MAKING: Design + Construct Exploration and Innovation

School of Architecture, Building and Environment

Collaborative Group Projects:
5th Year Architecture (TU832) &
4th Year Architectural Technology (TU831)

Féidearthachtaí as Cuimse
Infinite Possibilities

Ollscoil Teicneolaíochta Bhaile Átha Cliath
TU Dublin
Technological University Dublin

Project Description:

For this collaborative project, students were asked to explore the idea of Making in more depth. The TU Dublin Broombridge building will form the basis of this exploration. This formerly industrial building is due to undergo a change of use into an innovative educational facility for TU Dublin. Students were asked to imagine and resolve how this transformation might take place, focusing on questions of material and technique. The act of making a building (or designing how it is made) is never purely a technical act. Every decision has implications - implications on how the building appears, how the building performs, how the spaces feel and what the impact on our environment is.
Like many industrial buildings, Broombridge has a robust structure suitable for many uses, but its external envelope (roof and façade) has more limited qualities - unsuitable for many alternative uses. We asked students to retain the existing structure of the building but question how the envelope might be changed to better suit its future use as a centre for excellence in making and education: Design + Construct Sustainable Building Centre.

Design + Construct Sustainable Building Centre (D + C SBC) at the TU Dublin Broombridge campus is being developed as a centre of national and international significance to serve the Architecture, Engineering and Construction Sector. Through multidisciplinary collaboration and industry engagement, the centre will accommodate applied and practical innovation, education, and research at all levels. The centre will play a pivotal role in delivering on Project Ireland 2040 and the government's key priority areas of Climate Action, Housing, skills for Zero Carbon, digitalisation, productivity, and innovations. D + C SBC will provide 6,430m2 of core academic and research space which increase TU Dublin capacity to accommodate additional leaners, in collaborative, transdisciplinary education at all levels.

(Orna Hanly, Design + Construct TU Dublin Broombridge)

Contents:

Group 1 Presentation.......... 4

Group 2 Presentation.......... 8

Group 3 Presentation.......... 12

Group 4 Presentation.......... 16

Group 5 Presentation.......... 20

Group 6 Presentation.......... 24

Group 7 Presentation.......... 28

Group 8 Presentation.......... 32

Group 9 Presentation.......... 36

Group 10 Presentation.......... 40

Group 1:

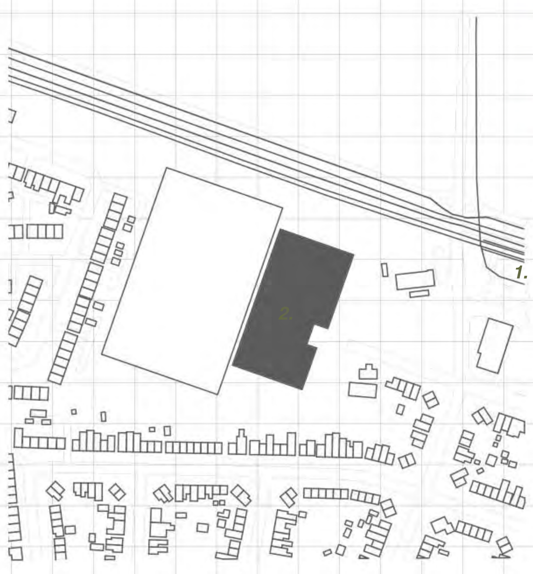
Evan Brady (AT), Cian Carroll (AT), Seonadh Ganley (A), Roman Hartmann (A), Mark Leonard (AT), Evelyn Phelan (A), Ally Webb (A).

Abstract:

Group 1's approach to the building put emphasis on making use of as much natural light as possible. By designing angled louver blades on the east façade, we optimized the light reflection during daylight hours, so the natural light could penetrate far into the large spaces. The initiative we took to focus on retaining existing building fabric and repurposing damaged on-site material was paramount to our goal of reducing the carbon footprint of our design. The internal to external mezzanine paired with the large glazing panels formed a connection between the 3 built spaces. The selected bay of our design allowed us to show this ecological balance between the spaces.

