



# IMVELO

(a place for skills development )  
**Construction Centre: Mamelodi**

Professionals in construction industry in partnership with local community  
in job creation, upliftment and sustainable environment.

Submitted by: Christopher Lindeire

Student no: 25353455

Mentor: Prof. K. Bakker

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University of Pretoria.

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## ABSTRACT

The design that is substantiated by this discourse is a Construction Centre in Mamelodi Township. The objective is to provide training and skills for those individuals who are unemployed and exhibit talent and skills in arts and other crafts related works. It will provide technical skills to people who want to improve their informal housing. But due to their background, need financial support and opportunity in order to acquire these skills. The centre will also provide research and development facilities in low cost housing and alternative materials in the construction industry.

Funding for this project will come from the University of Pretoria (the client), the Department of Science and Technology, and other private organizations interested or involved in construction. The common aim is to contribute to the new Government policy on housing delivery '**Breaking New Ground, 2004**' which advocates quality of housing rather than quantity as in previous schemes of the Reconstruction Development Programme (RDP). The project's purpose is to re-direct professional efforts towards the needs of the poor in informal settlements in urban areas.

The objective of the centre is not only to educate and train students in the applied arts, crafts and construction field but also to provide them with skills to make a feasible living of it. It also aims to market them by establishing small-medium enterprises. In this way, successful students can have some source of income to finish subsidy housing units or improve their informal housing. Thus, the aim is bridging the idea of art and architecture with the more practical economic business education and improving the built environment. The works produced by students would be marketed and sold by them on the site and in various local enterprises outposts.

The training and research development will be provided by renowned and respected artists and craftsmen in order to pass on cultural skills to a younger generation. Professionals, students from University of Pretoria and allied institutions will provide technical and academic research. The research will be on new technology and methods of improving informal housing and low cost housing. Technical assistance will also be provided by former students who return to the centre to teach whilst supporting the idea of giving back to the community what they have been taught.

The design is aimed at integrating African applied arts, crafts and local building techniques with Western construction technology, within the urbanized context of Mamelodi.

Exhibitions, flea market activities, art and construction workshops as well as performances for children and adults are among the envisaged for the Centre. These would eventually serve to increase public awareness on applied arts, crafts and new building technologies in construction industry within local community.

Additionally, the Centre will contribute to the upliftment of the poor and disadvantaged communities through involving them in the construction of the centre itself and assuming that the training facilities in arts, crafts and construction skills provided at the centre can be used by them for use in constructing subsidised houses. It will also help community members in formalising the existing informal construction industries (for example, Zozos and welding workshops) to small-medium construction enterprises in the community. The construction industry will have another source of skilled labour from the graduates of the Centre.

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## 1.0 INTRODUCTION

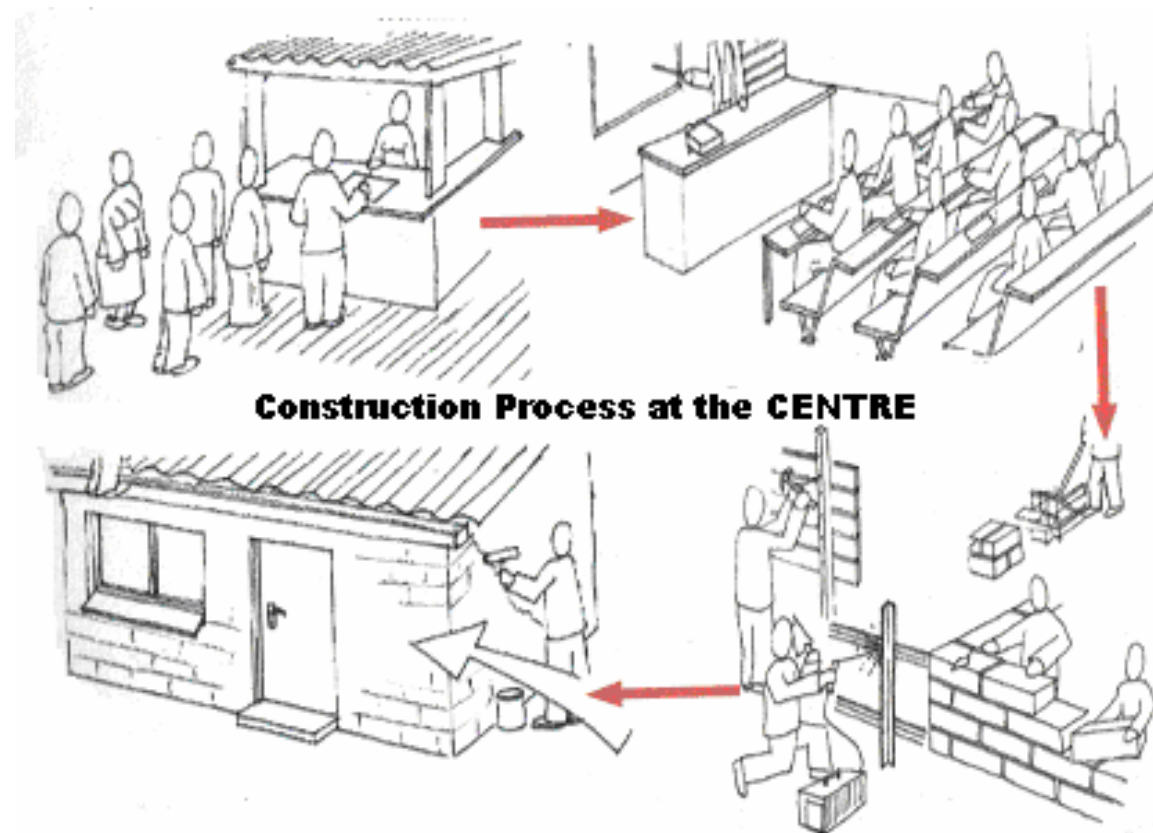


Fig.1: Community Development Process (Araujo, 2004:70)

## 1.1 BACKGROUND

The design discourse, the training and research development centre in the arts, crafts and building skills is a formal proposal for the site situated on the corner of Hans Strijdom Drive and Hinterland Drive Street, on the Mamelodi campus of University of Pretoria in Mamelodi precinct of Tshwane Metropolitan.

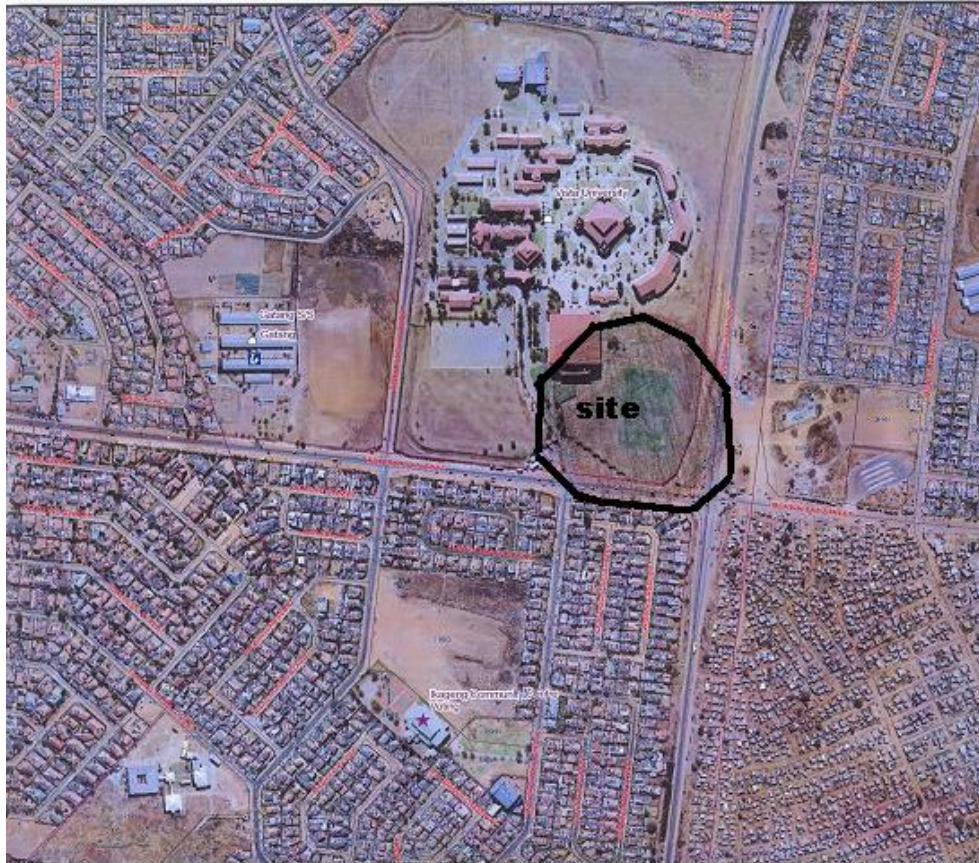


Fig.2: Aerial map of the site. (Tshwane Metropolitan Council, 1999).

The chosen site would be ideal for the proposed design, because it is currently an open space and is owned by the client, University of Pretoria. It is also ideal in that Mamelodi Township is one of the largest sources of construction workers and has one of the highest populations in the Tshwane Metropolitan.

It is also the purpose of the Centre to provide skill training in construction to unemployed, and those individuals who exhibit talent and skills in arts and other craft related works, individuals who do not have financial support or the opportunity due their background. It will also provide research development in construction methods and innovative materials in construction industry for small enterprises and poor households in the local community.

The construction industry is in its widest sense, its whole infrastructure, not only the materials and people on the building site, but also the companies that quarry the raw materials, the transport companies, the processing and manufacturing companies that produce composite building materials and standardized units, the architects and engineers who design the buildings, the team in construction management and cost control, the finance companies that inject capital and speculate through property, and the government bodies that affect the industry (Strike, 1991:1).

The construction industry is also one of biggest employers in this country. The skilled and technical people that the industry employs, come from tertiary institutions and technical colleges where the entry requirement of a post – secondary school certificate. The majority of population is left without technical skills which they need if they are to contribute to ever-growing construction industry.

In the new democracy, local applied arts and crafts skills are being used in major architectural projects as a symbol of national identity thereby increasing the need of more artists and craftsmen/women in the local construction industry.

Most of the unemployed are illiterate and unskilled. They range between the productive ages of 18-40 years. They are often found in the townships poor informal households. Some of these unemployed

are good natural craftsmen/women who have never been to (technical) schools. Due to the political history of the country and poverty, they have been left without the necessary exposure or skills the manpower needed in construction industry thereby increasing skill shortages and unemployment.

If these people get the necessary skills, they will be able to support themselves and their children (education) thereby reducing illiteracy levels and unemployment in the next generation.

In this country, the issue of housing people is very closely coupled with job creation and economic upliftment within the user communities. However, the high level of lack of skill and unemployment among people results in a problem of proper housing. Housing is a basic human need, but it is beyond the means of the low – income households and the unemployed who constitute the majority of the population.

The low-income households spend 90% of their income on their basic needs such as food and clothing and they only save 5-10% for housing. As a result, they are not able to afford to build proper houses even with housing subsidy offered by the Government at present. They need other sources of income or means to enable them to complete their houses.

The problems are increased by the way informal housing (shacks) is mushrooming in every city and towns in the country, the government alone can not manage to provide suitable formal housing to all citizens. It is these low –income households that contribute greatly to the economic development of the country with the labour services they provide, hence, their housing needs should not be accepted as only state responsibility. The private sector (construction industry) contribution is vital in this case.

Osman and Hindes (2005:58) argue that the dominance of state in housing delivery has seen limited intervention by other potential role players so much that designers have distanced themselves from such ugliness of housing environments. They further say that, any housing programme that only deliver house units are doomed to fail. Housing

delivery need to be combined with mechanism for the community upliftment, job creation, capacity building, empowerment and public utilities.

Therefore the involvement of construction industry in particular institutions like University of Pretoria in housing delivery, is a welcome development. Dewar in his Keynote address, 33<sup>rd</sup> World Congress of Housing cited in Osman and Hindes (2005:58) explains how the institutional mechanisms developed during apartheid have not adapted well to becoming mechanisms of development.

Dewar (1998:370) further added that although the legislative obstacles were removed in 1994, operative barriers to the delivery of sustainable housing still remain and he is optimistic that the new policy approach (Breaking New Ground, 2004) will prove to be ground breaking. This is if only new partnership is set in place for effective implementation as it will be seen at the Construction Centre by the University of Pretoria.

Currently the Peoples Housing Process (PHP) is one of the programmes for housing delivery in South Africa. The Peoples Housing Process (PHP) is a form of housing delivery in South Africa that depends heavily on community initiative and beneficiary involvement in its delivery process. It makes use of subsidies provided through the Department of Housing. Though instead of an established developer producing the housing on behalf of the beneficiaries, the community drives the construction process, and at the same time local jobs are created and there is development of skills.

Ramasodi and Van Bergen(2005:10) in their paper to the 33<sup>rd</sup> World Congress of Housing summed up the PHP delivery system by observing that while the programme has addressed short term housing needs, self build, or community build is essentially problematic. The “one off” subsidy invested in a structure built by unskilled and semiskilled labour is inappropriate given the need to build sustainable communities. The design and quality that can be achieved with the help of welfare associations together association with professional design and construction teams far outstrips what can be achieved by beneficiaries and semi skilled construction teams.



The idea that beneficiaries will gradually improve their homes over time seems unlikely given the fact that almost all beneficiaries in the programme are unemployed or earn R1500 or less per month. Given the gradual rise of unemployment in the country the serviced site/ self-build programmes actually create slums and the subsidy spent in these programmes is merely dead capital.



Fig.3: Subsidised house at floor level with a shack (informal housing) besides it, creating a slum in Mamelodi (Author).

Ramasodi and Van Bergen (2005:10) concludes by saying that a comprehensive welfare system is the only way to guarantee that the poor and unemployed do not remain marginalized and have the opportunity to become part of the broader economic cycle.

This is one of the concerns the Centre will be dealing with in that it will provide both good technical know-how (skills) in construction and an additional source of money to the beneficiaries who will then be able to easily build their own houses.

***“Opportunities for skills transfer and development need to be created and provided to ensure the involvement of poor communities in shaping their own future. Therefore the construction industry has ability to shape and change the future of our country and its people.”*** (Agenda 21:2002).

## 1.2 STATEMENT OF THE PROBLEM

The above concerns form the basis of the investigation for this dissertation. It has been shown that poor communities in South Africa

need to have access to skills; and this would encourage the rest in the promotion of social, economic and environmental sustainability which are crucial to the positive development of the country.

To help address the above issues, the proposed intervention will contribute to community empowerment through the provision and design of Construction Centre. The main emphasis of development is geared toward providing information and technology transfer on construction practices. It is also geared towards, housing support and job creation initiatives that use innovative building techniques, arts and crafts, in order to develop the informal industries to small-medium enterprises and to sustain the relevant capacity of individual beneficiaries of the subsidy programme.

## ART AND ARCHITECTURE

Architecture and art cannot become independent from one another because art and sculpture as well as other crafts are considered as enhancement to the buildings, all working together towards common expression rather than being masterpieces in themselves.



Fig.4: Mosaic on Ndebele traditional house (<http://www.museums.org.za>).

## TRADITIONAL AND WESTERN MATERIALS

Most of informal dwellers are from rural areas or have roots in the rural areas. They have skills in traditional house construction and community

participation, such that using their skills in modern materials and skills will be an innovative way of improving the informal settlements.



Fig.5: Building with stabilized interlocking adobe bricks, Orange farm, Johannesburg, South Africa (Photo by author, 6th April, 2005).

### 1.3 AIMS OF THE PROJECT

The above concerns form the basis of investigation of the dissertation. The need for poor communities in South Africa to have access to facilities; encourages and promotes social, economic and environmental sustainability which is crucial to the positive development of our country.

The proposed intervention will attempt to tackle the above issues by contributing to the community empowerment through the provision and design of Construction Centre. The main emphasis of development is geared toward providing professional information and technology transfer on construction practices, housing support and job creation initiatives using new building techniques, arts and crafts to the community.

The project will also provide a framework for the development of infrastructure of the intersection node to enhance commercial and traffic activity. This is in order to create greater income whilst generating opportunities and the physical and psychological enrichment of the community around the centre.

### 1.4 ACCOMMODATION REQUIREMENTS

The design of the Construction Centre will consist of the following:

- Exhibition hall to exhibit products from the centre and for a number of activities like dances, social functions.
- Formal trading stalls to provide space for traders to sell their goods made at the centre. Ablution facilities for the public.
- Administration facilities for general information about the centre, offices, workshops for practical training and working.
- Arts and crafts studios.
- Pedestrian movement to and fro the site.
- Construction yard and re-use /cycle yard.

### 1.5 PROGRAMMES TO BE IMPLEMENTED.

#### INFORMATION AND TECHNOLOGY TRANSFER

The intervention will provide the community with access to appropriate information and skills training programmes. These will include workshops on various building methods, techniques, effective recycling and re-use of waste products. The facility will also include an advice centre where all needs, request, and problems of the community will be addressed.

#### SUSTAINABLE BUILDING AND PRACTICE

By making the community aware and conscious of their everyday actions as to how they affect the lives of others and the natural environment surrounding them is vital for sustainable development. The goal is to provide prosperity for all with the least possible impact on the environment and without compromising the needs for basic human rights.

The facility provided must be the main vehicle to create awareness towards sustainability (socially, economically, and environmentally), and it must also ensure that these values are instilled in all members of the targeted community.

## HOUSING SUPPORT

The proposed facility will provide information and assistance to the community. This will be done by providing new house designs, upgrading and maintaining the existing ones as well as tackling issues regarding settlement planning and design. Planning, designing and guidance on various housing options including alternative methods and techniques will be incorporated into the activities of the Centre.

## JOB CREATION

Helping the community to develop their existing skills and to learn new ones is crucial in enabling job creation and economic growth. The majority of the activities are aimed at community empowerment through the transfer and sharing of various construction, building skills, arts, crafts, and creating work from the waste.

All the programmes and activities will encourage and promote participation from a diverse multitude of people including professionals, the unemployed, the aged and the youth.

## 1.6 GENERAL OBJECTIVES.

The objective of this thesis is to design a building that will:

1. Enable the community to experience art and craft activities used in the construction industry whilst and participating in them. By creating different types of workshops with varied open spaces, the centre should be a place for both fine and applied arts and crafts for the public, while serving as a gathering place.
2. Create space for local artists and craftsmen/women so that they can express their talents and pass them on to young generation. This will ensure that the culture and skills will not die

or be forgotten. The Centre will enable unskilled people to have basic education in technical skills and learn to create arts and crafts for the construction industry and their own homes.

3. Be used for research and exhibition for arts and crafts used by the construction industry. It will also be used by education institutions for the research development of arts, crafts and building technology into local architecture.
4. Have a demonstration facility that will experiment with the building methods, that will re-use /recycled materials, buildings (experimental buildings), arts, crafts and buildings using alternative material and methods. For example the use of cement and steel in crafts and sculptures.

## 1.6 GENERAL ASSUMPTIONS

- The Tshwane City Council will give permission approval to the development framework, design and erection of the Construction Development Centre on the site chosen
- The members of construction industry through the Construction Industry Development Board (CIDB) will assist the University of Pretoria to fund the construction and utilised this facility with the participation of the local community of Mamelodi. The partial operation cost after completion will be funded through selling of artistic work and crafts and the use of the facility by the construction industry and other education institutions.
- Education institutions will incorporate 'learn and build' workshops, and programmes for students involved in the built environment as a module for part of their studies.

## 1.7 RESEARCH METHODOLOGY

### METHOD USED FOR THIS STUDY

It is only through understanding and working with the community that one can formulate his /her own perception regarding the state of affairs within specific a community. Therefore, the Descriptive Survey and the Historical method will be the form of research method to be used to conduct investigation and gather data:

- The history of Mamelodi was obtained using historical and literal data.
- The Descriptive Survey method was used to set up questions regarding the immediate community needs and requirements surrounding the proposed site, together with personal investigation gathered from experiences on the site and surrounding areas.
- The Descriptive Survey method was used to determine the availability of small scale enterprises and waste resources.

### LIMITATION OF STUDY

The limitations of the study include:

- Time constraints affected the collection of data on the community. Hence, there will be assumptions made regarding the community needs and requirements.
- It was difficult to get Development frame work for Mamelodi and the area of study as a result the development framework for the intersection was based on the immediate needs, problems and requirements of the community.

## 2.0 UNDERSTANDING THE PROBLEM



## 2.0 INTRODUCTION

General design objectives for the Centre were investigated, identified and highlighted during interviews with the community, the construction industry community and other projects with similar concepts and principles. Further objectives were identified and generated through applying appropriate architecture (sustainable) and technologies with regard to site –specific conditions; community needs, climate, topography, vegetation, use of local labour and materials, construction and implementation. The following objectives were identified as relevant to this thesis in trying to achieve:

### 2.1 ART FOR THE PEOPLE

Awareness of art in South African culture lies low on the list of priorities. There are isolated institutions, some producing exceptional works and artists, others at best mediocre. The public in general knows too little to either distinguish between them. This resulted in the so –called ‘high – art’ culture, the untouchable product, exhibited in sterile conditions in a museum or a gallery, aiming at the avant-garde- but divorced from life and not interacting with the needs of the society. No real bond can be established under these circumstances, no understanding and thus no love of art can develop. We need something to relate to, something humane and offering hope.



Fig.6: Cry against war, an example of high art Mixed media artwork (Campbell 1999:7).

The need for human involvement exists in art, as it does in everything else that concerns society. The need is becoming recognized all over the world and right here in the country, the ‘New South Africa’ ideal is the manifestation of it. This can be clearly illustrated in the way the

cultural arts have been incorporated in recent prominent architectural buildings constructed in New South Africa.



Fig.7: New constitutional courts entrance where letters of 11 languages of country are incorporated in wall façade (SA Digest, 2001:10).

It is commonly known that art mirrors the needs and hopes of society; it is a reflection of its fears as well as its dreams. Through art, society’s problems can be recognized, assuming this to be the true function of art. Thus, artists producing art for this purpose form an integral part of society.

For too long, artists have been removed from architecture, which is seen as elitist and above **the everyday needs of the community**. This breach resulted in a society which neither understands nor appreciates art, except as something apart and unconnected. Thus, it is proposed that the whole idea of art and craft training should be extended to the public involving them and making them feel committed through the use of art in construction industry. Society must understand art, if it is to understand itself as

**“Architecture is produced when a building and culture come into contact, and connect in such a way that something valuable happen”** (Ballantyre: 2003:115).

The awareness of applied arts in Mamelodi, is through the Arts and Crafts Centre run by the Department of Arts and Culture. According to Matlatsi (2006), the centre is failing to perform its mandate of preserving and training young people in arts and crafts because of the lack of funds and equipments.



Fig.8: Traditional African Artwork. (Campbell 1999:39).

Therefore, the Centre's art workshop facility will act as an alternative to the Government run facility in the area to develop, research, and pass on the skills of applied arts to more people especially the young generation to ensure continuity of cultural practices and source of income.

## 2.2 ART AND ARCHITECTURE

It can be said that it is only relatively recent that architecture and art become independent from one another in the Western World. Initially, art and sculpture as well as other crafts were considered as enhancement to the buildings, all working together towards common expression rather than the masterpieces in themselves.

On the other hand, in African cultures, that separation has never really set in. Art and religion, religion and nature, art and nature, art and architecture are all still aspects of each other.



Fig.9: Mosaic done by community worker (SA Digest, 2001:97)

The aim of blending the arts with architecture is not to diminish the importance of either. Architecture can be a canvas for human expression, as it is for artistic activities. The building in itself will become an artwork to be admired by all and pulling the focus to the inside of the building, making you aware of similar activities inside.

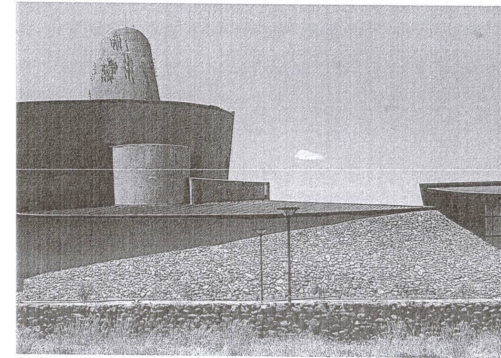


Fig.10: Northern Cape Legislature: sculptural elements and rich earthy colours decorated in beadwork and scarification form a complex interpretation of traditional responses (SA Digest, 2001:38).

The introduction of artistic poetry in architecture in the form of mosaics, sculptural elements, detailed surfaces, and earthy surfaces, is hopefully reminiscent of beadwork, basket weaving and traditional skin decoration (scarification). The use of these elements is a way of making the handmade surface an integral part of the buildings. This serves to connect the public with the buildings as narrative structure that they can identify with and through this create a set of buildings representative of their land and future and not a handful of edifices borrowed from schemes of the past (Malan & McInerney, ed, 2003).

Architecture offers an important mirror to a given culture. It is, therefore of great importance that architecture be showcased in the society. Architecture has an important role to play in the growth of South Africa as a young democracy and greater public awareness of architecture should be actively promoted.

Through the Centre, which will incorporate art, mosaics and other related artistic work in its design; it is expected that the students training in arts, crafts and construction will not only put their individual mark on their environment and thus assimilate their spaces, but also surround themselves, as well as the public with sources of inspiration and ownership of all artistic work done on a building. Art should not only be

seen, it should be about the experience, inspiration, stimulation, familiarization and communication.

## 2.3 ROOTS OF CRAFTS

Crafts is the practice of making decorative or functional objects, wholly or partly by hand, which requires both manual and artistic skill. The term crafts also refer to objects made in this way. Crafts today predominately comprise weaving, basket making, embroidery, quilting, pottery, wood making, and jewellery making. They are made by amateur craftsmen/women at home, as a hobby with minimum equipment and by professionals with regular outlet for their product.



Fig.11: Beading work by rural woman (Malan & McInerney, ed, 2003: 27).

Crafts can also be used as occupational therapy. For example, patients may be taught crafts to strengthen weakened muscles, or to help in gaining the use of artificial limbs. Emotionally disturbed people are also taught crafts as an outlet for their feelings. Crafts also provide the disabled with an occupation that diverts attention from their handicaps. This aspect will be incorporated in the design in form of occasional workshops held for these people.

Crafts are as old as human history. Originally fulfilling utilitarian purposes, they are now a means of producing aesthetically appealing handmade objects in a world dominated by mechanization and standardization. Among the earliest basic crafts are basketry, weaving, straw –work, and pottery. Nearly every craft now practiced can be traced back many hundred years or even thousands of years.

For years, this traditional skills and talents has been passing on from parent to child in rural areas as a source of income and livelihood but with new a western style of living, the tradition set up of passing on skills and talents is almost not there. Hence, the need for the Centre to develop these talents and skills to match international standard for good income and exposure.



Fig.12: Cultural artifacts hand made to be sold to locals and visitors (<http://www.museums.org.za>).

There is also a need to bring the traditional crafts from the rural areas to urban areas where people will appreciate it much as a source of income and cultural heritage. Cultural crafts are associated with people living in rural areas but there are many people living in urban areas with the same skills and talents. Providing them with resources and a place to develop their skills in an urban environment is the great challenge of the Centre. Therefore, the Centre will have workshops for wood and crafts, sewing, painting and braiding.



## 2.4 LOCAL, RESEARCHED MATERIALS AND CONSTRUCTION TECHNOLOGY.

### RECYCLED MATERIALS

The informal housing (shack dwellers) is the biggest producer of housing stock in most of developing countries. Most of it is illegal and built through self help construction process. The sector is characterised by insecure tenure, poor quality environments, small units, high density inadequate physical and social services and unavailability of finance and credit services.

On the other hand it is affordable and presents not only problems but also solutions to housing shortages and problems. There is possibly no better starting point for the sustainable agenda in the developing world than the shack.

This building type is predominant in all cities of the developing world and it is a highly paradoxical phenomenon. The informal housing (shack) is perfect example of resource efficiency that most of developing countries are struggling to achieve- its use of local materials and full re-use and recycling of building materials and components.



Fig.13: Informal housing showing the use of locally available materials and recycling /re-use of materials –Mamelodi (photo by author, 2006).

A conventional shack can consist almost entirely of re-used materials and components sourced close to the site. Since they are self built, shacks exploit the most abundant skills and technology available within the community and household.

With more people living and coming to live in these informal settlements, lack of materials within reach are scarce such that materials are collected far and are expensive. Most of these materials are industrial waste dumped far away. It will be one of the duties of the Centre to avail industrial waste to the community by establishing new or reinforcing existing re-cycling centres and doing research on innovative ways of using industrial waste in informal housing. The Centre will also use some of the recycled materials in non load bearing walls like partitions and external walls as one way of showing the community the use of recycled materials. A re-cycling yard within the Centre will be established as model to aspiring local recycling yards within the community.



Fig.13: The Centre will reinforce the existing re-cycling yard as above in the area (photo by author taken on 12<sup>th</sup> May, 2006).

## ALTERNATIVE MATERIALS

In search for alternative materials which meet the expectations of the population as well as the housing and environmental requirements, the technology which use raw earth, timber from sustainable managed sources and other organic products such as straw and bamboo as raw material present great potential.

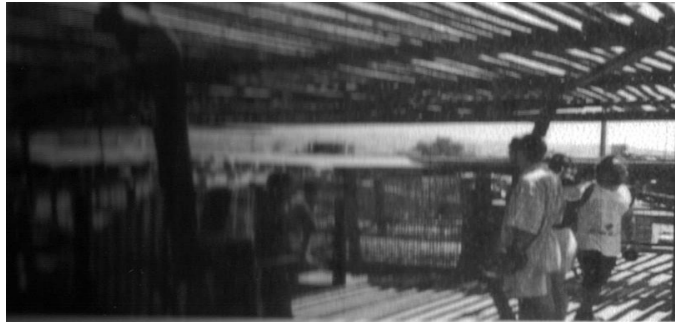


Fig.14: The Centre will use combination of steel and reed (timber) cladding as done at African Market-Durban (KZNA Journal, 2001:31).

Although there is currently much resistance to the utilisation of these materials, they have been used in developing countries since time immemorial. Some of these techniques are deeply rooted in the culture of different regions, and if they were to be used in a technically correct and economically viable way, it would be possible to restore the confidence of the government, construction industry and the users.

Each construction technique becomes unfavourable went into disfavour mainly due to the technological changes brought on by the Industrial Revolution and the consequent new demand on the market. It remains one of the major problems of the traditional rural construction methods, which are environmentally friendly. This has been adapted in urban housing and is mostly abandoned in urban development because of the false idea of being modern.

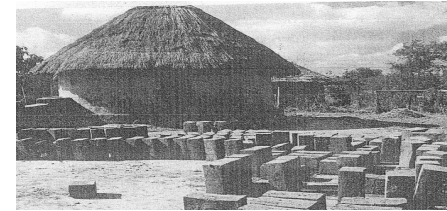


Fig.15: Traditional house and sun dried earth blocks, Limpopo Province, South Africa (Du Plessis, 2002:47).

Most of informal settlers are migrants from rural areas, using their cultural skills in construction will be useful and easy. With community participation, it will be easier to use these talents/skills in the use of improved traditional materials (du Plessis, 2002:28).

Building materials absorb most of the cost in house construction – closely related to labour use and construction techniques. Therefore development and use of alternative locally available cheap materials appears to be the key solution to the problem.

Community or beneficiaries participation in production of locally available improved building materials can contribute to economic and social life of the area. Some of the technology used to produce these alternative materials can be hard to be adopted by the private sector. Community participation is vital in this case as it require more unskilled labour and can greatly increase sense of ownership. Alvar Aalto combined ideas from the Modern Movement with the traditional and the classical to find a fitting architectural expression in Finland; South Africans architects can also reformulate modernism to fit local conditions. Therefore, the centre will use some of the alternative materials instead of the normal building materials and will have workshops and laboratories to research on materials and construction technologies.

### MODULAR/OPEN PLAN PRINCIPLES

The concept of modular expansible design could be proved to be pivotal for achieving housing with a flexibility to respond to changing needs and incomes. The beauty of modular housing – itself a Modern Movement concept – is that the *same* house design offers suitable

options for persons of varying incomes or even for the same person whose income might vary over time.

Peeters and Osman (2005) investigated the construction of portable shacks in Mamelodi, locally known as 'Zozo' and proposed a modular system. The modular system will make the Zozos easy to assemble and transport and most importantly it will increase its structural capacity. The proposal was suggested to one of the local 'Zozo' construction yard owner's near the proposed site. Mabogoane (2006) agreed that, indeed the parts of the 'Zozo' they are making are heavy to transport and they are not structurally stable. They are standing today because the shacks are close to each other such that they act as one unit to adverse wind. He however, said they can not afford to make small parts as suggested in modular system because it will require more material, thereby increasing the price. He further said that although most of the materials are free (industrial waste), the transport cost is high as all industries are located far away from the townships.

The above problem comes back to the involvement of the private sector, in this case, by helping out to dispose their industrial waste where it is needed for recycling. The City of Tshwane can also help in designating industrial waste sites that could be useful to the communities and near the communities. The Centre will also form partnership with industries whose waste is needed in the community and establish many re-cycling yards.

## 3.0 CONTEXT ANALYSIS

### 3.1 INTRODUCTION

The context of the problem is also part of the solution to the problem. The process of analysing and interpreting the parts of the problem is prerequisite to reassembling the parts into a whole. While the process remains the same, the factors in each situation are variable and unique to each site.

With this in mind, the context study will look at context from regional scale and zoom in to the site scale to identify factors that could influence the design. Through a process of contextual analysis, the complexity of the site in the urban context is revealed. New problems identified by this analysis are addressed in a development framework.

### 3.2 LOCATION

The chosen site is situated in Mamelodi Township, Tshwane Metropolitan city, in the Gauteng Province of South Africa. Tshwane, as a built environment forms an integral part of the Southern Africa context. It is the administrative capital of South Africa as well as a major commercial, manufacturing, transport and cultural centre.

The city is a microcosm of culture and veritable window on Africa. It is a very strategic location within easy reach of Johannesburg International Airport and it is a gateway to many favourite tourist destinations.



Fig.16: Map of Mamelodi relative to the City of Tshwane (Tshwane City Council, 2006).

The Tshwane Metropolitan area is in excess of 900square kilometres with population over 2million. Tswane is geographically situated between the 25.8 degrees to 30.7 degrees east and 22.0 degrees to 25.9 degrees south.

### 3.3 HISTORICAL OVERVIEW.

Mamelodi was originally known as Vlakfontein farm, the Tshwane(Pretoria) City Council bought the farm in 1945 to provide accommodation for the city's black labourers . In 1962 the name changed to Mamelodi. It is situated 20 kilometres east of the Tswane City centre. Mamelodi is a dynamic community, set at the foot of majestic Magaliesberg Mountains, forming its northern and eastern borders. The Pretoria –Witbank highway, forming the southern border. Its closest neighbour, Eerterust, is on its western border (Tshwane City Council, 2006 :10).

Although a large area at 4158 hectares, most of it is not suitable for vast developments due to its geographic state. A tributary of the Apies river – Moretele divides Mamelodi west and east adding to Mamelodi pictorial attributes.





Fig.17: Pictorial view of partial Mamelodi Township-Tshwane City (Tshwane City Council 2006).

In the early, middle and late Stone Age, there were communities who occasionally inhabited an area right on the foot of Mamelodi by the so-called Magaliesberg. In this area, the Stone Age men produced their tools and weapons from quartzite rocks, found in the mentioned Magaliesberg.

In around 1200AD, the first black communities settled down in the Tshwane area; they grew crops, kept domesticated animals, made pottery items and smelted iron to make tools and weapons. The first known settlers, The Matebele tribe and the Bakwena tribe, settled

along the Magaliesberg. This was around 1825-1826 (Tshwane City Council, 2006 :17).

The first residents were black-Africans, subsequently removed from other black areas like Riverside, Eersterust, Eastwood and Lady Selbourne. Gradually, more people have been moving in the area, either forced by the authorities or in search for employment (from the rural areas, like for instance Limpopo, Mpumalanga, Mozambique or Zimbabwe). In 1953 saw the first housing units being built and Mamelodi was officially proclaimed a Township (Tshwane City Council 2006: 17).

During the 1980s Mamelodi Town Council commissioned private developers to develop land to the east of the original township. The areas towards the east develop rapidly especially as people such as civil servants could now obtain housing subsidies and were able to relocate to the newly developed areas (Tshwane City Council, 2006).

Mamelodi means 'mother of melodies' given to President Paul Kruger by the Africans because of his ability to whistle and imitate birds and true to this name is the heritage of an original and unique jazz style called Molombo Jazz, originating from mbaqanga, traditional Pedi and Ndebele drumming, Zionist – Baptist gospel music and the African jazz guitar (Tshwane City Council, 2006: 17).

Mamelodi boasts a truly multi-cultural community. Ethnic groups living in this peaceful suburb include Northern Sothos, Tswanas, South Sothos, Vendas, Zulus, Ndebeles, Xhosas, Swazis as well as many foreign groups (Tshwane City Council, 2006: 18).

### 3.4 REGIONAL ANALYSIS

The rail track and different roads leading to Mamelodi from Tshwane Commercial Business District (CBD) are probably the most significant form-giving elements within the landscape. Commuters are dependent daily on the means of transport to provide access to job opportunities in the Tshwane CBD and surrounding areas.

The edges between developed and developing areas are sharply defined by these paths. The various formal and informal commercial centres create landmarks within landscapes. The bus station and University of Pretoria – Mamelodi campus are important landmarks and transport nodes. As almost all of South African Cities and Towns, Tshwane is set out on a grid system and introduces a specific man-made order into the landscape.



Fig.18: Access to site regionally (Tshwane City Council 2006)

### 3.5 THE SITE IN URBAN CONTEXT

The site is situated in Mamelodi district (Township) of the City of Tshwane. Kelvin Lynch defines a district as an area of a city with the same physical qualities in terms of its inhabitants, texture, typology, form, activities and building types (Lynch, 1986:66). As we have already described in the background of Mamelodi and the next chapters in the book, it will be found that indeed Mamelodi is a district.



Fig.19: City of Tshwane showing Mamelodi and surrounding districts (Tshwane City Council, 2006)

According to Kelvin Lynch (1960:46) the image of the city can be analyzed into five urban elements: paths, nodes, edges and landmarks. Through analysis of the chosen site and its surroundings, it will identify some of these elements and their influence on the design.

### **PATHS**

Paths, according to Kelvin Lynch (1986:48) are the most prominent urban elements. Its importance is more than just to connect nodes. Movements are the most important way of experiencing the city. Paths can be railways, main roads, streets side-walks, short cuts over open sites or anything that functions as movement elements. The following routes of importance were identified in the vicinity of the chosen site:



Fig.20: Aerial photograph of site surroundings (Tshwane City Council 2006)

**HANS STRIJDOM DRIVE:** It is the most direct main road to Mamelodi from Tshwane CPD. It is a two a lane road passing along the proposed site of the Construction Centre.



Fig.21 View from Hans Strijdom Drive with Mamelodi campus on the left and proposed site in concreted strip fence (author).



**HINTERLAND DRIVE:** It is the road coming from the inner part of the Mamelodi with commercial, residential and entertainment facilities along the road. The Hinterland Drive ends on Hans Strijdom Drive. This is where there is transport traffic nodes to town, Hans Strijdom Drive and extension 6 through Mohwelere Street.

This Four way junction is the most important transport node for buses and taxis drop-off, conveniently situated opposite the site.



Fig.22: View from Hinterland Drive (author).

**MOHWELERE STREET:** This is the main Street from most of the informal settlement on the right and formal housing on the left. On both sides of the road is a line of informal trading stalls.



Fig.23: View from Mohwelere Street with the proposed site on the left and shack housing on the right. Streets lined with informal trade (author).

**RAIL TRACK;** this is the only rail transport from Tshwane CBD to Mamelodi. It is the cheapest means of transport for the community.

### **NODES AND LANDMARKS**

A node is the focal point where important paths cross or where concentration of activities occurs. Nodes are important in urban fibre as orientation points, forming part of the framework of reference. According to Lynch (1986:73), nodes are usually the core of the district. In the immediate vicinity, University of Pretoria-Mamelodi Campus and the newly built municipal bus station are identified as nodes. University of Pretoria – Mamelodi campus is situated on the corner of Hinterland Drive and Hans Strijdom Drive located to the North-West of the proposed site. The campus is enclosed by bricks and a concrete panel fence. The fence, therefore completely separates the campus from the neighbourhood environment.



Fig.24: Fence around the campus along the Hinterland Drive on left and Hans Strijdom Drive on the right (author).

The municipal bus station is situated along the Mohwelere Street. It is newly built. It is only used on specific times during the day by the municipal buses. There is a public toilet at the bus station though not

operational. The entrance is on Mohwelere Street and the exit is on the Moretlwa Street.



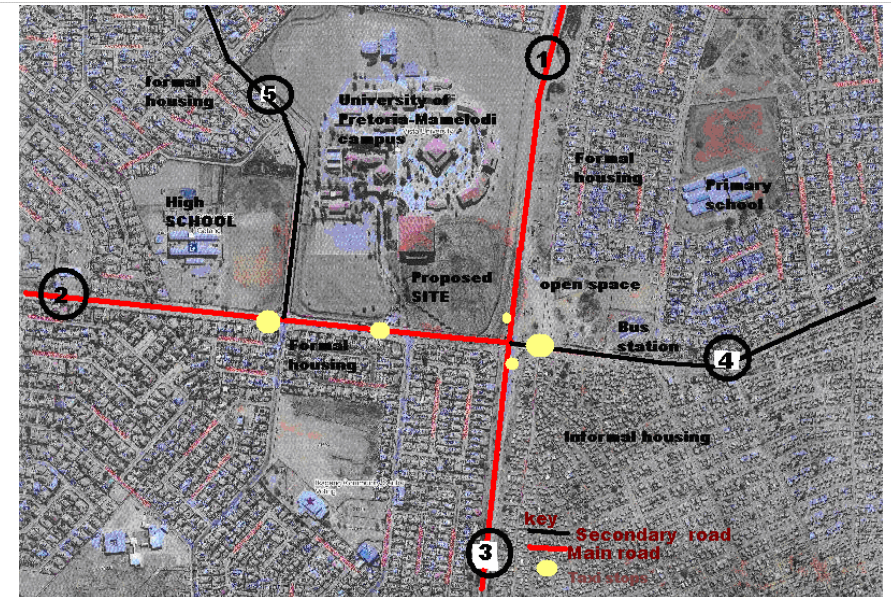
Fig.25: Entrance to Bus station on Mohwelere street (author).



Fig.26: Exit from Bus station on Moretlwa street (author).

## EDGES

Edges occur where districts connect or where there is a break in the continuity of the urban fabric. The site is defined by Hans Strijdom Drive which runs from the south to the north forming the edge on the east side of the site and it is the sites major traffic artery. The southern edge is formed by Hinterland Drive. The northern edge is partly formed by Campus multi –purpose hall and classrooms. Both Hans Strijdom and Hinterland Drives carry pedestrian and vehicular traffic, rendering the site accessible.



(1) To Witbank (2) To Mamelodi Town centre and CBD (3) To Pretoria CBD (4) and (5) Main secondary distribution road.

Fig.27: vehicular access and physical edges of the site created by the various roads.

