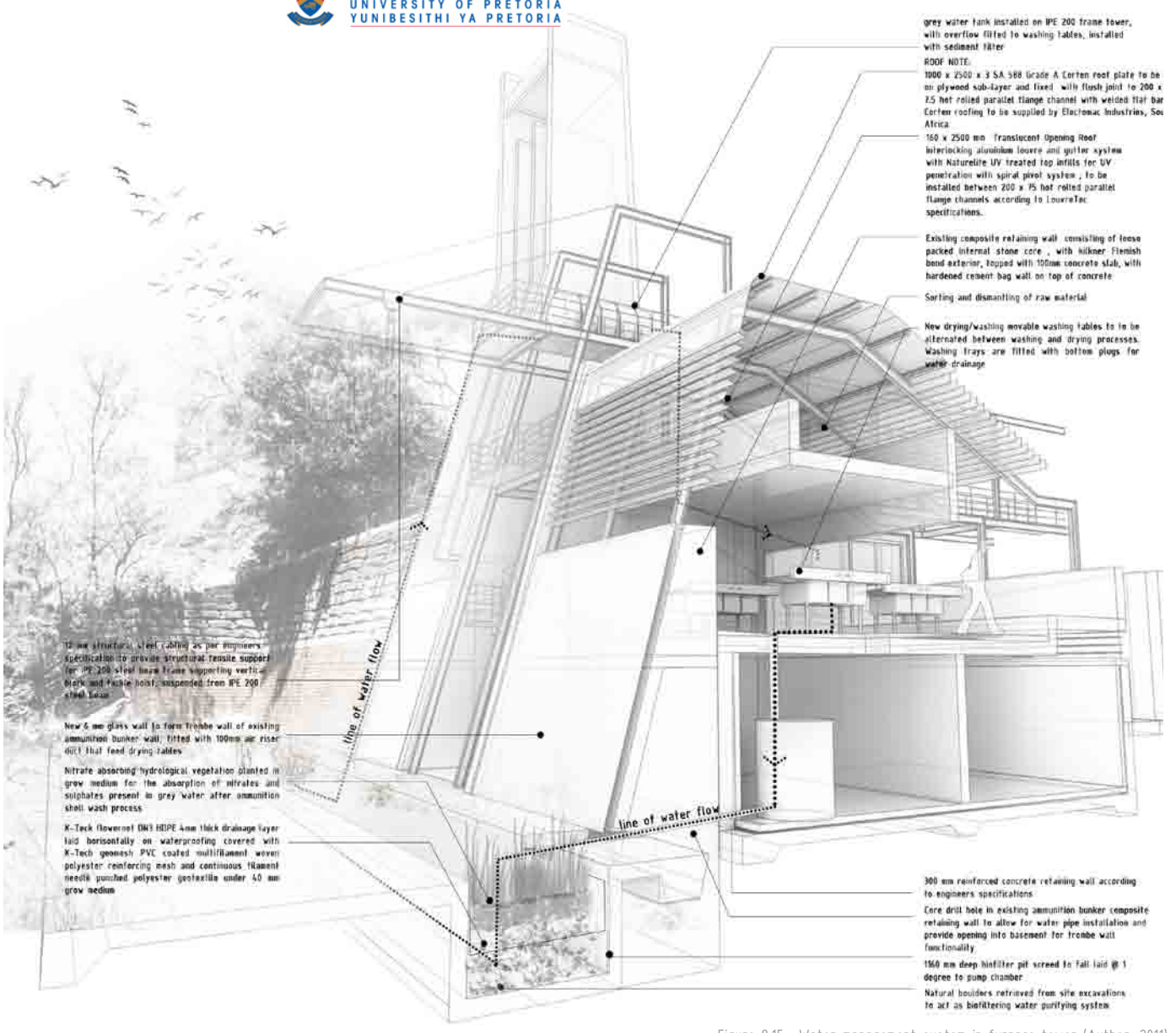


Figure 8.15: Water management system in furnace tower (Author, 2011)

Heat transfer

A heat transfer strategy is incorporated to enhance the drying process of raw material after washing. The existing composite retaining wall is adaptively reused as a trombe wall system because of the wall's northern orientation (exposure to solar radiation) and massive characteristic. A 7 meter wall strip is fitted with a clear glass facade to form a pressure cavity between the glass and existing wall. Openings that connect the cavity with the adjacent basement interior are core drilled through the existing bunker wall. External openings are provided in the basement for fresh air intake. As the trombe wall heats up, air pressure differences allows air to circulate from basement interior into trombe wall cavity where the air temperature rises drastically, therefore ventilating the basement while providing hot air that is utilised in the drying process.

Foundry ventilation

Foundry space is ventilated through the Translucent Opening Roof interlocking louvre system, which allows for natural day lighting of workspace, while providing direct vertical heat extraction. Therefore cross and stack ventilation are alternated options, depending on weather and climatic conditions.
.

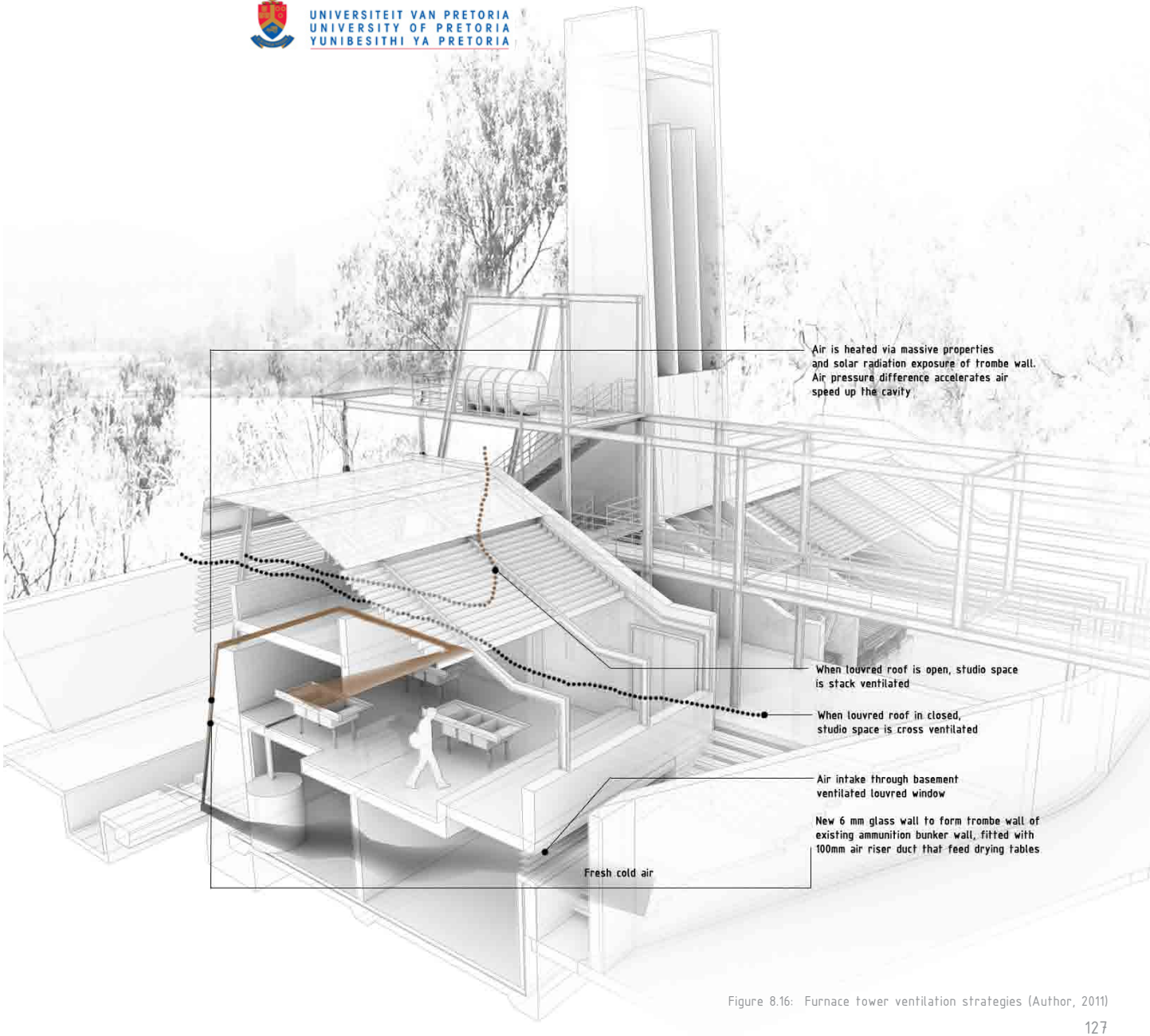


Figure 8.16: Furnace tower ventilation strategies (Author, 2011)

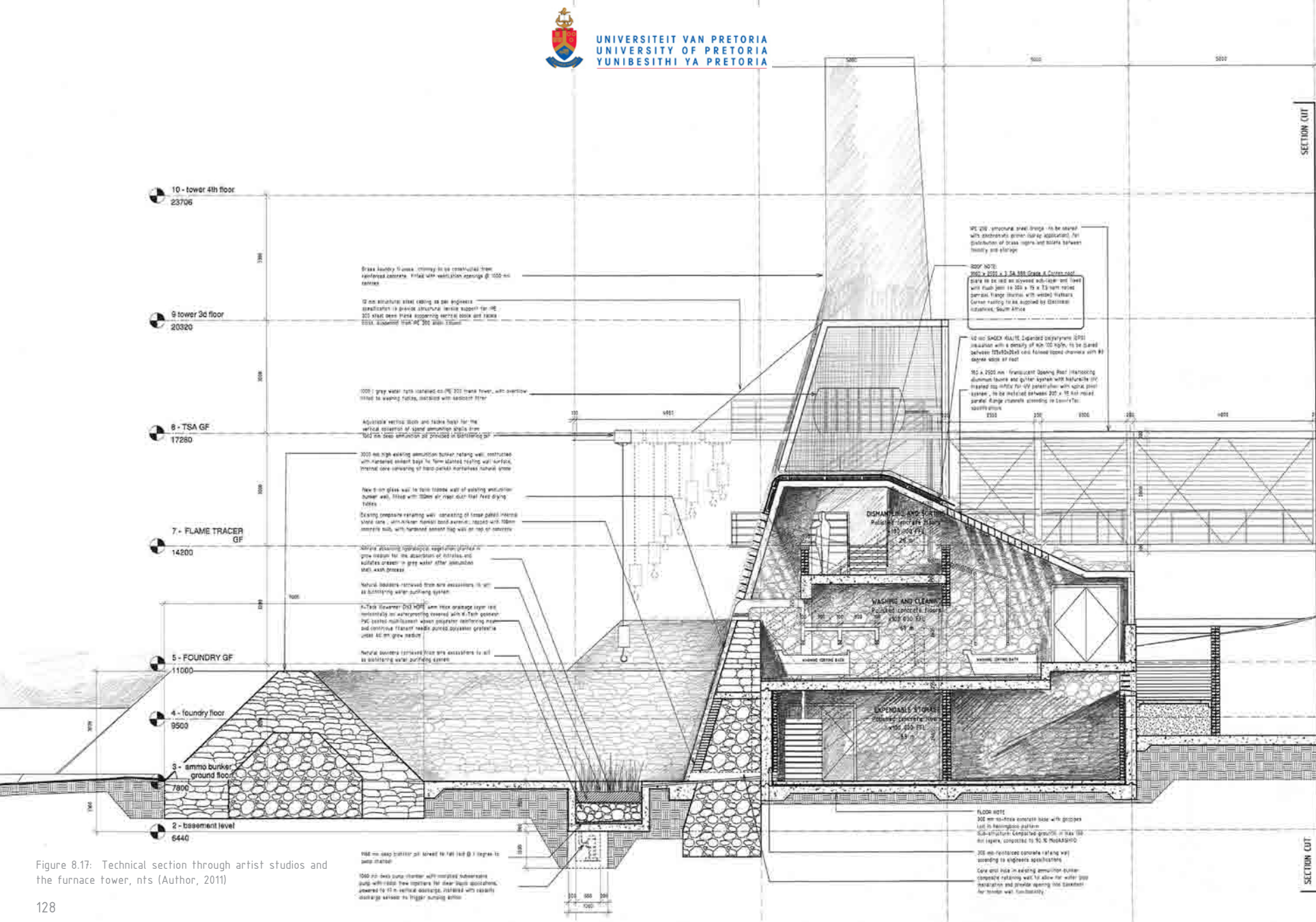
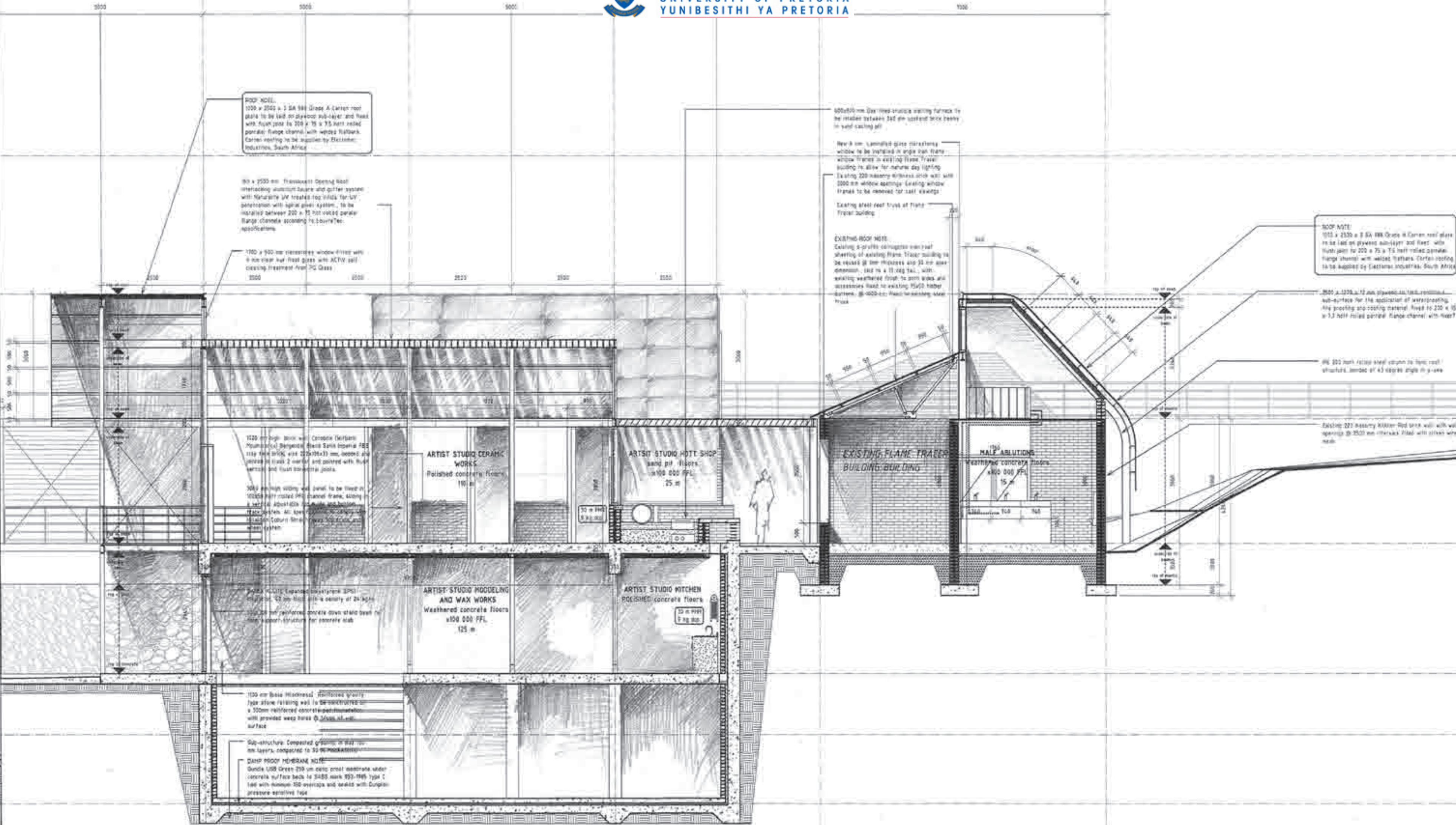


Figure 8.17: Technical section through artist studios and the furnace tower, nts (Author, 2011)


ARTIST STUDIO CERAMIC WORKS
Polished concrete floors
ARTIST STUDIO HOTT SHOP
sand pit floors
ARTIST STUDIO MODELLING AND WAX WORKS
Weathered concrete floors
ARTIST STUDIO KITCHEN
POLISHED concrete floors
EXISTING FLAME TRACER BUILDING
MALE ABLUTIONS
Weathered concrete floors
ROOF NOTE:
EXISTING ROOF NOTE:
DAMP PROOF MEMBRANE NOTE:

8.7 The artist studios

Adaptability

The artist studios functions as independent work spaces that could be occupied on a rental basis by different local artists. This series of artist foundries has the adaptive ability to function as double units when companies amalgamate for larger scale sculpting projects. Individual structural adaptability is achieved by the incorporation of removable Mentis grating flooring panels that allow for larger foundry machinery and kilns to be placed on the foundry ground floor level. An opening louver roof system allows the foundry worker to adjust light quality and UV penetration of the non-structural roofing system. The western facade is defined by a stereotomic edge that blocks western solar penetration, while the eastern facade forms an adjustable typology that alternates according to user needs
.

Studio and basement ventilation

Eastern composite sliding walls, modelled on the Hillaldam Coburn Straightaway 900 track and wheel system allows for adjustable options, optimising passive cross ventilation, natural day lighting and extending spatial qualities beyond the limited workshop space. Studio basement ventilation is achieved by introducing light and air shafts into the western facade that form worktop modelling space on the foundry ground floor level. These shafts contain openings with adjustable interlocking louvers, therefore recycling air through cross ventilation.

Services

Service ducts are provided between artist studios, therefore shared between adjacent work spaces. Water supply enters the foundry from the eastern servitude, located next to the service road, through a horizontal excavation between the artist studios and existing Flame Tracer building. Municipal water supply is considered as the primary source of water, where secondary sources consist of rain water, recycled from the slope of Magazine Hill, harvested in the Red Magazine crater. The four main service shafts connect to the municipal servitude located to the north of the foundry next to Magasyn Street.

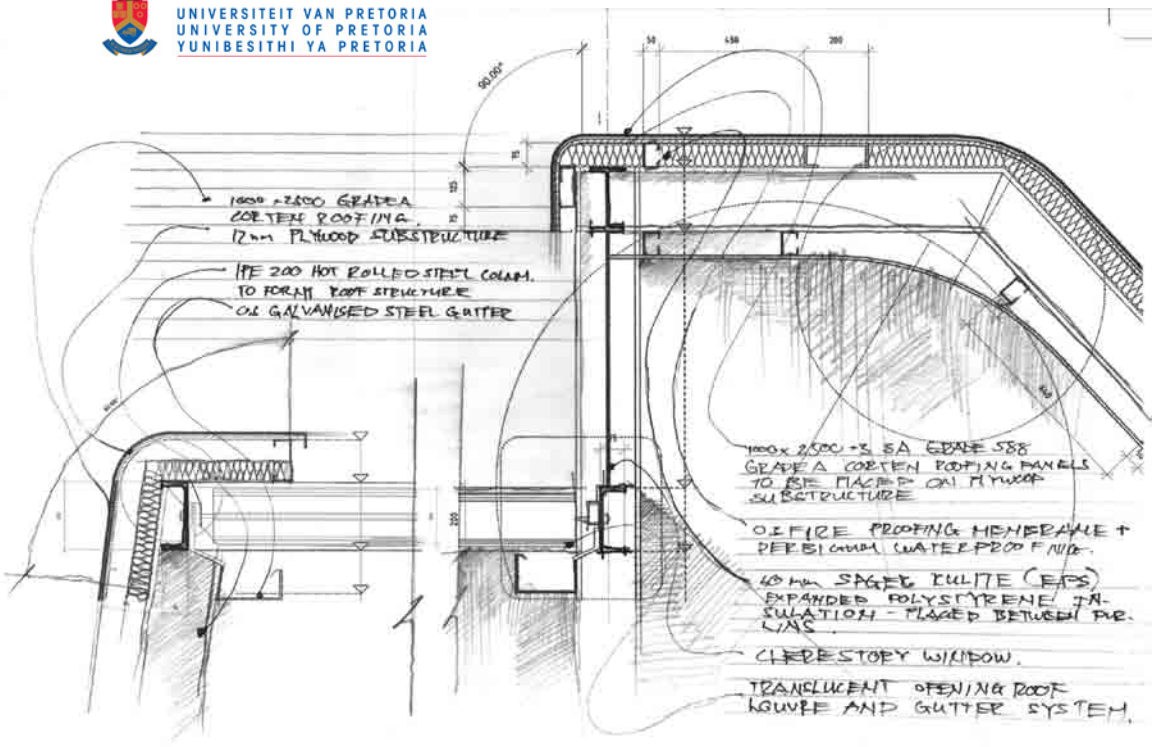


Figure 8.18: Detail of roofing system, nts (Author, 2011)

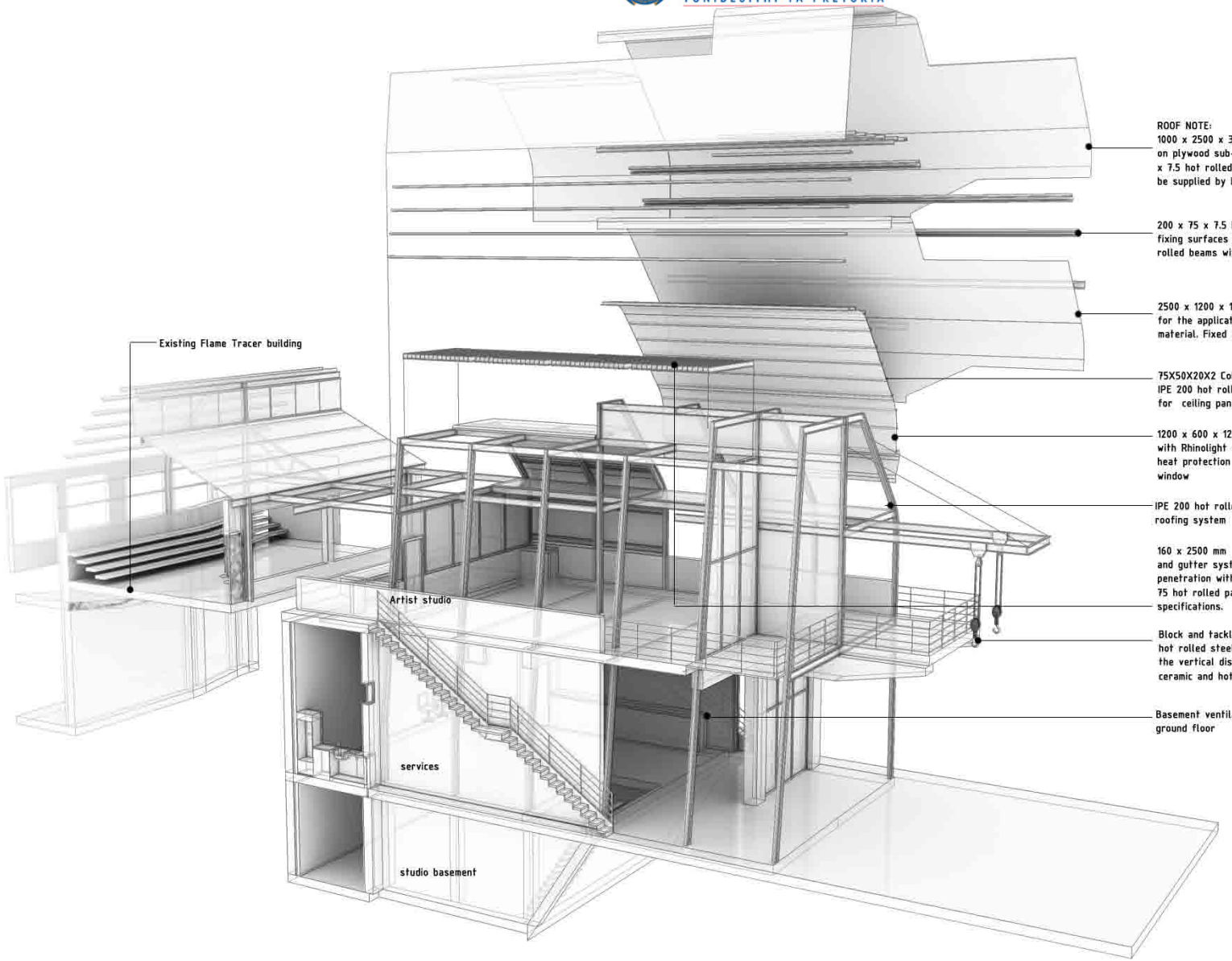


Figure 8.19: Structural exploded view of artist studios (Author, 2011)