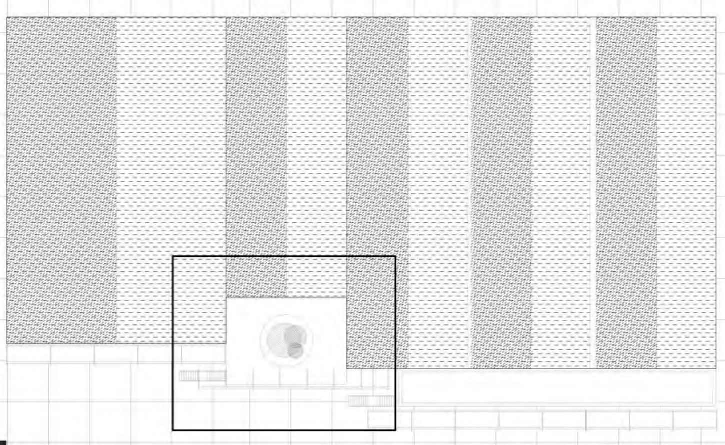
TUD BROOMBRIDGE

Evan Brady*
Cian Carroll*
Seonadh Ganley
Roman Hartmann
Mark Leonard*
Evelyn Phelan
Ally Webb

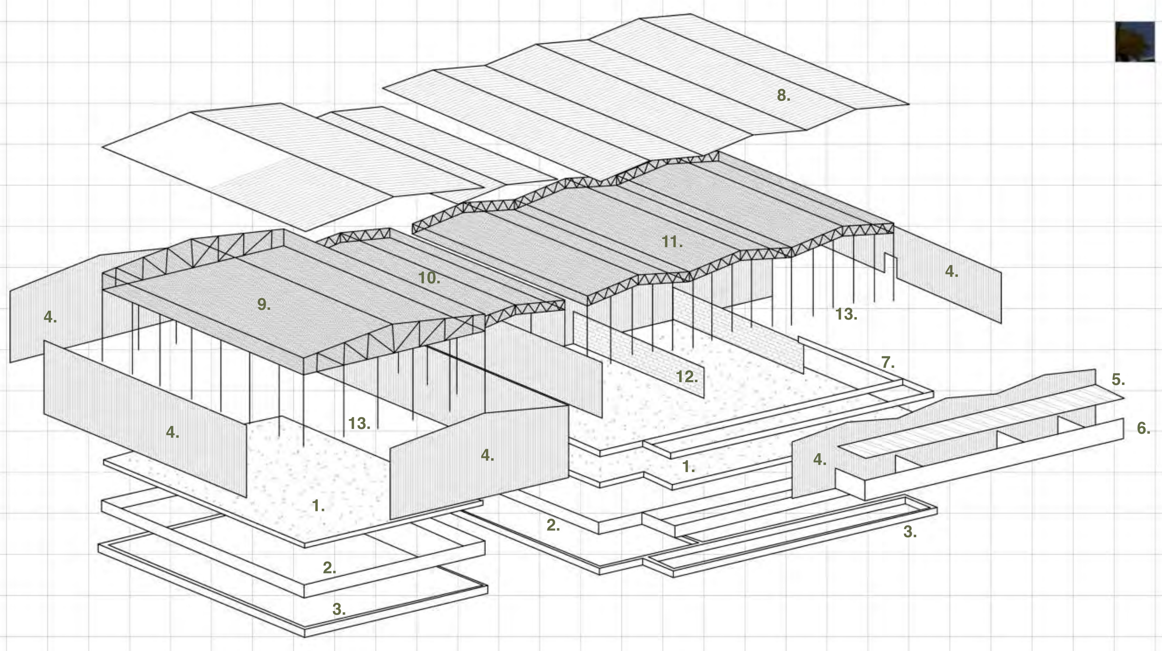


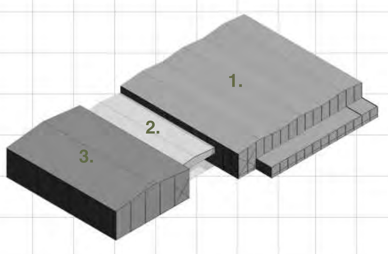
Site Plan

1. Broombridge Luas Stop
2. TUD Broombridge Site

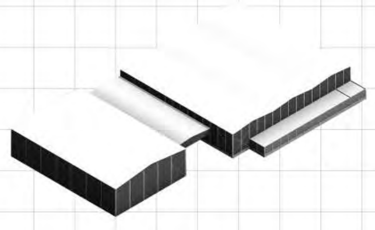


Area in focus

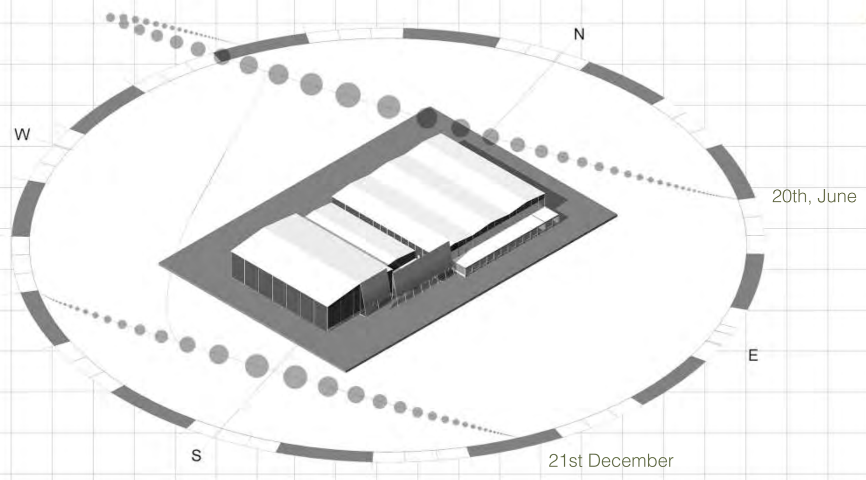




1. Material Research + Workshops
2. Communal Cafe + Exhibiton Space
3. Multi-purpose space



Existing



Existing Materials for re-use.

