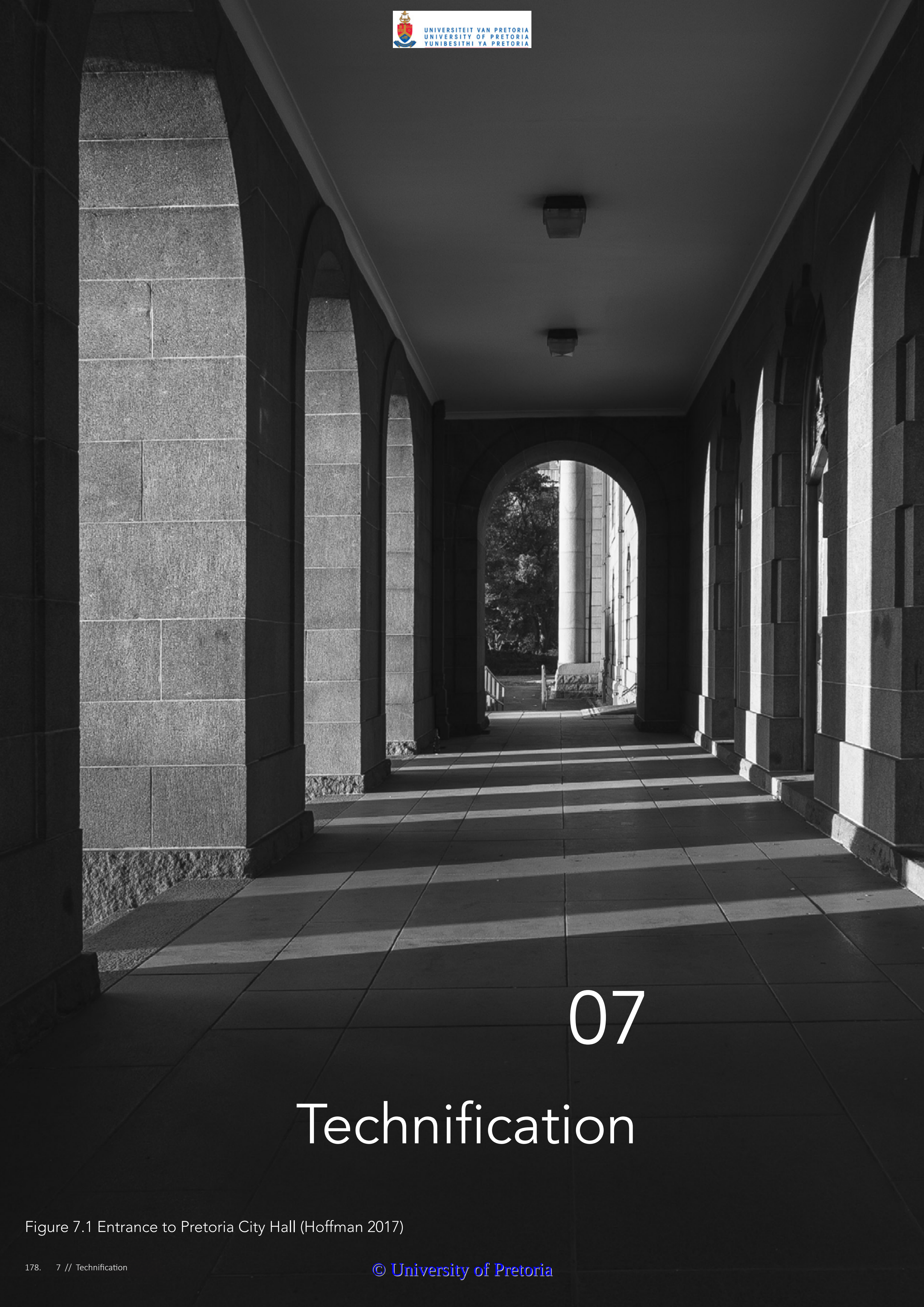


07

Technification

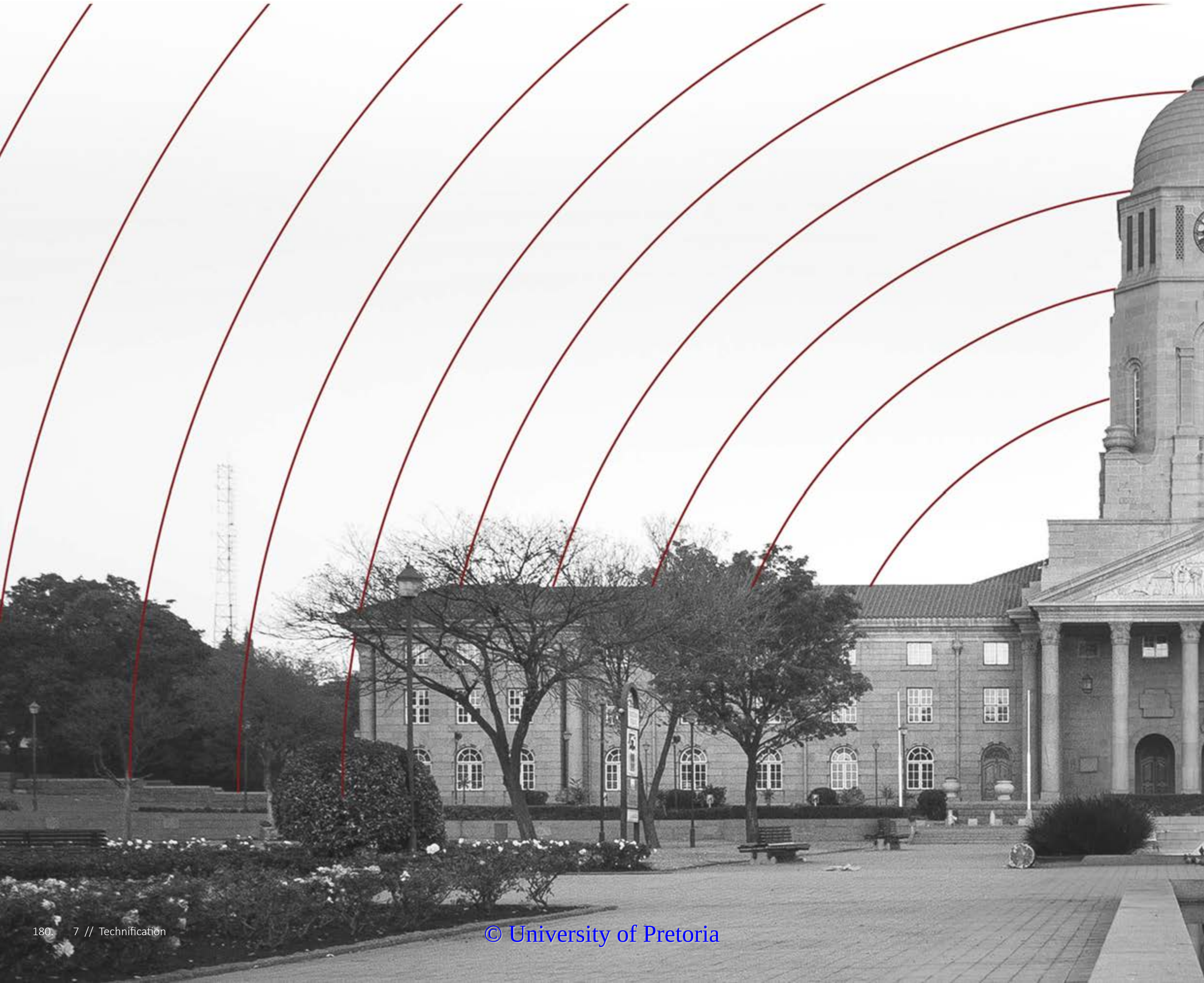
Figure 7.1 Entrance to Pretoria City Hall (Hoffman 2017)

The Transparent Nature of Architecture

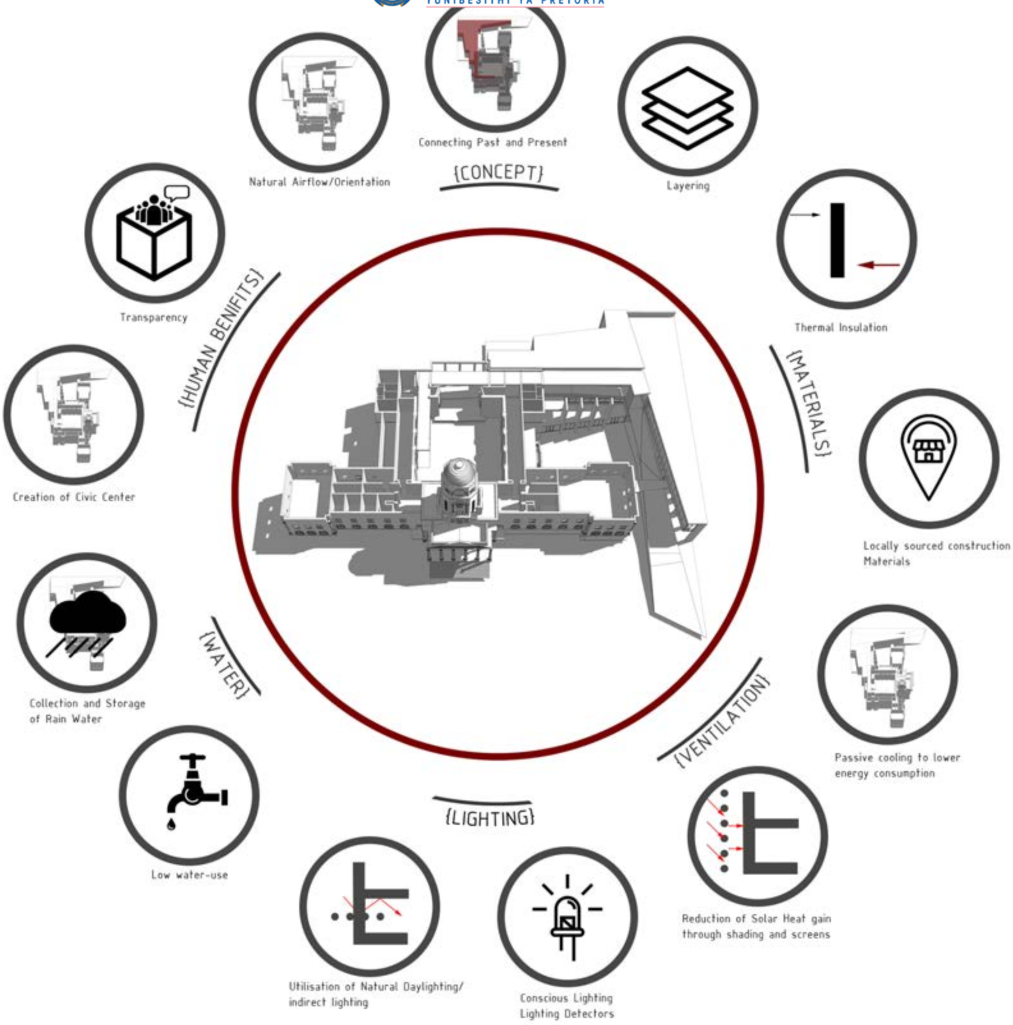
7.1 - Introduction

The premise in which the technical argument is grounded carries on from the core design concept of architecture's role in facilitating transparency in a democratic society as established in the urban vision as well as supported by Nikitin (2009) when discussing the value of civic centres. From the macro scale of the immediate context of the new Local Government Square, to the facilitation of protest in the design to how the new connects to the existing, it is argued that, in order for architecture to be transparent in its approach, it is proposed that rigour between these varying scales is required. To achieve this goal, the technical approach is handled at three different scales: that of the macro building climate, the tripartite structural system, and through the debate of junctions.

Figure 7.2 Transparent Nature of Architecture (Author 2017)




ANDRIES WILHELMUS JACOBUS
PRETORIUS

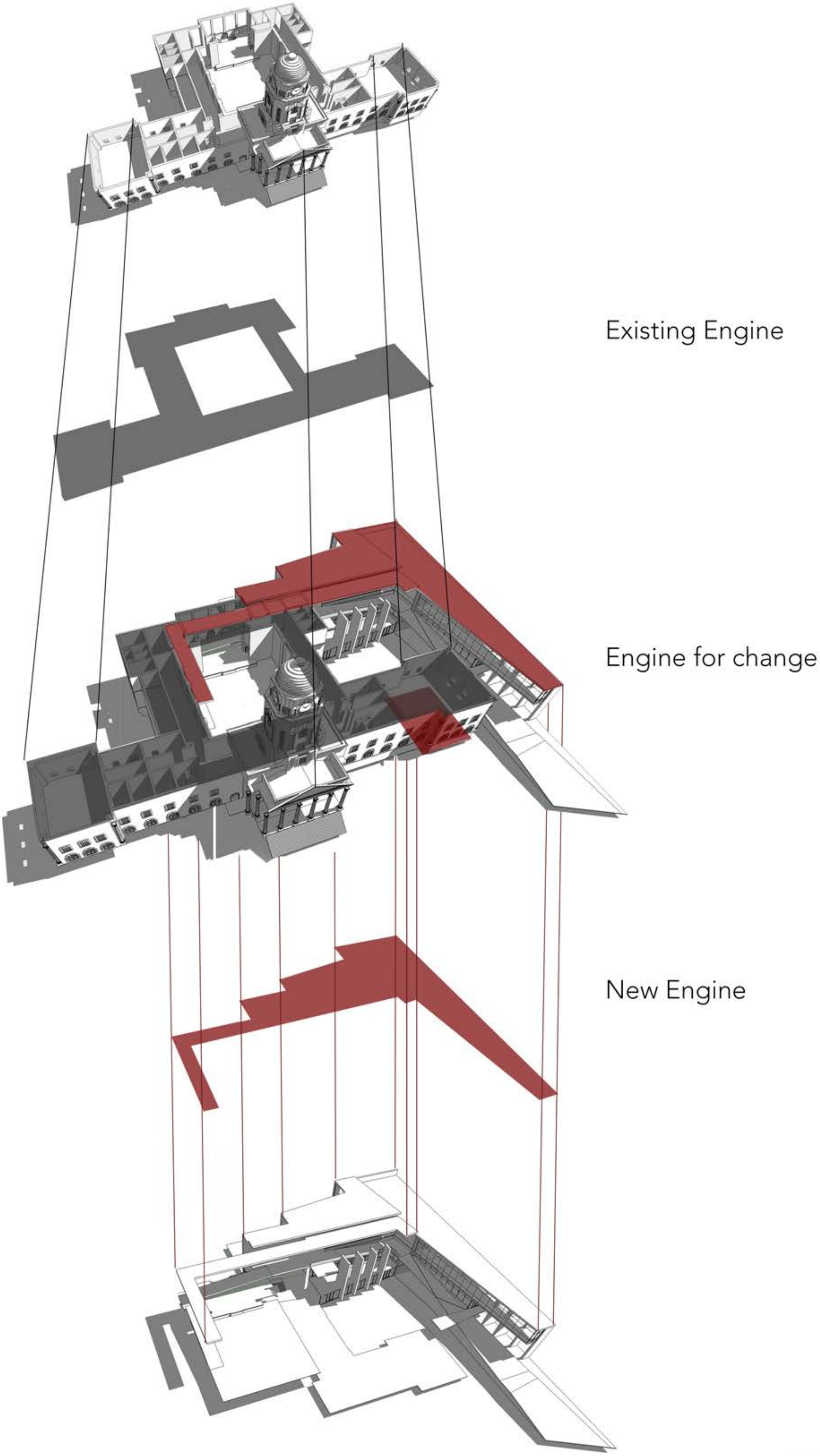


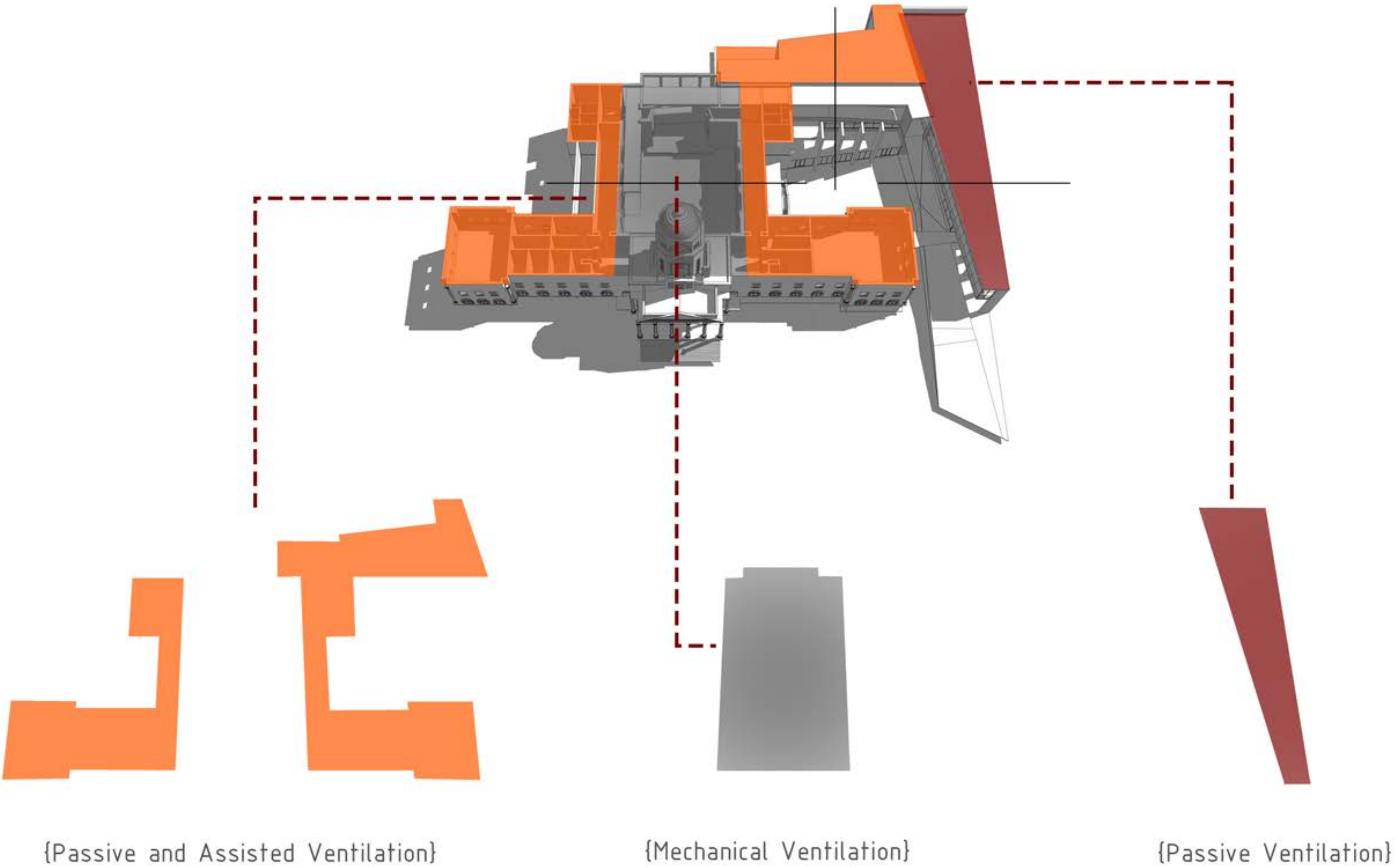
7.2 - The building as an Engine for change

Pretoria city hall was further investigated as a starting point for the technical resolution, in an attempt to uncover the original technical advancements that were utilised during its construction. What was identified led to the new being regarded as an engine for change. Pretoria city hall was constructed with two main systems. The first being an advanced air circulation system intended to keep internal air temperatures constant, and the second being the inclusion of a small distribution plant positioned in the basement of the northern wing (Herring 1935). Pretoria City Hall was able to appropriately facilitate its needs through the use of these systems further cementing its position as a symbol of progress.

Central to the initial technological investigation of the project was the continuation and completion of the design intention of reactivating Pretoria City Hall as a civic centre, rather than the basic technification of the building. Therefore, looking at the building as a new engine is an extension of this line of thought as well as of the existing structure's self-reliance. The technical resolution will therefore focus on the ventilation of the design as well as introduce a new function of water collection in response to the current water shortages experienced in South Africa (The Water Project 2017).

Figure 7.3 Above; The building as an engine for change (Author 2017)
Figure 7.4 Right; Engine layers (Author 2017)


Existing Engine
Engine for change
New Engine



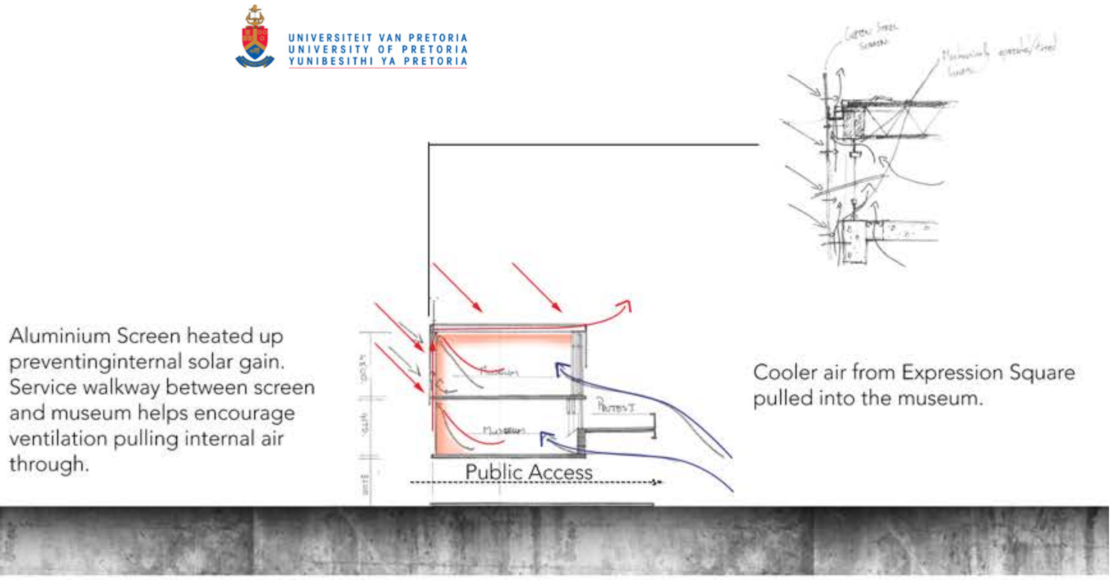
7.2.1 - Ventilation Systems

The ventilation for the design was divided into three zones so to best respond to the existing as well as move towards creating a greener building. The three zones are passive, assisted and mechanically serviced. Each zone was determined as a response to several established issues.