## ANALYSIS OF PROPOSED SITE

The site selected for this study is situated in the eastern part of Mamelodi, on the corner of Hans Strijdom Drive the main direct road from Tswane CPD to the site and Hinterland Drive. The site is currently used as an open play ground within the campus. The most important landmark in the area is the University of Pretoria –Mamelodi campus. The campus has educational institutional scale with predominately



brick and painted steel sheets and concrete and brick fence surrounding the campus. Another important land mark in the area is the municipal bus station bound in steel fence.



Fig.28: The accessibility of the site via vehicle, rail and foot as well as the surrounding socio-economic context makes it suitable for the proposed Centre (author).



Fig.29: bus station fence with Mamelodi campus in the background and football ground next to a bus station (author).

The area to the east of the site is characterized by informal commercial trading along the main routes- Hans Strijdom Drive, Hinterland Drive, and Mowelere street.



Fig.30: Shack panels made of steel sheets and timber assembled and made of site (author).



Fig.31: Informal trading stalls on the intersection (author).



Fig.33: Informal trading stalls along Mohwelere street (author).

## HOUSING

The site is surrounded by mixture of classes and cultures. There are formal housing units, shacks and institutional housing.



Fig.34: Aerial map of the site showing surrounding residential (both informal and formal housing), main roads and institution buildings (author).



## VISUAL SITE ANALYSIS



Fig.35: site pictures (author).



### 3.6 CLIMATIC DATA

In the design, solar architecture is proposed. Solar architecture involves designing with climate: for wind, shelter and outdoor space; light and daylight; heat and warmth; cooling and ventilation. People built structures for thousand years, and when the majority of architects realize the importance of working with and not against the climate, the term will change, by itself, to Architecture:

#### TEMPERATURE

Tshwane (Pretoria) enjoys a warm, pleasant climate with an average of nine hours sunshine per day for 300 days a year, making the use of sun control an integral part of the design. Summers are hot, with temperature ranging between 18 and 32 degrees Celsius, with an average of 29 degrees Celsius. Winters are dry and cool to mild with an average temperature ranging between 6 and 23 degrees Celsius.

Pretoria's temperature allows outdoor activities almost all-year round. It is recommended that summer sun be screened and winter sun be allowed to penetrate. External spaces should provide shade in summer for outdoor activities. Lightweight insulated roofs are feasible in this region, provided that walls and floors supply thermal mass.

#### RAINFALL

Tshwane (Pretoria) is situated in the summer rainfall region of southern Africa. The average annual rainfall is 763mm of which 88% falls during the summer months. Rain is usually in the form of thunderstorms which is sometimes associated with hail or lightning and large amounts of water falling in short periods of time.

This should be kept in mind during the design process, as provision should be made for the rapid drainage of large amounts of water away from the building. The possibility of flooding and collection of rain water may cause problems if not attended to. Therefore an inventive solution for collection of rainwater must be found. The re-use of the contained water will be considered.

#### WIND

Tshwane city is located between parallel mountain ranges running in the east –west direction that forms the natural boundaries to the north and the south. These ranges directly influence the air movement patterns. In summer 41% of the days are breezy and winds are predominately east – north easterly to east – south –easterly. During the winter 60% of the days are breezy and winds are predominately south – westerly with a fair amount originating from the north –east (De Lange, 1999:45).

## SUNLIGHT

Sunshine in Tshwane (Pretoria) varies between 60% during winter and 80% during summer.

With the above information in mind a relevant solar architecture needs to be found within the context. Solar architecture requires an architect to refocus on quality of design at all levels.

With solar qualities in mind, we are presented with a challenge to design in the name of architecture, a climatically – aware response to the need of the shelter. This requires technical discipline in planning and especially giving attention to detail in designing openings, shuttles, shading and the envelope.

The selection of materials will thus not be made on visual criteria alone. Materials have varying thermal properties. These varying performances implicate careful choice and careful design. Responding to the bioclimatic challenge will permit spaces which respond to peoples basic needs for natural day lit, harmonious comfort in their built environment /surroundings (De Lange, 1999:46).

## CONCLUSION

The site analysis and investigation has revealed the following design generators:

- Movement/route /linkage of pedestrian and vehicles
- Collection/gathering /meeting of people and vehicles.

- Climatic conditions of the site
- The need for a special place (landmark).

## 4.0 THEORETICAL EXPLORATION

## 4.1 INTRODUCTION

Theory is a discourse that describes the practice and production of architecture and identifies challenges to it. In this project, the researcher will attempt to integrate different philosophical thinkers, thoughts from different professions on which some architectural concepts in this project will rely.

## 4.2 NEEDS AND COMMUNITY

The main aim of this discourse is to address community's needs and problems; therefore it is important to understand human needs in life.

Architecture deals with aspects of human life and in order to be effective in fulfilling its purpose, it is duty bound to understand the psychology which drives human behaviour.

In order to meet the community's everyday needs, an architect's goal is to be a professional interpreter of the peoples needs into form and space:

***“What is so badly needed is for architects, and developers who employ them to be more sensitive to the deep-rooted feelings of ‘ordinary’ people and to find ways of integrating their opinion and needs into the creative process from which new buildings emerge” (Charles, Prince of Wales, 1989:12).***

The Construction Centre will therefore, interpret the community's needs by having a variety of spaces.

In order to define these spaces, there is a need to know the community's everyday life activities in making of spaces.

Henri Lefebvre, French philosopher, attempted to define his ideas of everyday life and the nature of space, mainly in urban environments. Many architects have tried to apply his philosophy of “Everyday Life” into architectural realm:

***“What is the goal? It is the transformation of life in its smallest, most everyday detail” (Lefebvre: 1947: 29).***

Lefebvre was very active and influential in the French urbanism in the 1960's and the 1970's when he called for more centrality in the city, street life, residential participation and opportunities for spontaneity

In terms of the “Everyday life” philosophy, the centre will create different types of closed and open spaces for its function. It takes into consideration daily activities happening within the intersection and create similar but varied spaces platform for additional activities. A few principles of this philosophy to be used in the design:

1. Strengthen the existing pedestrian movement instead of creating a new system.
2. Catering and improving art and crafts activities instead of inverting new ones.
3. Connecting and widening surrounding community spaces into the centre instead of creating unique and isolated spaces.
4. Using local materials instead of imported ones.

5. Reinforcing the informal housing and trade into formal housing and trade around the centre and intersection.

#### 4.3 BUILDING AND SPACE

Once the spaces are defined, then there is a need to design an appropriate building on spaces created. Building for people goes with good architectural practices,

***“Most of the buildings erected today are built within a different realm. They are merely meant to be buildings, not architecture...” (Gehry:1993:36.).***

Frank O.Gehry, an architect answering a question of his impression of architecture today in an interview for Fashion Television.

So what is the difference between merely erecting buildings and creating architecture? A simple definition of architecture could then be formulated as the construction of buildings for people. However, people do not perceive buildings as mere brick walls and concrete slabs, rather as living environments with dimension character space as we can notice it in informal housing structures, it is their home their building. Therefore,

***“Architecture is space”*** – Louis Khan (Fisher and le Roux, 1998:152)

It is essential that in pursuing the creation of architecture to perceive it, essentially as the creation of space. In order to understand the essence of the space, it is important to consider it in the way that the user would

experience it. For example, the relationship between interior and exterior, open and enclosed, path and node become defining factors of the nature of the design.

This approach towards architecture leads to the conclusion that architecture is in fact not merely the building, but rather the space created within /around the building. The importance of spatial responsiveness in architecture goes beyond the barriers of the mere walls that enclose it.

The success and relevance of that space is subject to the needs and nature of the community that it serves. It should serve as a vehicle of unification within the community and it should play an important role in the establishment of a healthy community identity. Therefore, a building is a symbol within the community if it responds to the environment and space it occupies well. The proposed building will respond positively on the corner as a landmark within the community and serve or solve community’s needs.

#### 4.4 CULTURAL ART AND BEAUTY

For the building to be an identity of the community it must identify itself with the culture of the community. Culture is the very old traditional and historical inheritance to many people. Jennifer Bloomer (1993) established the original of beauty to humankind as cited in De Lange (1999):

***“The connection of beauty to Eros, eroticism is historical and clear. Cupid is the son of Venus; Eros is the prick of shame. In twentieth century there is certain aesthetics of apparatus of prosthesis, of the instrumentalization of, sado-masochism. Of the image of technology. But venustas has disappeared from formula. Haphaestus (the husband of Aphrodite) has supplanted Eros”.*** (Jennifer Bloomer, 1993:80 cited in De Lange (1999).

Beauty has, in patriarchal societies, throughout the ages been assimilated with women; and yet beyond that to the shame of nakedness. It is the naked woman that presents the memory of the first breath and the interconnectedness of humanity. By covering Venus man is attempting to hide the embarrassment of his own creation. He is smoothing out the synclines and anticlines of his own being. But it is precisely in the sublime and involuted spaces of nature that real beauty originates. Perhaps the naked woman exacts a too explicit memory.

Fashion provides a simple and comfortable, if shallow, structuring of the principles of an acceptable perception. The principles of fashion, like beauty, rely heavily on memory, but it is not a memory of being.

Having lost himself in fashion (the propriety of aesthetics), man has not only lost beauty but also his sense of nature that initiates his own existence. There is no information from the parts as to the wholeness of the creation cycle.

Although Hegel, the famous philosopher argues that a philosophical work has to be devoted to aesthetics, the philosophy or science of the beautiful, must exclude natural beauty. More precisely, artistic beauty is superior to natural beauty as the mind that produces it is superior to nature. One must therefore say that absolute beauty, the telos or final essence of the beautiful appears in art and not in nature as such (Derrida 1987:25).

In architecture, in a similar manner, the contemporary fixation with the façade as some sort of dressing for the building is an acknowledgement of the embarrassment of its form and space, the politics of its evolution and the economics of its making.

***“For a building to be beautiful it must bear the picture writing of its own origins”*** Bloomer (1993:80) concludes.



Fig.36: Façade of the BAT Centre with art, murals and bright colours (SA Digest, 1997:25).

Indeed the incorporation of pictures and writings on buildings has increased the importance and appearance of the buildings in its surroundings. Therefore, in some of the Centre façade there will be artwork which will enhance the beauty of the buildings and will use heights as a tool to act as landmarks and an important part of the building.

#### 4.5 POSTMODERNISM AND TRADITIONAL ART

The Centre will be designed with modern architecture and materials but Modern architecture because of mechanization has led to a disregard of natural, human, and environmental concerns which is contrary to art advocates in the past (classical) architecture. The result culminated in sterility, endless repetition and dehumanisation. The international Modernist rejected any symbolic meaning in favour of pure functional efficiency.

Postmodernist were quite willing to continue the technological breakthroughs of modernism, but they desired to add colour, decoration and sculptural and painterly embellishments that would give a structure some special iconographical meaning.

The Postmodernist also chose to respond to the desires and needs of their pluralistic society. Architects have once again become the partners of painter, sculptors and maisaicists. For the postmodernist, decoration is not to be a mere architectural embroidery, but a basic part of a larger architectural statement.



Fig.37: Traditional maisaic, art and craft inside the Mpumalanga Legislature (Malan & McInerney, eds, 2003: 27).

Well placed sculptural groups, frescoes or mosaics can create points of interest in an overall design as well as give definition to exteriors and interiors that serve as symbols of human involvement.

The Centre's buildings will be of Post –Modern architecture, though with biased to critical regionalism. Local arts, crafts and decorations will be incorporated in the buildings to encourage the sense of ownership and beauty of the buildings to the local community.

## 5.0 PRECEDENT STUDY



## 5.1 INTRODUCTION

Precedents are studied with the aim of finding relevant information which can play a role in the forming of conceptual decisions with regard to the design thesis. The following precedents were chosen on their functional, typological and architectural qualities.

## 5.2 THE BAT CENTRE- DURBAN

Architects: Collaborative cc assisted by RAP Studio.

### RELEVANCE-Function

The BAT Centre share similar ideas towards the upliftment of the Arts training in South Africa and promotion of community involvement. The BAT Centre focuses on promoting public awareness towards the arts in general, providing the opportunity to those less fortunate to receive training and education in the arts.

The scheme shares the approach of using any available materials to their disposal, leaving the surfaces unfinished where possible, and built with funding from the private sector.

The design tries to create a place within the urban fabric where all arts and other related functions can interact with one another. Many of the aspects mentioned influenced the design of the Construction Centre but were applied in an individual manner. For example the involvement of the community, mosaics finished outside of the building and being a private funded Centre.



Fig.38: Façade of the BAT Centre (KNIA1996:4)

There is a series of interlinked studios for the sculpture, ceramic, graphics and movement. Shops set on the principal façade on the ground level, sell articles made by South African artists, as well as articles produced at the BAT centre itself. The same idea will be employed at the Construction centre where shops will be along the main roads. The restaurant and shops generates income for both centres. Local artists use the BAT gallery for exhibitions and a small flat on the second floor provides the accommodation for the visiting lecturers and artists. All activities within the centre revolve around a central courtyard onto which nearly all the spaces front consciously planned to link and overlap different functioning spaces.

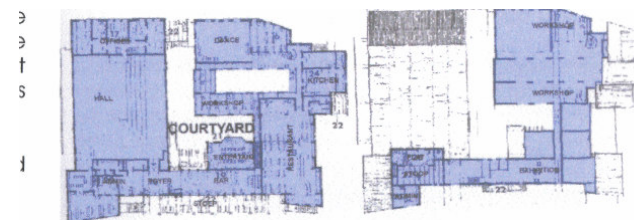


Fig.39: BAT Centre floor plans (KNIA1996:4)

The courtyard becomes the heart of the centre, from where the internal orientation can easily take place and functions as the central circulation space of the centre. The courtyard makes the spatial flow within the centre transparent and the user of the centre at all times aware of the activities taking place around the courtyard.

The building intends to be a model to show that good buildings don't have to be excessive or expensive, but can use the simplest, cheapest often re-cycled materials and be built by the unskilled without affecting the quality of the experience.

There is nothing fixed or solid about this building, it is meant to be tinkered with, to change and adapt as the need changes. Materials used to contrast with each other, as well as contrast in form, light and function.

The rich textures and colours of the buildings are overwhelming and the whole surface of the building is alive with interest, making you want to touch and admire simultaneously. The building in itself becomes the work of art.



Fig.40: Murals and portrait bust on façade (KNIA1996:4).

### 5.3 THE AFRICAN CRAFT CENTRE-ROSEBANK, JOHANNESBURG.

**Architects: Kate Otten Architects**

#### RELEVANCE-TOPOLOGICAL

Both Construction and The African Craft Centre projects propose space for traders to sell of local products and situated on very public sites with major pedestrian activities in and around the site /buildings are a major concern for both projects.



Fig.41: View of African Craft Market (SA Digest, 2001:161).

The use of different materials and detailing was observed and will be done at the Construction Centre even though standard profiles and members were used. The following was observed and used in the proposed design:

- the handling of surfaces and texture
- the use of steel structures in combination with plastered bricks
- the use standard window section and corrugated steel sheeting.



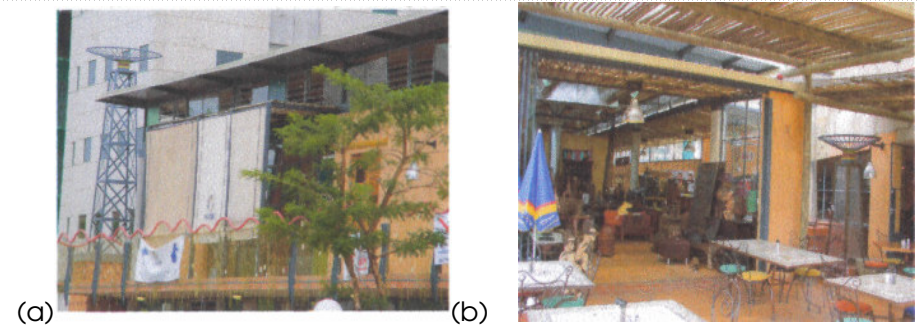
Fig.42 Façade of the building (SA Digest, 2001:161).

The building is a long, narrow, and simple, two storey structure that responds directly to the site, client and user constraints. A double volume space links the path where the street used to be.



Fig.43: Double volume space for trade and exhibition as in exhibition hall at corner of Construction centre (SA Digest, 2001:161).

The building has rich, earthy colours and textured plastered walls, juxtaposed with steel structure in charcoal blue. Light, texture and colour play an important role in the expression of the building, which is appropriate to its scale and design. The African Market is a building that encourages movements through and around, and the architecture reflects this in its openness and lightness.



(a) (b)

Fig.44: (a) and (b) mixed use of materials to be used at the Centre as well (SA Digest, 2001:161).

The building in itself becomes a craftwork and invites one to experience it both visually and physically through one's senses by touching it, listening to the activities inside, smelling the different material from which the articles sold inside is are made, almost as if giving one a taste of Africa.

On the southern end of the building is a cluster of towers, answered by three light shafts at the northern end, all of which are an interpretation of the craft aspect of the market through their steel basket caps tiled necks, textured plastered shafts and bases. The three towers are designed to be important urban makers of the building. In the Construction centre, the towers are for the circulation and landmark.





Fig.45: Steel basket tops (SA Digest, 2001:161).

The northern end of the building has a large curvy outside balcony that looks onto and links into the public pedestrian space that connects the craft market and the mall and ends in a grandiose flight of stairs. The stairs are an important design element to invite one into the building and open up the building as to make it part of the public activities and make them likewise part of the market. In the Construction Centre the exhibition on the intersection invites one into the centre and make it part of the public activities.

#### **5.4 THE DURBAN STATION INFORMAL MARKET**

**ARCHITECTS: OMM DESIGN WORKSHOP ARCHITECTS**

#### **RELEVANCE-INNOVATIVE WAY OF USING MATERIALS**

This is a superb example of successful fusion between western and African culture through architectural intervention which the proposed Construction centre will use in some of the building structures. A highly innovative combination of bamboo/reed cladding and steel as

structural material create a low-key, low-cost, yet effective intervention with much aesthetic appeal. The economic use of steel and a concrete structure is brightened up with a selective use of a basic colour.



Fig.46: The combination of steel construction and reed cladding reflects the influence of traditional African building techniques within modern day African context (KZNA Journal vol3 2001:31).

#### **5.5 UTHANGO LOTYBISSELWANO LEARNING CIRCLE**

**Cape Town, 1989**

**Architect: CS Studio**

#### **RELEVANCE**

The design is based around a movement route that becomes at the same time a link, as well as a space in its own right.



Another important design that was taken into consideration was the skills level required and the materials used. **Bright colours** were used to identify the building as a public facility and to liven up the environment.

Local people were trained to perform the construction. The centre is spatially arranged around the inner courtyard, which becomes a vehicle for communal affairs and illustrate the importance of the balance between inside and outside.

**The success of the project** lies within the fact that the community was actively involved in the design process. It inspired a sense of ownership and pride in the centre, as well as in the community itself - which led to the achievement of the main goal: the empowerment of the community (Smuts, 1996:.34-35).

## 5.6 COMMUNITY MURAL PROJECT

Two Durban-based artists, Terry-anne Stevenson and Mikula, founded the project in 1990. The project aims to bring public art to the community and to public places.

### RELEVANCE

The main figure in the mural depicts Nomkhubulwana, a mythical figure in Zulu history associated with agriculture and good luck. The mural project is an example of the uplifting effect of **beauty through art** upon people's lives. The power of art and beauty is however not restricted to the more conventional visual arts. It should be implemented to the full as a powerful instrument in the visual experience of space (Slessor, 1995, p.98). The murals will be part of decorations to certain parts of the buildings like the arts workshops and main facades of the Construction Centre.



Fig.47: Mural project in Durban (author unknown).

## 5.8 GEHRY RESIDENCE SANTA MONICA, USA

Frank O. Gehry, 1978



Fig.48: A bold, innovative use of materials(Gehry, 1993:37).

## RELEVANCE

The use of recycled materials create not only a visually stimulating combination of the old and the new, but it also relates specifically to the architectural context in the South African township, where the re-use of materials is essential. (Gehry, 1993: 37-38). Some recycled materials will be used on the centre to reduce the cost of construction and to be used as a practical example of the use of recycle material to the students of the centre.

### 5.9 INDIAN INSTITUTE OF MANAGEMENT.

**Architect: BALKRISHNA DOSHI (Bangalore, 1977-1985).**

#### RELEVANCE :Function

The campus for the Institute of Management includes administration offices, classrooms, laboratories and a library is arranged in a ladder-like plan along a longitudinal axis. The open spaces are occupied by pavilions used as teaching spaces, and therefore have irregular shapes. The striking features of the building are the corridors, or covered pedestrian streets that join the different elements together. In Doshi's words, "the width of the corridors was modulated in many places to allow for casual eating and interaction to take place" (Steele 1998:67).

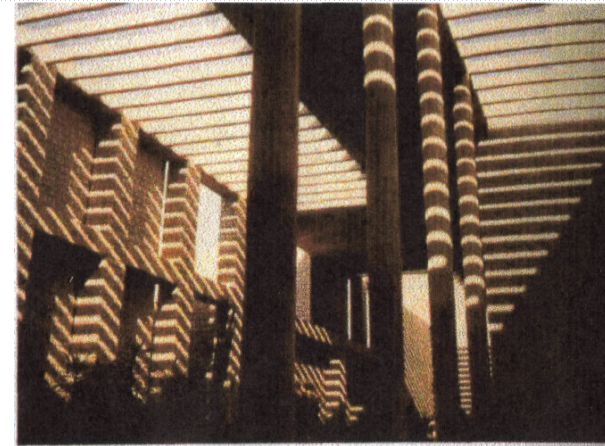


Fig.49:A view of the covered walkway space. The space is contained by horizontal concrete beams which cast shadows in a linear pattern onto the walls and floor (Steel, 1998:48).

The identity of the Centre as an educational building is important to differentiate it from other public buildings. The diverse functions accommodated in the complex will be combined by a main pedestrian walkway from which secondary covered walkways will branch off to the various functions. The walkways will promote interaction and communication. The height of colonnade will give it the sense of importance.

The Centre will be a very social building and so it will be important to provide spaces large enough for group gatherings and demonstrations.

The materials used in the building will be low of maintenance and very robust. The structure will be concrete columns and beams, with shading devices.

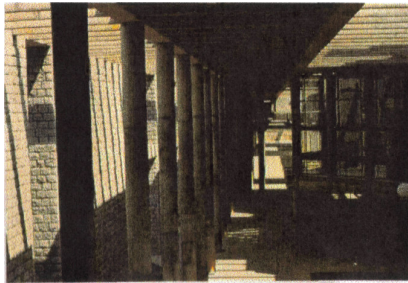


Fig.50: View down one of the covered walkways (Steel, 1998:48).

## 5.10 JN CENTRE FOR ADVANCED SCIENTIFIC

Bangalore, 1990-1994

Architect; CHARLES CORREA

### RELEVANCE

The centre for scientific research provides facilities for living accommodation and research facilities for visiting scientists and scholars as proposed at the Construction centre. The research laboratories, lecture halls, library and accommodation on the other side of the wall are informally arranged around open courtyard spaces. The wall binds the different parts of the building together. In the Construction centre all workshops and classrooms will be open to courtyards which will function as additional work area and gathering places.

Both projects proposes a tree-lined pedestrian walkway which will form the edge of the site on all street edges on intersection and parking area on the southern and eastern side of the building. This green space will become a community space in an urban environment where people can move away from the busy streets and sit and eat lunch or take a break in the shade of the trees. There will be an interaction between the informal green space and the building.

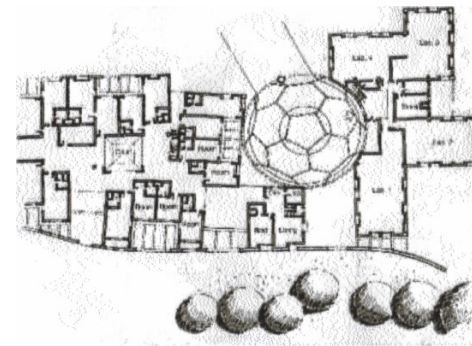


Fig.51: Part of the plan of the Centre for Scientific research showing the informal arrangement of spaces around internal courtyards (Steel, 1998: 8).



Fig.52: a view of one of the private green places between the wall and the work area (Steel, 1998:48).





## 6.0 BASELINE STUDY

## 6.1 ENVIRONMENTAL ISSUES

### 6.1.1 WATER

The consumption, collection, storage and re-use of water will be given special attention in the design for overall sustainability of the project.

- Rainwater will be harvested through the careful design of some of the roofs in the centre which will aid in its collection. The water will then be stored in order to be used in the Centre's operation, for the many different activities and programmes proposed.
- Grey water where possible from washing is to be recycled and re-used so as to reduce water consumption and sewerage charges. It can be used for maintaining courtyard lawns and construction purposes.
- Water devices with special, purpose made water collection, recycling and storage will be incorporated into the Centre's design to increase efficiency and use of water. Ultra-low flush toilets and manually flushed urinals will aid the Centre's water efficiency.
- The site existing topographic conditions which have a drop of 2m which will be manipulated and enhanced to improve the site's ability to catch and absorb water for landscaping.

### 6.1.2 ENERGY

It is important to reduce energy levels as almost 50% of all human energy produced is consumed by building and construction industry. This industry contributes to environmental damage as well as the depletion of precious non-renewable resources (Gibberd, 2002:10 cited in Araujo: 2004:59).

- Location of the facility will be within 400m of existing public transport services to minimise transport cost and energy as well as the environmental implications associated with burning of fuel.

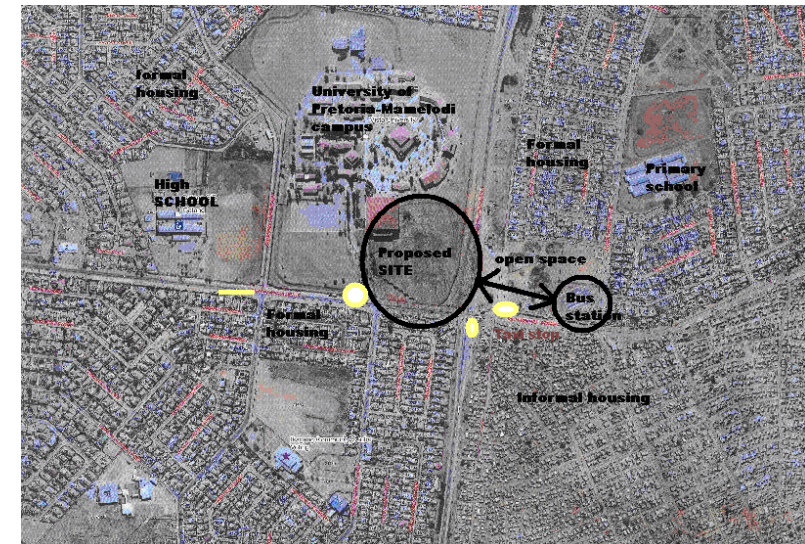


Fig.53: Location of Municipal Bus Station to the proposed site and points of taxi stops

- Passive environmental control systems need to be designed and implemented. Solar energy must be used to meet passive solar heating in the building (solar water heater will be used to heat water). Buildings with permanent inhabitants must have direct heat gain by allowing sunlight to be admitted into spaces through openings and skylight by orienting the required buildings to the

north. Solar shading devices like trees and large overhang are essential for keeping the heat out during summer while maximum penetration of sunlight is required for heating in winter. Excess solar energy during the day is stored as heat through the thermal mass (brick wall) of the building fabric and then released back during the night. Effective air circulation is necessary in spaces or areas that do not have direct exposure to the sun.

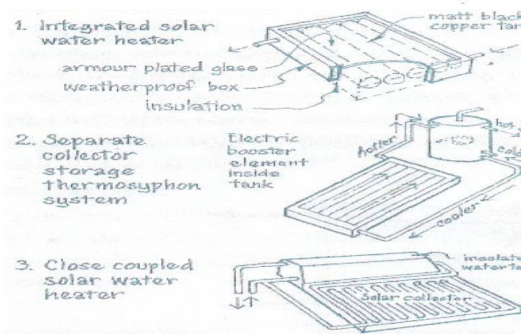


Fig.54: Types of water heaters (Ward, 2002: cited in Araujo: 2004:59)

- Natural ventilation must be designed and incorporated into the design and planning of the facilities to ensure that outside airflow is maximised. Windows, doors and screens must be opened and closed as desired by occupants to provide better control over their surrounding environment. Placement and size of internal and external openings become important when using passive ventilation principles such as the stack effect to create pressure differences in the building.

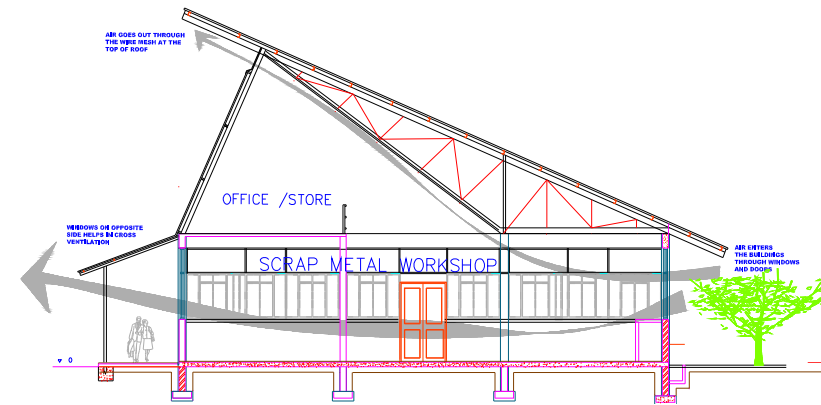


Fig.55: Ventilation strategy at the Centre (author)

- Sunlight is most abundant natural resource that can be used in the generation of energy and power by using photovoltaic cells. One building on the Centre will be designed to use this technology as a model to show the community as an alternative source of energy and power.

### 6.1.3 SITE

The proposed intervention or the proposed building will not cause destruction of natural environment or eco-system. The design will follow the natural fall of the slope such that all existing eco-system of the area will be incorporated.

Although, there has been no previously constructed building on the site. The site is being used as a playground; the proposed intervention will use natural vegetation to green-up the area.

### MATERIALS AND COMPONENTS

Large quantities of materials and components are essential for the construction of buildings. In manufacturing there is a requirement of great amounts of energy to produce while the process used to make them are often harmful to the natural environment and consumes non-renewable resources.

- The process of building of the Centre will incorporate at least 80% of building materials and components that have a low embodied energy. Locally made and sourced materials such as earth blocks, timber, timber window, frames and doors; concrete bricks/blocks will be specified. Some materials will be made through labour-intensive process at the Centre that will incorporate waste and other sourced materials.
- Due to the nature of the proposed Centre and its ideologies, most of the materials will be manufactured from renewable resources using environmentally friendly methods. A large portion of the building materials, methods components will be developed at the Centre.



Fig.56: Sun dried Cement /sand brick in Mamelodi (Author).

- All manufacturing process, wherever possible should incorporate environmentally friendly procedures and practices so as not to release any green house gases.

- Recycled and reused materials and components will be incorporated in the design wherever possible so that the Centre will become a showcase on its own.

Most conventional buildings accommodate activities that consume large amounts of resources. So specifying materials which are modular, locally manufactured with a low embodied energy is crucial to contributing to a greater system in the quest for holistic sustainability of the project.

## 6.2 ECONOMIC ISSUES

### LOCAL ECONOMY

It became evident that the greater residential population of Mamelodi is in need of economic upliftment and empowerment opportunities. This was highlighted during personal investigation held with the people around the proposed area.

- At least 60% of the construction and building of the Centre will be carried out by local contractors using local workforce in Mamelodi. The remaining percentage must be carried out by training the local community in the art of building and construction using various alternative methods, materials and systems. Students enrolled in education institutions will also be involved in supervising and design of the Centre.
- Most of the building materials will be produced within 100 kilometres of the site and the Centre will aim at using products made and sourced by and made in and around Mamelodi. Much



emphasis and investigation will be placed upon the use of alternative building methods and materials.

- A large contributing factor to the Centre's economic upliftment of an area is to tackle poverty through skills and knowledge transfer. Training and empowering the people in a range of various building and skills workshops as well as building on and incorporating local skills and traditions is vital to the operation and implementation of the Centre.
- Provision will be made for small and emerging businesses created through the Centres operation, training and focus of using waste for the creation of arts, crafts and furniture, spaces and vending structure will be provided as well as after hour community and business activities such as computer, sewing and literacy classes to take place within the proposed facilities. Members of the targeted communities who have undergone training at the centre can later be employed through building, upgrade and housing activities initiatives proposed by the Centre.

## **EFFICIENCY OF USE**

Internal and external areas of the facility are to be designed with multi-purpose and multi-function use of space. Maximum and constant use of many spaces must be designed and encouraged for the buildings to meet sustainability requirements and to ensure effective use of facility.

- The facility if possible should be occupied for 7 days. The buildings must engage all activities needed by the community and new ones to be developed for the community. If the buildings are to

be occupied successfully, the facility must be seen and accepted by the community as a tool or mechanism for the bringing about of economic, social and environmental change and sustainability.

- Shared use of space will be encouraged wherever possible
- The use modern technology will be emphasised at the Centre. Workshops should be of robust and flexible nature while the floor surfaces need to be durable and impact resistant. Majority of the other process at the Centre will be investigating new sustainable technologies that are people driven and labour intensive.

## **ADAPTABILITY AND FLEXIBILITY**

The proposed design will be able to accommodate future changes and extensions relatively easily. The facility will be designed so that the buildings can serve purposes as required by future users or clients.

- Internal partitions will be free from structural or load bearing responsibilities and should be flexible enough to allow the user to move and allow free placement or modification within a modular support system. An open plan office layout will be investigated. Infill panels developed at the Centre will be incorporated into the design and construction of various buildings.
- The buildings, construction and support systems must allow for easy access and modification to electrical or communication services. The design of water, grey water and sewerage services or pipes should allow for easy access and modification of the

system. Any service must be done with minimum disruption to the occupants.

- The design of the facility will focus on using modular structural dimensions and systems, which will call for easy, cost effective use and experimentation with modular and other alternative infill methods and techniques. A variety of structural support systems, incorporating various structural materials, will be investigated, depending on their availability and price.
- The execution of the various proposed facilities will adopt a construction process that is based on phased development. This is important for the feasibility of the project allowing some activities to start taking place within the preliminary structures provided. Providing the structural shell and encouraging the community to become involved with the infill stages and personalisation of certain sections, will greatly contribute to creating an overall sense of identity and belonging for both the building in its surrounding environment as well as the members of the immediate and surrounding communities.
- It is vital for the proposed building, along with all the activities and programmes offered, to provide opportunity for future growth, flexibility and adaptability. Design parameters incorporating size and type of structure as well as modular construction methods and innovative use of materials are important to the vision of creating a dynamic environment that encompasses and encourages growth and change. This will ensure a prolonged building lifespan that can accommodate change easily and

ensure that the facility meets the future needs of the community and again supports the sustainability of a greater, holistic system.

## **COST**

It is important to create spaces that will provide for long hours of occupancy. The other means of sourcing money to run the Centre should come from the sale of products and items from the Centre.

- Specialised detailing and system selection to keep on going costs to a minimum.
- The provision of housing accommodation will reduce risk of security cost issues at the Centre.
- The facility must be cost-effective in its implementation, construction and maintenance by encouraging participation.

## **6.3 SOCIAL ISSUES.**

### **OCCUPATION COMFORT**

User comfort and the creation of quality environment will be the main focus that will stimulate, encourage and promote social interaction. The design of positive environment and spaces can have a direct impact on the health, happiness and productivity of the occupants.

- All working, learning and recreation spaces will require electrical lighting to ensure multifunction use of the space after hours. During the day, the facility will make use of natural daylight while the buildings due to their construction methods, materials and

techniques will require users to adjust elements of lighting and lighting control to suite their needs. No spaces should require constant electrical lighting.

- Natural ventilation must be manipulated and maximised throughout the facility. Design parameters regarding building dimensions such as depth, height and structural spacing and placement can all contribute to ensuring maximum and effective use of natural ventilation. No mechanical ventilation will be used unless there is no alternative.
- Some of the operations taking place in the workshops and other construction areas will be separated or screened from other areas such as offices, learning and working environment to reduce disturbances of noise.
- All working, learning and recreation spaces will have views out.
- A clear relationship between inside –outside needs to be set up by enhancing and promoting contact from outside in, and from the inside out. Access to green outside spaces must be provided.

The buildings should not to be designed as an isolated object in the surrounding landscape, but rather as a vital component to an overall system of social, economic and environmental sustainability.

## **INCLUSIVE ENVIRONMENT**

The buildings are designed to accommodate everyone, which includes the poorest of poor, the youth and the aged, professionals, the disabled

and /or any other persons interested in the use of the facility. Ultimately the Centre is a peoples building for Mamelodi community that aims to improve and uplift the existing socio-economic and environmental context of the surrounding areas.

- The Centre is within 100metre from the municipal bus station and on the intersection of two the main streets, Hinterland and Hans Strijdom. It will allow for easy access for both vehicular and pedestrian access.
- It is vital that all activities and programmes that the Centre will be offering should have access to surrounding communities especially where the most desperate people are situated.
- All routes must be of a smooth and even surface so as to allow for easy access for wheelchair and manoeuvrability. The routes and circulation should be well lit and incorporate effective and legible signage that can be understood by all cultural groups. Changes in levels should have a ramp of 1:12 fall. Artwork by community members is incorporated in all routes and signage.
- The Centre will use contrasting colours and textures so that visually impaired people can distinguish between walls, floors, stairs, and various areas.
- The use of composting toilets and alternative methods of sewerage recycling and re-use will be investigated.
- The design and development of the Centre must allow for the provision and development of inclusive environment, especially in

the form of amenities such as shops and services within the community.

## **PARTICIPATION AND CONTROL**

The success of the Centre will be achieved through the participation, involvement, positive interaction or feedback from the community. The Centre aims at uplifting and empowering people through information, skills, and knowledge transfer to ensuring and promotes participation and awareness

- Factors affecting the conditions of general working environments which include thermal comfort, ventilation and lighting, should be incorporated into user-friendly system that allows for optimum control and effective usage.
- Planning, layouts, design and construction of the facility and majority of its spaces allow and provide for user arrangement or re-arrangement. Items such as internal partitions, fittings and furniture should be of a flexible nature to accommodate different user requirements. Provision should be made for the personalisation of working spaces as well as flexible support structures that allow for easy removal or erection of screening, walling and shading panels.
- Careful attention is given to the zoning of areas within the Centre. Public, semi-public and private areas need a clear identification. A number of public spaces will be incorporated into the design to stimulate interaction between people. Circulation, seating and landscaped areas will be designed and provided.

- Amenities such as shops toilets, access to water open spaces and comfortable seating should contribute to the creation of a quality environment that will encourage and stimulate their use by the user and the general community.
- The conception and ideology behind the establishment and successful implementation of the Centre is based on upon the will of the community to become actively involved in shaping and changing their existing and future situation.

## **EDUCATION, HEALTH AND SAFETY.**

The proposed development must ensure that issues regarding the health and safety of its users and surroundings are taken into account as a healthy, economically active workforce greatly contributing to the creation of a sustainable environment.

- Education, knowledge and skill transfer will be provided to the community. These will be in the form of structured courses, which focus on the sharing and implementing of the information regarding sustainability principles, practices, building and initiatives. Further access to education materials will be made available through books, brochures, journals, newspaper, and access to a technical advisor and internet facilities.
- Due to the nature of activities proposed at the Centre and work normally associated with building and construction, issues regarding injuries and other health hazards need to be taken very seriously. The provision of health and safety, protective gear and hazardous environment signage as well as general information



regarding the treatment of injuries must be available and easily accessible. First aid kits must be easily accessible while the buildings must comply with health and safety regulations.

- The Centre aims to steer the community in a direction of prosperity and empowerment by encouraging awareness towards their own development that is environmentally sensitive and sustainable.

## 7.0 DESIGN APPROACH

## 7.1 ARCHITECTURAL IDEAS

### SENSE OF PLACE

In addressing the problem statement in the Introduction (Chapter 1:4) there is a need to create the sense of place at the intersection. The ideas of Christian Norberg-Schultz are relevant in trying to establish just what is needed to achieve this.

Norberg-Schultz (1980) argues that Modern settlements of which Mamelodi is an example, lack spatial enclosure and a good building density. Buildings are freely placed within open space. Nodes, paths and districts have lost their identity and the landscape has become deprived of meaning. Character is needed in an environment to create a sense of place.



Fig.57: The present buildings of University of Pretoria do not relate to the main roads and the public in the areas (author).

The built environment should regain urban foci as places for common living and communal gathering. Buildings need to be meaningful sub-places that relate to the landscape and the urban whole. A characteristic environment must be established in the city with a clear distinction between the public and the private domains.

The qualities that gave buildings character in the past have to a large degree been lost. Modern buildings exist in a nowhere that space flows freely between the buildings. True urban 'insides' are lacking in our cities.

Spatially, the modern city is based on a confusion of scales- a pattern valid on one level has been transferred to another where it is less successful. Qualities of Modern buildings such as open flowing space and geometric minimalism work on a building scale but should not be transposed to the urban scale. The subtle interplay of forms becomes sterile monotony (Norberg-Schultz, 1980:195). Although the intentions of the Modernist were good, the built environment really fell short of what they aimed for.

The indiscriminate application of Modernist ideas on a city scale has led to many monotonous new developments. The essence of settlements is gathering but modern city design aimed for openness which neglected the notion of gathering. The direction architecture should take **now is architecture as the recovery of space as it will be the case at the intersection.** The concept of place unites contemporary architecture with architecture of the past, and this will bring us back to the reality of **things.**

Man must be able to dwell poetically to make his life more meaningful. Rich stimuli, in a meaningful environment possessing a character of its own, have stimulating effects on people (Norberg-Schultz, 1980:202) as the Centre's buildings are planned to have on the local community. Pictures showing examples of Charles Correa's work that evoke a feeling of place:



Fig.58: (Framton, 1996:188) showing outside working area with colonnade of columns.

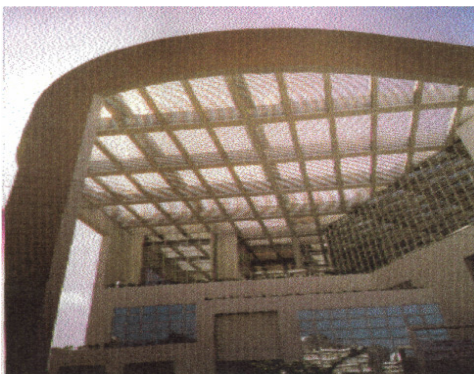


Fig.59:(Framton, 1996:188) showing the corner of the building

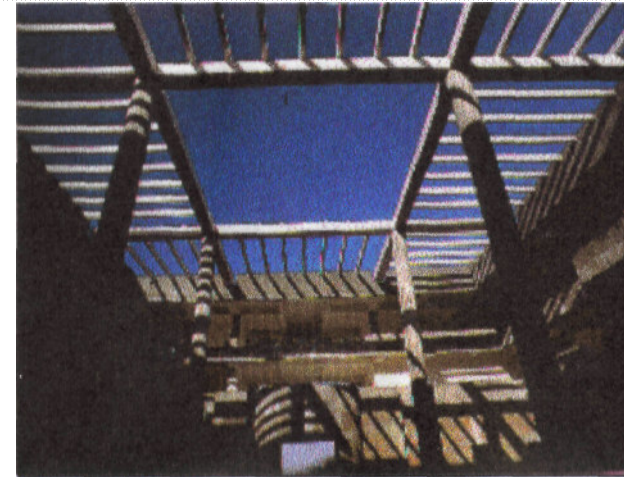


Fig.60: (Framton, 1996:188) showing the courtyard with pergola and open to sky.