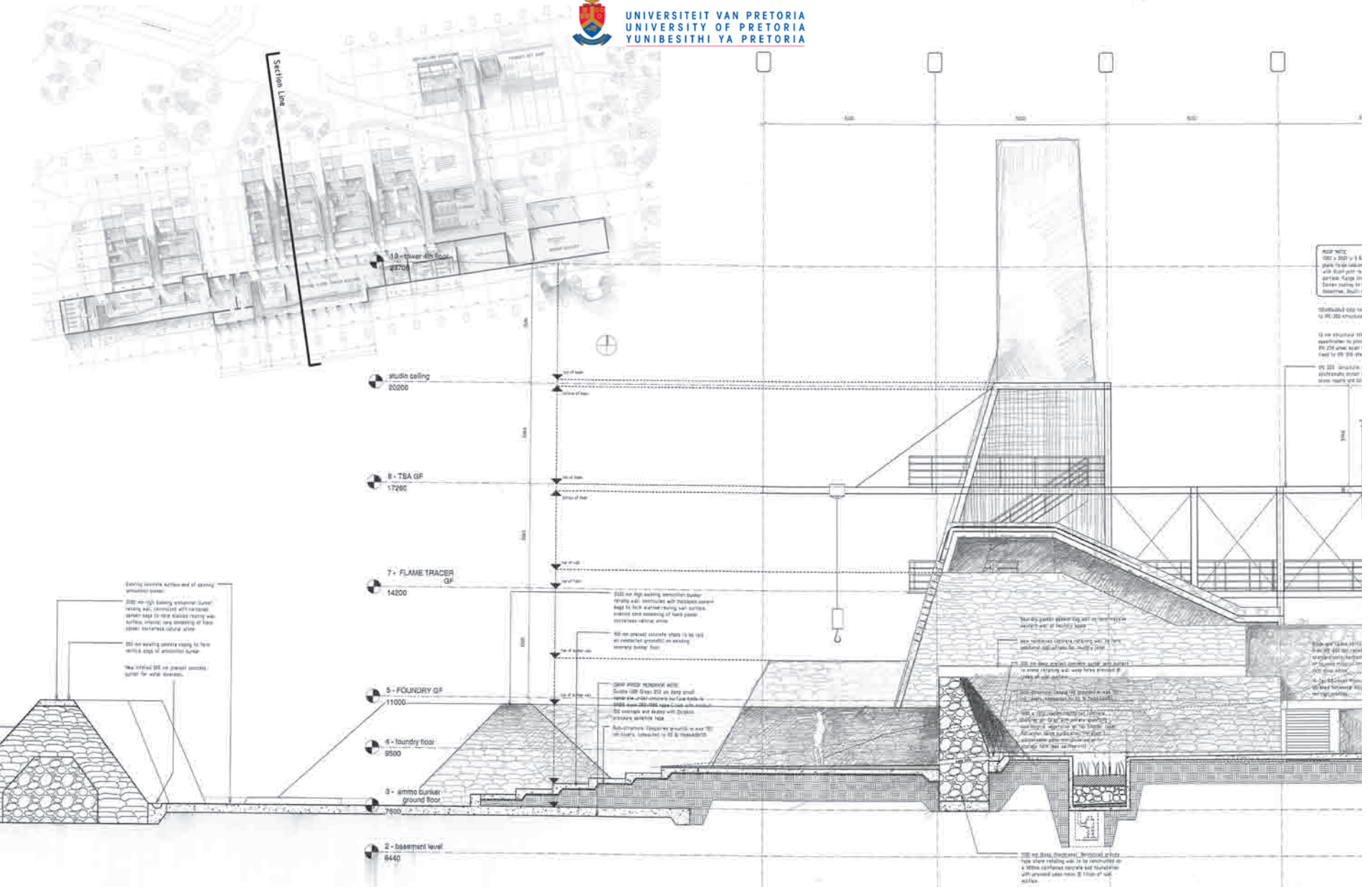
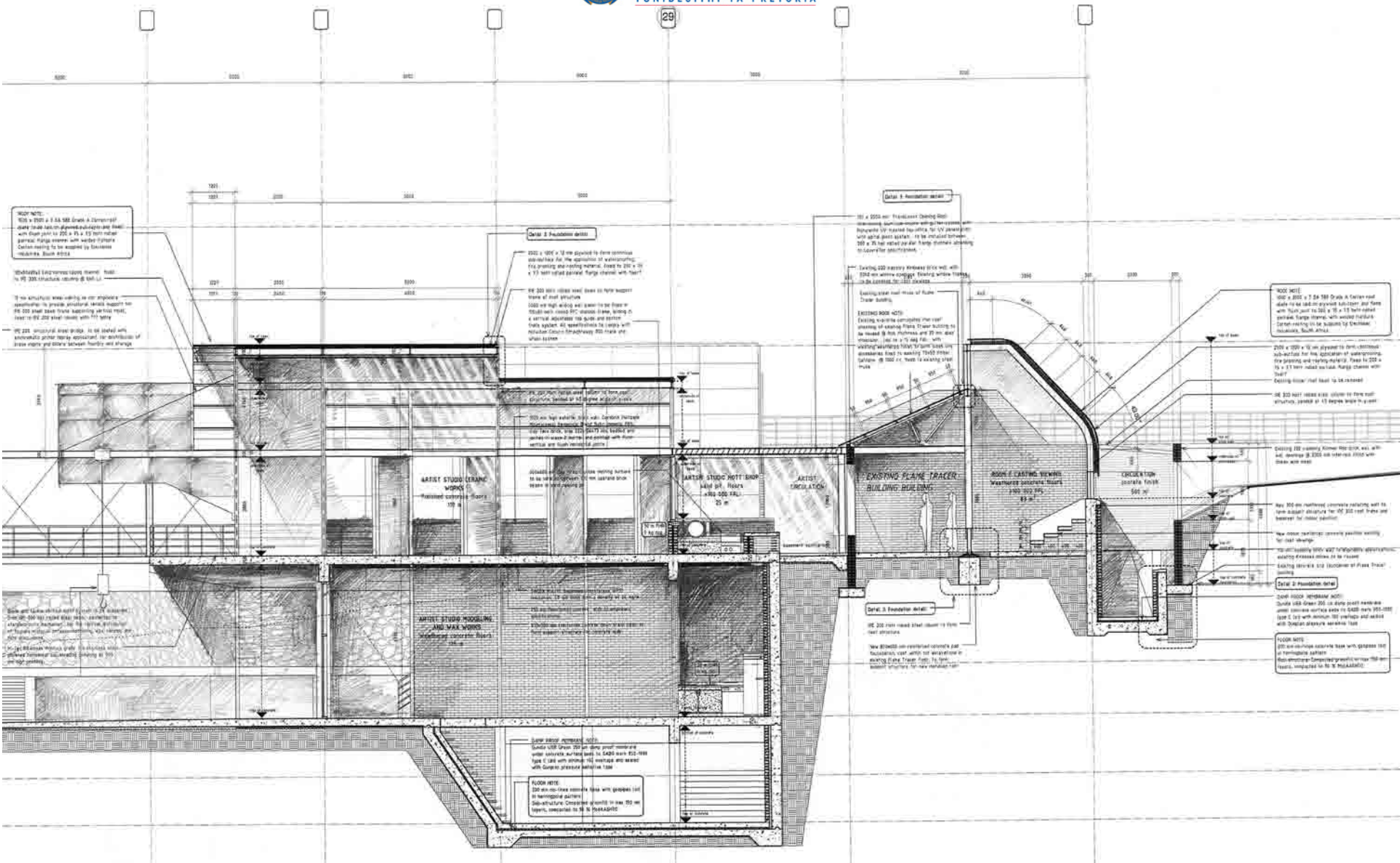


Figure 8.20: Technical section, nts (Author, 2011)


ARTIST STUDIO CERAMIC WORKS
ARTIST STUDIO MODELLING AND WAX WORKS
ARTIST CIRCULATION
EXISTING FLAME TRACER BUILDING BUILDING
ROOF NOTE:
FLOOR NOTE:
Detail 2 Foundation detail
Detail 3 Foundation detail

8.8 Existing Flame Tracer building

Structural integration of new and existing fabric

In the design, the Flame Tracer building serves as a public circulation route, where the process of ammunition reduction is viewed in the artist studios, from within a context of ammunition production (existing Flame Tracer building). It is within this seamless integration of existing and proposed programme that the structural tectonic of new and existing fabric also amalgamate to form a continuous aesthetic. A newly introduced roof is proposed over parts of the existing structure, thus alternating spatial experience between existing and new fabric. An IPE 200 hot rolled steel apex column frame is introduced into the existing building. The structure allows for a 1 meter clear glass frameless clerestory window to be installed on the existing building roof apex. Existing hot rolled composite angle iron steel roof truss members are bolted to 6 mm structural gusset plates that allow 4 member joints on each fixing surface. Apex gusset plates are to be cut on centrelines to separate the existing roof truss in half, which is then fixed to the new IPE roof apex column.

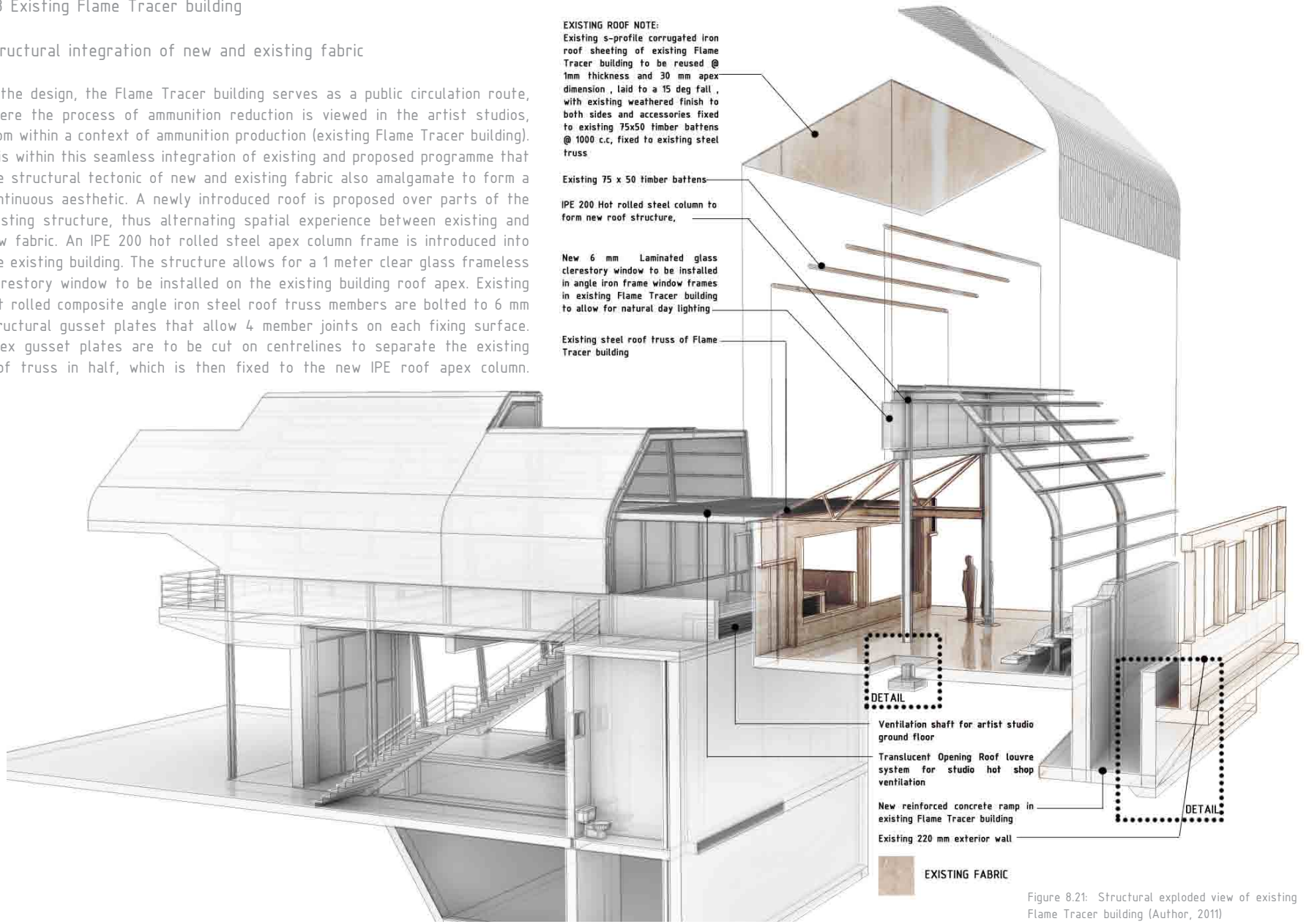


Figure 8.21: Structural exploded view of existing Flame Tracer building (Author, 2011)

All new structural columns are to be fixed to stub column foundations that are located in excavations in the existing Flame Tracer building. The IPE 200 roof apex columns transfer into smaller hot rolled sections that imply a subtle connection with existing fabric. IPE 200 columns are therefore bolted to 100 x 50 x 5 hot rolled parallel flange channels on both sides of IPE flanges to ensure efficient roof load distribution.

New reinforced concrete ramps connect the Flame Tracer building interior with new courtyards, providing an additional circulation platform in the substructure. The ramp is located inside the existing building, where the excavations respect original strip foundation boundaries and structural integrity of the existing exterior wall. The reinforced concrete ramp transfers into a solid balustrade that hides lighting fixtures. At night, directional lighting behind the concrete wall illuminates the weathered interior walls of the Flame Tracer building, emphasising architecture's mortality through contemporary detailing.

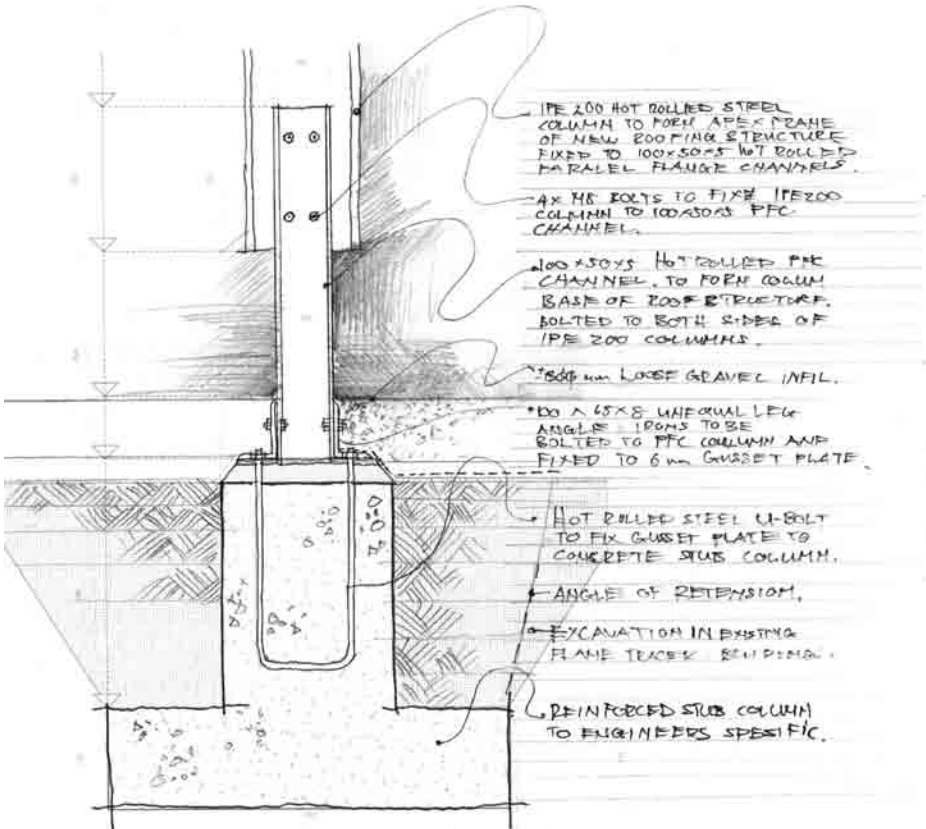


Figure 8.22: New roof column foundation detail, nts (Author, 2011)

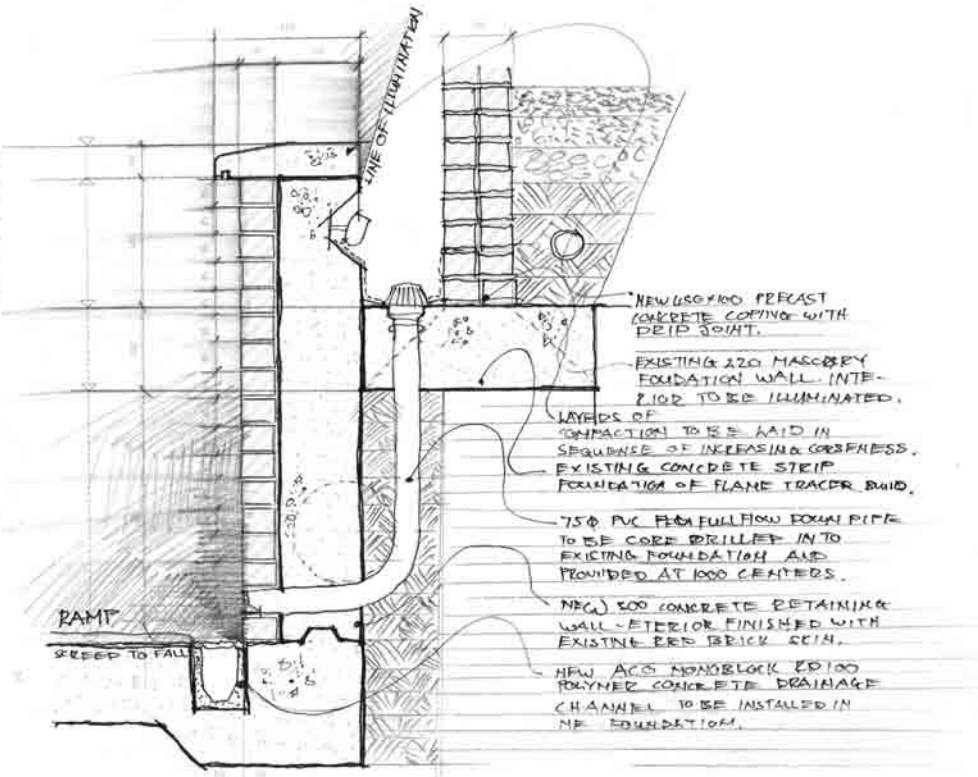


Figure 8.23: New ramp detail illumination the nexisting weathered interior walls, nts (Author, 2011)

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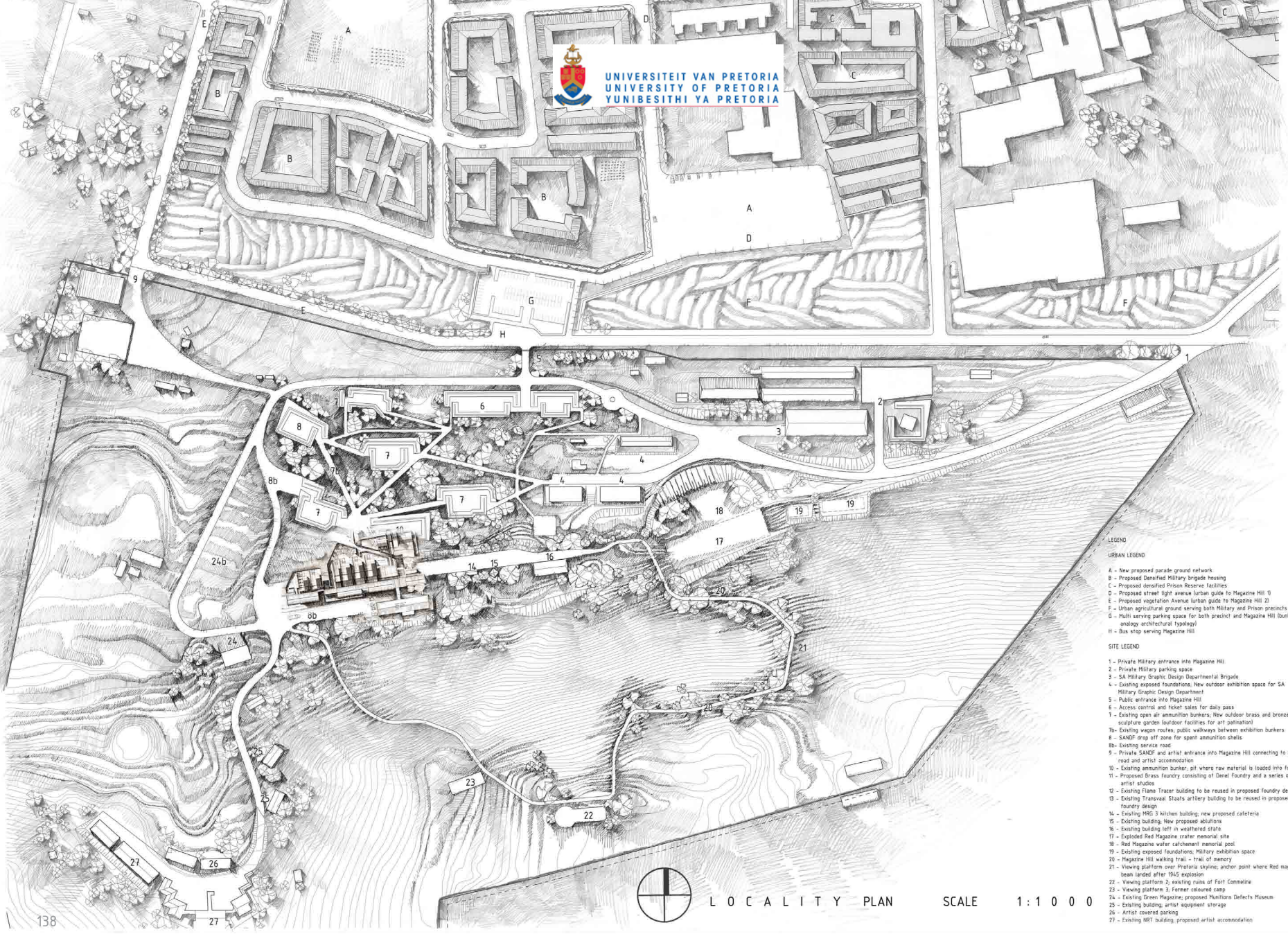
The conclusion includes the final drawings that was presented on 9 November, 2011 during tha final examination



LOCALITY PLAN SCALE 1:1000

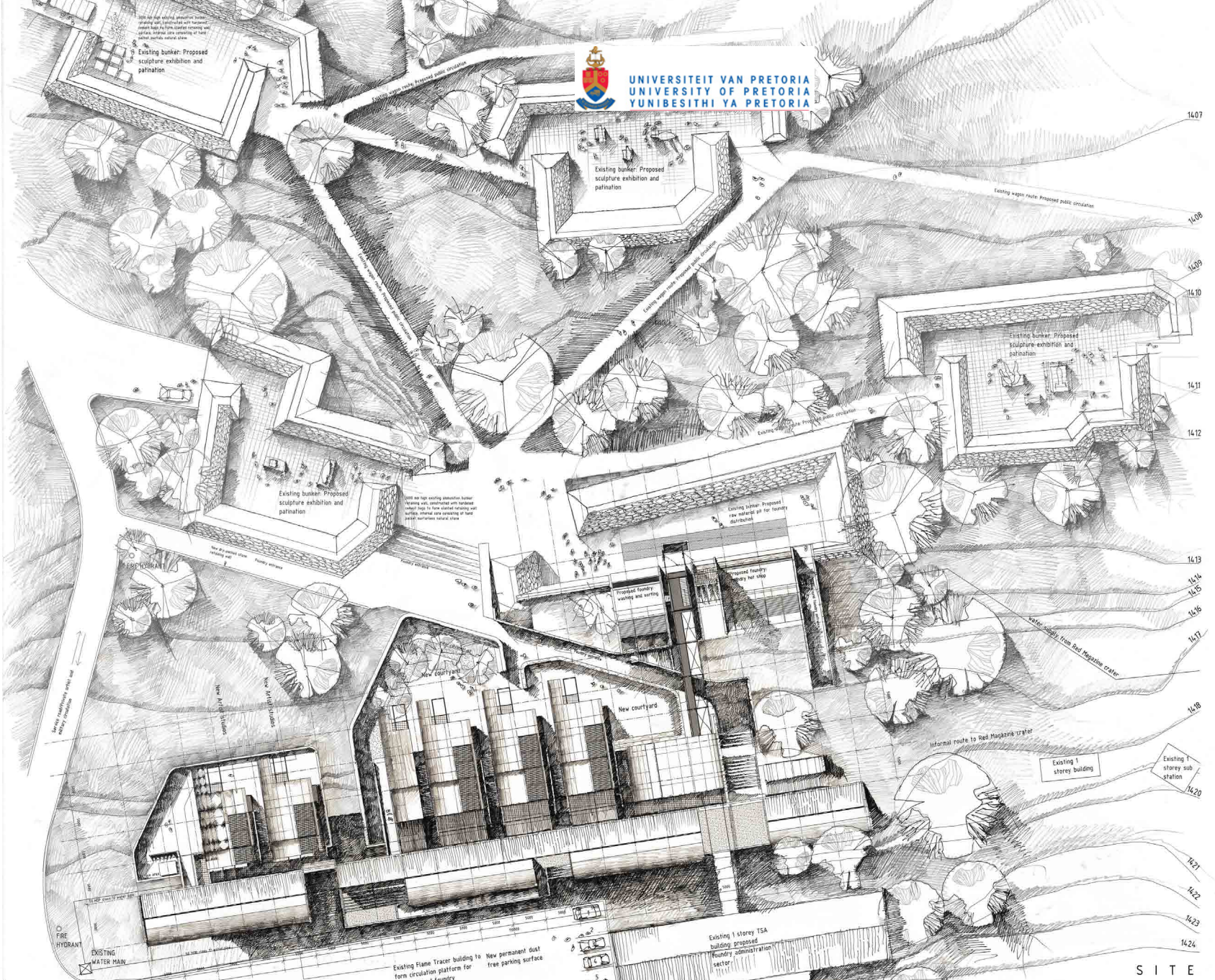
LEGEND

URBAN LEGEND

A – New proposed parade ground network
B – Proposed densified Military brigade housing
C – Proposed densified Prison Reserve facilities
D – Proposed street light avenue (urban guide to Magazine Hill 1)
E – Proposed vegetation Avenue (urban guide to Magazine Hill 2)
F – Urban agricultural ground serving both Military and Prison precincts
G – Multi serving parking space for both precinct and Magazine Hill (bunker analogy architectural typology)
H – Bus stop serving Magazine Hill

SITE LEGEND

1 – Private Military entrance into Magazine Hill
2 – Private Military parking space
3 – SA Military Graphic Design Departmental Brigade
4 – Existing exposed foundations; New outdoor exhibition space for SA Military Graphic Design Department
5 – Public entrance into Magazine Hill
6 – Access control and ticket sales for daily pass
7 – Existing open air ammunition bunkers; New outdoor brass and bronze sculpture garden (outdoor facilities for art patination)
7b- Existing wagon routes; public walkways between exhibition bunkers
8 – SANDF drop off zone for spent ammunition shells
8b- Existing service road
9 – Private SANDF and artist entrance into Magazine Hill connecting to service road and artist accommodation
10 – Existing ammunition bunker; pit where raw material is loaded into foundry
11 – Proposed Brass foundry consisting of Denel Foundry and a series of artist studios
12 – Existing Flame Tracer building to be reused in proposed foundry design
13 – Existing Transvaal Staats artillery building to be reused in proposed foundry design
14 – Existing MRG 3 kitchen building; new proposed cafeteria
15 – Existing building; New proposed ablutions
16 – Existing building left in weathered state
17 – Exploded Red Magazine crater memorial site
18 – Red Magazine water catchement memorial pool
19 – Existing exposed foundations; Military exhibition space
20 – Magazine Hill walking trail – trail of memory
21 – Viewing platform over Pretoria skyline; anchor point where Red magazine Roof bean landed after 1945 explosion
22 – Viewing platform 2; existing ruins of Fort Commeline
23 – Viewing platform 3; Former coloured camp
24 – Existing Green Magazine; proposed Munitions Defects Museum
25 – Existing building; artist equipment storage
26 – Artist covered parking
27 – Existing NRT building; proposed artist accommodation



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 was 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 itself identifies 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)

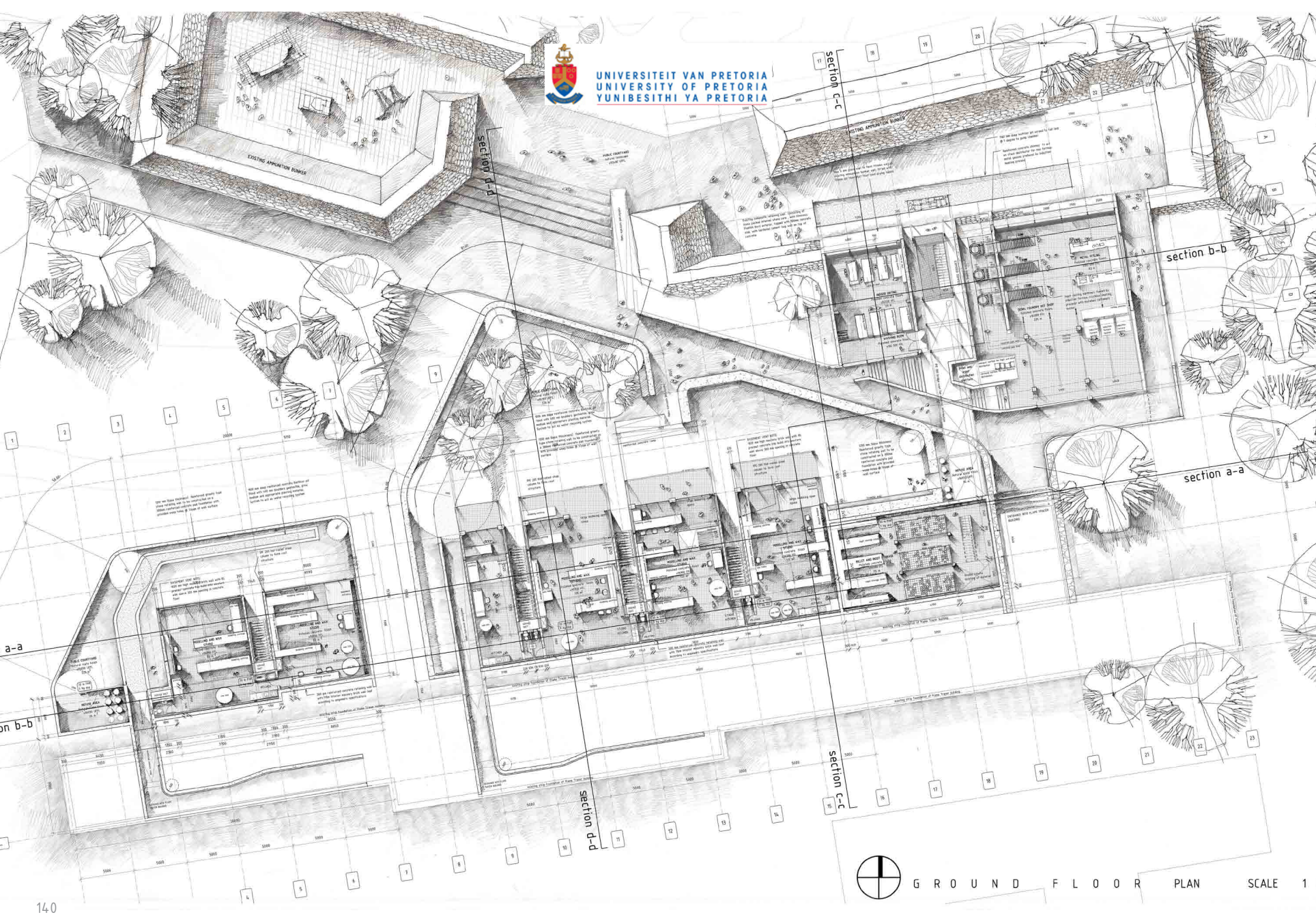
The second site generator comments on the steriotomic and tectonic relationship of the architectural response in relation to the existing fabric on site. All existing structures on Magazine Hill form part of an impervious military aesthetic that is steriotomic of nature. This impenetrable built fabric of existing structures on site consists mainly of hardened sement bags, natural stone retaining walls, concrete bunker walls and vernacular Kirkness brick buildings. The steriotomic character of built fabric thus relates to the existing, that which belongs to the site.