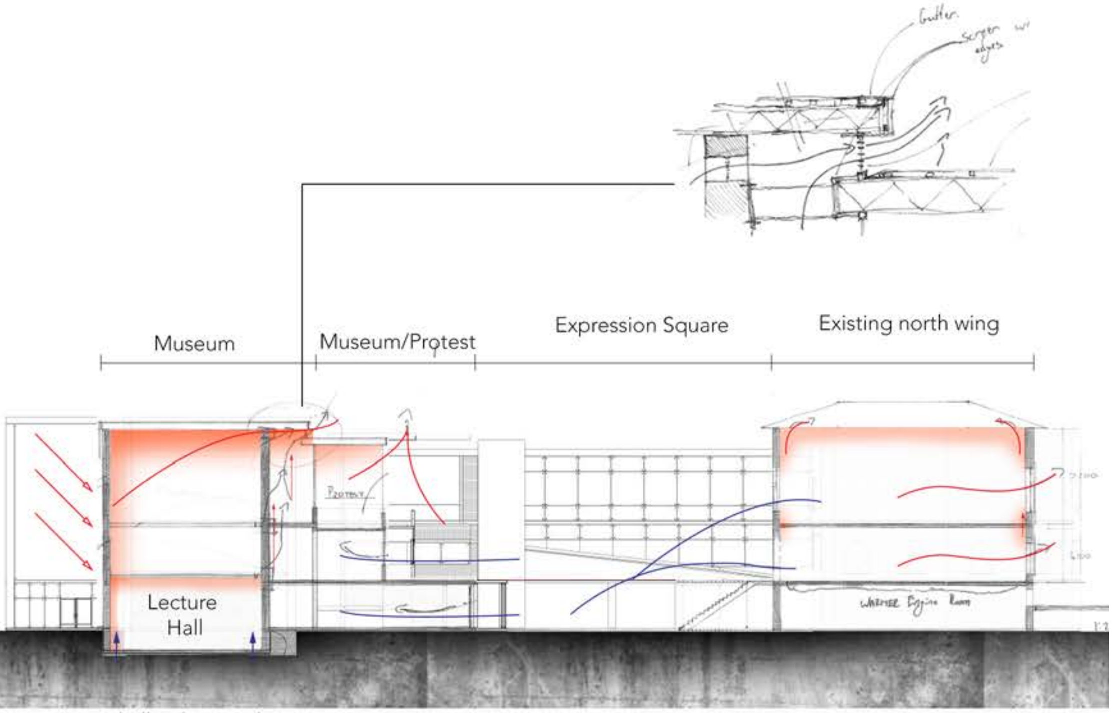
The first was that of the occupation of the design, which was determined through the programming of the building. Passive ventilation is positioned in the zone with the lowest occupation; assisted ventilation is positioned where the building is designed around public occupation; and the controlled mechanical zone (existing) is positioned in the debate arena which is to contain the highest concentration of people.

Through the establishment of the zones and the application of the principles required to allow for efficient passive ventilation, it was noted that Pretoria City Hall was designed in such a way that it, too, meets the requirements of passive ventilation systems. Therefore, the mechanical system would be controlled so as to prevent its unnecessary use when the hall is not fully occupied.

Figure 7.5 Above; Ventilation Zones (Author 2017)
Figure 7.6 Right; Ventilation Sections (Author 2017)

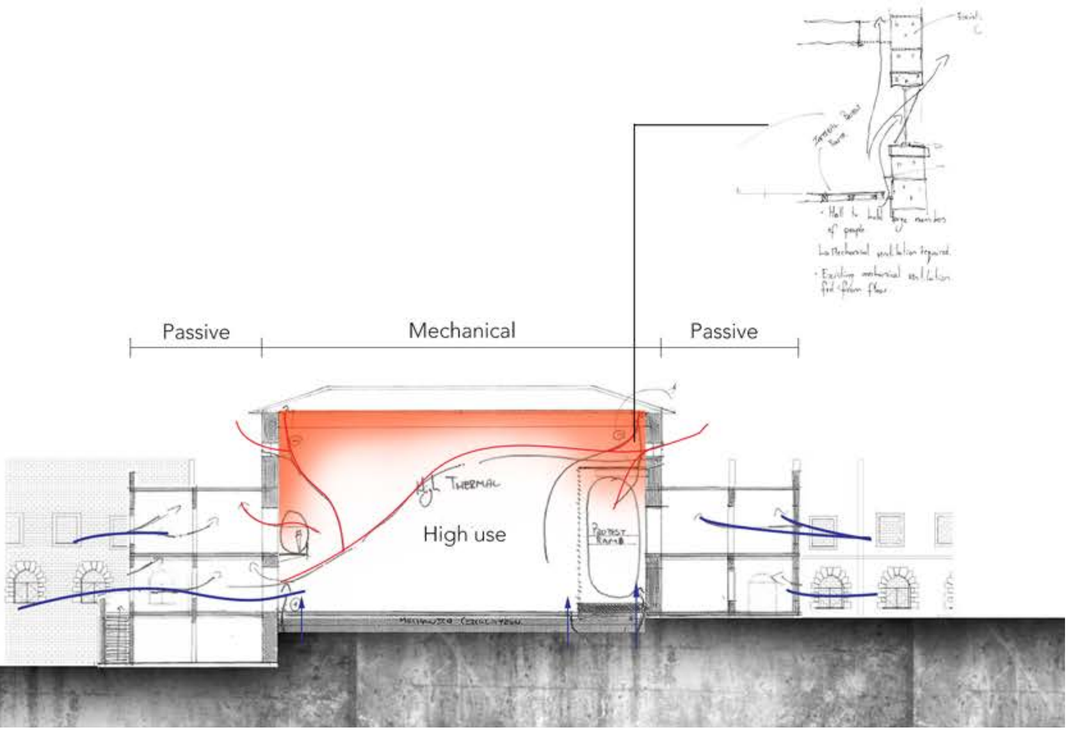


Passive Ventilation



Assisted Ventilation

Lecture hall utilises rock store and earth to maintain temperature



Mechanical Ventilation

Water Management

- Main water connection
- Potable water
- Roof catchement area
- Surface catchement area
- Rain water harvest flow
- Water storage tank
- Irrigation needed
- Pump

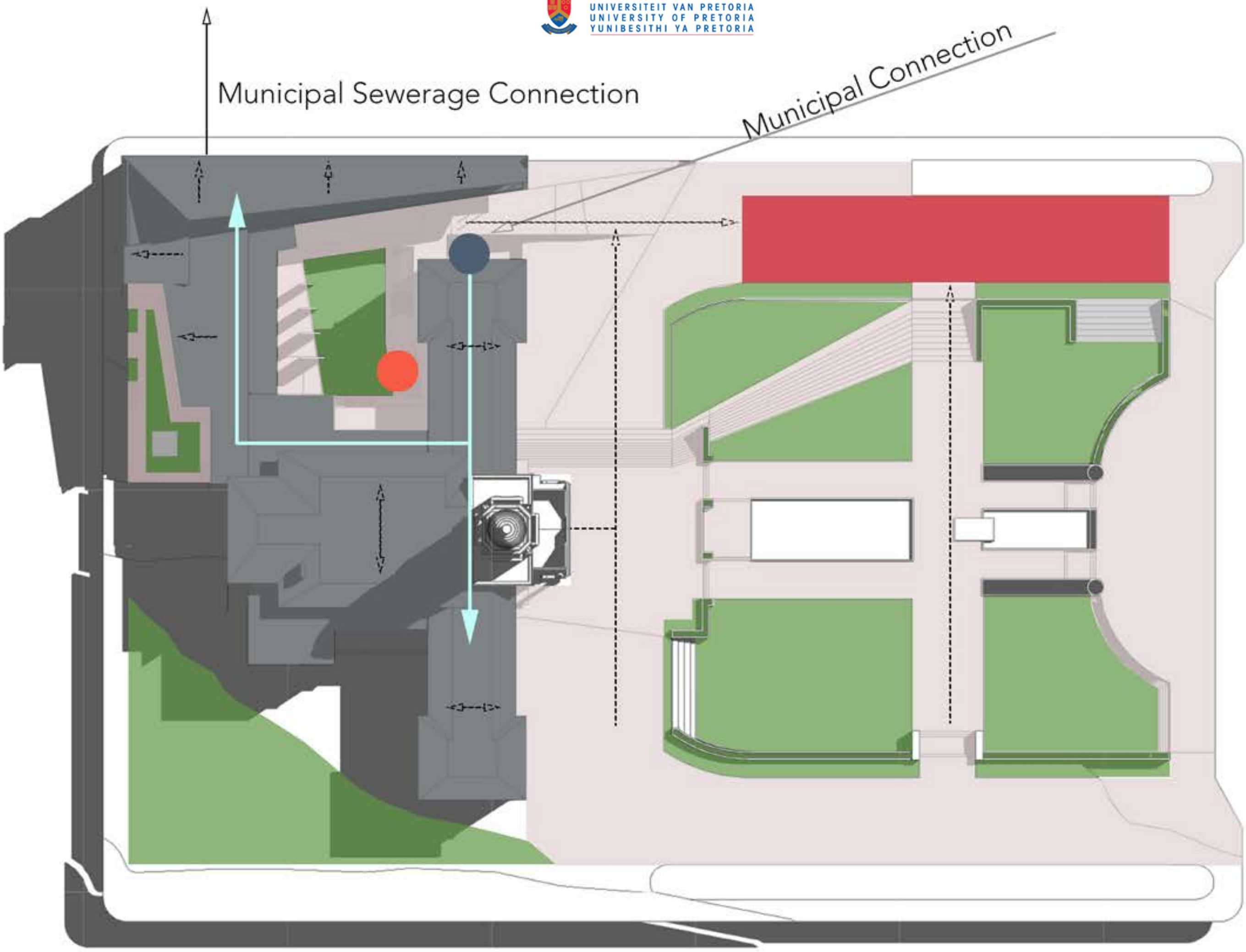
7.2.2 - Water Systems

Through the development of Pretoria City Hall, it is given a prominent seat in the political climate and therefore is required to act as an indicator of both political attitudes and responsible design. South Africa is currently experiencing its worst drought in over two decades (Da Silva 2017). The drought, coupled with infrastructure poorly managed by government (The Water Project 2017), has resulted in a wide spread crisis that affects many aspects of daily life, ranging from increased food prices due to the loss of crops, to certain areas experiencing water-shedding (Da Silva 2017).

The lack of management of the country's water systems by government supports the argument for transparency in our political environment to prevent this from happening in the future, and is therefore an appropriate system for the New City Hall to address.

Storm water will be collected from all hard surfaces on the City Hall block and rain water will be harvested from City Hall. All the water will be stored in a newly constructed water tank underneath the external expression square.

Figure 7.7 Right Top; Water Strategy (Author 2017)
Figure 7.8 Right Bottom; Water Budget Table (Author 2017)

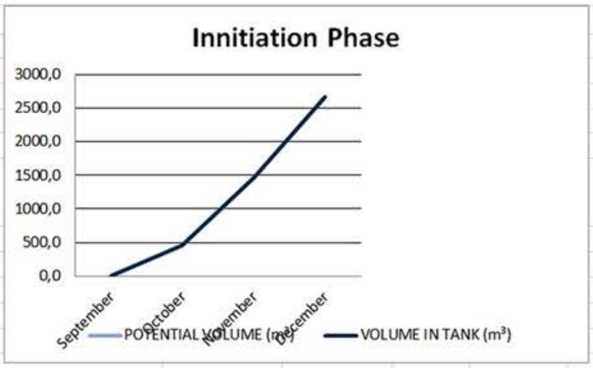


Water Budget

TANK CAPACITY (m^3):	3200
MIN VOLUME (m^3):	0

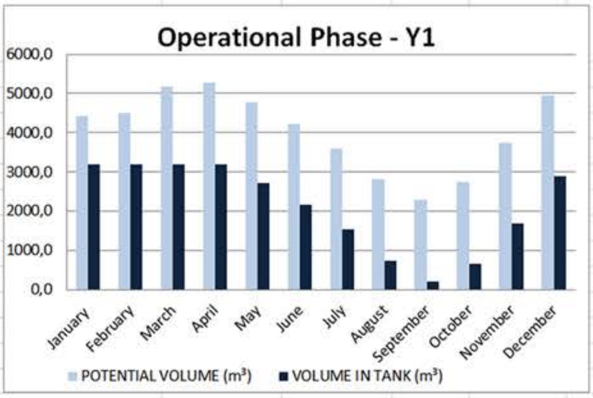
C1 WATER BUDGET INNITIATION PHASE

MONTH	YIELD (m^3/month)	DEMAND (m^3/month)	MONTHLY BALANCE	POTENTIAL VOLUME (m^3)	VOLUME IN TANK (m^3)
September	448,7	976,0	-527,3	0,0	0,0
October	1448,1	994,8	453,3	453,3	453,3
November	1998,7	985,8	1012,9	1466,2	1466,2
December	2202,7	1004,6	1198,1	2664,3	2664,3
	6098,2	3961,2	2137,0		



C2 WATER BUDGET YEAR 1

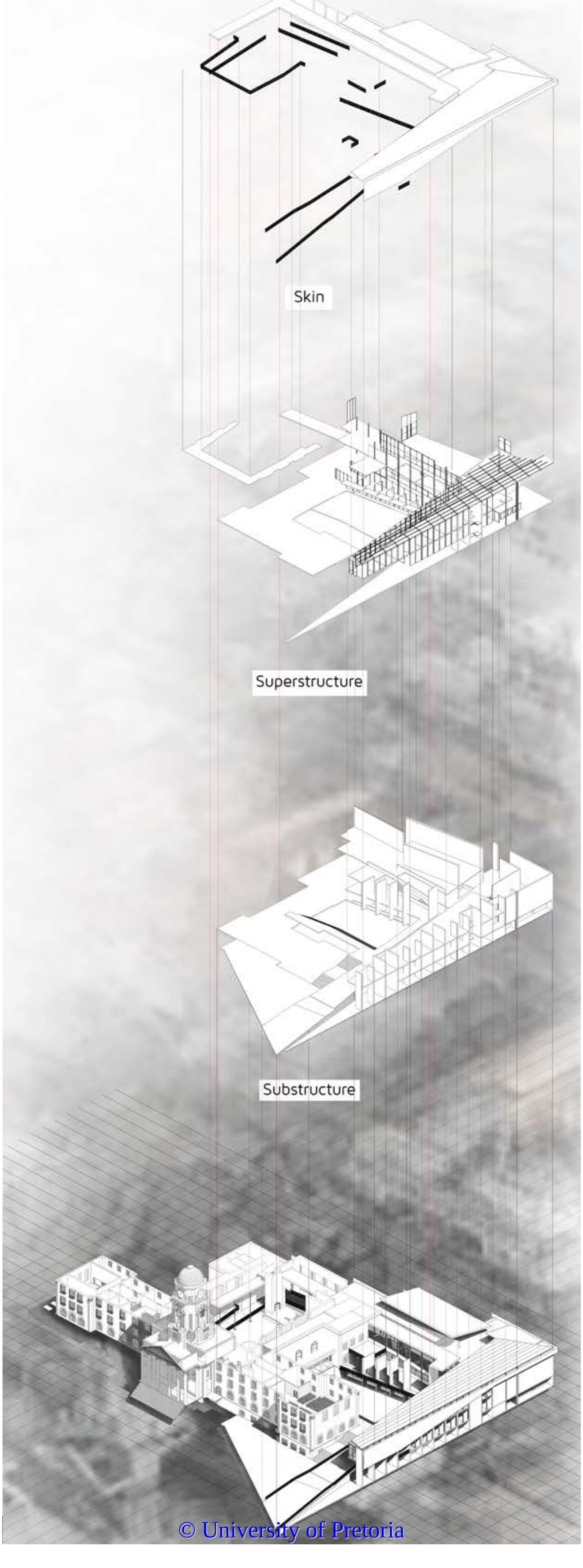
MONTH	YIELD (m^3/month)	DEMAND (m^3/month)	MONTHLY BALANCE	POTENTIAL VOLUME (m^3)	VOLUME IN TANK (m^3)
January	2773,8	1004,6	1769,2	4433,4	3200,0
February	1019,8	967,8	52,0	4485,4	3200,0
March	1672,4	975,2	697,2	5182,6	3200,0
April	1040,2	956,4	83,7	5266,3	3200,0
May	265,1	757,5	-492,3	4774,0	2707,7
June	142,8	685,9	-543,1	4230,8	2164,5
July	61,2	694,9	-633,7	3597,1	1530,8
August	122,4	912,6	-790,3	2806,8	740,5
September	448,7	976,0	-527,3	2279,5	213,2
October	1448,1	994,8	453,3	2732,8	666,5
November	1998,7	985,8	1012,9	3745,7	1679,4
December	2202,7	1004,6	1198,1	4943,8	2877,5
ANNUAL AVE.	13195,7	10916,2	2279,5		

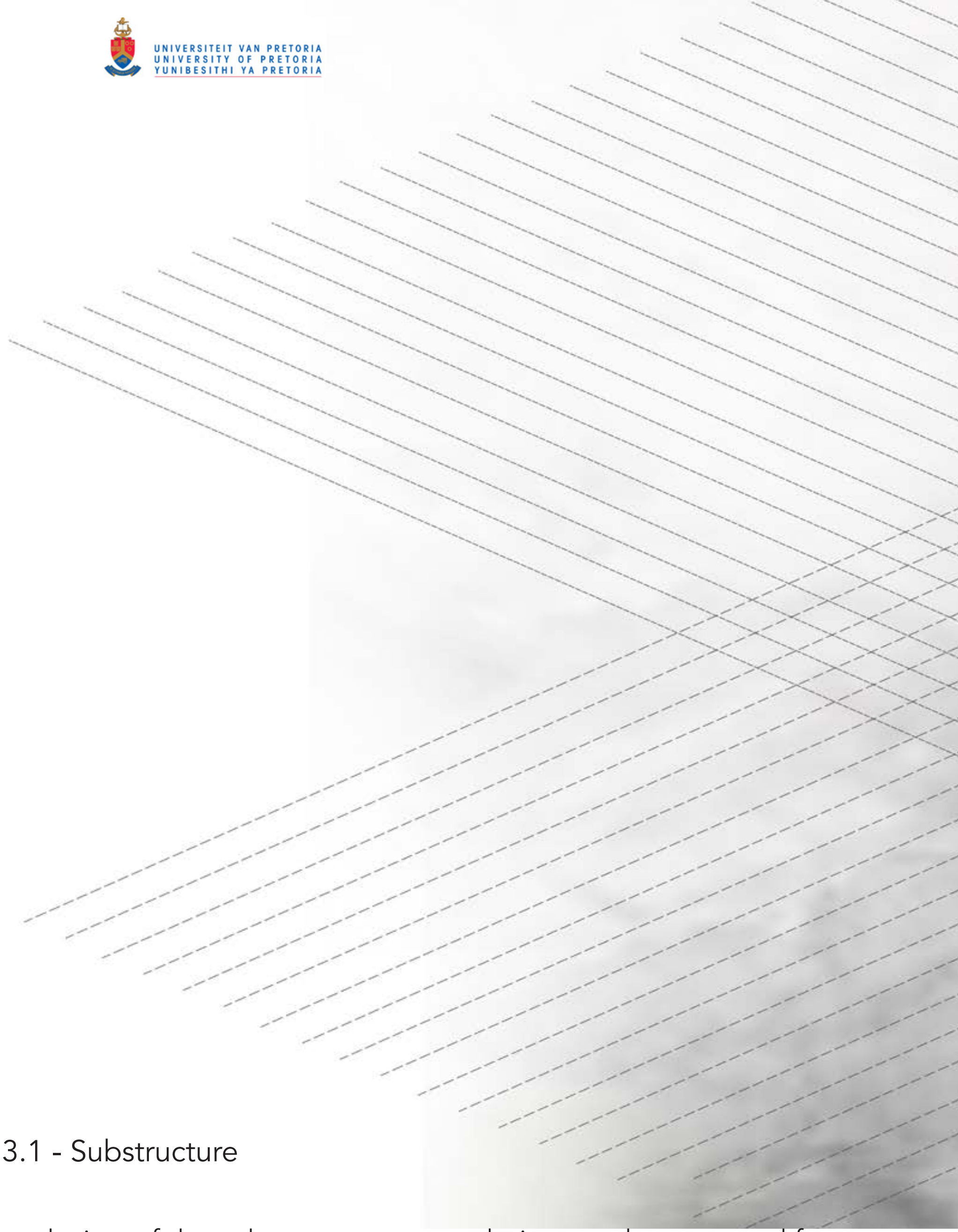


7.3 - Structural Systems

The structural approach is a response to the existing system of City Hall and an extension of Machado's (1976) idea of old buildings as palimpsest. It adopts a three-tiered approach, in which the substructure is an extension of the stereotomic nature of the existing, the superstructure is a response to the tectonic nature of society, and the skin is a response to the identity created through the interaction of all tiers.