## CRITICAL REGIONALISM

In his essay "The status of man and the status of his objects", Kenneth Frampton speaks of the modern public building as having been atomised into a network of abstract institutions; what can be viewed as the dissipation of the "agora".

*"The world has lost its power to gather people together, to relate and to separate them "* (Framton, 1996:188).



Modern planning is monotonous and lacking in character. Suburbia speaks of individualism with the private homes on private plots of land that don't relate to the street. The private realm has been placed above the public realm in importance to the in modern design, but both are needed. Modern buildings have turned their backs on the public realm offering little interaction with pedestrians on the street level. The emphasis now is on the individual in his apartment or office high above the street level activity, leaving the street edges sterile. The Centre will enhance the public and private interaction of spaces within the centre and at the intersection.

In the essay "Critical Regionalism", Frampton writes that what makes architecture regional is the vernacular style of the area, the climate, available materials and craft associated with the people living in the area. There is a "tension between universal modernization and the idiosyncrasy of rooted culture." There should be a "concentration on issues which relate directly to the specific place while adapting methods and approaches drawn from outside".

Points of discussion drawn from the paragraphs above will specifically be addressed in the design of the Centre:

- awareness of the place
- open to the sky spaces
- the tree as symbol of a place
- spatial enclosure-containment-urban insides
- character in the development
- sense of space – buildings a sub –spaces

- gathering points needed in the urban environment
- distinction between public and private domains
- creating a stimulating environment
- sense of place as a meaningful social 'inside'
- Education through architecture.

## 7.2 DESIGN INFLUENCES

### ALVAR AALTO AS A CRITICAL REGIONALIST

The work of Alvar Aalto is a very good example of critical regionalism. Aalto worked in the Modernist tradition but included cultural and climatic characteristics in the design of his buildings. His buildings are very definitely site specific with great care given to the positioning of the building on the site and how it connects with its surroundings. The landscape and nature are integrated into the designs and building landscape work together in harmony.

Aalto's use of materials is particularly influential on the design of the Centre's buildings in this thesis. In his brick buildings, Aalto expresses the decorative and textural qualities of the brick. The Brick is used in innovative ways that enhances the visual effect of a wall or plane. The effect that light can have on such surfaces is exploited, making light an important participator in the overall effect of the design, and allowing it to bring out the sensual qualities of the materials.



Fig.61: (Weston, 1995:115) an outside wall of a house by Aalto with brick and tiles used to create a very decorative effect.

## CHARLES CORREA'S WORK

The buildings of Charles Correa are responsive to the environment, specifically the climate. The climate in India and South Africa allows the exterior spaces connected to the building to be open to the sky. These spaces become important in the everyday lives of the inhabitants and around which many activities revolve.

In many of the buildings, Charles Correa uses a single roof in one plane that covers the building, uniting different spaces and elements under one roof. Open courtyard are shaded and thus assist in the natural cooling of internal spaces

A strong influence in this thesis is Correa's design of courtyards. They are well proportioned and scaled relative to the interior spaces and mass of the building. Interior spaces open out onto the courts, which are always paved and shaded, and defined as enclosed spaces. Other architectural characteristics influencing the Centre's design:

- the order, axes and pathways created by circulation routes
- natural lighting through skylights {see Fig 62(3)}.
- solar control through the use of concrete or wooden fixed louvers, or steel or bamboo rods performing the same function
- light revealed as a tectonic element by the patterns of shadows cast by shading devices onto floor and wall planes (3)
- the vibrant use of rich colours either through the use of paint or brightly coloured materials
- the simplicity and minimalism of the designs
- technology and materials are suited to the context in which the building are constructed.
- public buildings are open on the ground floor level and easily accessible (2)
- buildings are simple but very successful.
- the sensual quality of the buildings
- material use: rough concrete and face brick, coloured natural stone, painted plaster (5).

- the relationship of the buildings to nature and outside spaces
- the spatial hierarchy within the building ranging from large-scaled semi-public/public circulation spaces to small private spaces

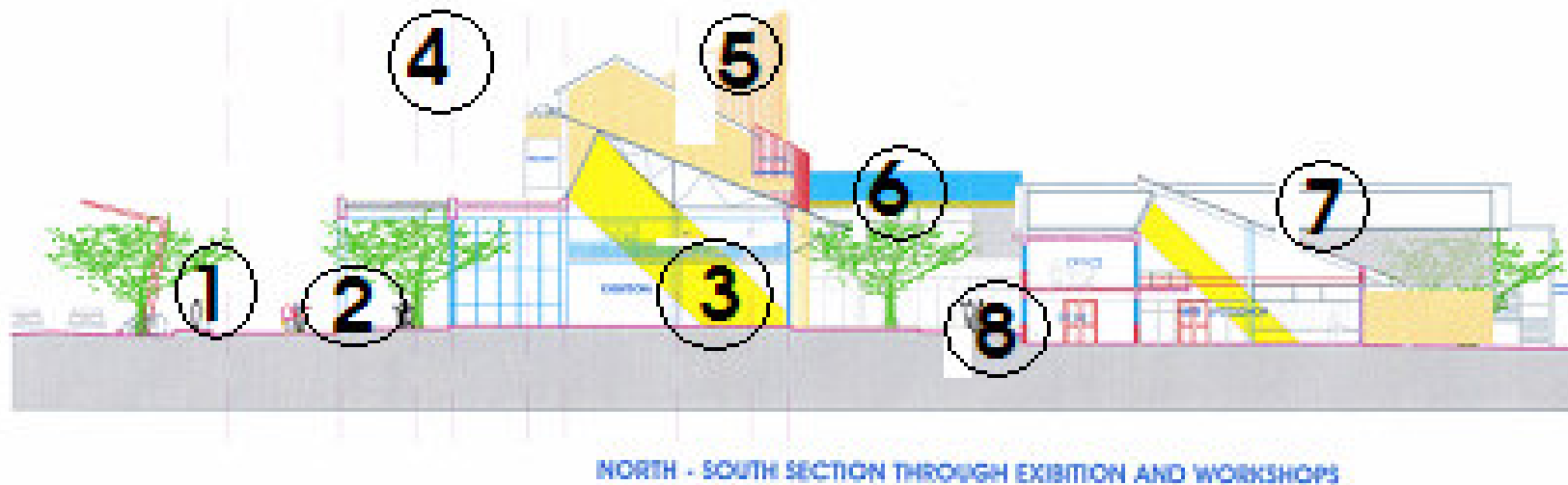


Fig. 62. Space relationship and characteristics at Construction Centre (author).

In Correa's buildings, external spaces don't exist as placeless open courtyards; rather they possess an intense feeling of place and meaning. It is hoped that the same quality will be achieved in the design of the Centre.

### **BALKRISHNA DOSHI**

The successful application of modern building methods in a developing country illustrates how foreign trends can be successfully assimilated into a local context. Balkrishna Doshi's buildings in India are in the Modernist tradition but in keeping with the vernacular style of the context. Cultural references in the buildings connect them with the past, and the resulting style is contextual. Some of the characteristics of his design which the Centre will apply in its design are:

- the use of concrete and brick together, expressing the concrete as a structural frame and the brickwork as infill panels
- material use: rough concrete and brickwork which are robust materials needing minimal maintenance
- inexpensive materials suited to economic climate and the local labour force
- simple building forms in the Modernist tradition
- the order of the plans: buildings are organized around the main circulation routes

### 7.3 CRITICAL REGIONALISM IN THE TARGET AREA

Relevant architectural design must take its clues from the local topography and natural or manmade parameters of its surroundings. In the design of this Centre a relevant aesthetic can evolve from a closer integration of art and architecture. An integration of art and craft into architectural design supports local talent, increases the uplifting character of architecture and provides opportunities for members of the community to become creatively involved

Relevant and functional architecture will also be applied with regard to site and local climate. Most of the buildings around Pretoria are what is called Pretoria Regionalism or Third vernacular. With this as guideline the centre will make economic use of locally/naturally

available and industrially produced materials with an empirical response to climate, all of which tempered the emergent tenets of the Modern (Fisher 1998:123):

***“It could be argued that regionalist architecture will be generated by the designer directly responding to the following aspects in a place specific way: climate, materials, site, defence, economics and religion. To this could be added the particular cultural expression of the community”*** (Fisher 1998:123)

Pretoria Regionalism is characterized by deep shaded eaves and verandas, low pitched roofing sheets where possible, sun-shy windows and sensitivity to landscape and land features. As Pretoria has an established brick aesthetic, bricks are used where possible whether plastered or un-plastered. Natural locally produced materials will be used as far as possible, supporting local business.

### 7.4 SUSTAINABLE BUILDING DESIGN

***“Sustainable development is development which meets the needs of the present without compromising the ability of future generation to meet their own needs.”*** (W C E D. 1987:4).

The principles of sustainable building design were applied in a general and specifically to selected buildings. The proposed buildings were designed as

new and healthy entities. The buildings have to be an integral part of the site. Buildings are positioned with regard to the site's form and orientation.

Use of local materials from the vicinity supports local businesses, facilitates transportation arrangements and contributes to sustainability in the wider sense of the word. It is expected that the materials used are energy efficient, using minimum energy in production, transport and use. The materials chosen are durable, long lived and easy to maintain and repair.

A loose fit approach was taken in regard with the design to ensure that the buildings could be adaptable for future use, as well as for prolonged life. Individual spaces might accommodate a variety of uses, some not foreseen in the original design.

## 7.5 CONCLUSION

The General CONCEPT of the design will be that the buildings should be designed in such a way that if the construction uses local skills and unskilled labour, supporting the idea that the community should be actively involved in the construction of the facilities. In helping with construction of the Centre, a sense of community pride and social upliftment is achieved, making them feel needed and creating a sense of ownership towards the facility in general.

***"...One must look at the way people build shacks and say 'its not an ideal unit of accommodation and one is not legitimising that kind of poverty, but in fact what people are doing is they're taking action for themselves and creating something and that, surely ,is the beginning of***

***something'. That attitude started to become the basis of my approach to design*** (Joe Noero, architect, in an interview with ADA magazine).

In conclusion, the character of the design for the Centre will be of richly coloured and textured enclosed and interior with inside and outside spaces connected and able to function together or separately.

On the street edge the building will present a city scaled façade, robust but inviting pedestrians off the street. The roof will facilitate a transition of scales from the street façade to the lower smaller scale of the interior courtyards.

The building will be legible, with clearly defined main pedestrian entrance at the main entrance to the campus and the intersection corner. Some of the circulation routes will be visible from the streets.

The materials used will be readily available in the local context; steel and concrete will be used for structural frame and brick /concrete brick for wall in-fill panels with steel roof structure. Flooring in public parts of the building will be textured natural stone or brick.

People will be able to orientate themselves in the building around the walkway spaces and as many rooms as possible will have a view out onto the courtyard.

Using the above architecture ideas as basis for design, the following design guidelines will be followed:



- The connection between **interior and exterior** will be a basic design principle to influence the design of the centre. The spatial relationship between the various elements should be experienced as a whole.
- The climatic experience of the centre is very important. The climatic **passive design principles** will play an integral part in the individual buildings, as well as the centre as a whole { see Fig 62 (3)}.
- The centre will enhance the aesthetic quality of the area. **Bright colours** will be used to create this effect {see Fig 62(6)}.
- It will be important for the community to be able to **identify** with the Centre and to perceive it as a vehicle for personal and communal improvement and a gathering place {see Fig 62 (6 and 2)}.
- The centre will be designed in such a way that it will become an object of **beauty** within the community – a place that inspires a community's pride {see Fig 62(2)}.
- The architectural language should reflect the richness of combining both **AFRICAN AND WESTERN CULTURES** acknowledging the contrast, yet celebrating the unification thereof.
- Mono-pitched roofs with deep eaves {see Fig 62(7)}
- Modular and structural frame with infill for easy adaptability and flexibility {see Fig 62(4)}

## 8.0 DESIGN DEVELOPMENT

## 8.1 CONCEPT

The existing buildings at intersection fig. 64 do not define it as a space as a result some of them being set far back from the corners. In this design proposal new buildings fig.65 will be placed along the street edges connecting with some existing building.

The new buildings will define a space at the intersection which will bind the disparate building scales which are adjacent to each other. It is proposed that the main pedestrian entrance will be on along the Hinterland Drive near the main entrance to the campus forming a cruciform tower as landmark.

## 8.2 LEGIBILITY OF THE SITE

- To increase the legibility of the site, paths, nodes and landmarks must clearly be identifiable.
- The intersection of Hinterland Drive and Hans Strijdom Drive must be a node.
- In order to do this, the proposed buildings in the framework will define space at the intersection
- The entrances of the buildings should be at the corner that it is visible.



Fig.64: The existing intersection lacking spatial definition (author).

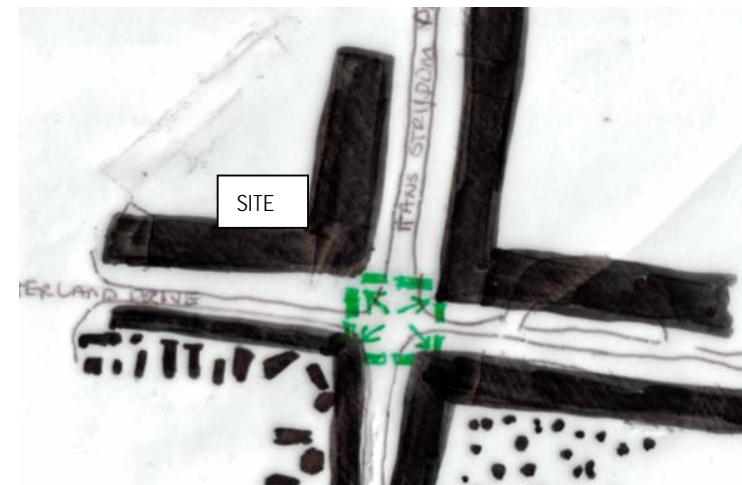


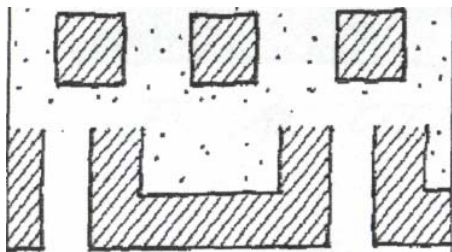
Fig.65: Proposed INTERSECTION – Forming spatial definition of urban space (author).

There are two objectives to be achieved in designing path enclosure at the intersection:

- to give each path a strong character, easily distinguished by users
- to bring out the relative functional importance of each path.

### CONCEPTUAL ENCLOSURE THEORY

LESS ENCLOSURE



MORE ENCLOSURE

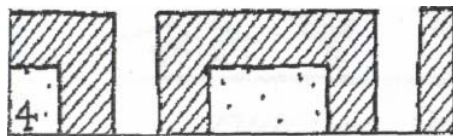
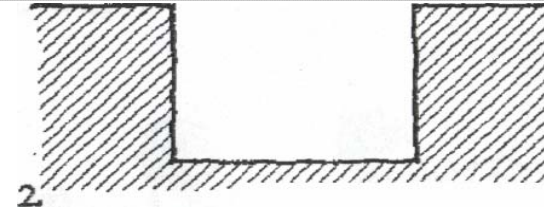
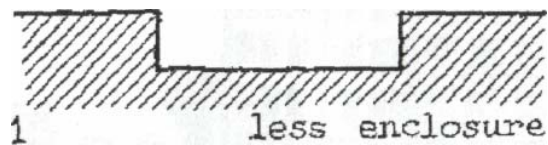


Fig.66: Enclosures in plan (Bentley, 1985:45)



MORE ENCLOSURE

Fig.67: Enclosure in section (Bentley, 1985:45)



Fig.68: St. Giles, Oxford, England (Bentley, 1985:45)

A path's legibility is crucially affected by its enclosure in plan and section. Height/width ratios of less than 1:3 seem weakly enclosed (1, 2), so avoid them where possible- Where this is difficult, enclosure can be increased by planting (3).

Paths are channels of movement. Examples are Hinterland Drive and Hans Strijdom Drive. To reinforce the paths, Bentley (1985: 52) suggests that the path enclosure must be increased. This must be done in plan and section.

## CONCEPTUAL ENCLOSURE THEORY APPLICATION

A typical Mamelodi street shows that there has not been made a proper provision for pedestrian sidewalks. The existing Mamelodi street section has no space definition. The buildings are far from the street edge, with brick fence around it.

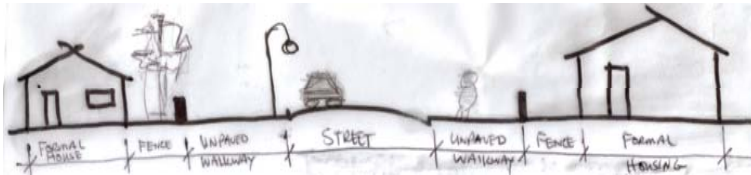


Fig.69: Existing Mamelodi Street section (author).

In the proposed street section at the intersection and all main streets in Mamelodi, the height of buildings is adjusted to form a defined path. There are paved sidewalks with street lights modified from the existing street lights and activities like informal trading stalls for pedestrians.

Active streets make vibrant paths where people will feel that they are part of the community.

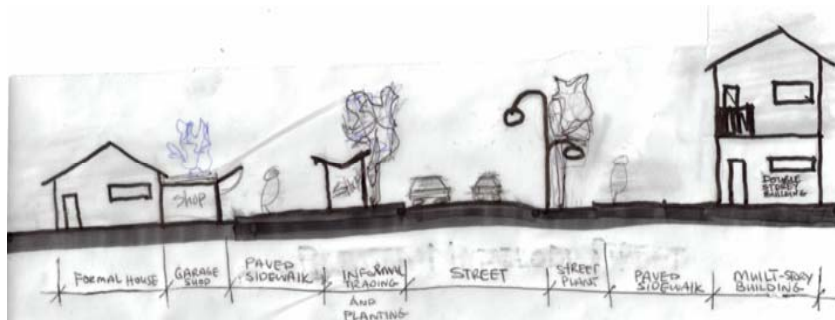


Fig.70: Proposed Mamelodi Street section (author).

In contrast to nodes, which can be entered, landmarks are point of reference which most people experience from outside. The corner of Hans Strijdom Drive and Hinterland Drive is an ideal place for a landmark, because a lot of people pass it. It is also situated near bus stop and proposed taxi rank, making it a good meeting place.

Well defined paths around the site, distinctive nodes created as well as a landmark at the corner of Hans Strijdom Drive and Hinterland Drive will increase the legibility of the site.



### 8.3 FRAMEWORK



Fig.80: The proposed site within the existing fabric (author).

The existing site situation

- No paving on side walks
- Informal trading stalls along the roads
- No vegetation/trees
- No landmark on the intersection
- Ugly edge on the Hans Stijdom Drive on University of Pretoria side fence.

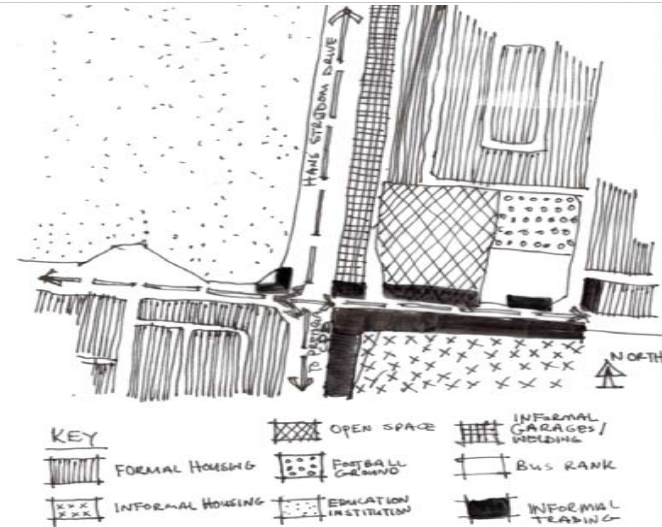


Fig.81: Existing zoning framework at the intersection (author).

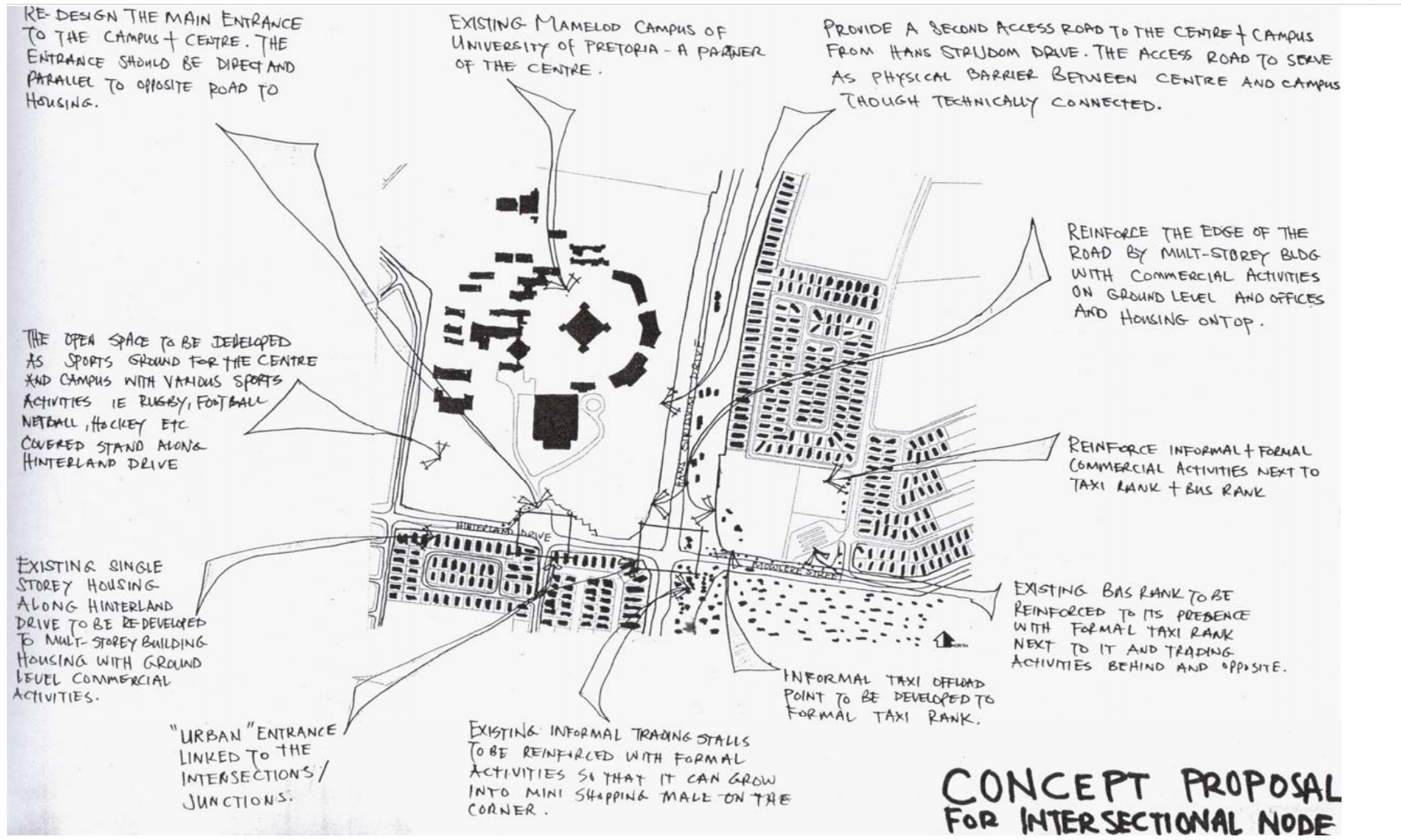
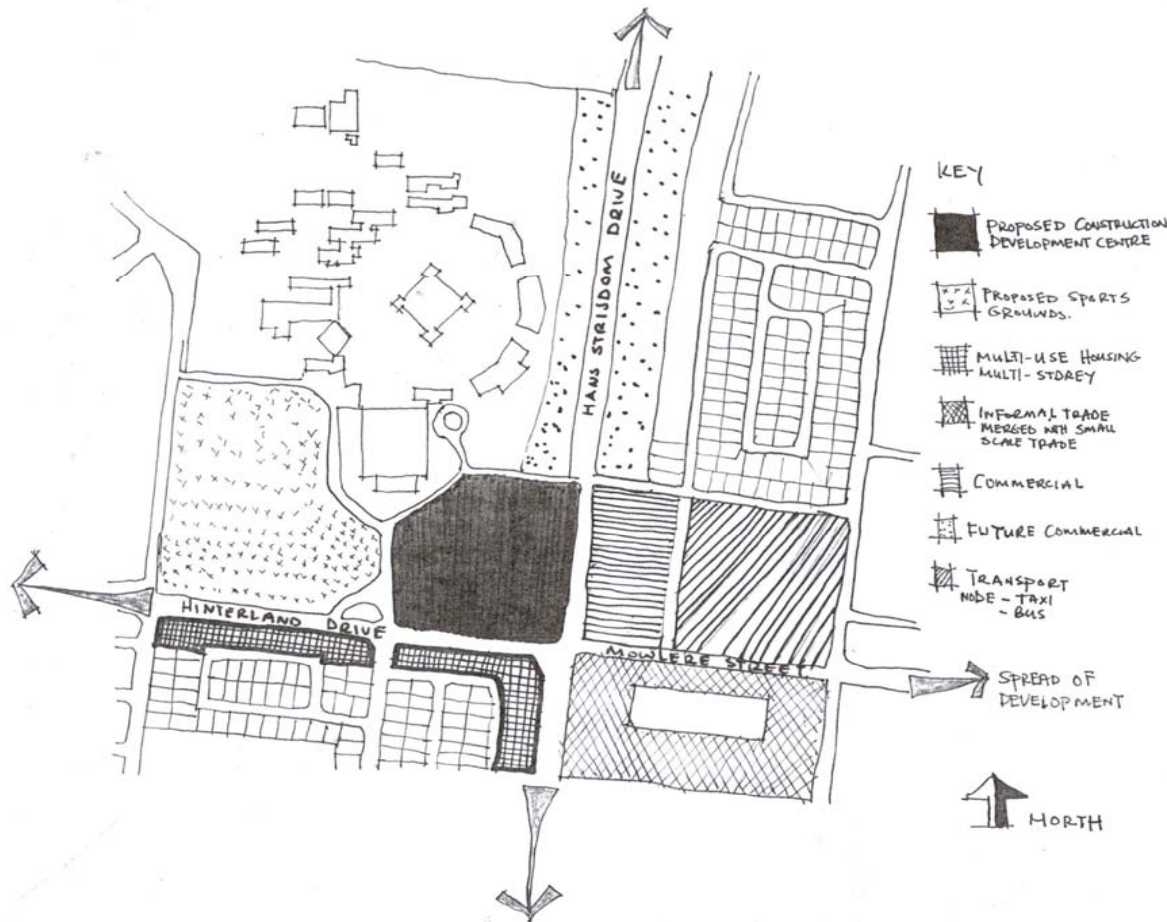


Fig.82: Proposed conceptual framework at the intersection (author). Scale 1:4,000.

## PROPOSED INTERSECTION DEVELOPMENT FRAMEWORK

- The Construction Development Centre will generate the opportunity for the Sustainable future development at the intersection and along the roads.



Opportunity offered/ skills mastered at the centre

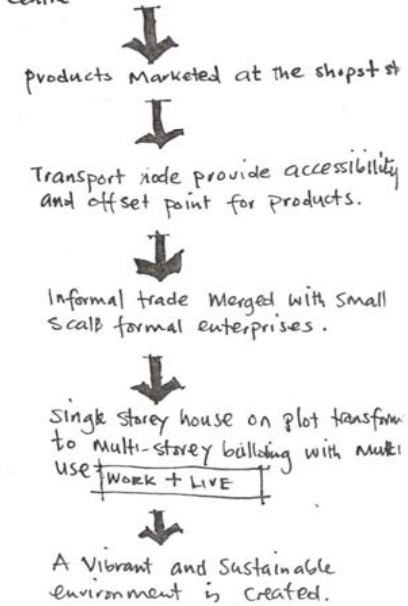


Fig.83: The proposed development framework at intersection (author).

The proposed intersection development framework will be done in two phases:

#### PHASE ONE

- Creating a pedestrian friendly intersection by paving the side walks along the Hans Strijdom and Hinterland Drives.
- Creating a landmark on the corner of Hans Strijdom and Hinterland Drives.
- Reinforced the edge of Hans Strijdom and Hinterland Drives with multi-storey buildings.
- The proposed Community Construction Centre

#### PHASE TWO

This phase will include:

- Formalising the informal commercial activities along the Hans Strijdom and Hinterland Drives where there is heavy pedestrian and vehicular moments from Tshwane CBD with formal trading stalls.
- Formalising the informal taxi stopping points along the the Mowlere street with a TAXI RANK next to existing Bus rank
- Upgrade and legalise the existing informal welding and garage stalls to formal light industry factory shells along the Hans Strijdom Drive.

### 8.4 SITE ANALYSIS, PLANNNING AND DESIGN

The following diagrams analyse the site and illustrate the principles on which the design and planning of the site is based.

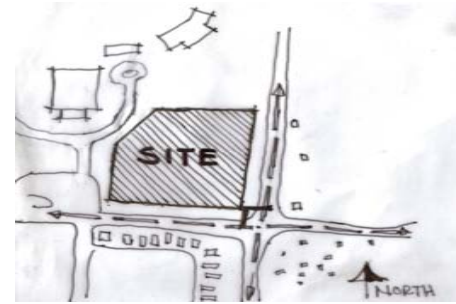


Fig.84

#### THE PROPOSED SITE

The site is on the corner of Hans Strijdom Drive and Hinterland Drive. These are two main roads from Tshwane CBD to the site. Hinterland Drive has more pedestrian and vehicular movement. Hans Strijdom Drive is more vehicular and the most direct route to CBD.



Fig.85



## BUILDINGS STANDING ON THEIR OWN

Large open areas are not contained or defined. The buildings at intersection do not relate to each other spatially

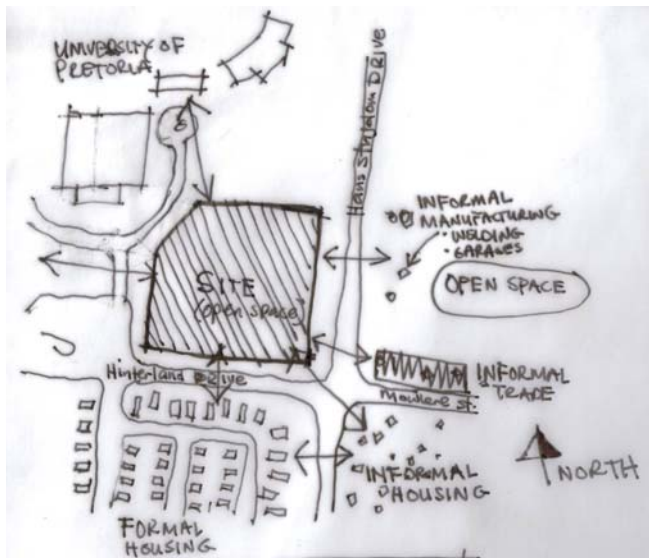


Fig.86

### SPACES AROUND THE SITE

Various spaces surround the site and create an opportunity to relate existing activities with the centre. The informal settlement will

provide the best field research and experimental area for the Centre.

The informal trade will compliment the Centre's sources of funding by selling products from THE CENTRE to the community. Informal small enterprises along the Hans Strijdom road will transform to formal enterprises with activities of the Centre.

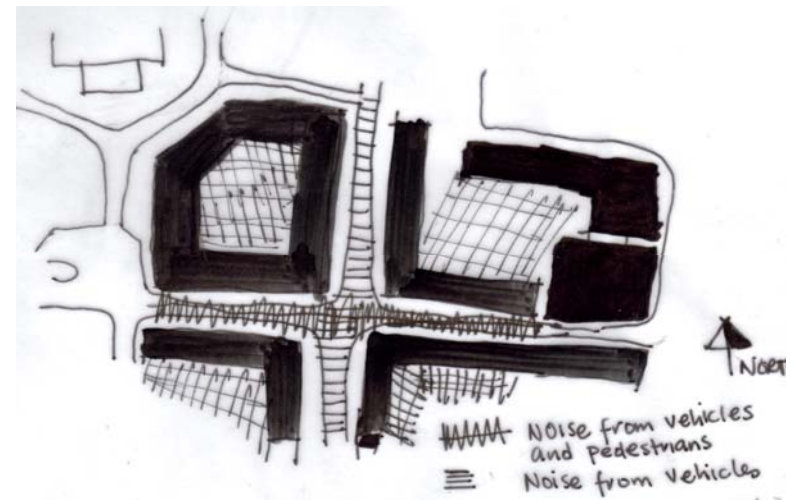


Fig.87

### RESPONSIVE BUILDINGS ENCLOSURE

Open areas are not contained or defined as in fig.6.14. The buildings are not related to each other spatially. The proposed Buildings are placed on the site so that the street edges are defined and contained internal spaces are created inside. The



proposed layout of the Centre is structured around the CENTRELISED PUBLIC SPACES.

The intersection corners and all corners are defined as entrances, landmarks and directional pointer.

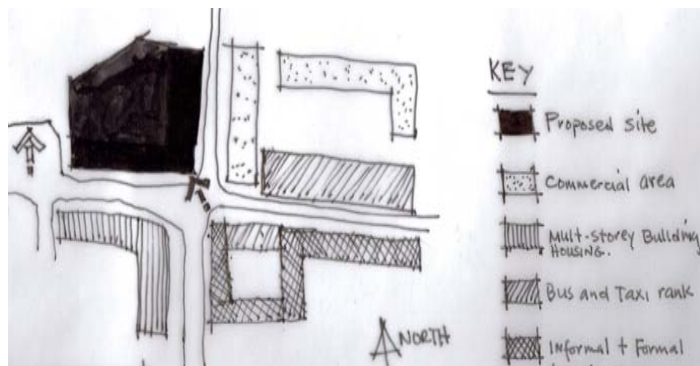


Fig.88

#### ACCESSIBILITY & FUNCTIONS OF THE SITE

Buildings placed close to street edges so that street edges are defined and street spaces are contained.

Pedestrian are encouraged to enter the building en route to their destination.

The main pedestrian entrance to the Centre is on the existing main entrance to the campus on Hinterland Drive.

Vehicular access will be on the existing main entrance to the campus on the Hinterland Drive.

A taxi node is created next to existing bus rank to formalise the taxi stop points along the streets.

Commercial activities reinforced along the Hans Strijdom Drive and Mowlere streets and pedestrian side walks introduced at the intersection.

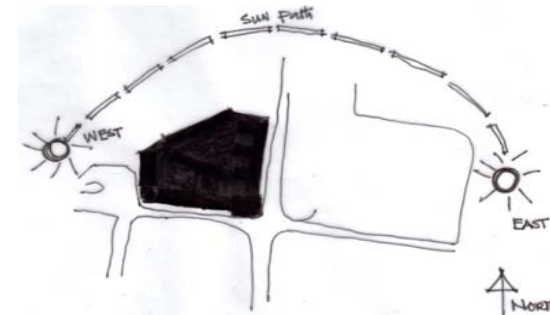


Fig.89

#### ORIENTATION OF BUILDINGS

Buildings are orientated to the NORTH where possible or along the street edges to define the street edges and responds to it as urban spaces.

Where housing units could be not being oriented to the north, they could look out onto the internal courtyard.

Buildings must be able to shade off summer sun and allow in winter sun.

Where the building is facing the strong west winds and east sun appropriate measures should be taken i.e planting trees to block the winds and shade uncomfortable sun.

## 8.5 DEVELOPMENT OF THE DESIGN

The following diagrams illustrate the concepts and development of design.

Site analysis in terms of site planning

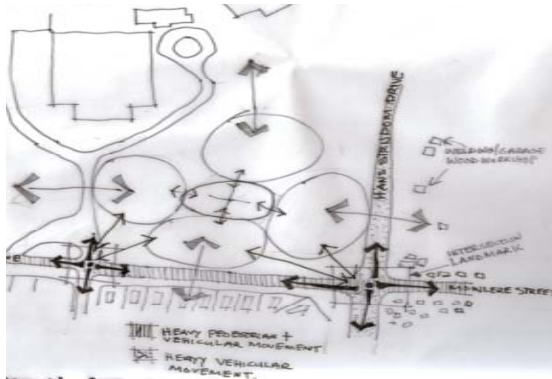


Fig.90

### CONCEPTUAL SITE RESPONSE AND USE

- Bubble diagrams to show relationships of functions, space and movement
- Movement of people and cars as main movement system.
- Daily activities at the intersection to determine the functions of the spaces and of the Centre.
- Addressing the street edge as urban fabric.
- Intersection as landmarks and entrance points to the Centre.

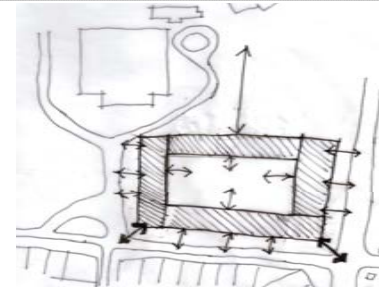


Fig.91

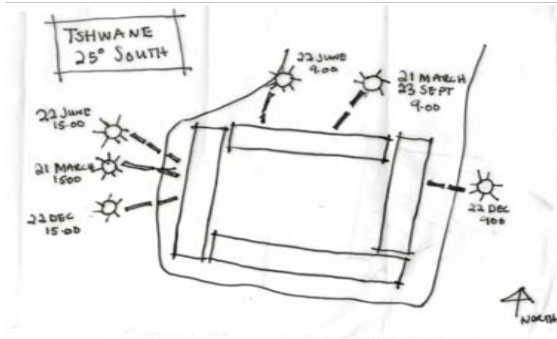
### FIRST CONCEPTUAL SITE RESPONSE TO PLAN FORM AND MOVEMENT

- Locating blocks according to movement system and in relation to the existing pattern of enclosure of the whole campus and its grid system
- Intersectional nodes to be entrance nodes to the Centre.
- Areas along Hinterland Drive and Hans Strijdom Drive to be public areas with commercial activities.

### CONCEPTUAL RESPONSE TO CLIMATE

The basic concept is to shade the internal courtyard from which cool air can be drawn into the building in summer. The trees must be deciduous (e.g. Celtis Africana), so that sunlight can enter the courtyard in winter. Hot air inside building will be expelled from the openings placed close to the ceiling of each level.

The northern part of the courtyard is landscaped, planted with grass. During summer when the solar angle is higher and it is warmer, people may relax on the lawn. During winter less sunlight will reach the courtyard. The southern part receiving should have a hard concrete surface with high thermal capacity, meaning a more comfortable environment.



The western building will create a warmer courtyard, screens off the cold WESTERN wind in winter.

Fig.92: Movement of sun in relation to the building of the Centre

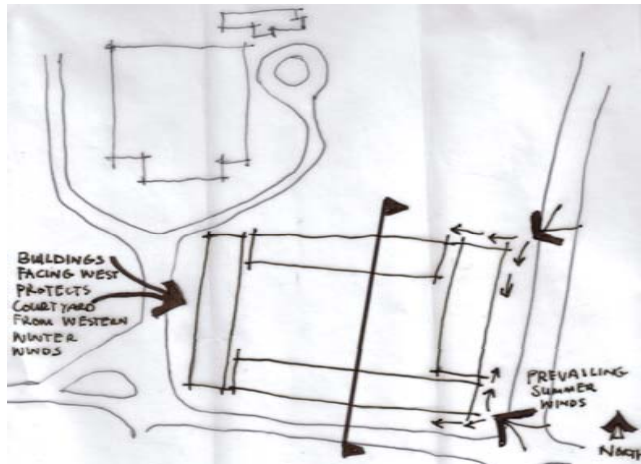


Fig.93; Wind movement to first conceptual block plan (author).

The cooling effect of a wind that meets an opening in the façade at an angle is much greater than of a perpendicular wind. In the summer months, the wind is north-easterly to south-easterly, thus meeting the shops and classrooms at an angle with the result that good cross-ventilation takes place.

## CONCEPTUAL CLIMATIC CONTROL DESIGN SKETCHES

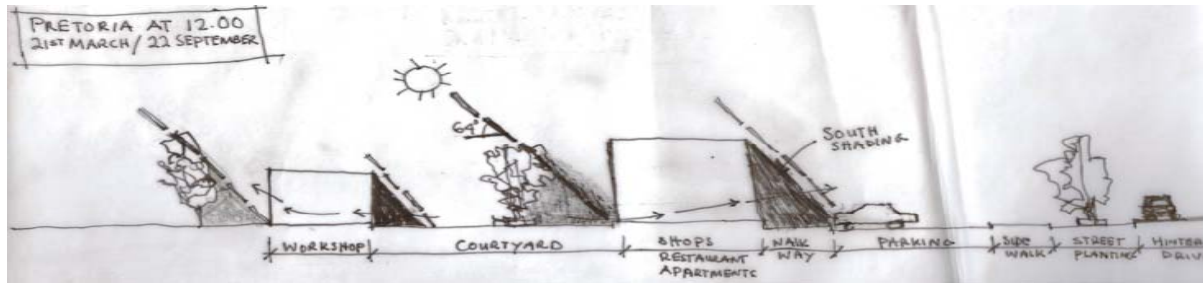


Fig.94: Conceptual North – South section through the Centre, showing the cooling effect of shaded courtyard and shading on south side which will allow full length glazing to shops and offices windows. the northern side need large overhang to protect sunlight in summer.

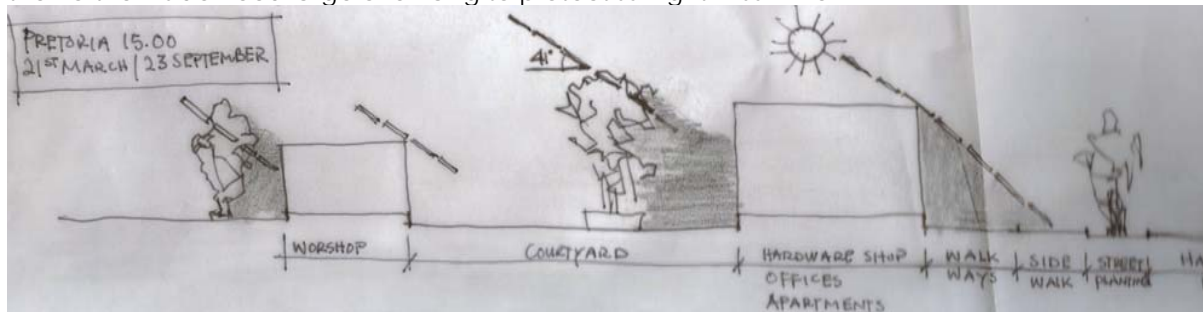


Fig.95: Conceptual West – East SECTION through the Centre. All walkways are shaded. The need for screen on the building from sun, wind and rain.

