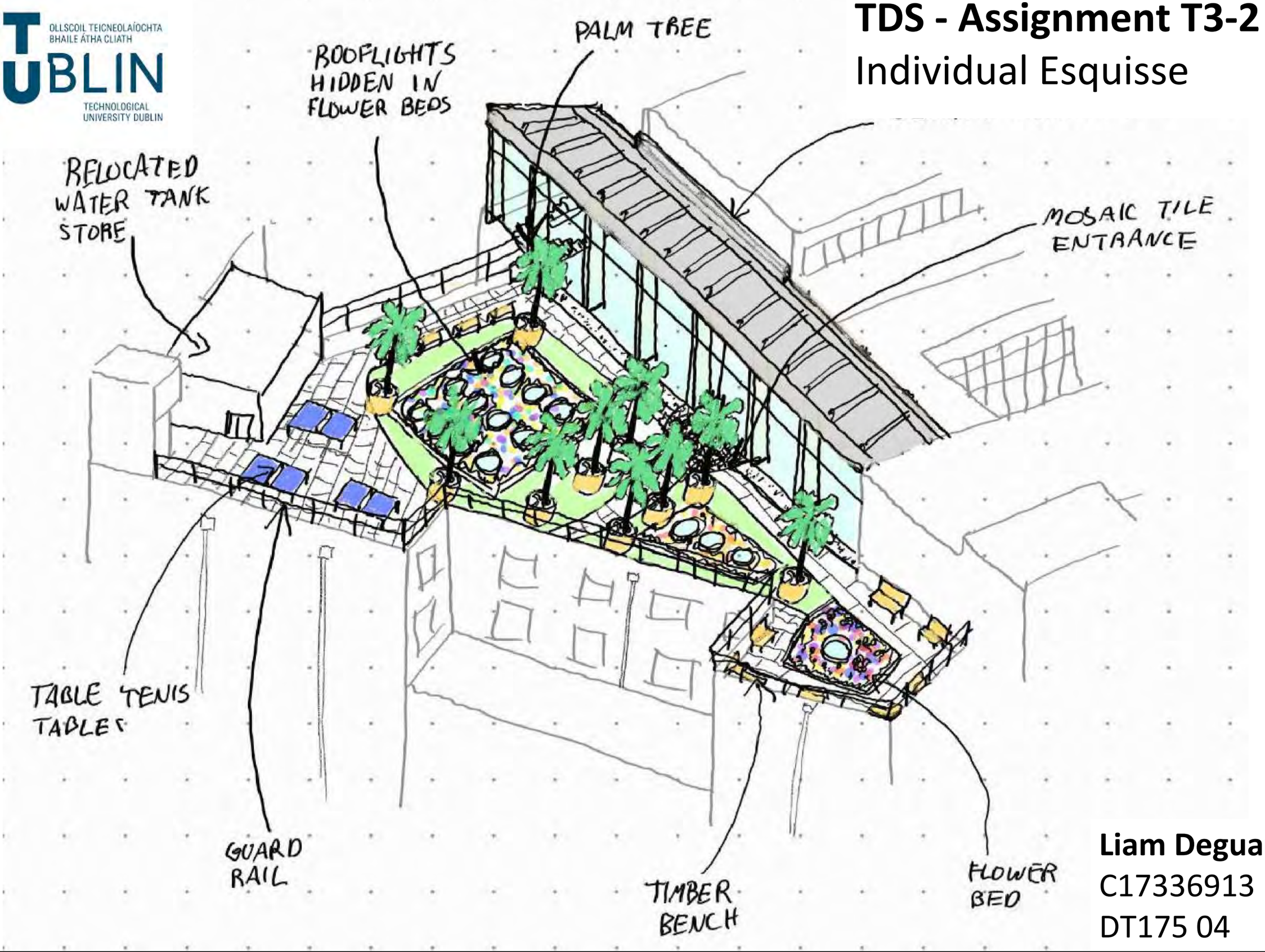
OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
DUBLIN
TECHNOLOGICAL UNIVERSITY DUBLIN

TDS - Assignment T3-2

Individual Esquisse



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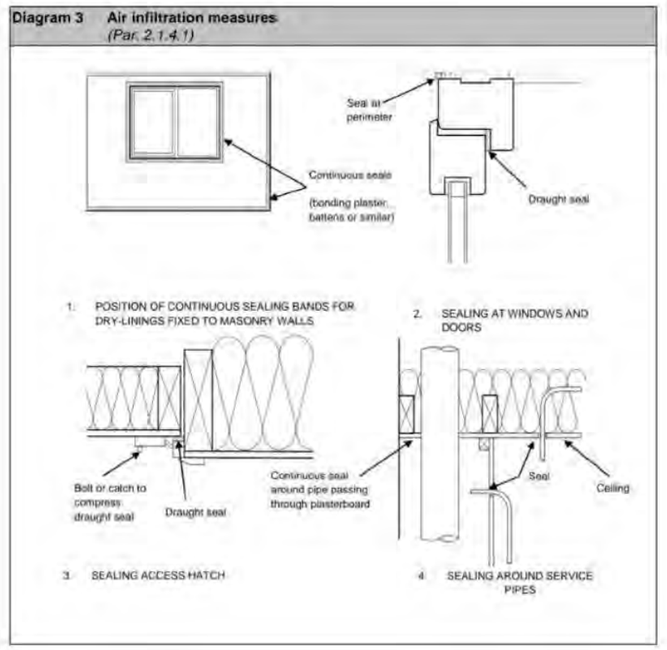
C17336913
DT175 04

Contents

TGD L

2.1 Building Fabric

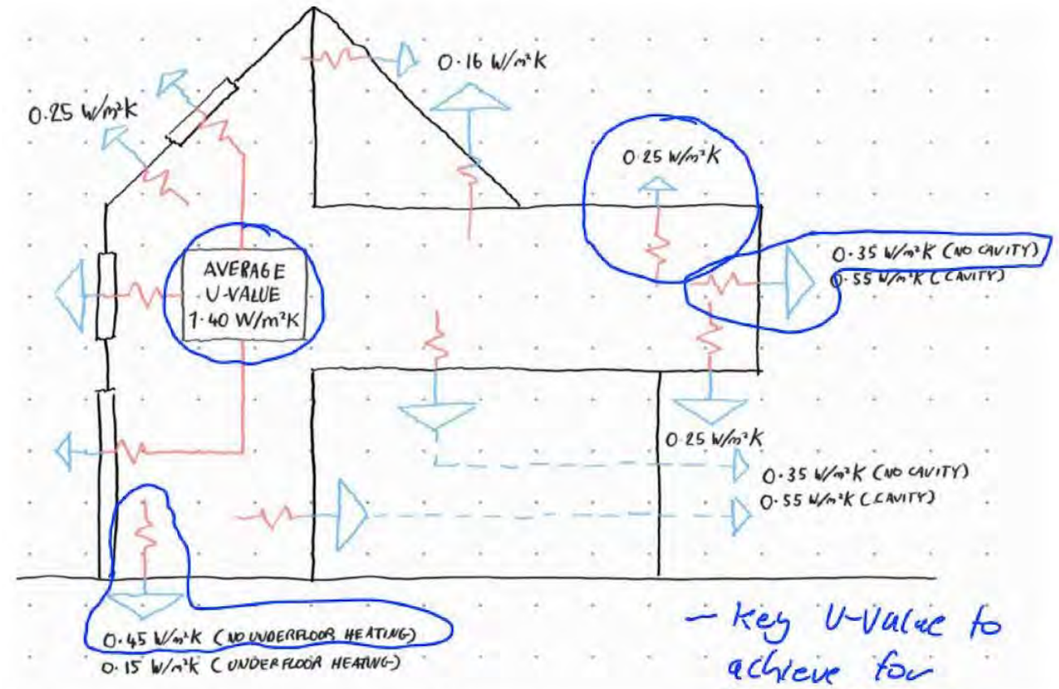
TGD Regulation	Current Compliance	Response Proposal
2.1.3.1 To avoid excessive heat losses and local condensation problems, reasonable care should be taken to ensure continuity of insulation and to limit local thermal bridging, e.g. around windows, doors and other wall openings, at junctions between elements and other locations. Any thermal bridge should not pose a risk of surface or interstitial condensation. See Appendix D for further information in relation to thermal bridging and it's effect on building heat loss.	The building fabric is currently uninsulated which is causing a high amount of heat loss throughout the building.	Insulating the building is necessary to comply with this regulation. There are 2 options to achieve this: 1) Externally insulate and clad/render over the insulation. 2) Internally insulate the building. The esquisse explores how these 2 options could be carried out with the implications of each.
2.1.4.2 For material alterations or material change of use, infiltration of cold outside air should be limited by reducing unintentional air paths as far as is practicable. Measures to ensure this include: - (a) sealing the void between dry-lining and masonry walls at the edges of openings such as windows and doors, and at the junctions with walls, floors and ceilings (e.g. by the use of certified air tightness tapes and/or membranes); (b) sealing vapour control membranes in timber-frame constructions; (c) fitting draught-stripping in the frames of openable elements of windows, doors and rooflights; (d) sealing around loft hatches; (e) ensuring boxing for concealed services is sealed at floor and ceiling levels and sealing piped services where they penetrate or project into hollow	Much of the external windows and doors cause a significant amount of heat loss.	

TGD L

2.1 Building Fabric

Table 10 Maximum elemental U value (W/m²K)[1,2] for Material Alterations		
Column 1 Fabric Elements	**Column 2 Area-weighted Average Elemental U-Value (Um)**	**Column 3 Average Elemental U-value – individual element or section of element**
Roofs Pitched roof - Insulation at ceiling - Insulation on slope Flat roof	 0.16 0.25 0.25	0.35
Walls Cavity Walls[3] Other Walls	0.55 0.35	0.60
Curtain Walls	1.8	0.60
Ground Floors	0.45[4,5]	
Other Exposed Floors[5]	0.25	0.60
External doors, windows and rooflights	1.60	3.0

Notes:
1. The U-value includes the effect of unheated voids or other spaces.
2. For material alterations, the U-values relate to the new works.
3. This only applies in the case of a wall suitable for the installation of cavity insulation. Where this is not the case it should be treated as for "other walls".
4. This U value only applies where floors are being replaced.
5. For insulation of ground floors and exposed floors where the source of space heating is underfloor heating, a floor U-value of 0.15 W/m²K should generally be satisfactory where floors are being replaced.



Minimum U-Value Building Envelope Diagram

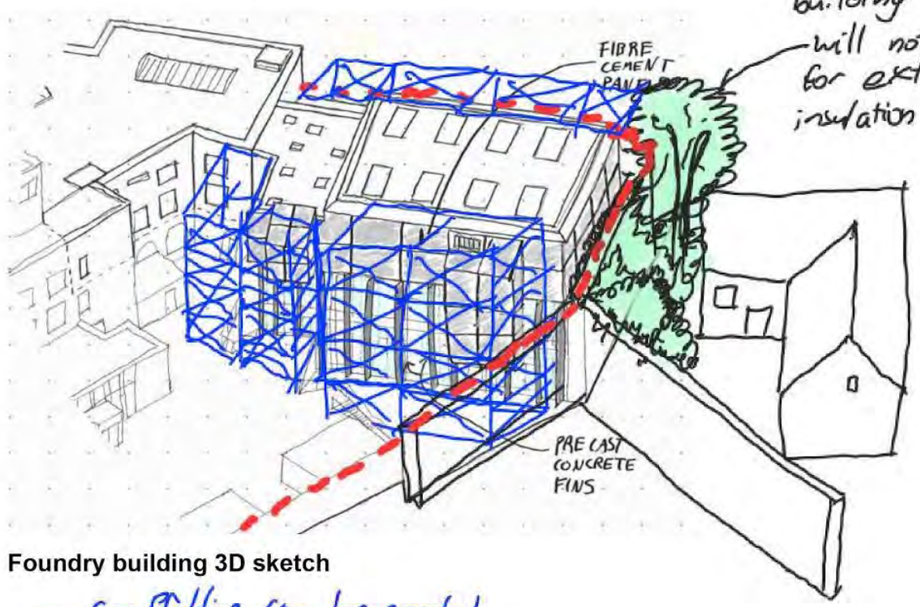
TGD L

2.2 Building Services

TGD Regulation	Current Compliance	Response Proposal
2.2.4.2 Natural ventilation strategies should be considered appropriate for the building geometry. Particular attention should be paid to limiting solar gains by ensuring that areas of the external building fabric which are susceptible to solar gain have appropriate areas of solar shading	The lack of insulation ensures that overheating is not an issue. Most large windows in studios have internal blinds to combat solar shading.	The large area of glazing on the foundry building may cause overheating post insulating the building. Angled pre-cast concrete fins could be placed in front of all vertical mullions to provide solar shading.

Adjoining property has too much grass + shrubery on boundry wall making it impossible to access this side of the foundry building which will not allow for external insulation / cladding

Example project with a fibre cement clad box on a glazed box, shaded by columns.



Foundry building 3D sketch

— scaffolding can be erected.
--- Site Boundary

TGD L

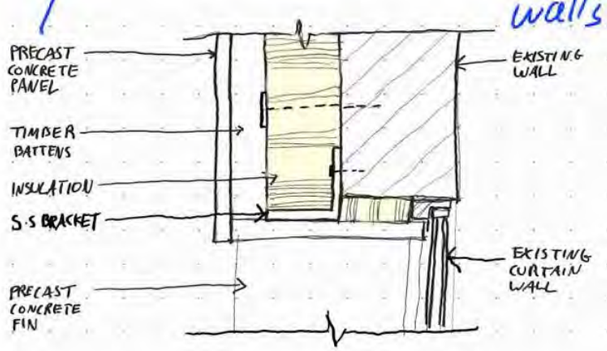
2.3 Major Renovation

TGD Regulation	Current Compliance	Response Proposal
2.3.3 When undertaking on or in connection with a building that is of architectural or historical interest the aim should be to improve the building as far as is reasonably practical. The work should not prejudice the character of the building or increase the risk of long term deterioration of the building fabric or fittings. Refer to Par 0.5	Linenhall is not a protected structure however it may be listed as one in the future. We must protect the character of the building. cannot clad entire external fabric due to boundary conditions.	The foundry buildings concrete facade bears ugly streaks of staining that completely distract you from the beauty of the brutalist architecture of the building. I propose 2 options to renovate the facade. 1) Externally insulate and clad the building with fibre cement panels to maintain the character of the building whilst giving it a modern aesthetic by covering the stained concrete. This may not be allowed due the historical nature of the building. 2) Internally insulate the building and cleaning the existing stains. This will require specialist advice from a conservation architect.

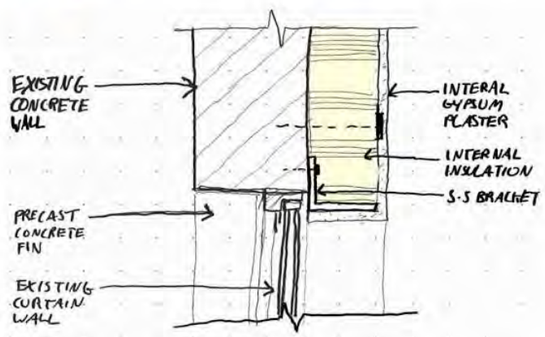
Diathonite evolution internal walls?