In contrast to the existing steriotomic aesthetic, a tectonic response implies new built form. In the design of the foundry, both aesthetics are utilised to anchor the new proposal within the historical arena of Magazine Hill. The furnace tower forms part of the steriotomic design elements while sorting , washing and hot shop space start to integrate/weave the steriotomic with the tectonic, capitalising on the advantages of both systems, while creating the illusion that the furnace tower grows from the existing bunker space.

An additional series of bunkers is added to the existing labyrinth of submerged space that forms exhibition courtyards for sculpture works in the artist studios. This design addendum is constructed as an analogy of the existing bunker space, thus steriotomic in nature, connecting the existing military aesthetic with contemporary architecture (in compliance with Venice charter, Article 13). New tectonic artist studios project over the new bunkers, forming a concealed courtyard typology.

Building on the conceptual premise that the site heals itself from impurities (rain season exposes mortar shells and ammunition cartridges that is imbedded in the soil after the explosion of 1945), the foundry design uses the landscape to harvest and purifies grey water for foundry use.

SITE PLAN 1:200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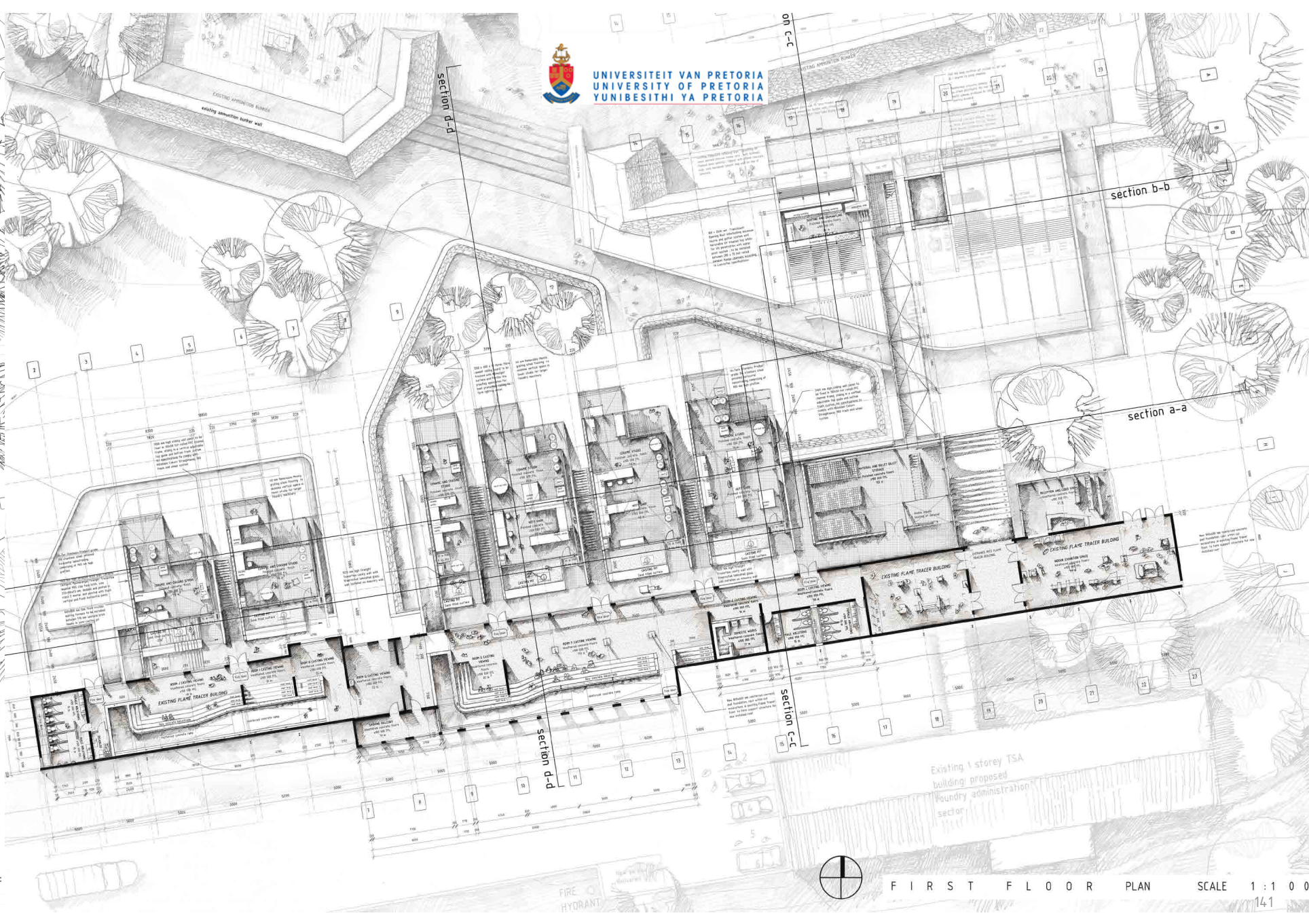
EXISTING AMMUNITION BUNKER
section a-a
section b-b
section c-c
section d-d
GROUND FLOOR PLAN SCALE 1



FIRST FLOOR PLAN SCALE 1:100

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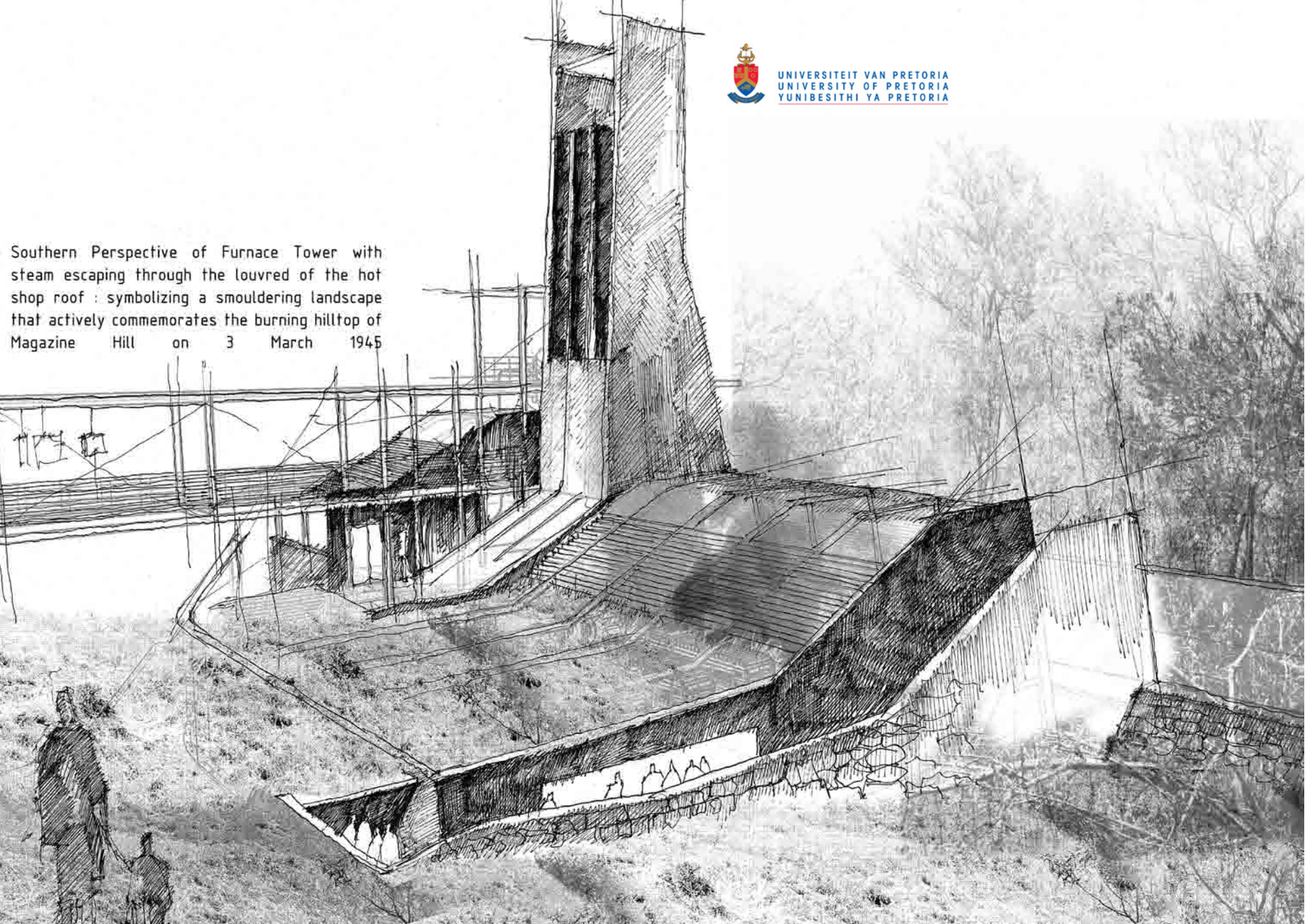
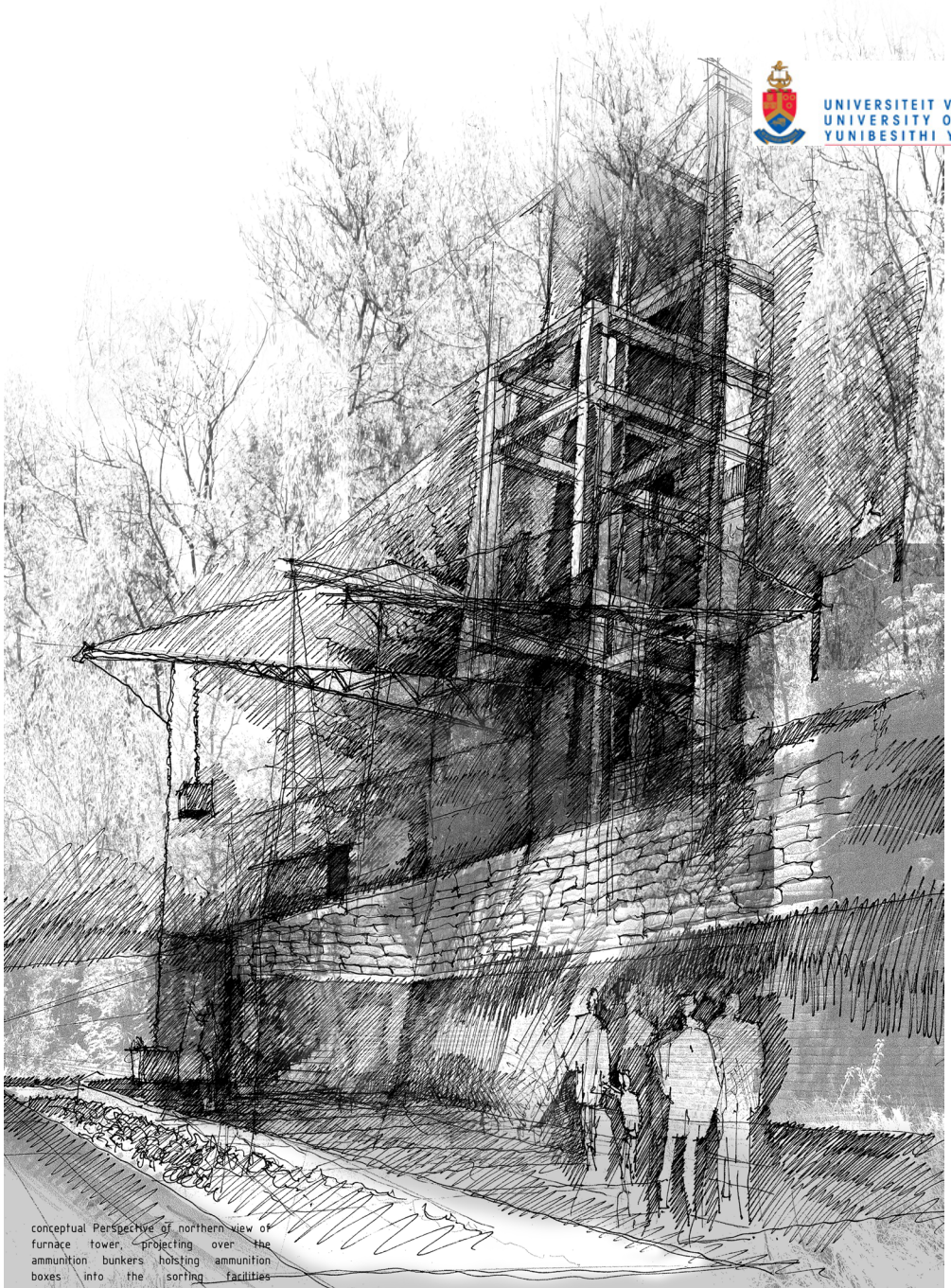
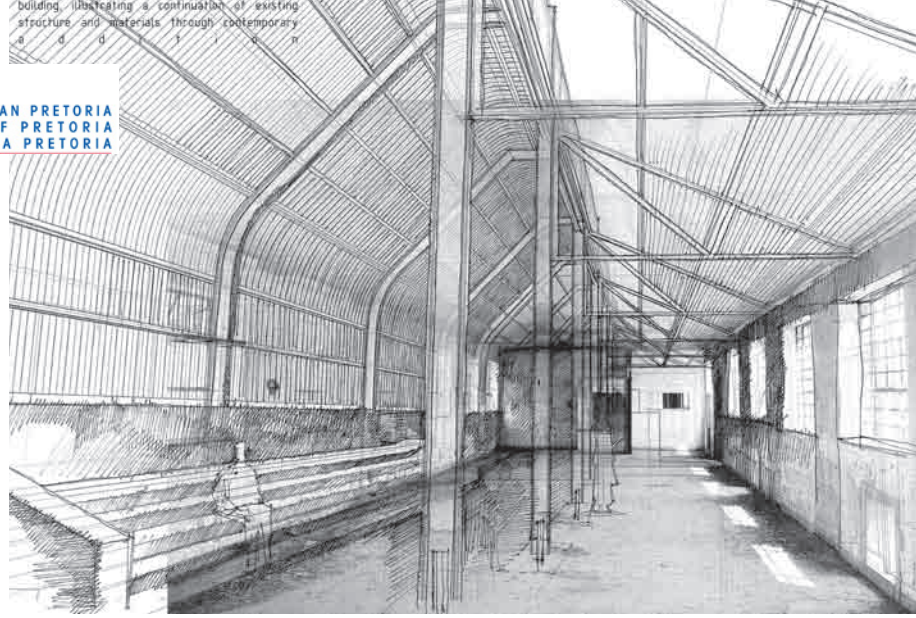
Southern Perspective of Furnace Tower with steam escaping through the louvred of the hot shop roof : symbolizing a smouldering landscape that actively commemorates the burning hilltop of Magazine Hill on 3 March 1945

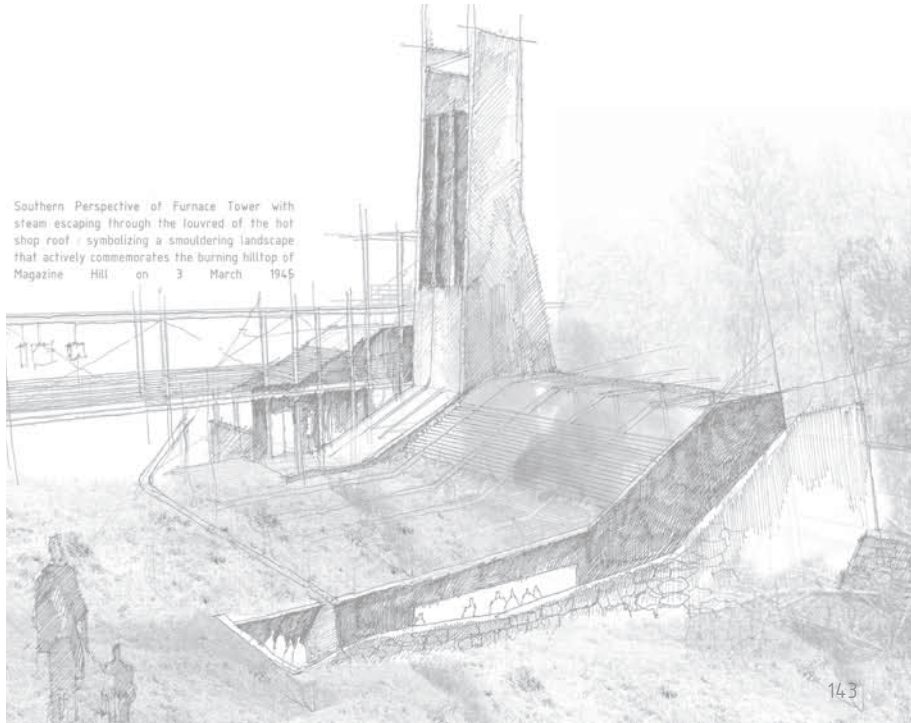




conceptual Perspective of northern view of furnace tower, projecting over the ammunition bunkers hoisting ammunition boxes into the sorting facilities



building illustrating a continuation of existing structure and materials through contemporary addition



Southern Perspective of Furnace Tower with steam escaping through the louvred of the hot shop roof - symbolizing a smouldering landscape that actively commemorates the burning hilltop of Magazine Hill on 3 March 1945

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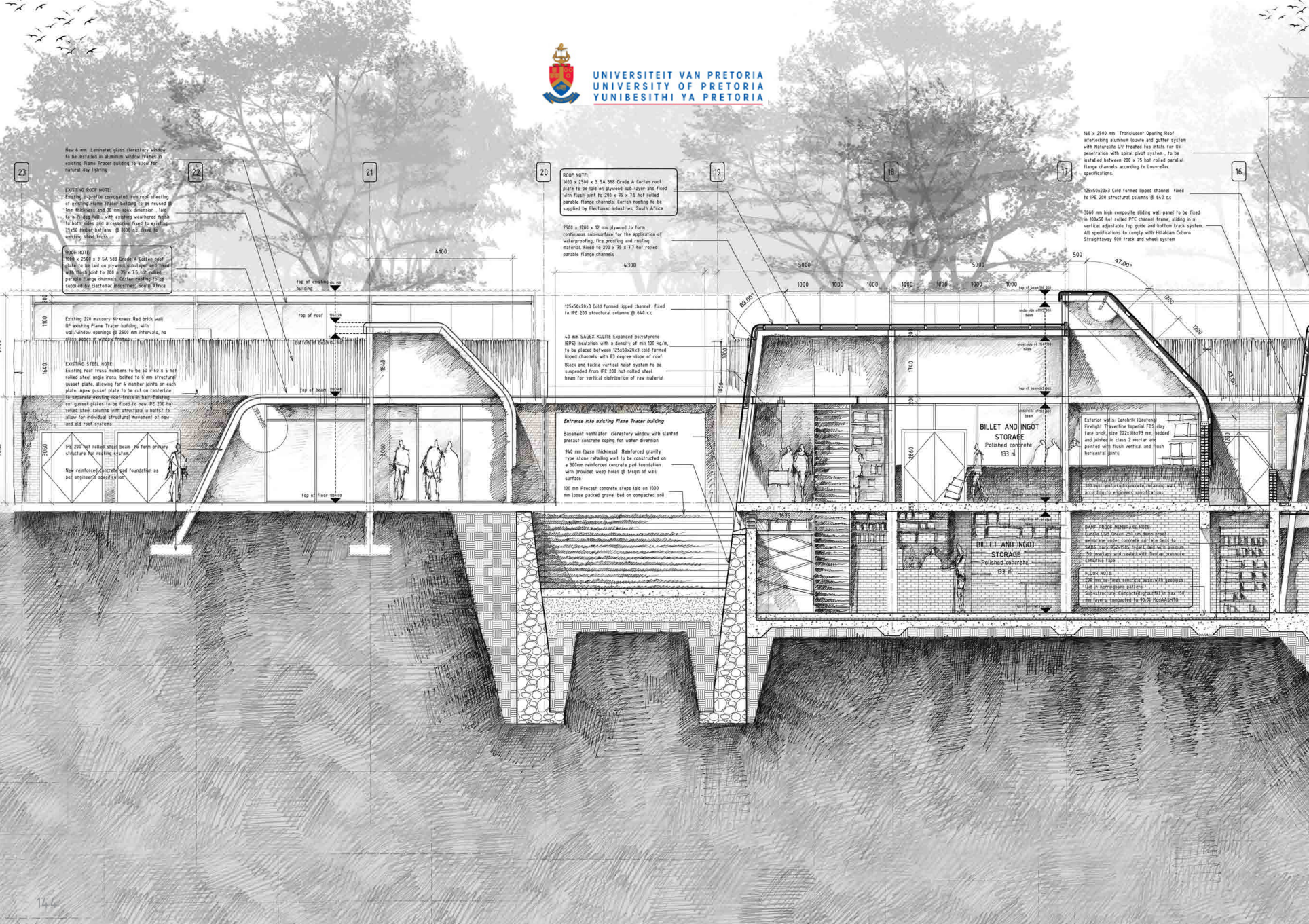

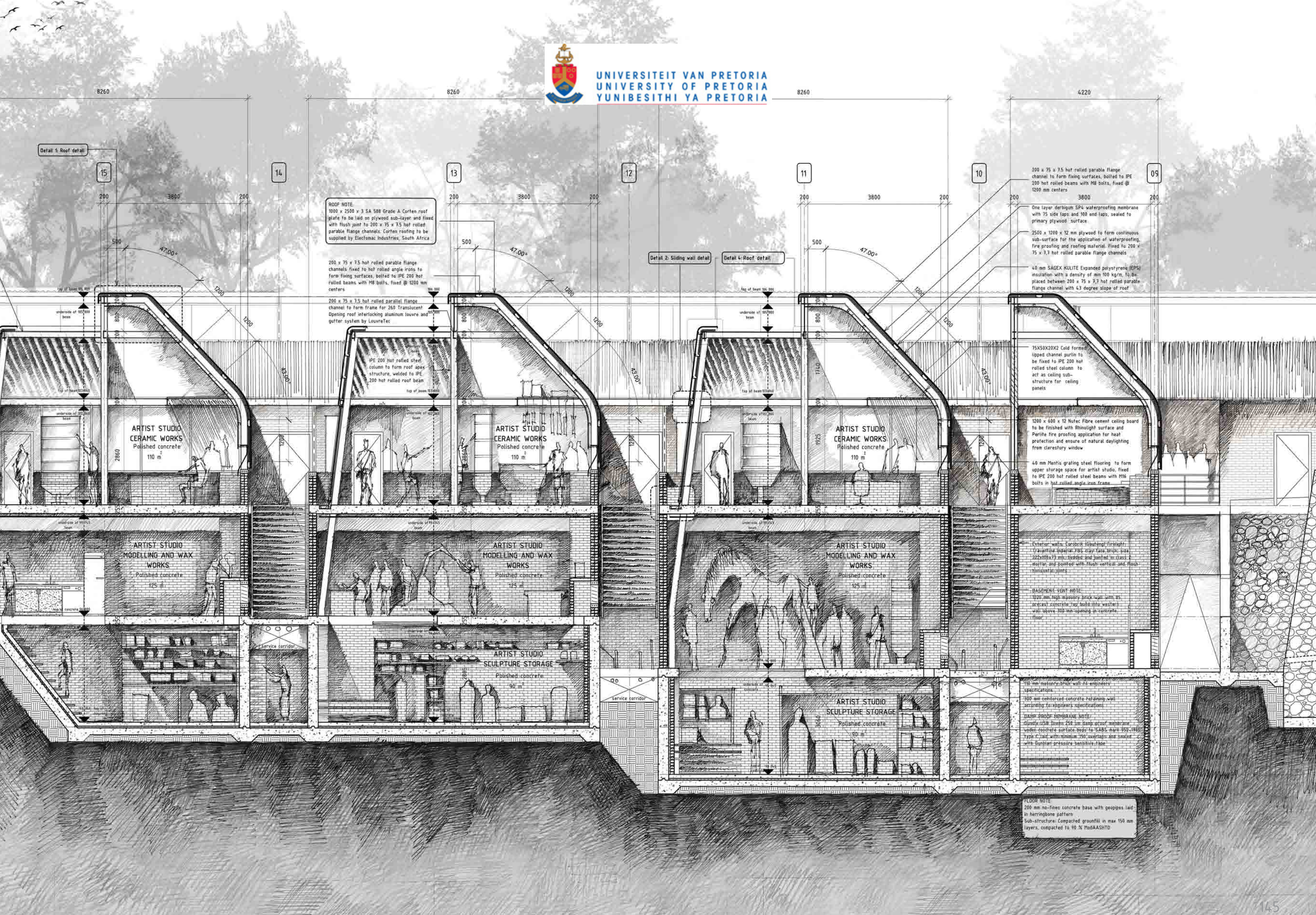

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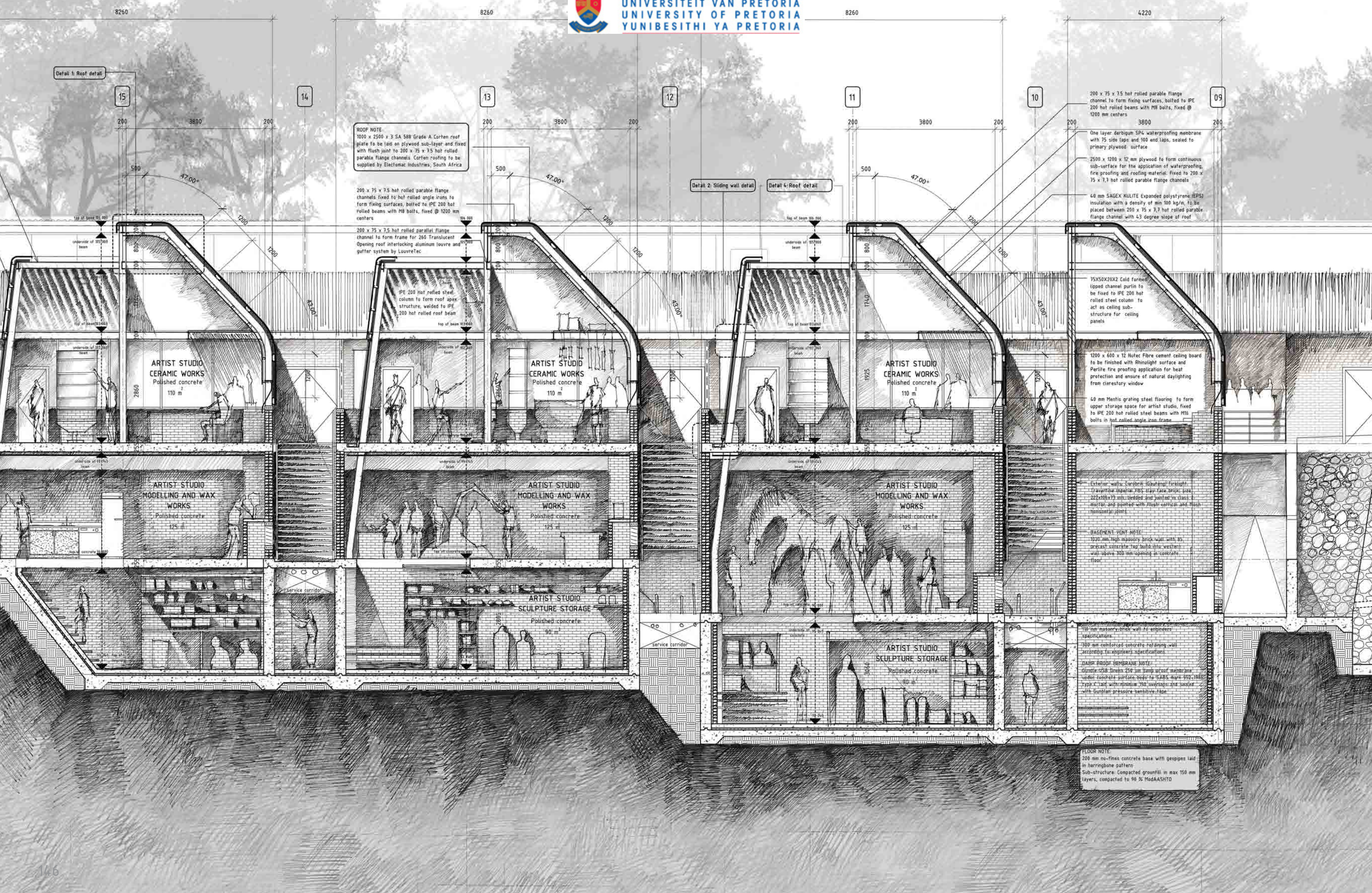