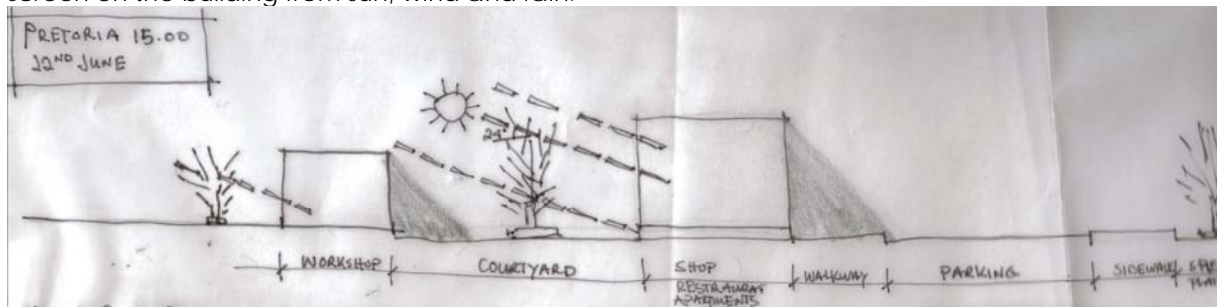
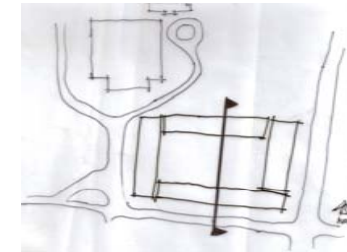
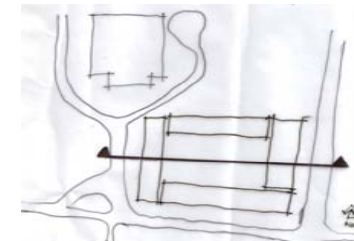


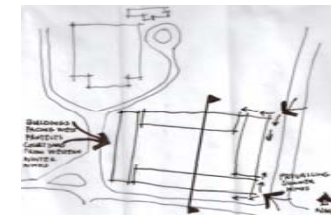
Fig.96: Conceptual North –South section. In winter, trees will loose their leaves and let the warm sun through because the sun angles are low to pass through the large overhang. The southern facades are not exposed to sun where large window openings will bring light into buildings.



Site



Site



Site

## CONCEPTUAL OUTDOOR PLACE THEORY

The most important outdoor spaces in the design of the Construction Development Centre are the internal courtyard and the urban space along the streets. In order for these spaces to have enough space definition, it should comply with the basic space requirements that Bentley (1985:54) suggests:

- Compact plan forms, with strong enclosure in plan and section
- Entrances positioned to emphasis the node as an element distinct from its surroundings.
- Entrances designed for minimum interruption of the node's enclosing surfaces.

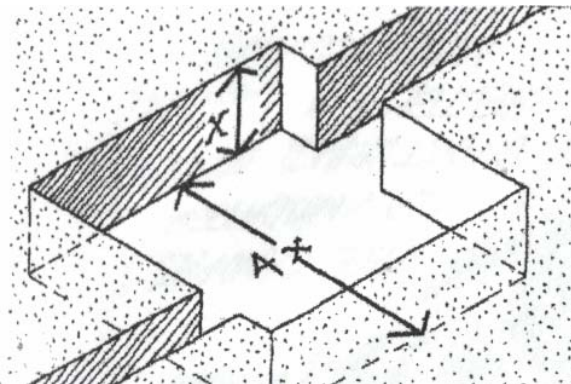


Fig.97: The height to width ratios can be opened up to 1:4 before an enclosure seems too weak.

Outdoor space will be partly covered and the main courtyard will be exposed to direct sunlight and planted with deciduous trees

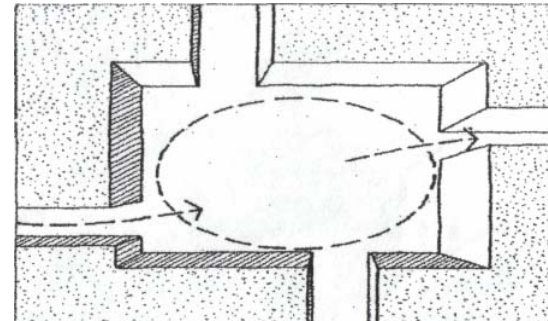


Fig98: The node seems more distinct if it is not possible to see straight through from one entrance to another

Bentley (1985) goes on to say that designers tend to think in terms of specialised spaces for different activities, separated off from one another.

*"But activities in public spaces are public activities.... It is the activities themselves which act as the most important supports for other activities: people come here to experience other people. So if public space is chopped up into separate activities, most of its robustness is removed"* (Bentley 1985:56).





Fig.99: Robust outdoor space, Treviso, Italy (Bentley 1985).

### DESIGN CONCEPTUAL DEVELOPMENT

Following the existing patterns of movement and circulation along the main roads influenced the movement systems at the Centre. Buildings are placed along the routes as well as activities within these spaces are to engage with the passer-by, stimulating interest and awareness towards the Centre and its programmes.

### INTERACTIVE ROUTE

Establishing an interactive route along the roads will allow the Centre to actively engage with people passing through the site and the community as whole. Discussions between workers and people on the route are encouraged and provide a good platform from which to exhibit and showcase the various activities and products developed at the Centre. Various spaces and buildings will encourage interest on the operations of the Centre. Building edges along these routes are permeable to allow outside interaction with activities happening deep inside the Centre.

### LAYOUT AND DESIGN OF BUILDINGS

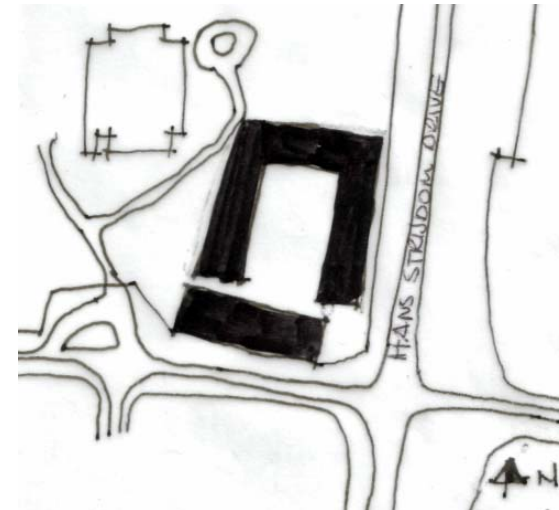


Fig.100

### DIAGRAM 1

The first concept for the positioning of buildings on the site was a U-shaped and linear building forming an internal courtyard. There will be entrance on the corner of Hans Strijdom Drive and on the main entrance for pedestrians. Vehicles will be using the existing Main Entrance to the Campus.

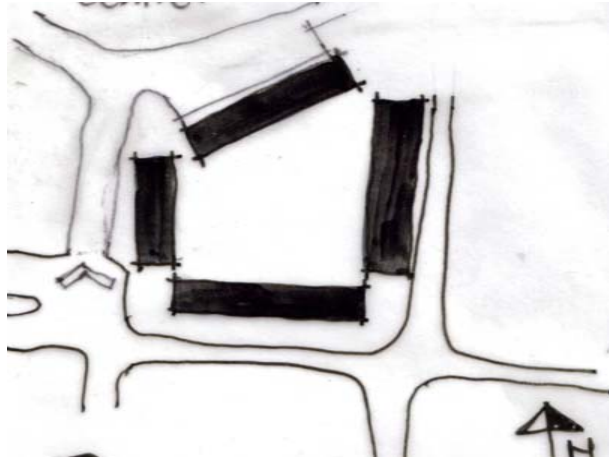


Fig.101

### DIAGRAM 2

The U-shaped building is fragmented to add more pedestrian entrance on Hans Strijdom Drive and from the proposed parking near the existing multi-purpose Hall which has access road from the main entrance and the Centre will use this road for vehicle access to the centre and parking between the road and the west facing building of the centre.

The main entrance is redesign and west block is parallel to the road. The northern block is twisted along the access road.

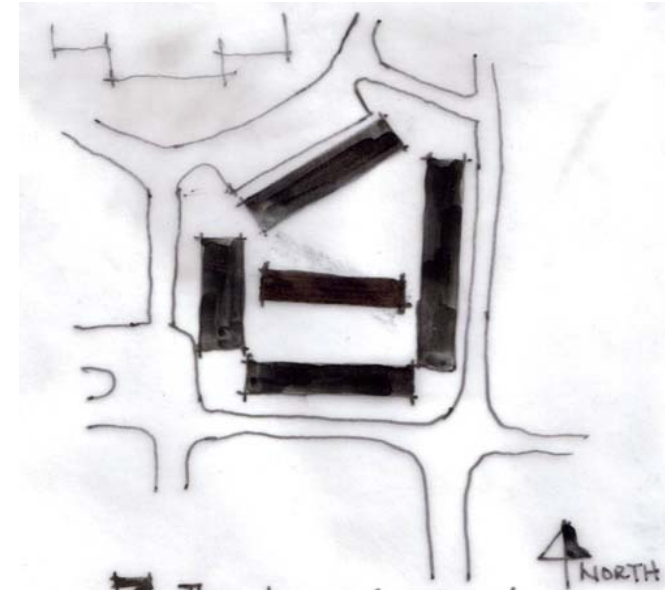


Fig.102

### DIAGRAM 3

The huge courtyard is broken up by adding another block in the middle. This will make the Centre have more and different courtyards for different functions and sizes.

Fig.100- 103, Conceptual planning sketches (May, 2006).



Fig.103

#### DIAGRAM 4

The pedestrian entrance at the main entrance to the campus expressed as a cylindrical circulation tower and becomes another landmark. Another block is added at the corner of intersection, also to serve as landmark and exhibition hall.

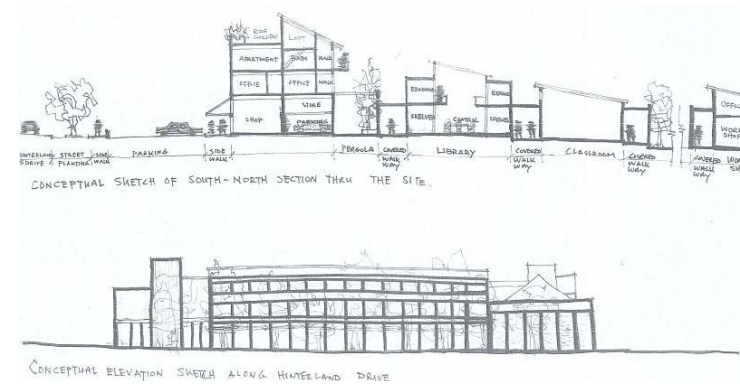


Fig.104: Conceptual Section and elevation phase resolution of design (May, 2006) (author).

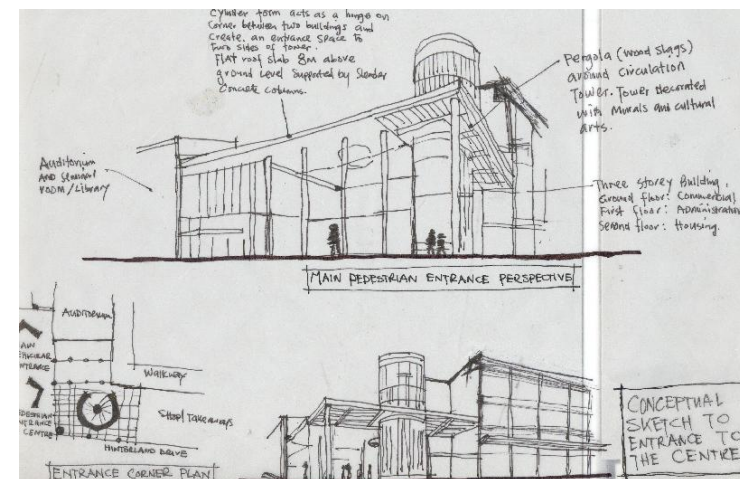


Fig.105: The conceptual pedestrian entrance at the main entrance to the campus expressed as a cylindrical circulation tower and becomes another landmark (author).

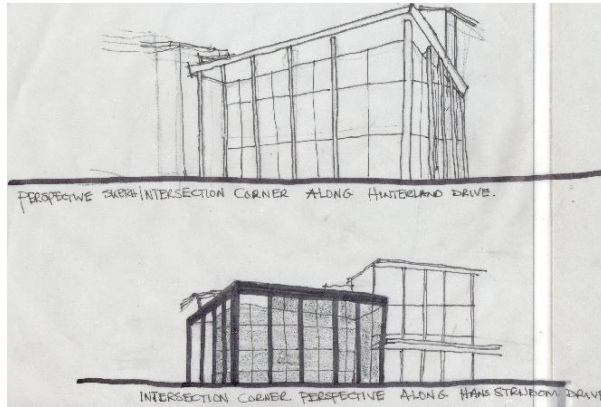


Fig.106: The conceptual corner of Hinterland and Hans Strijdom is exhibition hall with colonnade around as another landmark on the intersection (author).

## CONCLUSION

In the search for the form for the Construction Centre, the intention was to create a building form dictated by the site, function, needs of the people and buildings that will address the regionalist view.

The major influences on the finalising the plan form was the intersectional landmark, identified by the designer as well as the public space and the street edge. The final building form is not identical to each other, yet they have the same function, finish and aesthetic quality. The form the buildings are kept as simple as possible, in order for them to address the concept of being economical.

The building form was designed to appear a horizontal as possible as to encourage human scale and address the street edge. The buildings

also needed to reflect an industrial -type building form of simplicity and prefabrication, as some of the buildings in the end had to reflect their function as being workshops and has to be removed if the function does not exist.

*“Form -making is the core act of Architecture. The crucial moment of concentration on form should have the same freedom and independence from programme, function, economic and the other pragmatic concerns that architecture has to address anyway as sculpture or other arts: and architectural form making should be an imaginative inhabited investigation in three dimensions”* (Mouton, 2001 cited in Haig Beck & Jackie Cooper,2000:409).



Fig.107: Model of concept phase resolution of design (May, 2006) (author).

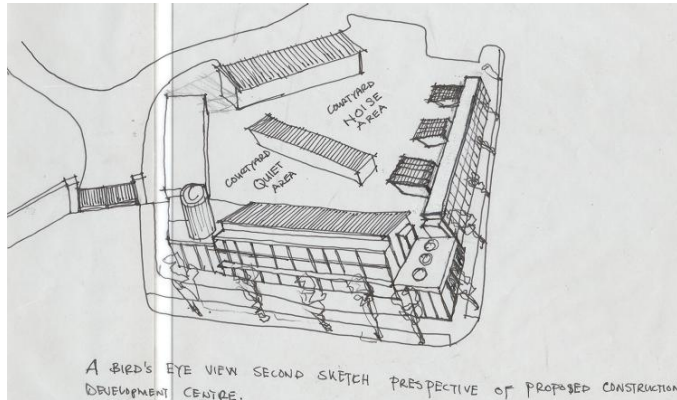


Fig. 108: Conceptual bird's view (May, 2006) (author).

## 8.6 BRIEF AND ACCOMMODATION

### BRIEF

The client brief was the centre to provide practical training skills to unemployed in arts and other crafts related works. It will provide free technical skills to people who want to improve their informal housing, but due to their background, need financial support and opportunity in order to acquire these skills. The centre will also provide a research and development facilities in low cost housing and alternative materials in the construction industry.

### PROGRAMME

1. ADMINISTRATION	2. EDUCATION	3. SKILL TRAINING	4. COMMERCIAL
Reception	Classrooms (technical, business)	Workshops (wood, metal, arts, crafts, painting )	Book/stationery shop
Administration (registry, offices, accounts)	Seminar room	Research labs	Take a ways/restaurant
Offices for lecturers and researchers.	Computer room	Experiment/scrap yard	Hardware shop
Apartment for staff and students	Library	Material testing lab	Communication centre (e-mail, telephone, cell phone and fax
	Exhibition space		Offices and apartments for rent



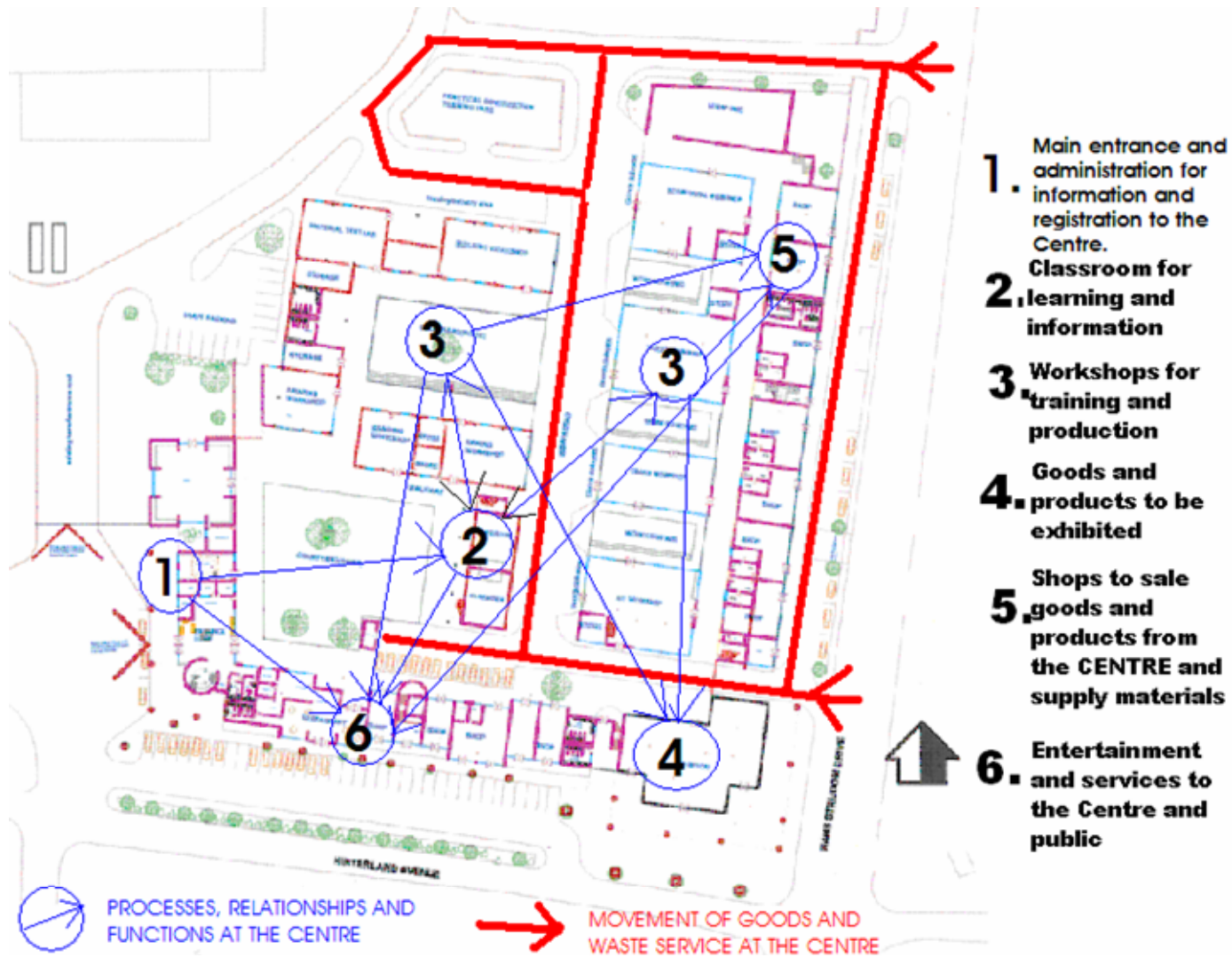


Fig.109. Space relationship, goods and waste movement (October, 2006).

## ACCOMMODATION

### GROUND FLOOR

Restaurant (kitchen included)	450mm <sup>2</sup>
13 shops	4,000m <sup>2</sup>
Metal workshop	250mm <sup>2</sup>
Painting workshop	200m <sup>2</sup>
Arts workshop	150m <sup>2</sup>
Wood and Crafts workshop	250m <sup>2</sup>
Information centre	200m <sup>2</sup>
Sewing /braiding workshop	144m <sup>2</sup>

### FIRST FLOOR

Offices	2000m <sup>2</sup>
Administration	300m <sup>2</sup>
4 classrooms	1200m <sup>2</sup>
Library	550m <sup>2</sup>
Research labs	150m <sup>2</sup>

### THIRD FLOOR

Family apartment	900m <sup>2</sup>
------------------	-------------------

Add services and circulation	3000m <sup>2</sup>
<b>GRAND TOTAL</b>	<b>13,760m<sup>2</sup></b>

### 8.7 ALLOCATION OF FUNCTIONS

Following the development framework shown in 8.3, commercial functions are placed on the ground floor along the streets edge. There is huge traffic of pedestrians and vehicles along these streets through the intersection and this will also ensure that these edges are active. The more the people, the safer the streets will be.

The administration of the Construction Centre is accommodated on the first floor. The offices are facing the main streets on south side and facing the courtyard on the northern side. The offices are designed to use natural ventilation and the windows are large for optimum use of natural light.

Classrooms will divide the big courtyards into two courtyards. Research laboratories and seminar rooms will be on the western building close to the proposed car parking and the main existing multipurpose hall. The buildings will be shaded from western sun by sun shading devices- ie large overhang. The workshops will be joined to offices and shops along the Hans Strijdom Drive forming small courtyards between them.

The housing will be on the second floors of the building along the streets, Hinterland Drive and Hans Strijdom Drive. Apartments are either north facing or look down into the internal courtyard. The apartments increase the height of these buildings, helping to define the streets as paths.



Fig.110: Ground floor accommodation –MAY, 2006 (author).

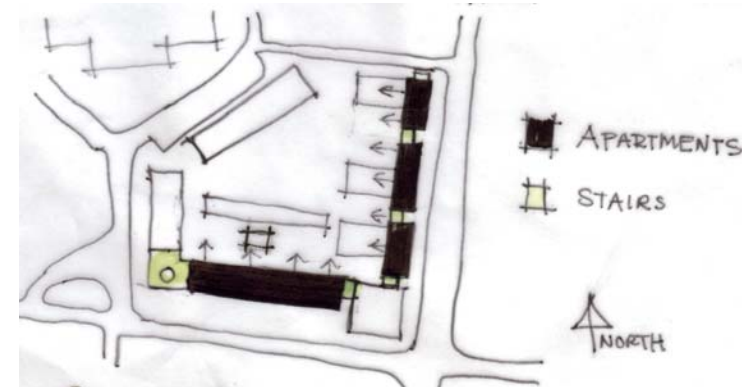


Fig.112: Second floor accommodation –May, 2006 (author).

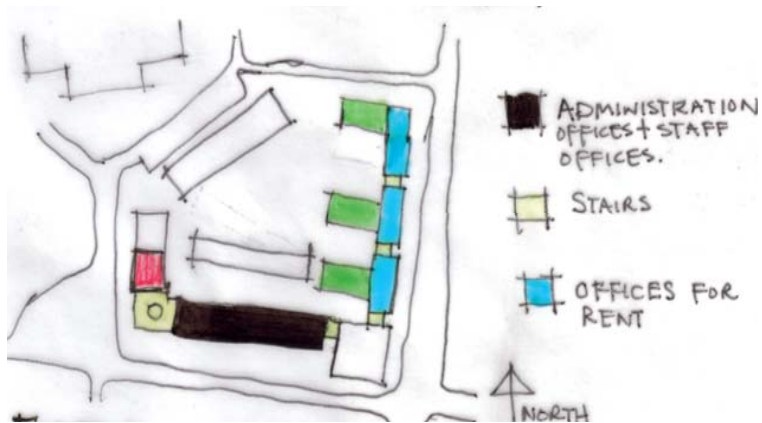


Fig.111: First floor accommodation-May, 2006 (author).



Fig.113: Model of concept phase resolution of design (September, 2006) (author).

## 8.8 FUNCTIONAL DESIGN ANALYSIS OF MAIN ACTIVITY AREAS. WORKSHOPS

The workshops are designed in a semi – industrial to suit the use and function of the building. The workshop areas can be described as light production and assembly because the production is small and production runs variable or irregular. This is because the primary purpose of these workshops is to train people and producing will be secondary purpose. A wide variety of equipment and machines from small to sophisticated machines will be available.

The deepest part of the workshop will be the working area which will be 12metres maximum deep. This depth allow for sufficient natural light and ventilation. Provision should be made in design for the support and routing of services and easy access for maintenance and alteration. Environmental services, air ducts for supply and extraction, steam or water pipes and lighting cables can require routing to particular work areas. The selection of the workshop structure was influenced by the services loading and routing demands. The daylight requirements are based on the production process and working conditions of people. Work people need outside awareness.

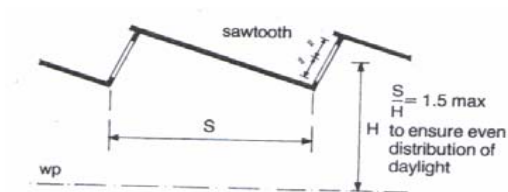


Fig. 114: Sawtooth roof exploration (Tutt, P and Adler, D.1998:20).

There is evidence of increased productivity and improved labour relation if people are able to identify external conditions.

### METAL WORKSHOP

Size: 250m<sup>2</sup> including storage and office. Programme: Working hall: 160m<sup>2</sup> working benches surrounded by machines. General store: 72m<sup>2</sup> ground and first floor accessible to working area. Tool box storage and sink with direct access to the working area. Courtyards facing the working area in the workshops.

Flow scheme: off-load area along the service road. Store portable trolley/racks. Cutting area: abrasive cutting (2x1.2) hand guillotine (1x1.5). Work/process stations: forge (2x1), welding plant (2.8x2.5), brazing (Co<sub>2</sub>+ asetilen 2x3), drill (1x2), hand grinder (1x2) work bench (2.5x2).

Finishing area: painting (2x2), acid (1x1.5)

Store: indoor ground or upper flow.

### WOOD WORKSHOP

Size: 250m<sup>2</sup>. Capacity 15 -20 people.

Flow scheme:

Offloading area: along the service road. Store: open area with racks accessible to service road. Cutting area: radial saw (1.5x3), power saw

(2x1). Working area: carpenter's bench (3x4.5) lathe (2x3) dust collector (1.5x2).

Finishing: painting and brushing (3x2)

### **ART WORKSHOP**

Size: 150m<sup>2</sup>. Capacity: 20-30 people

Equipment: 15 double tables, painting board, sink, paper cupboard and general store.

### **PAINTING WORKSHOP**

Size: 150m<sup>2</sup>. Capacity: 10-20

Equipment: Drawing table 3.5 per person, regular table 2.0 per person, store, sink and paper cupboard.

### **SEWING WORKSHOP**

Size: 144m<sup>2</sup>. Capacity: 10-15 people.

Equipment: working table + machine (2.2 per person)

Store.



## 9.0 TECHNICAL ANALYSIS

There is a long established tradition of a brick aesthetic in Pretoria, which began with the influence of Dutch architects who arrived in Pretoria in the late 1800's. Since then a sense of using brick decoratively and innovatively has been evident in many Pretoria building (Fisher, 1998:129)

The popularity of brick as a building material can be ascribe to its widespread availability and that it has been embedded in building tradition both abroad and locally. The brick has timelessness about it and, because so commonly used, has acquired a democratic character. The modular nature of the brick allows it to be used in many patterns and for many different applications (paving, walls and landscaping). It is also relatively inexpensive compared to other building materials and it requires low maintenance.

Other building materials that typify Pretoria architecture are corrugated steel roof sheeting, glass and reinforced concrete. The influence of the Modern movement on Pretoria architects initiated a culture of reinforced off-shutter concrete structures and wall finishes. Not only do inexpensive materials like rough concrete and infill brickwork fit into the Pretoria aesthetic, but they are also suited to the economic climate and the local labour force. Therefore, the Centre will use the principles of Pretoria in its material selection and construction method.

## 9.1 STRUCTURE

Open building principles will be used at the Centre to ensure that a large number of people participate in the development of the built environment in order to achieve rich, layered and sustainable environment. The aim of open building is to find principles of ordering and combination to give

optimal freedom for design and installation (Dekker 1998: 312). The structure remain constant while building interiors, infill panels and other walling elements are free to change depending on climate, as well as new building technologies developed at the Centre.



Fig.115: In-fill panels developed at the 'Green Wall project (Brewis, 2003:17 cited in Araujo, 2004:112).

### Structural Requirements

- Low maintenance and cost funding from well wishers
- Simple construction to be done by skilled and unskilled labour
- Large spans in workshop to provide enough workplace
- Readability- able to be a show case of area.
- Adaptability to be able to suit various activities as needed

All buildings will be constructed with three types of structural systems, namely concrete, steel and timber using a contractor:

## Concrete structural frame

- Structural vertical support is reinforced concrete column grid of 6000mm x6000mm and 3000mm x3000mm. This will give good workplace for various function and uses.
- All columns are exposed off-shutter concrete as a aesthetics and easy to maintain the surfaces
- All columns will be rectangular to embed well with in-fill walls except at circular columns at the entrance and exhibition hall colonnade for aesthetics purposes.

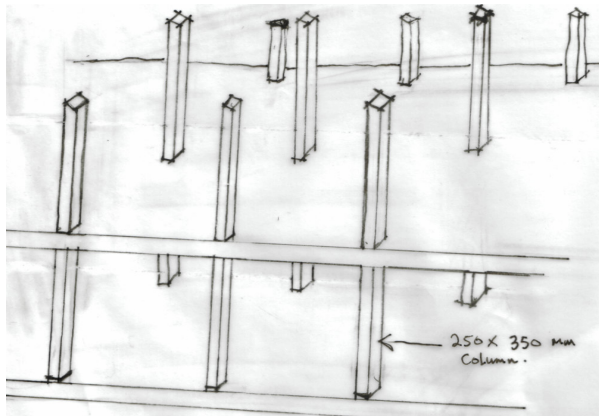


Fig. 116: Concrete frame structure (author).

### A. Steel structural frame

- Deliberately left visible inside and outside to contrast materials and as aesthetics.

- Designed as a modular system for easy manufacturing and assembly.
- Made of prefabricated steel elements and assembled on site
- I-profile steel columns and beams

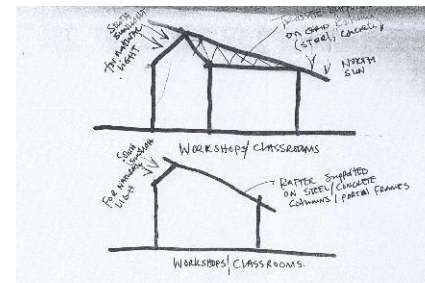


Fig.117: Steel portal frame structure (author).

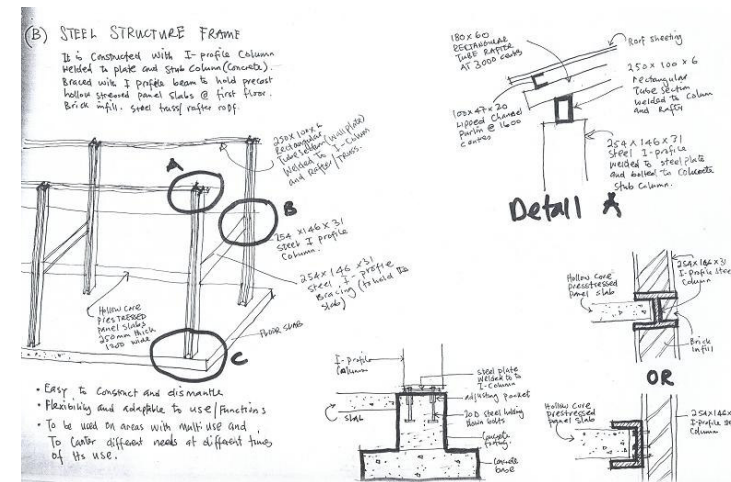


Fig.118: Steel Frame structure exploration (author).

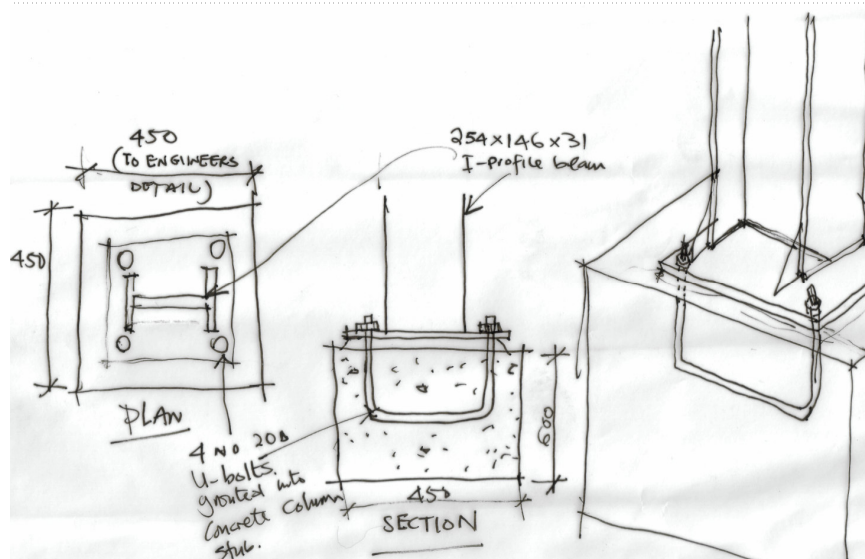


Fig.119: I-beam connection to stub column sketch detail (author).

### Timber structural frame

- Timber pergola on courtyards and walkways. Some used in innovative way by combining with steel as structural member and natural timber as shading member.

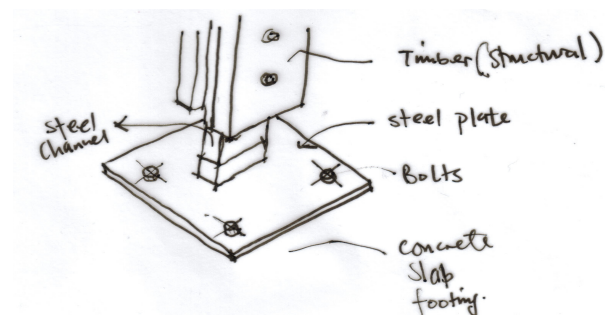


Fig.120: Timber pergola footing detail (author).

All structural and non structural components such as non – bearing walls, steel profiles, partitions and glass sheets will be in modular dimensions. All in-fills will be done by local skilled or unskilled labour.

## 9.2 ROOF STRUCTURE

The structure of the roof is a conventional I- Beam roof structure for concrete structure and I- Column and I- beam roof structure.

All exposed steel work is coated with one coat zinc phosphate as a prime on clean surface (SABS 1319). It is finish off with one coat grey alkaline enamel paint (SABS 630 TYPE 2)

The roofs will be multifunctional as they are not only designed to provide protection from the elements, but also form covered walkways, help to shade facades and permit rainwater harvesting.

The roofs are either of prefabricated roof sheeting or in-situ casted concrete slabs. Structural concrete roof will be for the southern and exhibition hall.

The use of prefabricated roof sheeting gives reference to the Pretoria Regionalism as it is part of regionalist repertoire of the materials. The workshops will consist of structural steel roof frame and will be made of prefabricated steel roof members that are bolted together.

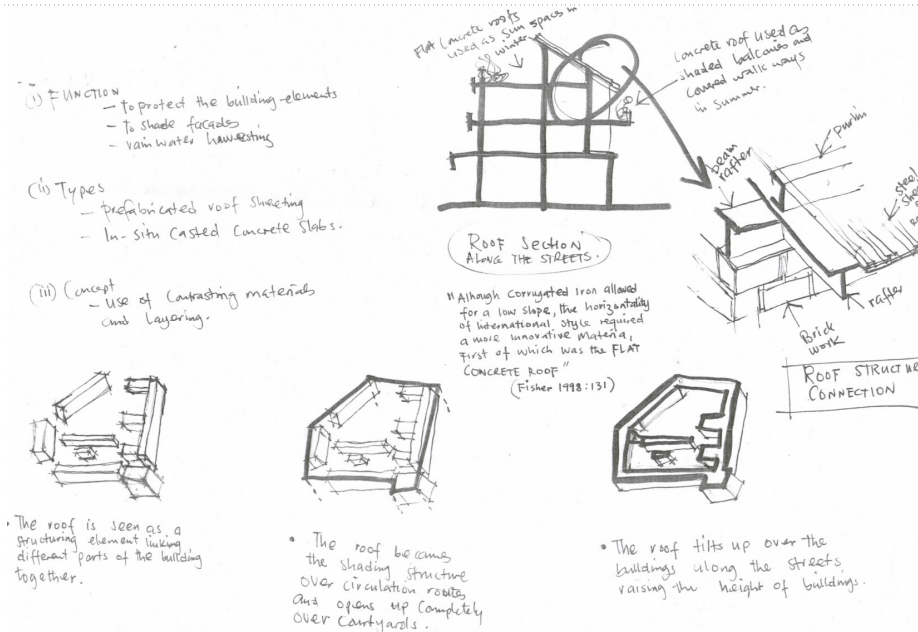


Fig.121: Roof exploration – June 2006 (author).

The roofs will tilt up along the street edges to contribute to the scale of the streets.

### 9.3 SLAB

The structural reinforced concrete roof slabs expressed as horizontal planes that extends beyond the structural support in multi-storey building structures. Ground floor slab in workshops will be of 150 minimum with expansion joints every 3 metres.

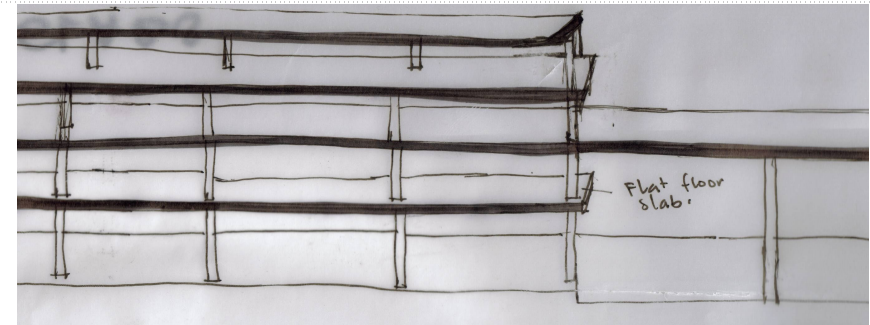


Fig.122: Conceptual slab sketch layout on administration block {May, 2006 (author)}.

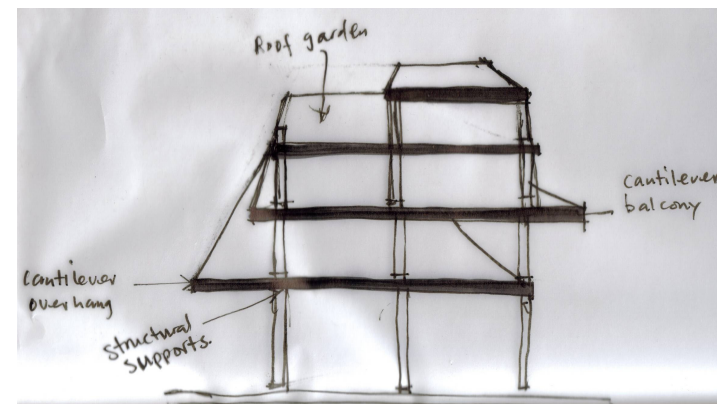


Fig. 123: Conceptual slab sketch layout extending fixed points on administration block {May, 2006 (author)}.

Top roof slabs as roof gardens facing south. Steel roof facing north in administration block.



## 9.4 MATERIALS

Materials to be used will be the locally available and simplest as it is being proposed that the building will be built by unskilled or semi-skilled labour mostly.

Materials will be limited to steel, brick, timber, board, steel and concrete.

These materials will be used to contrast with each other, as well as to form a contrast in surface, form, light, and function. For example the BAT Centre below.



Fig.124: Façade of BAT Centre.

The use of materials to contrast with each other can be seen where wood is juxtaposed with steel, concrete is contrasted with industrial type I-beams and glass is used next to un-plastered rough bricks. Rich colours and textures can be seen and most of floors consist of a cement screed with ceramic tiles laid in patterns. Mosaics on the floors, against plastered walls, as well as murals done by the students and the community. The building itself becomes a work of art and a hand –

made quality to it. The impact of materials used and natural elements such as water and plants are considered to compose a collage of textures stimulating the visual, aural and tactile senses.

A relevant aesthetic can evolve from a good integration of art and architecture, essential in reconnecting to the tradition of indigenous African architecture and continuing the work of modern architects. An integration of art and crafts into the architectural design supports local talents, increases the uplifting character of architecture and provides opportunities for members of the community to become creatively involved in making of murals and mosaic works.

### BRICKS

The use of bricks is a labour intensive, but affordable material that weathers well when used correctly.

Bricks to be used on the Centre will be a locally made brick by local people using sand and cement as raw materials. The factory made brick will be used where necessary as aesthetic. The bricks will be coloured to match the factory made bricks used on all buildings of the Mamelodi campus.

### STEEL

Steel products such as I-sections, angles and roof sheeting will be used in such places as roof, framework, door and window frames. Combining steel and timber elements in walkways and workshops through exposed junction and connections highlights the structural integrity of

materials and enhances the education/learning experience of the Centre.

Standard steel sizes are specified and used because of their availability, ease procurement and erection. The intended future re-uses recyclability, low maintenance and learning value of the material.

Waste steel elements such as rebar, roof sheeting, sections and a variety of steel off-cuts from industries are incorporated into the screening, light framework, building component development, furniture and arts and crafts workshops.

## **TIMBER**

Timber is used in the project mainly in the wood workshop as learning tool in use of timber:

- Timber is a renewable resource
- Timber is an ideal material for low –energy buildings
- Timber has good insulating properties
- Timber has good recycling qualities.

Timber floor, external cladding, panelling, walkways and lightweight clip on are incorporated into the overall design of the centre. Large amount of waste timber off-cuts, boards, shavings and panels produced at packaging, cabling and other industries in Pretoria is evident in the construction of informal housing. This timber will be

incorporated into the Centre and used as balustrades, fenestration, insulation, screens and furniture.

## **GLASS**

Modular, stackable, interlocking glazed panels are developed and used especially on the northern facades. The intention of this system is based on the disassembly, recycling and re-use of the panels as well as the future flexibility of the Centre. The use, development and experimentation into alternative glazing techniques is demonstrated and investigated as part of activity of the Centre.

## **WASTE MATERIALS**

A vast amount of waste materials including industrial, construction and inorganic waste are relatively available. Waste materials like car tyres, building rubble, timber off-cuts, steel sheeting and old car windscreens will be incorporated into the material development programme involving the manufacture of screens, walling panel, fenestration, furniture, tools, and arts and crafts as fig 125 below.

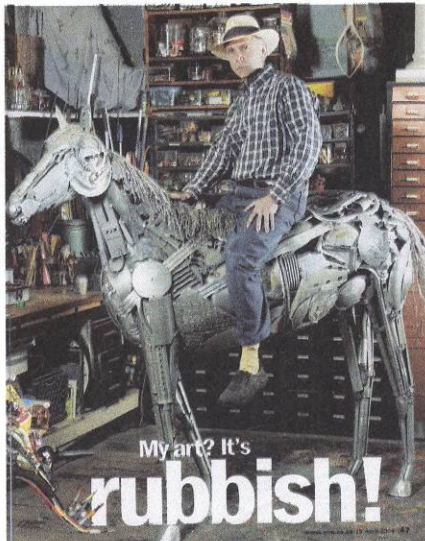


Fig.125: Art using discarded waste (Araujo, 2004:8).