Figure 7.9 Right; Structural Layers of the new building (Author 2017)


Skin
Superstructure
Substructure

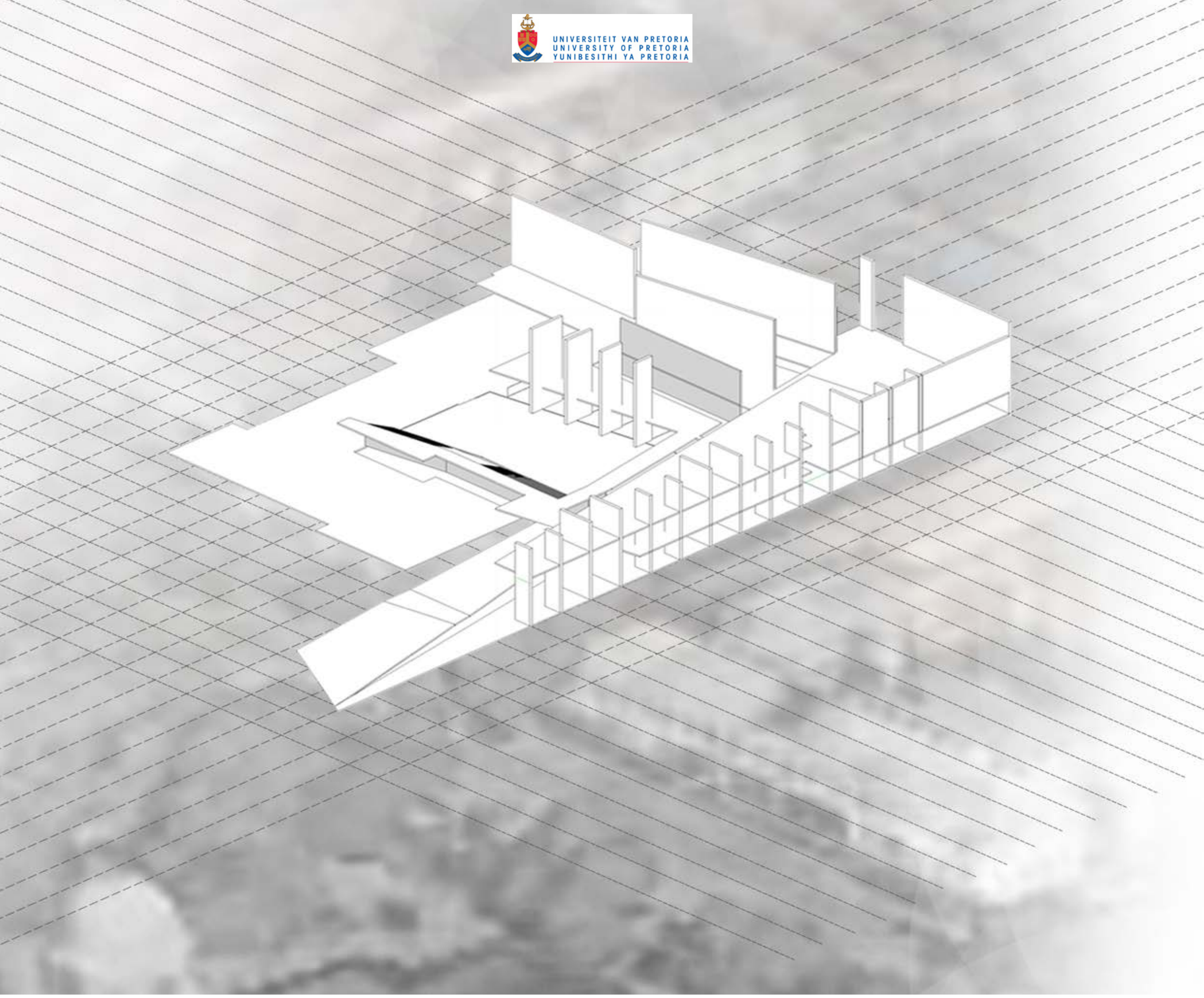


7.3.1 - Substructure

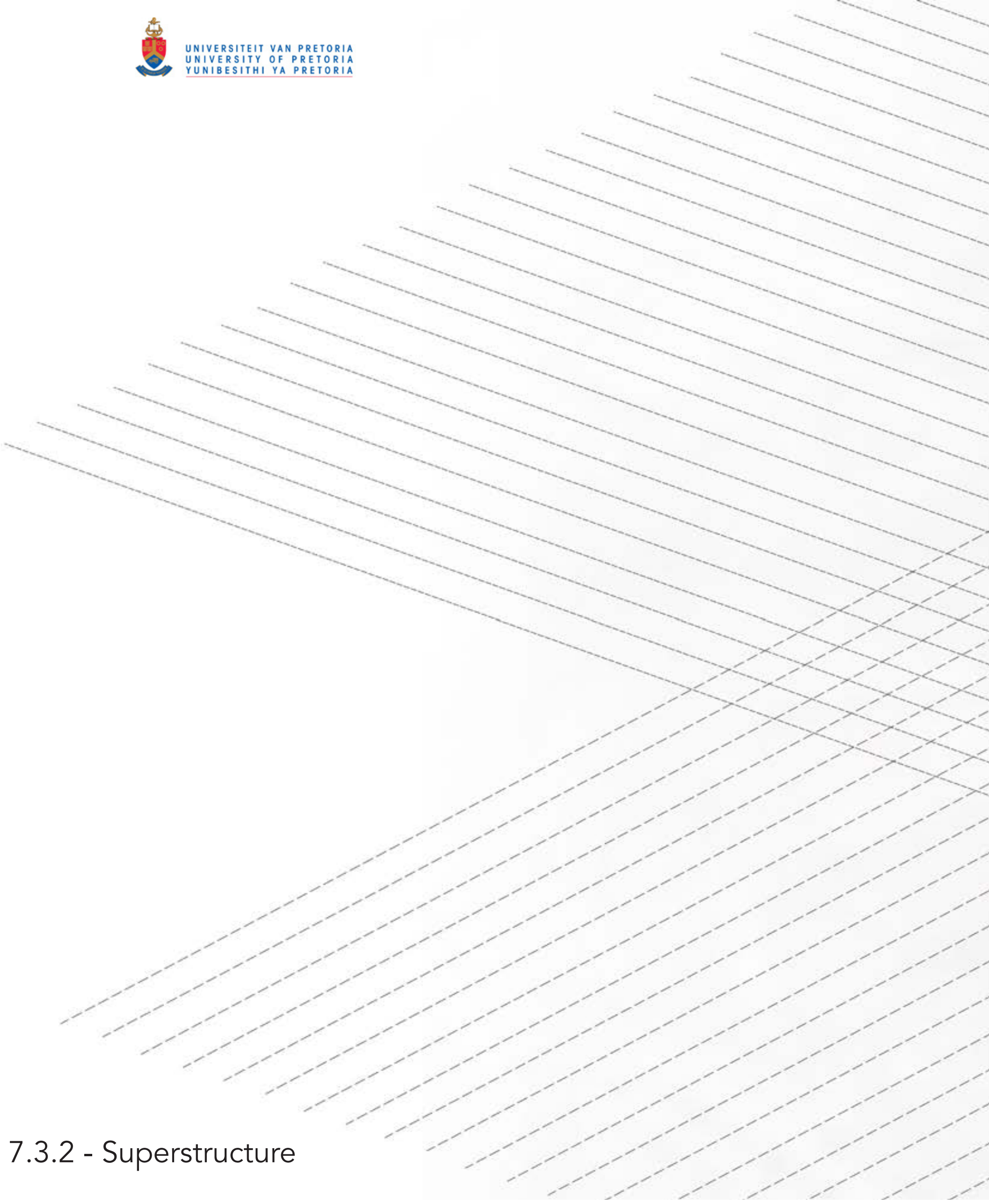
The design of the substructure and its materiality was approached as a response to the existing. The response to the stereotomic nature of City Hall was to recreate its longevity and integrity so to respect the heritage along which the new has developed. Furthermore, the stereotomic nature of the substructure is used as a metaphor for society's ability to learn from the past and use it to create a better future.

It is arranged according to the existing 5000x5000mm grid of City Hall with the stereotomic concrete elements supporting the new. The substructure is intended to respond to the existing in its ordering, yet be removed from it as it acts as the foundation for the new. The existing sandstone and concrete-block exterior walls informed both the thickness and height required by the new system. The structural walls support the tectonic steel superstructure.

Figure 7.10 Right Top; Substructure (Author 2017)
Figure 7.11 Right; Structural Layer Material Palette (Author 2017)



1. 400mm Concrete Walls organised along the existing 5000x5000 grid.
2. Brickwork framing walkways in the museum.
3. Concrete paving slabs for market space.

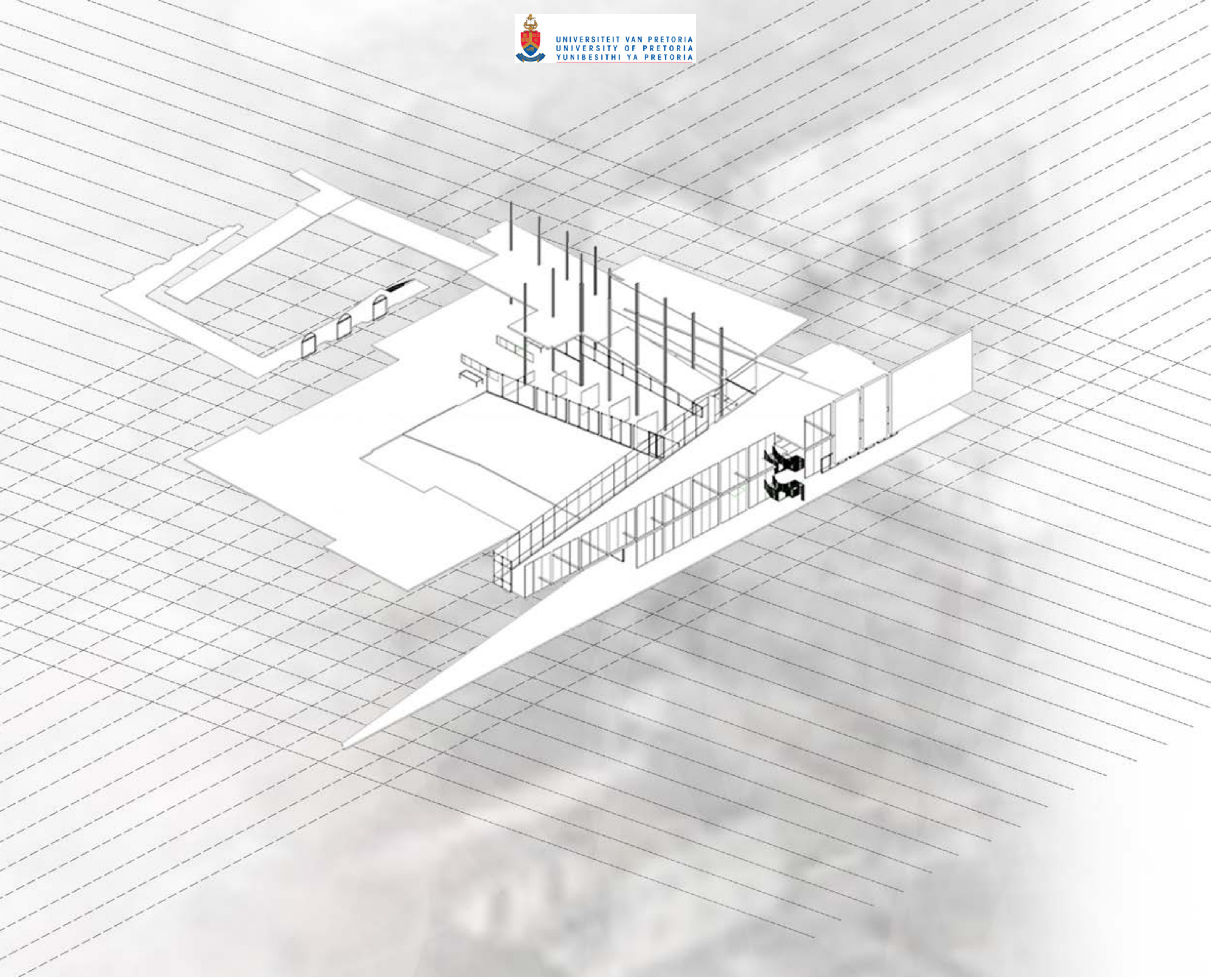


7.3.2 - Superstructure

The design approach to the superstructure and its materiality was chosen as a response to the tectonic nature of society and its rejection of the stereotomic presence of city hall. The superstructure plays an important role in the understanding of the architecture. It is used as a metaphor for the progression of society, where at times it has developed from the past and at other times it has been used to support, protect and reactivate the past.

Steel construction was chosen as an appropriate system, as its slender elements will be in stark contrast to both the existing and the substructure. The use of steel embodies the adaptability of society, a notion that is not present in the stereotomic elements. It responds to the ordering system of the substructure, yet its adaptability allows for the creation of dynamic spaces in response to the dynamic nature of the public.

Figure 7.12 Right Top; Superstructure (Author 2017)
Figure 7.13 Right; Superstructure Layer Material Palette (Author 2017)



1. Open web steel trusses.
2. H and I sections for horizontal and vertical structural elements.
3. Mentis grating for walkways.
4. Structural Mulions.

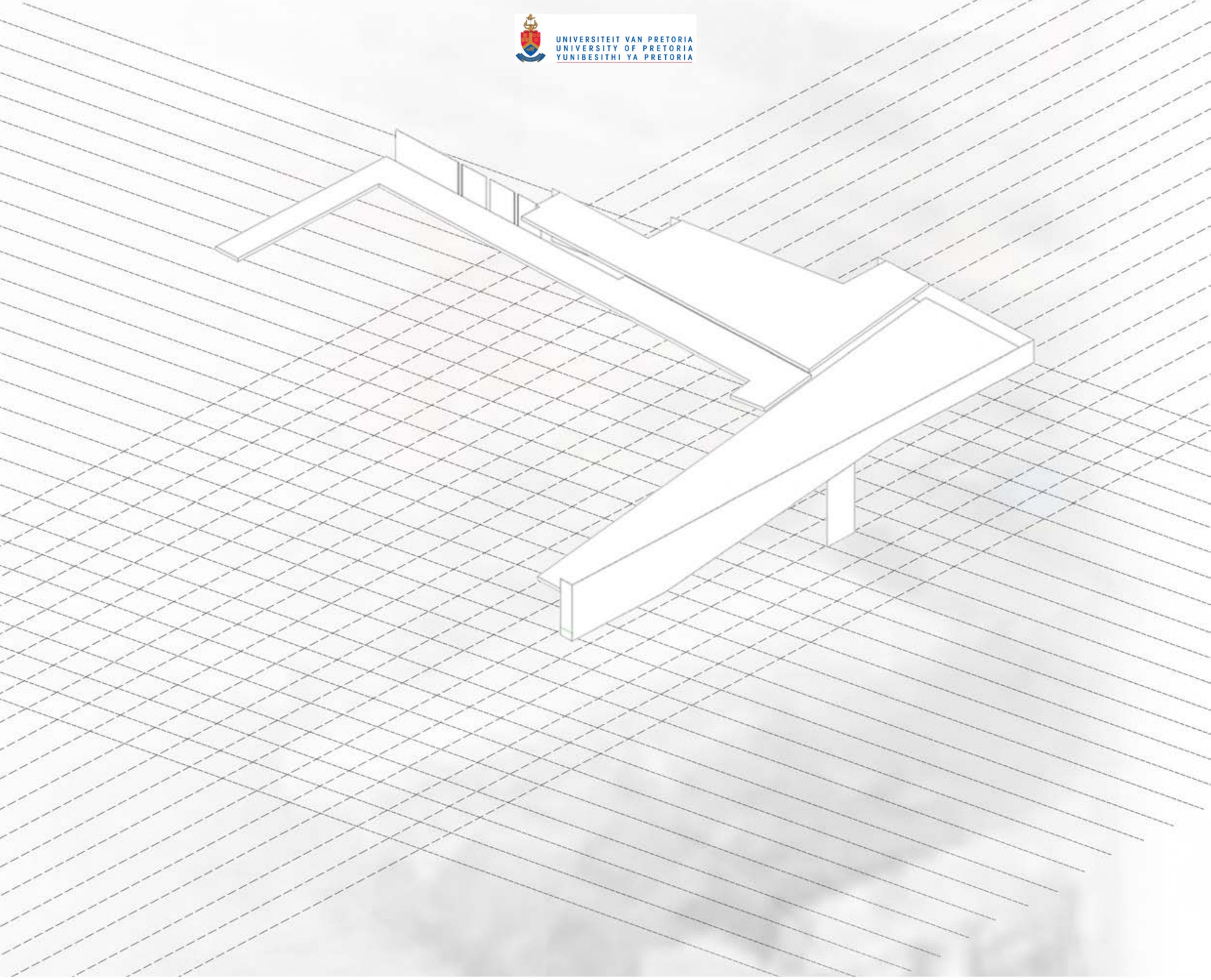
7.3.3 - Skin

The design approach to the skin and its materiality responds to the identity of our society and its ability to express that which is happening around us. It plays an important role in both the understanding of the architecture and in facilitating the passive ventilation. The skin deals with the physical screen which wraps around the building as well as the roofs.

Euro Steel Aluminium sheet 1200 H14 was selected to be used for the screen and Klip-Lok 406 was chosen as the roof sheeting. The screen is used to suggest the internal movement of protest on the northern elevation and facilitate ventilation in conjunction with the roof.

The layering of the three structures sees a response to Nobel's (2008) argument towards the hybridisation of architecture, in that it is through the layering of the three systems that the new identity is embodied and becomes established in our understanding of it.

Figure 7.14 Right Top; Skin (Author 2017)
Figure 7.15 Right; Skin Layer Material Palette (Author 2017)



1. Patterned Aluminium Screen supported by Square and Rectangular hollow sections.
2. Patterned Aliminium balastrades.
3. Acoutic panels spaced to expose concrete ceiling.

7.4 - Debate in Junctions

Our understanding of architecture does not end once the user understands the general program or function of the building, but rather, it is developed through the process of exploration. The idea of debate in junctions therefore argues for transparency in junctions. It proposes that, in order to successfully achieve the transparent rigor required of a political building, the junctions which put it together require clearly defined focuses creating an easily understood architecture.

The spatial manifestation of debate in architecture deals with architecture in a manner which all can understand. Different opinions surrounding an issue (i.e. the junction between the floor of the new with the existing) are put forward and discussed, with one of three results becoming the newly created junction. This approach towards the development of junctions creates a clearly defined intention that helps to develop a narrative in support of the surrounding programs and functions of the building.

In order to properly facilitate the clear language created through the debate of junctions and establish the appropriateness of the given result the tectonic approach is organised along the three core functions established for the design: Display, Debate and Spectate.