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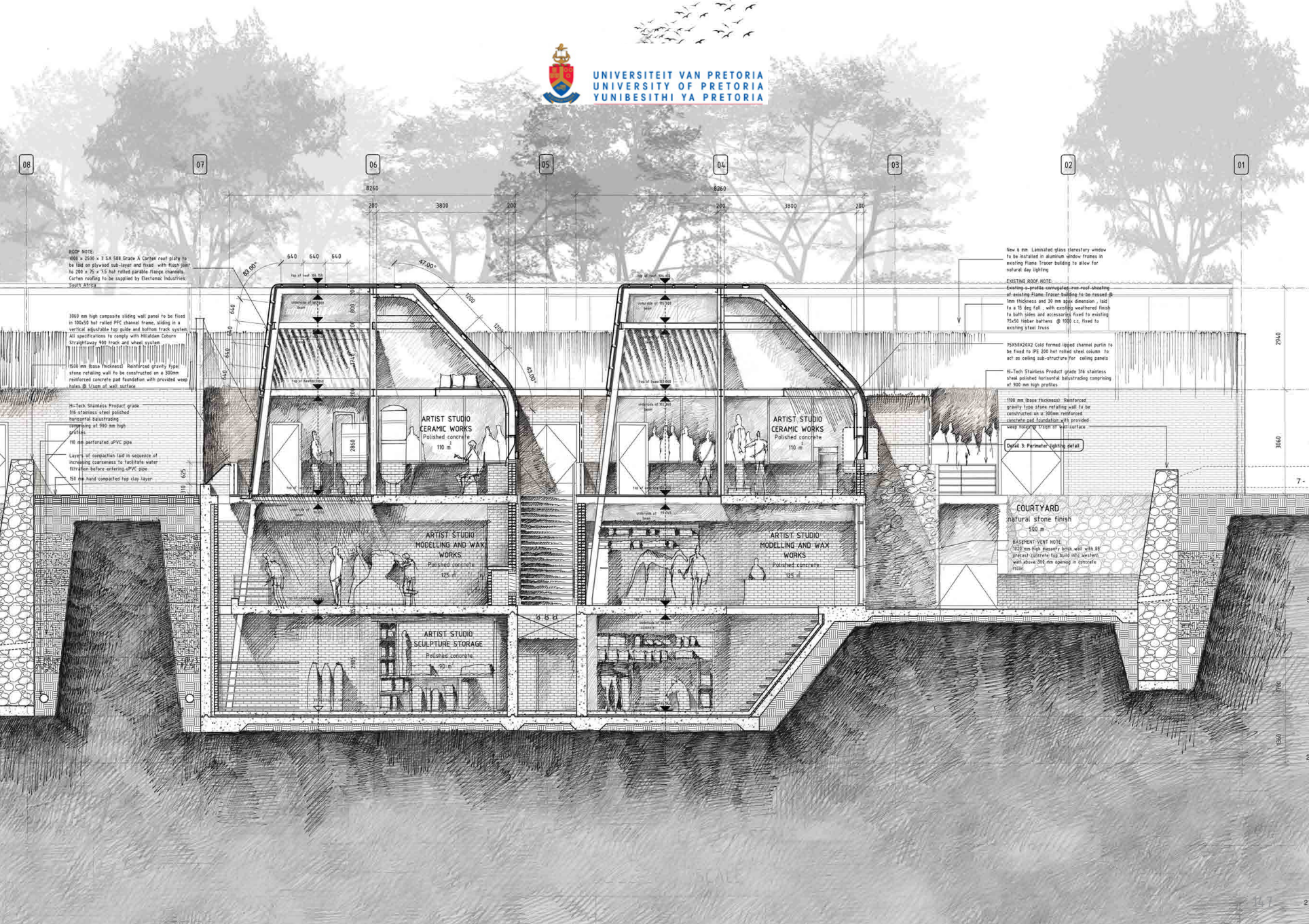
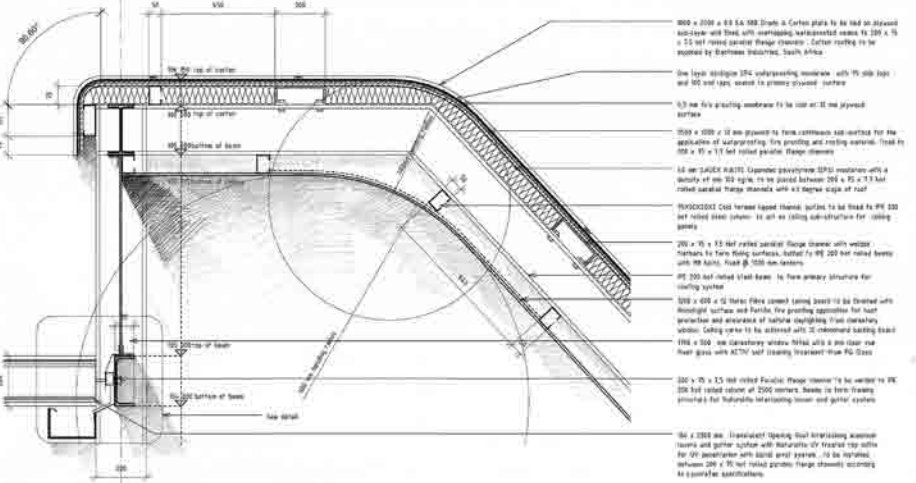
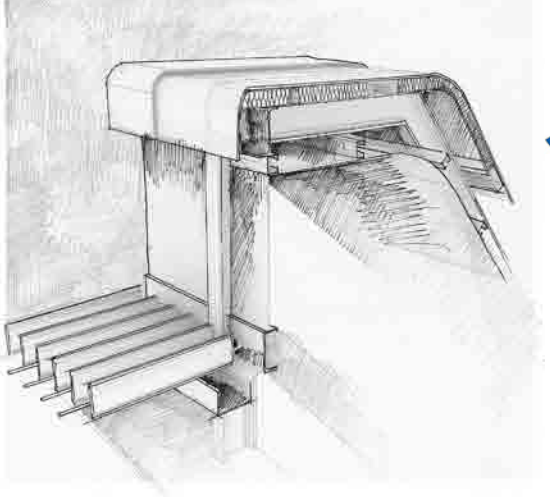
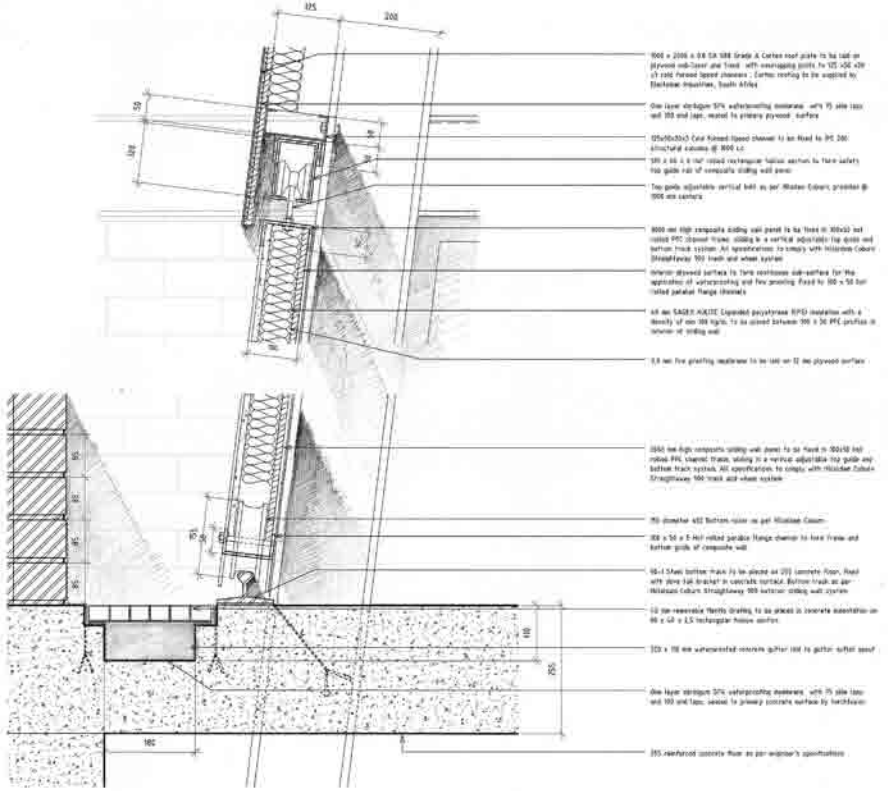
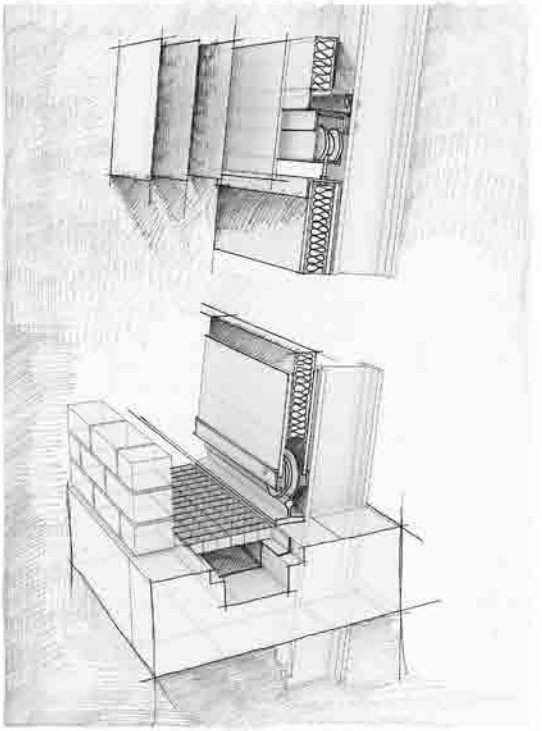




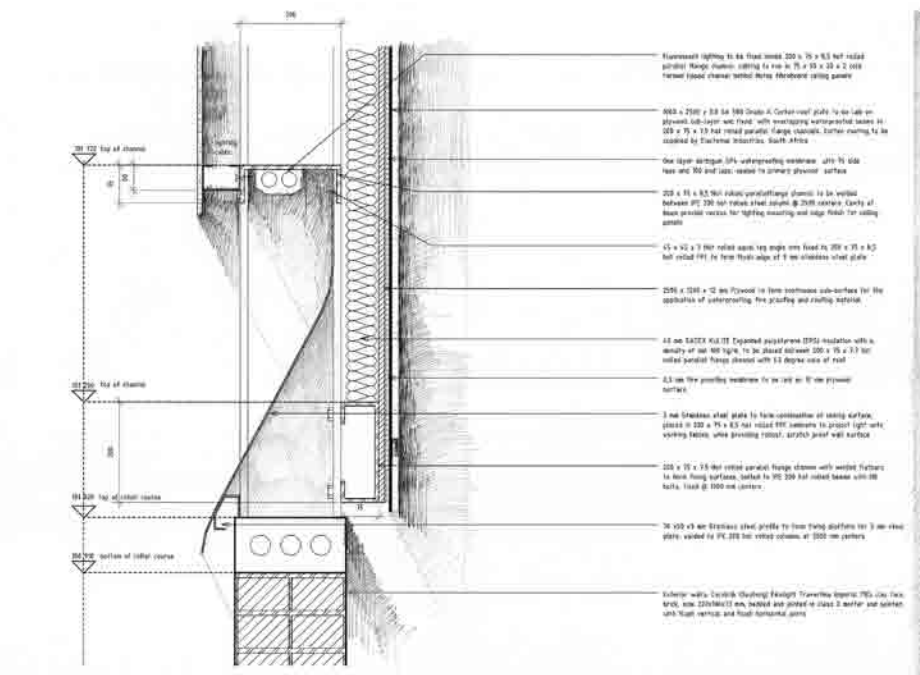


D E T A I L 1 : ROOF DETAIL SCALE: 1 : 10

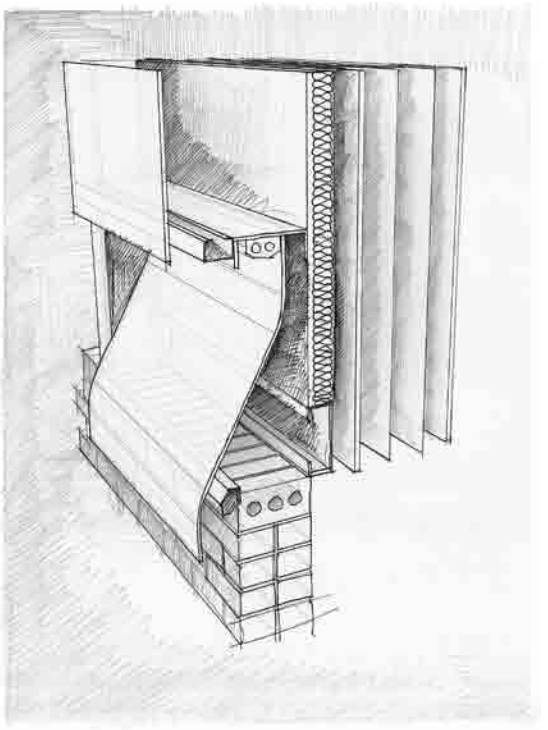


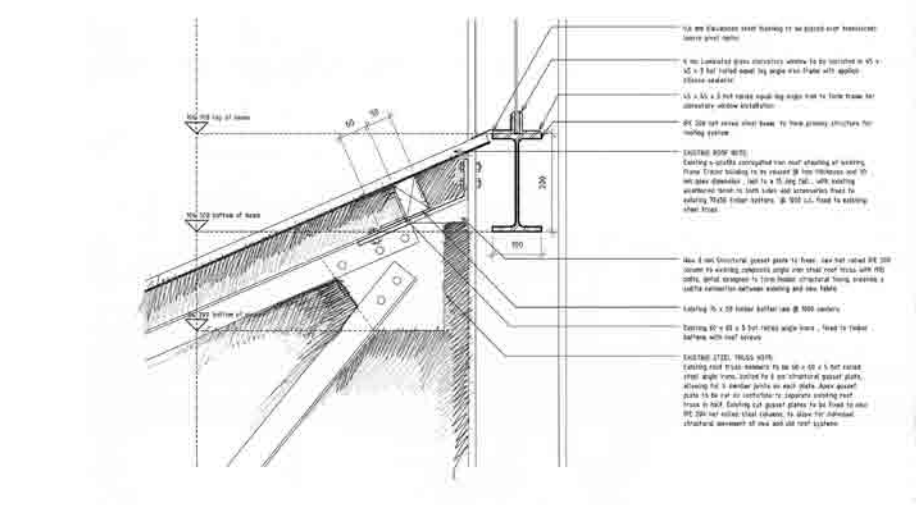


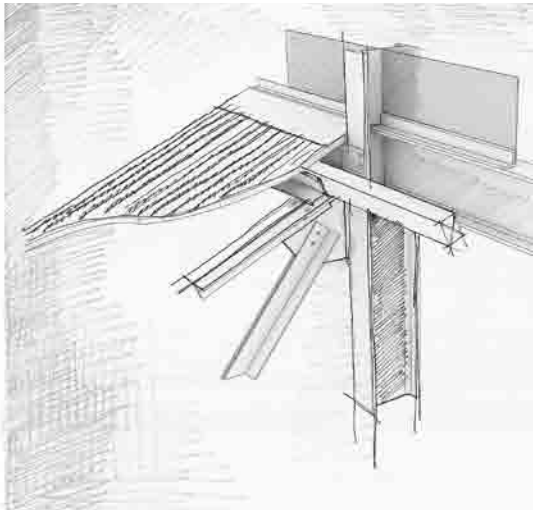
D E T A I L 2 : SLIDING WALL DETAIL SCALE: 1 : 5

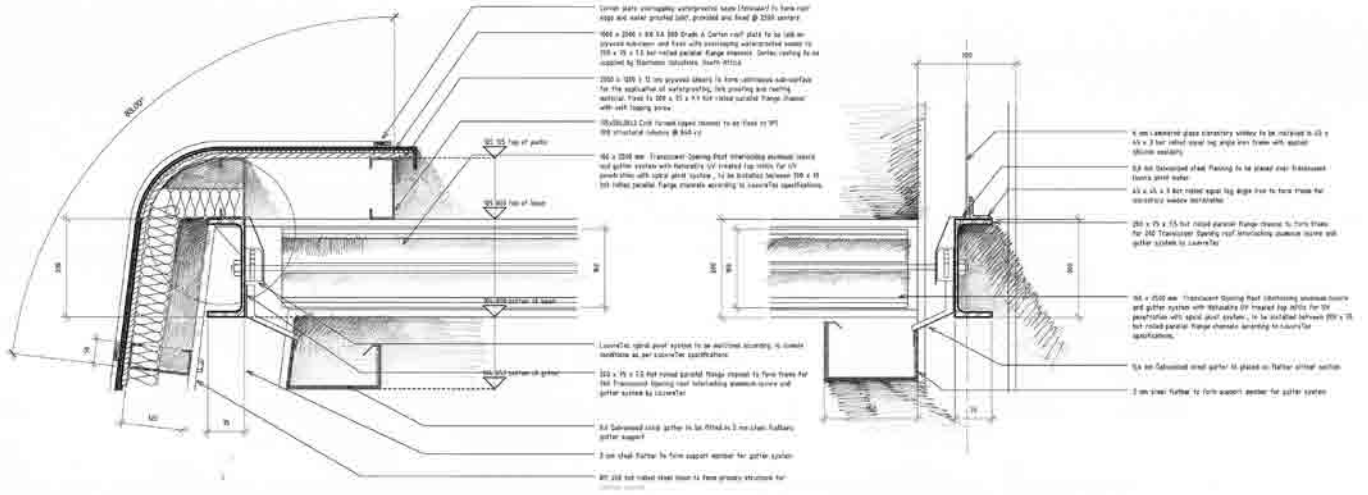


DETAIL 3: PERIMETER LIGHTING DETAIL SCALE: 1 : 5

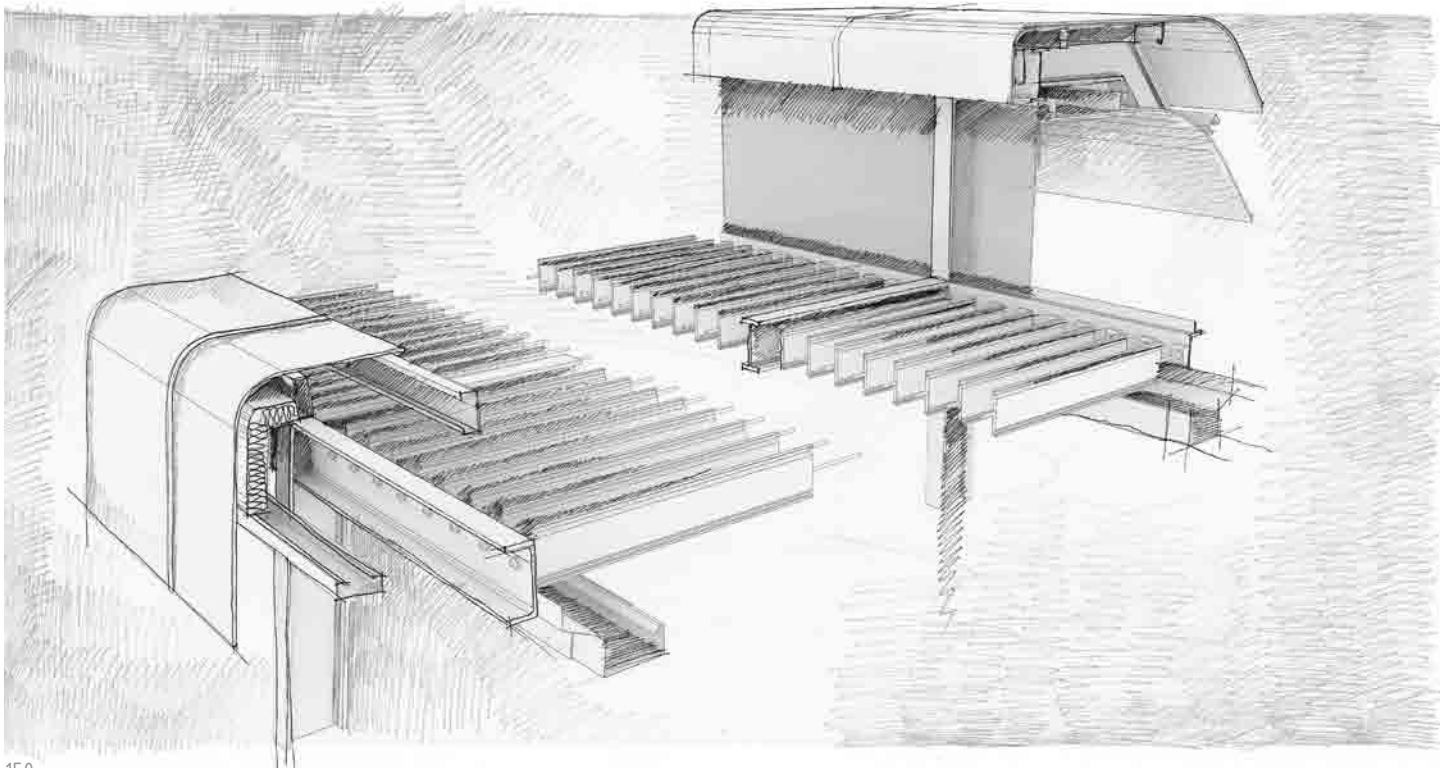




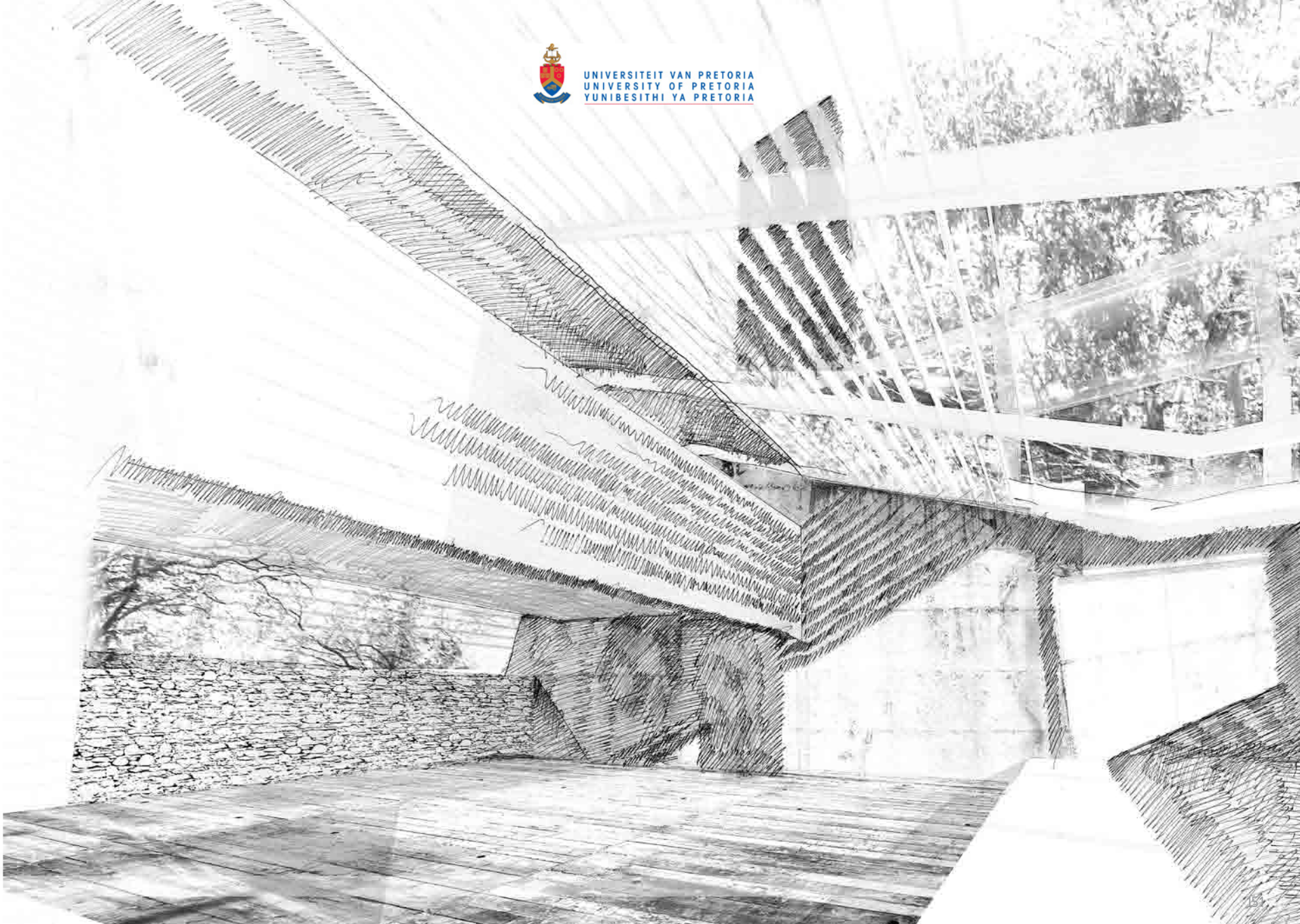




D E T A I L 4 : ROOF DETAIL SCALE: 1 : 5



D E T A I L 4 : ROOF AXONOMETRIC DETAIL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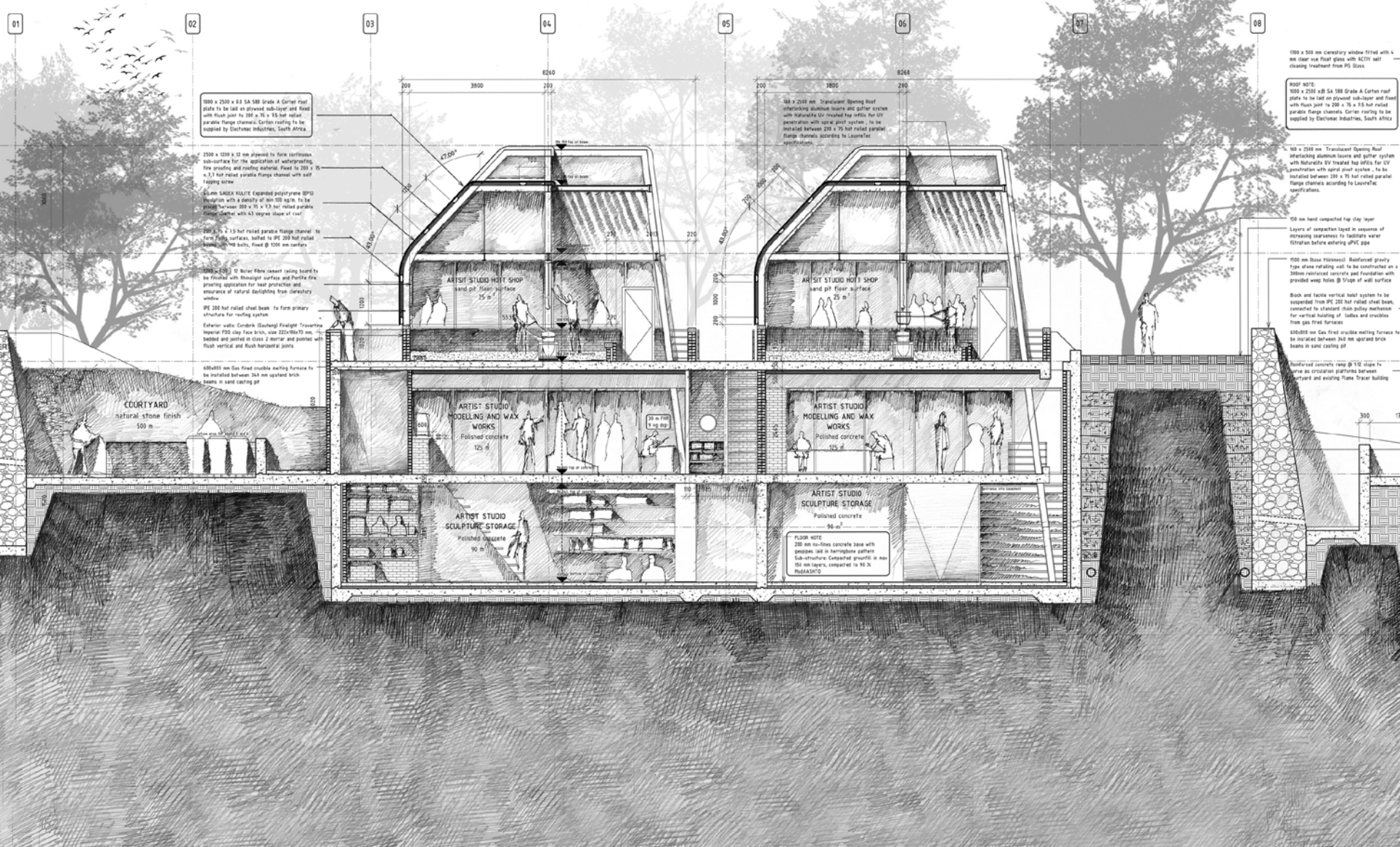