## 9.5 LIGHTING

The centre will be connected to the municipal electrical supply and through the use of photovoltaic panels. Solar energy will be used for low power applications such as lighting.

The design of the Centre ensures that natural lighting is sufficient for day-time activities. All light fittings are energy efficient. Various areas need different lighting levels. For example: offices- 500 lux , classrooms- 300 lux, workshops-300 lux , ablution facilities -150 lux (Tutt, P and Adler, D. 1998:413).

## 9.6 WATER AND WASTE SERVICES

Water supply to the Centre will be connected to the main municipal water supply. Some rain water will be collected and directed through steel gutters into plastic water tanks in selected building on the centre while in other building it will be left to water the lawns of courtyard or drain it away in storm water drains/channels out of the site to existing drainages along the roads.

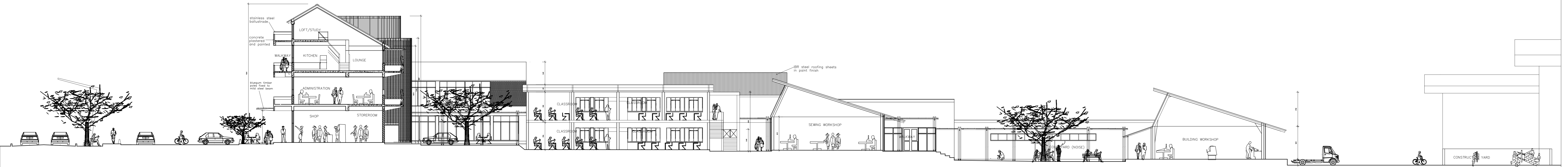
## 9.7 VENTILATION

The centre will be reliant on passive ventilation principles for heating and cooling. A building depth of 10m maximum in offices and 12m depth in workshops will ensure that cross ventilation through manually operated openings is achieved. In summer, air passing through the buildings is first cooled in shaded courtyards, with combination of deciduous Celtis Africana and Acacia Sieberiana trees before it is drawn through and under the buildings.

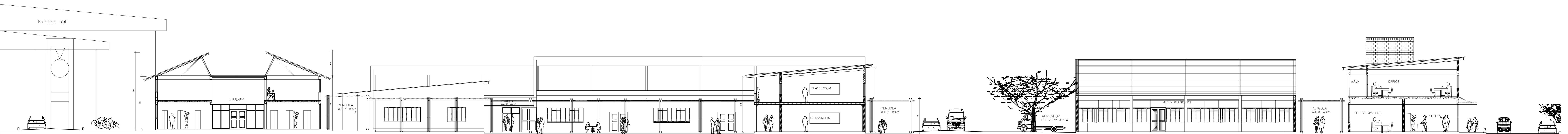




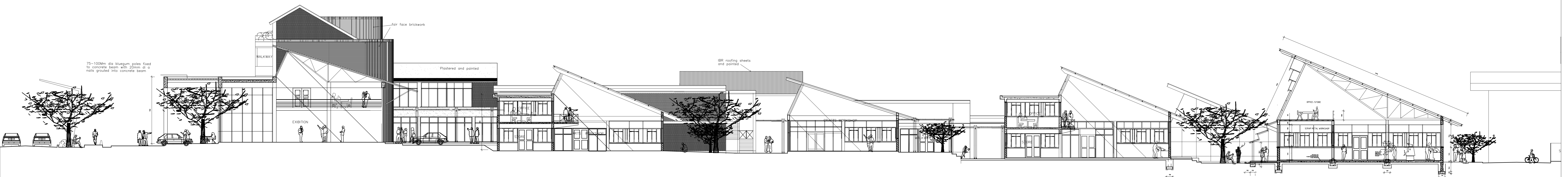




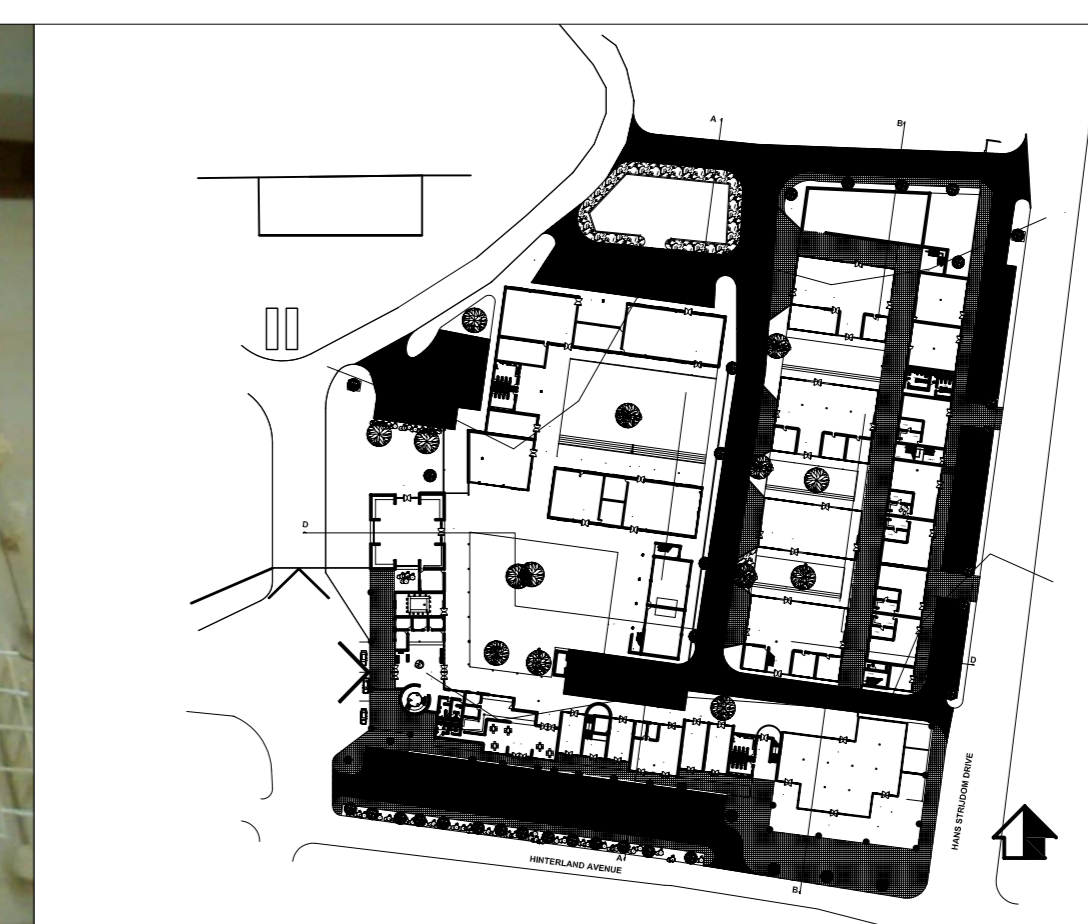
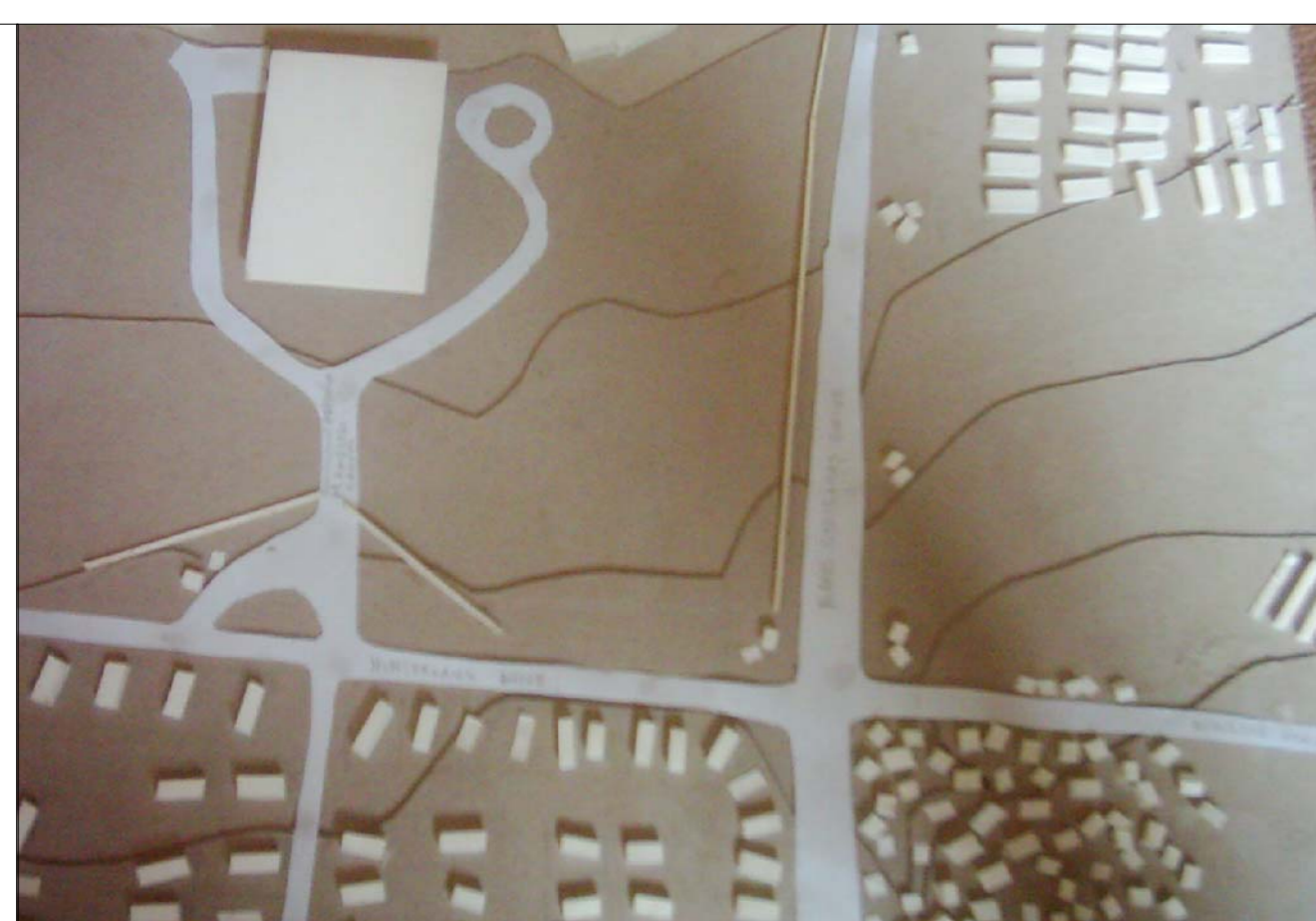
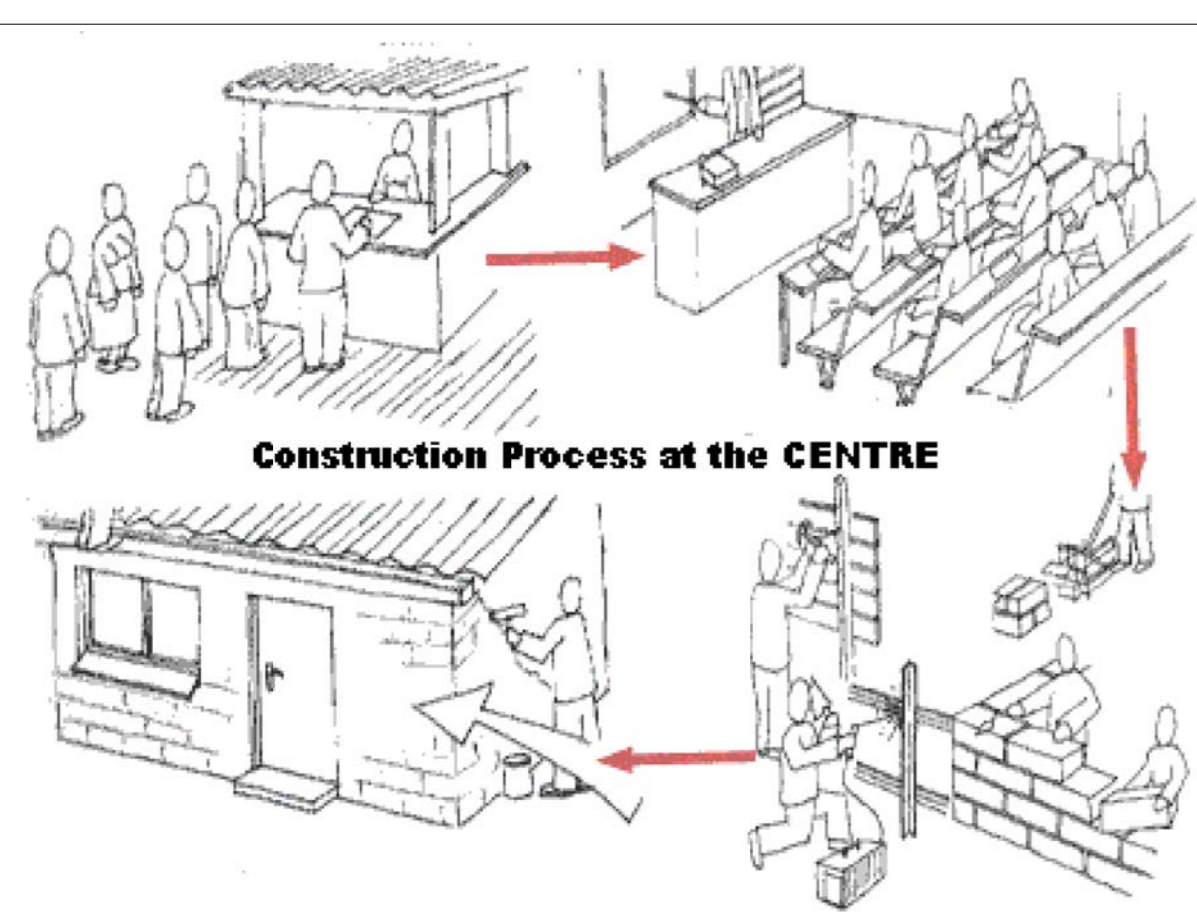
NORTH - SOUTH SECTION (A - A) THROUGH OFFICES AND APARTMENTS SCALE 1:200



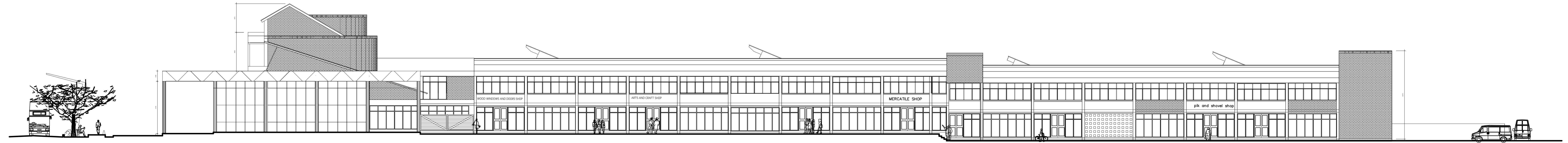
WEST-EAST SITE SECTION (D - D) THROUGH CLASSROOMS AND LIBRARY SCALE 1:200



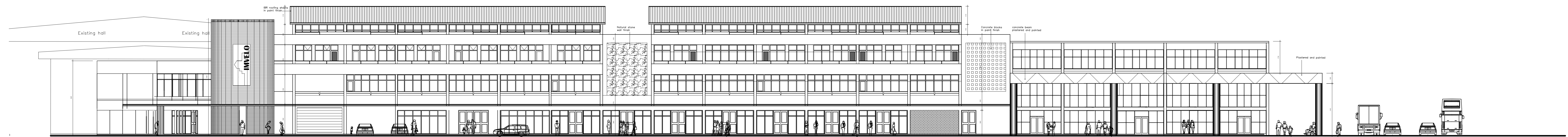
NORTH - SOUTH SECTION (B - B) THROUGH EXHIBITION AND WORKSHOPS SHOWING THE SOUTH LIGHT INTO THE MIDDLE OF WORKSHOPS. SCALE 1:200



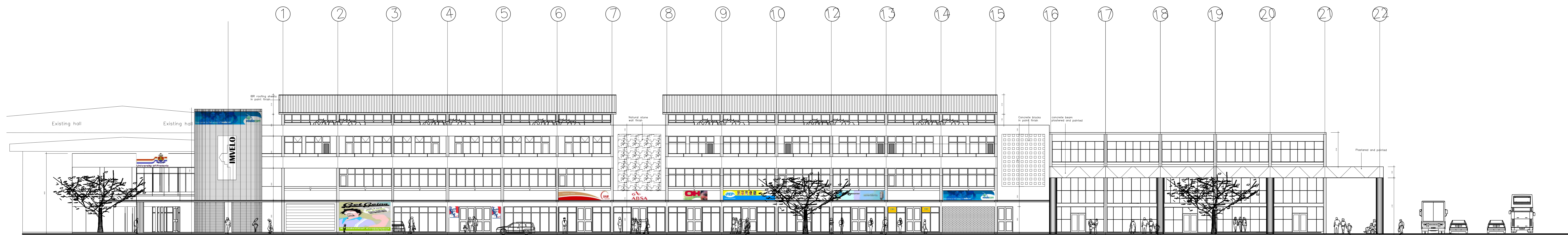




ELEVATION ALONG HANS STRIJDOM DRIVE 1:200

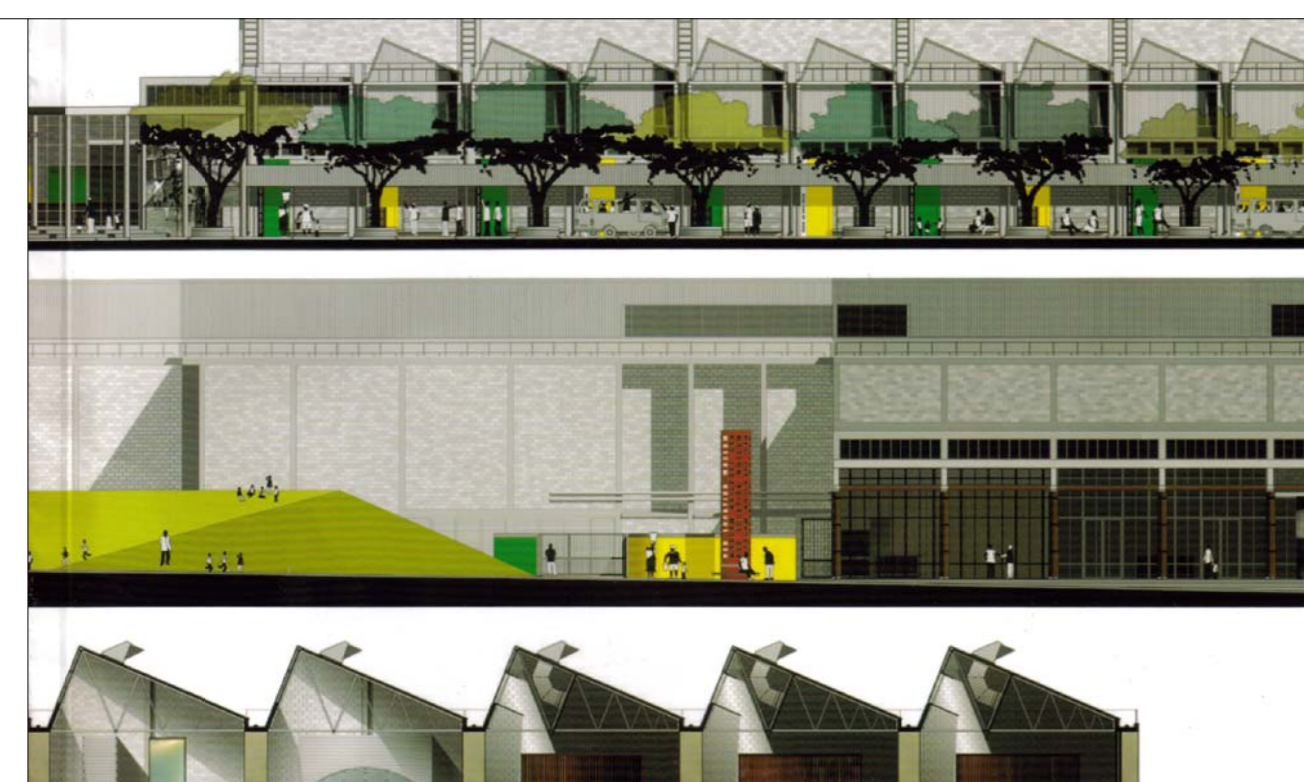


ELEVATION ALONG HINTERLAND DRIVE 1:200



ELEVATION ALONG HINTERLAND DRIVE 1:150

PRECEDENTS



RED LOCATION MUSEUM

Architect: Noero Wolff  
Ref.: SA Architecture,  
May/June 2006

Inspired by :

Natural way of lighting large space  
catching south light from the top  
exposed concrete frame structure



JUBILEE HOUSING

Architect: Osman and Munching  
Ref.: SA Architecture,  
Nov/Dec 2005

Inspired by

concrete frame structure  
urban in fill  
mixed use- shops, housing and offices

LOCAL ARCHITECTURE  
INFORMAL HOUSING

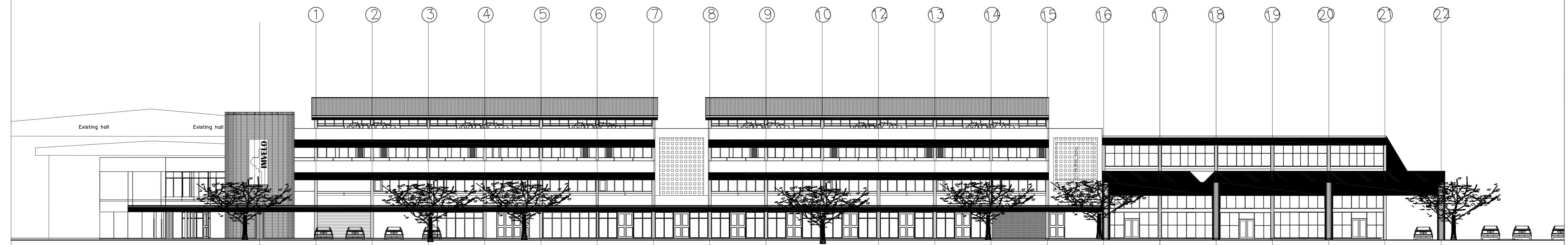
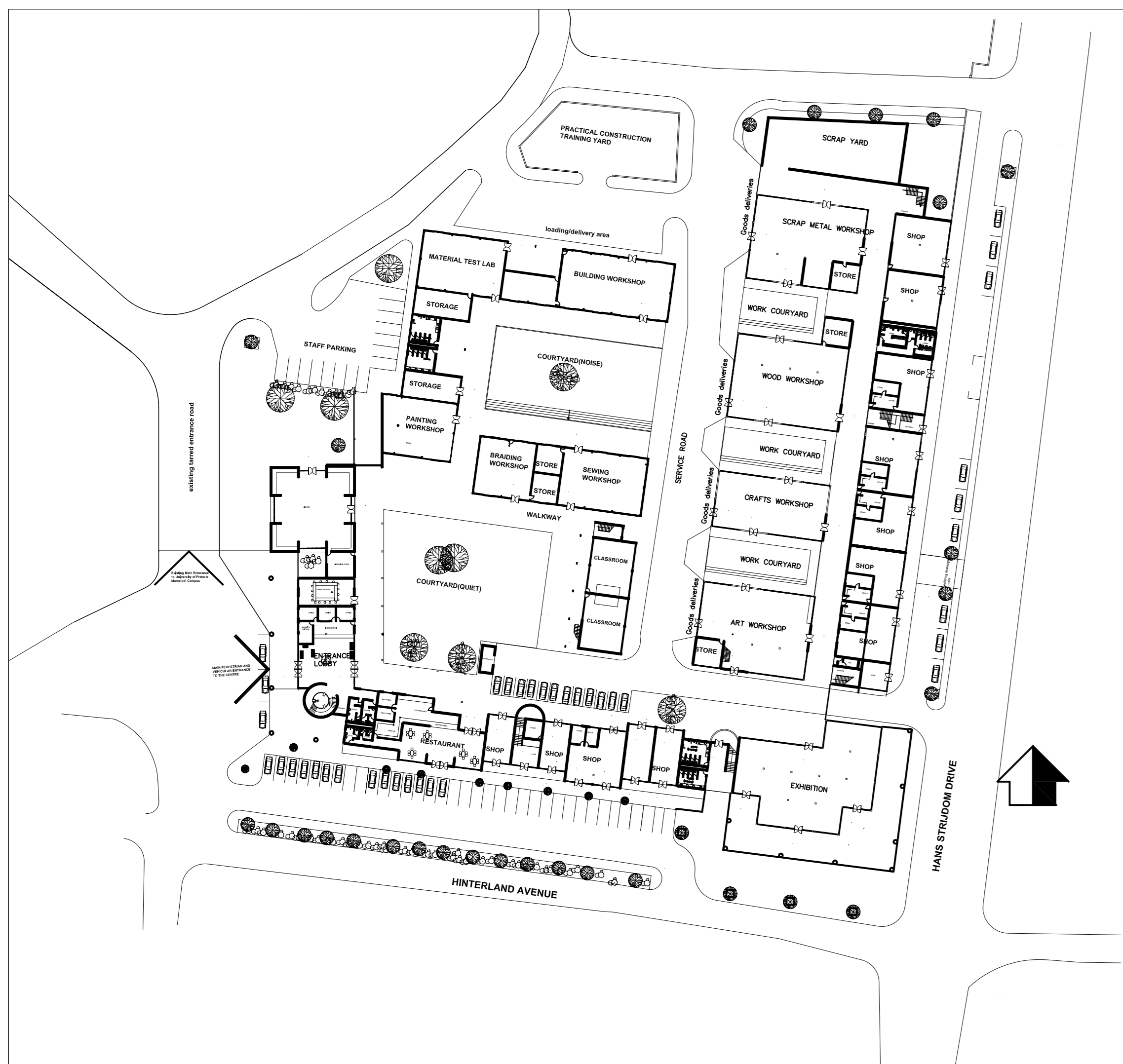
Photo by author

Inspired by

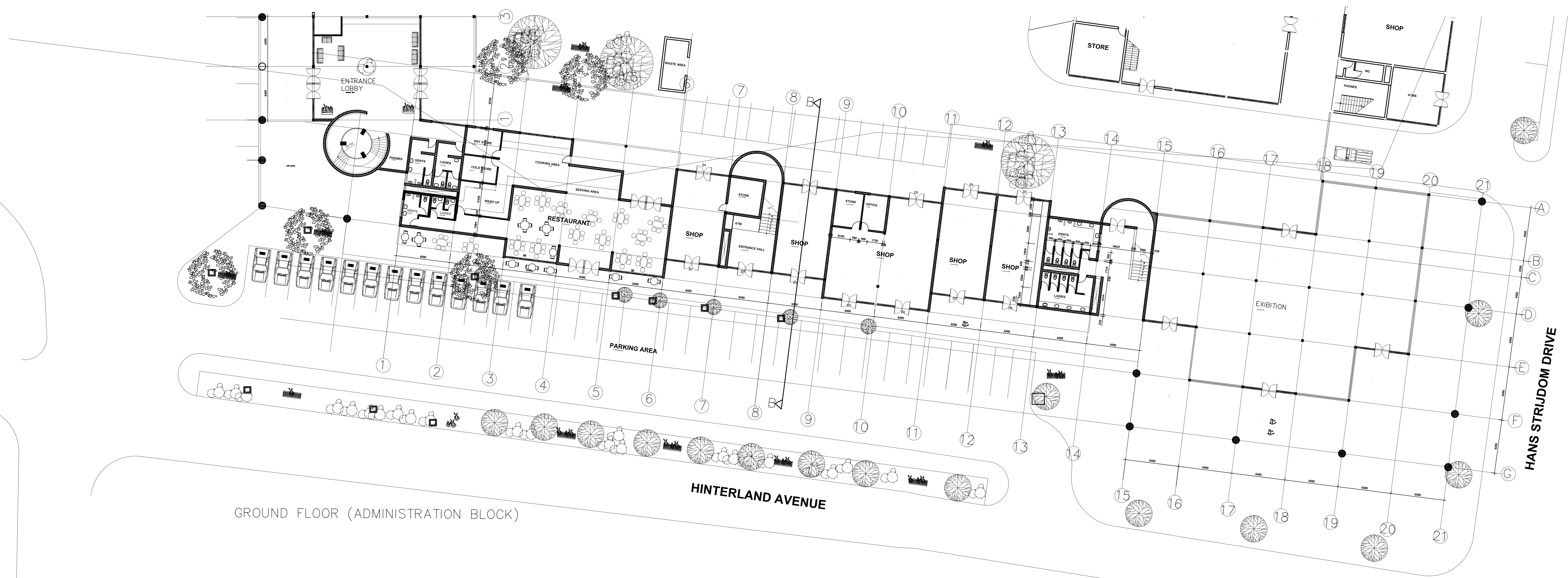
re- use of materials  
mono pitched roof







ELEVATION ALONG HINTERLAND DRIVE



GROUND FLOOR (ADMINISTRATION BLOCK)