Clean the facade facing the courtyard

Staining on concrete facade



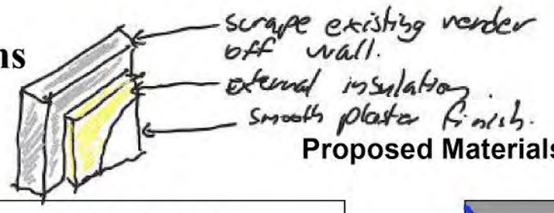
Foundry building curtain wall head detail - Externally Insulated



Foundry building curtain wall head detail - Internally Insulated

Design Development Esquisse

Material investigations



not viable due to access of foundry building boundary wall.

Existing Materials

Pebble-dash Render

The main building is finished in an off-white pebble dash render.

Concrete

The foundry building has a cast-in-situ concrete facade.

- staining can be removed by sandblasting powerwash.

Asphalt Roof

The existing main building has an asphalt flat roof finish.

- Replace existing roof finish with Bauder bitumen membrane to cover with green roof.

Green Roof Park

A roof park similar to The Highline, New York on the roof of Studio 4 will have paving and green roofing.

- Must be extensive green roof to accomodate people walking and trees.

Proposed Materials

White Render

Re rendering the main building is necessary due to the staining of the existing render It is proposed to externally insulate the building with a smooth white render finish for a fresh, modernist aesthetic.

Fibre Cement Panels

Cladding over the foundry buildings stained concrete facade will cover up the staining and add a modern aesthetic to the brutalist architecture of the building.

Proposed Pavilion Materials

Zinc Roof

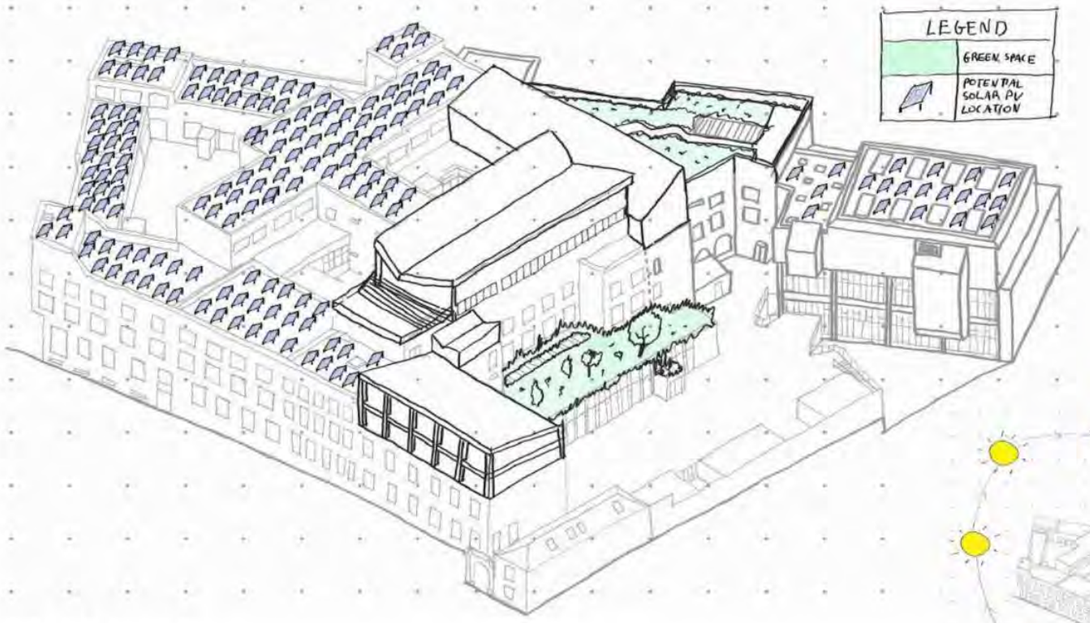
The proposed pavillion parallel to the roof park will be covered by a zinc roof.

Glulam Timber

The proposed pavillion along the roof park will have an expressive glulam structure.

Design Development Esquisse

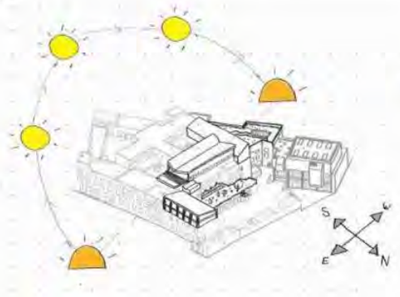
Environmental Design Strategies



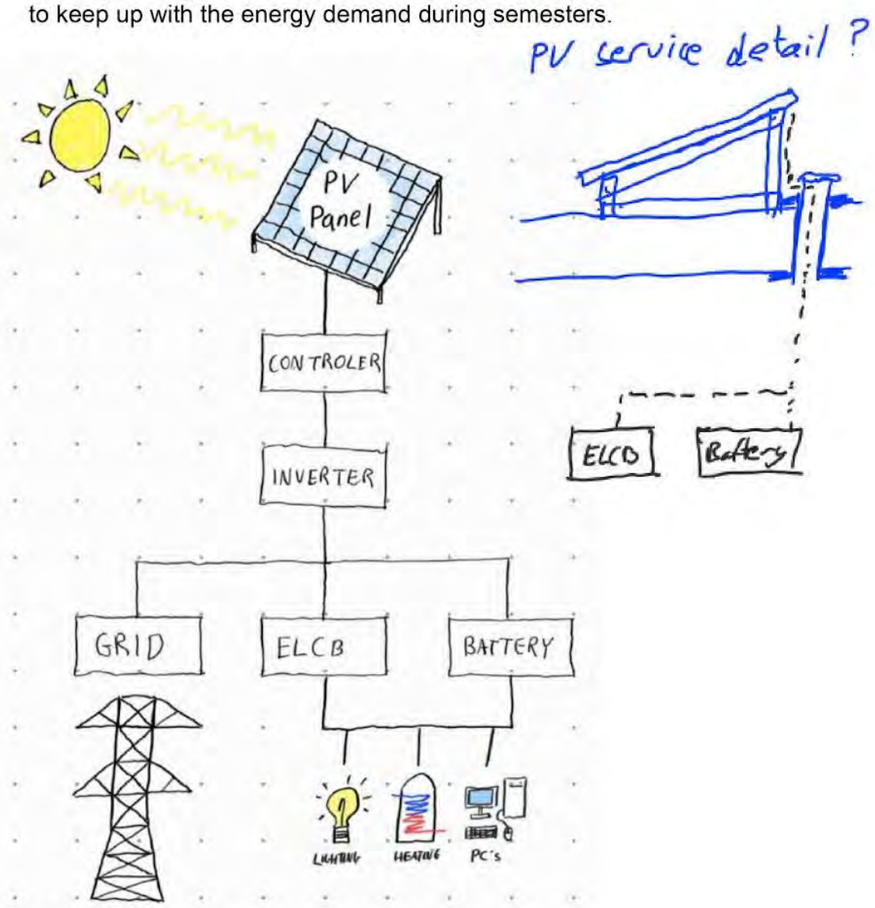
3D Site Drawing

Renewable Energy:

- Currently linenhall has no source of renewable energy.
- Currently the building requires a large amount of energy to heat the uninsulated building. This heating demand can be lowered by insulating the building and lowering the temperature of the existing radiators.
- PV panels are ideal for an education building because they can provide energy for heating and lighting the building during each semester. Energy gained during the holidays can be stored in batteries to use when the buildings energy requirements are too high for the PVs to keep up with the energy demand during semesters.



Solar Analysis



PV Panel System Diagram

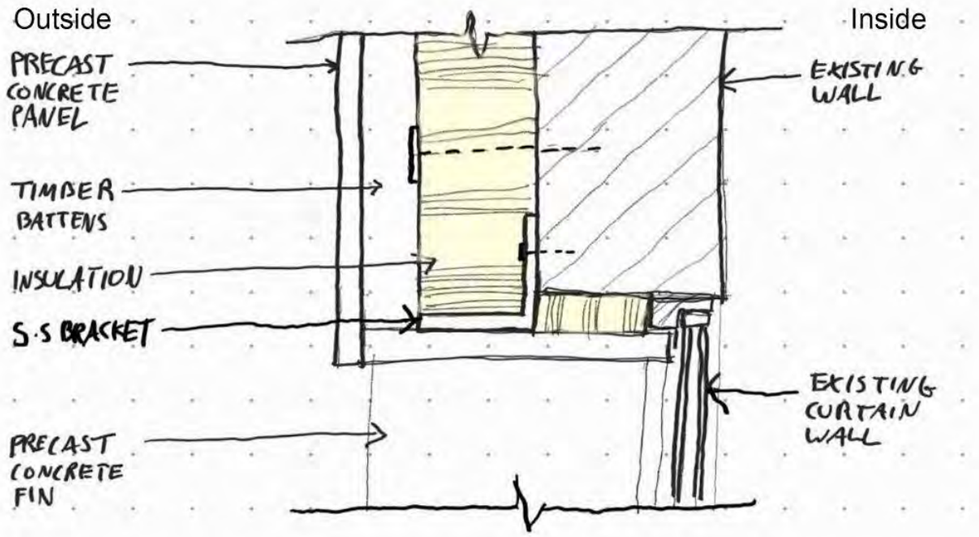
Green Space:

- Currently the linenhall campus has no green space. This is detrimental for the environment because there is no host for trees and plants that produce oxygen as well as no natural habitat for wildlife.
- Currently there is a lack of outdoor “hangout” space for students to eat lunch and breathe fresh air during lunch hour.
- All the buildings on the site have flat roofs which have great potential to convert to green roofs.

Green Roof Wildlife Habitat

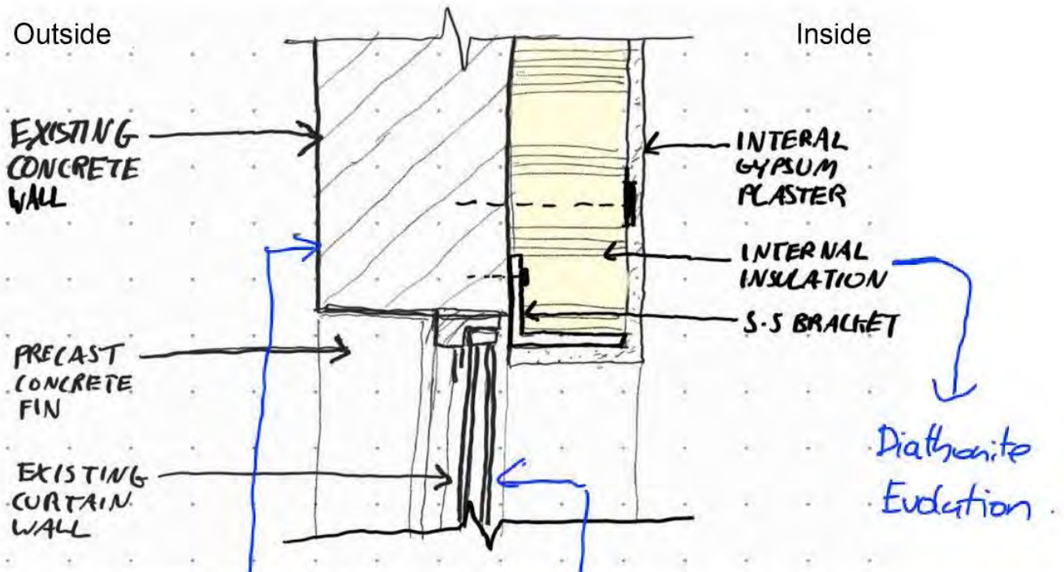
Preliminary Detail Design

Foundry Building Curtain Wall Head Detail



External Insulation Method
NTS

not viable due to access of factory building boundary wall



External Insulation Method
NTS

Sandblast powerwash existing facade.

upgrade to double glazed curtain wall.

Design Development Esquisse

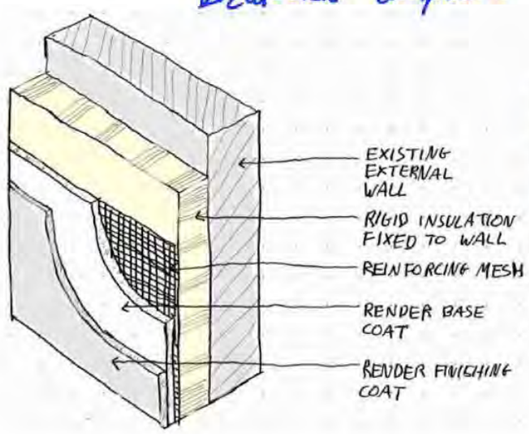
TGD L

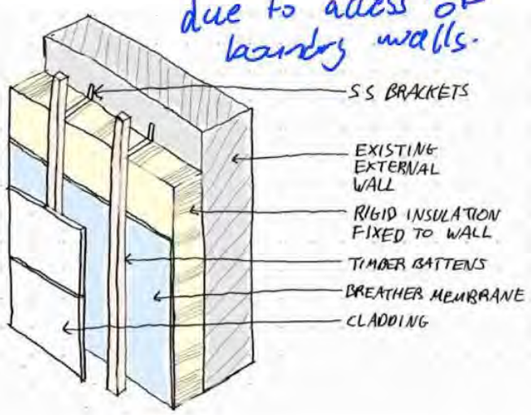
2.1 Building Fabric

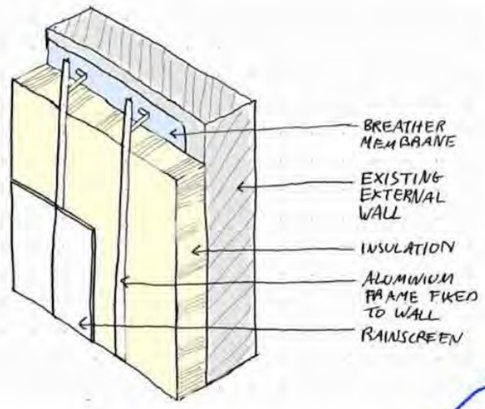
Foundry and Main Building Walls

External Insulation vs Internal Insulation

External insulation options		
Insulated render	**Timber, tile and slate cladding**	**Rainscreen cladding**
Insulated render is the most cost-effective form of external insulation, though the system might be prone to damage and the selection of the render must be carefully considered in respect of a potential need for the existing wall to 'breath'. → Wood fibre is breathable. → Diathonite is a breathable compound.	Cladding offers the best performance characteristics by separating the thermal insulation from the weatherproof layers. It also offers the designer a wide flexibility in the specification of cladding material and façade design. On the other hand, it is likely to be expensive, require a higher degree of design input and present the greater depth of construction. Not a viable option due to access of laundry walls.	Rainscreen cladding is a common choice for buildings of over 3 stories. It is usually applied to high-rise post-war apartments. Not a viable option due to access of laundry walls.