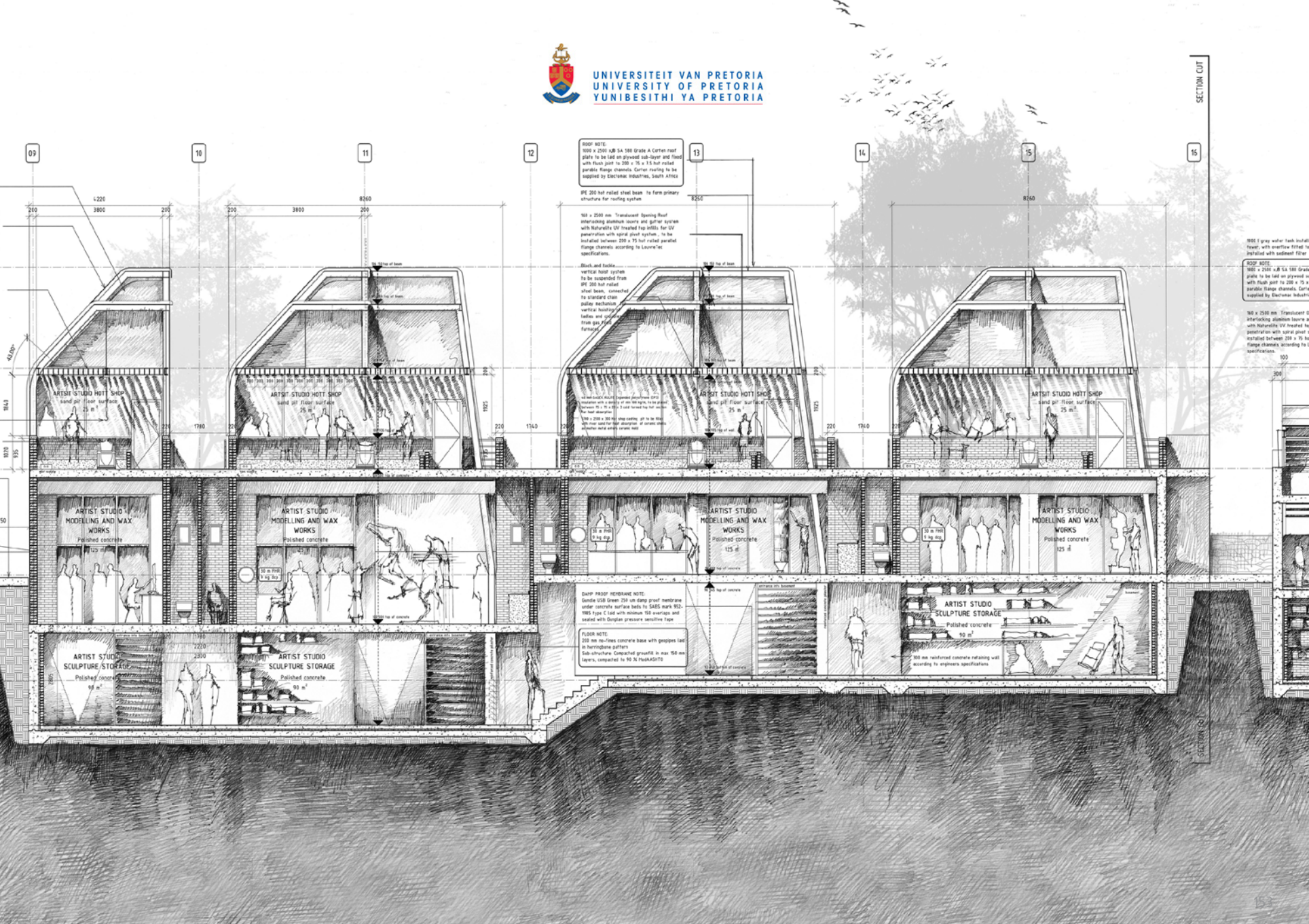
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SECTION CUT
09
10
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16
ROOF NOTE:
1600 x 2500 x,8 SA 588 Grade A Corten roof plate to be laid on plywood sub-layer and fixed with flush joint to 200 x 76 x 3.5 hot rolled parable flange channels. Corten roofing to be supplied by Electomac Industries, South Africa
IPE 200 hot rolled steel beam to form primary structure for roofing system
160 x 2500 mm Translucent Opening Roof interlocking aluminium louvre and gutter system with Naturelite UV treated top infills for UV penetration with spiral pivot system , to be installed between 200 x 75 hot rolled parallel flange channels according to Louvrelec specifications.
Block and tackle..... vertical hoist system to be suspended from IPE 200 hot rolled steel beam, connected to standard chain pulley mechanism vertical hoistrope with ladles and counterweight from gas fired furnaces
ARTIST STUDIO HOTT SHOP
sand pit floor surface
25 m²
ARTIST STUDIO MODELLING AND WAX WORKS
Polished concrete
125 m²
ARTIST STUDIO SCULPTURE STORAGE
Polished concrete
90 m²
DAMP PROOF MEMBRANE NOTE:
Gundle USB Green 250 um damp proof membrane. under concrete surface beds to SABS mark 952-1985 type C laid with minimum 150 overlaps and sealed with Gunplan pressure sensitive tape
FLOOR NOTE:
200 mm no-fines concrete base with geogrpes laid in herringbone pattern
Sub-structure Compacted grounfill in max 150 mm layers, compacted to 90 % ModAASHTO
300 mm reinforced concrete retaining wall according to engineers specifications
SECTION CUT

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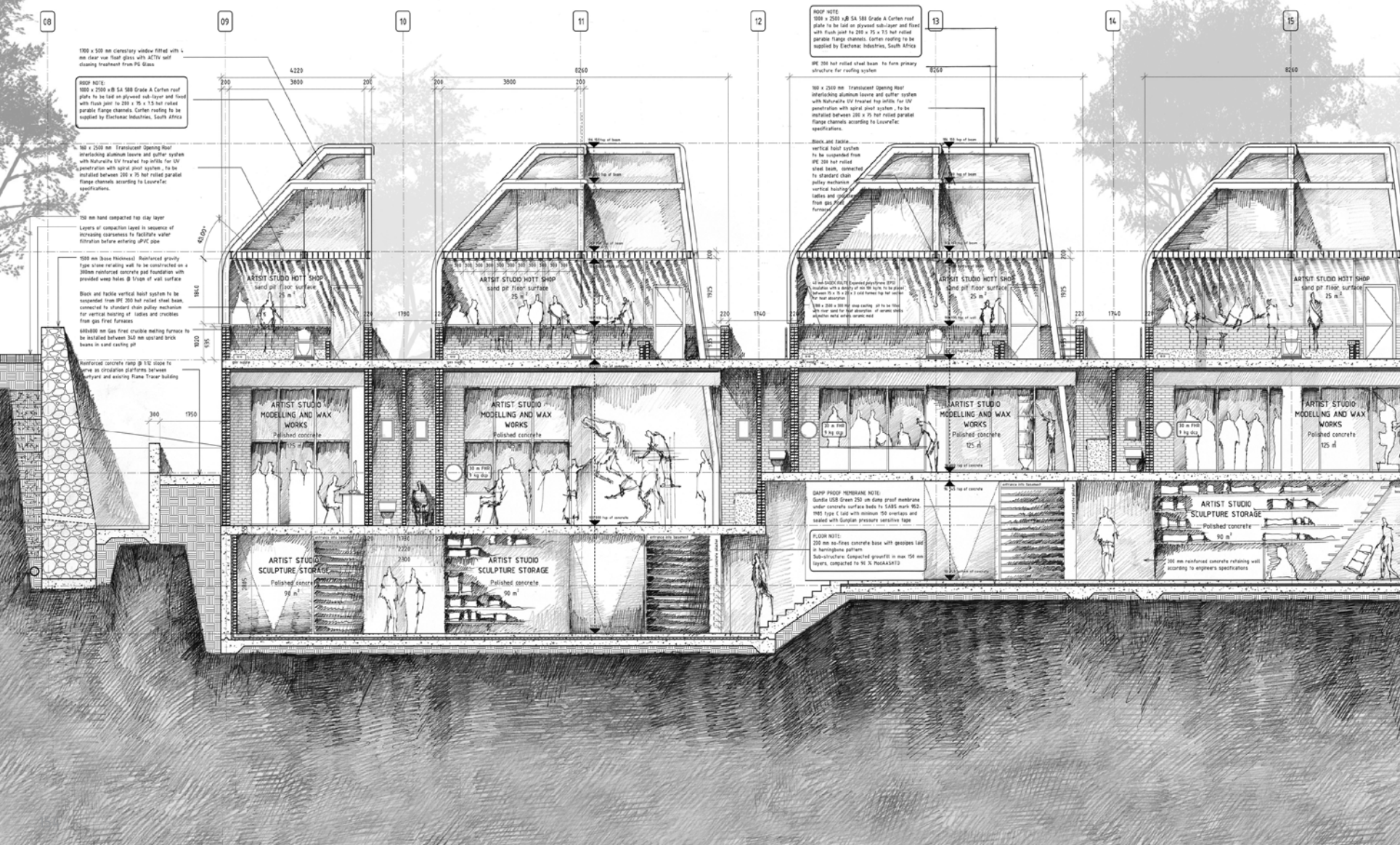

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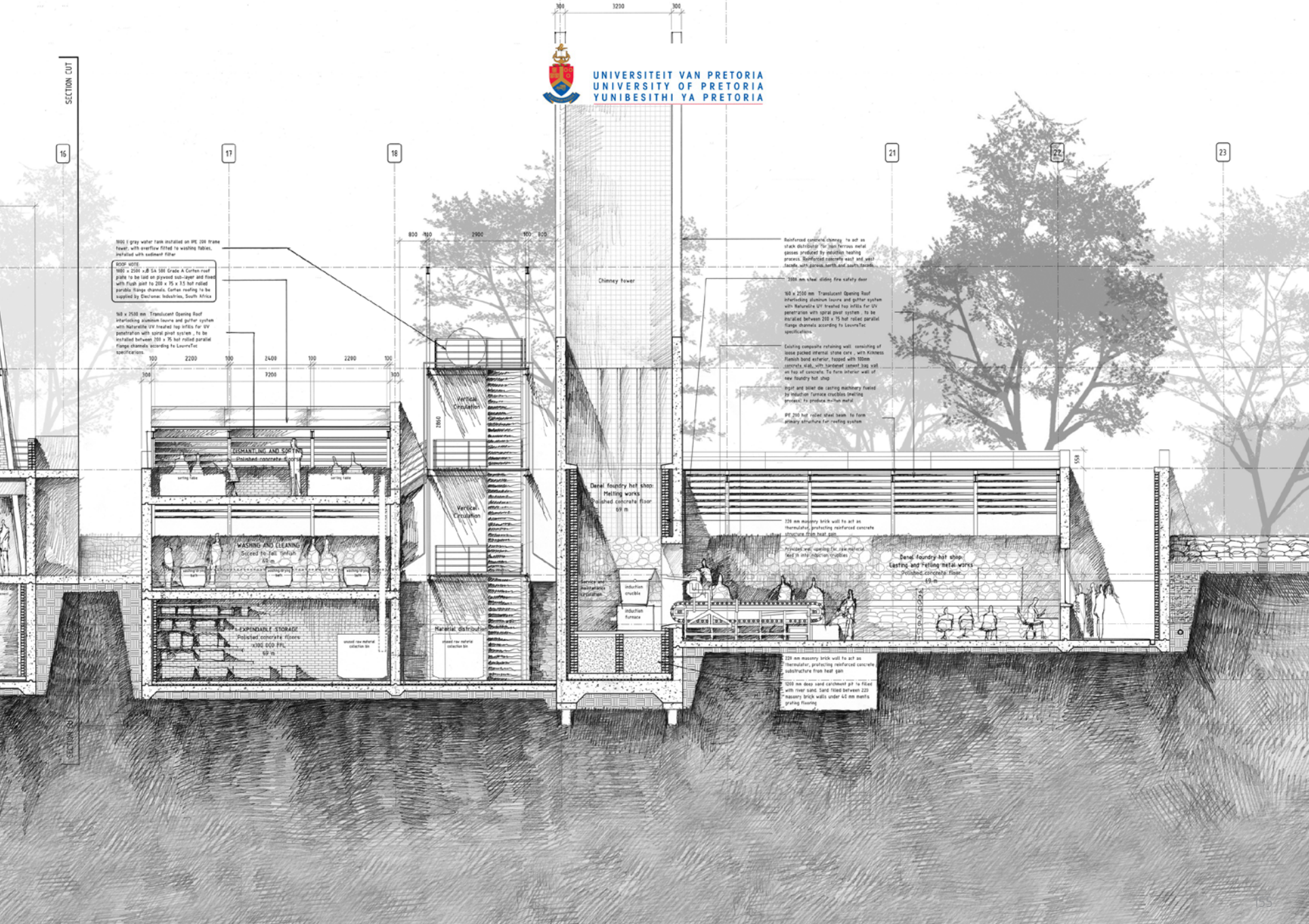

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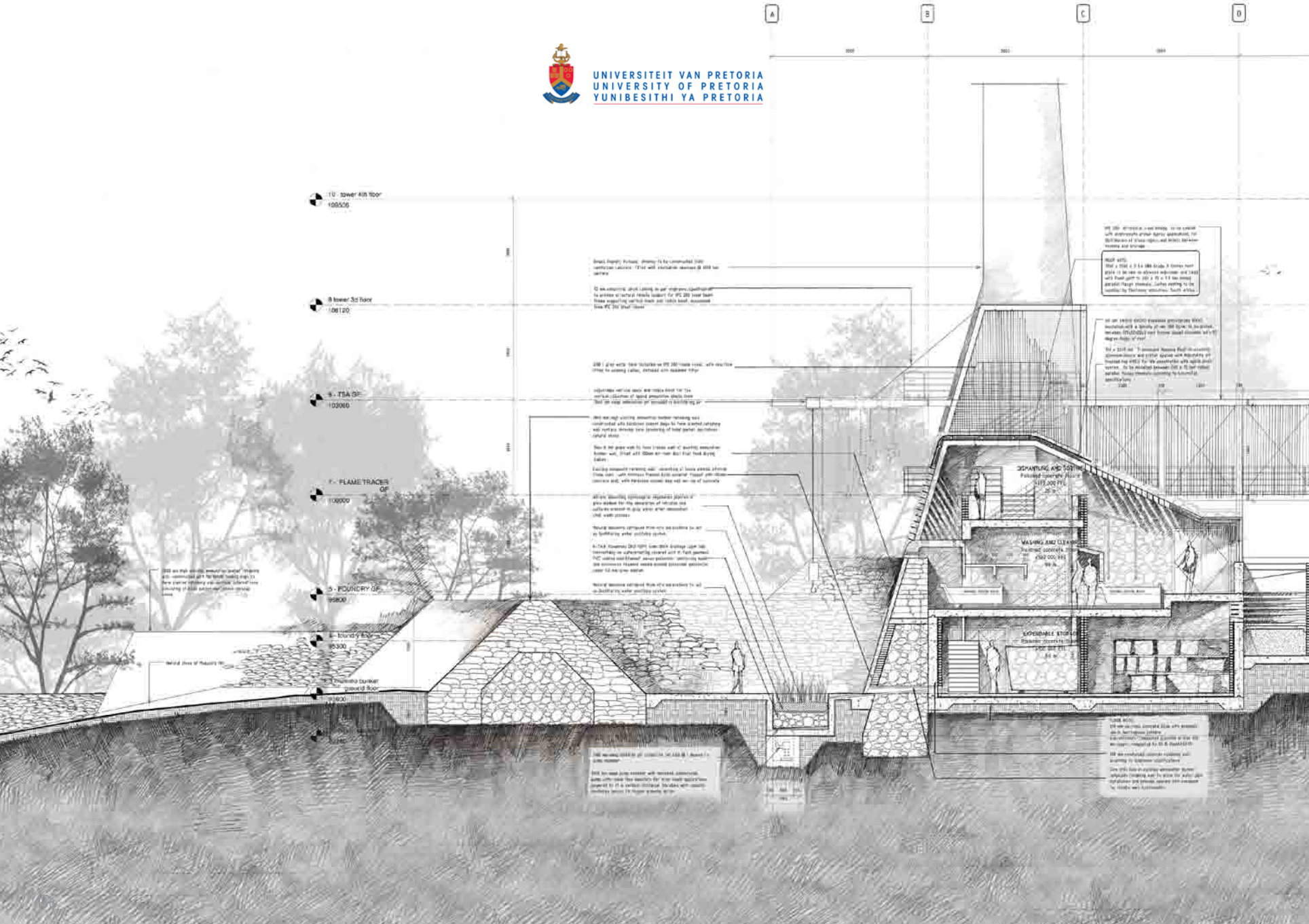

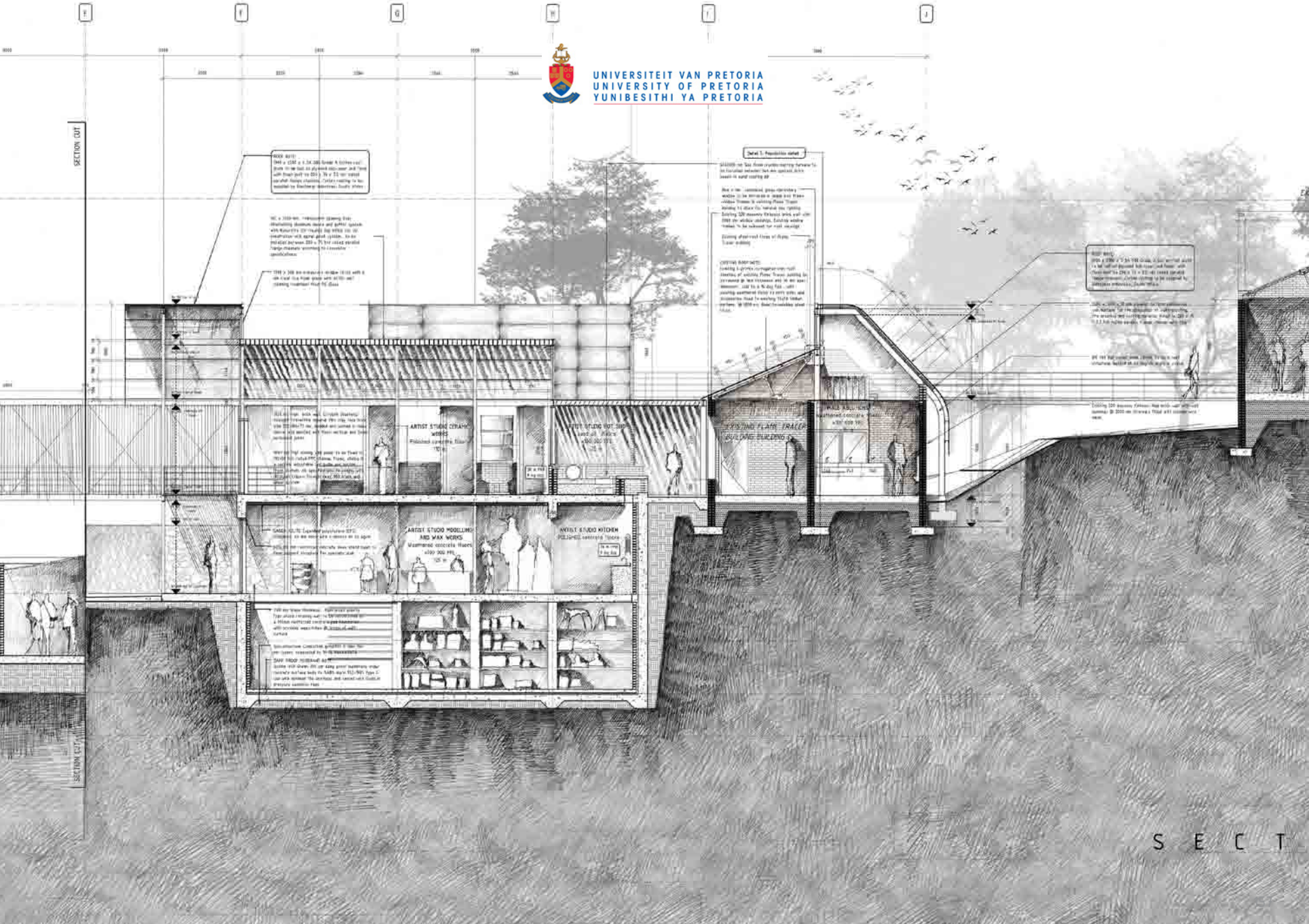
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SECTION CUT
SECTION CUT
ARTIST STUDIO CERAMIC WORKS
ARTIST STUDIO MODELLING AND WAX WORKS
ARTIST STUDIO KILN SHED
ARTIST STUDIO KITCHEN
EXISTING FLARE TRACEY BUILDING BUILDING
S E C T

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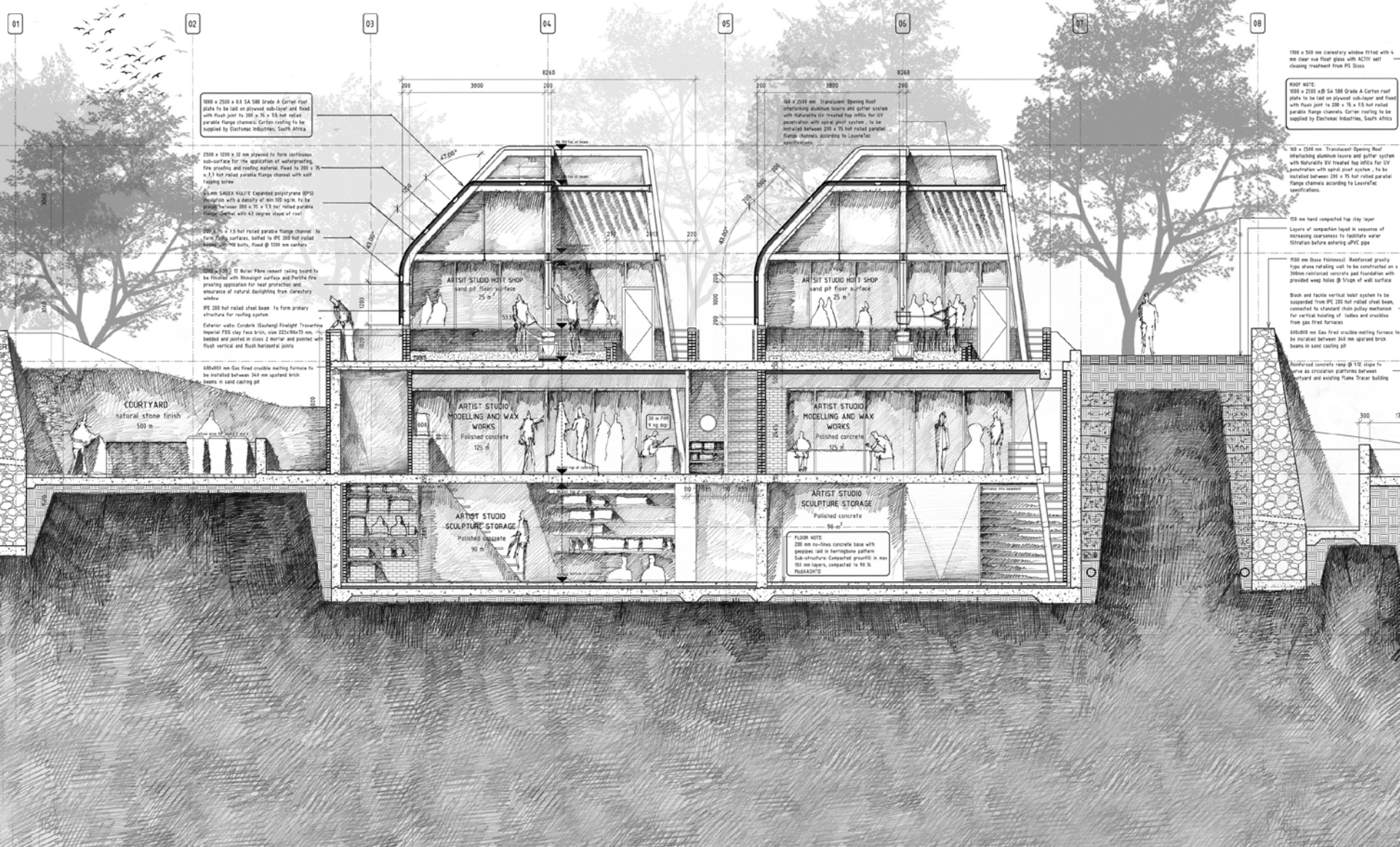