**ADMINISTRATION**

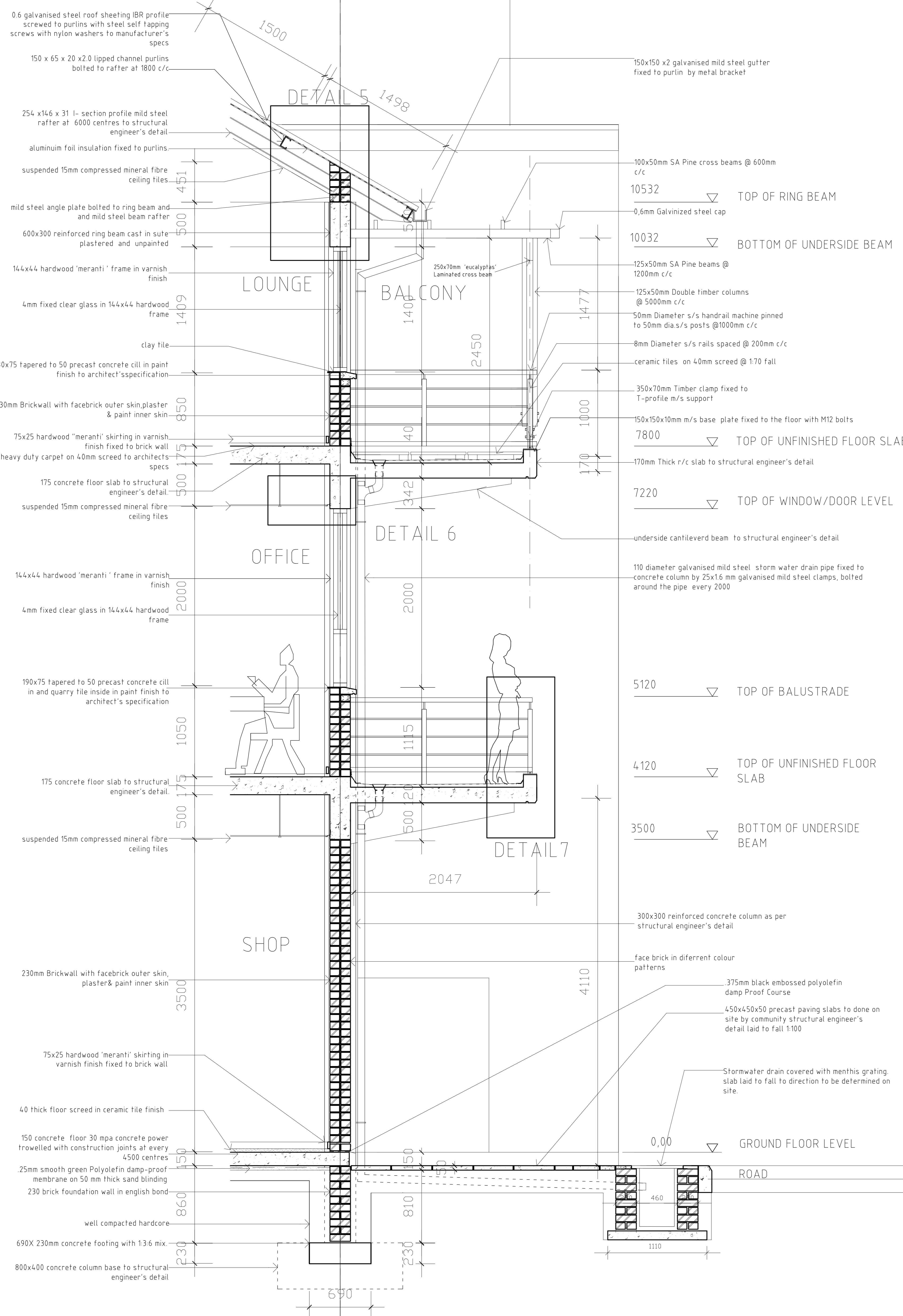




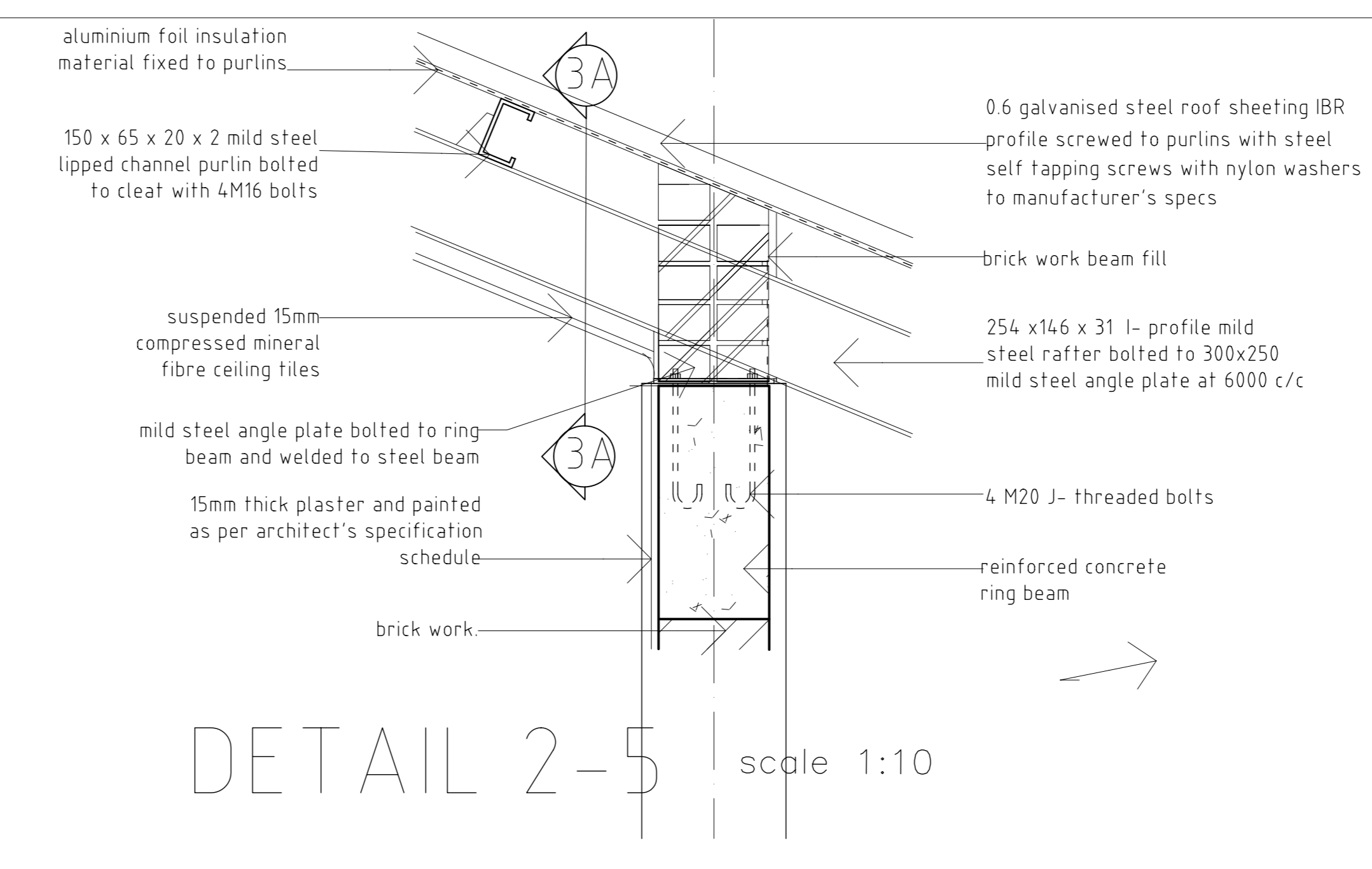
SOUTH -ELEVATION ALONG SERVICE ROAD FACING EAST SCALE 1:200

**ADMINISTRATION**

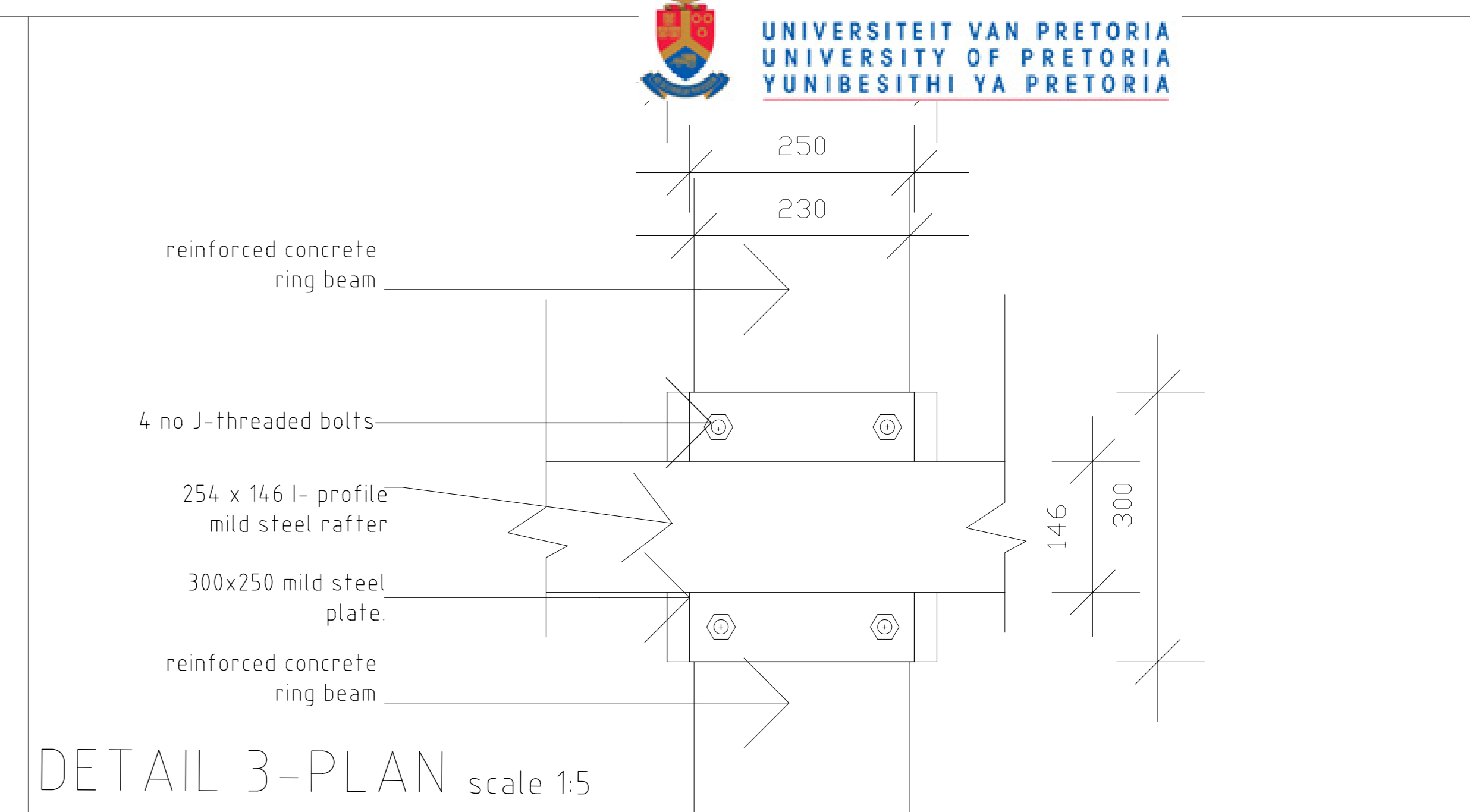




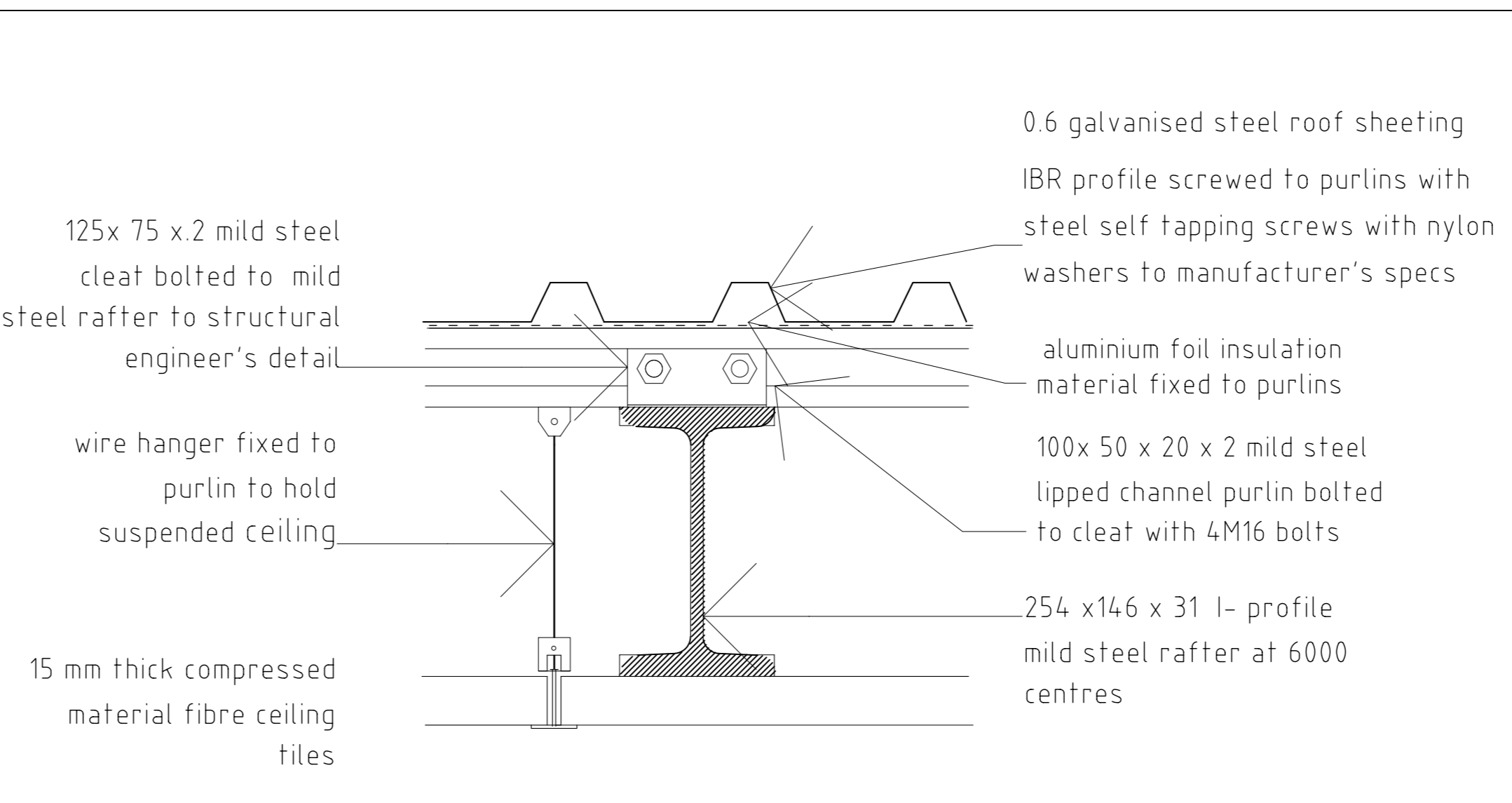
WALL SECTION 2 SCALE 1:20



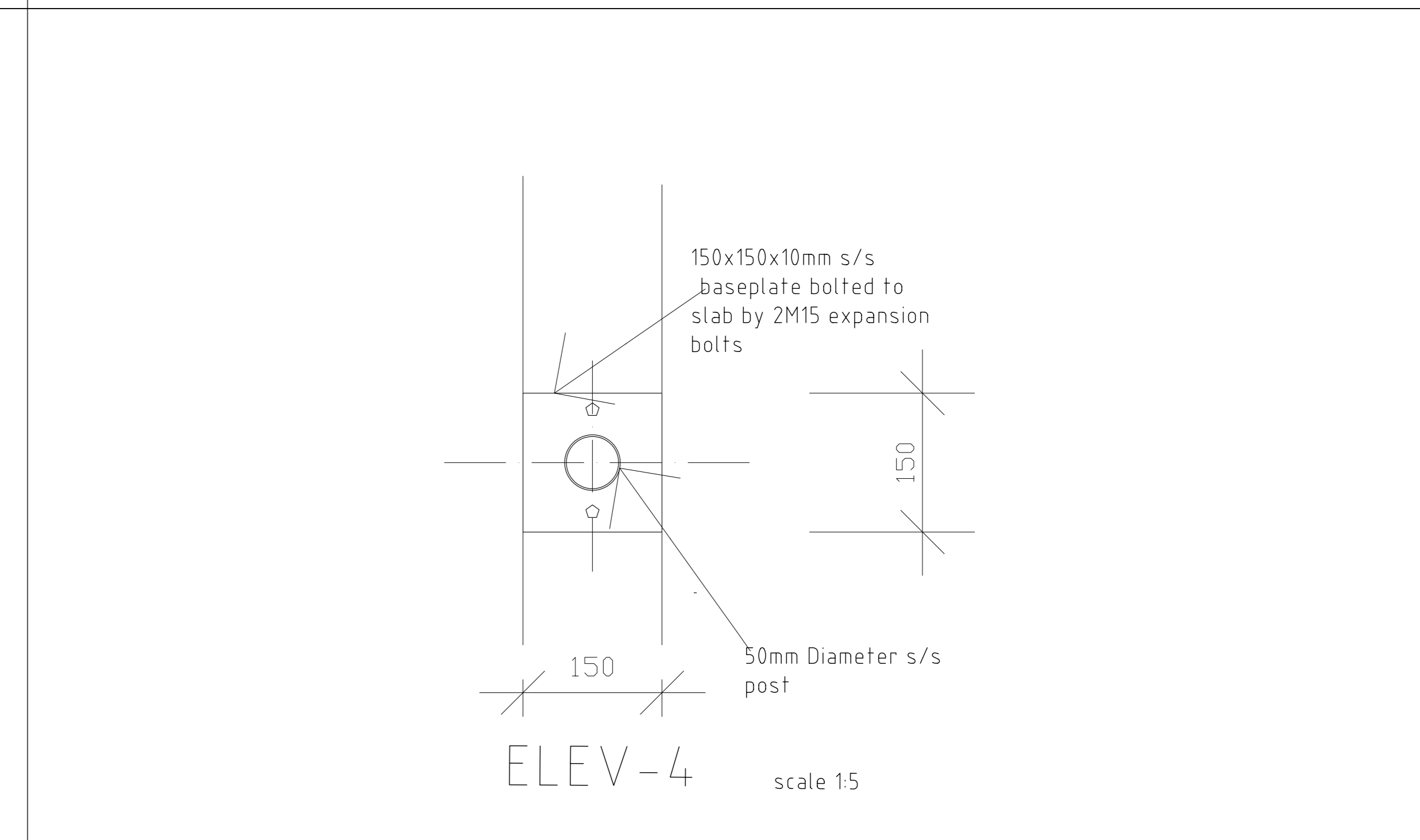
DETAIL 2-5 scale 1:10



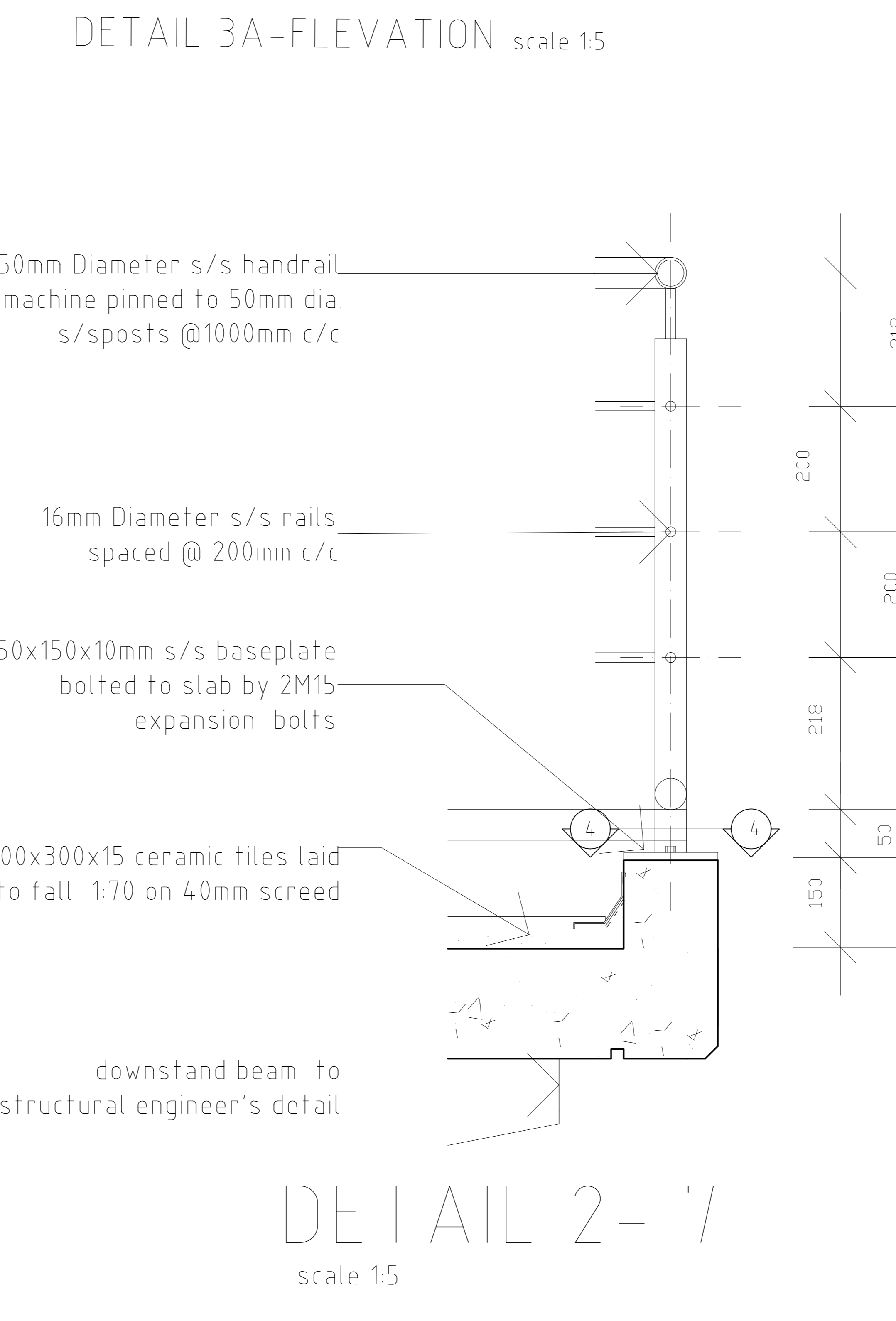
DETAIL 3-PLAN scale 1:5



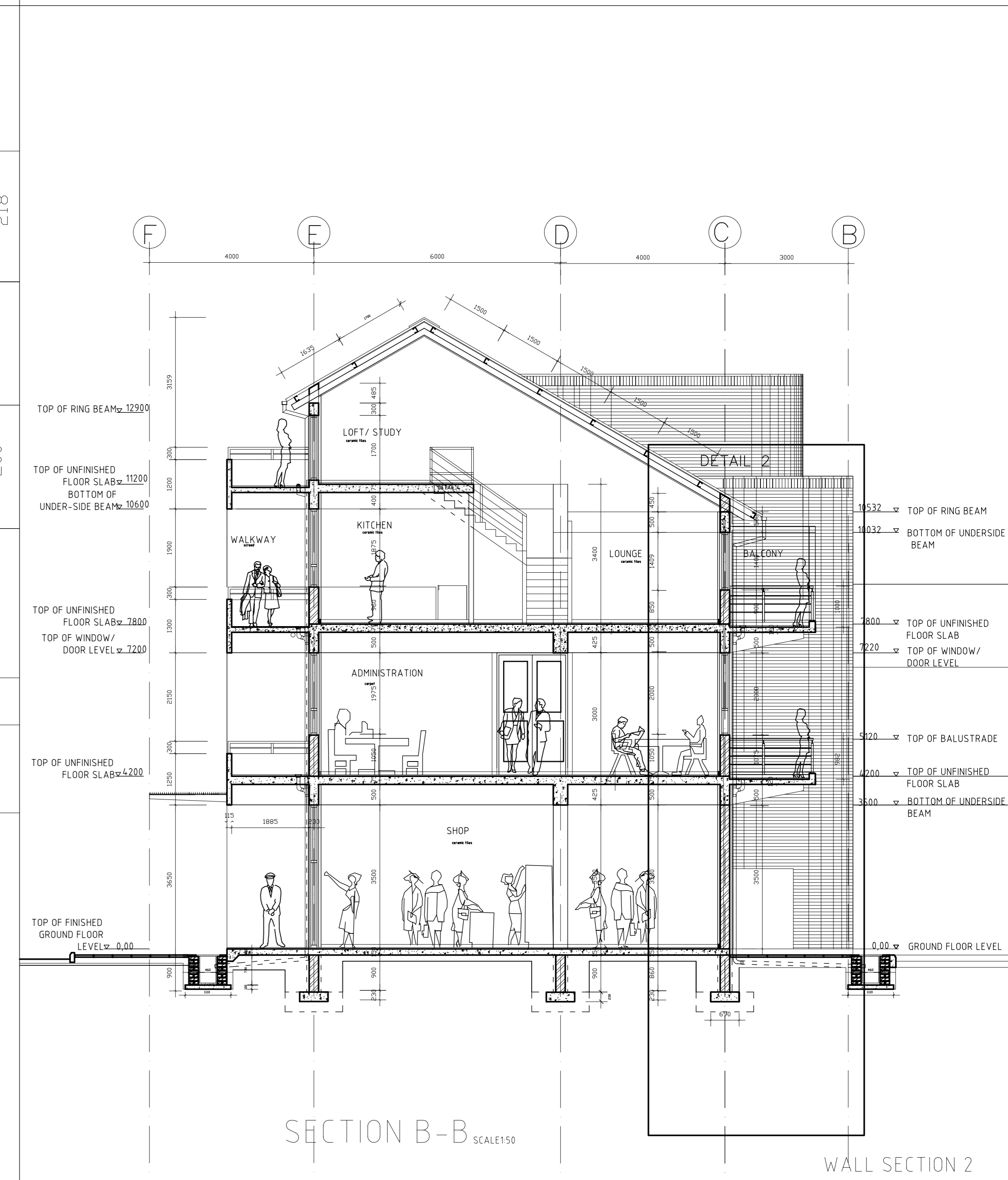
DETAIL 3A-ELEVATION scale 1:5



ELEV-4 scale 1:5

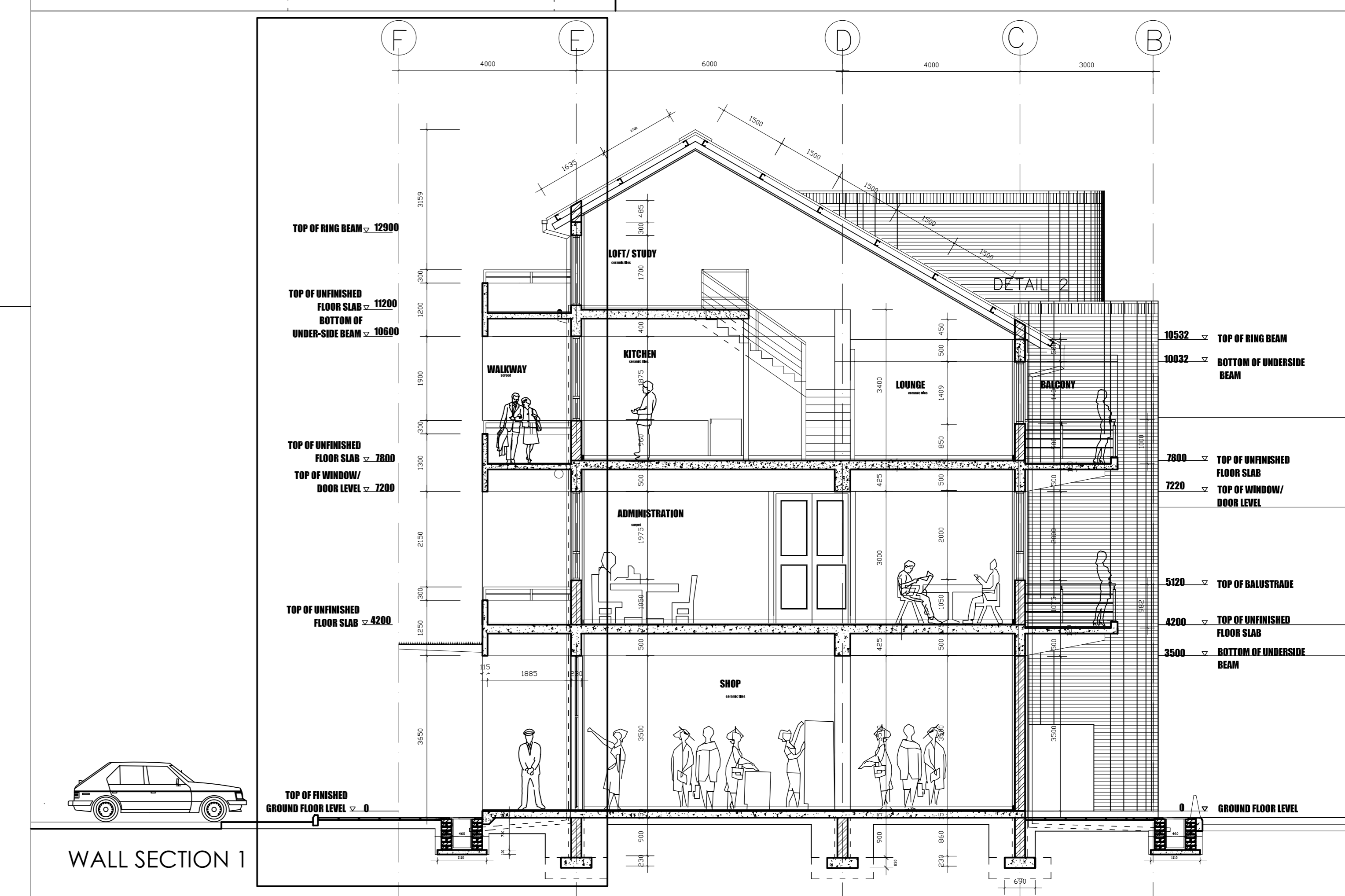
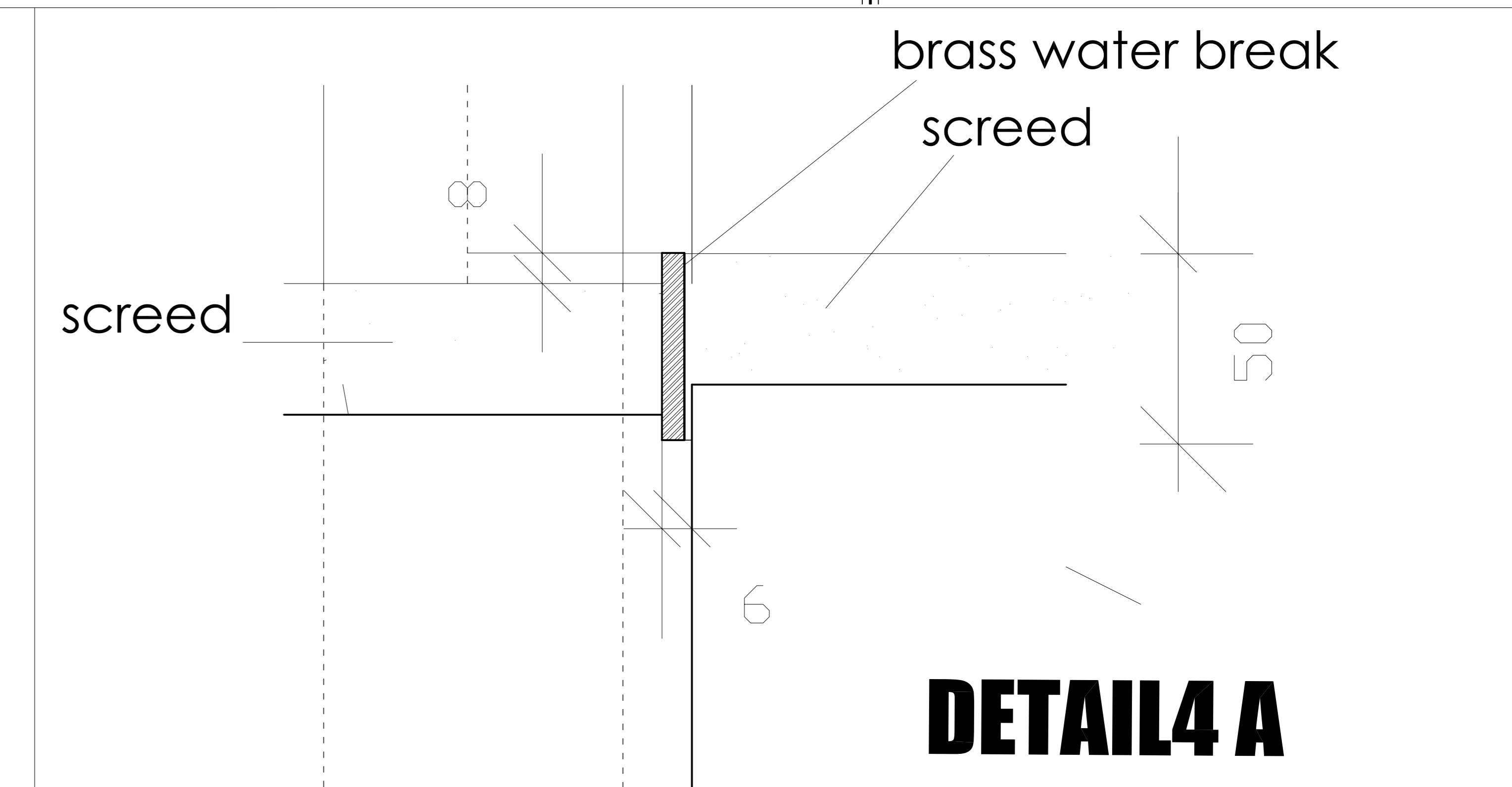
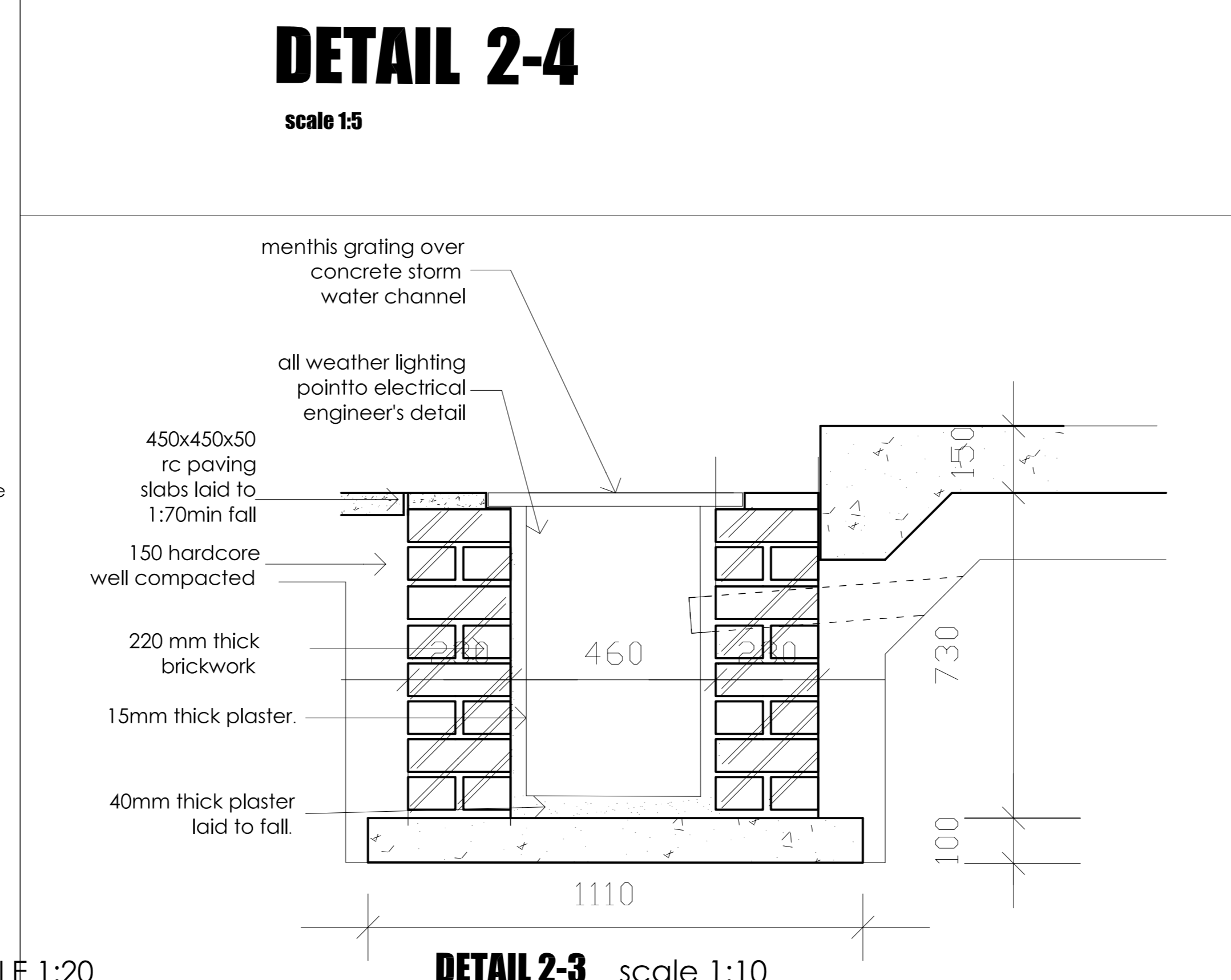
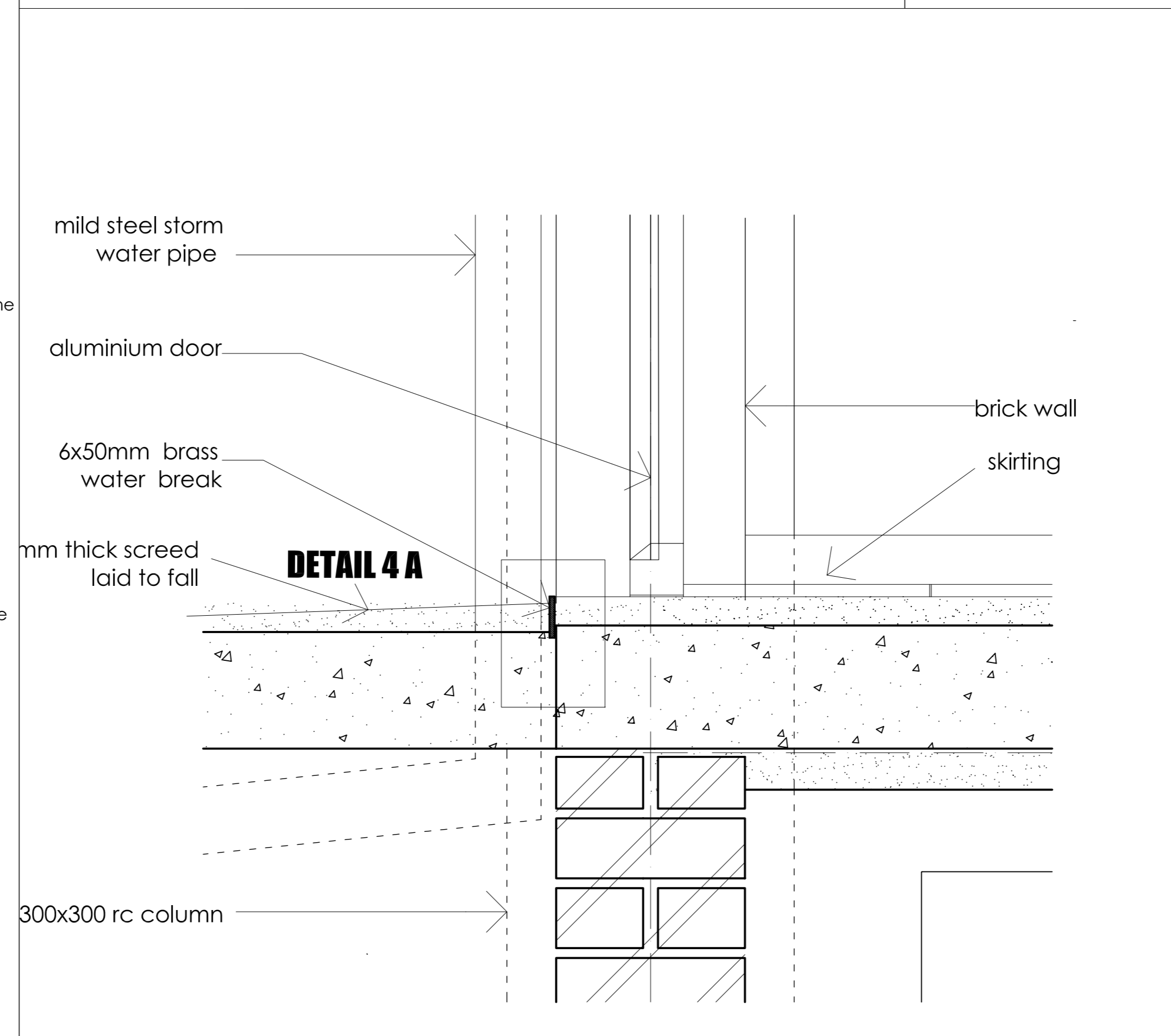
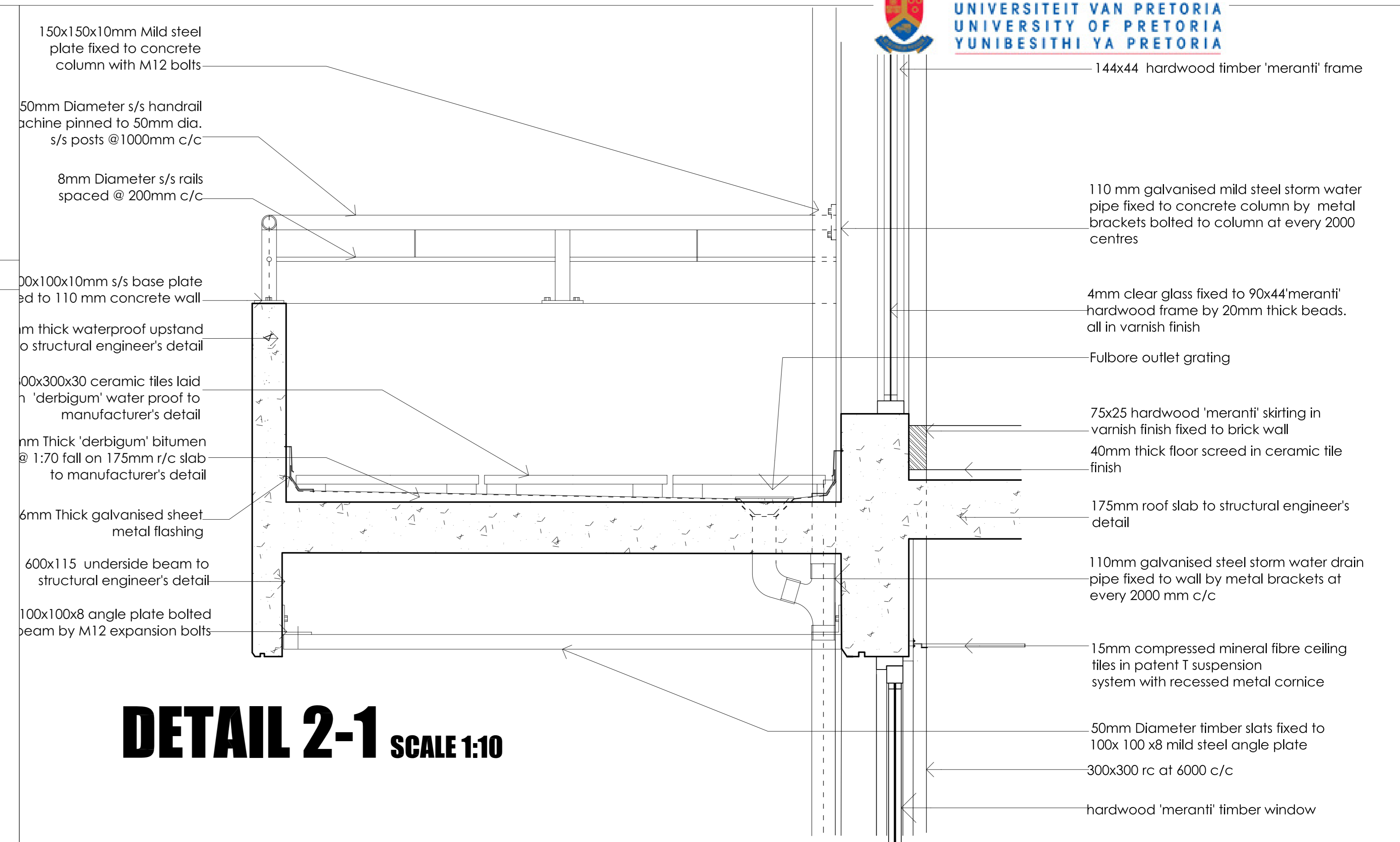
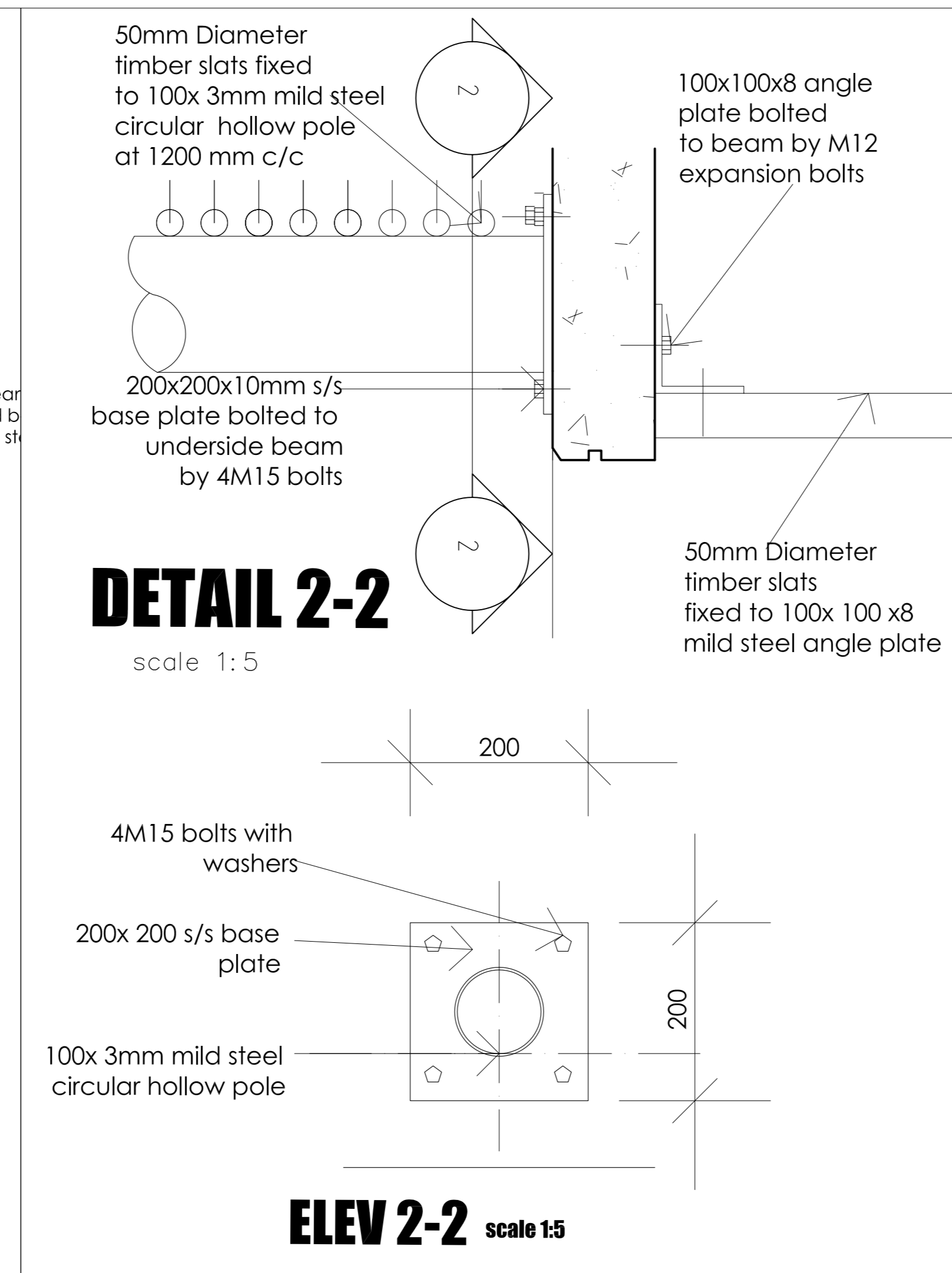
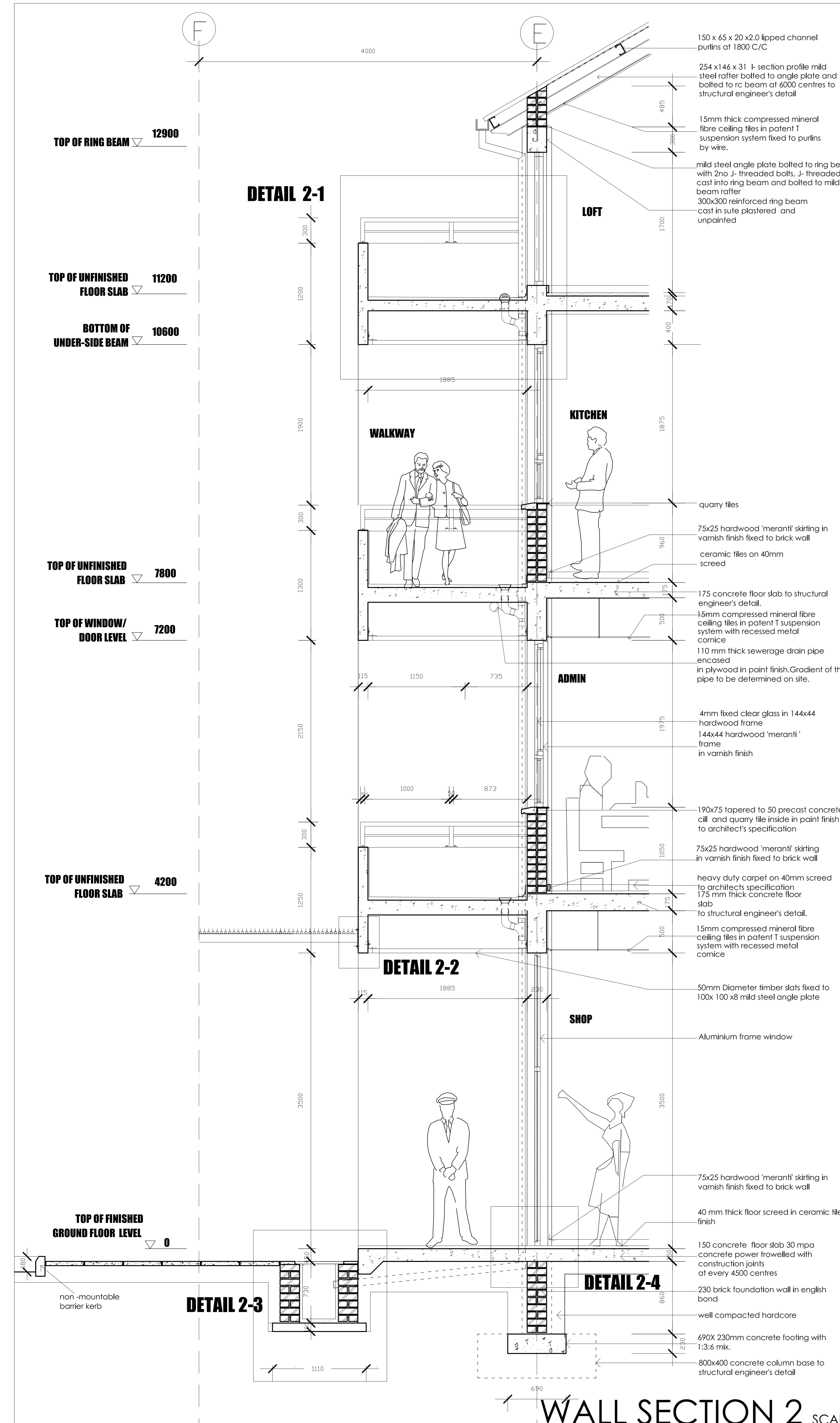