Pros	Cons
Applying insulation externally will change the appearance of the building. This might be an intended benefit, or it might be considered detrimental to valued historical building. → Existing building has deteriorated external finish.	It might need planning permission.
External insulation usually provides the designer with a greater flexibility in the choice of insulation materials and insulation thicknesses to obtain optimum u-values.	Living spaces will continue to be relatively slow to warm-up.
The majority of thermal bridges can be eliminated.	Junctions between the added insulation and other elements (eaves, verges, openings etc) will need redesigning.
External insulation will preserve the existing internal thermal mass. The thermal mass might be considered important in regulating the internal room temperatures.	Replacing windows at a later date is difficult. - Single glazed windows require upgrading
The works will not unduly inconvenience the occupants.	Adjoining properties may cause thermal bridging issues.

Foundry building has a large external concrete mass which will be maintained by internally insulating.

Ref: https://www.greenspec.co.uk/building-design/developing-retrofit-strategy/

Design Development Esquisse

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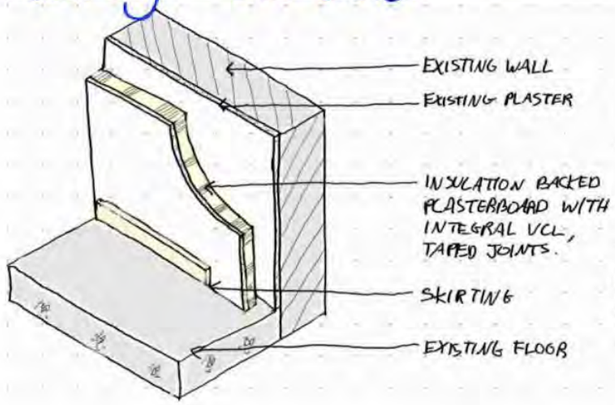
2.1 Building Fabric

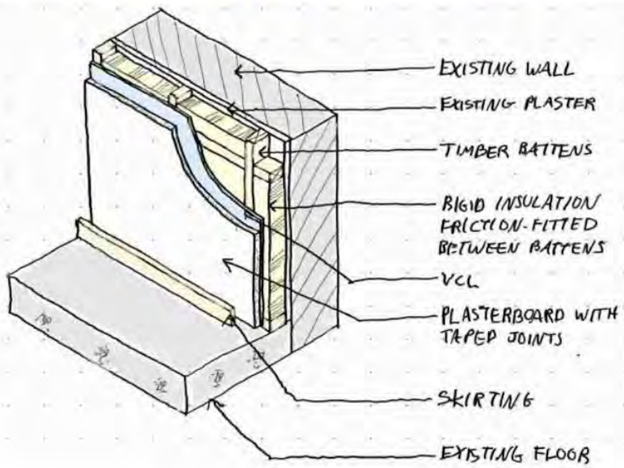
Foundry and Main Building Walls

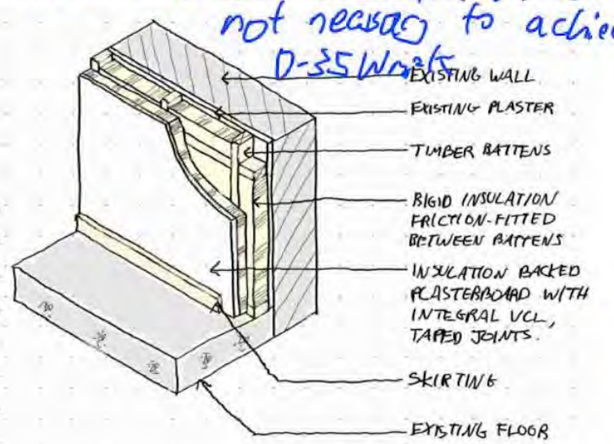
External Insulation vs Internal Insulation

no decorative internal features in team 2/6 phase.

External insulation options		
Insulation applied directly to the wall	**Insulation fitted between battens**	**Improving the u-value and reducing thermal bridging**
The relatively small depth of the build up makes this solution particularly suitable for applications where internal floor area is at a premium.	Where space permits, the combination of battens and rigid / semi-rigid insulation can provide optimum thicknesses of insulation.	Battens with plasterboard thermal laminate fixed to the face of the battens. This has the effect of reducing thermal bridging through the timber whilst offering the potential to increase the thickness of insulation.
Best solution for foundry building - Diathonite	Thermal bridging an issue.	This thickness of insulation is not necessary to achieve D-35 Works







Pros	Cons
Maintains the external appearance of the building Brutalist architecture of foundry is maintained	The adding of insulation reduces internal space, and, in historical buildings, will likely compromise decorative features
Spaces are quick to warm-up	The necessity to minimise encroachment on space will restrict the designer's choice of materials and possibly restrict achievable u-values
Works can be done during summer holidays.	The occupants will probably have to relocate during the period of the works

Ref: https://www.greenspec.co.uk/building-design/developing-retrofit-strategy/

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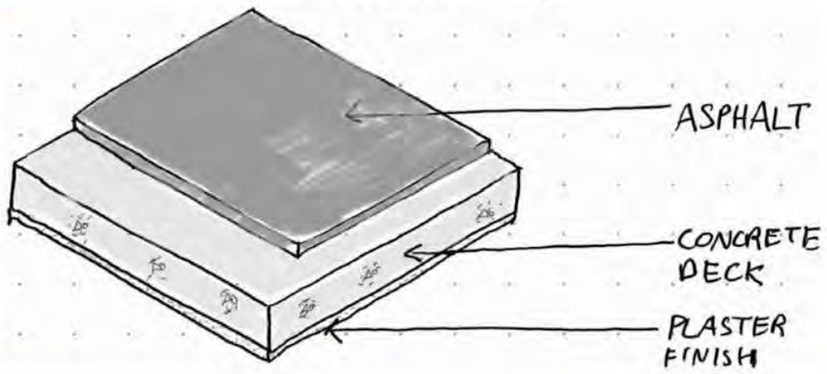
2.1 Building Fabric

Foundry Building Roof Insulation

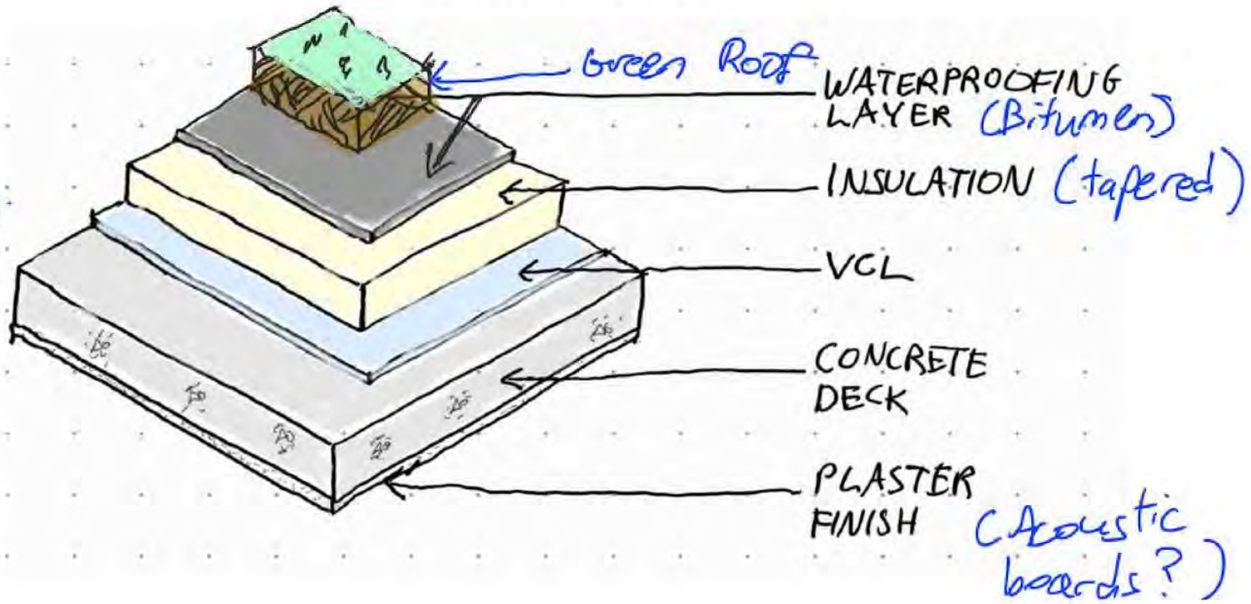
Existing roof build-up



Roof Insulation options	
Overlay	**Total Renewal**
Appropriate where the existing deck is sound and where the waterproof membrane is aged. Either a new membrane is placed over the existing complete with insulation and ballast (inverted warm) OR the existing membrane is prepared as a vapour check and insulation is added complete with a waterproof membrane over (warm).	Appropriate where the existing deck and roofing system has failed. The deck and waterproof membrane is stripped and replaced new decking and roofing system (warm or inverted warm as shown below)

Design considerations
Following a detailed inspection of the existing roof, the following design factors should be established:
The required u-value of the roof. → 0.25 W/m²K
The extra loading to the existing roof structure from additional insulation / ballast / traffic / equipment both during and after construction. + green roof and occupants
The required compressive strength of the insulation where permanent plant or equipment is located upon the roof surface.
The required fire resistance.
Check condensation risk (see BS 6229:1982 and BS 5250: 2002 for guidance)
Determine method of adhesion / fixing / ballasting
Fall requirements
Any particular acoustic requirements - Studio located underneath

Proposed roof build-up



Ref: https://www.greenspec.co.uk/building-design/developing-retrofit-strategy/

Design Development Esquisse

L

Conservation of Fuel and Energy – Buildings other than Dwellings

Building Regulations 2017

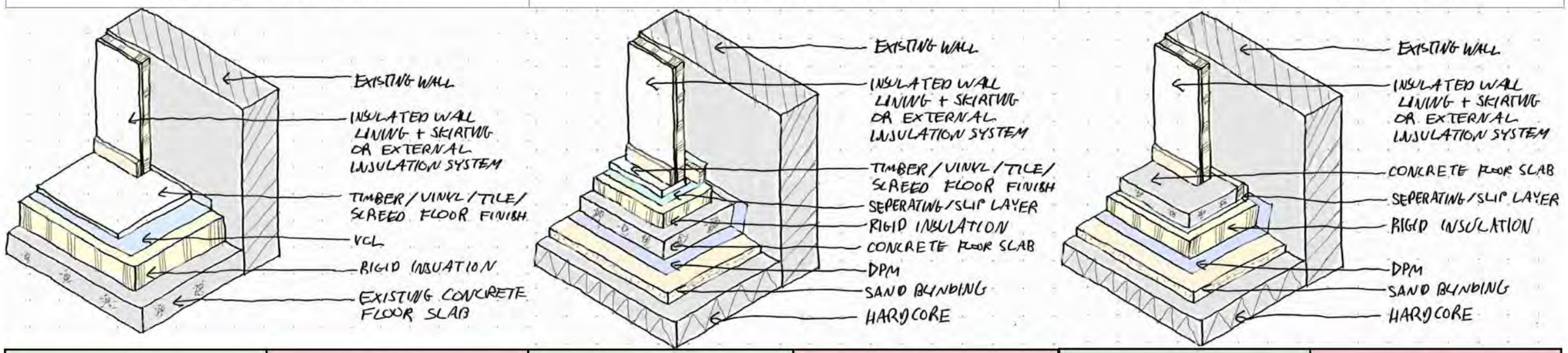
Technical Guidance Document

TGD L

2.1 Building Fabric

Foundry Building Floor Insulation

Floor insulation options		
Upgrading an existing slab	New slab – insulation above slab	New slab – insulation below slab

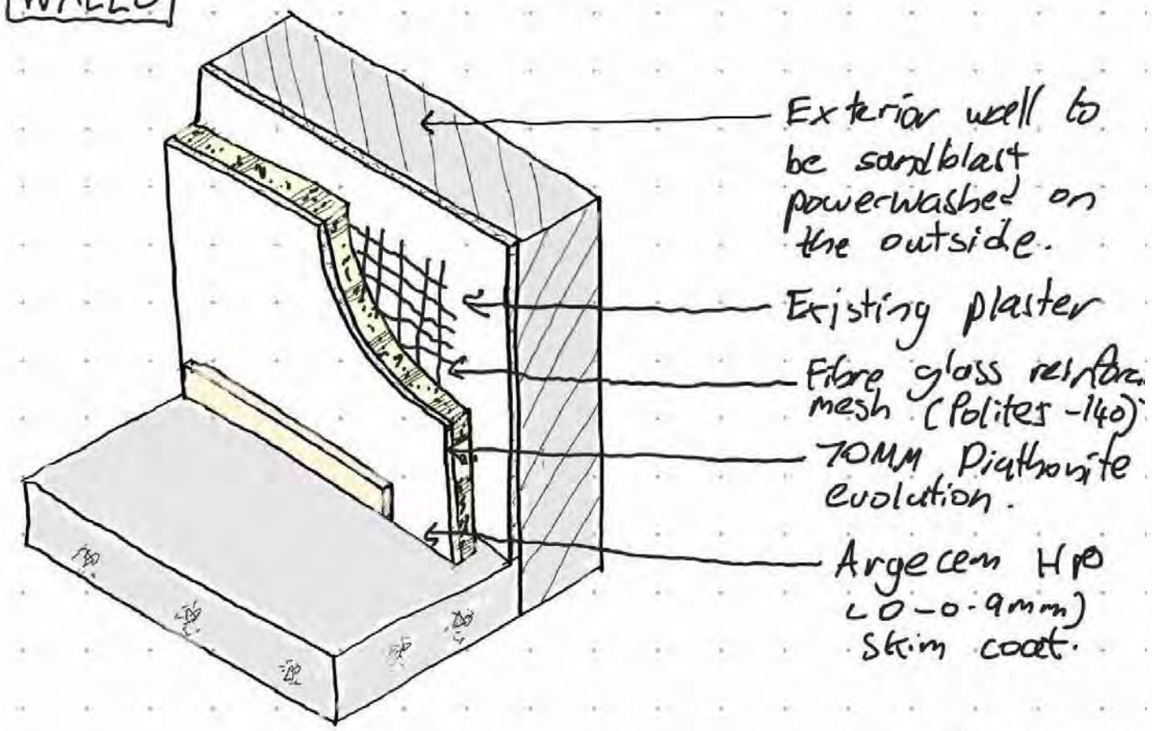


Pros	Cons	Pros	Cons	Pros	Cons
Easiest way of improving thermal performance	Raising the floor level through added insulation will usually require skirtings and radiators to be removed and re-fixed and doors to be reduced in height	Insulation above the slab increases the heating response time. Temperatures will increase more quickly when the heating system is switched on in comparison with below slab insulation	Point loading requires careful specification of the floor finish where it bears on a smaller area of insulation beneath	Provides thermal mass, particularly useful in southward facing rooms and helps maintain steady temperatures	Rooms are slower to heat in comparison with an above-slab condition
	unequal step heights at staircases and the raising of step heights at external doors.	The insulation zone can be used to run services and underfloor heating	When in conjunction with timber-based flooring it is not advisable for use in 'wet' rooms such as kitchens and bathrooms	Thickness of insulation is less restricted than for an above-slab condition	
			The effect of temperature regulation by thermal mass is unavailable	Point loading is less of an issue where the load is spread over the slab	