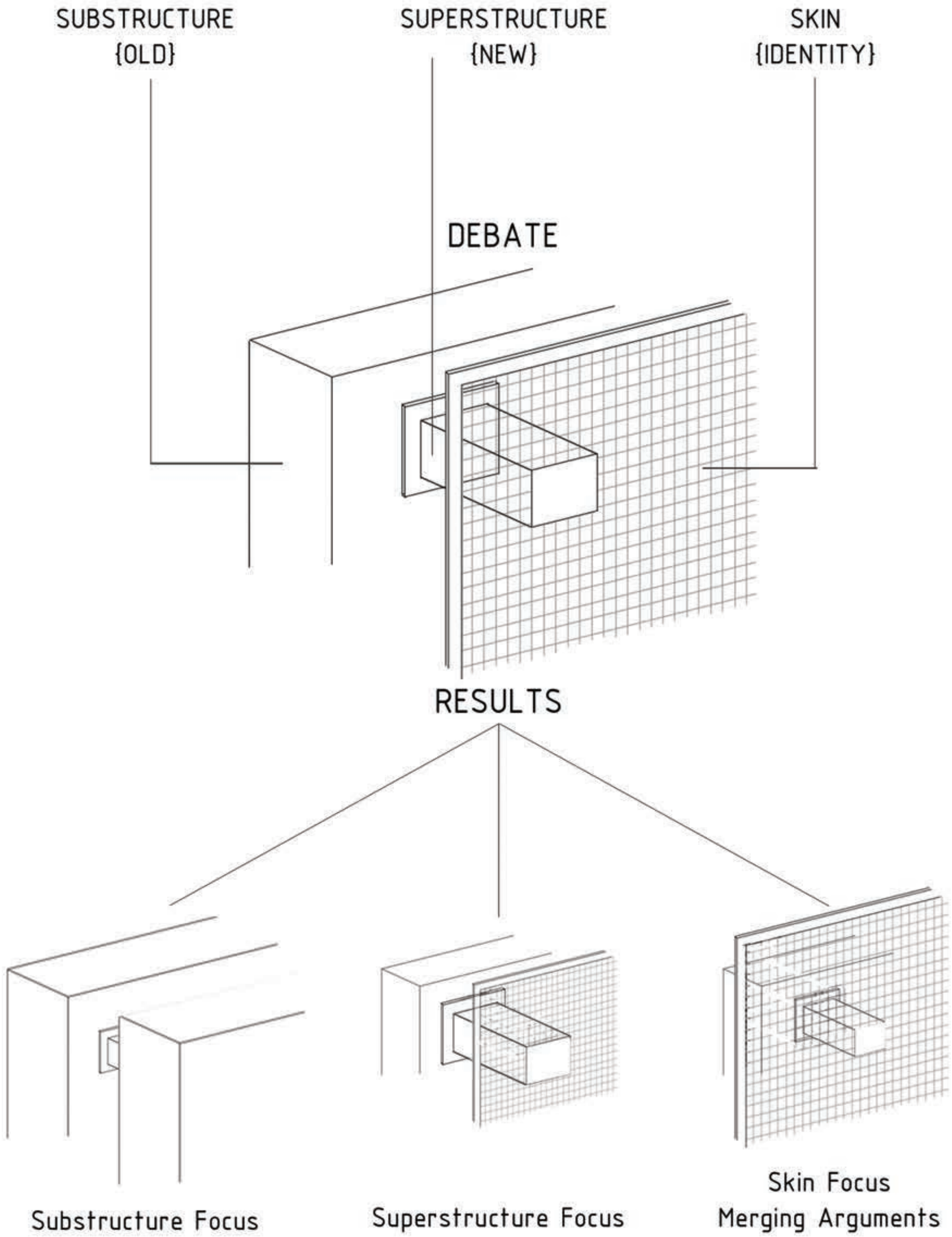


Figure 7.16 Debate in Junctions (Author 2017)

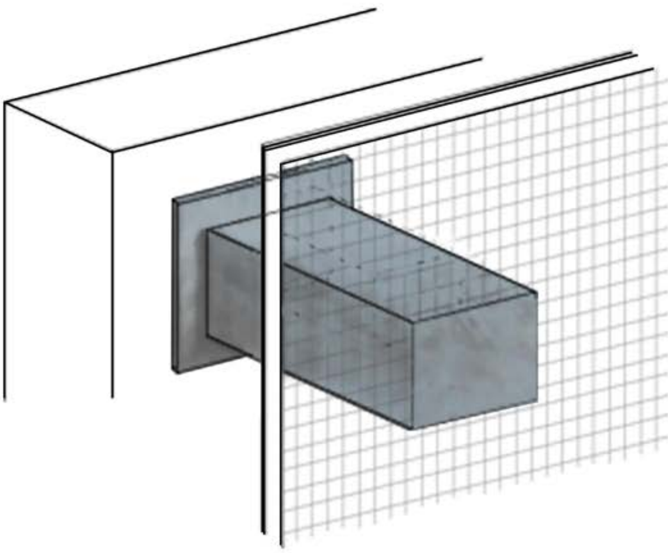
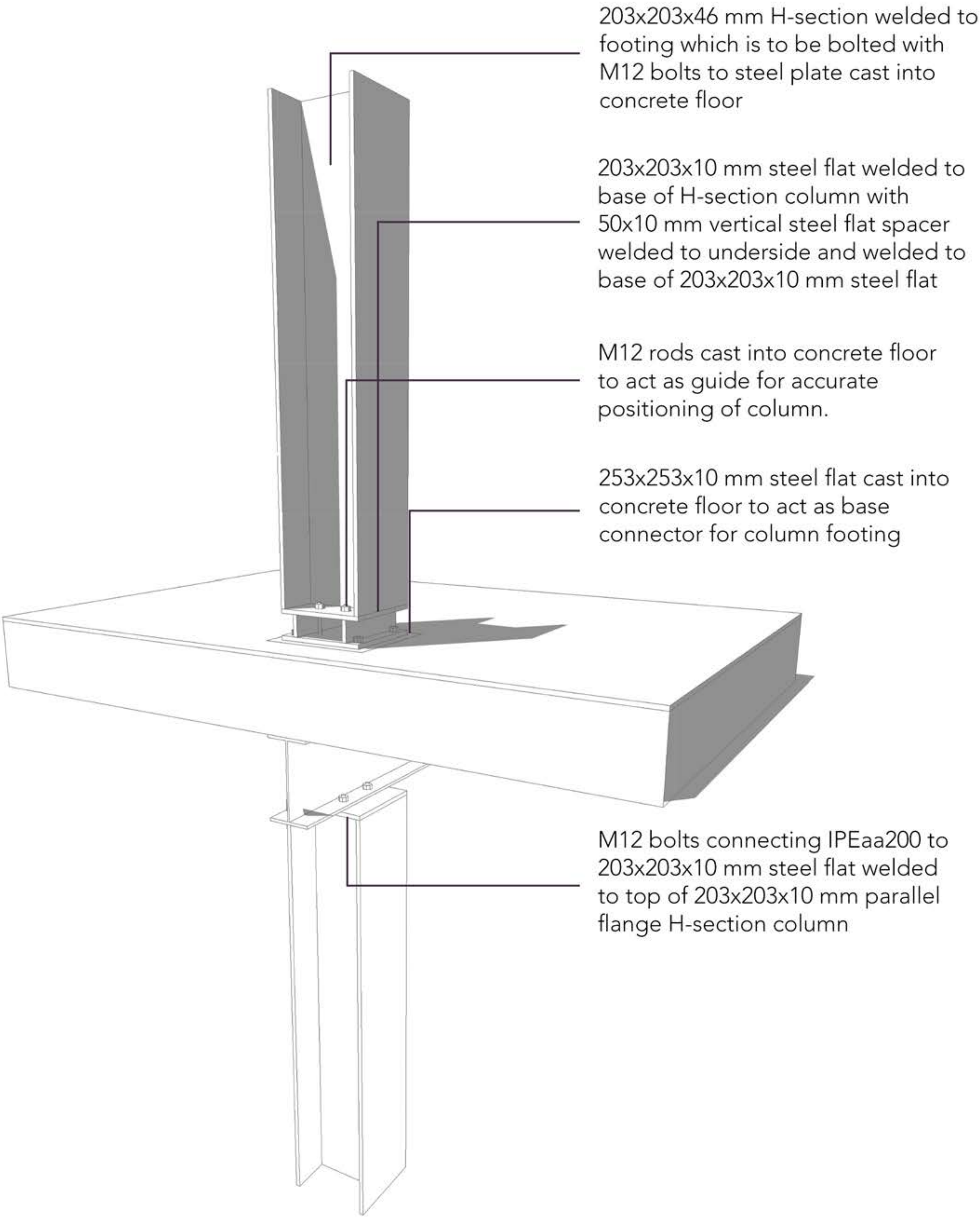


Figure 7.17 Above; Display Junction (Author 2017)
Figure 7.18 Right; Junction between steel column and concrete floor slab 3D (Author 2017)

7.4.1 - Display (Superstructure)

Display deals with the issues of memory in architecture and the appropriation of space in architecture's control of public and private expression spaces (Jarvis 2009). The main programmatic driver of display is that of the Museum of Democracy, which is used as an indicator of the progression of democracy. Display reveals an understanding and control of the existing in its architectural resolution.

Therefore, when applied to the issues of debate in junction, the technical resolution would focus on and highlight the connections of the superstructure as a means to express its ability to learn from the past in its creation and connection to the new.


203x203x46 mm H-section welded to footing which is to be bolted with M12 bolts to steel plate cast into concrete floor
203x203x10 mm steel flat welded to base of H-section column with 50x10 mm vertical steel flat spacer welded to underside and welded to base of 203x203x10 mm steel flat
M12 rods cast into concrete floor to act as guide for accurate positioning of column.
253x253x10 mm steel flat cast into concrete floor to act as base connector for column footing
M12 bolts connecting IPEaa200 to 203x203x10 mm steel flat welded to top of 203x203x10 mm parallel flange H-section column

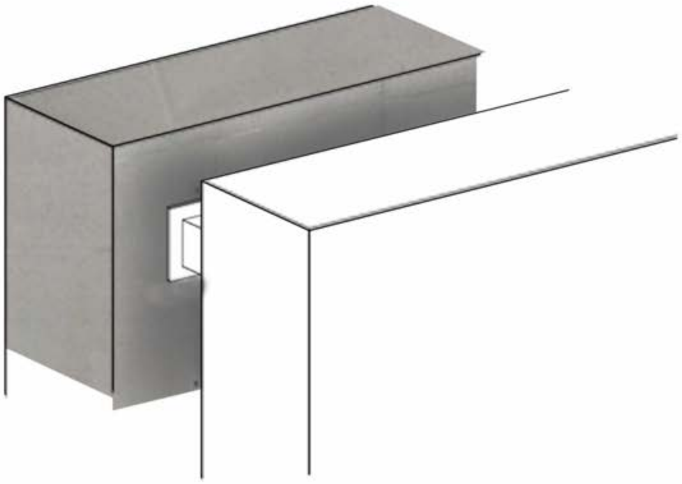
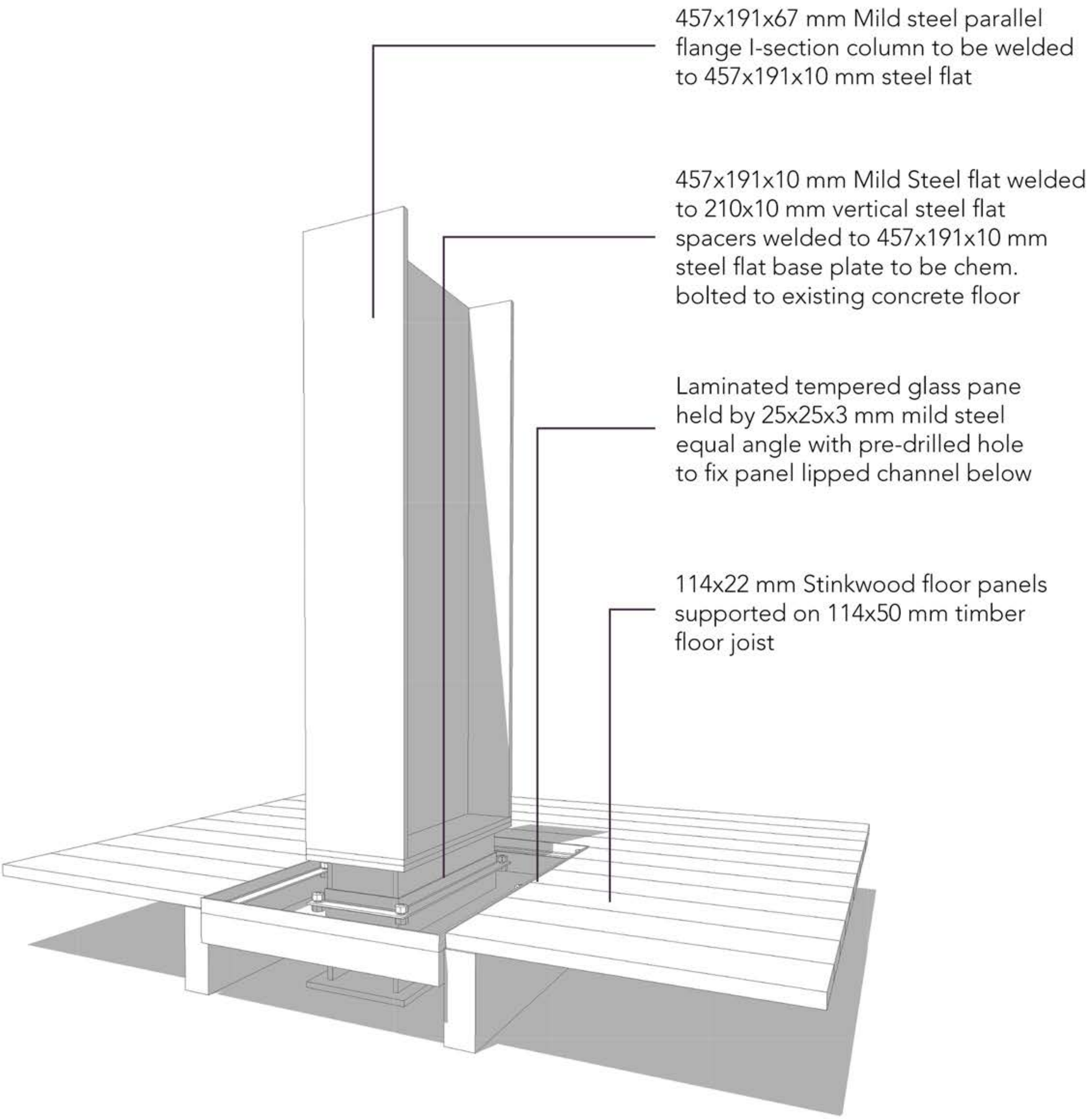


Figure 7.19 Above; Debate Junction (Author 2017)
Figure 7.20 Right; Column footing through new opening in Council Chambers 3D (Author 2017)

7.4.2 - Debate (Substructure)

Debate deals with the issues of verbal and architectural contestation, with the main programmatic driver being the debate arena, which is experienced at direct and indirect levels. Debate reveals an approach to the heritage of the architecture and argues in support of the past in its ability to facilitate the change seen by our society.

Therefore, when applied to the issues of debate in junction, the technical resolution would focus on clearly defined and developed junctions between the existing and the new. It aims to highlight the past, so to respect the existing structure while suggesting the changed societal perception needed for its reactivation.


457x191x67 mm Mild steel parallel flange I-section column to be welded to 457x191x10 mm steel flat
457x191x10 mm Mild Steel flat welded to 210x10 mm vertical steel flat spacers welded to 457x191x10 mm steel flat base plate to be chem. bolted to existing concrete floor
Laminated tempered glass pane held by 25x25x3 mm mild steel equal angle with pre-drilled hole to fix panel lipped channel below
114x22 mm Stinkwood floor panels supported on 114x50 mm timber floor joist

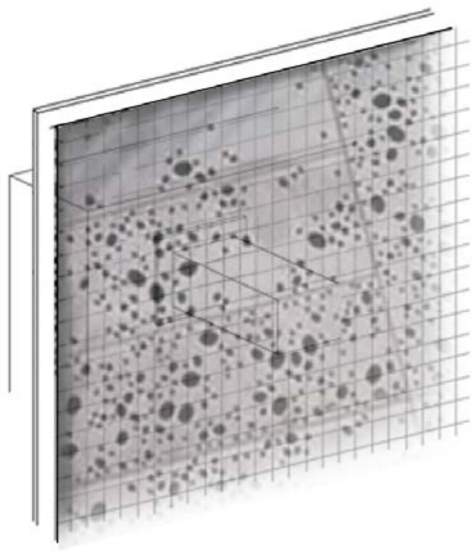
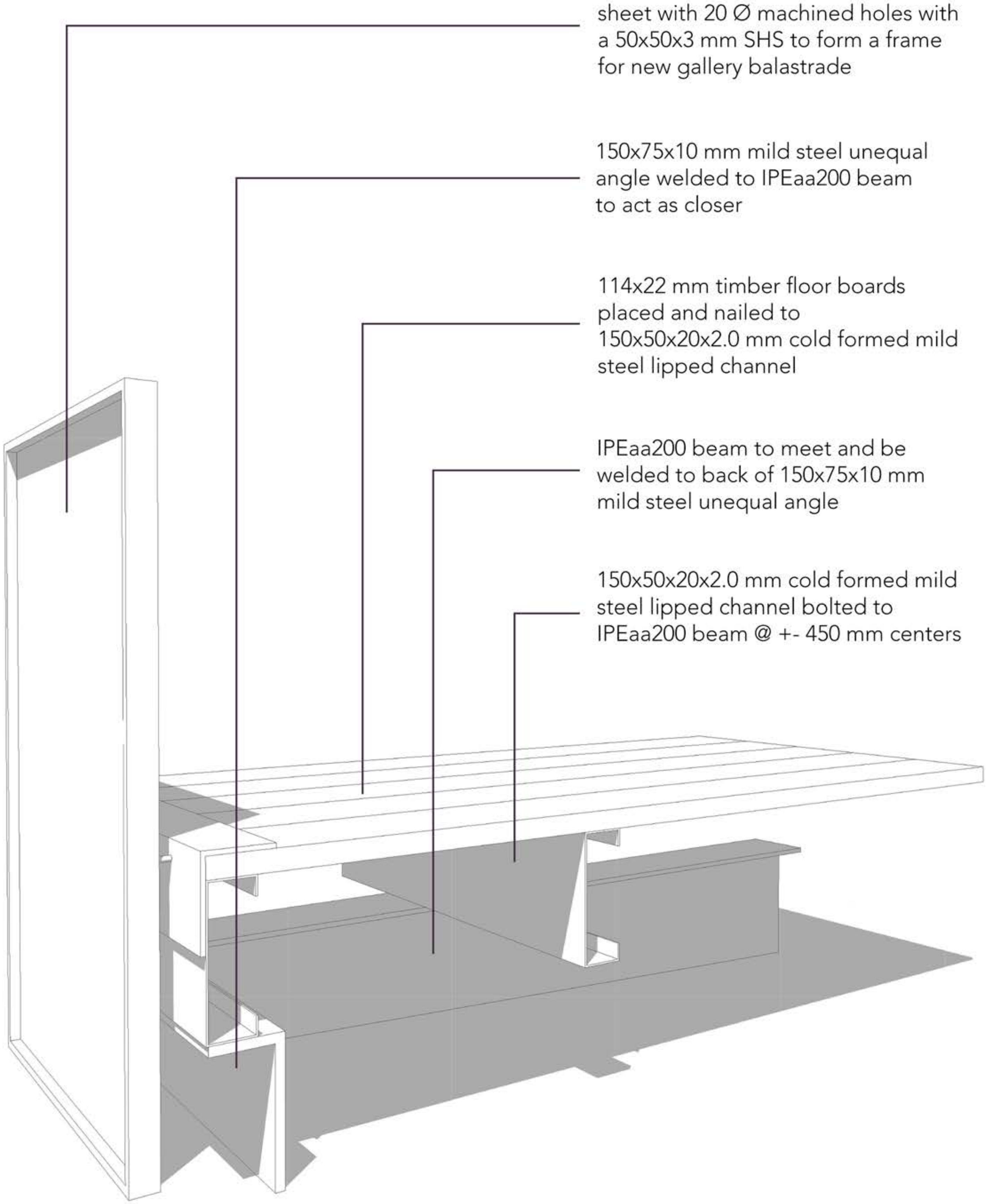


Figure 7.21 Above; Spectate Junction (Author 2017)
Figure 7.22 Right; Protest gallery balustrade 3D (Author 2017)

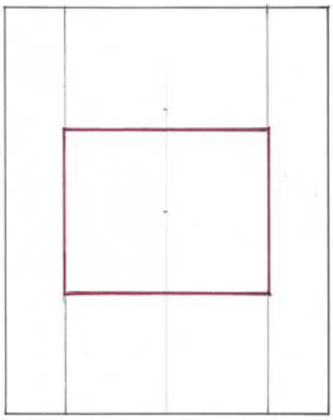
7.4.3 - Spectate (Skin)

Spectate deals with the issues of transparency and the gaining of knowledge through the appropriation of varying platforms along the main protest route as established through the design process. The intention is to help protesters develop and understanding of their social and physical surroundings. Programmatically, spectate is centred between the display and debate functions of the design yet it takes a step back so to simplify the platform and highlight that which the platform engages with.

Therefore, when applied to the issues of debate in junction, the technical resolution would focus on the structural system of the skin and how it connects to the building. The intention is for the junction to be clearly defined and used as a tool to focus the individual on the space that is being framed.

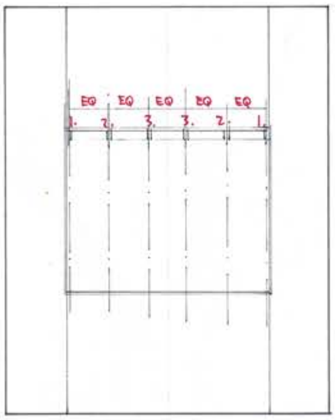

Euro steel sheet 1200 H14 aluminium sheet with 20 Ø machined holes with a 50x50x3 mm SHS to form a frame for new gallery balastrade
150x75x10 mm mild steel unequal angle welded to IPEaa200 beam to act as closer
114x22 mm timber floor boards placed and nailed to 150x50x20x2.0 mm cold formed mild steel lipped channel
IPEaa200 beam to meet and be welded to back of 150x75x10 mm mild steel unequal angle
150x50x20x2.0 mm cold formed mild steel lipped channel bolted to IPEaa200 beam @ +- 450 mm centers

7.5 - Steps taken to break through Existing



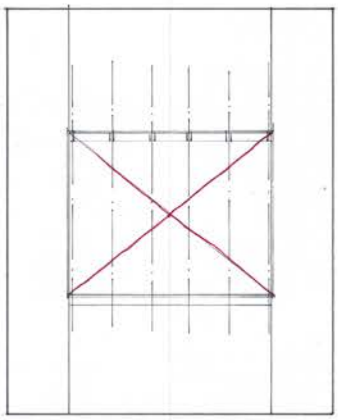
Step 1.

Angle grind around proposed opening to prevent flacking of the existing plaster during construction.