DETAIL 2-7 scale 1:5

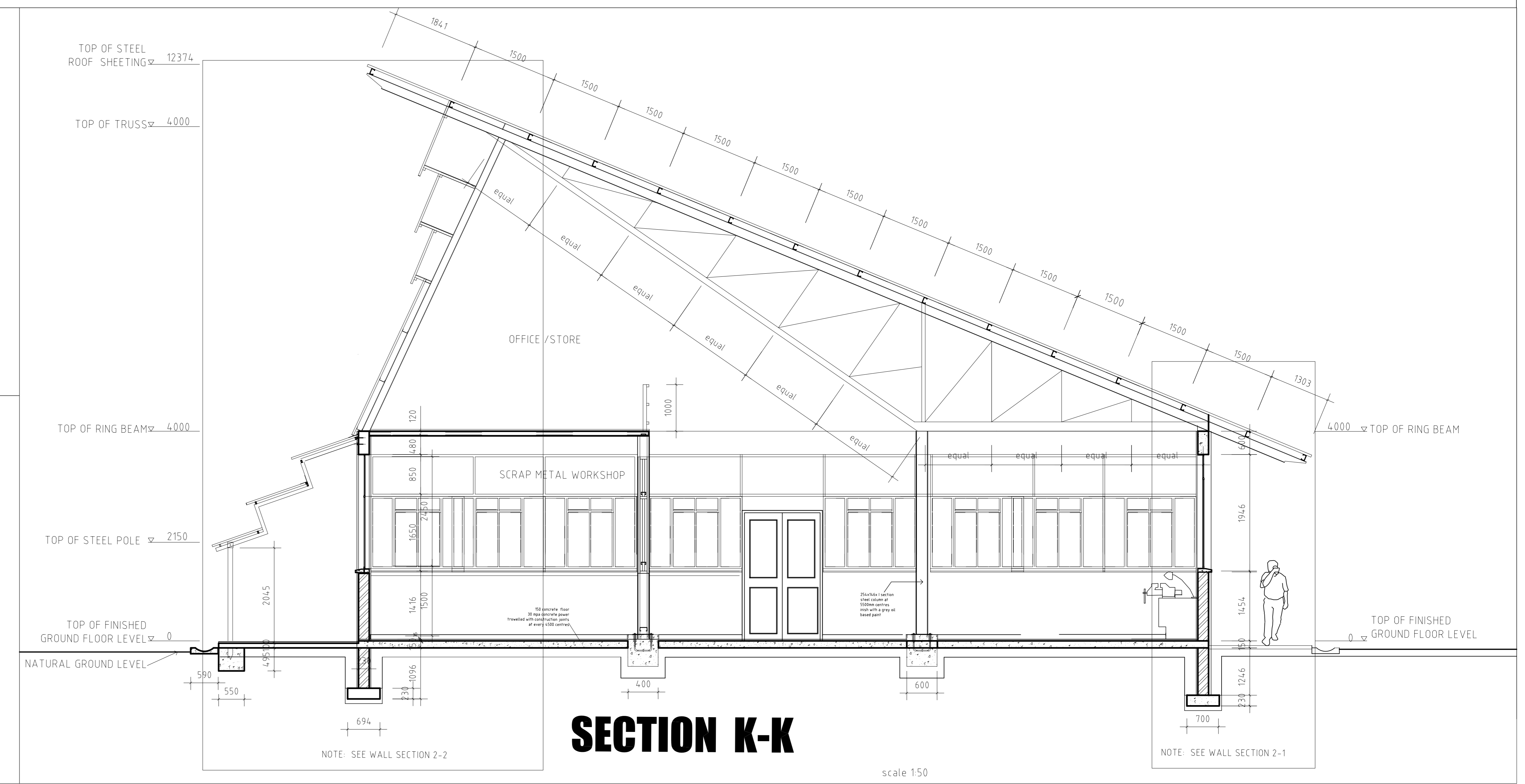
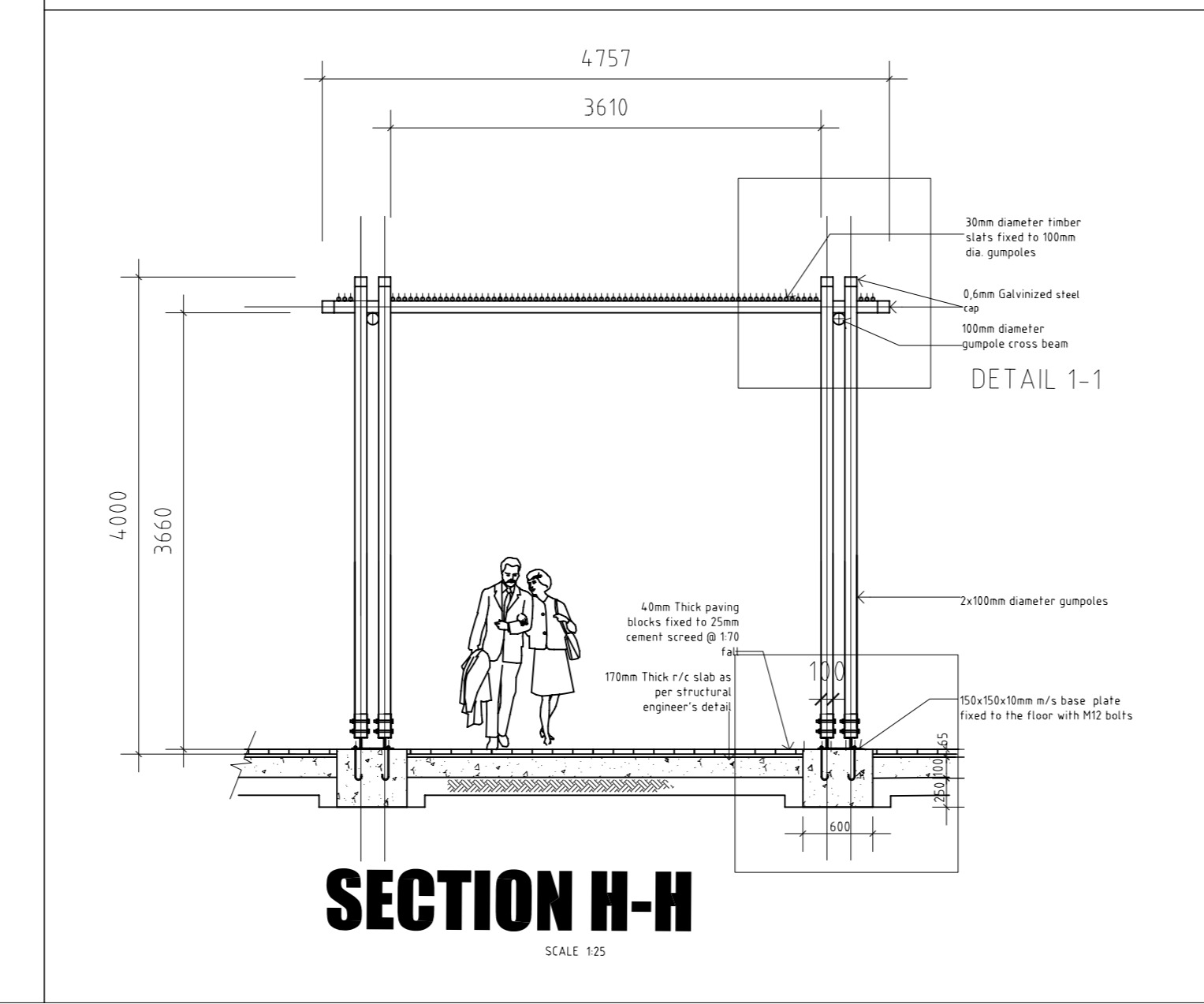
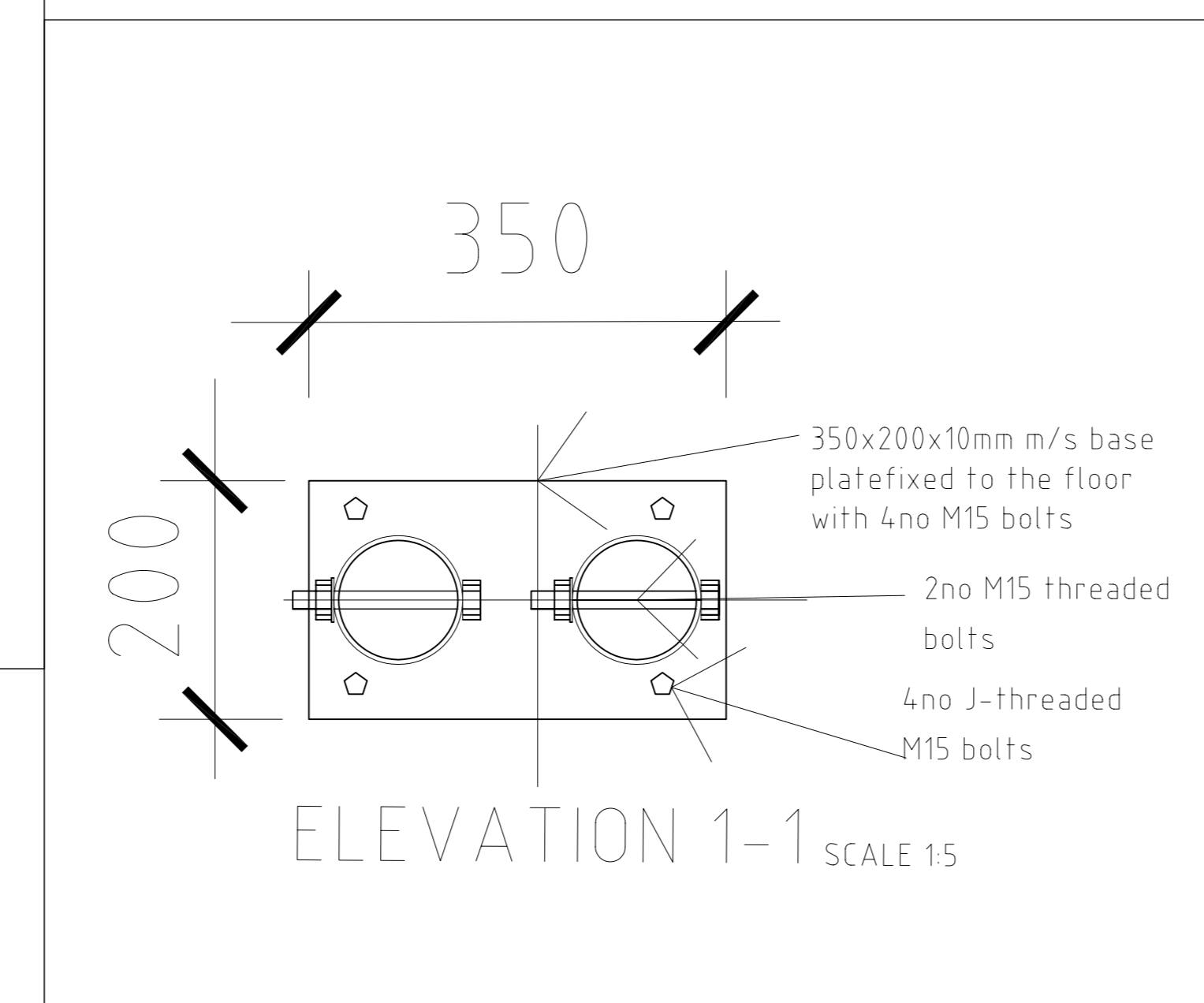
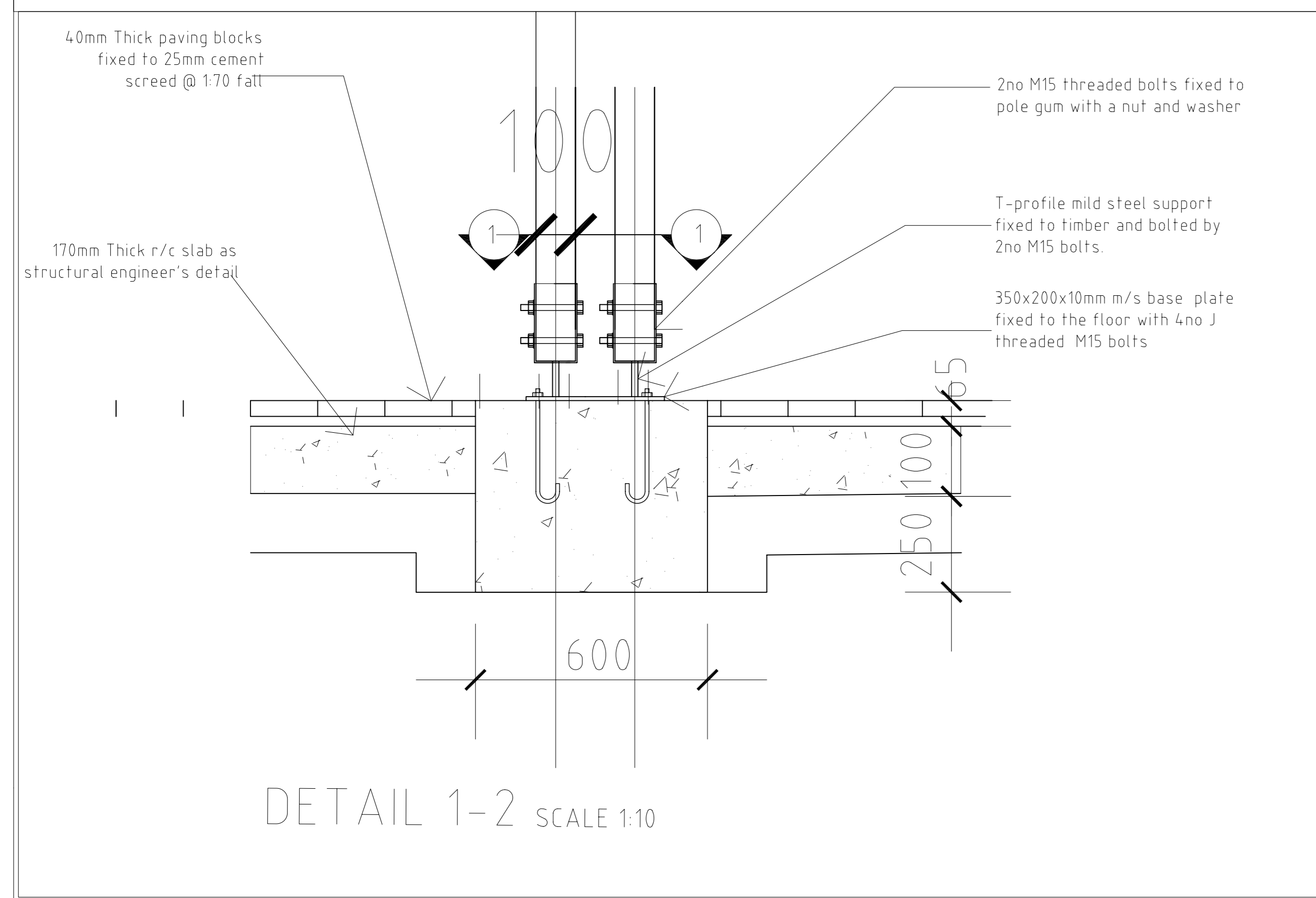
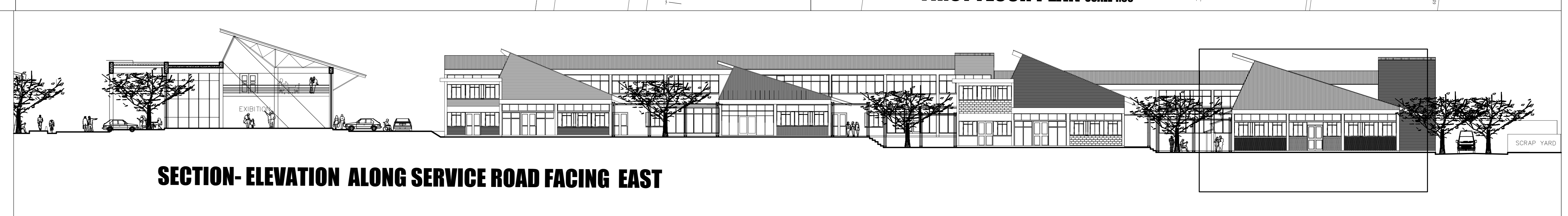
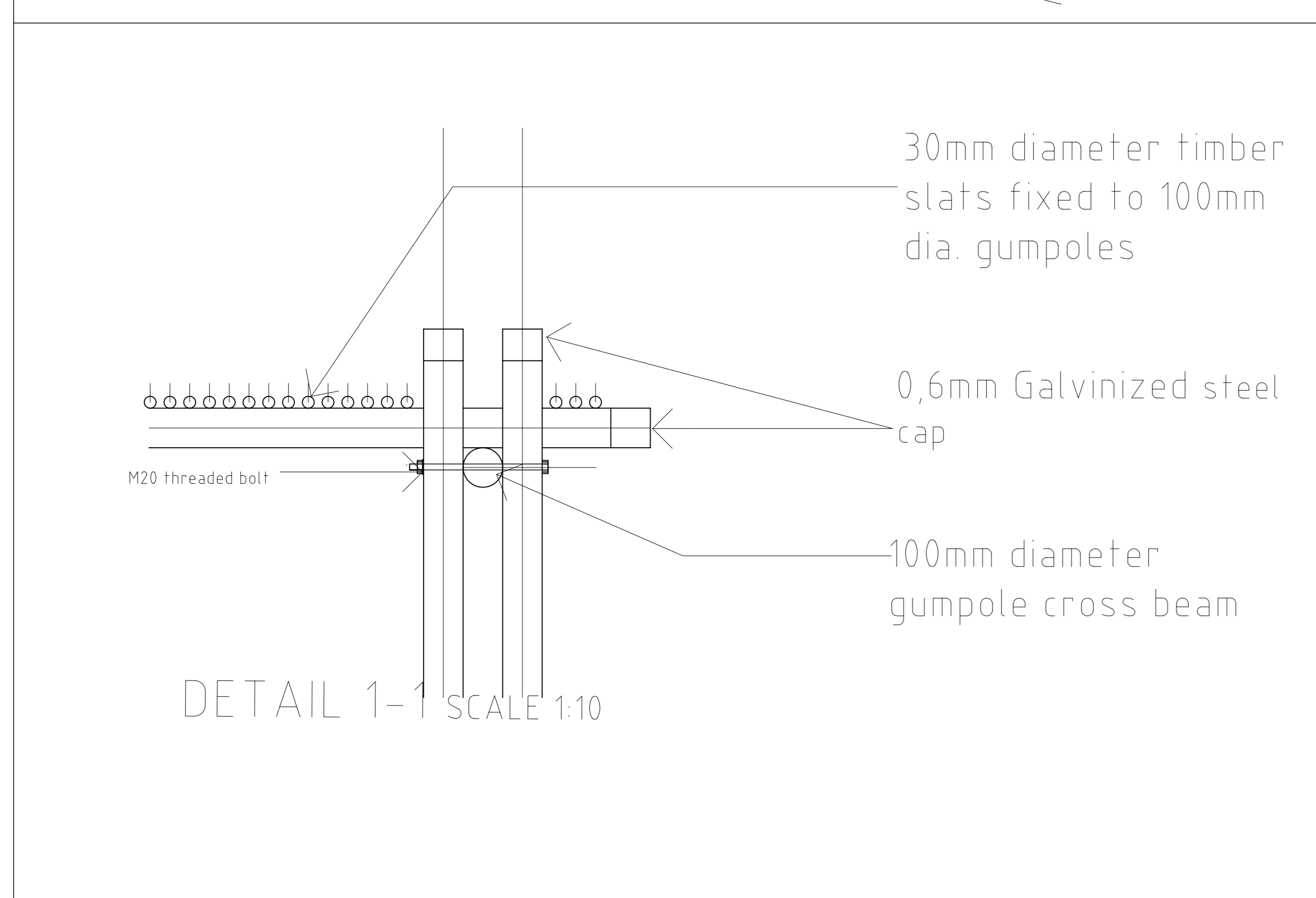
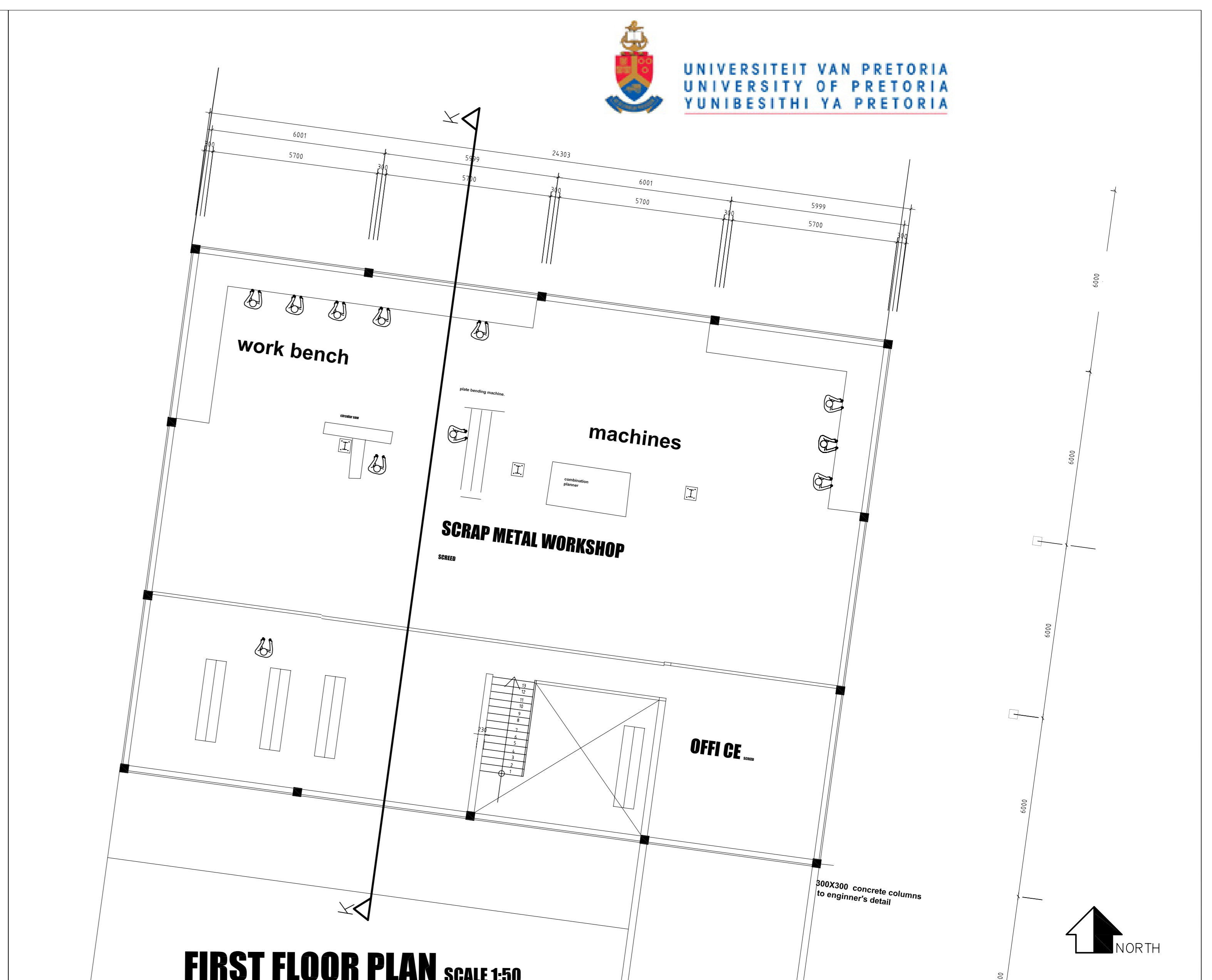
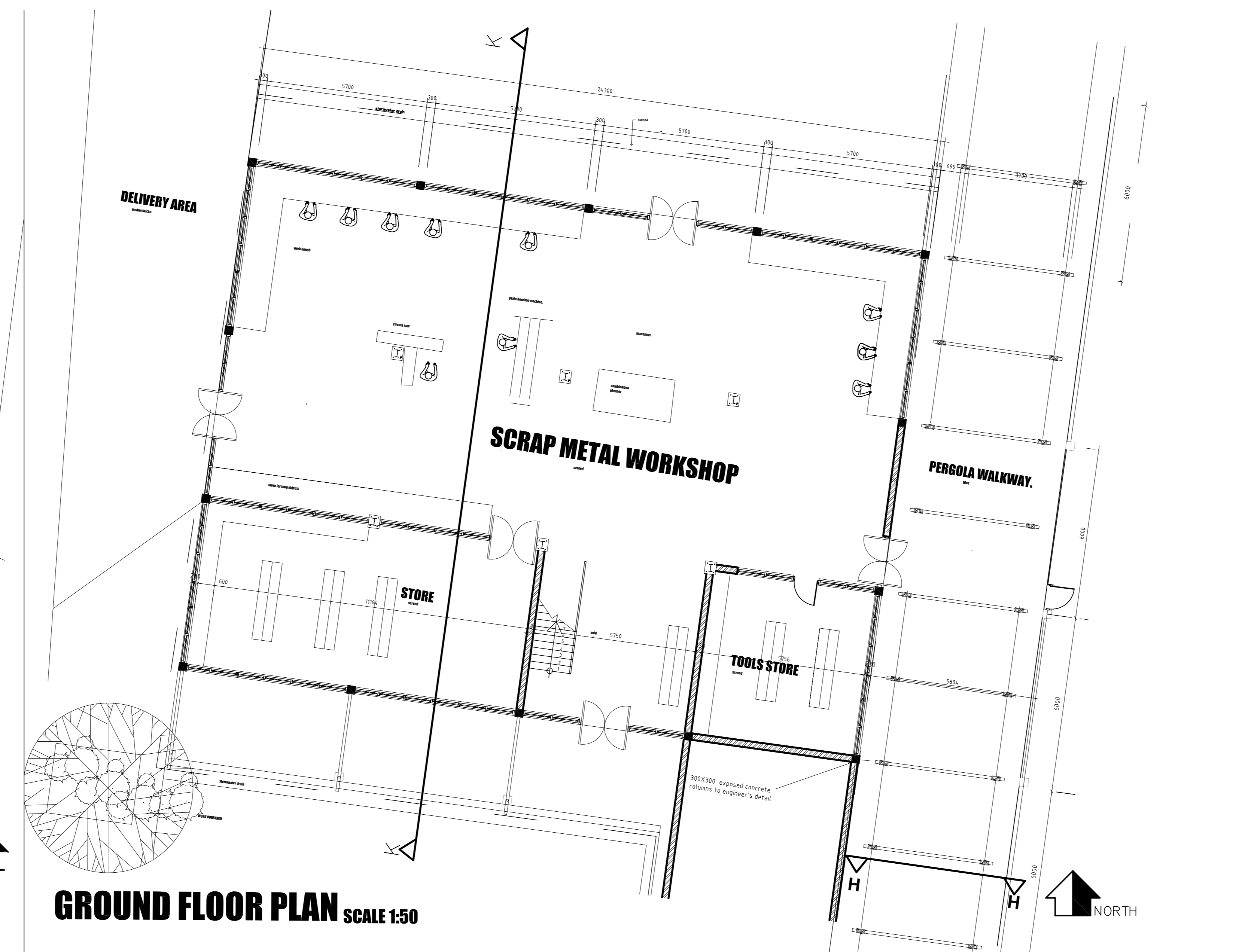