Ref: https://www.greenspec.co.uk/building-design/developing-retrofit-strategy/

Foundry Building Upgraded Fabric

WALLS - MIN U-VALUE : 0.35 Wm^2K



U-Value = **0.32 Wm^2K**

$\frac{1}{x} = 0.35$

$1 = 0.35x$

$\frac{1}{0.35} = x$

$2.86 = x$

$y \times 0.045 = 2.86$

$y = \frac{2.86}{0.045}$

$y = \boxed{63.5}$ minimum thickness of insulation

Floor - MIN. U-Value = 0.45

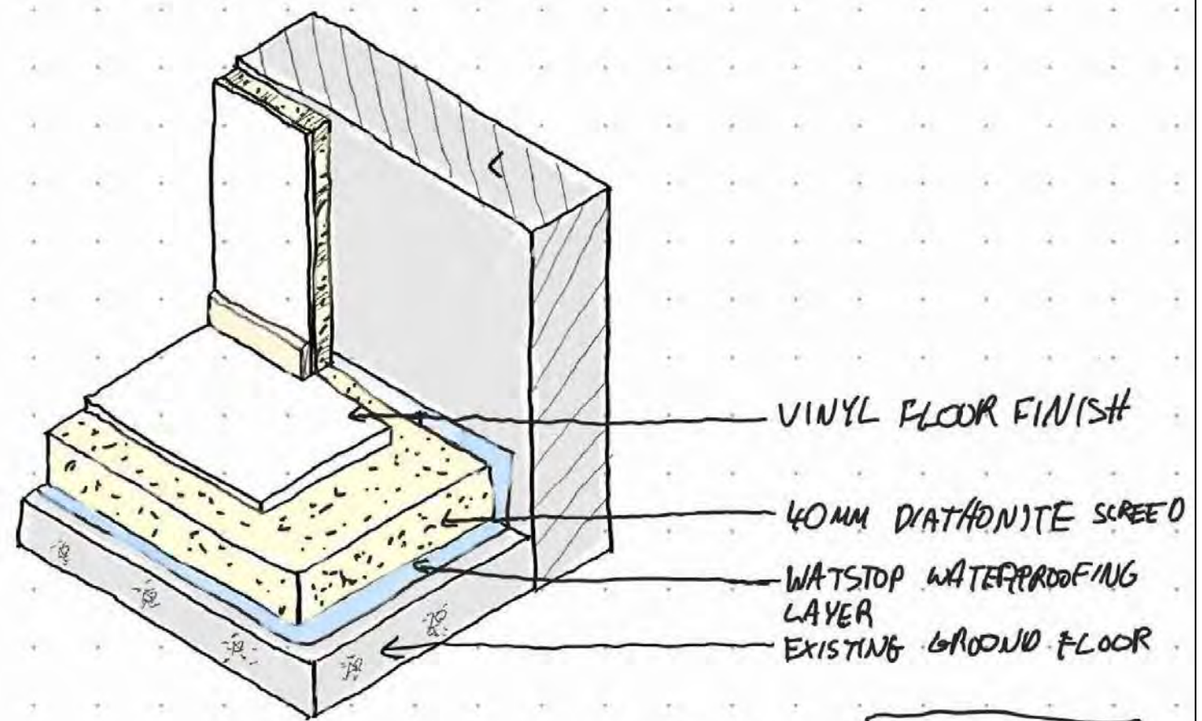
$\frac{1}{x} = \frac{0.45}{1}$ $\quad \frac{0.45x}{0.45} = \frac{1}{0.45}$ $\quad = x = 2.22$

$0.06 \times t = 2.22$

$t = \frac{2.22}{0.06}$

$t = 37$

↳ Minimum 40mm screed.

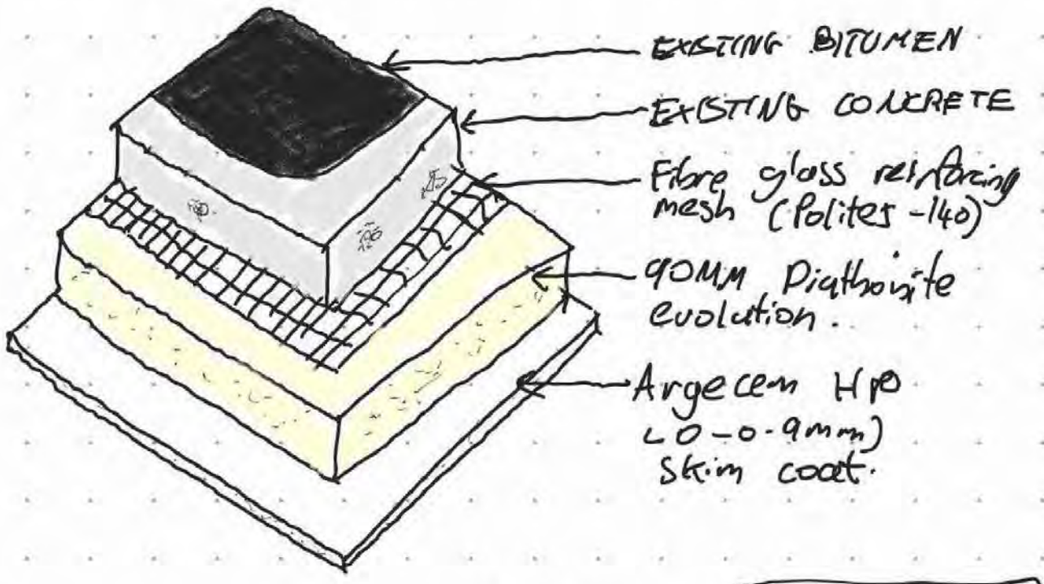


U-Value = **0.41 Wm^2K**

MAIN BUILDING UPGRADED FABRIC

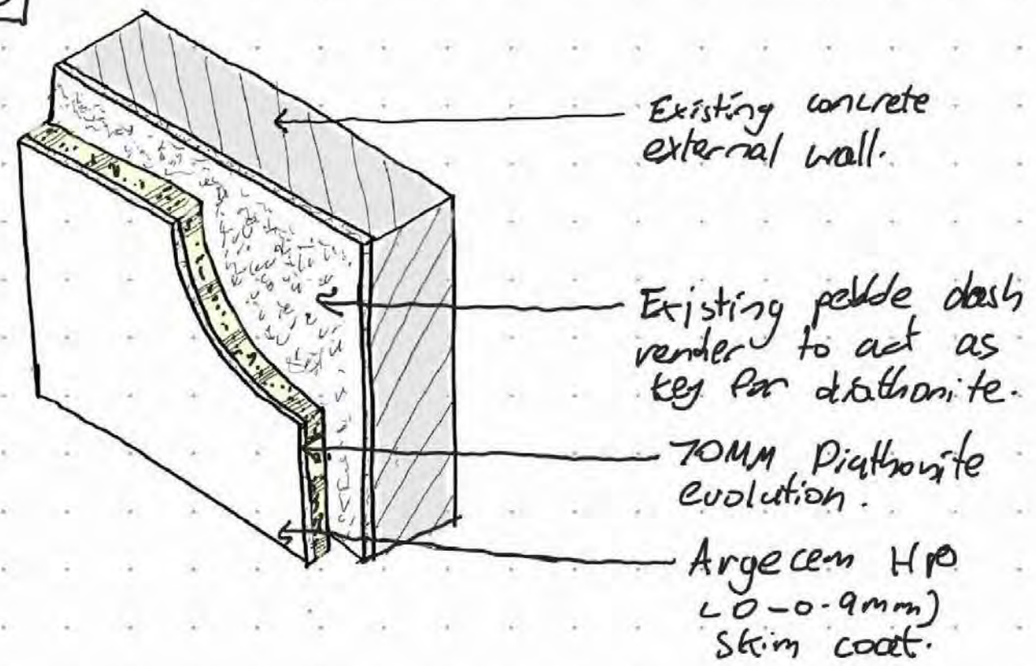
ROOF

MIN. U-VALUE:
- 0.25 $Wm^{-2}K$



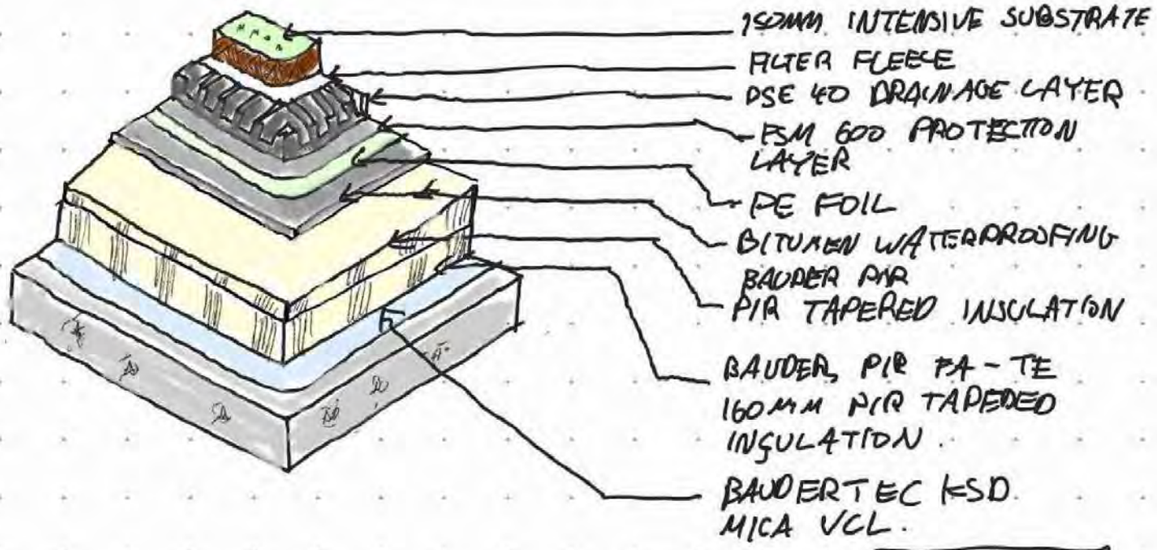
U-Value = **0.25 Wm^2K**

WALLS



U-Value = **0.32 Wm^2K**

Roof – 0.25 Wm^2K



U-value = min. 0.24 Wm^2K

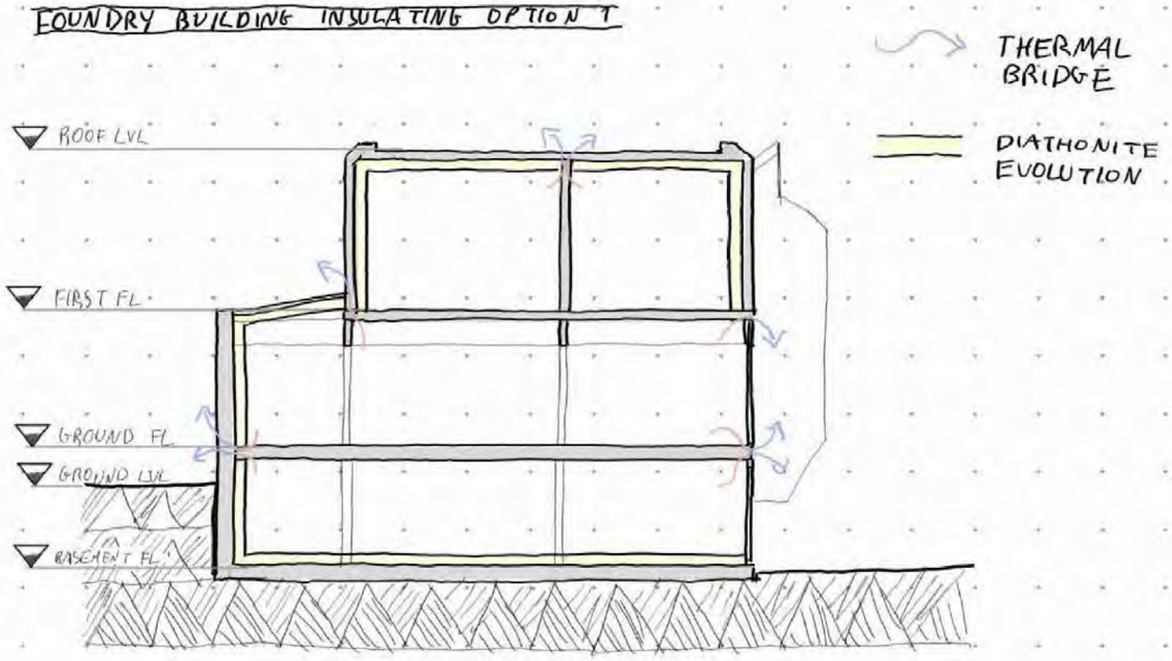
$t \times 0.022 = 4$ $\quad t = \frac{4}{0.022}$

$\frac{1}{x} = 0.25$ $\quad t = 181mm$ minimum thickess of PIR insulation.