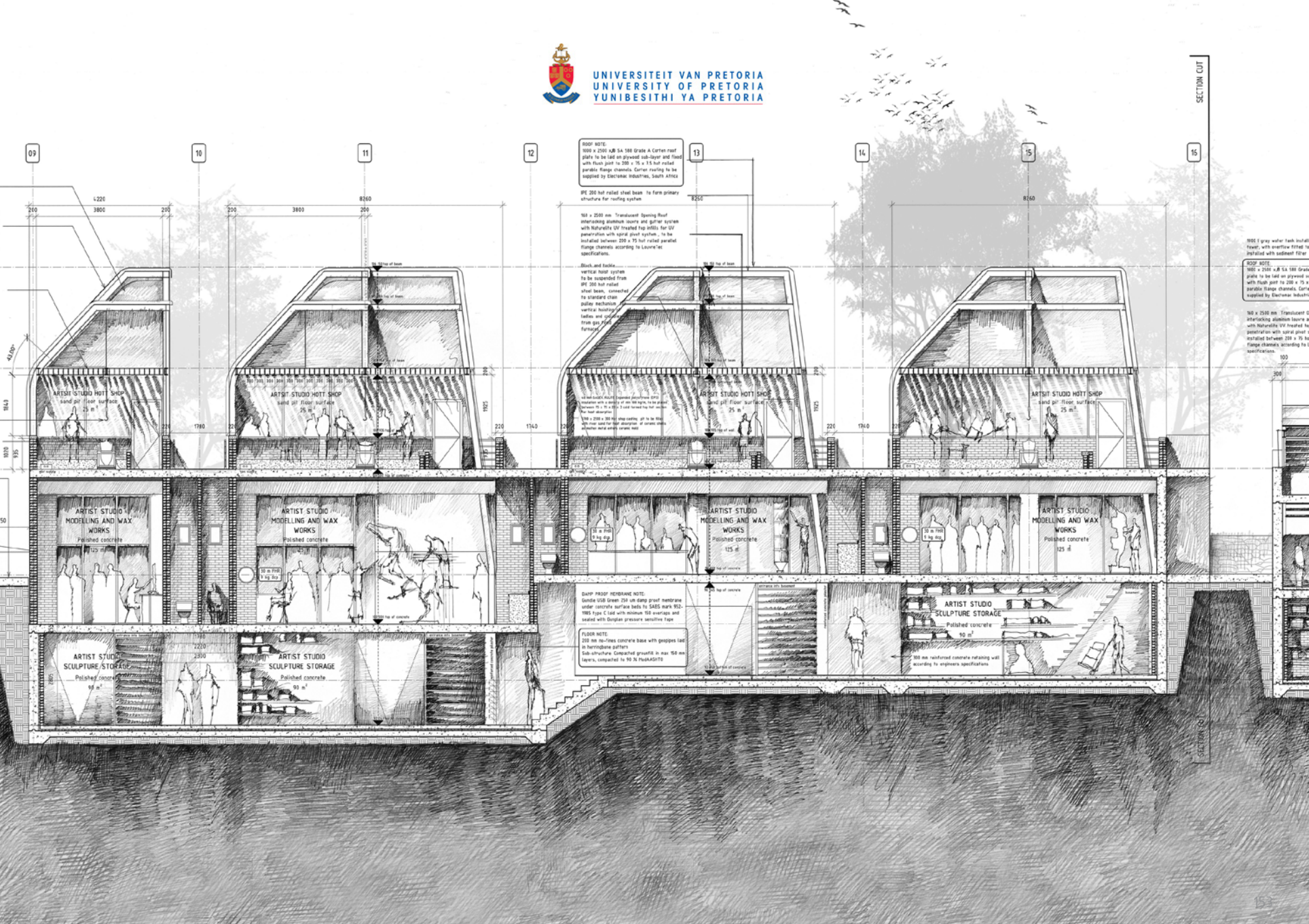
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UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
SECTION CUT
09
10
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15
16
ROOF NOTE:
1600 x 2500 x,8 SA 588 Grade A Corten roof plate to be laid on plywood sub-layer and fixed with flush joint to 200 x 76 x 3.5 hot rolled parable flange channels. Corten roofing to be supplied by Electomac Industries, South Africa
IPE 200 hot rolled steel beam to form primary structure for roofing system
160 x 2500 mm Translucent Opening Roof interlocking aluminium louvre and gutter system with Naturelite UV treated top infills for UV penetration with spiral pivot system , to be installed between 200 x 75 hot rolled parallel flange channels according to Louvrelec specifications.
Block and tackle..... vertical hoist system to be suspended from IPE 200 hot rolled steel beam, connected to standard chain pulley mechanism vertical hoistrope with ladles and counterweight from gas fired furnaces
ARTIST STUDIO HOTT SHOP
sand pit floor surface
25 m²
ARTIST STUDIO MODELLING AND WAX WORKS
Polished concrete
125 m²
ARTIST STUDIO SCULPTURE STORAGE
Polished concrete
90 m²
DAMP PROOF MEMBRANE NOTE:
Gundle USB Green 250 um damp proof membrane. under concrete surface beds to SABS mark 952-1985 type C laid with minimum 150 overlaps and sealed with Gunplan pressure sensitive tape
FLOOR NOTE:
200 mm no-fines concrete base with geogrpes laid in herringbone pattern
Sub-structure Compacted grounfill in max 150 mm layers, compacted to 90 % ModAASHTO
300 mm reinforced concrete retaining wall according to engineers specifications
SECTION CUT

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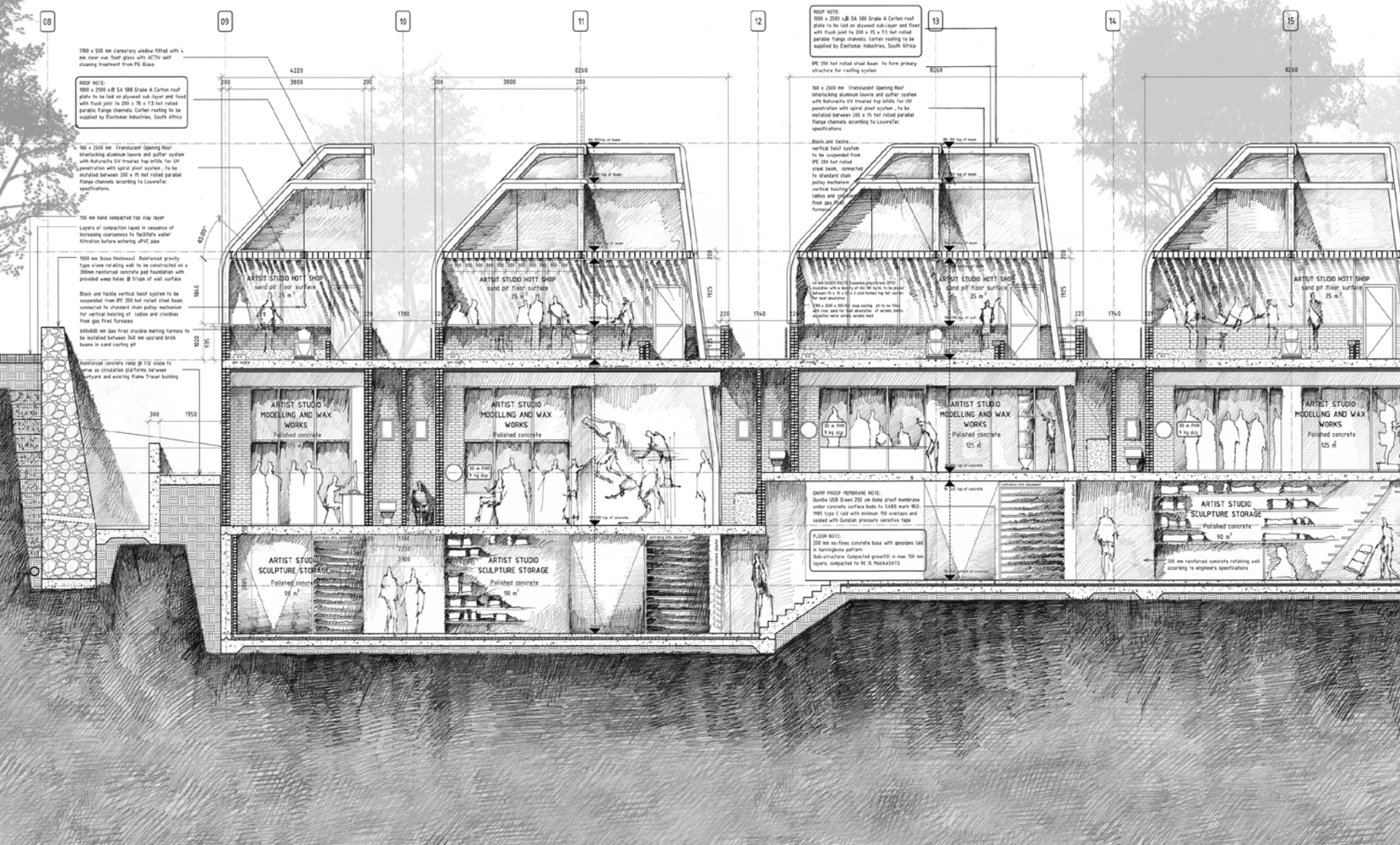

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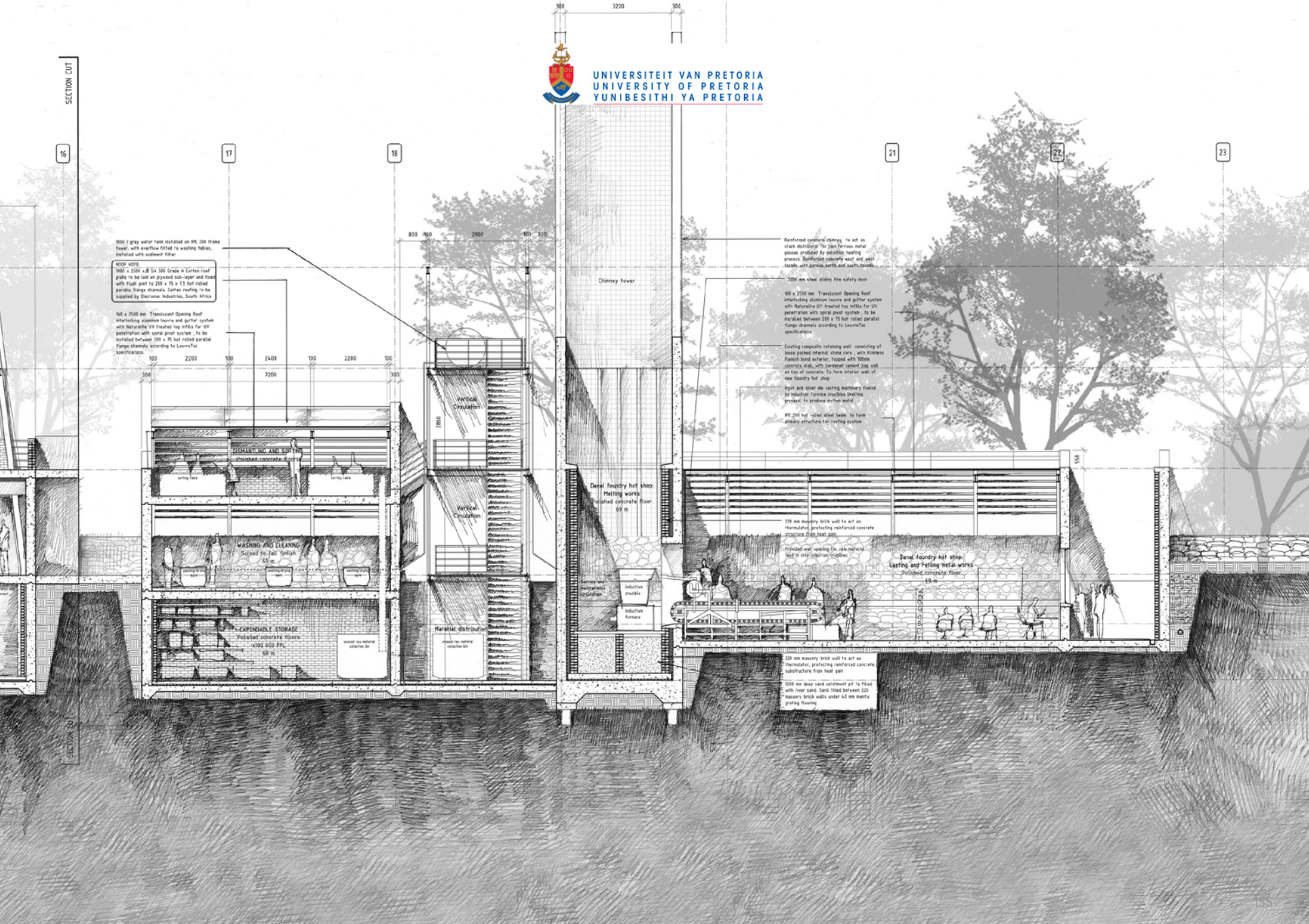

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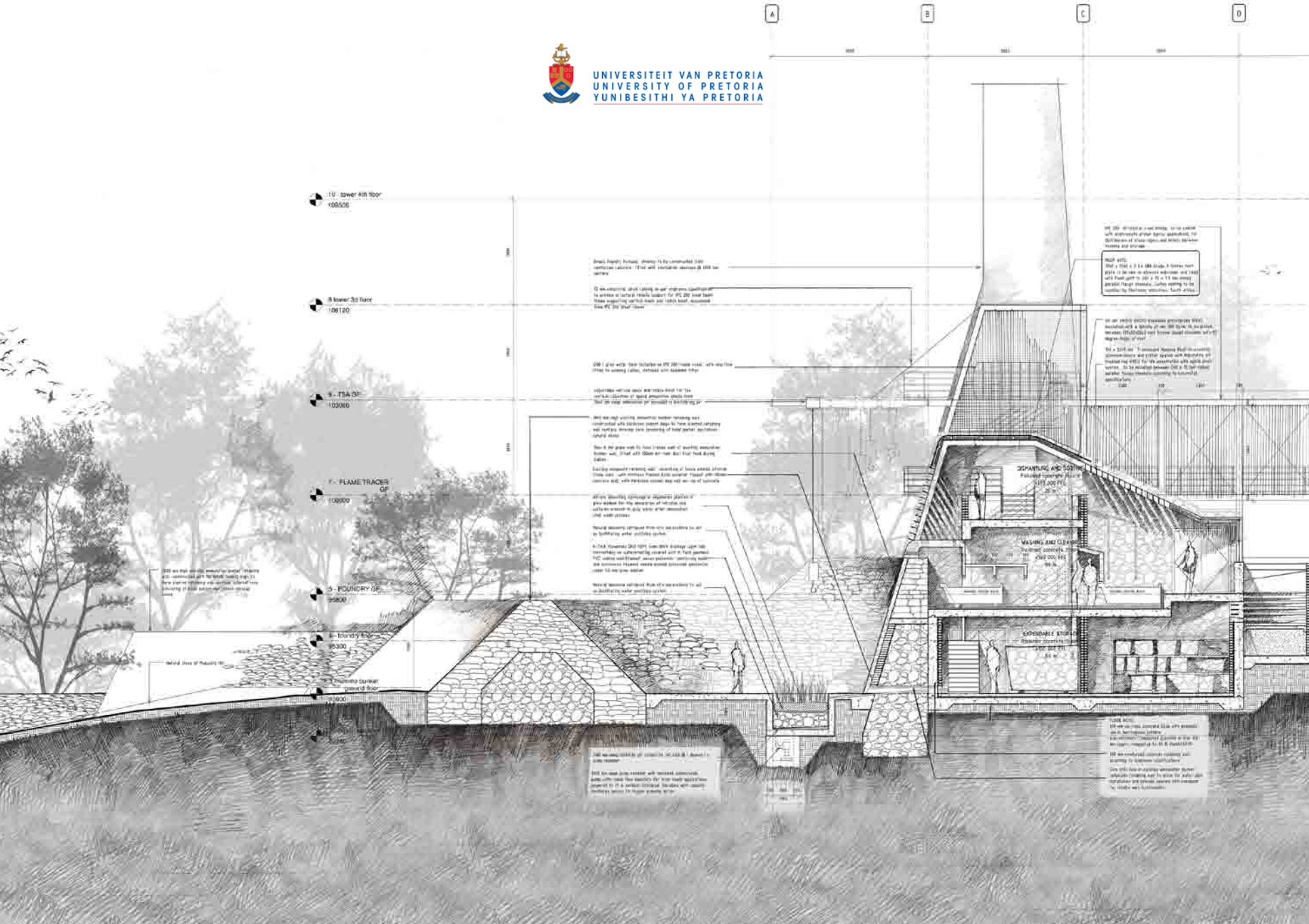

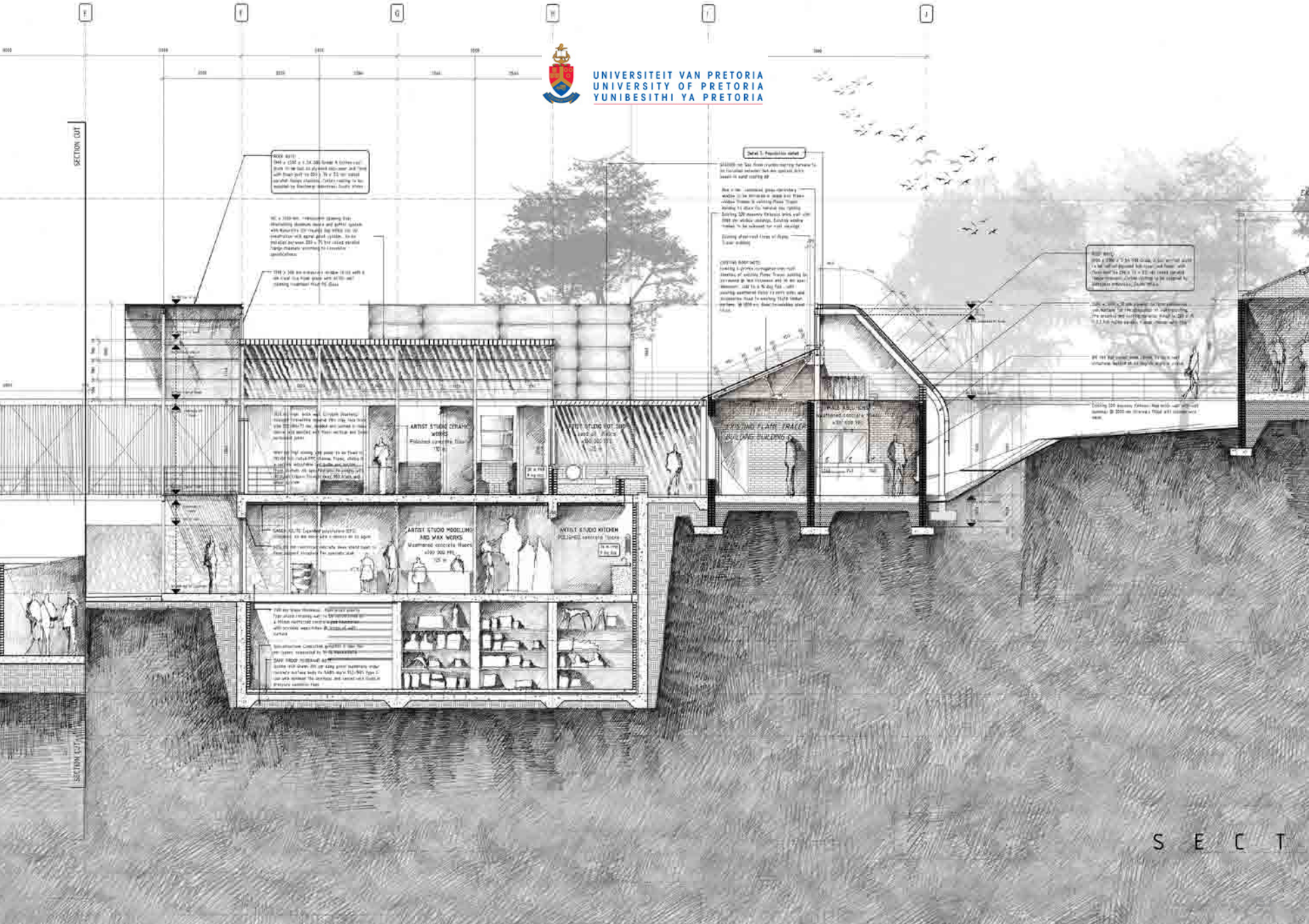
UNIVERSITEIT VAN PRETORIA
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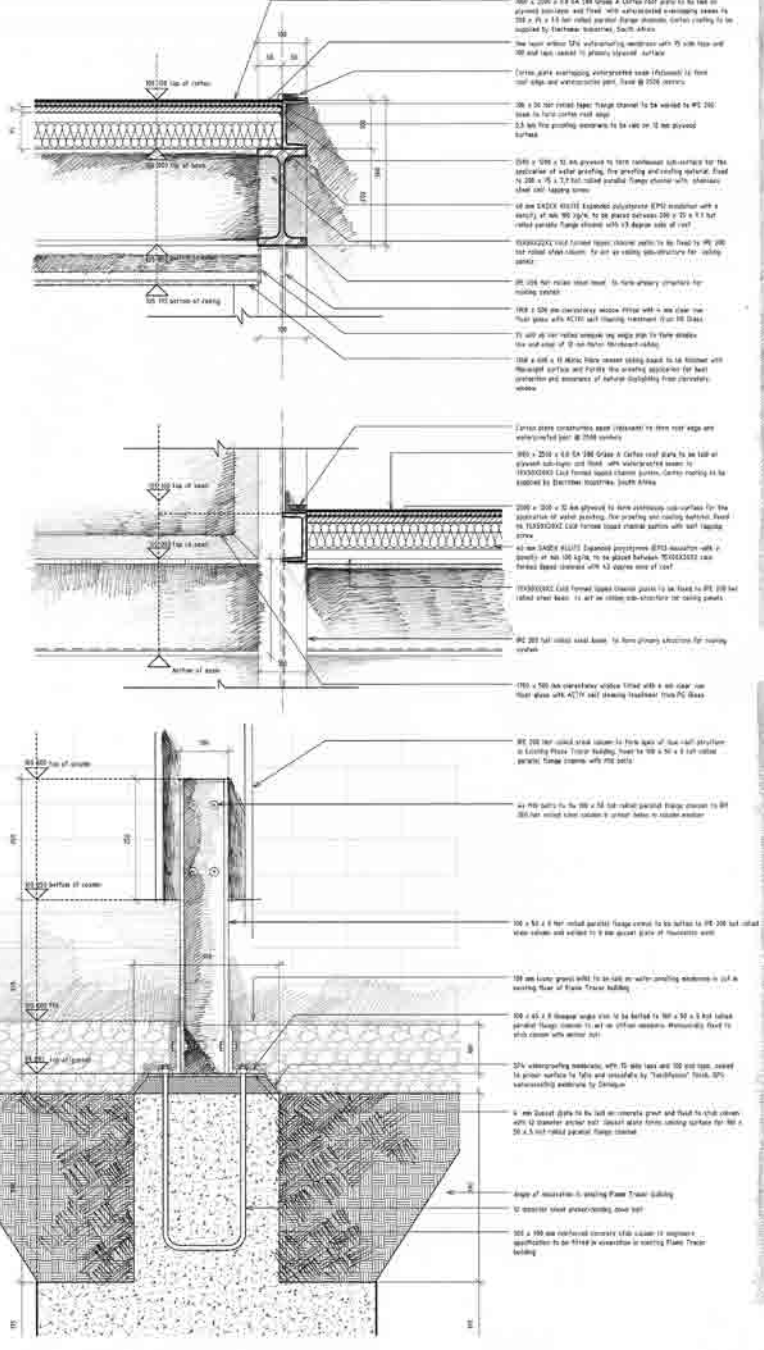
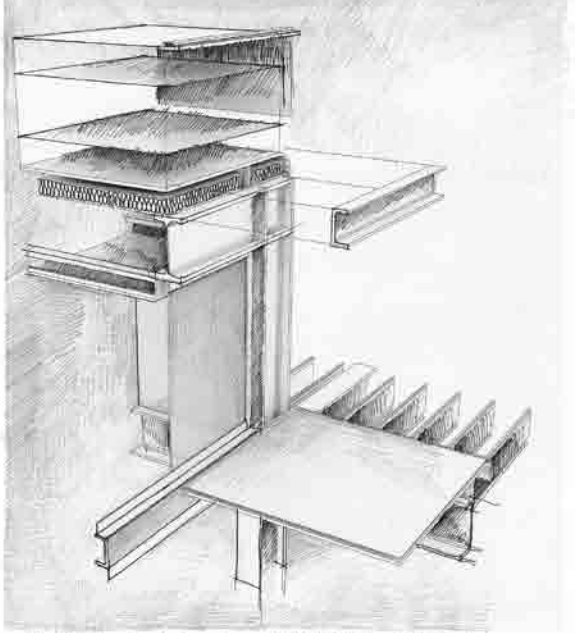
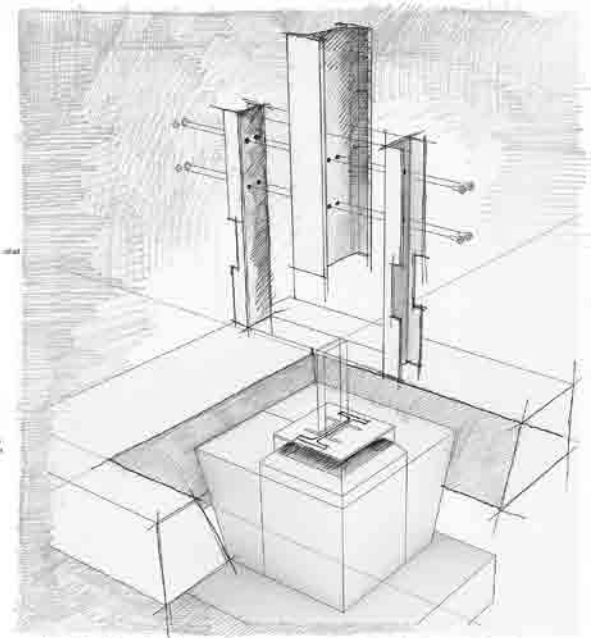
YUNIBESITHI YA PRETORIA
SECTION CUT
SECTION CUT
ARTIST STUDIO CERAMIC WORKS
ARTIST STUDIO MODELLING AND WAX WORKS
ARTIST STUDIO KILN SHED
ARTIST STUDIO KITCHEN
EXISTING FLARE TRACEY BUILDING BUILDING
S E C T