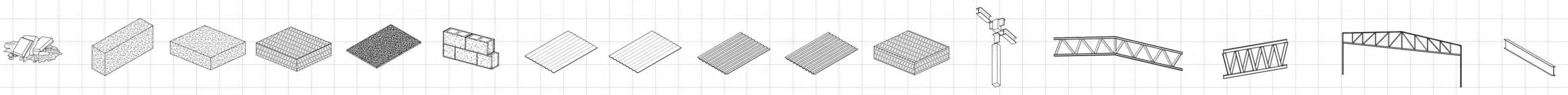
1. Insulated Conc Slab With 100mm Poured Screed (5165m2)
2. Rising Foundation Block Wall (Length: 563.8m)
3. Concrete Strip Foundation (Length: 563.8m)
6. Outhouse Brick Infill Wall (78.2m2)
7. 1m Rising Black Wall (Length: 282.7m)
8. Westen South Wing Roof Cladding (866.3m²)
9. South Wing Steel Truss Structure (Quantity: 8)
10. Middle Steel Truss Strcuture (Quantity: 7)
11. North Wing Steel Truss Structure (Quantity: 39)
12. Internal Block Wall (324m²)
13. Steel U.C Columns (Quantity: 114)
15. 200mm Thick Conc. Slab (826m²)