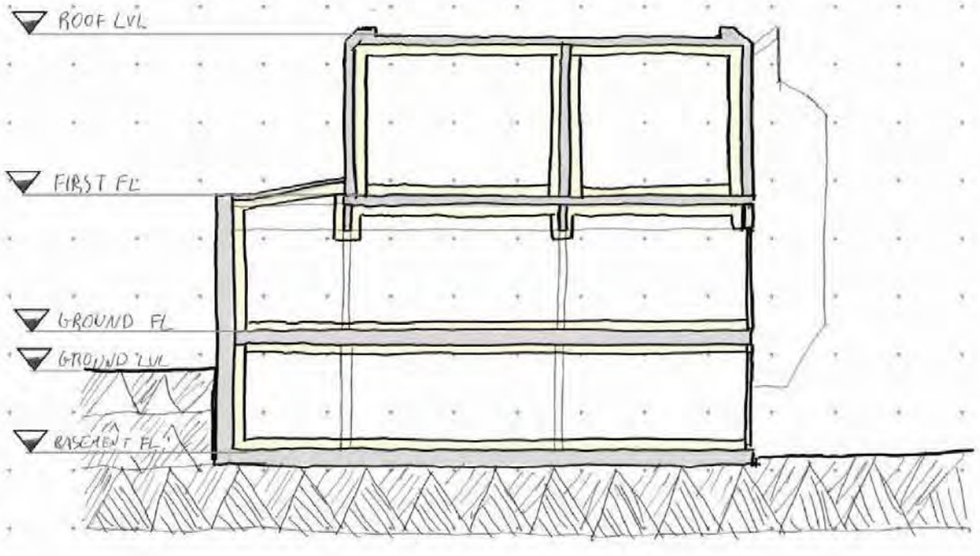
$x = \frac{1}{0.25}$

$x = 4$

FOUNDRY BUILDING INSULATING OPTION 1

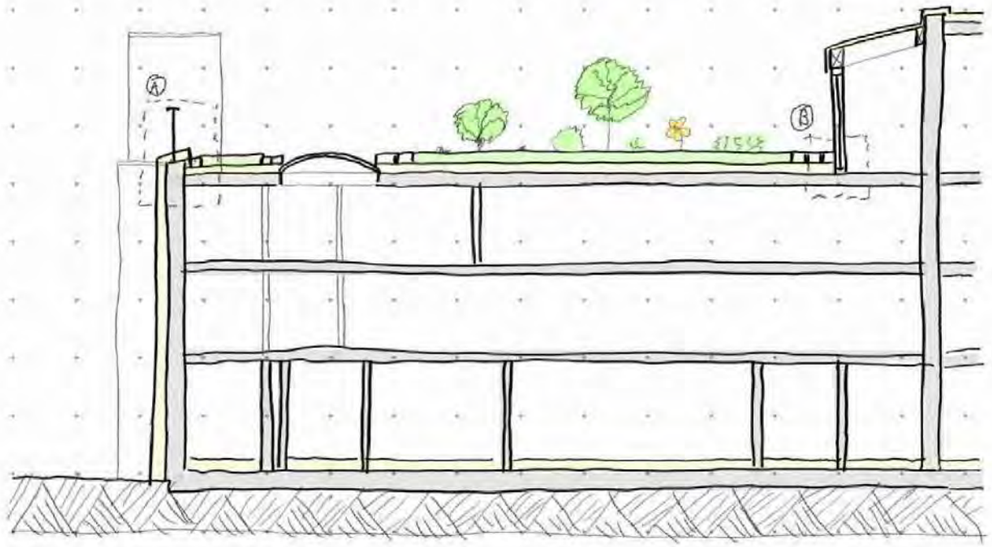


FOUNDRY BUILDING INSULATING OPTION 2



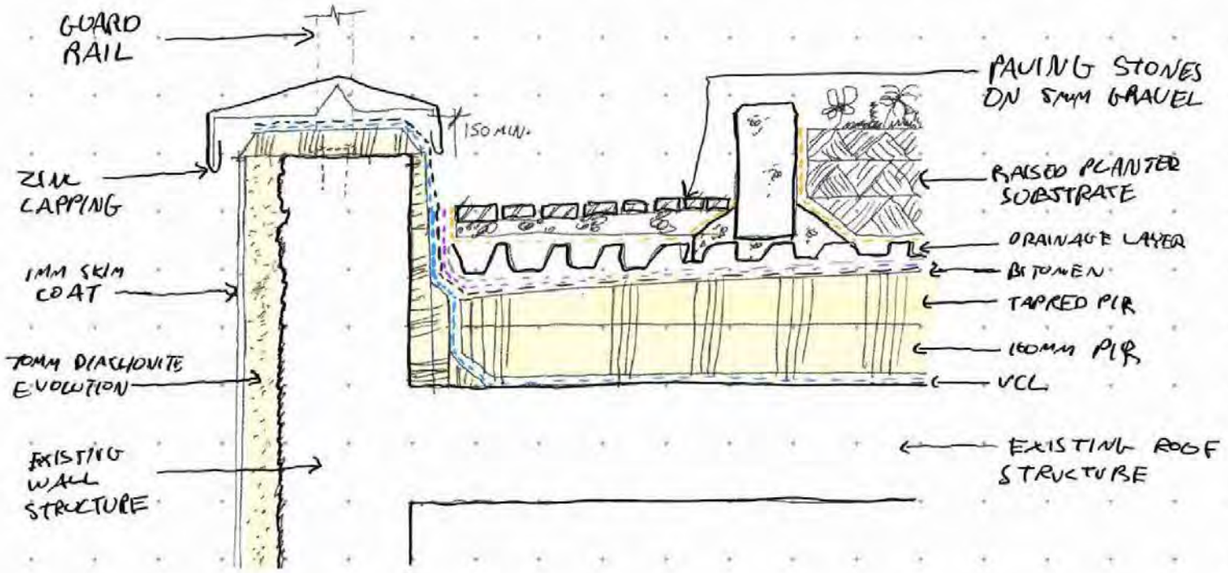
MAIN BUILDING INSULATING OPTION 1

- EXTERNAL INSULATION
- GREEN ROOF



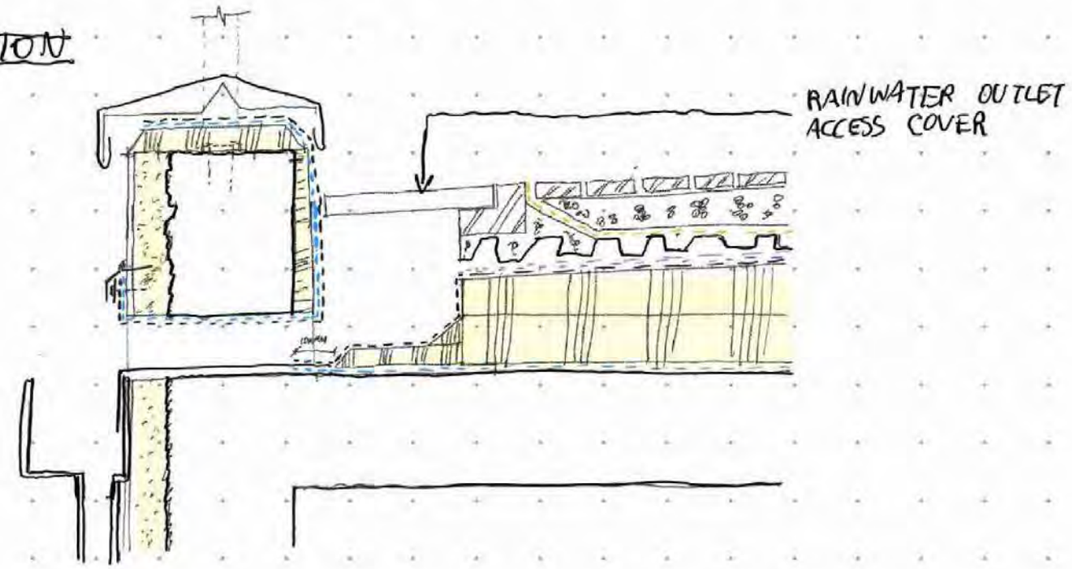
DETAIL ①

GREEN ROOF – PARAPET

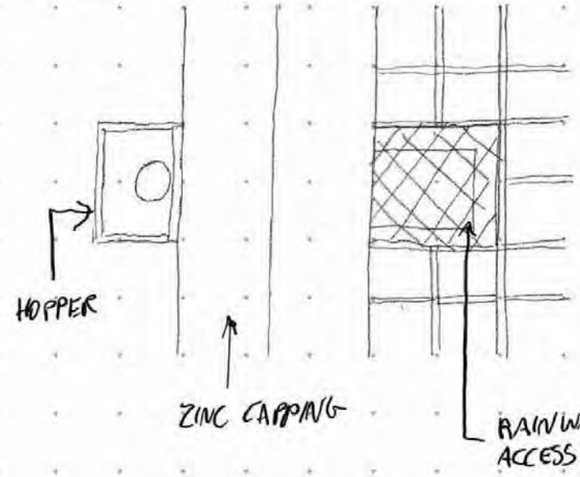


GREEN ROOF – PARAPET RWO

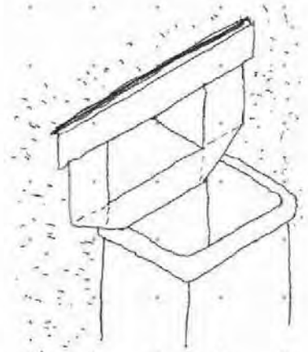
SECTION



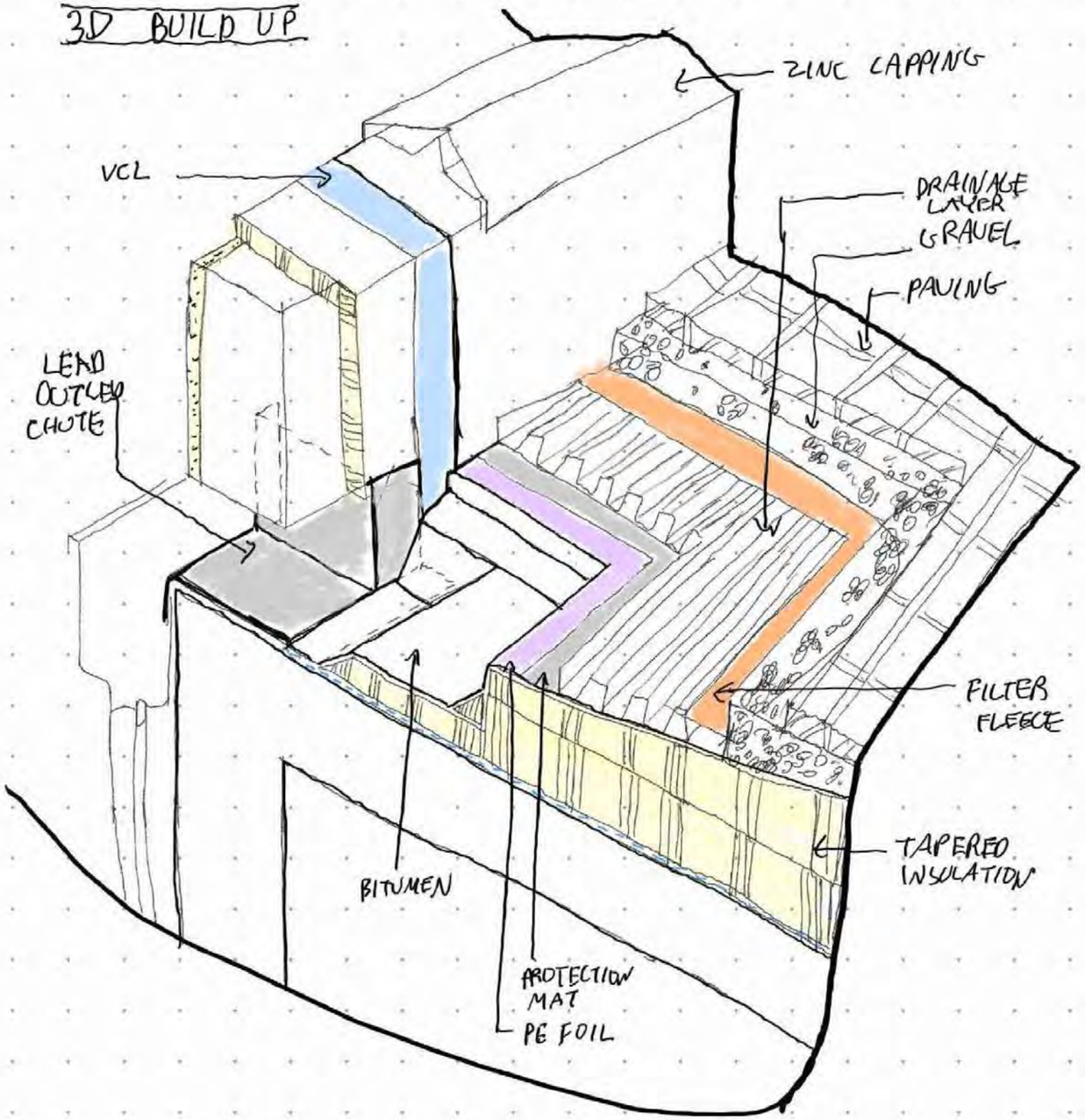
PLAN



3D HOPPER OUTLET

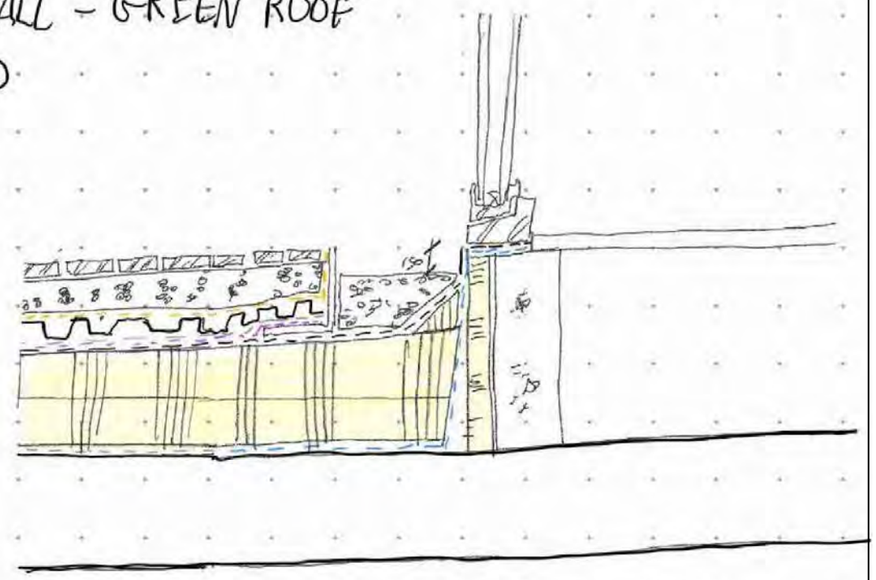


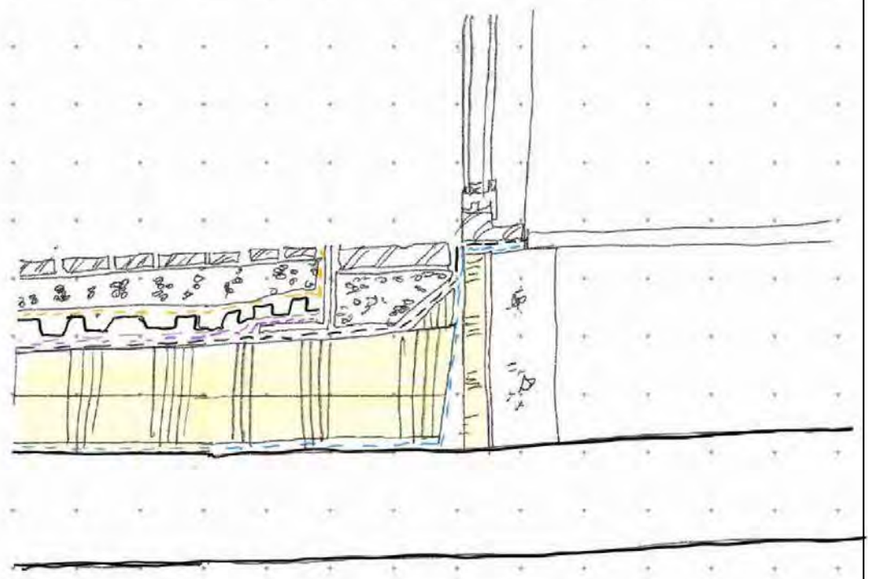
3D BUILD UP



DETAIL ②

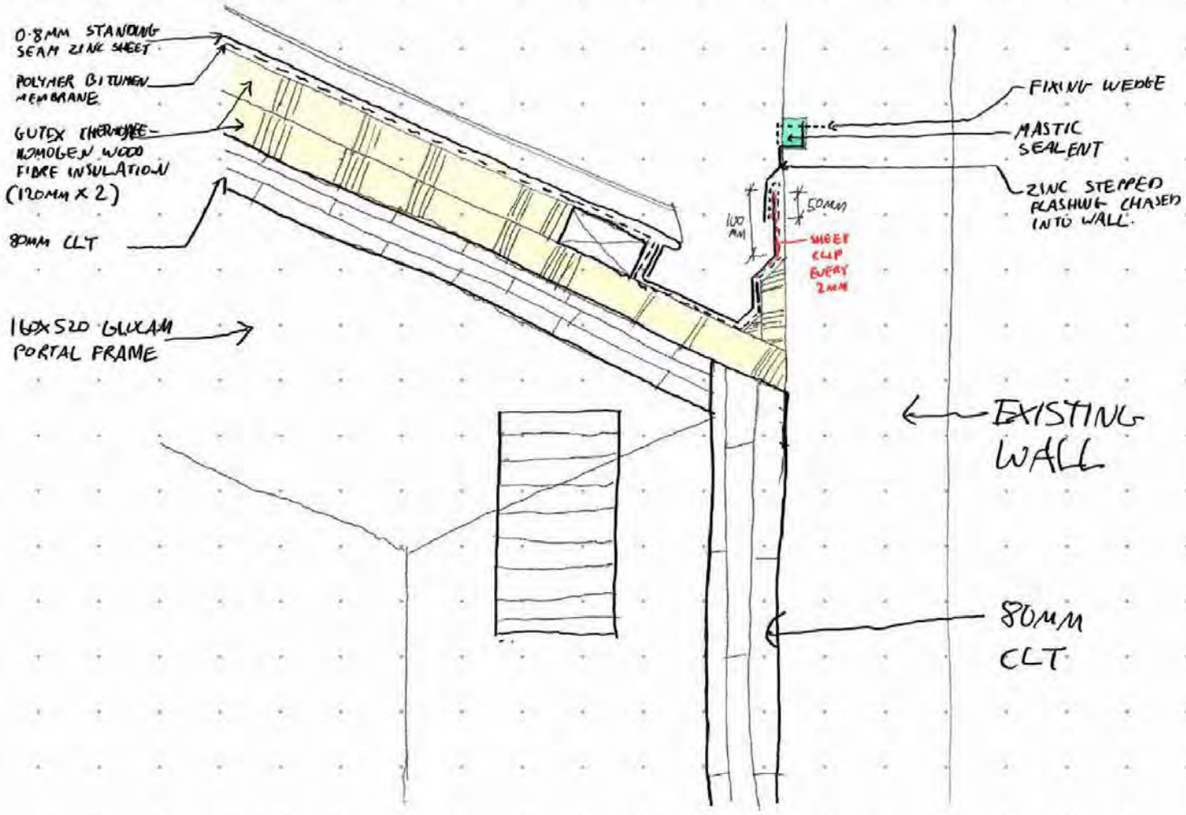
CURTAIN WALL - GREEN ROOF THRESHOLD





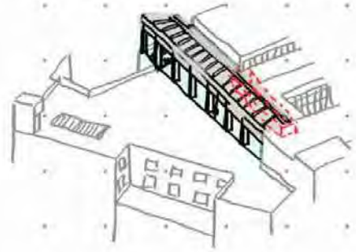
DETAL ③
PAVILION ROOF - EXISTING WALL

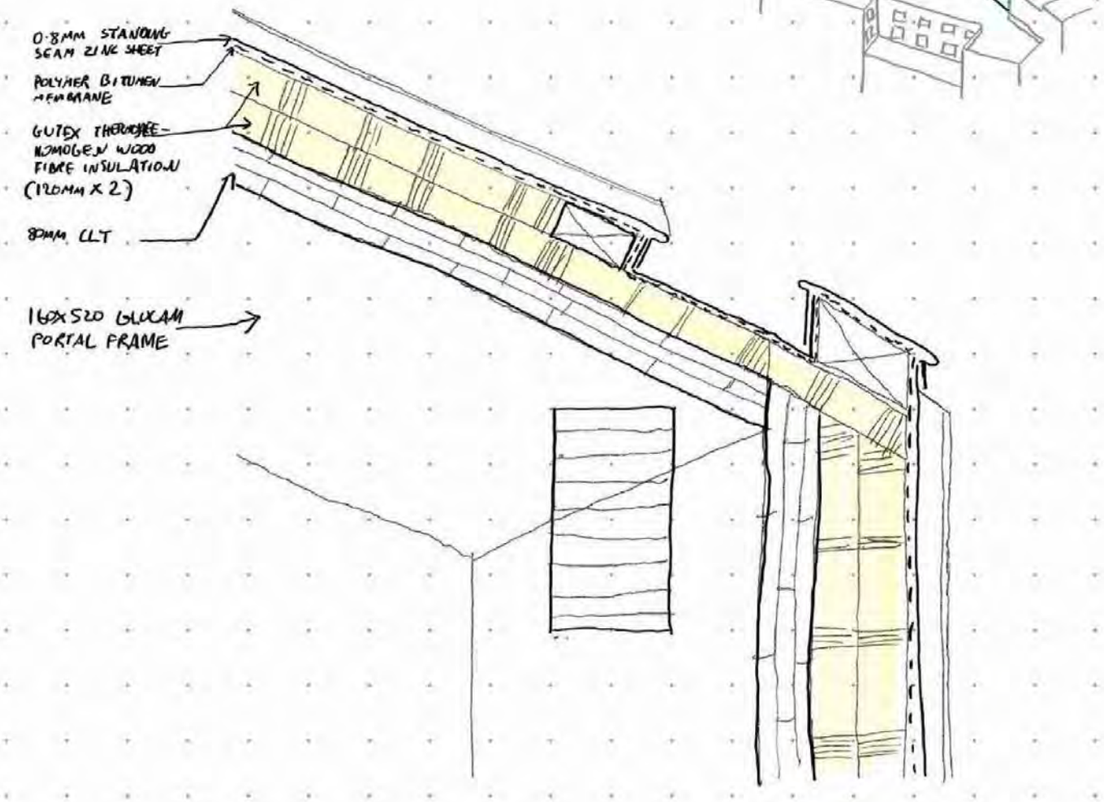
3D DETAIL LOCATION



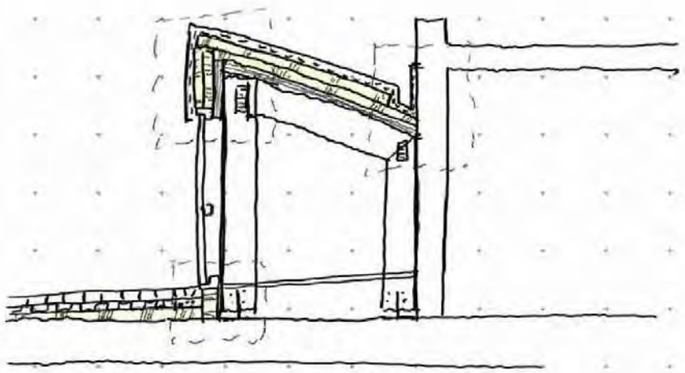
PAVILION ROOF - PROPOSED WALL

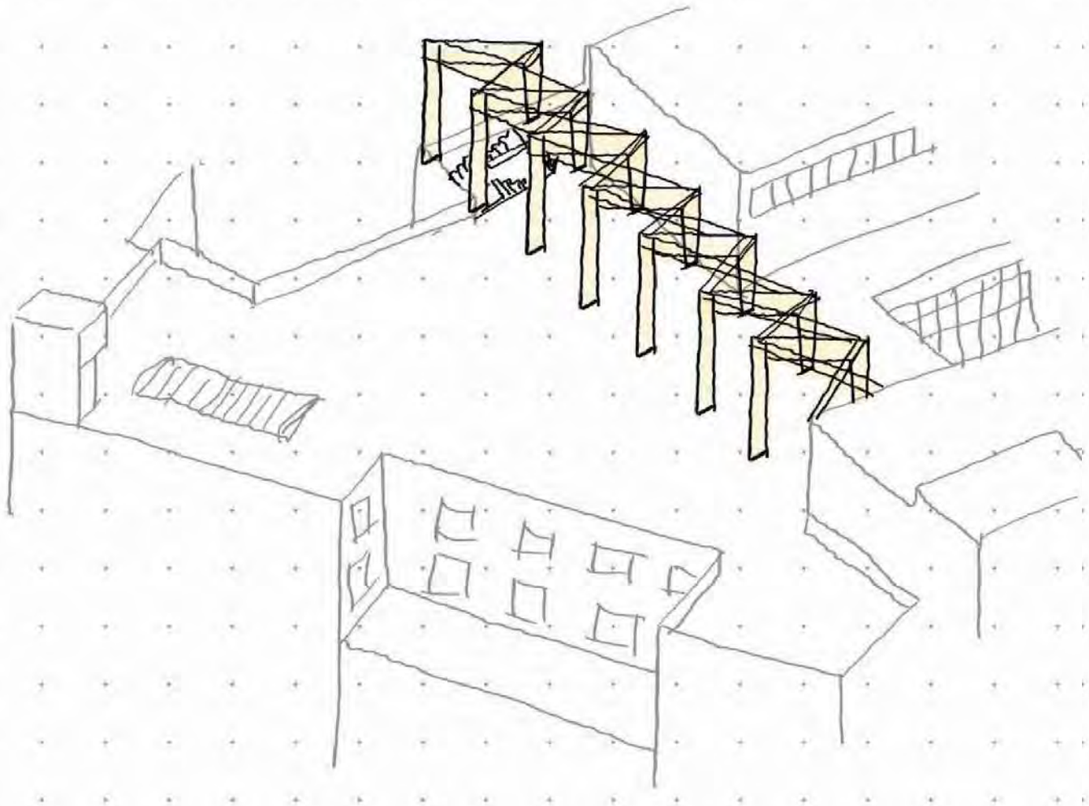
3D DETAIL LOCATION



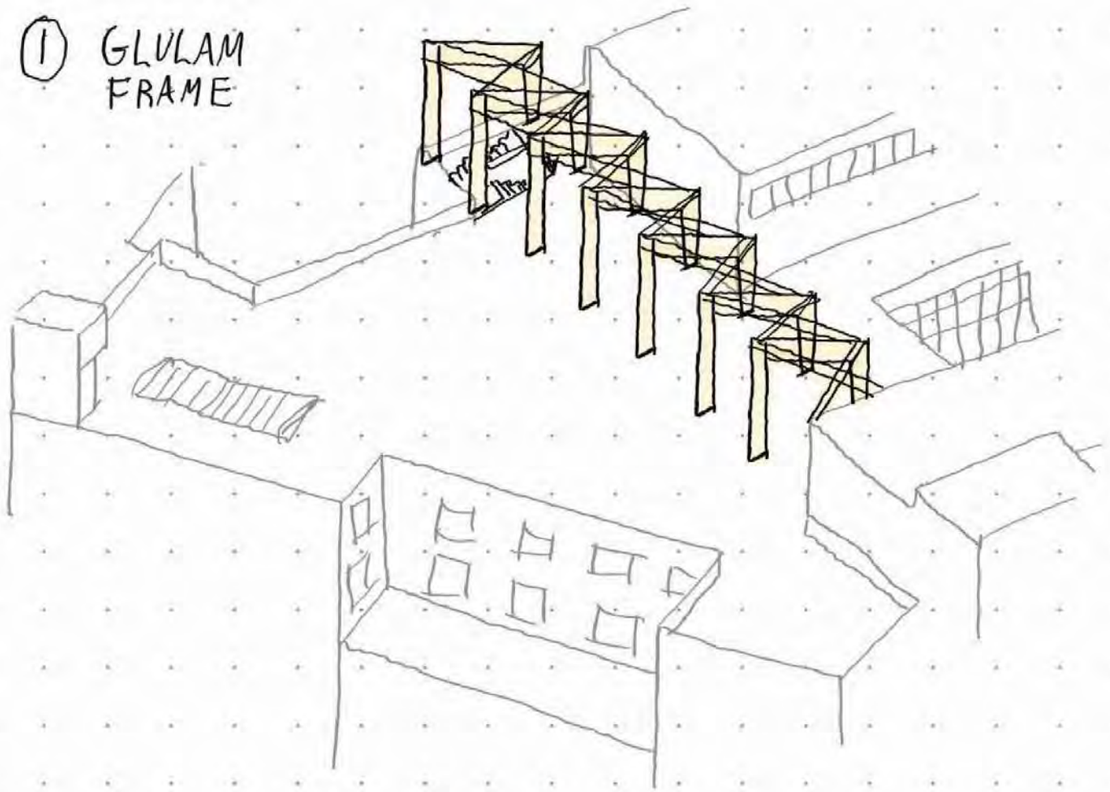


NEW GLULAM STRUCTURE