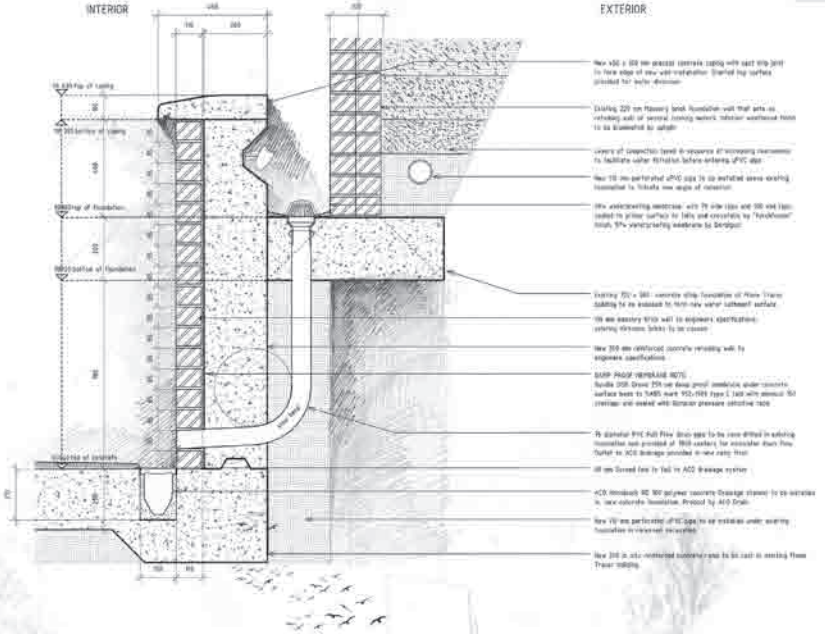


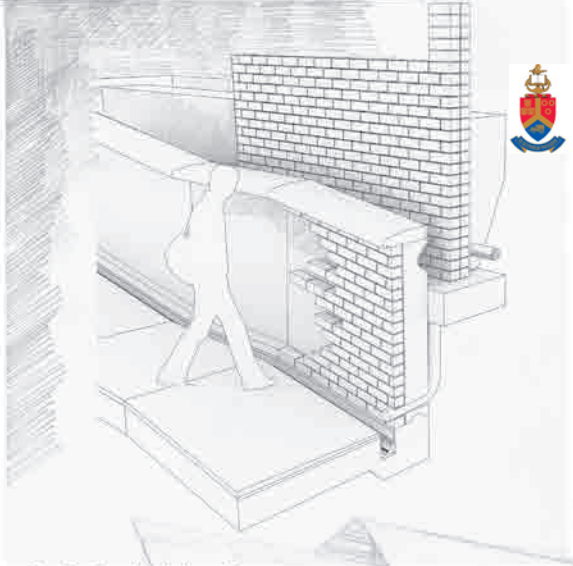


D E T A I L 6 : ROOF DETAIL SCALE: 1 : 5



D E T A I L 7 : FOUNDATION DETAIL SCALE: 1 : 5





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D E T A I L 8 : FOUNDATION DETAIL SCALE: 1 : 5

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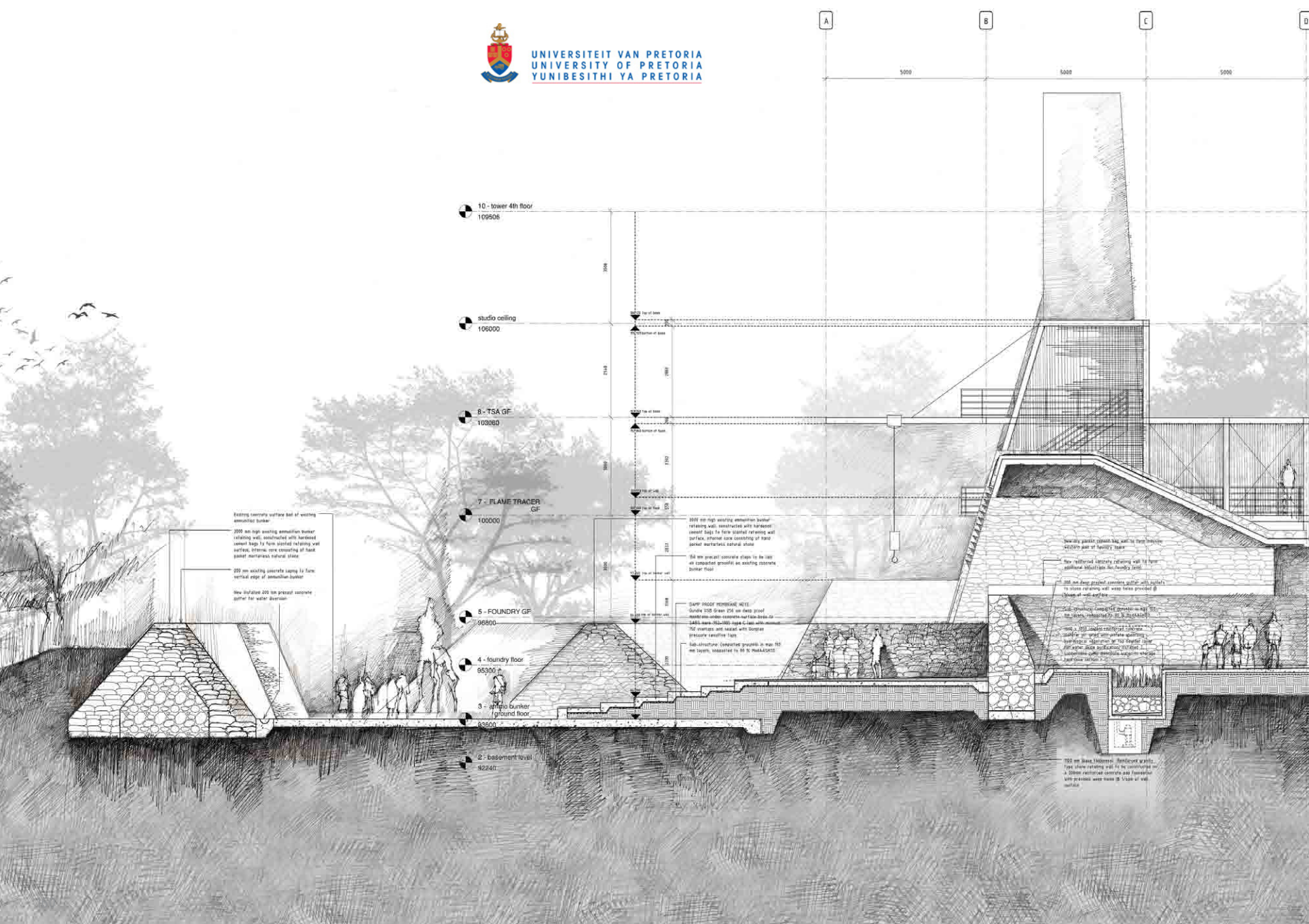

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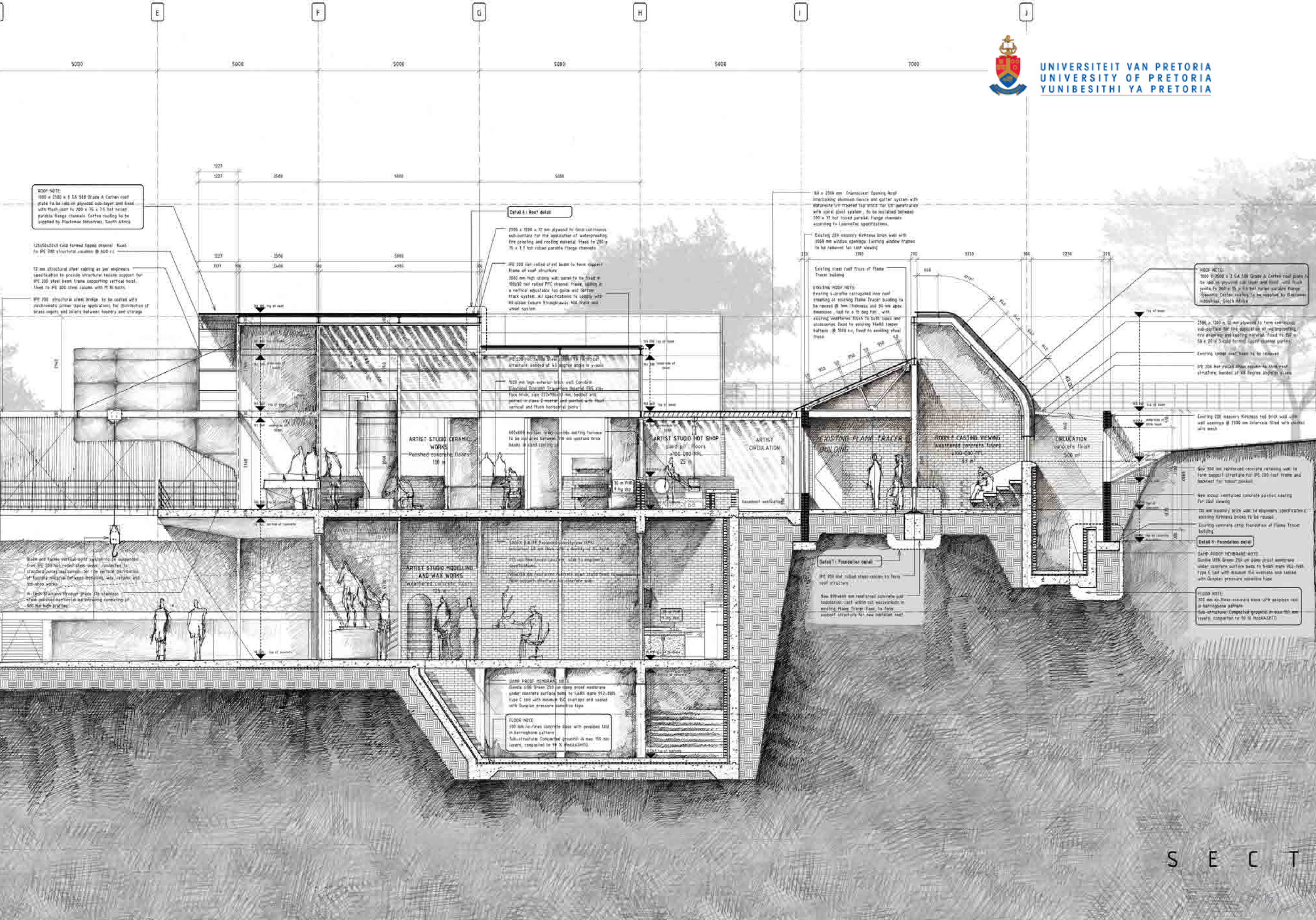
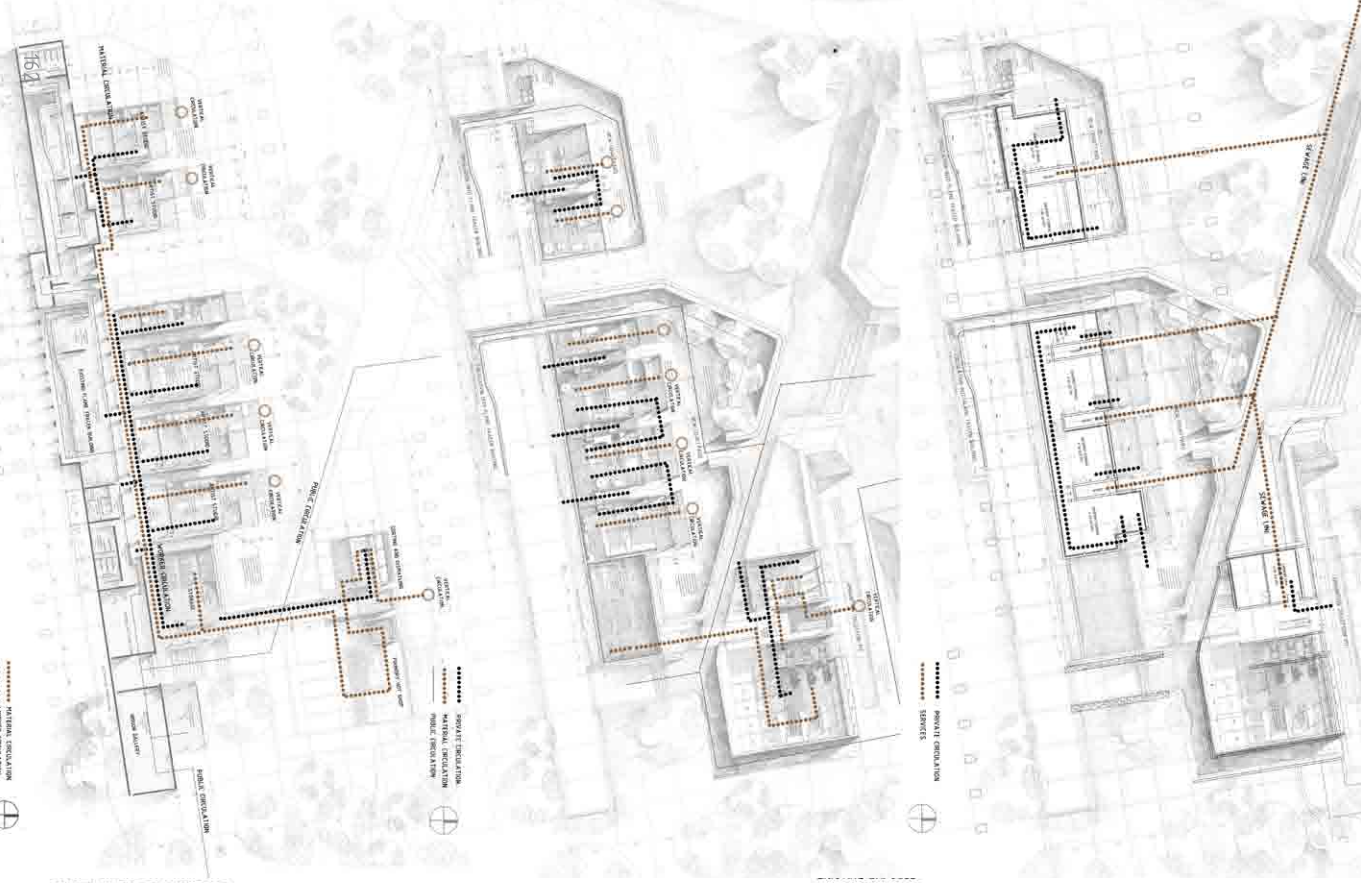
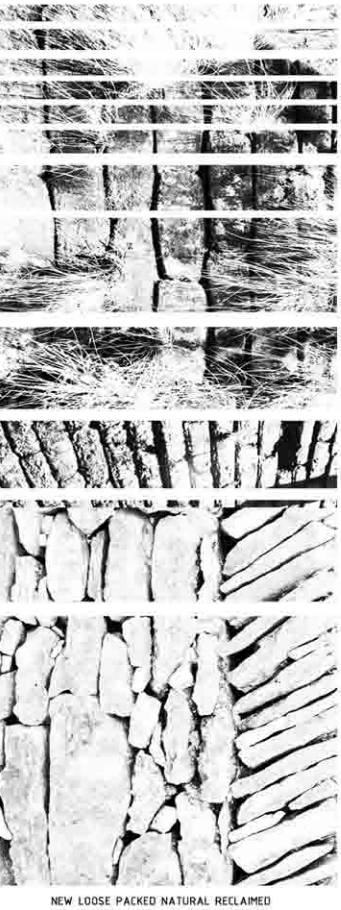


S E C T

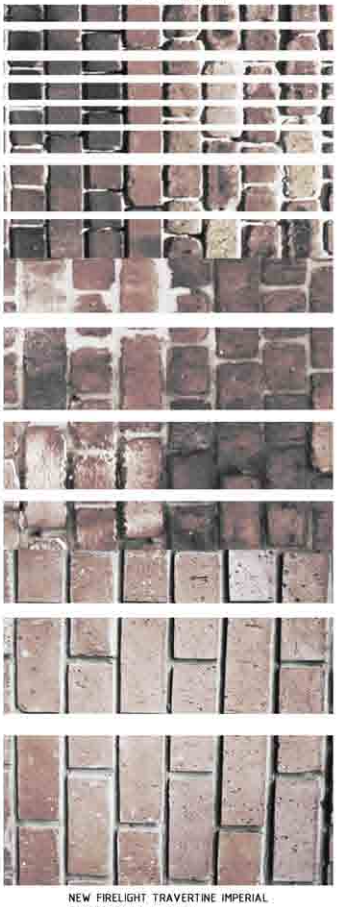


EXISTING HARDENED CEMENT BAG (PETRIFICATION PROCESS) TO FORM SUBMERGED STONE WALLS



NEW LOOSE PACKED NATURAL RECLAIMED STONE RETAINING WALLS

EXISTING KIRKNESS AND RED BRICK STRUCTURAL WORKS

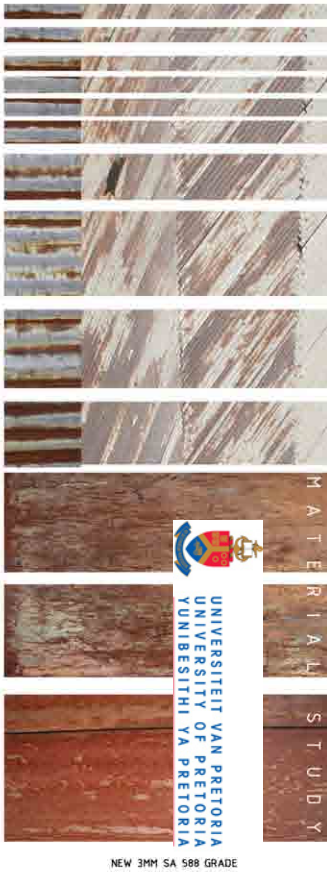


NEW FIRELIGHT TRAVERTINE IMPERIAL FBX BRICK BY COROBRIK

ROOF TRUSSES AND MILITARY SHADING DEVICES

NEW TRANSLUCENT OPENING ROOF INTERLOCKING ALUMINIUM LOUVRE AND GUTTER SYSTEM WITH NATURELITE UV TREATED TOP INFILLS

EXISTING WEATHERED CORRUGATED IRON ROOF SHEETING



NEW 3MM SA 588 GRADE A CORTEN STEEL

MATERIAL STUDY

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IMPLEMENTED BUILDING SYSTEMS

WATER MANAGEMENT

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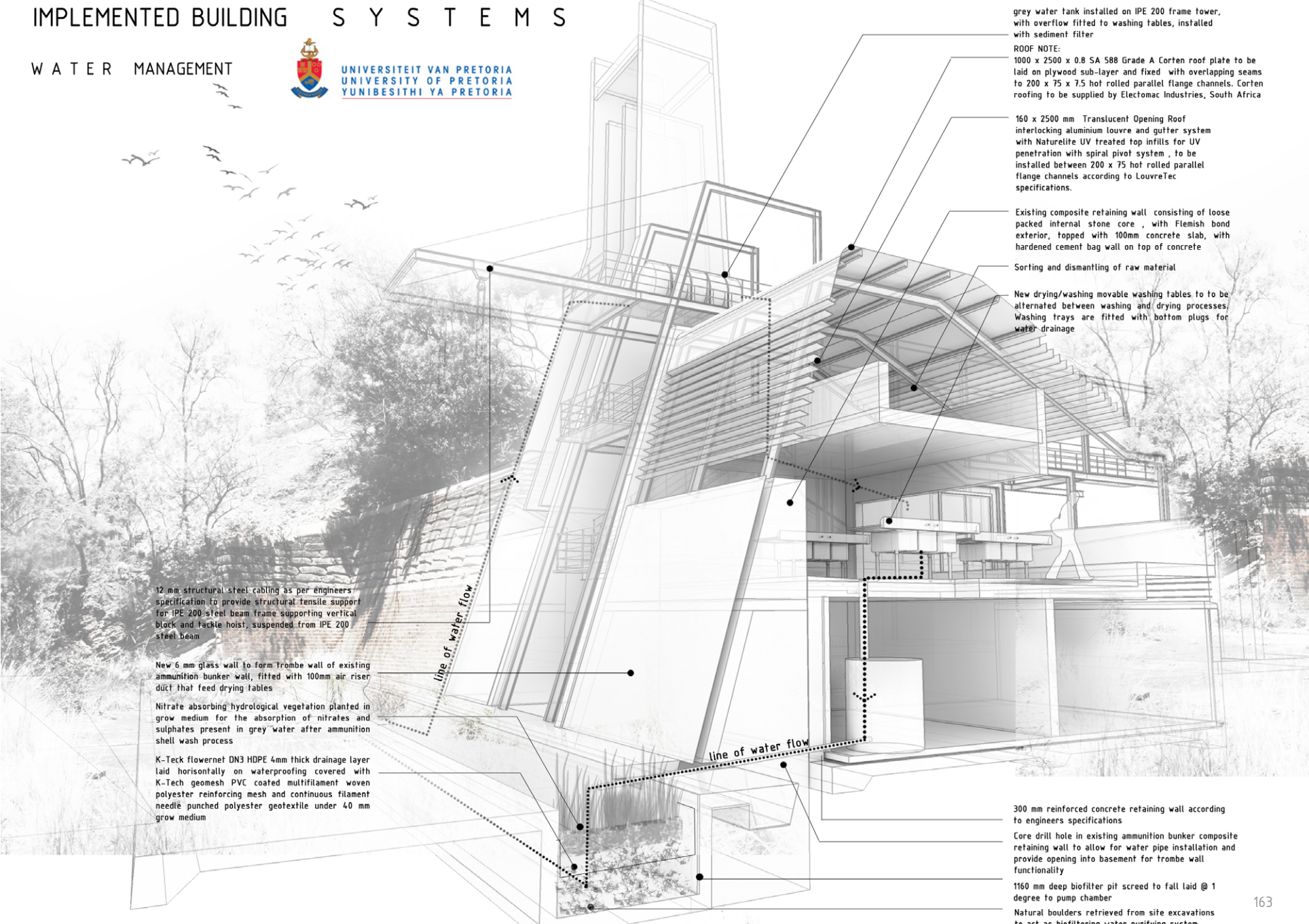

S T R U C T U R A L EXPLOSED VIEW OF ARTIST STUDIO

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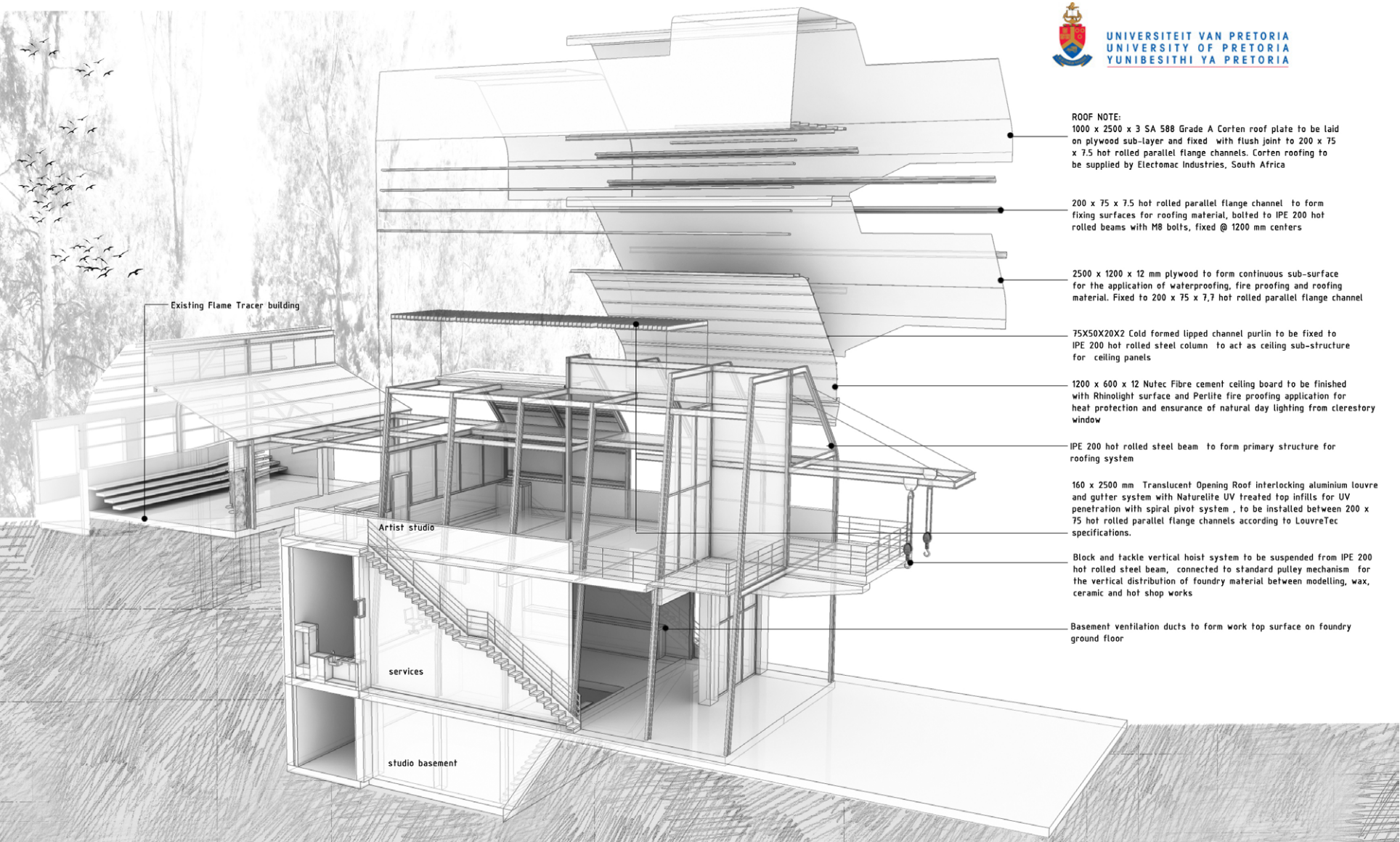


ROOF NOTE:
1000 x 2500 x 3 SA 588 Grade A Corten roof plate to be laid on plywood sub-layer and fixed with flush joint to 200 x 75 x 7.5 hot rolled parallel flange channels. Corten roofing to be supplied by Electomac Industries, South Africa

200 x 75 x 7.5 hot rolled parallel flange channel to form fixing surfaces for roofing material, bolted to IPE 200 hot rolled beams with M8 bolts, fixed @ 1200 mm centers

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 parallel flange channel

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

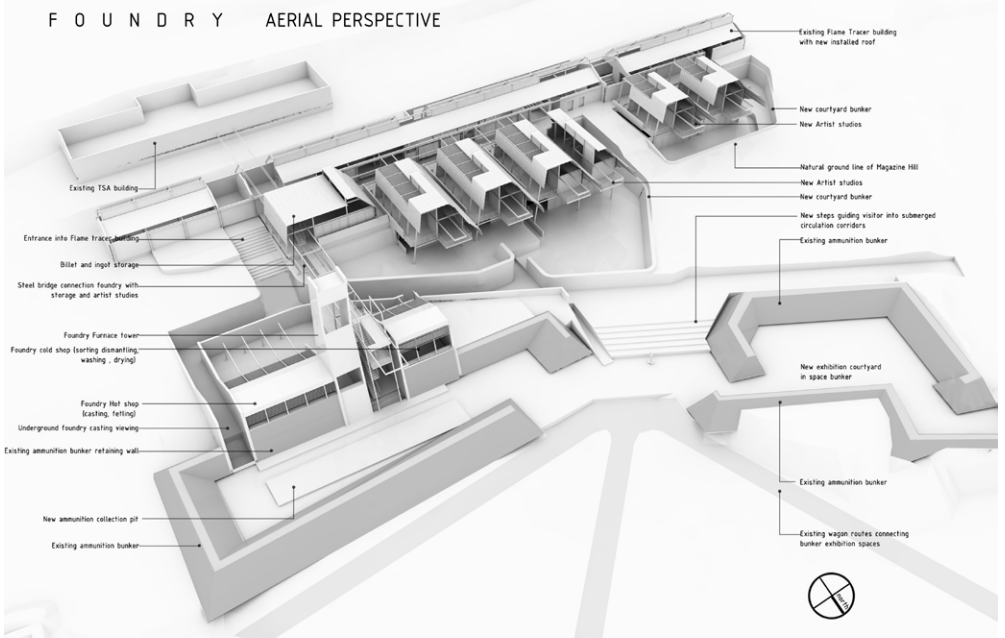
1200 x 600 x 12 Nutec Fibre cement ceiling board to be finished with Rhinolight surface and Perlite fire proofing application for heat protection and ensurance of natural day lighting from clerestory window

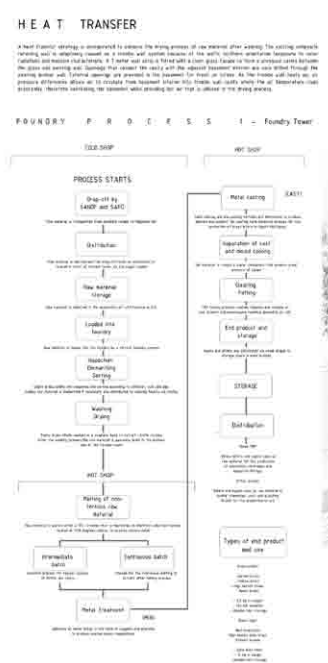
IPE 200 hot rolled steel beam to form primary structure for roofing system

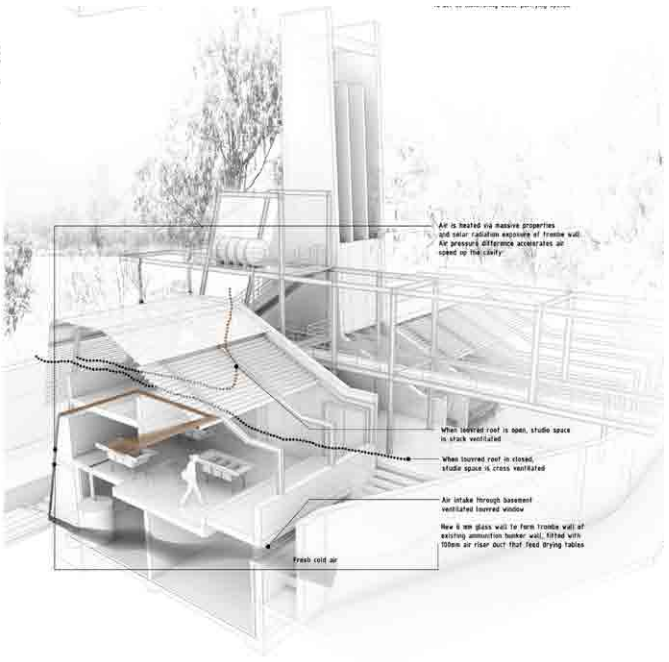
160 x 2500 mm Translucent Opening Roof interlocking aluminium louvre and gutter system with Naturelite UV treated top infills for UV penetration with spiral pivot system , to be installed between 200 x 75 hot rolled parallel flange channels according to LouvreTec specifications.