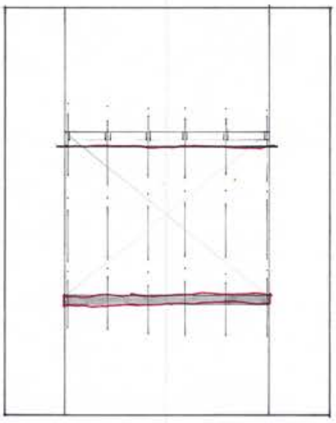
Step 2.

Temporary supports placed through existing wall to carry load above. I-section supported on either side and placed @ equal increments.



Step 3.

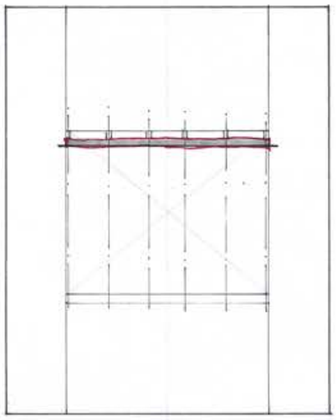
Once I-sections have been stabilised the opening can be created.



Step 4.

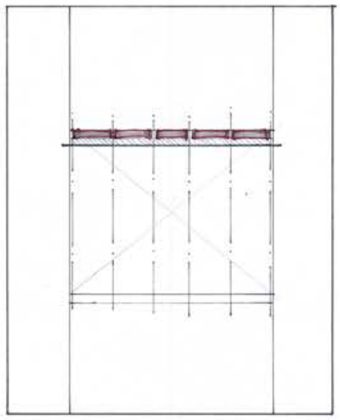
Start of new lintle with steel plate spanning new opening.

New concrete floor can be attached to existing.



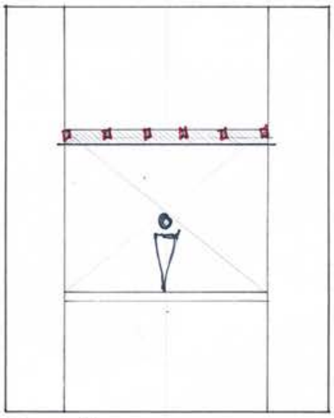
Step 5.

Form work placed around steel plate and packed with concrete on top of steel plate.



Step 6.

Once base concrete has cured, dry-mix concrete is rammed into space between temporary I-sections and allowed to cure.



Step 7.

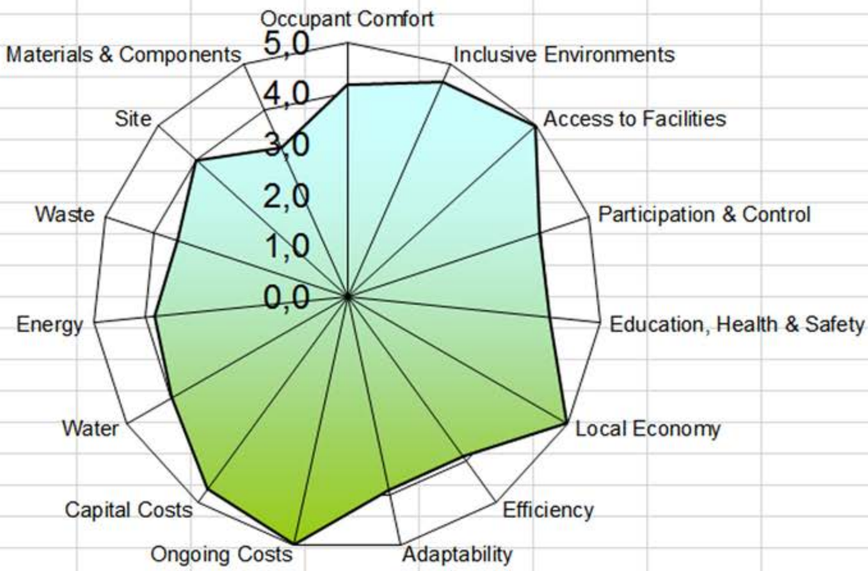
Final step is to ram dry-mix concrete into gaps created by the removal of the temporary I-section supports.

Figure 7.23 Above; Steps taken to break through existing walls
Figure 7.24 Right; SBAT (Author 2017)

7.6 - SBAT

SUSTAINABLE BUILDING ASSESSMENT TOOL (SBAT- P) V1

PROJECT	
Project title:	Architectural Hybridity In Democracy
Location:	Pretoria, Pretoria city hall
Building type (specify):	Community
Internal area (m2):	
Number of users:	300-5000
Building life cycle stage (specify):	Design



Social	4,4	Economic	4,5	Environmental	3,7
		Overall	4,2		

7.7 - Technical Iteration Process

7.7.1 - First Technical Iteration

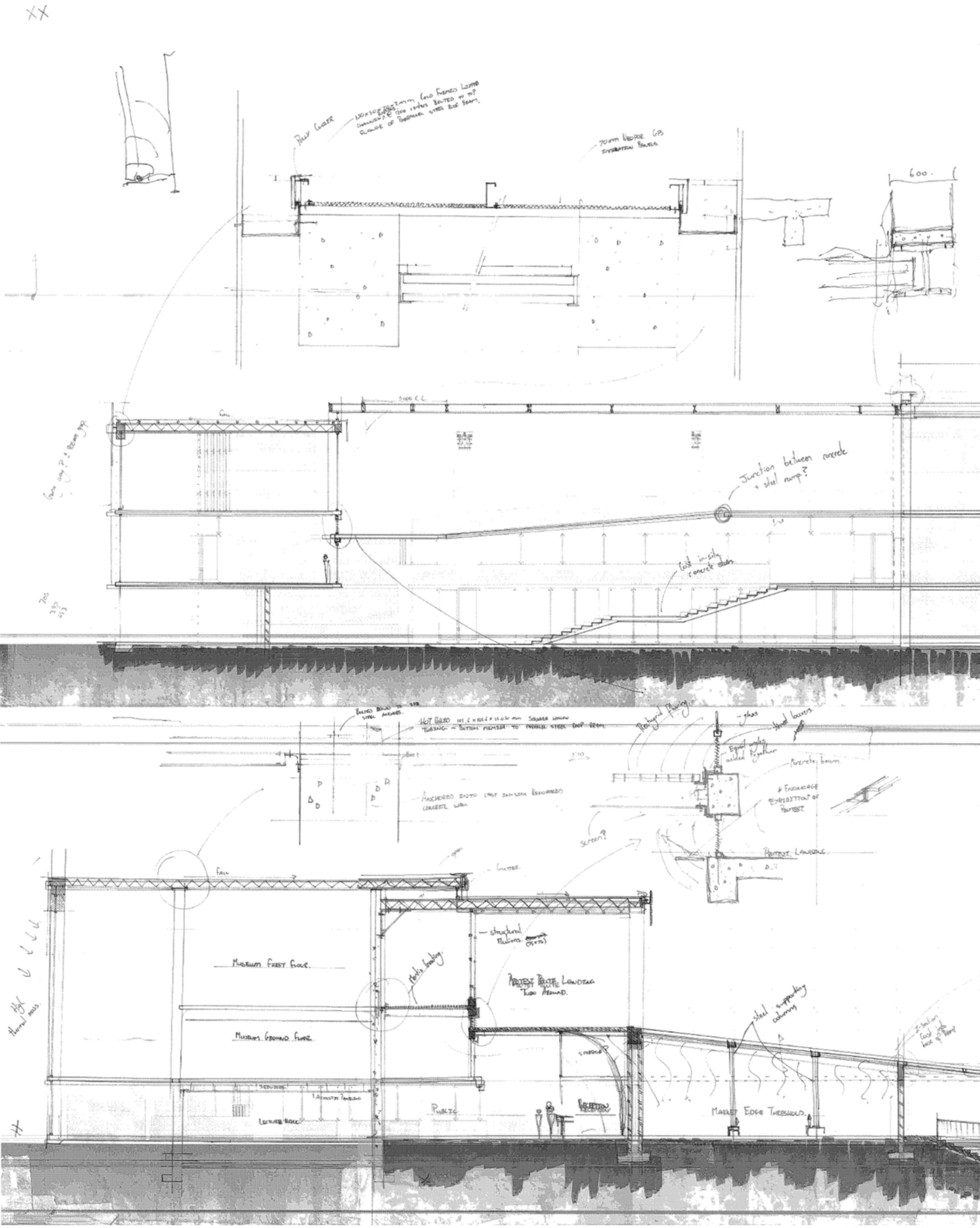
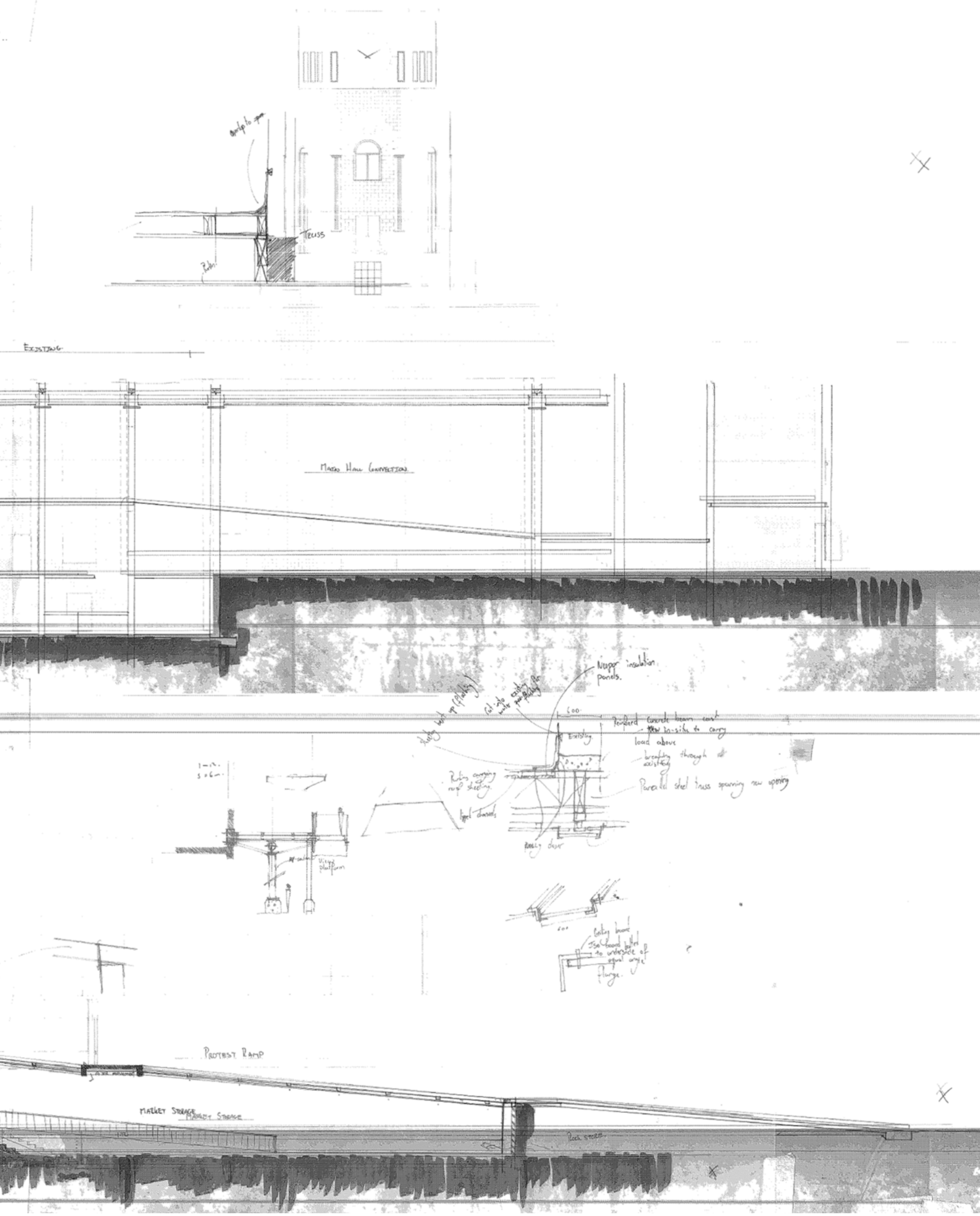
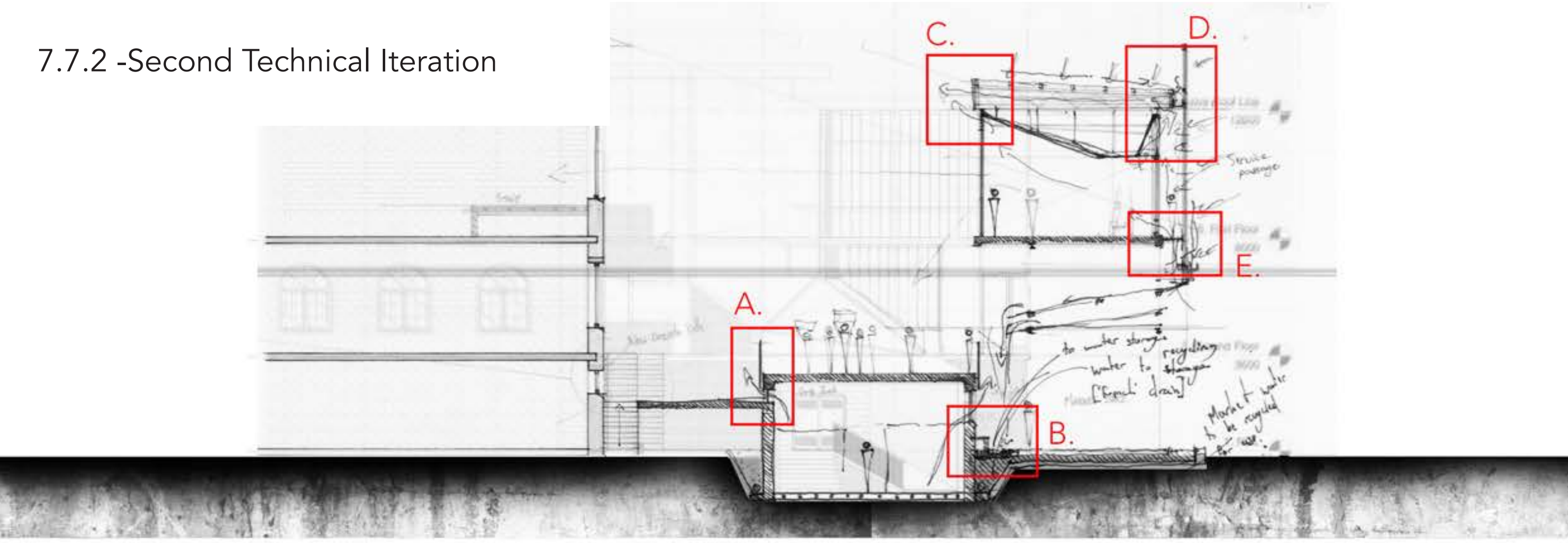
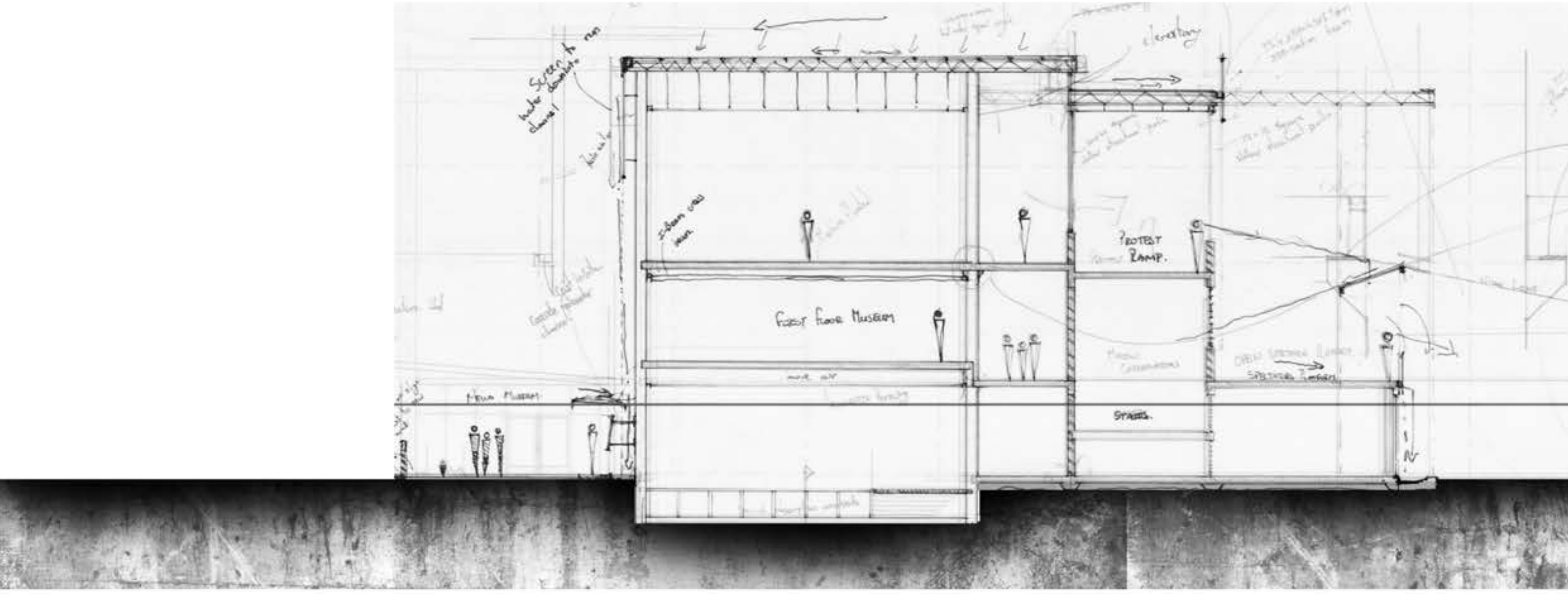


Figure 7.25 First iteration of technical sections (Author 2017)