Existing Materials for recycling

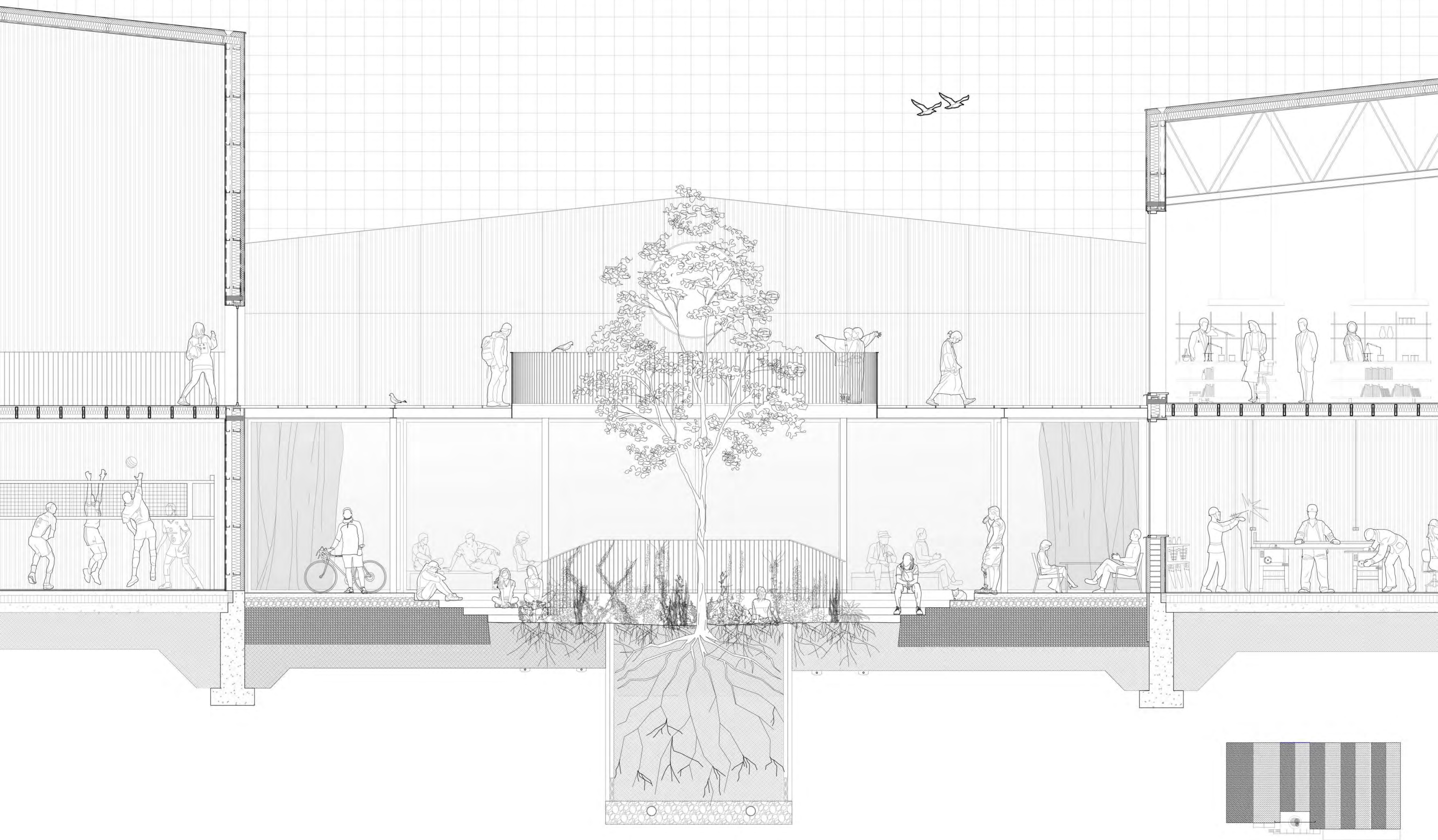
5. Outhouse Timber Joist Roof (350m2)
8. Majority of Roof Cladding (5171m2)
14. Token External Wall Itnsulation (3880m2)