Block and tackle vertical hoist system to be suspended from IPE 200 hot rolled steel beam, connected to standard pulley mechanism for the vertical distribution of foundry material between modelling, wax, ceramic and hot shop works

Basement ventilation ducts to form work top surface on foundry ground floor


F O U N D R Y AERIAL PERSPECTIVE
Existing Flame Tracer building with new installed roof
New courtyard bunker
New Artist studios
Natural ground line of Magazine Hill
New Artist studios
New courtyard bunker
New steps guiding visitor into submerged circulation corridors
Existing ammunition bunker
Existing TSA building
Entrance into Flame tracer building
Billet and ingot storage
Steel bridge connection foundry with storage and artist studios
Foundry Furnace tower
Foundry cold shop (sorting dismantling, washing , drying)
Foundry Hot shop (casting, fetting)
Underground foundry casting viewing
Existing ammunition bunker retaining wall
New exhibition courtyard in space bunker
Existing ammunition bunker
New ammunition collection pit
Existing ammunition bunker
Existing wagon routes connecting bunker exhibition spaces


H E A T TRANSFER
F O U N D R Y P R O C E S S 1 – Foundry Tower
COLD SHOP
HOT SHOP
PROCESS STARTS
Drop-off by SAMDF and SAFC
Distribution
Raw material storage
Loaded into foundry
Dismantling Sorting
Washing Drying
HOT SHOP
Melting of non-ferrous raw material
Intermittent batch
Metal treatment
Metal casting
CASTI
Separation of cast and mould cooling
Cleaning Fettling
End product and storage
STORAGE
Distribution
Types of end product and use


Air is heated via massive properties and solar radiation exposure of trombe wall. Air pressure difference accelerates air speed up the cavity.
When louvred roof is open, studio space is stack ventilated
When louvred roof is closed, studio space is cross ventilated
Air intake through basement ventilated louvred window
New 6 mm glass wall to form trombe wall of existing ammunition bunker wall, fitted with 100mm air riser duct that feed drying tables
Fresh cold air

This appendix illustrates photographs of the final architectural model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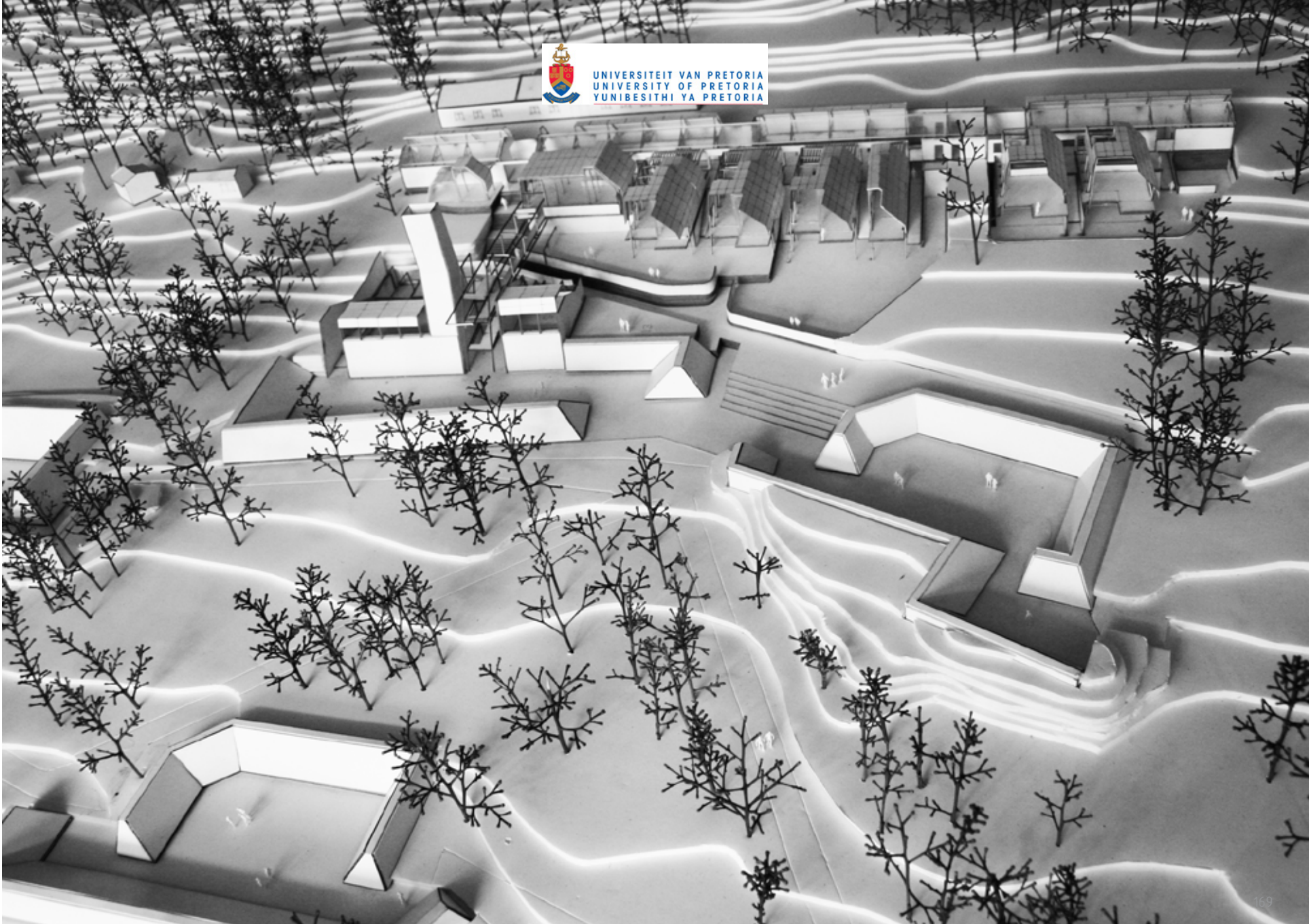
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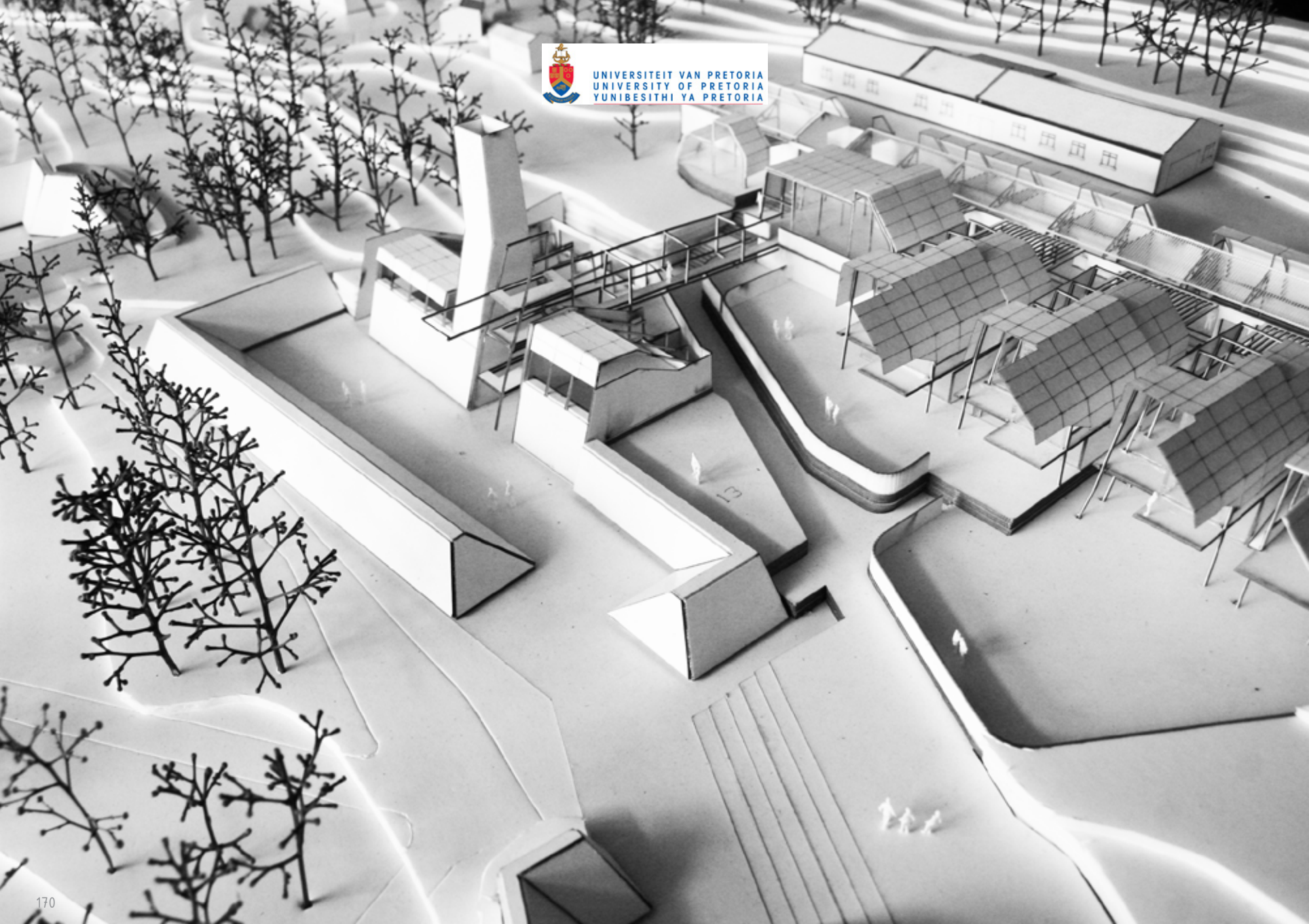
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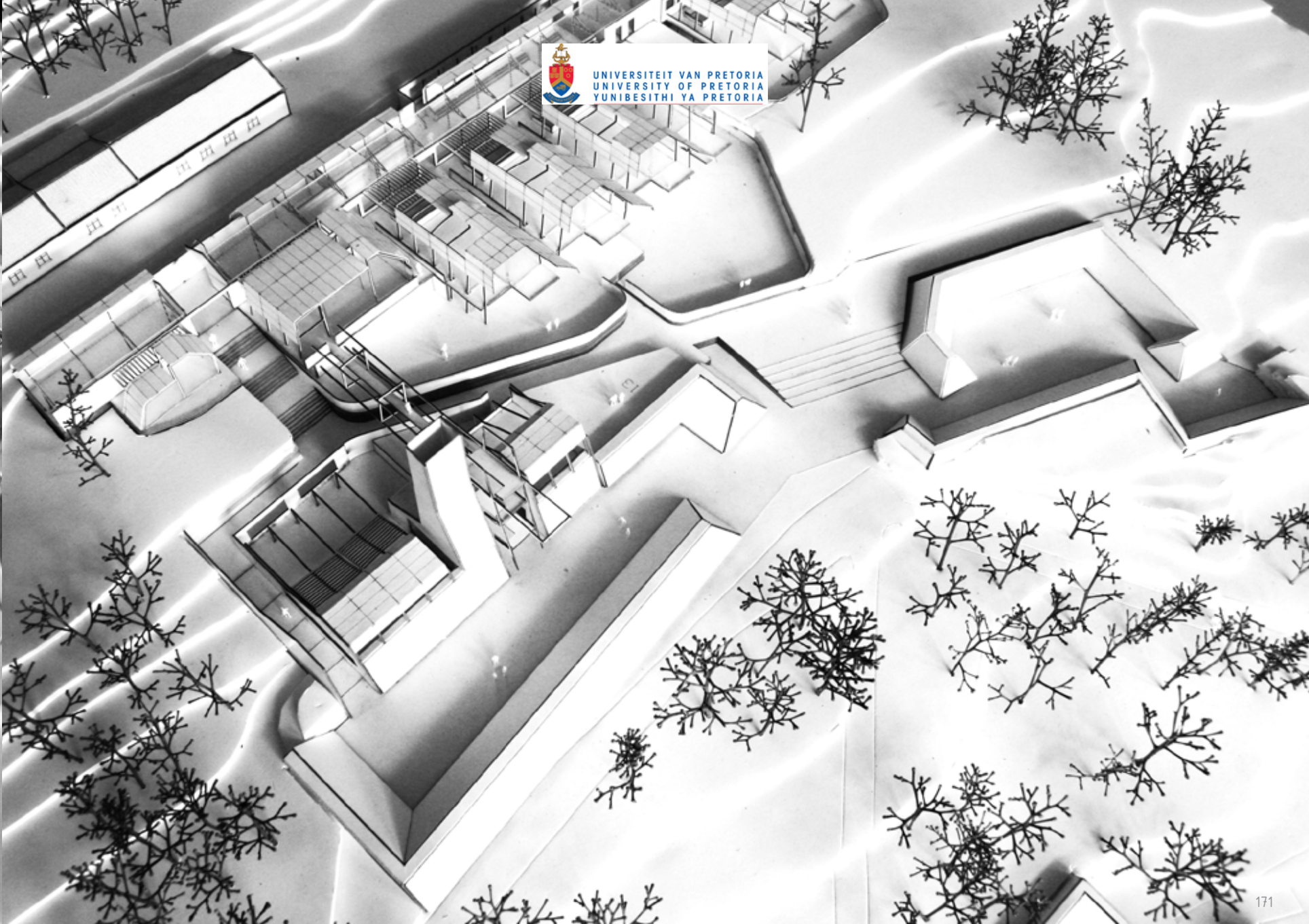
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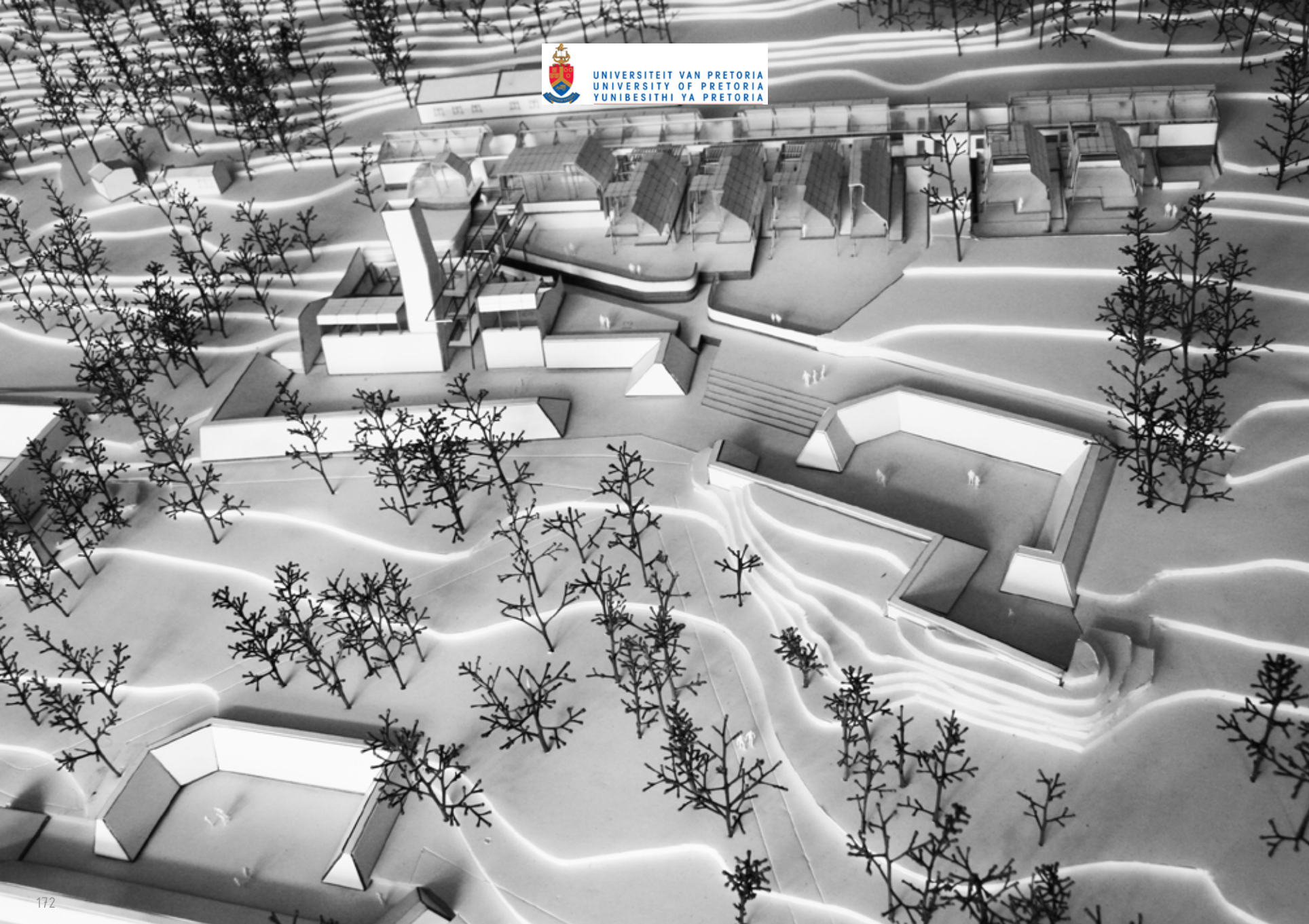
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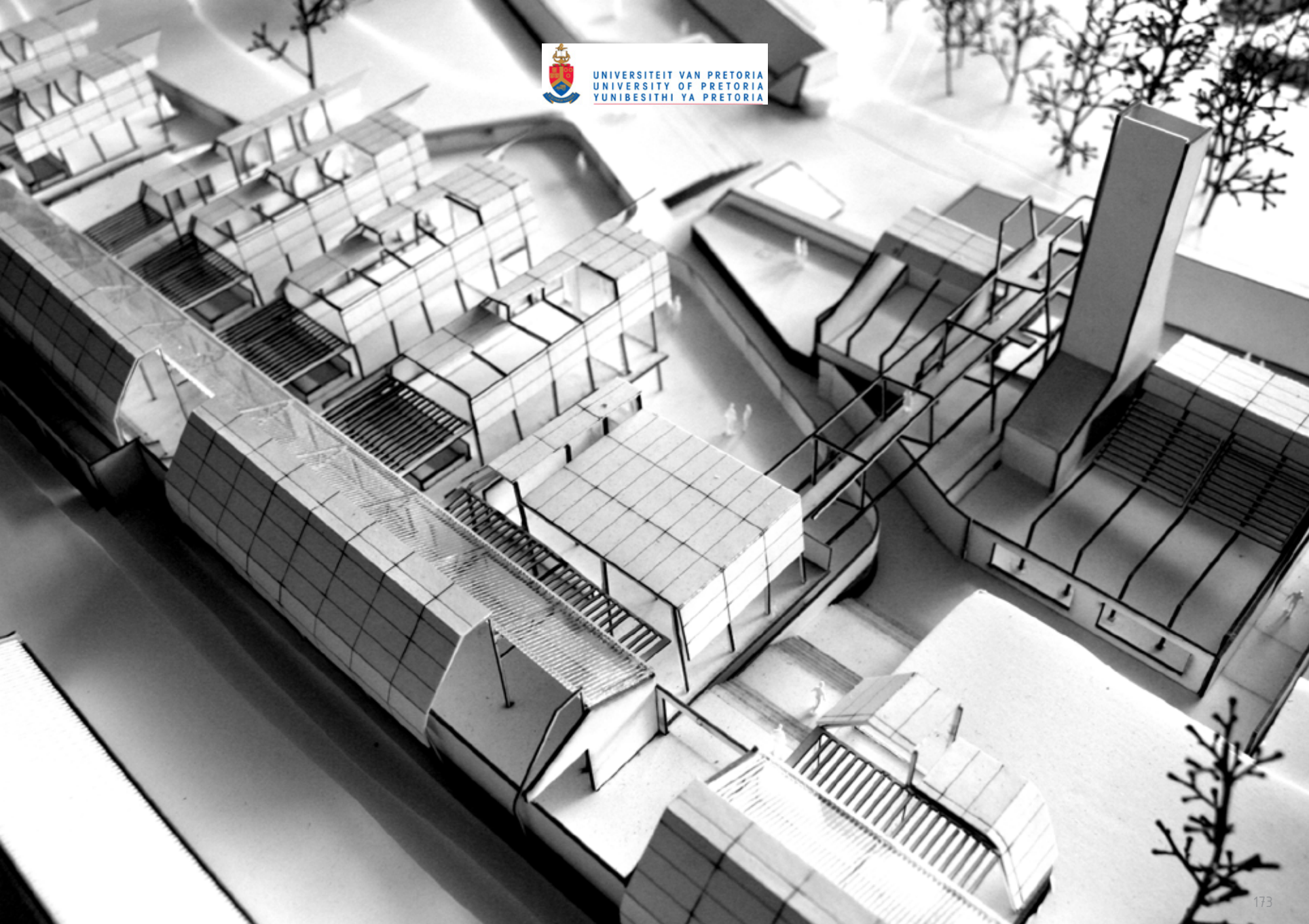
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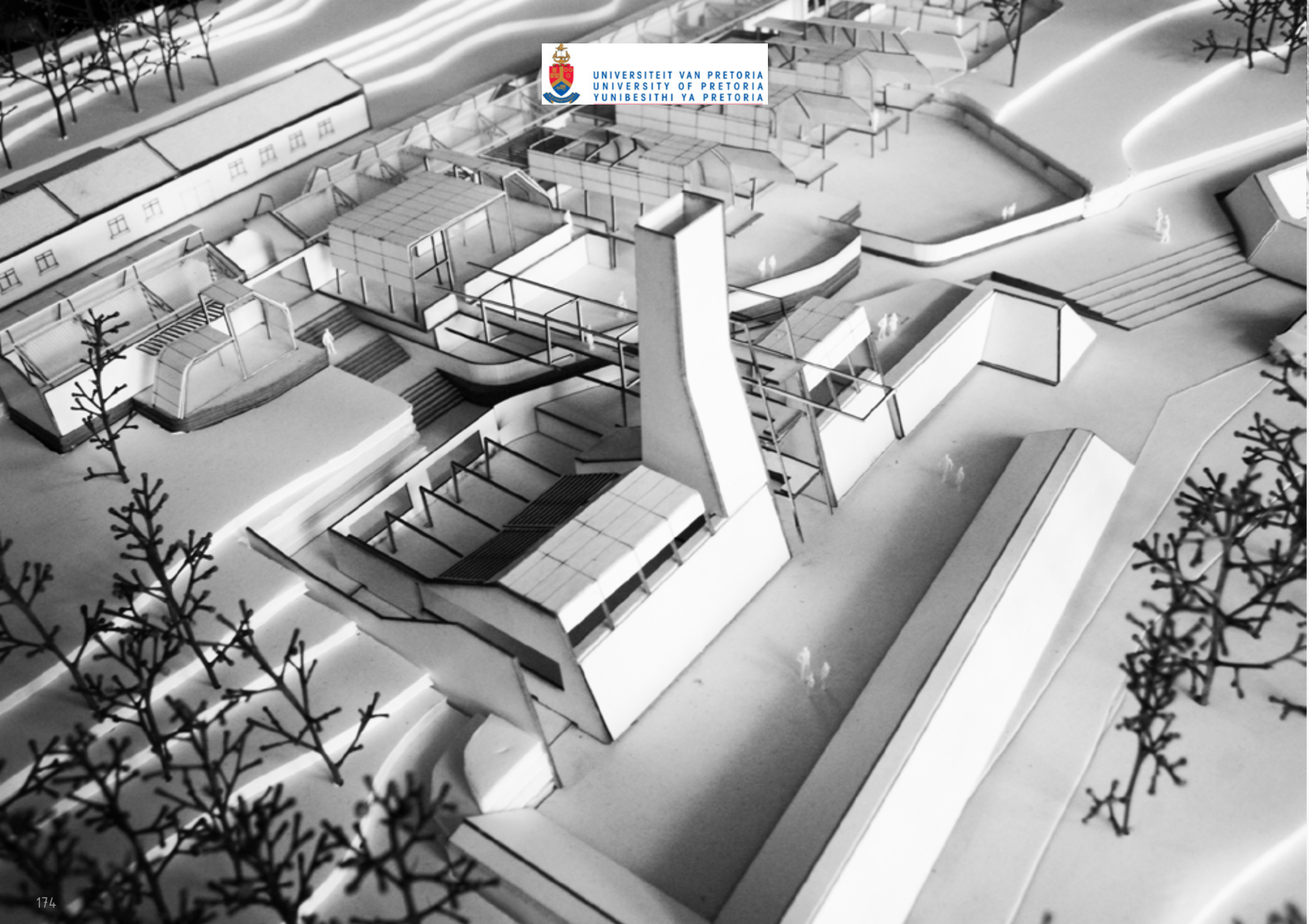
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