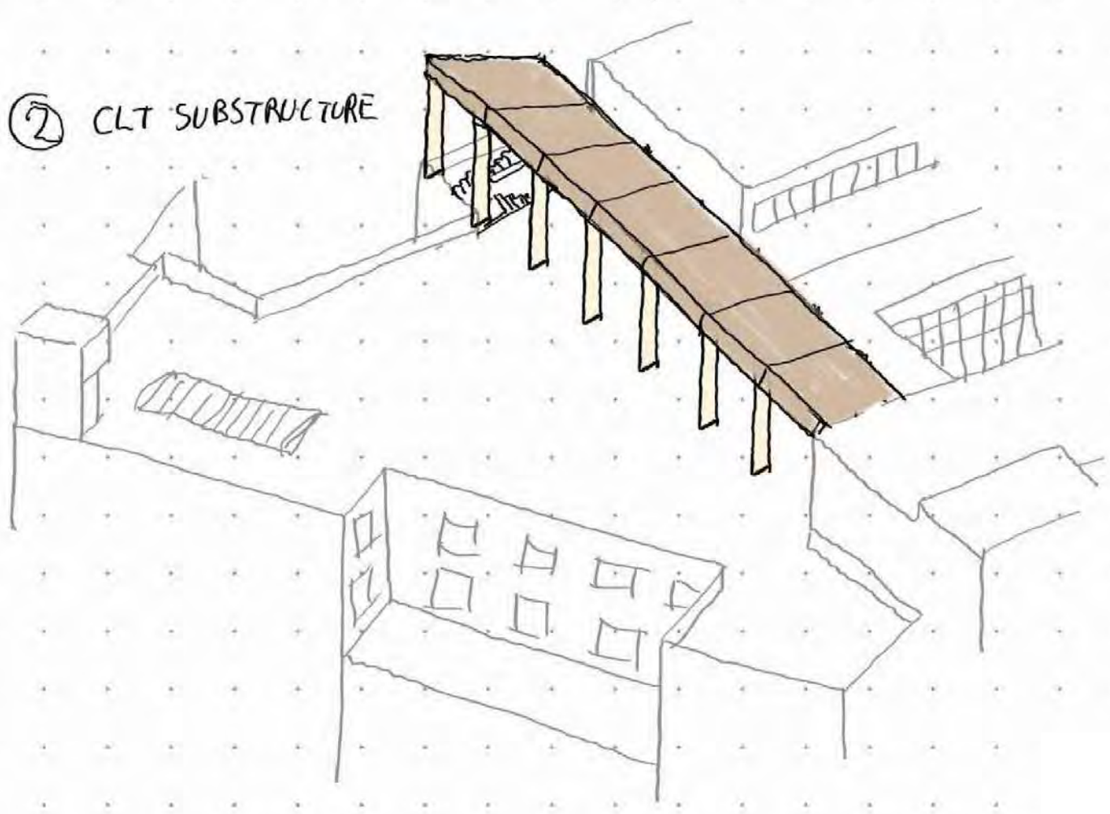




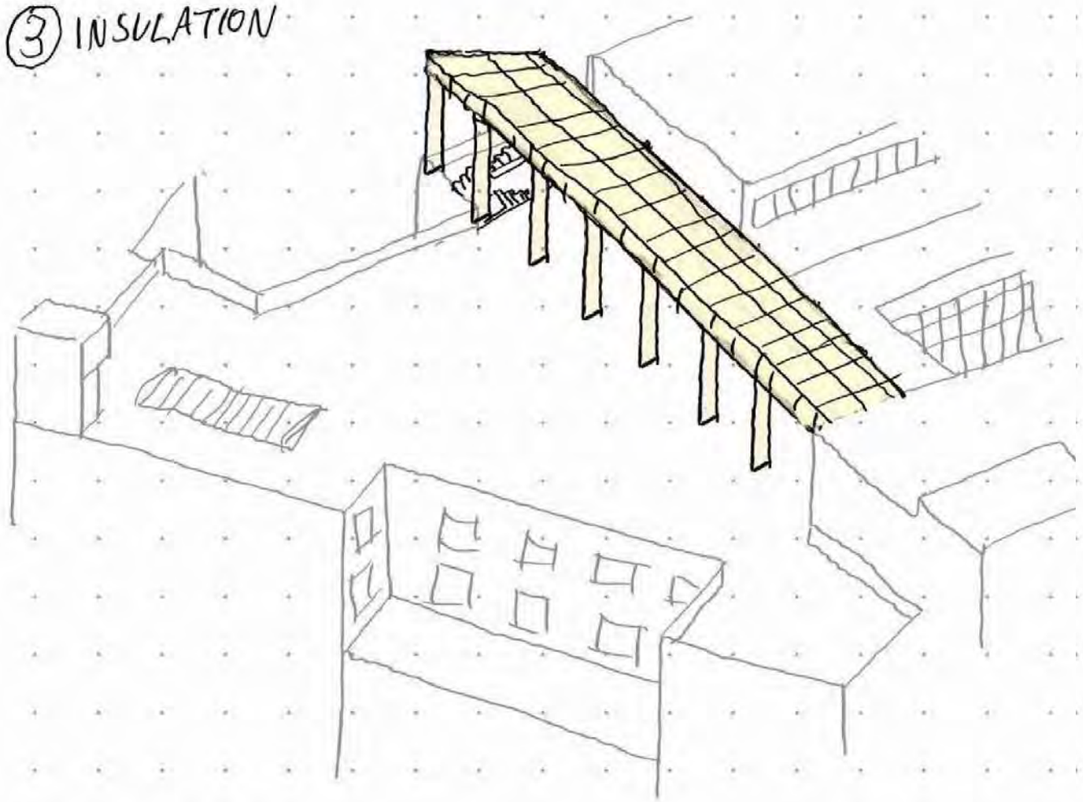
① GLULAM FRAME



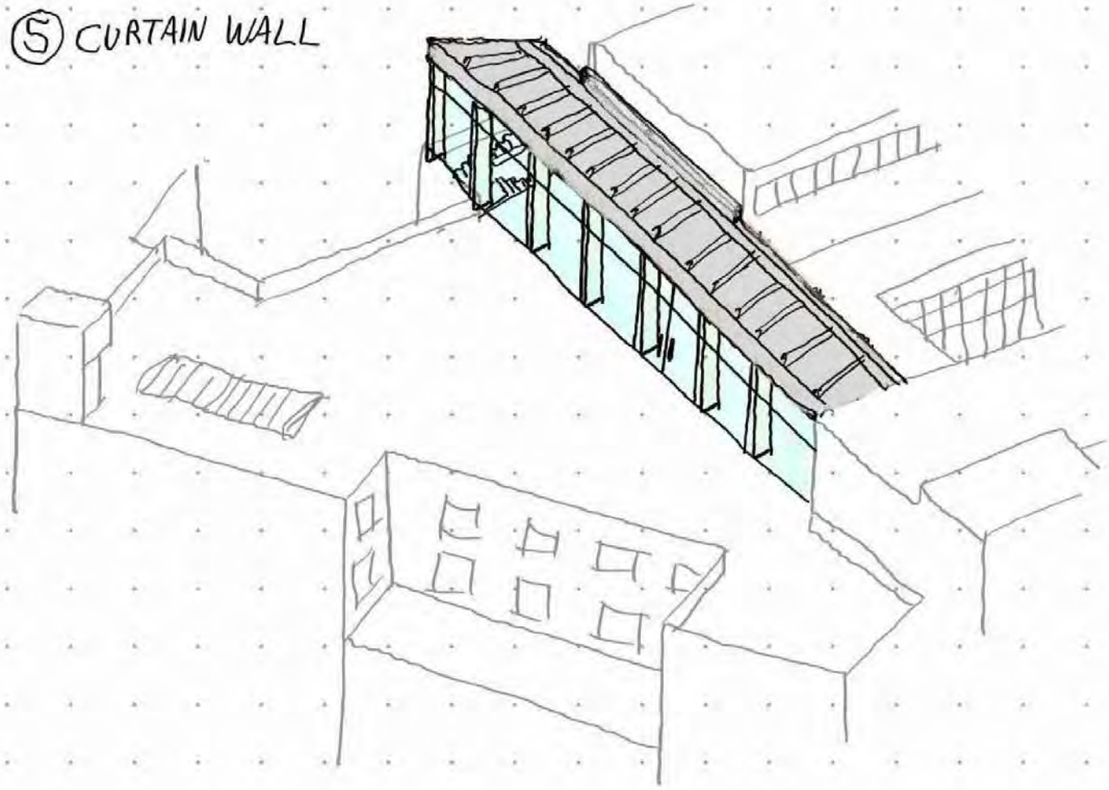
② CLT SUBSTRUCTURE



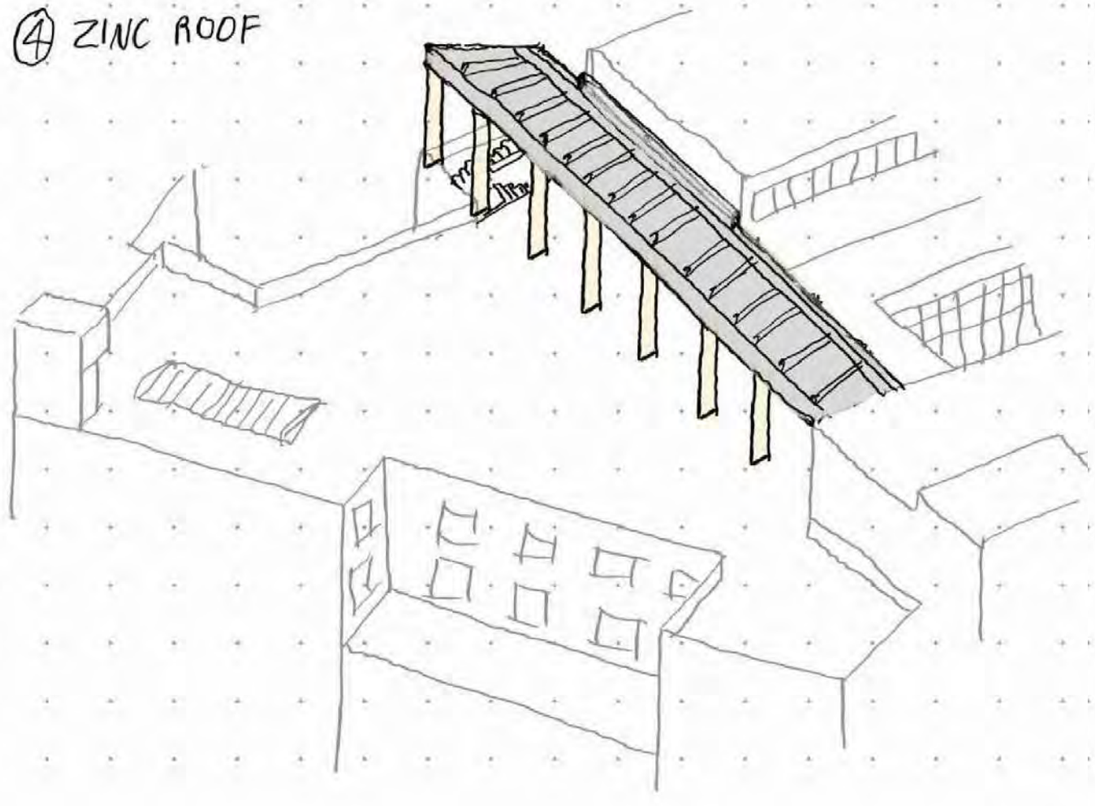
③ INSULATION



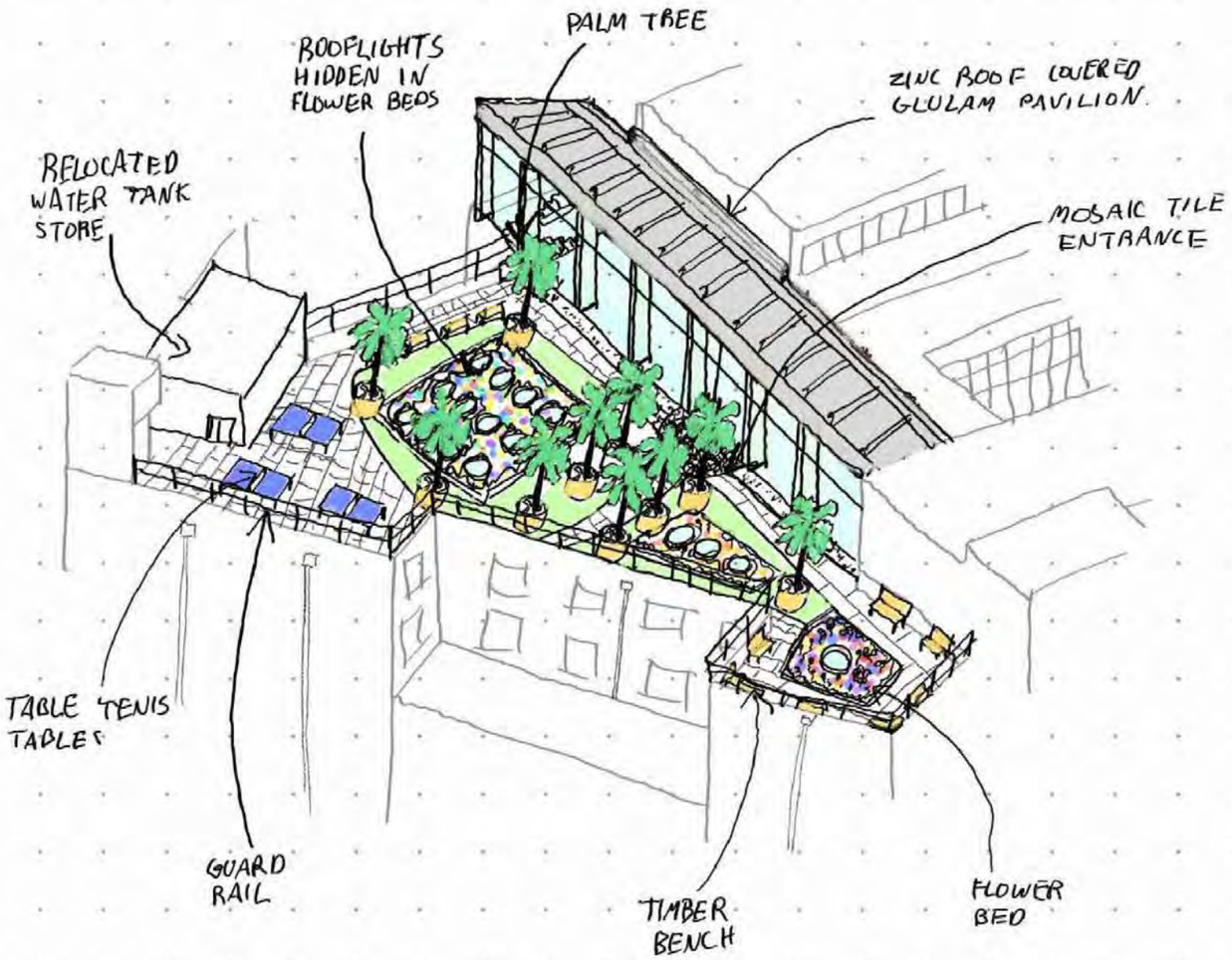
⑤ CURTAIN WALL



④ ZINC ROOF

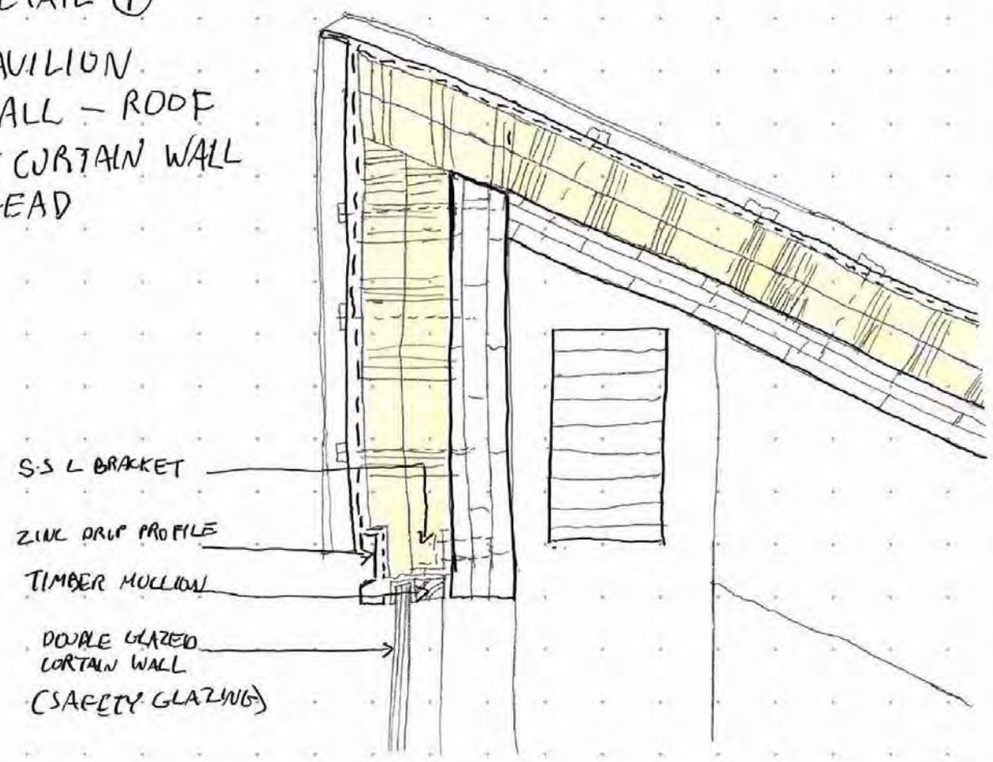


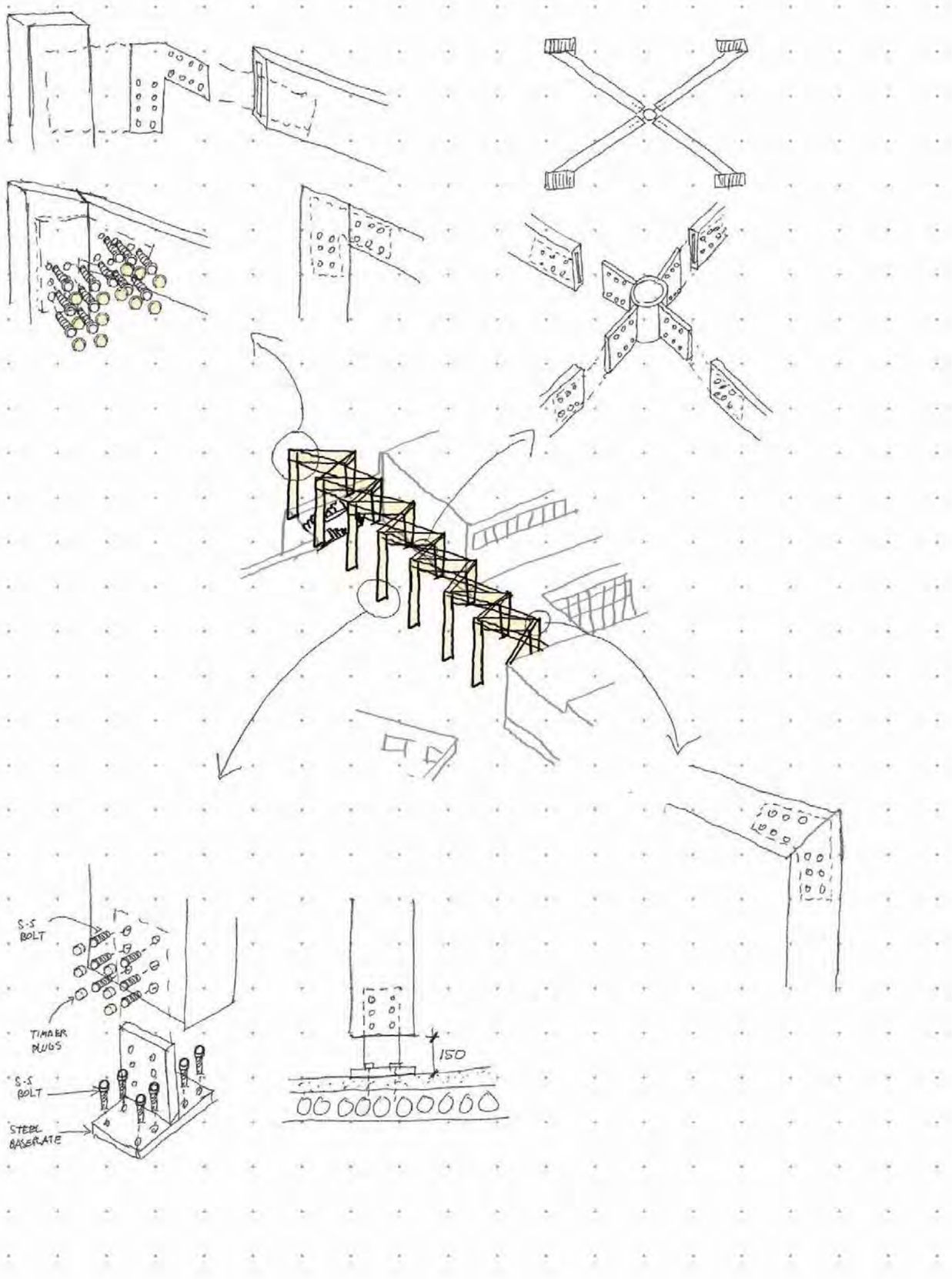
PROPOSED PAVILION + ROOF PARK

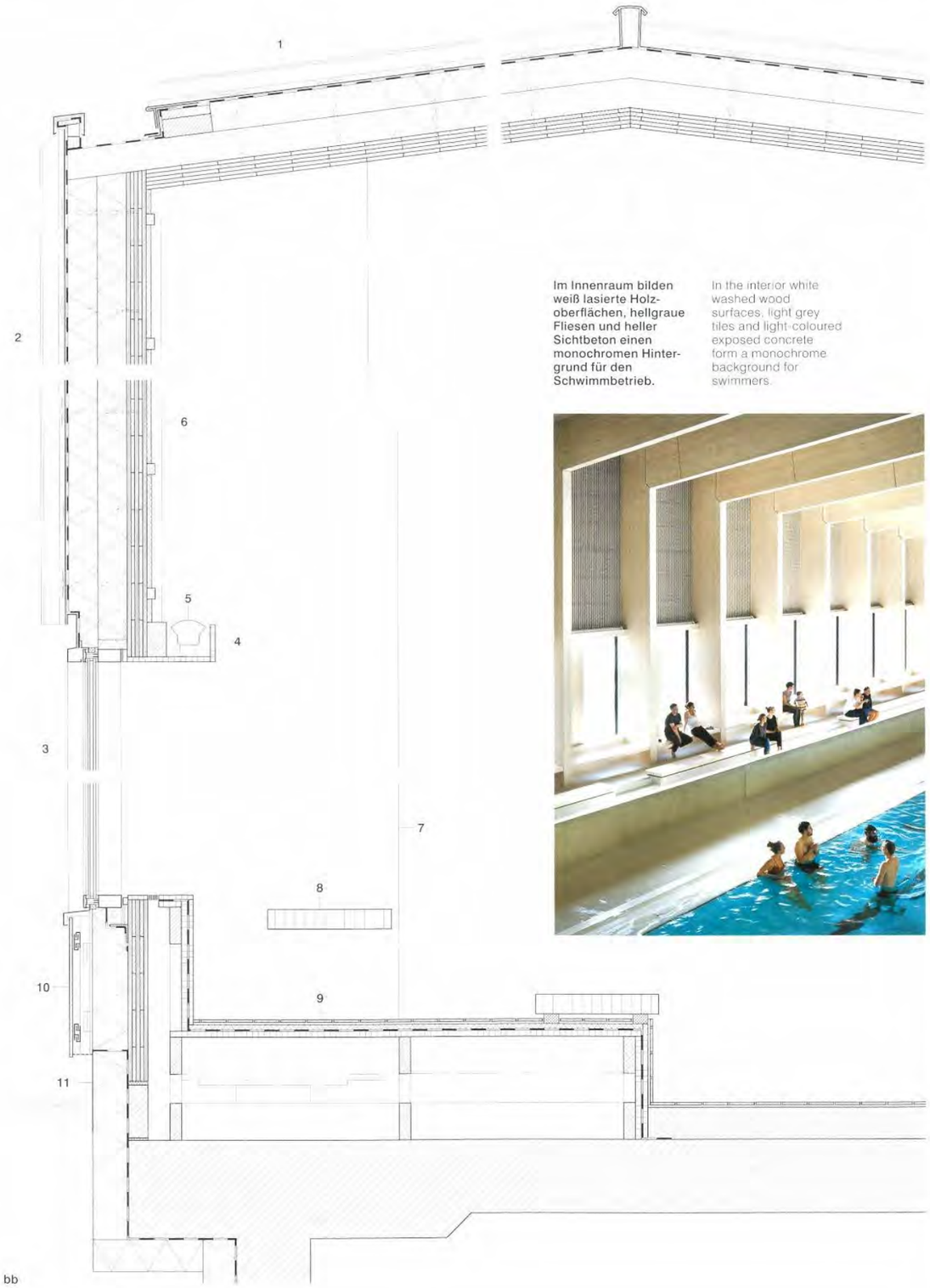


DETAIL ④

PAVILION WALL – ROOF + CURTAIN WALL HEAD

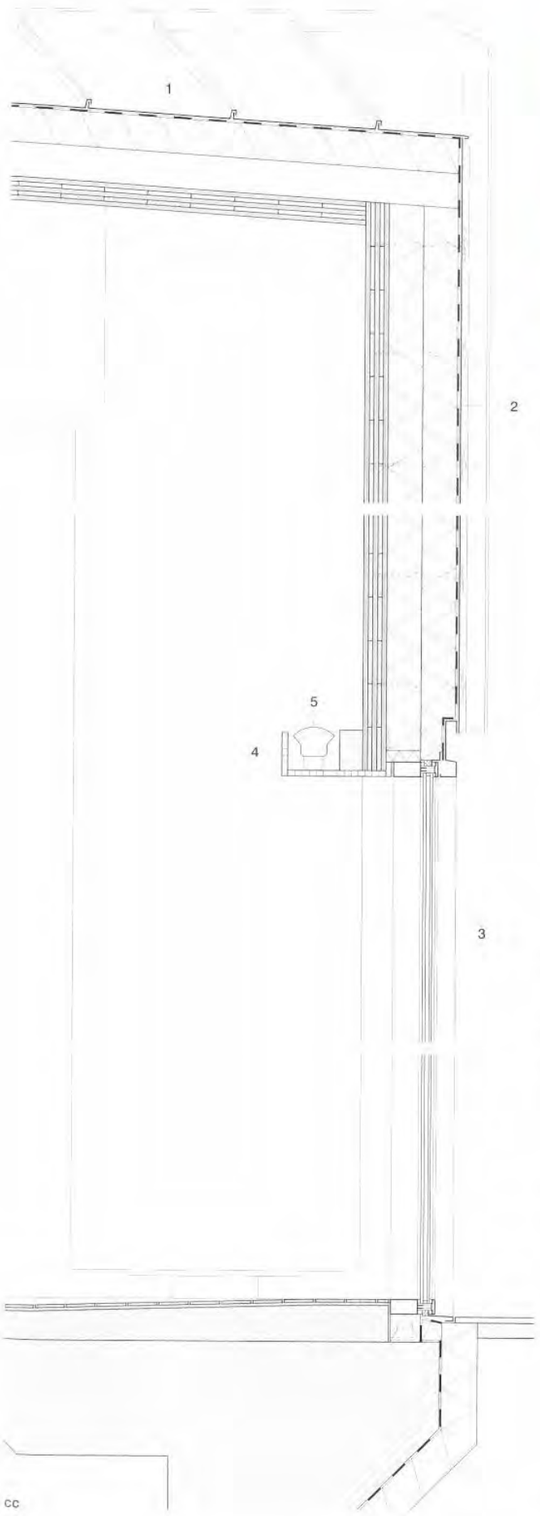



S.S BOLT
TIMBER PLUGS
S.S BOLT
STEEL BASEPLATE
150



Im Innenraum bilden weiß lasierte Holzoberflächen, hellgraue Fliesen und heller Sichtbeton einen monochromen Hintergrund für den Schwimmbetrieb.

In the interior white washed wood surfaces, light grey tiles and light-coloured exposed concrete form a monochrome background for swimmers.



Schnitt
Maßstab 1:20

1 Dachaufbau:
Stehfalzdeckung Zinkblech 0,7 mm; Trennlage
Abdichtung Polymerbitumenbahn; Wärmedämmung Schaumglas 2× 120 mm; Decke Brettsperrholz 80 mm; Träger Brettschichtholz 220/1120 mm