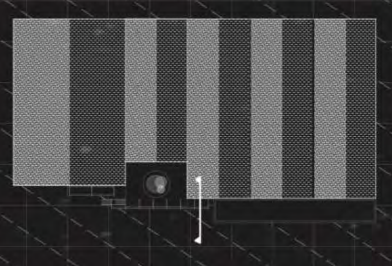
Recycling where possible

4. Steel Corrugated Metal Cladding (7660m2)
Reused Internally, New External Cladding proposed



Rubble	18.34m² re-use for concrete
Strip Foundation	Combined length: 563.6m
Concrete Slab	5991m² re-use
Rigid Insulation	5165m² re-use
Concrete Screed	5165m² re-use
Block Wall	782.7m² re-use
Asbestos Roof	Cladding 5170.7m² Discard
Corrugated steel Cladding	6037m² 866.3m² re-use
Internal Sheets Corrugated Steel	1580m² 60% re-use 40% end of life
External Sheets Corrugated Steel	7660m² re-use
Insulation	3880m² recycle to kingspan programme
Timber Columns in outhouse	end of life
North wing truss	13 re-use
South wing Bracing	8 re-use
South wing truss	8 re-use
U.C Steel Columns	(203 x 203) 11.5m~ (180 x 165) 7.6m~

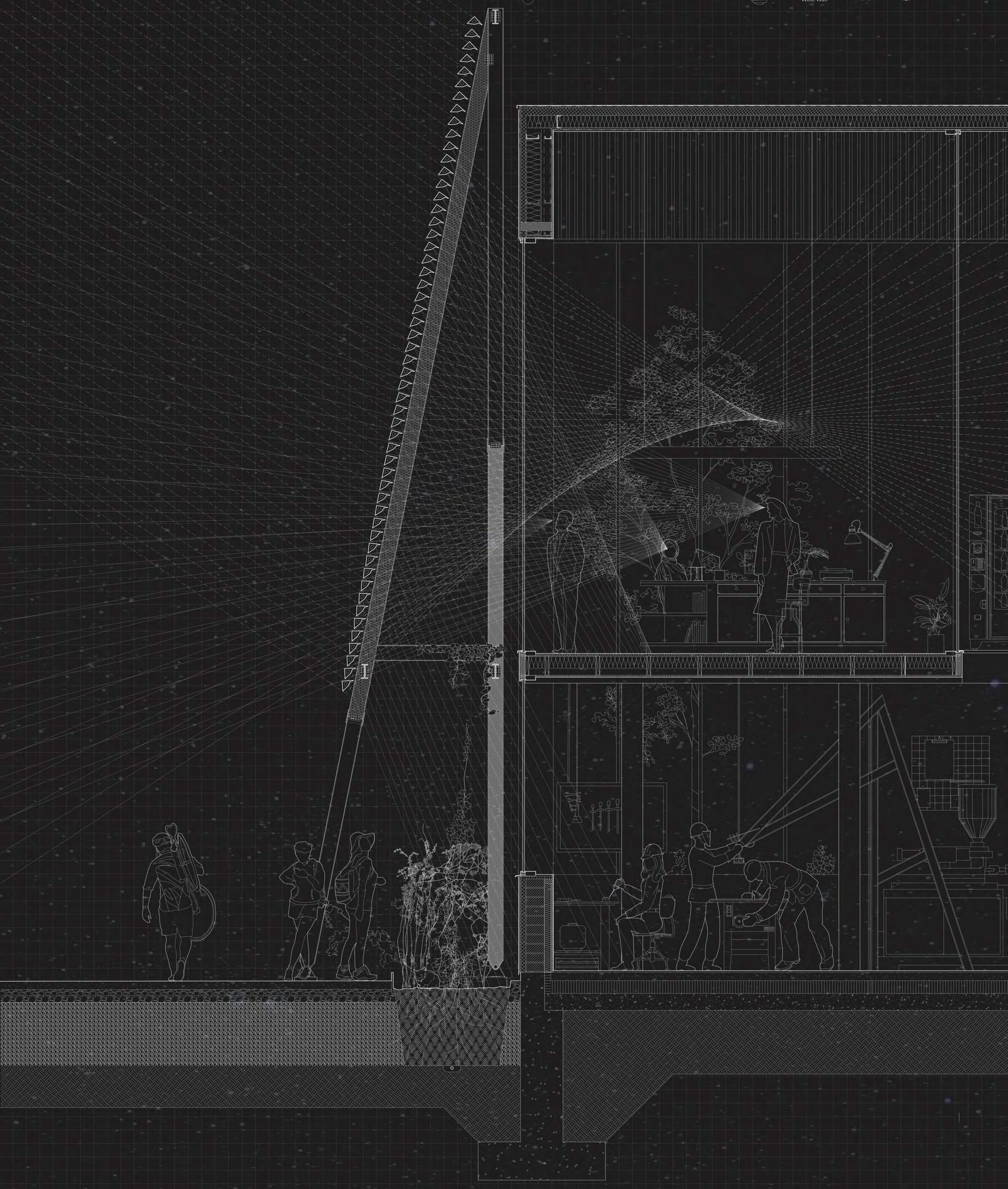


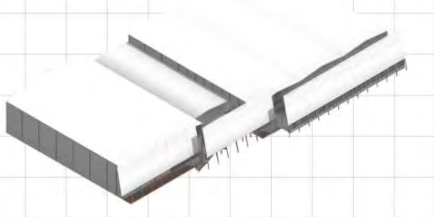


Rainwater Collection

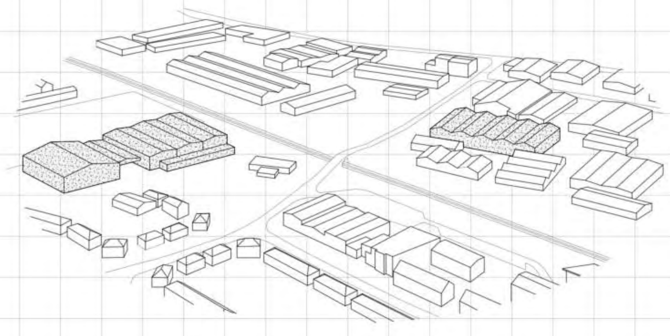
Average Rainfall on site 4369l/yr
Average Water Usage/ per day 5524l/hr
79% of required water can be collected from rainwater each day

Surface	*Lux [lx]*	*Luminance [cd/m²]*
Ceiling	635	160
Floor	735	182
North Wall	612	155
East Wall	595	149
South Wall	684	170
West Wall	513	127





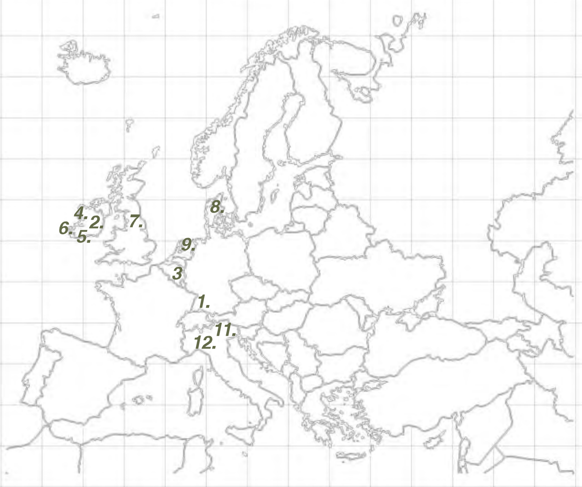
Proposed Elevation



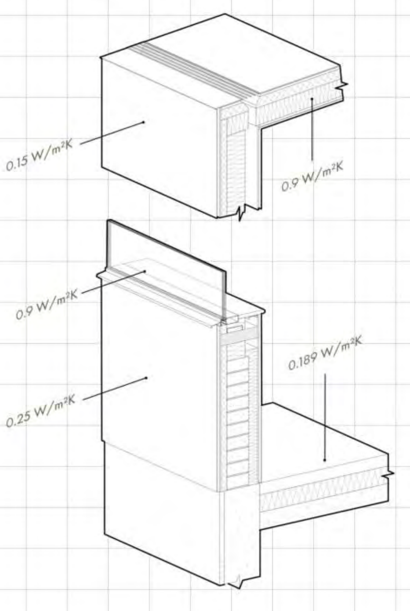
Colorman's Factory & Yeast Factory Set for Demolition