7.7.2 -Second Technical Iteration





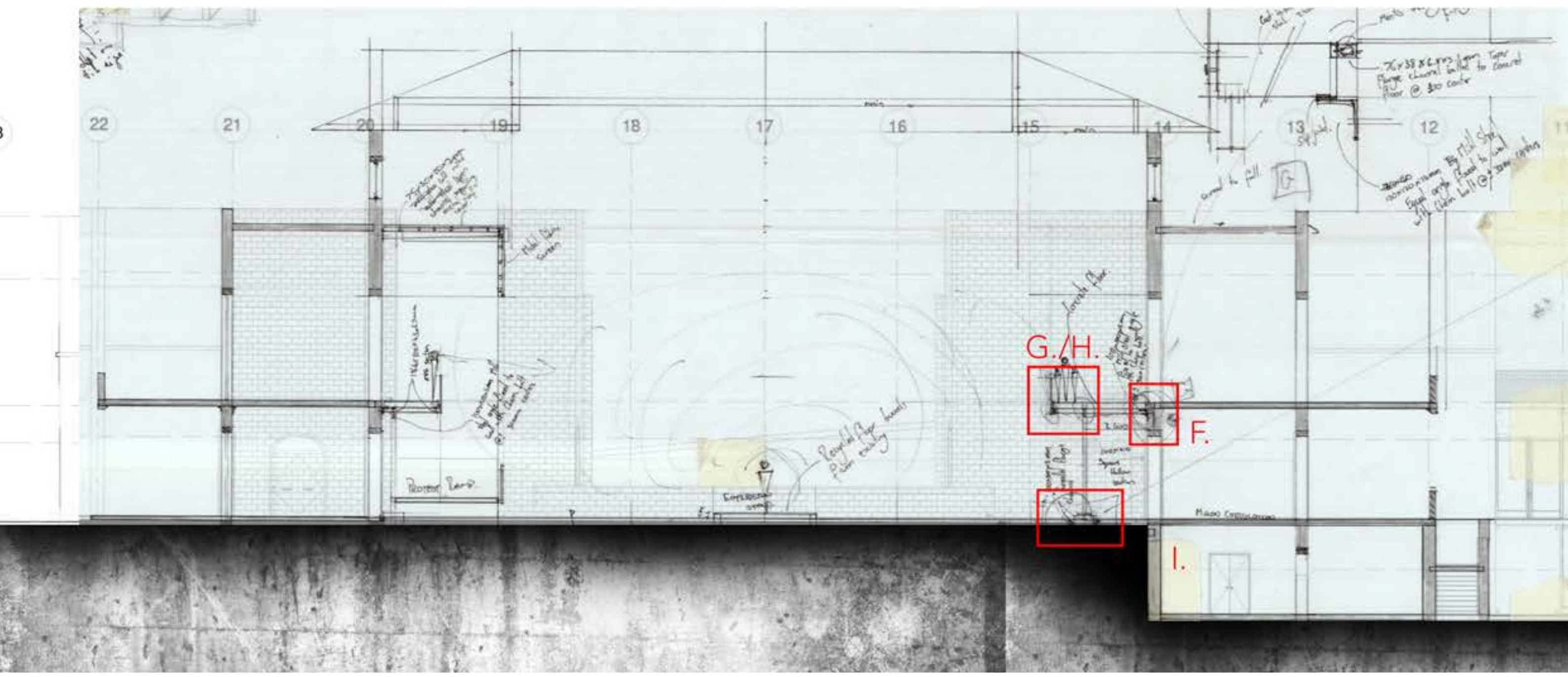
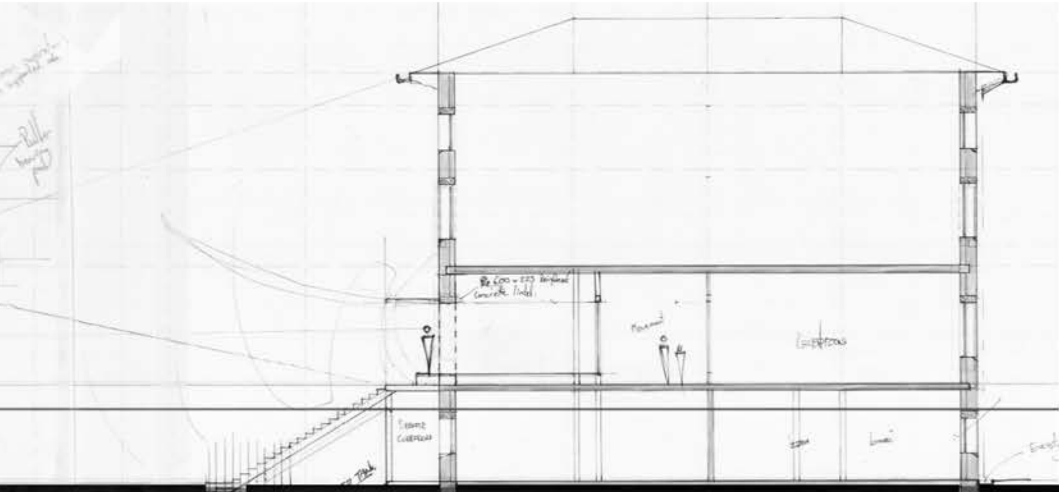
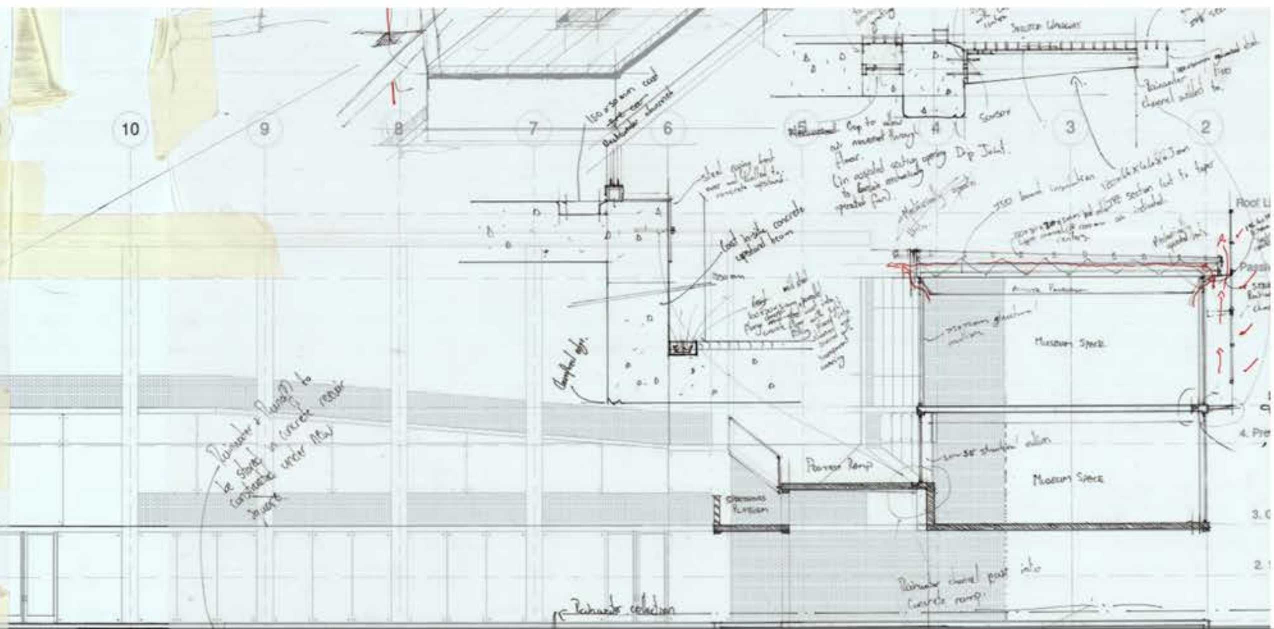


Figure 7.26 Second iteration of technical sections (Author 2017)

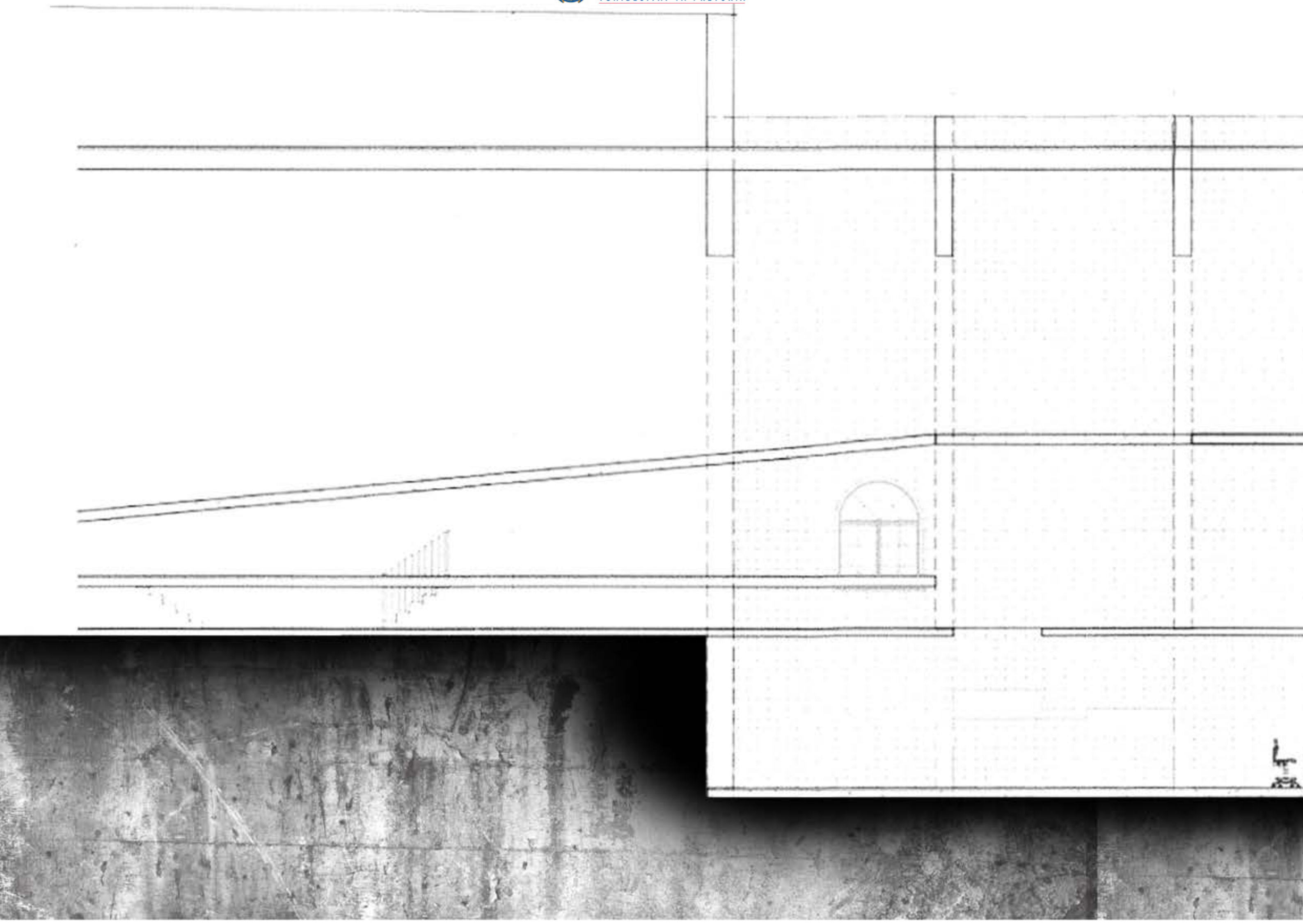
Section A

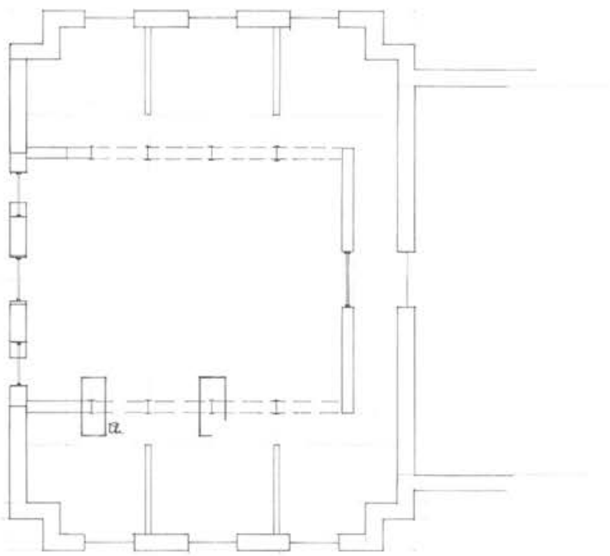


Section B



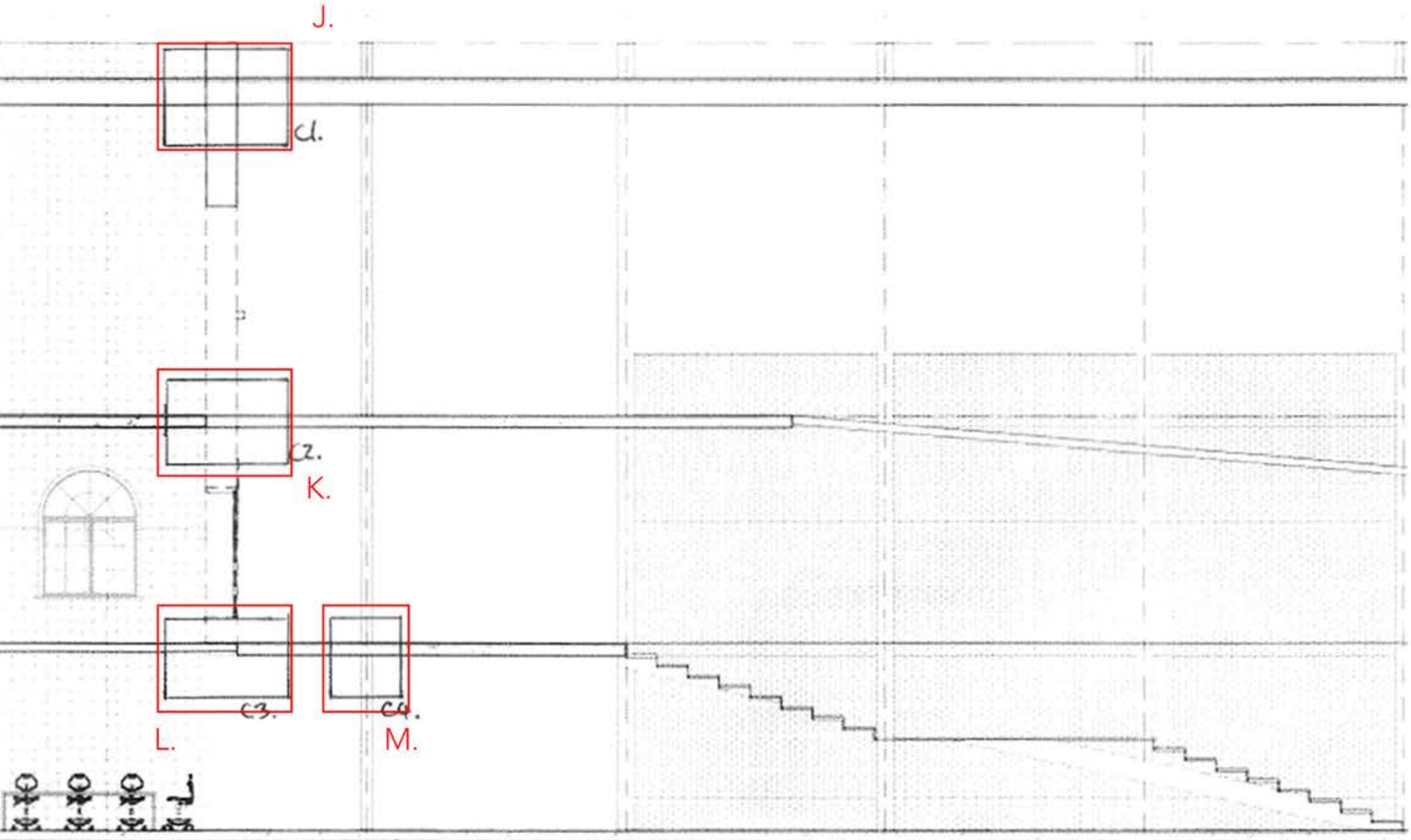
Section C

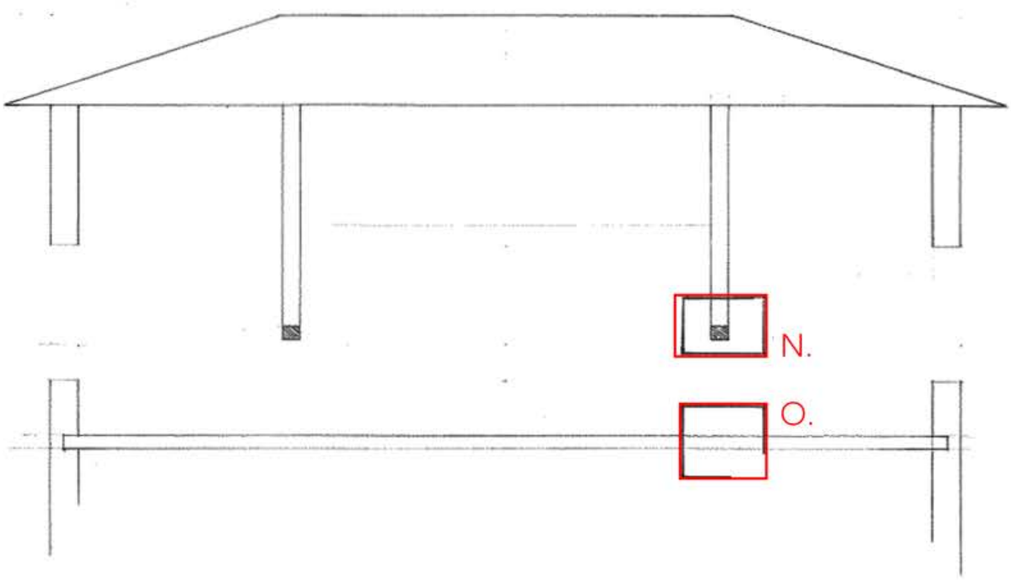




Plan of new Council Chambers

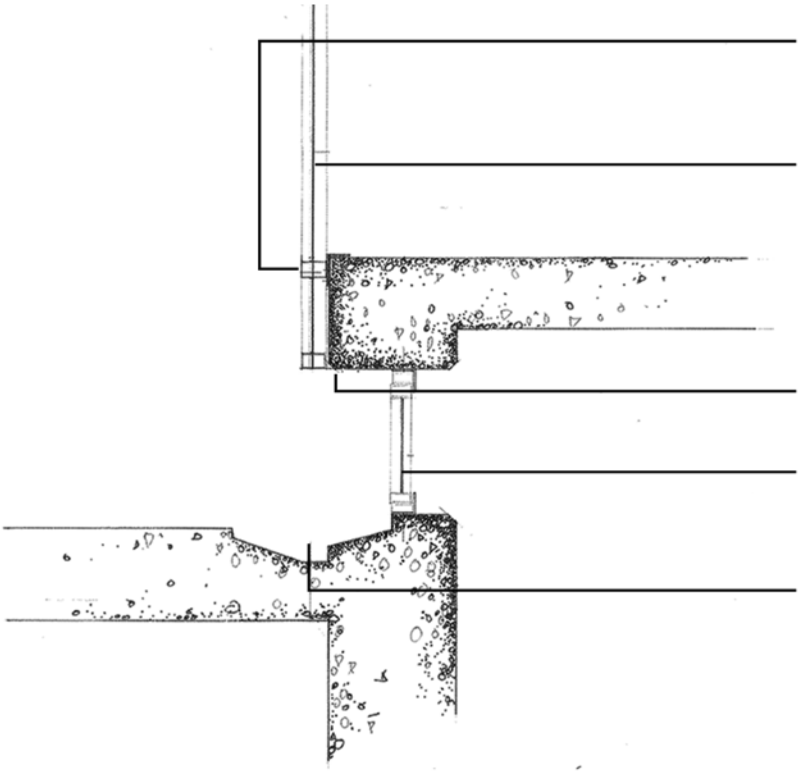
Figure 7.27 Above; Section between existing and new (Author 2017)
Figure 7.28 Below; Council Chamber Plan (Author 2017)
Figure 7.29 Right Bottom; Section through Figure Council Chambers (Author 2017)





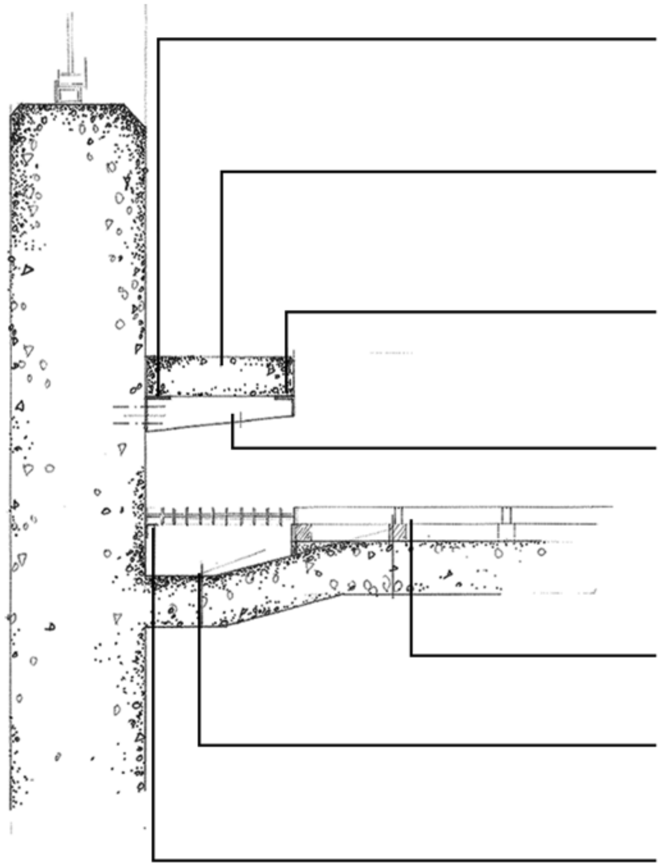
Section Through council chambers

7.7.3 Technical Crit detais



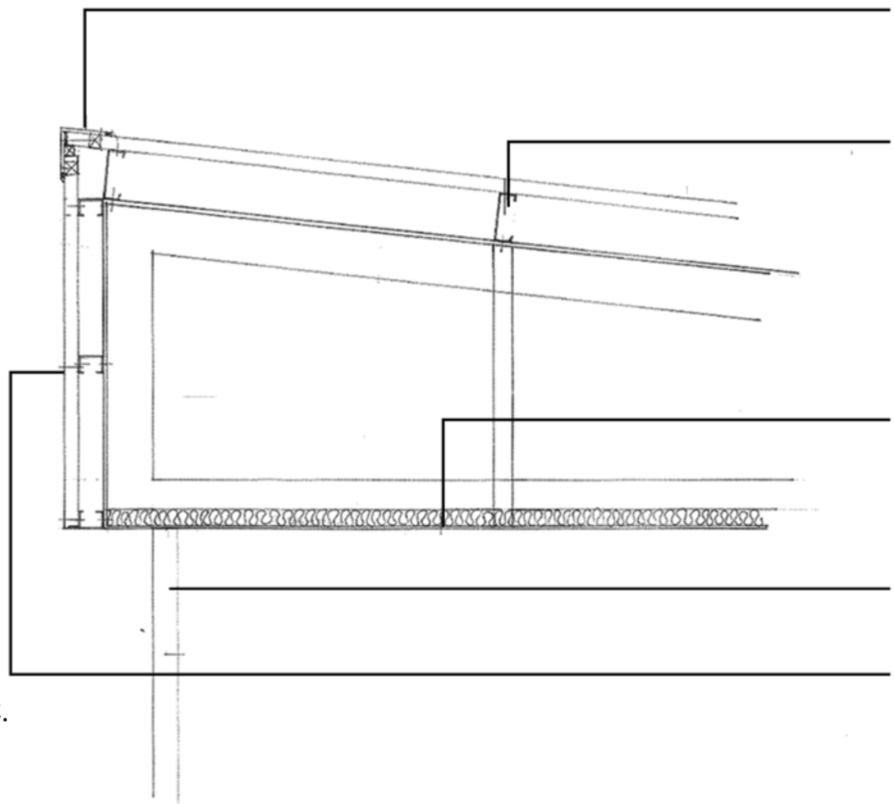
Detail A.