2 Fassadenaufbau:
Stehfalzdeckung Zinkblech 0,7 mm; Trennlage; Wärmedämmung Schaumglas 2× 120 mm
Außenwand Brettsperrholz 80 mm
3 Pfosten-Riegel-Fassade:
Isolierverglasung ESG 10 + SZR 16 + ESG 8 mm
Rahmen Aluminium
4 Verkleidung Dreischichtplatte 20 mm
5 LED-Lichtband
6 Akustikverkleidung Südfassade:
vorgefertigte Paneele aus Lattung gewachst weiß 20/42 mm + Konterlattung 34/45 mm dazwischen Schalldämmung Mineralwolle 20 mm
7 Stütze Brettschichtholz 220/1000 mm
8 Sitzbank Brettschichtholz Fichte 500/80 mm
9 Aufbau Zuschauerpodest:
Keramikfliese 10 mm
Fliesenkleber 10 mm
Fliesenträgerplatte XPS 20 mm
Marinesperrholz 25 mm
Unterkonstruktion Kantholz
10 Fassadenaufbau Sockelbereich:
Faserzementplatte 12 mm
Unterkonstruktion Metallschienen horizontal 27 mm
Hinterlüftung/Unterkonstruktion Metallprofile vertikal ⊔ 55 mm
Wärmedämmung Schaumglas 140 mm
Außenwand Brettsperrholz 80 mm
11 Sockelverkleidung Aluminium pulverbeschichtet

Section
scale 1:20

1 Roof construction:
0.7 mm standing seam zinc sheet; separating layer; polymer bitumen membrane; 2× 120 mm foam glass thermal insulation; ceiling: 80 mm cross laminated timber; 220/1120 mm glulam beams
2 Facade construction:
0.7 mm standing seam zinc sheet
separating layer
2× 120 mm foam glass thermal insulation
80 mm cross laminated timber wall
3 Transom and mullion facade:
double glazing 10 mm toughened safety glass + 16 mm cavity + 8 mm toughened safety glass
aluminium frame
4 Cladding: 20 mm three ply panel
5 LED strip lighting
6 Acoustic cladding south facade:
Prefabricated panels of 20/40 mm white glazed battens + 34/45 mm counter battens, between them 20 mm mineral wool acoustic insulation
7 220/1000 mm cross laminated timber column
8 500/80 mm spruce glulam bench
9 Construction spectator stands:
10 mm ceramic tile
10 mm tile cement
20 mm XPS tile backer board
25 mm marine plywood
substructure timber sections
10 Facade construction plinth area:
12 mm fibre cement panel
substructure 27 mm horizontal metal tracks
back ventilation
substructure 55 mm vertical metal channels
140 mm foam glass thermal insulation
80 mm cross-laminated timber wall
11 Plinth cladding
powder-coated aluminium