SECTION B-B SCALE 1:50

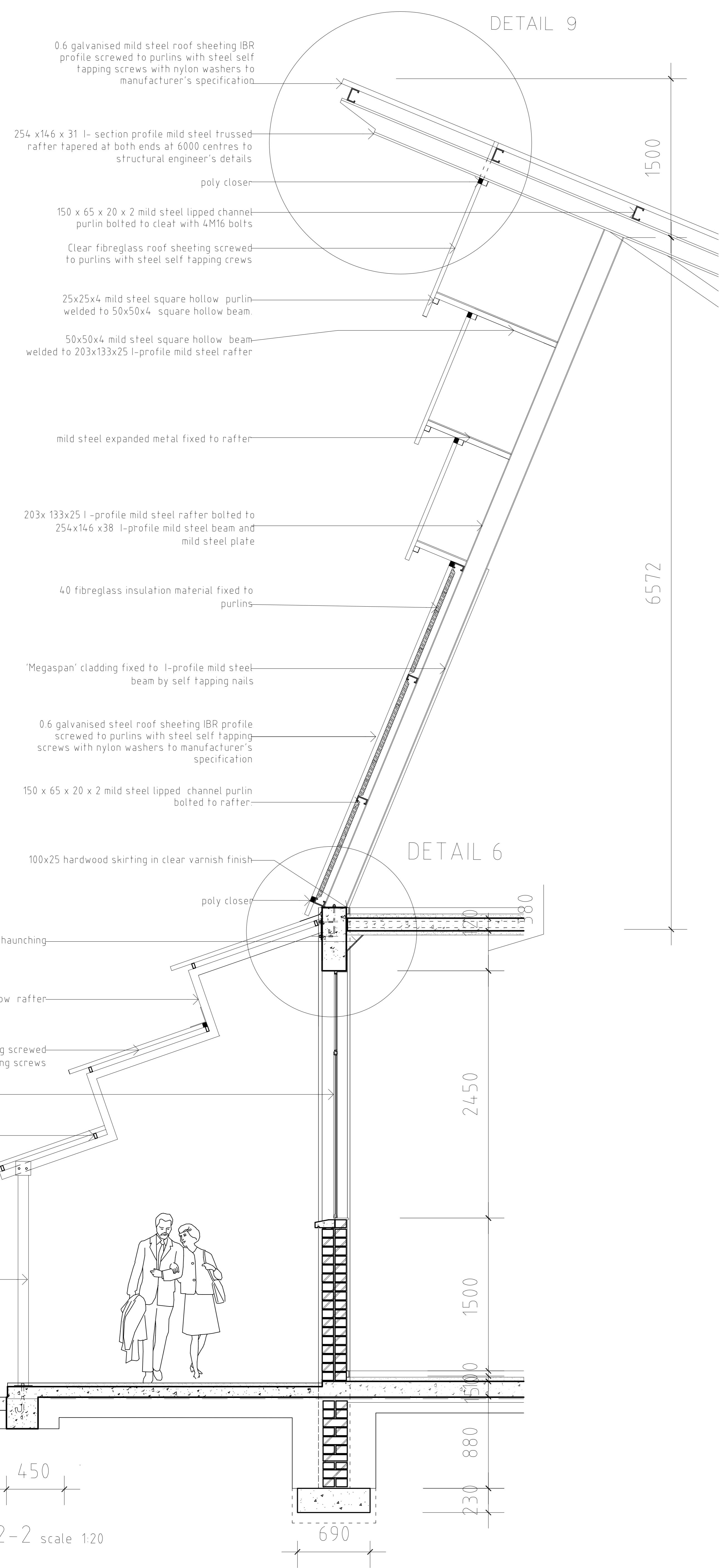




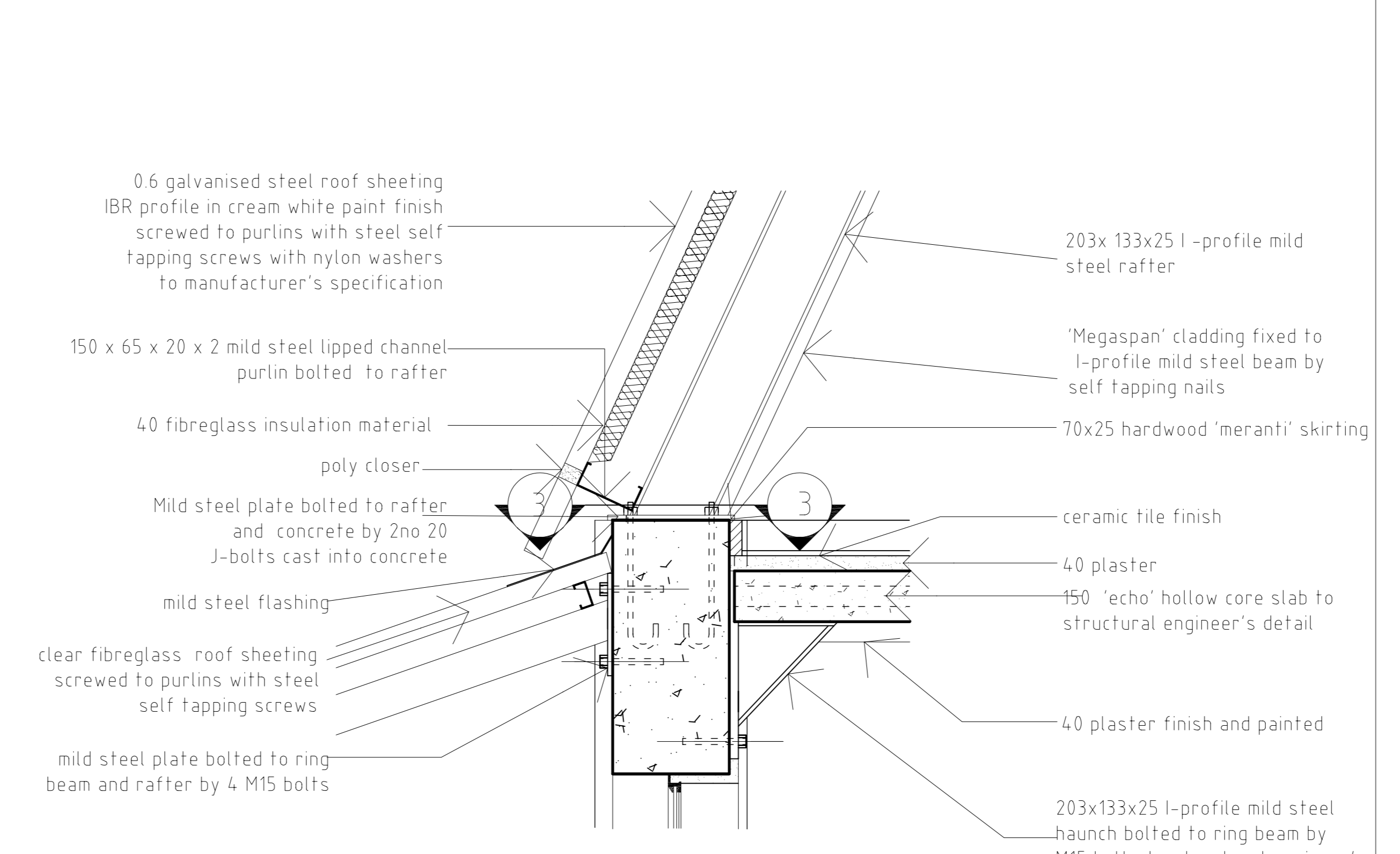




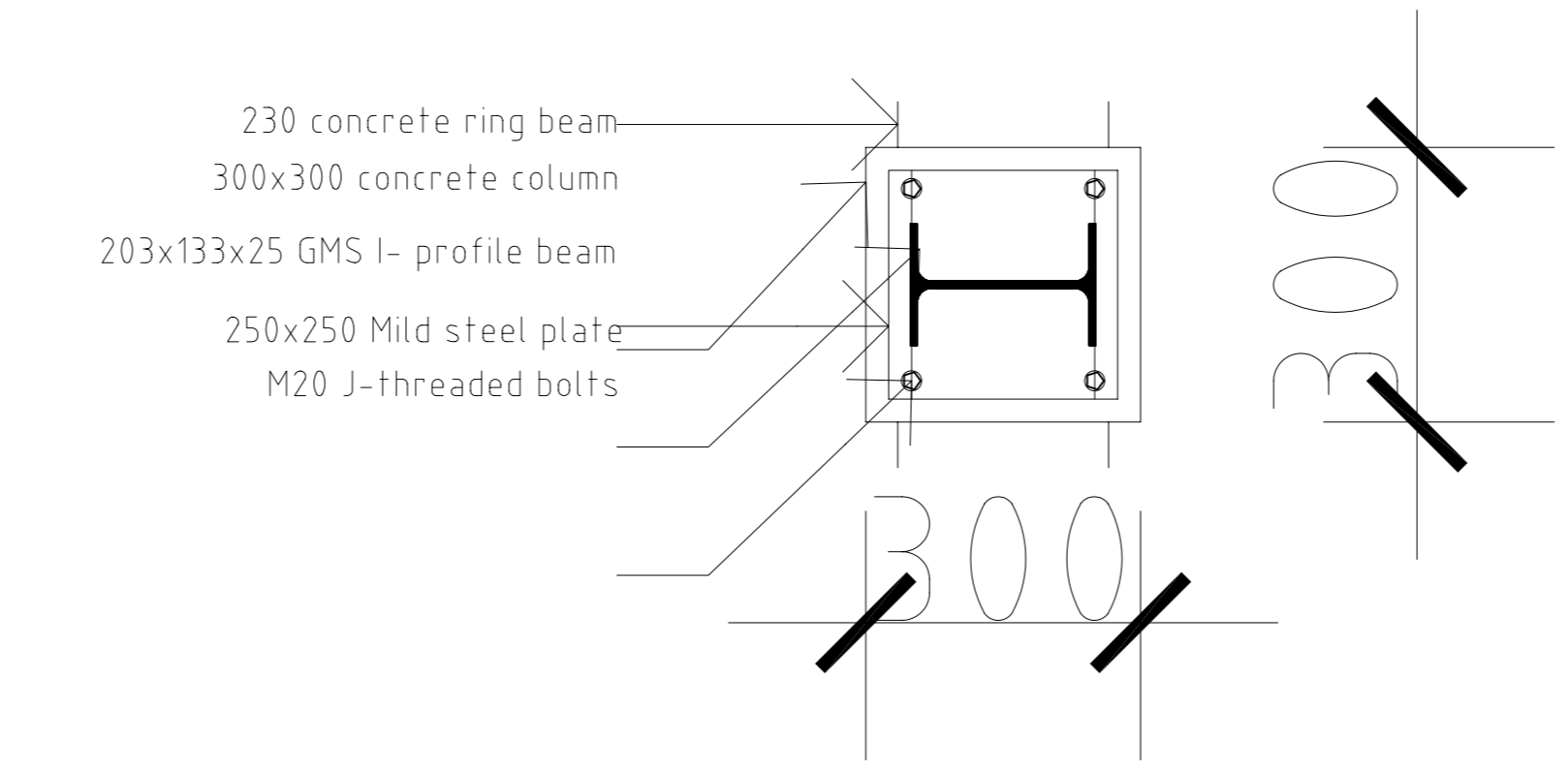




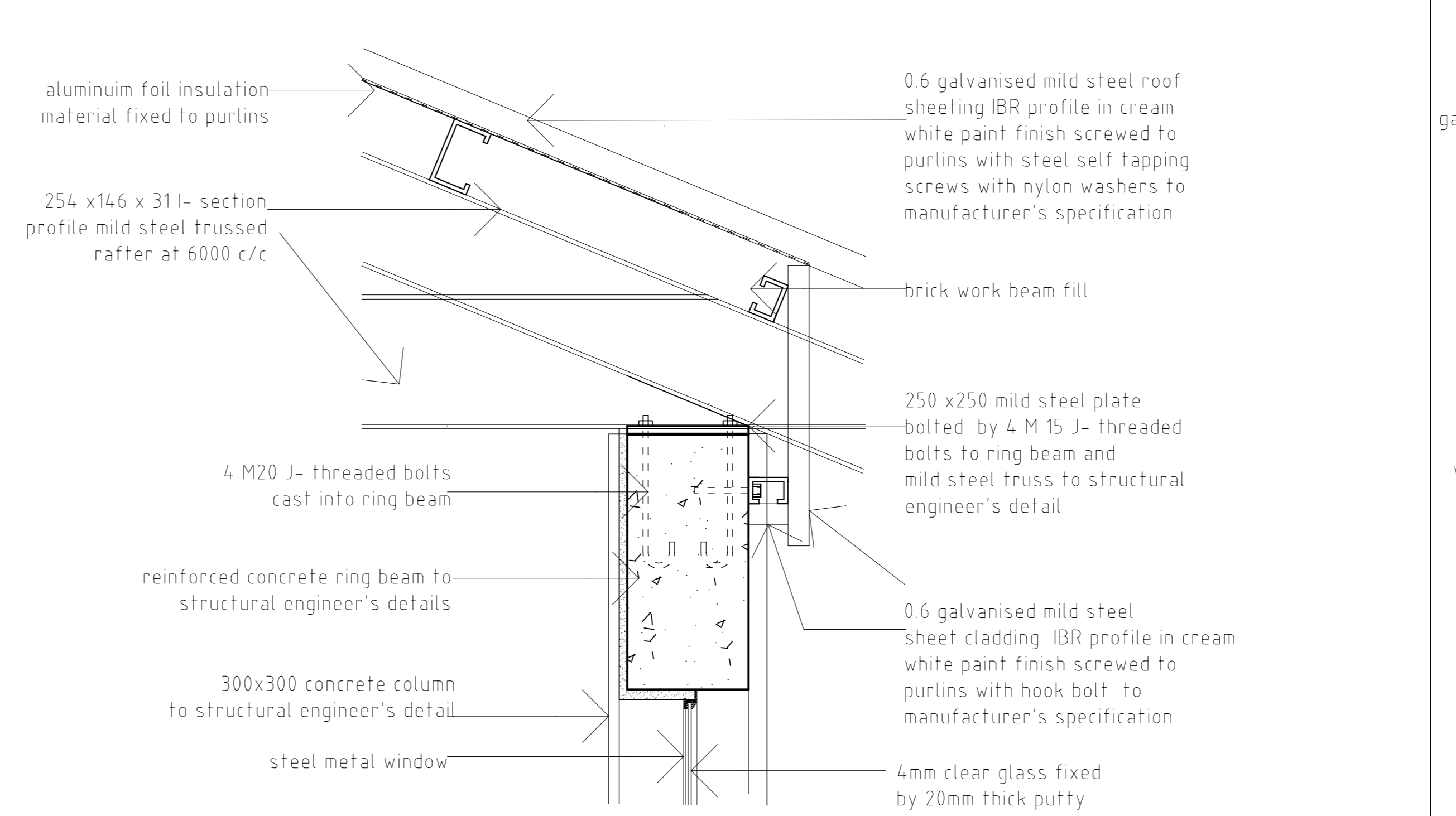
WALL SECTION 2-2 scale 1:20



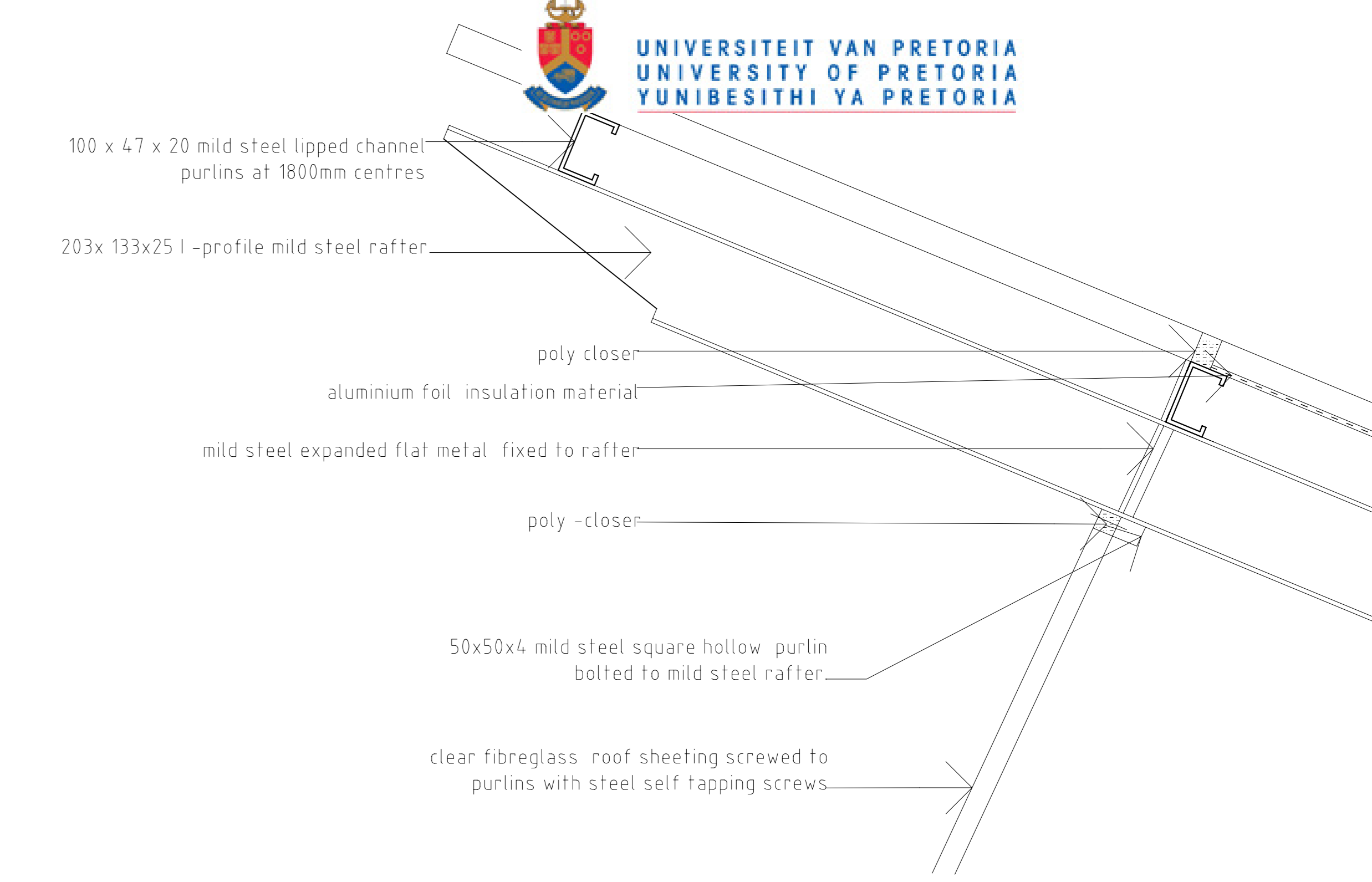
DETAIL 6 scale 1:10



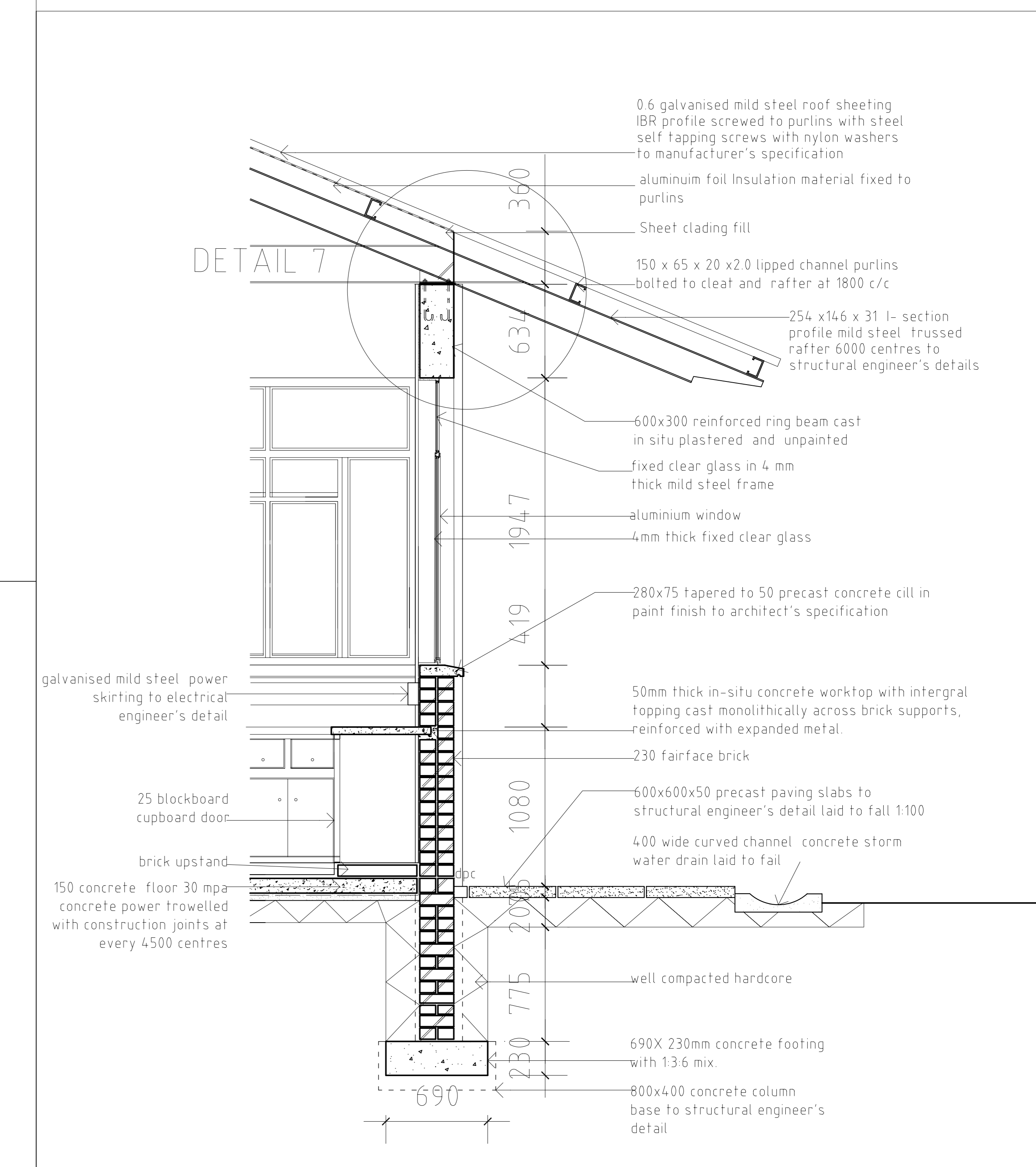
ELEVATION 3-3



DETAIL 7 scale 1:10

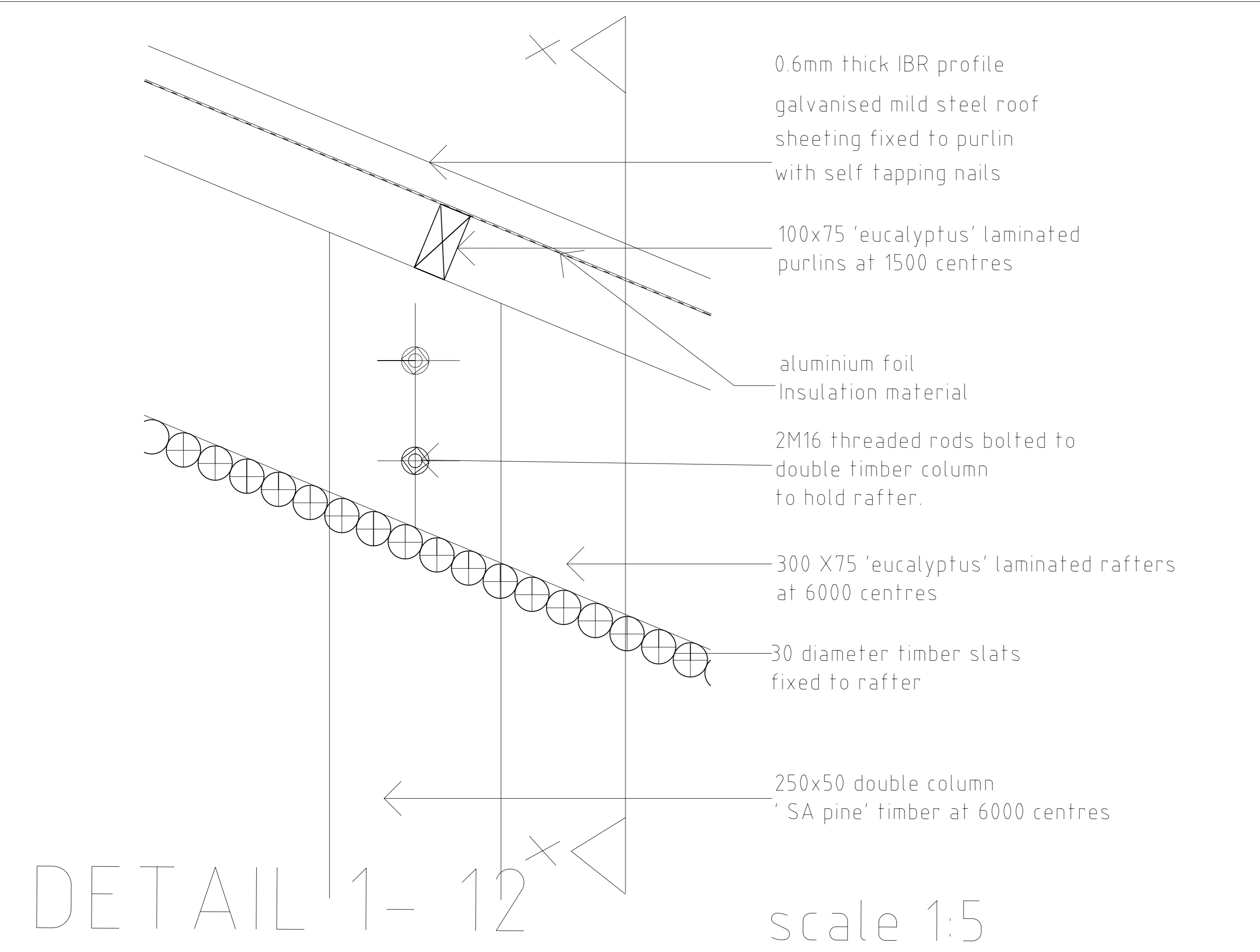


DETAIL 9 SCALE 1:10

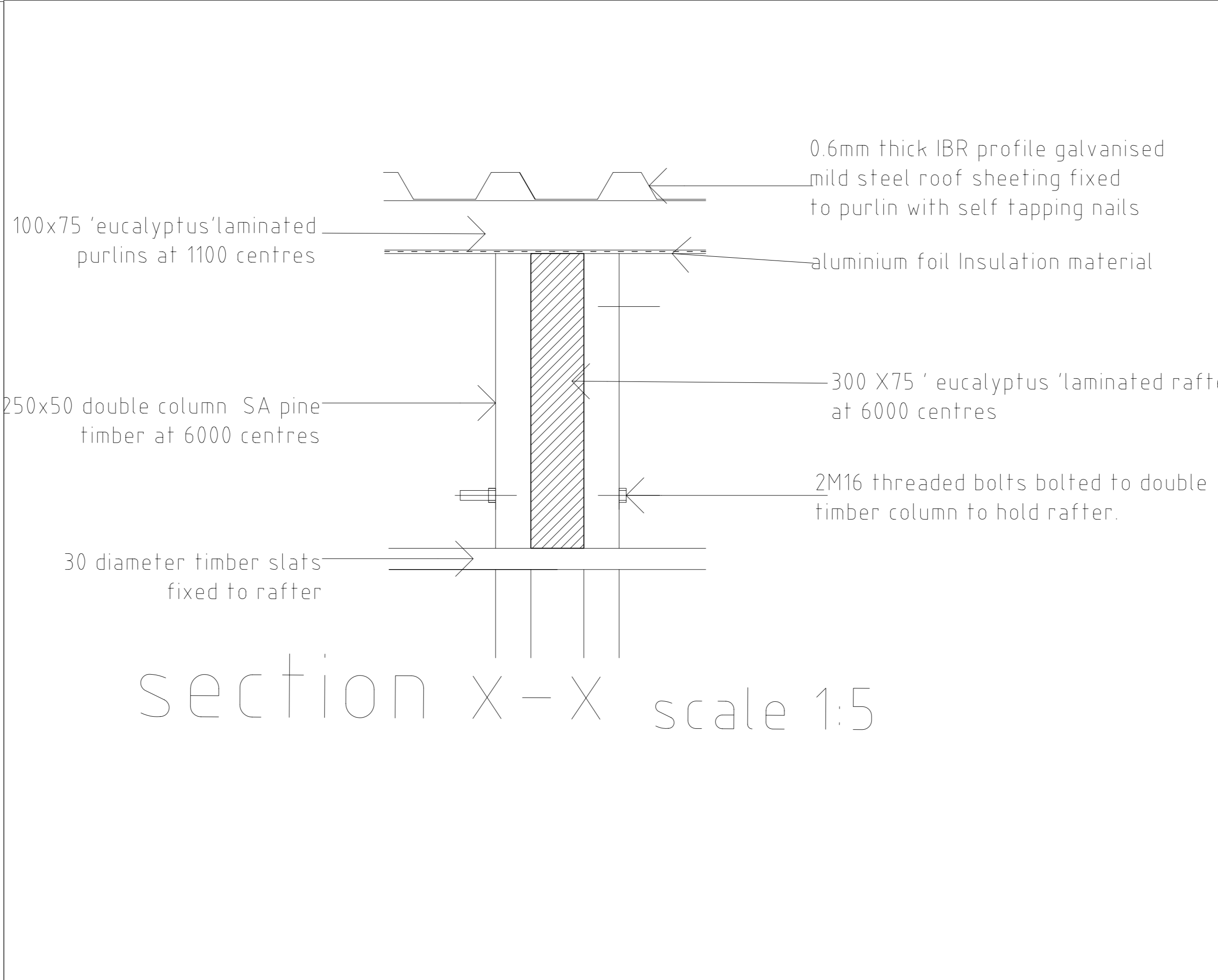


WALL SECTION 2-2 scale 1:20

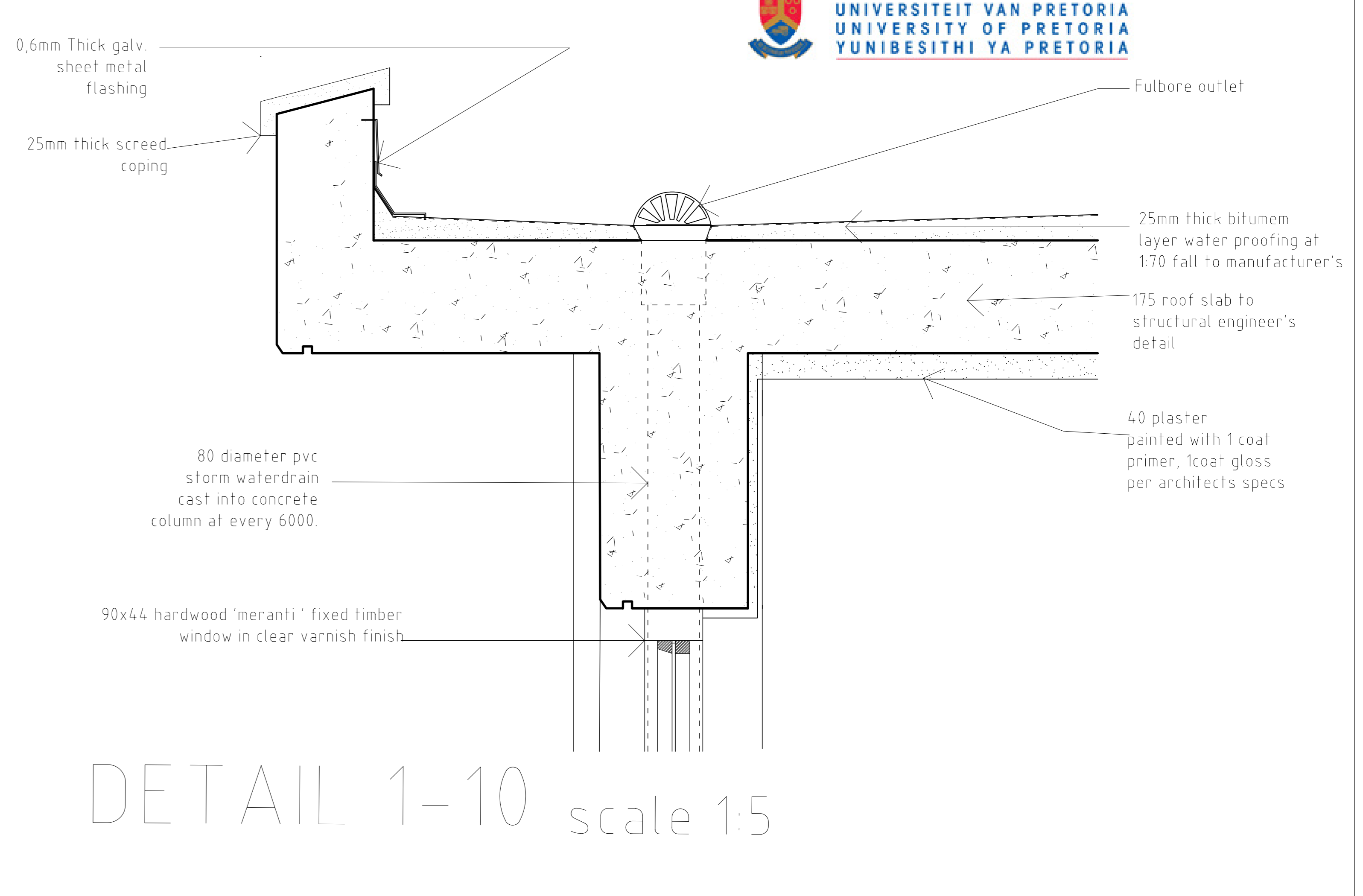




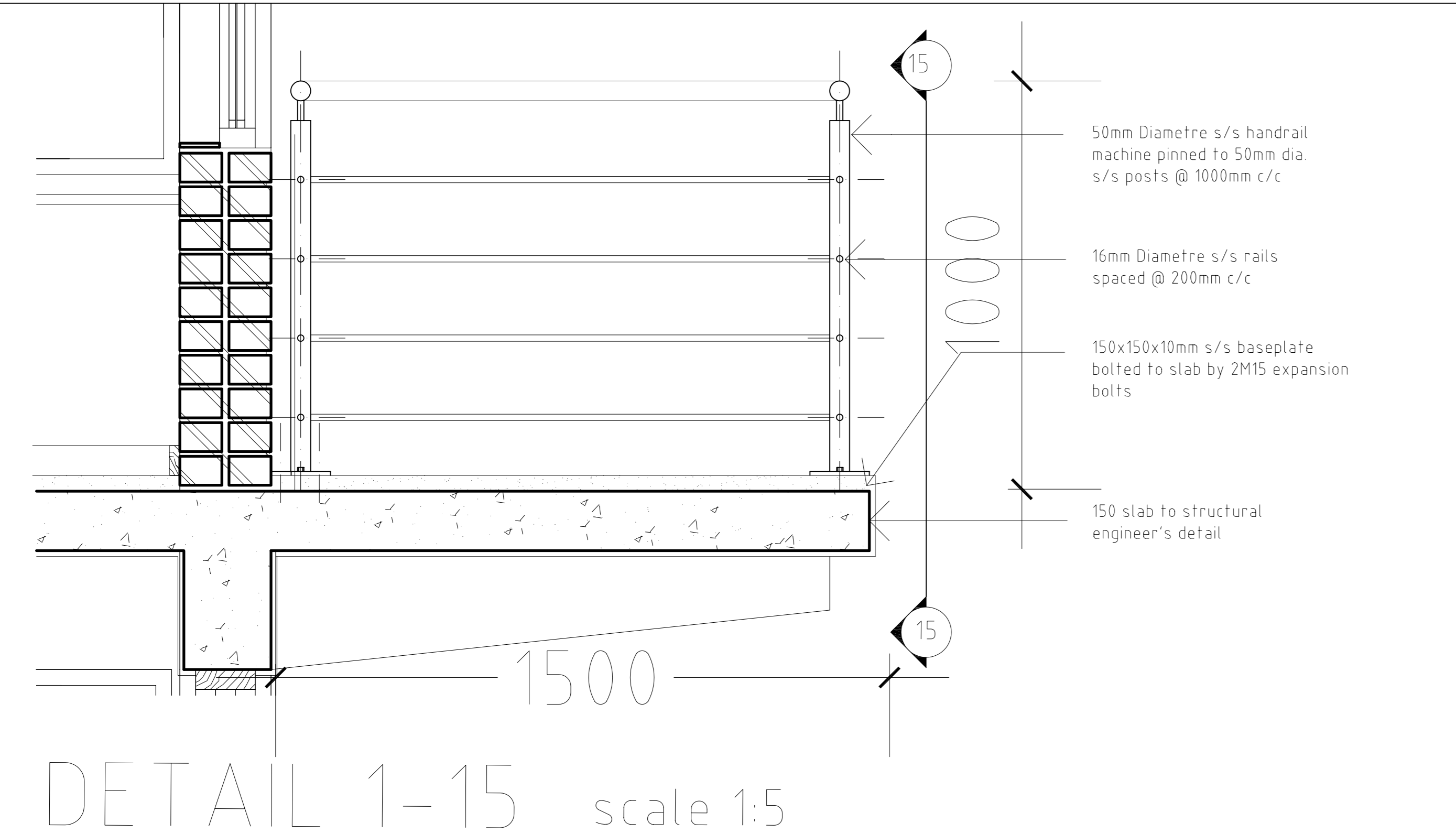
DETAIL 1-12 scale 1:5



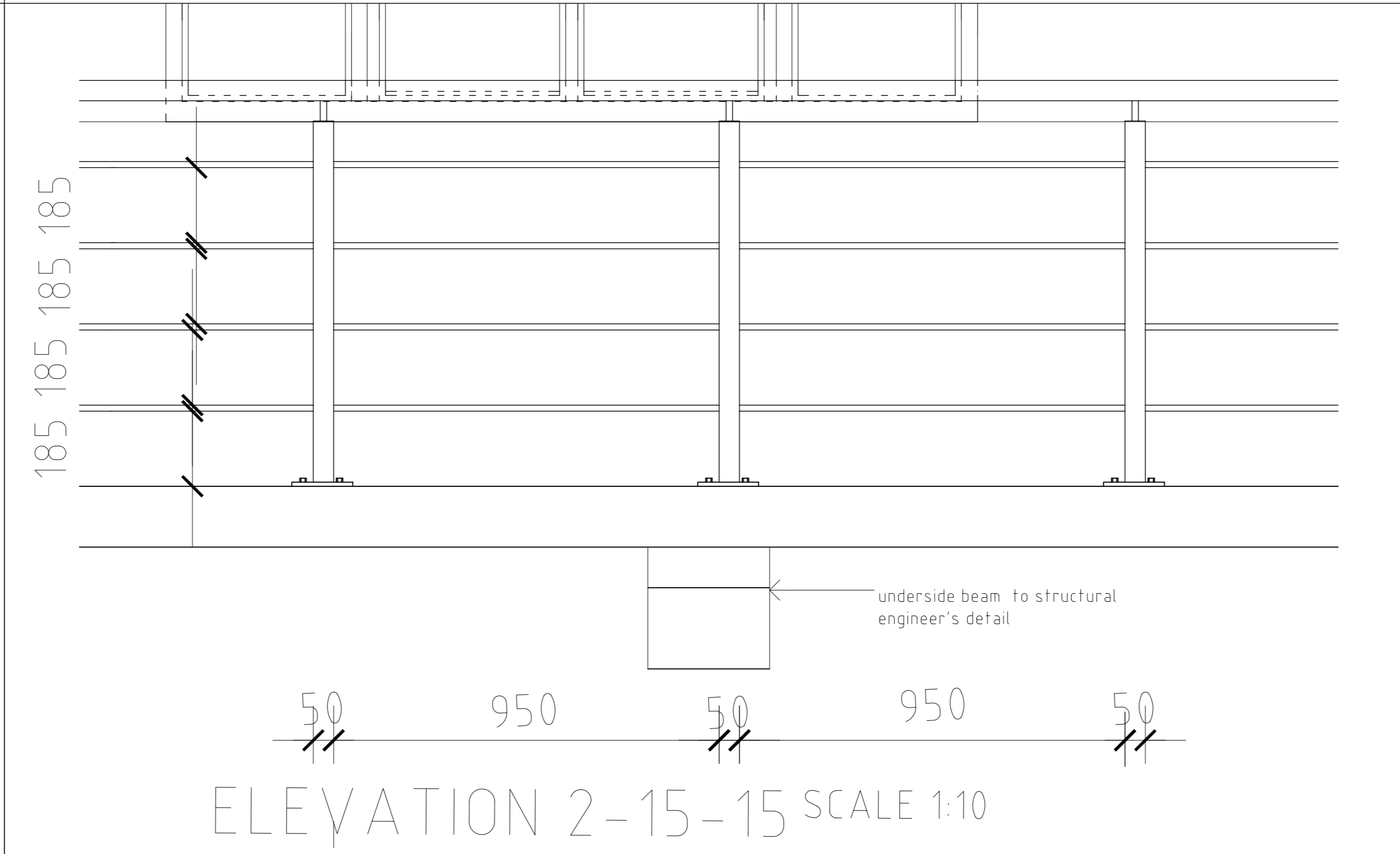
section X-X scale 1:5



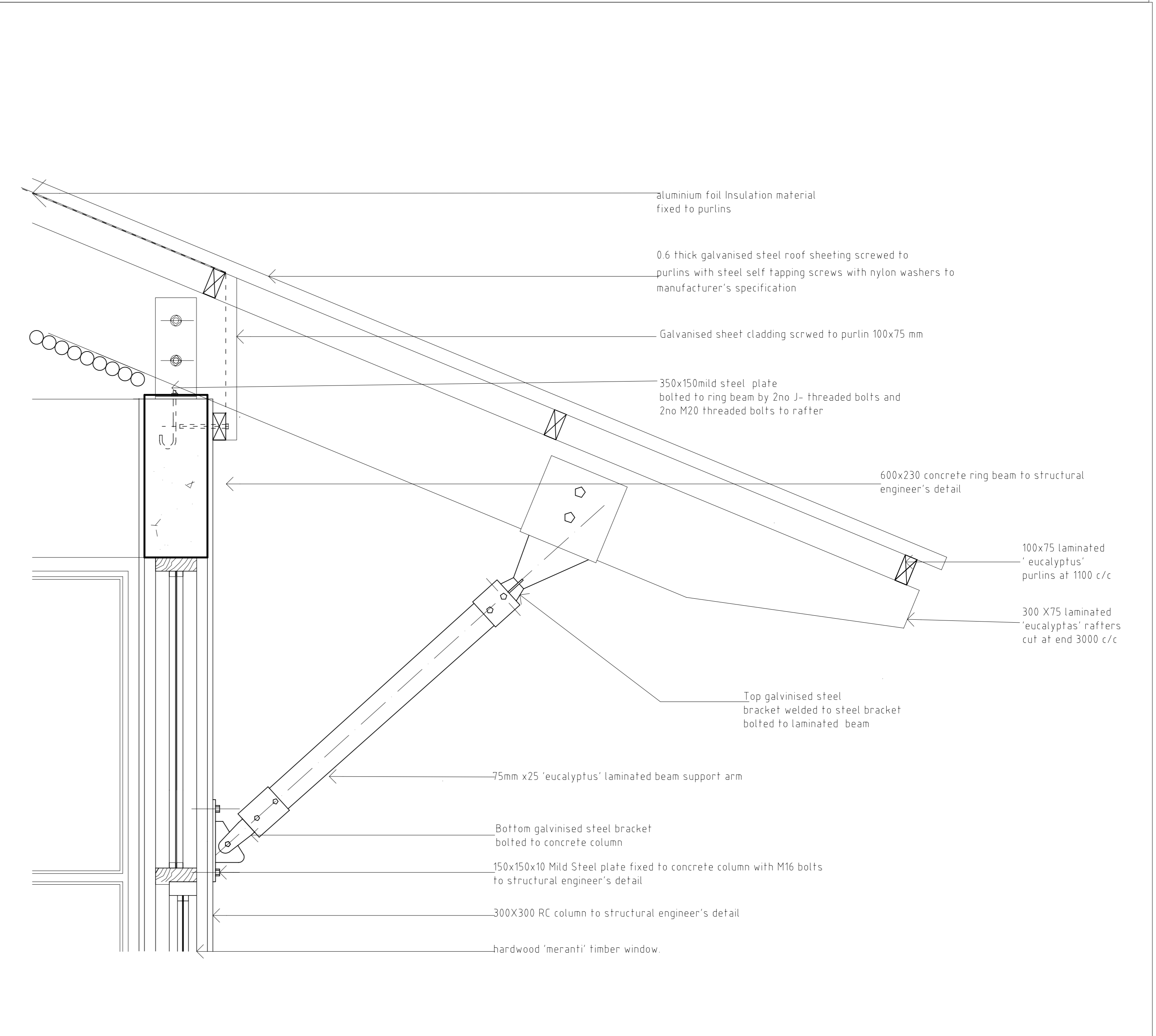
DETAIL 1-10 scale 1:5



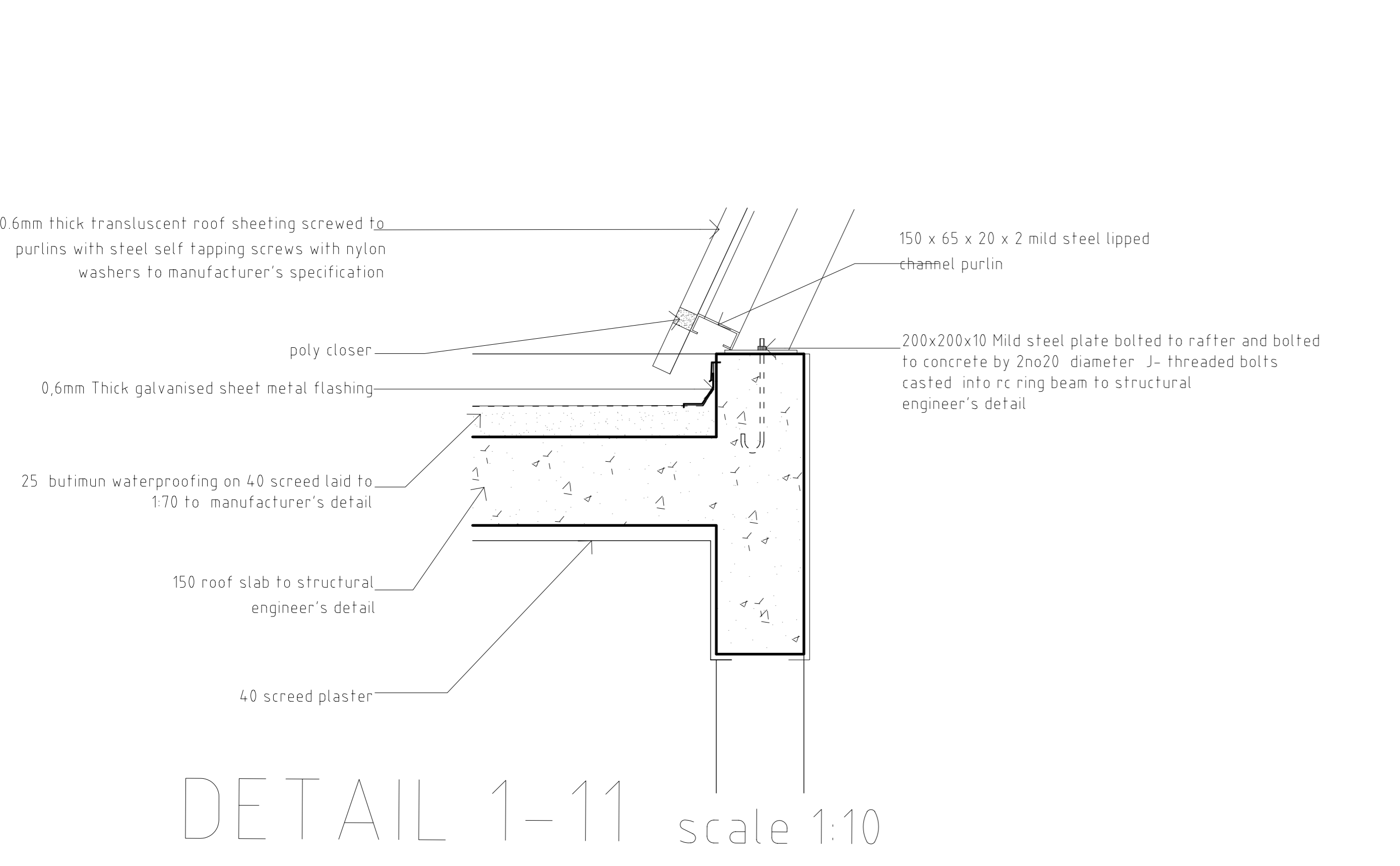
DETAIL 1-15 scale 1:5



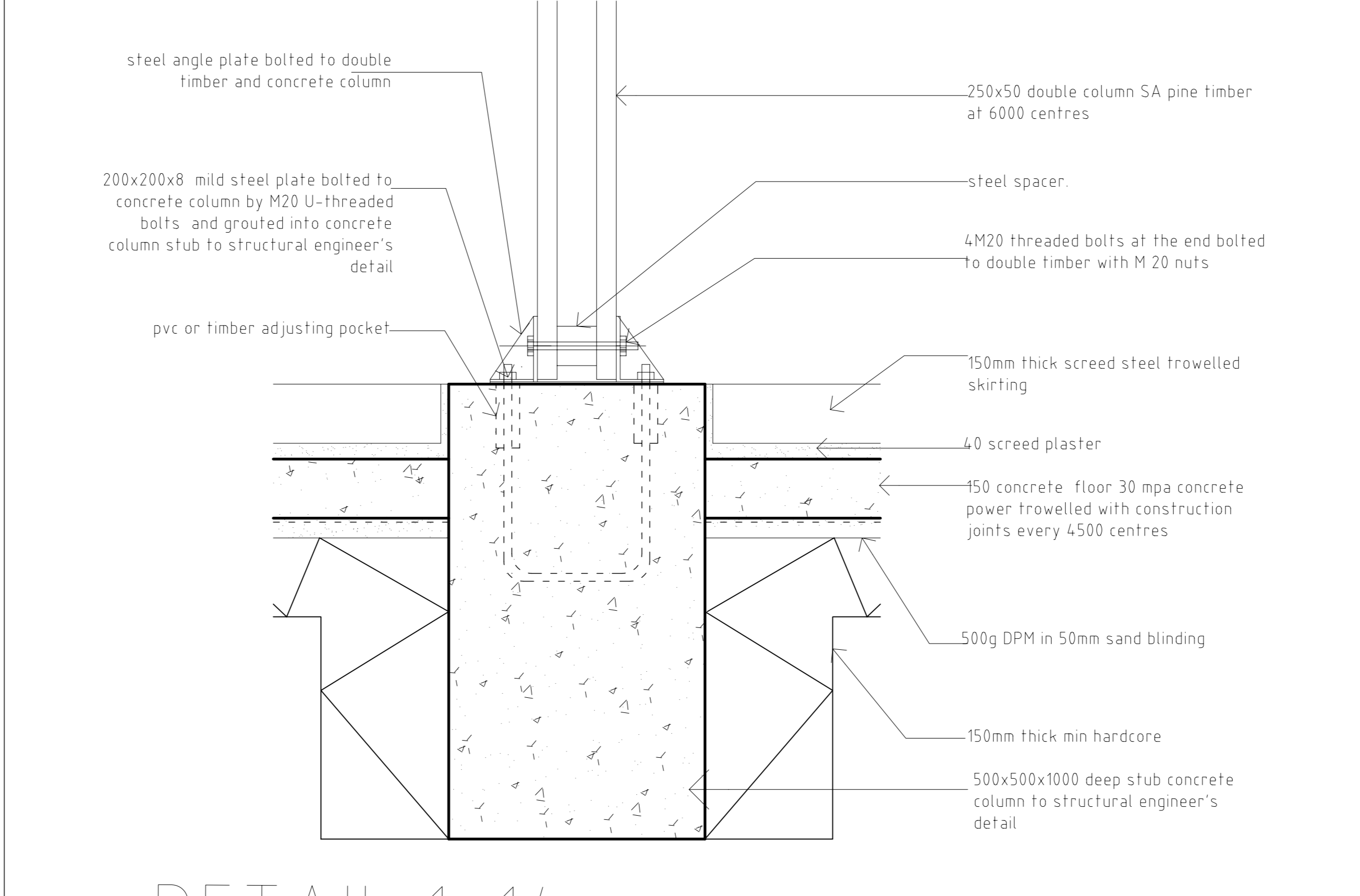
ELEVATION 2-15-15 SCALE 1:10



DETAIL 1-13 scale 1:10

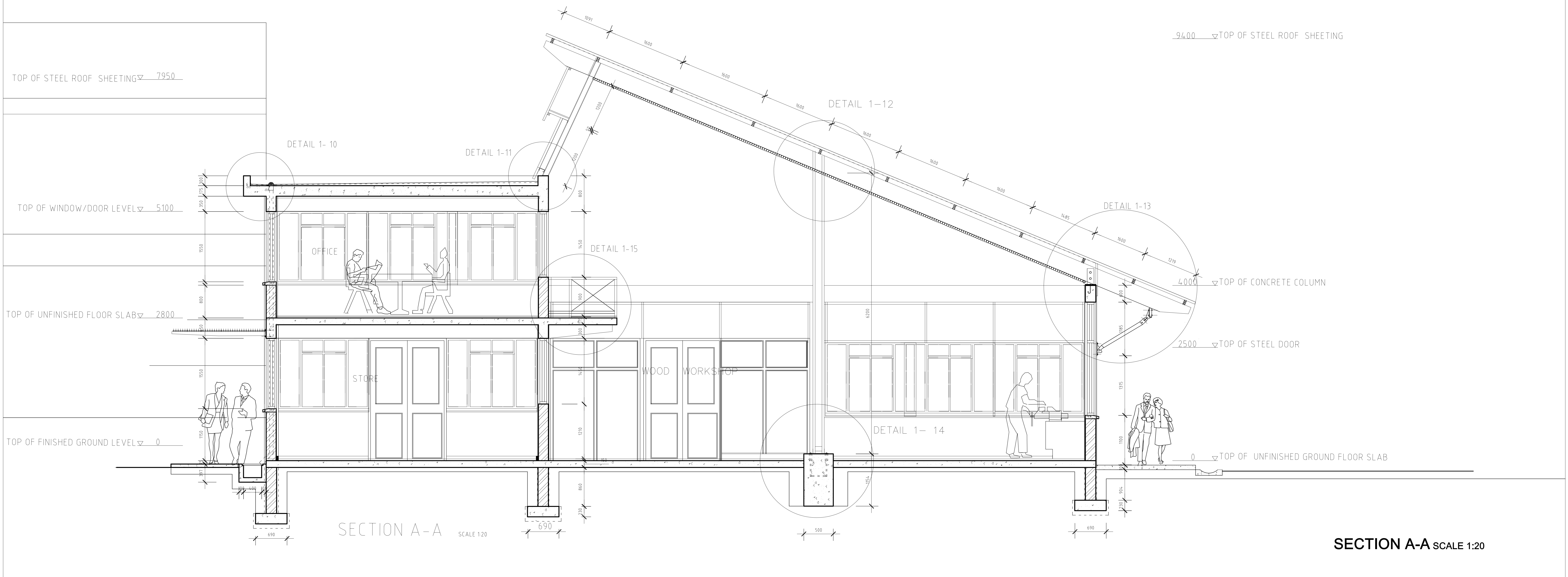
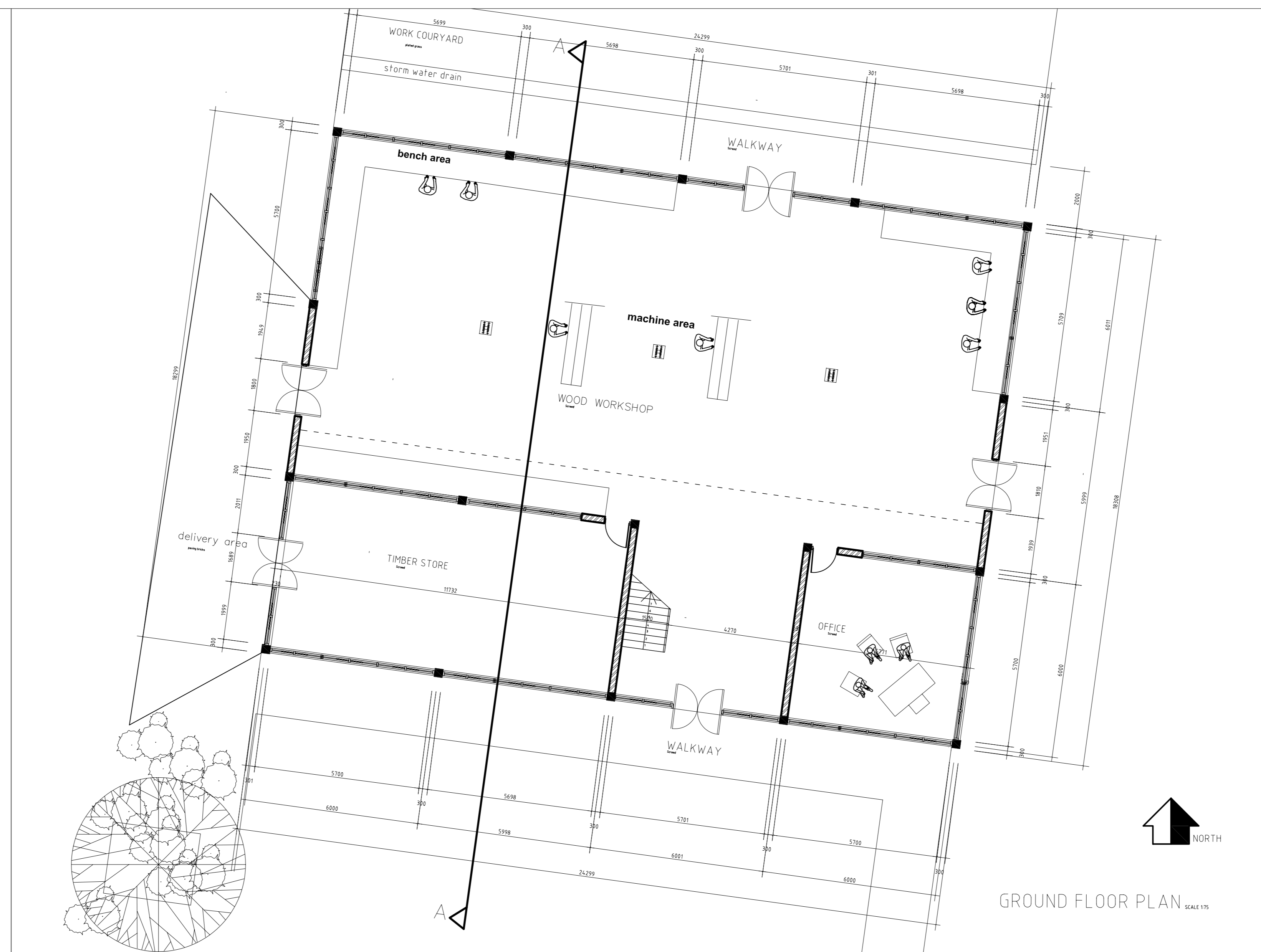
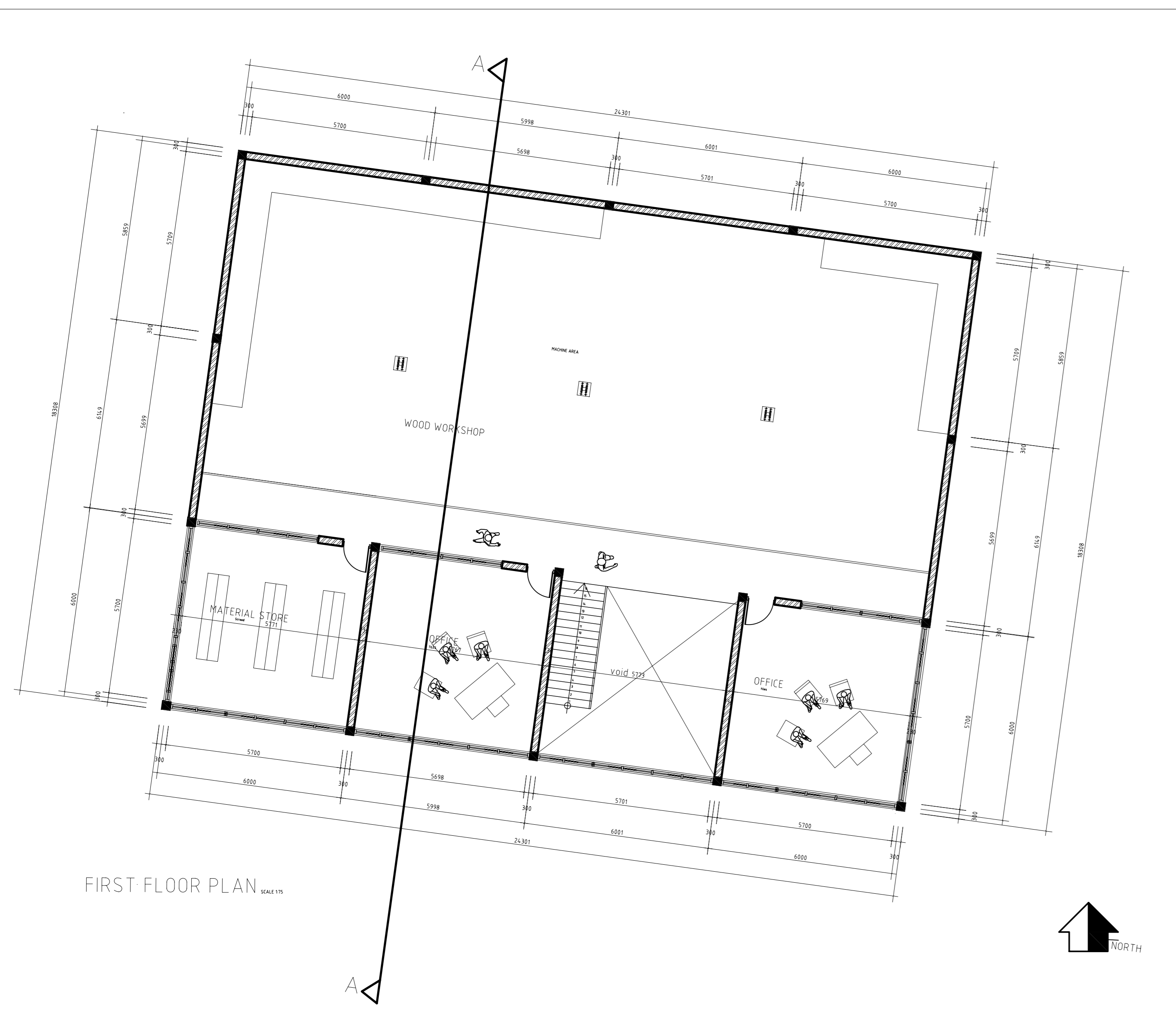


DETAIL 1-11 scale 1:10



DETAIL 1-14 scale 1:10





WOOD SHOP DETAILS 1