Figure 7.30 Protest Ramp Edge Detail Figure (Author 2017)



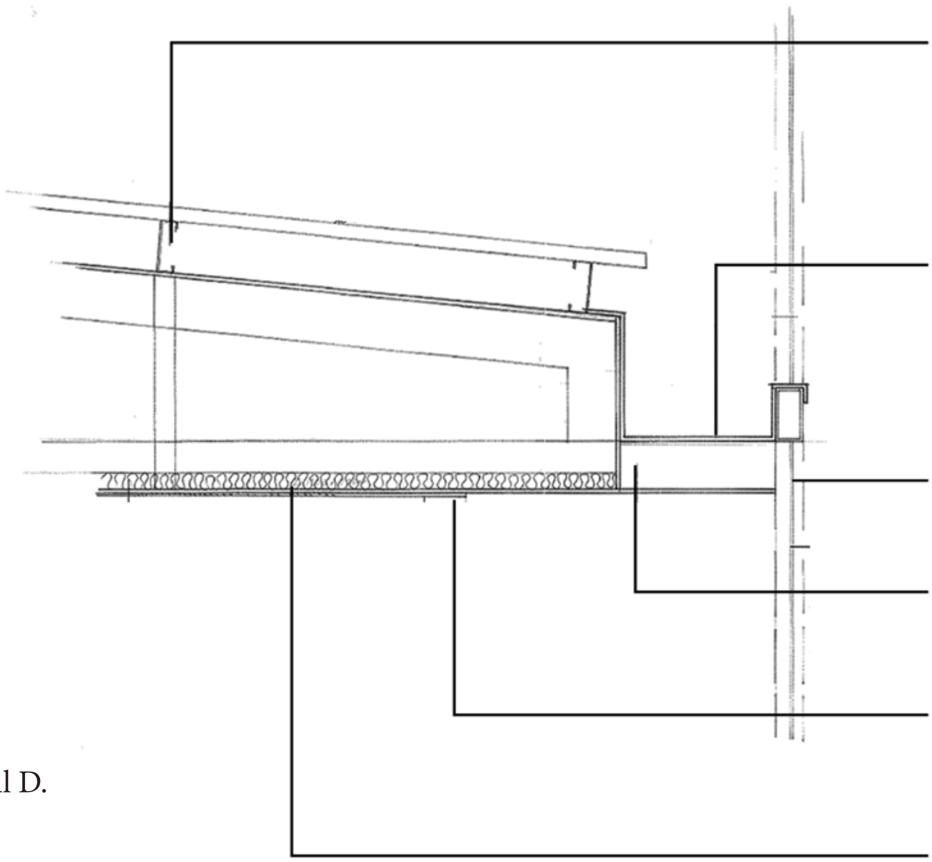
Detail B.

Figure 7.31 Market junction with storage wall (Author 2017)



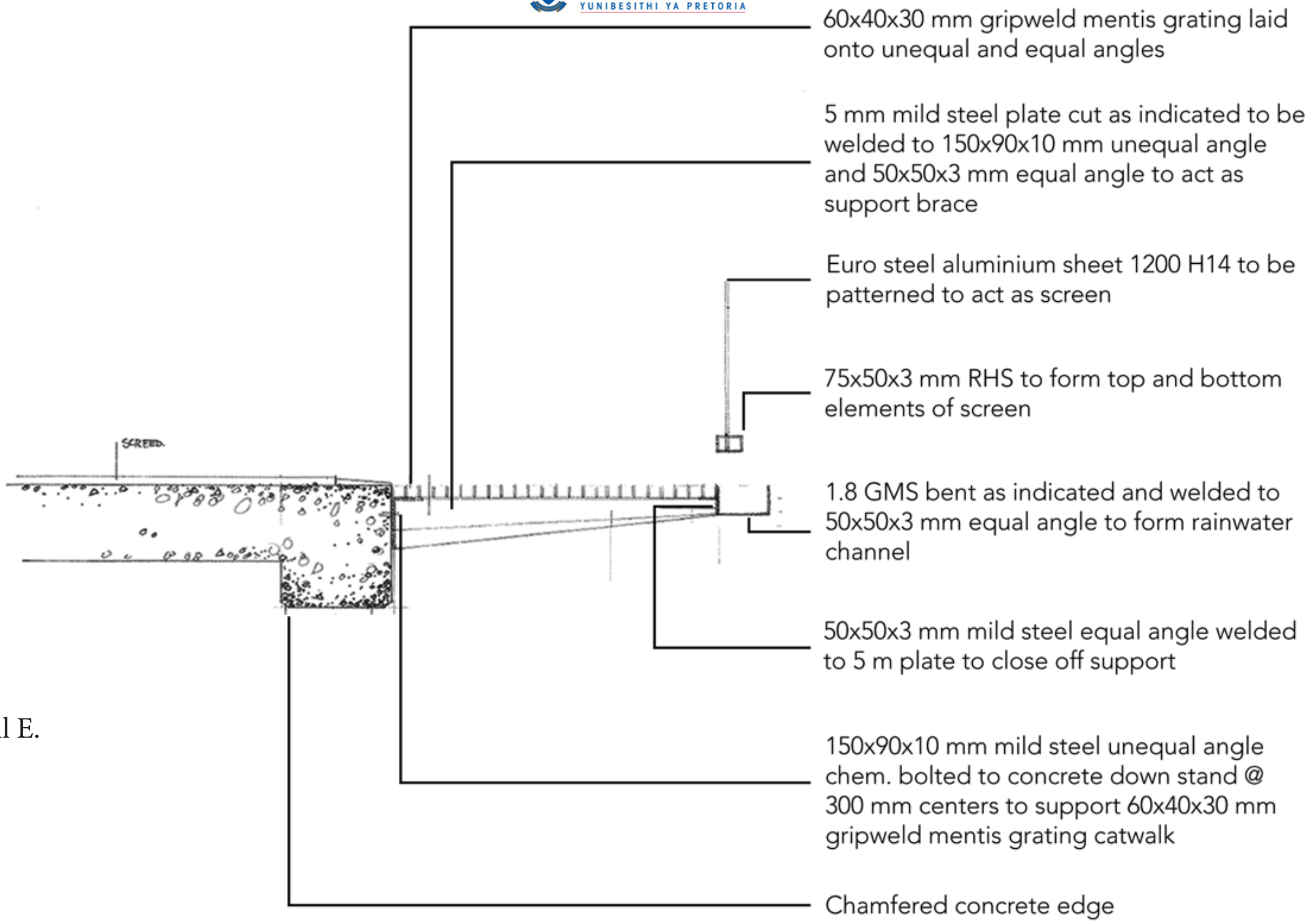
Detail C.

Figure 7.32 Rood end detail (Author 2017)



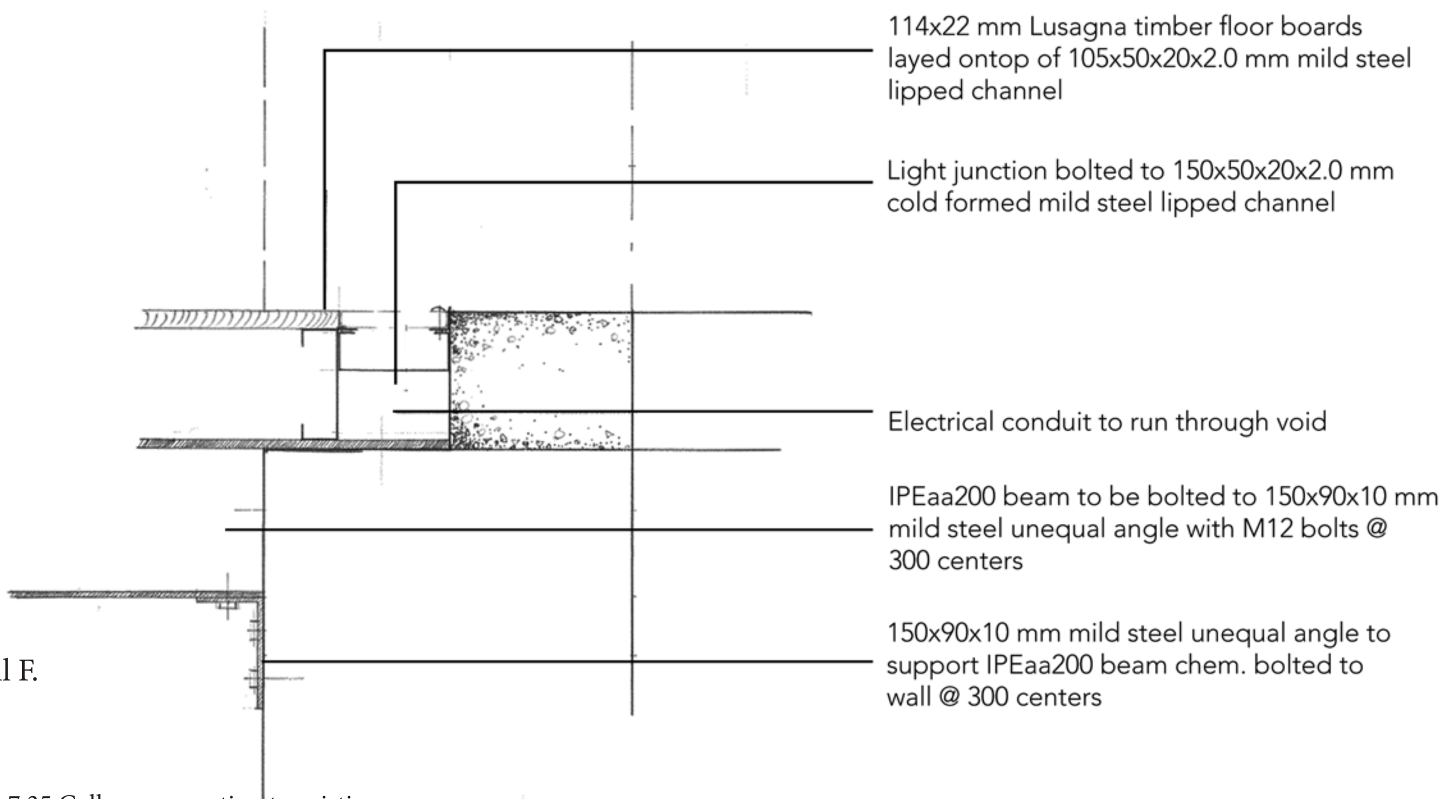
Detail D.

Figure 7.33 Roof gutter detail (Author 2017)



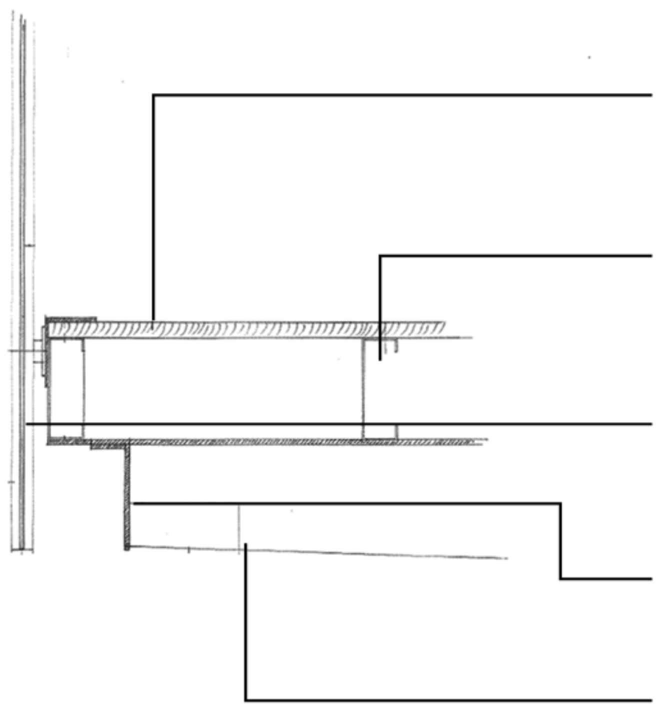
Detail E.

Figure 7.34 Catwalk Detail (Author 2017)



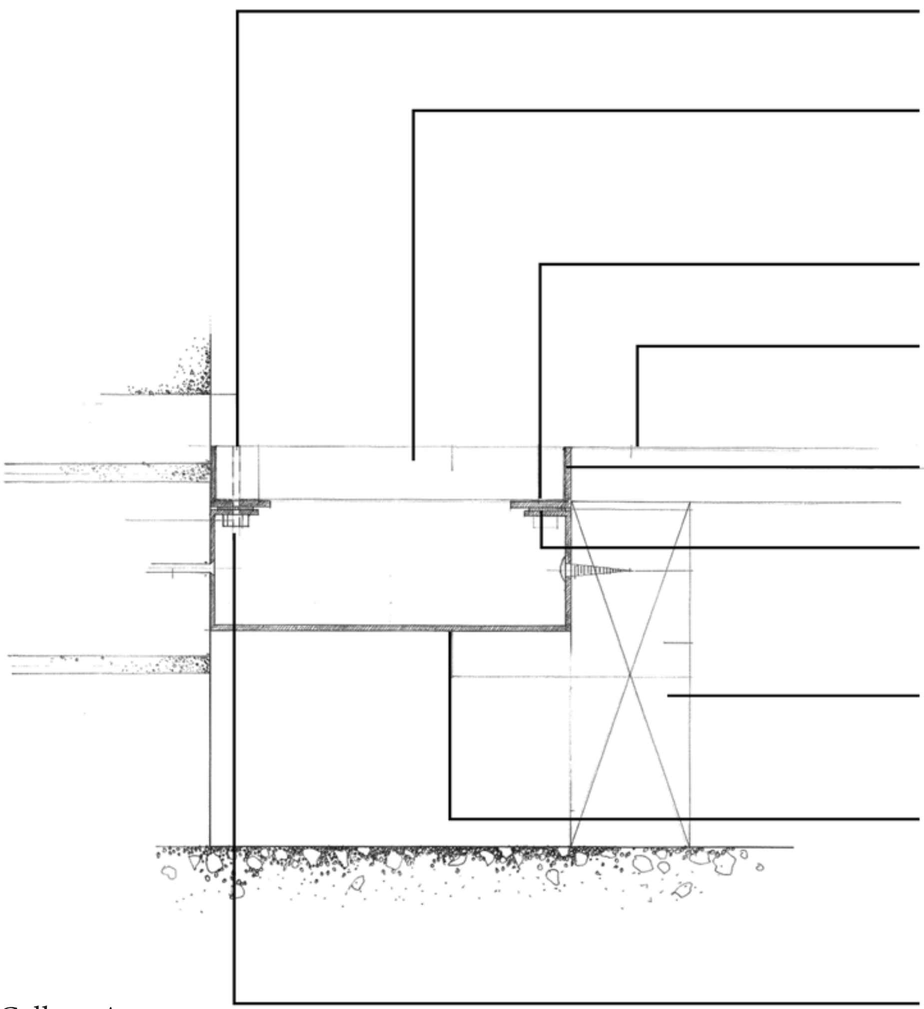
Detail F.

Figure 7.35 Gallery connection to existing (Author 2017)

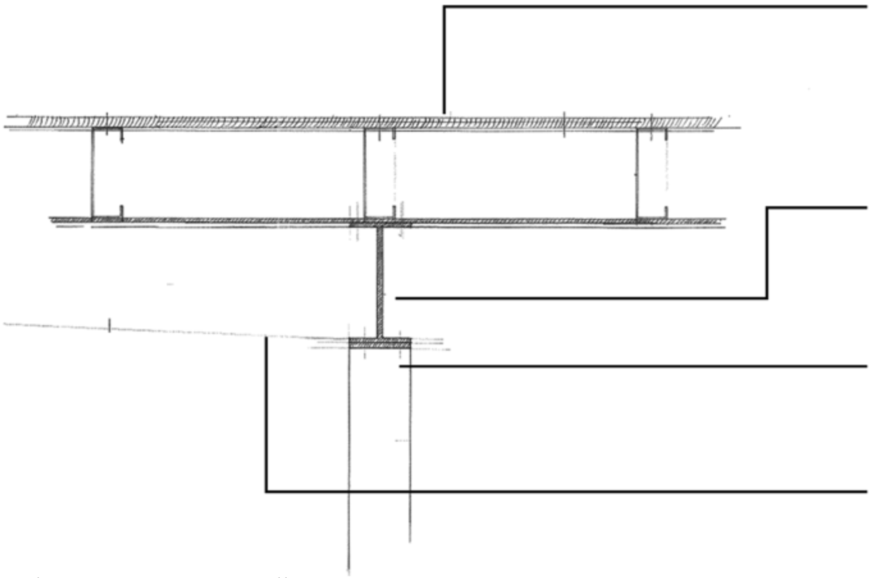


Detail G.

Figure 7.36 Gallery balustrade detail
Figure (Author 2017)
Figure 7.37 Below; Callout A, Lipped
Figure channel lighting detail (Author 2017)



Callout A.



114x22 mm timber flour nailed and supported by 150x50x20x2.0 mm mild steel lipped channel @ 450 mm centers

IPEaa200 I-section beam welded to 100x100x10 mm steel flat cut and welded to a second IPEaa200 I-section

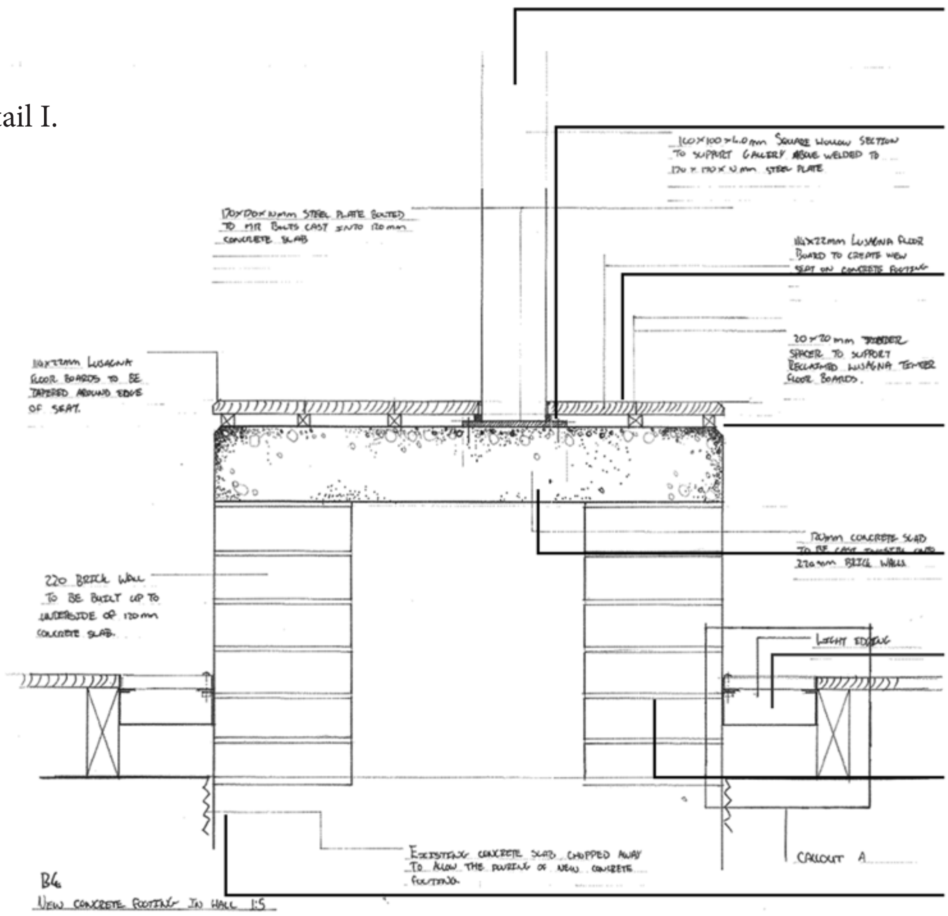
100x100x4.0 mm SHS column capped with 100x100 steel flat

IPEaa200 cut as indicated to form end of gallery

Detail H.

Figure 7.38 Column connection to gallery (Author 2017)
Figure 7.39 Below; New concrete footing in debate arena (Author 2017)

Detail I.



100x100x4.0 mm SHS to support gallery above welded to 120x120x10 mm steel plate

120x120x10 mm steel plate bolted with M12 bolts cast into 120 mm concrete slab

114x22 mm Lusagna floor boards to create new seat on concrete footing

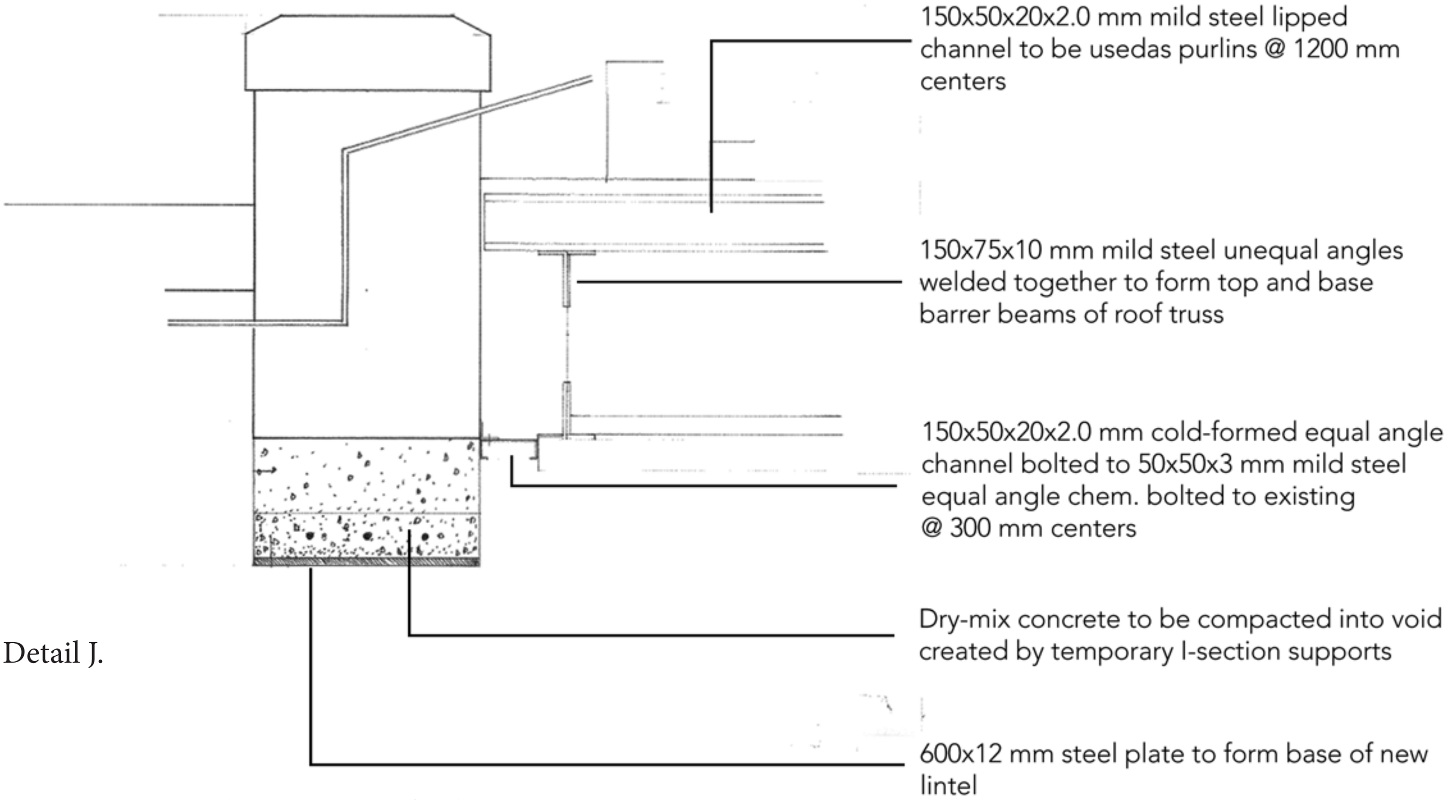
20x20 mm timber spacer to support reclaimed Lusagna timber floor boards

120 mm concrete slab to be cast in-situ onto 220 mm brick wall

Callout A

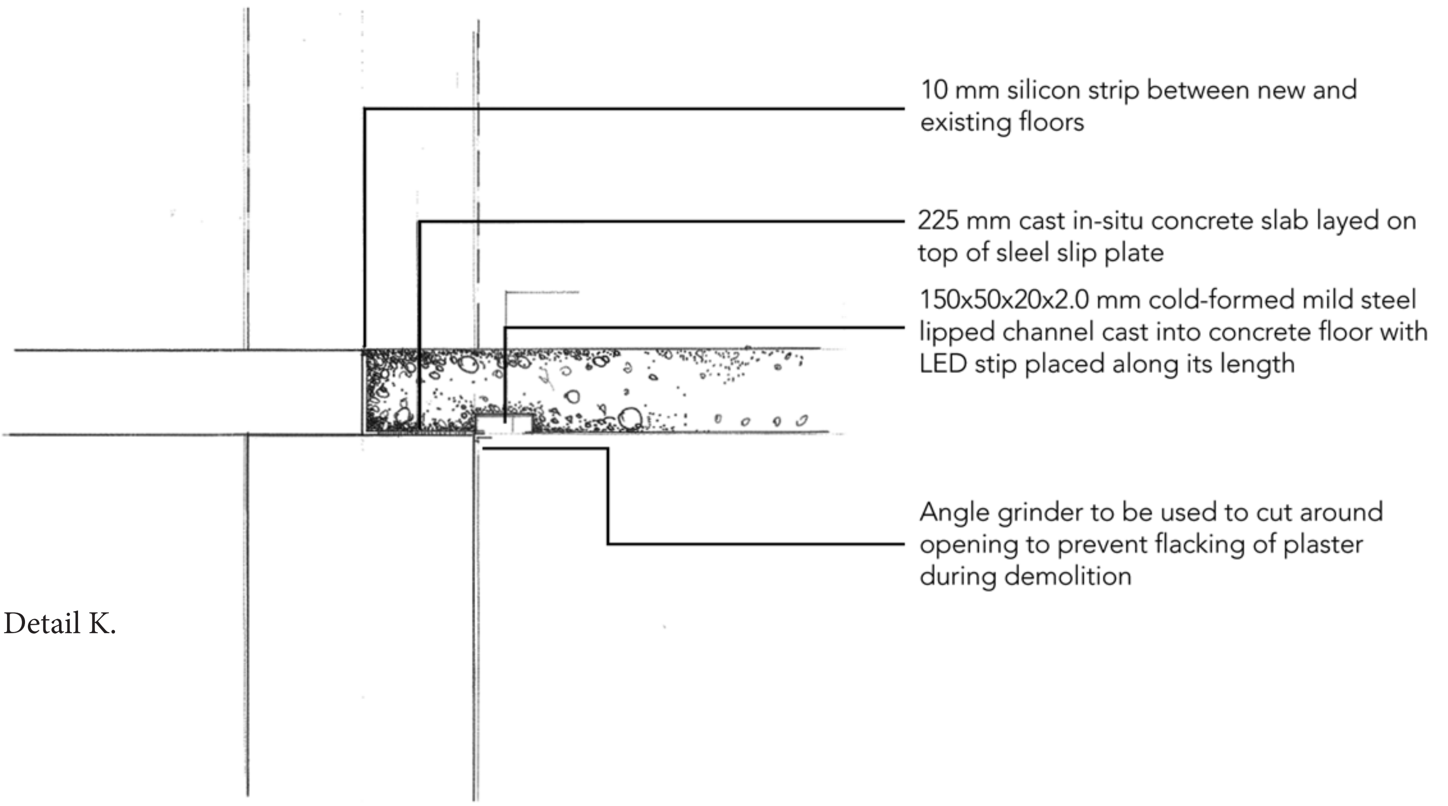
220 mm brick wall to be built up to underside of 120 mm concrete slab

Existing concrete slab shapped away to allow the pouring of new concrete footing

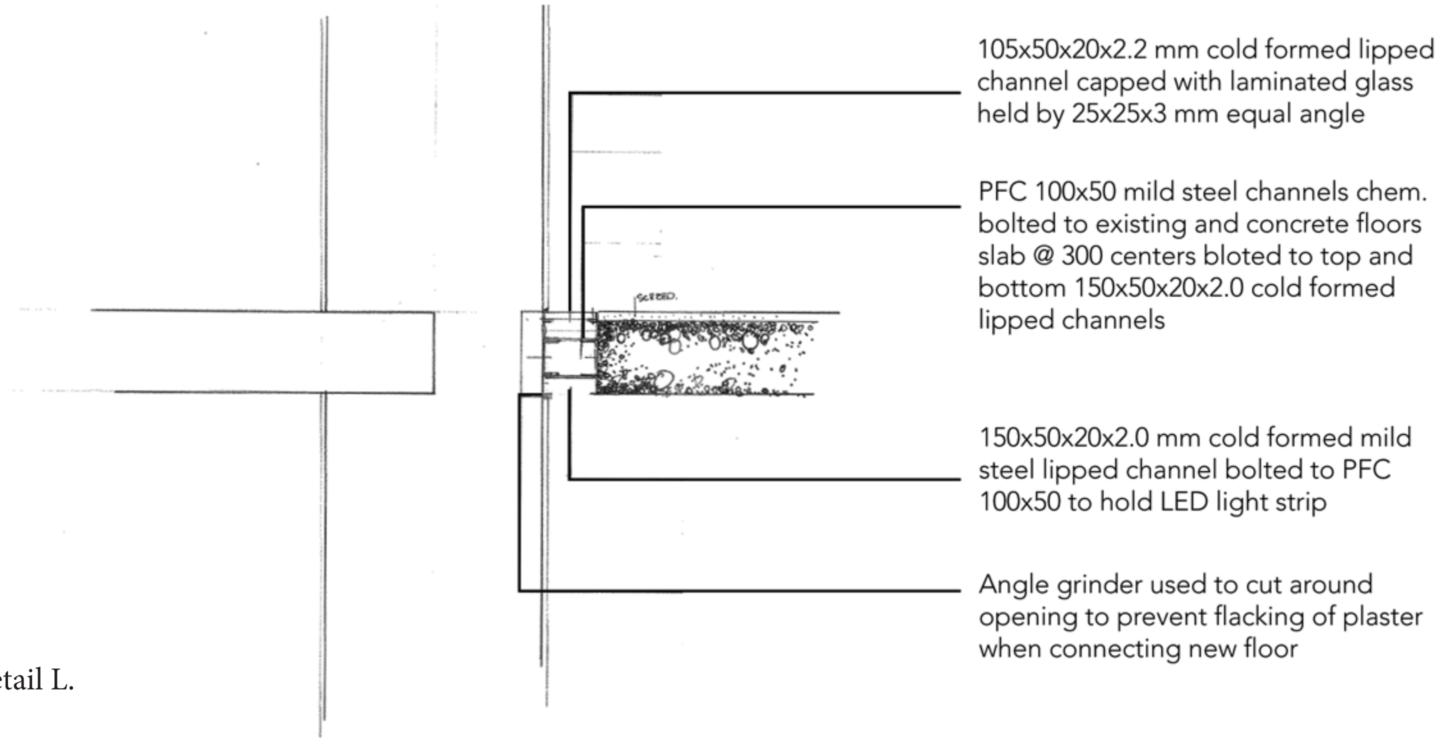


Detail J.

Figure 7.40 Junction between new roof and existing with new lintel (Author 2017)
Figure 7.41 Below; Junction between new and old through new opening (Author 2017)

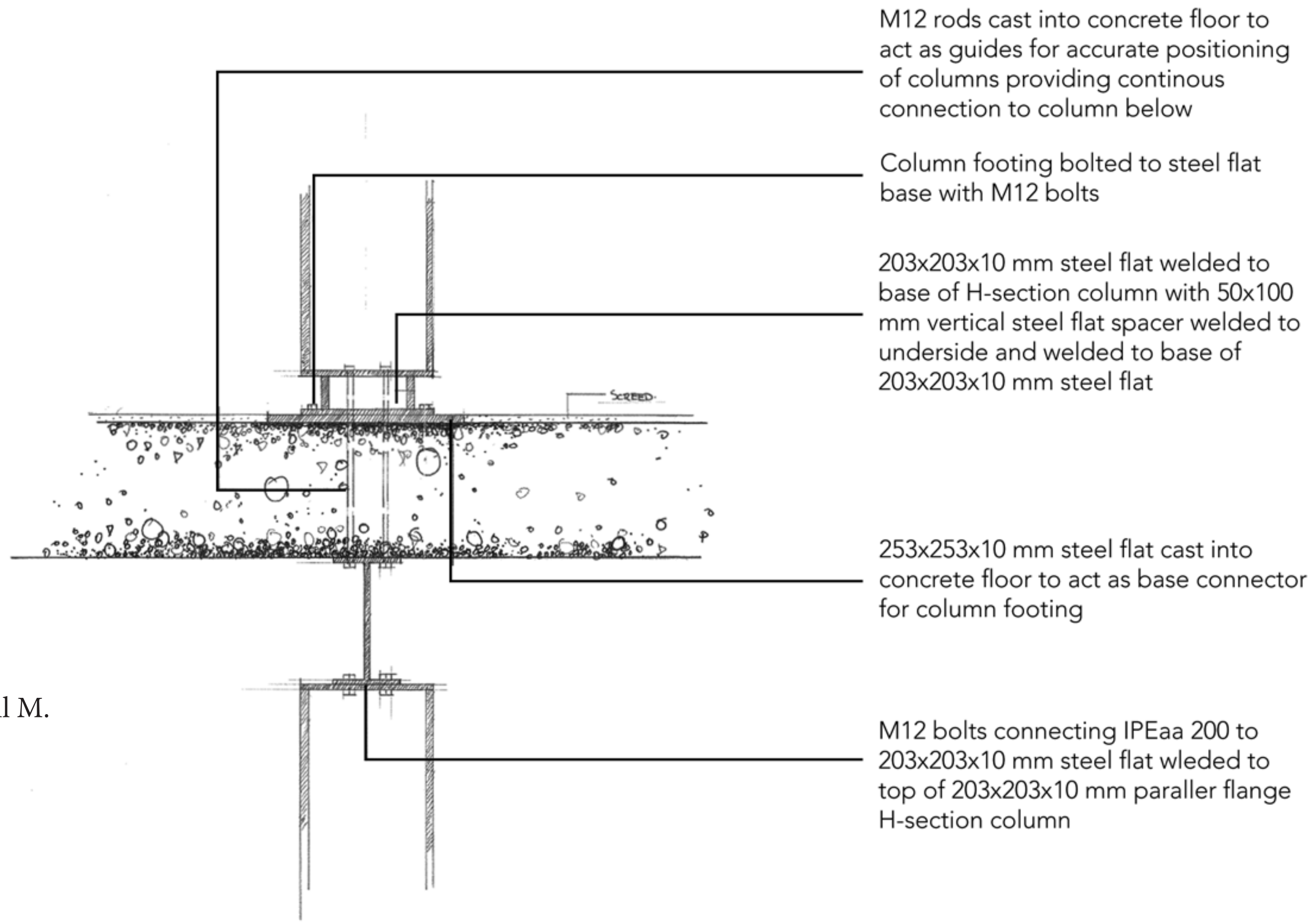


Detail K.

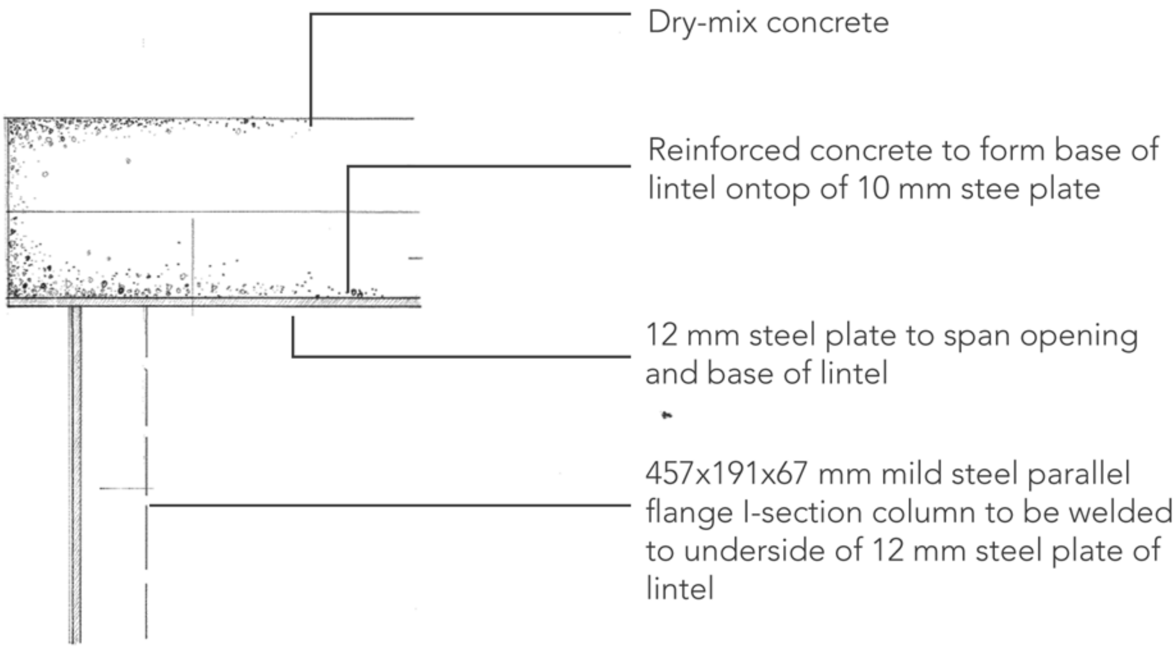


Detail L.

Figure 7.42 Junction between new floor and existing wall (Author 2017)
Figure 7.43 Below; Junction between steel column and concrete floor slab (Author 2017)

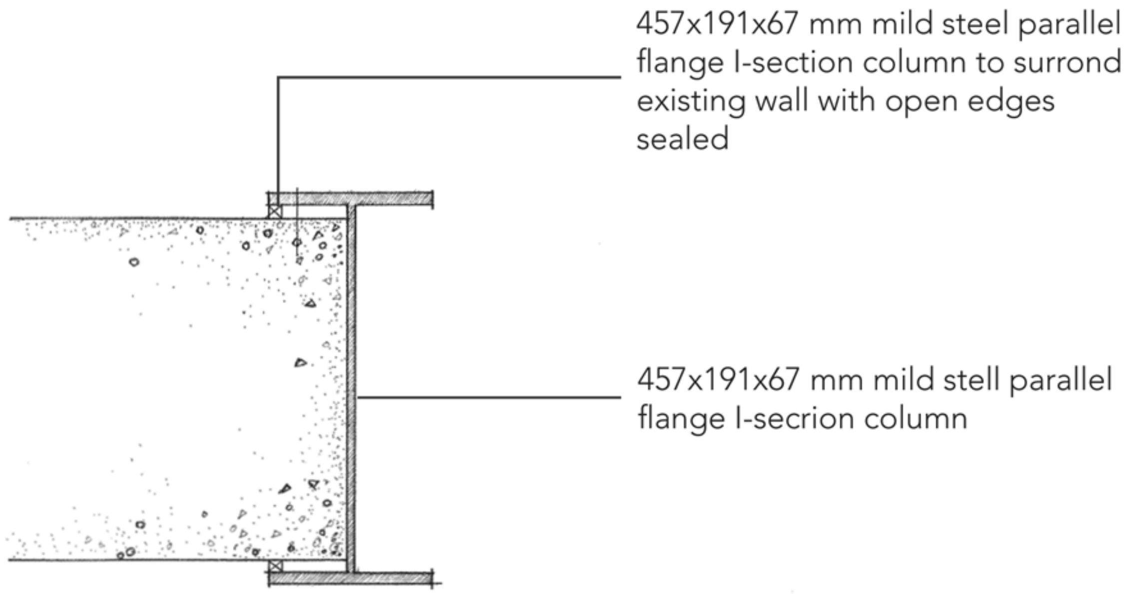


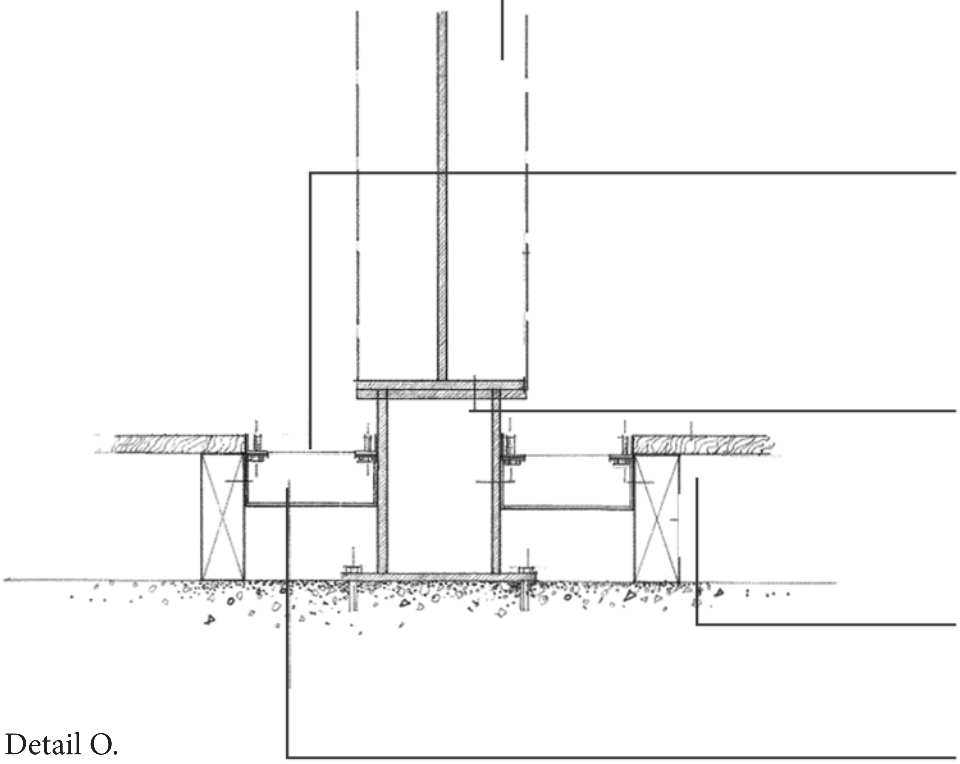
Detail M.



Detail N.

Figure 7.44 Detail of new lintel with existing (Author 2017)
Figure 7.45 Below; Plan through column connection with existing (Author 2017)





457x191x67 mm mild steel parallel flange I_section column to be welded to 457x191x10 mm steel flat

Laminated glass pane held by 25x25x3 mm mild steel equal angle with pre-drilled hole to fix pane to lipped channel

457x191x10 mm mild steel flat welded to 210x10 mm vertical steel flat spacers welded to 457x191x10 mm steel flat base to be chem. bolted to existing concrete floor

114x22 mm Stinkwood timber floor supported on 114x50 mm timber floor joists

150x50x20x2.0 cold formed mild steel lipped channel bolted to colmn footing and fixed to floor joist with self taping screw

Detail O.

Figure 7.46 Column footing through new opening in the Council Chambers (Author 2017)
Figure 7.47 Below; Plan of new column footing (Author 2017)