1220.75m² of Corrugated Steel
115 Steel columns salvaged from Portal Frames (10m Tall)

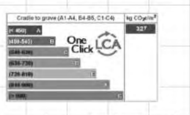
23.6m of steel needed for 50 fins in one bay.
In total we need 2693m² for all of the fins for the whole facade.
There is 1963m² of corrugated steel to be recycled from the Broombridge Site, but an estimated 25% of this is unusable. 75% is remaining, amounting to 1472.25m².
Therefore - we need to salvage 1220.75m²



1. Gutex: Waldshut - Tiengen, Germany
2. Gyproc: Kingscourt, Co. Cavan
3. Equitone: Kapelle-op-den-bos, Belgium
4. Kore:Kilnaleck, Co. Cavan
5. Medite Smartply: Clonmel, Co. Tipperary
6. Glenfort Timber:Dungannon, Co. Tyrone
7. Protega: Durham, UK
8. Outline: Jutland, Denmark
9. HempFlax: Oude, Pekela
10. Texsa: Chignalo, d'Isola, Italy
11. Rothoblaas: Cortaccia, BZ, Italy



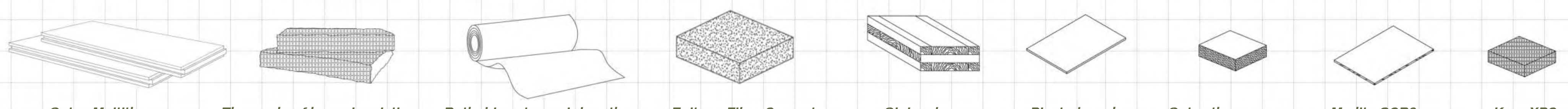
U-Value Calculations



LCA
327 kg C02e/m² [A]

A	B	C	D	E	F	G	H
Material Name	Material Volume	Material Density (kg/m3)	Material Weight	Material GWP A1-A3	Material GWP A4-A5	GWP All Stages (A1-A5)	Total GWP
BDCC_EquitoneFibreCement	6.39 m³	1630	10419.566872	0.593	0.075	0.668	6960.270671
BDCC_Glass	4.32 m³	1000	4318.296235	4.2	0.123	4.323	18667.984624
BDCC_Glulam	1.00 m³	400	399.24072	0.126	0.006	0.132	52.699775
BDCC_GutexMultitherm	16.43 m³	140	2299.549855	-1.15	0.12	-1.03	-2368.536351
BDCC_GutexThermoroom	24.42 m³	130	3174.282285	-1.15	0.12	-1.03	-3269.510753
BDCC_GyprocFireline	5.73 m³	921	5280.508111	0.248	0.005	0.254	1341.248552
BDCC_HempInsulation	74.16 m³	37	2743.765707	0.289	0.08	0.369	1012.448646
BDCC_MediteOSB3	7.98 m³	600	4786.180681	3.72	0.006	3.726	17833.309217
BDCC_ProtegaPaint	1.44 m³	330	473.715643	2.84	0.035	2.875	1361.932473
BDCC_RothoblaasBreather	0.27 m³	264	72.033502	0.87	0.145	1.015	73.114004
BDCC_RothoblaasVapor	0.54 m³	570	309.852546	0.87	0.145	1.015	314.500334
BDCC_TexsalonRoofMembrane	0.16 m³	933	150.779875	0.2217	0.145	0.3667	55.29098
	142.83 m³		34427.770031				42034.763072

GWP New Materials (of area researched / designed)
Total GWP 42034



Gutex Multitherm
16.43m³
-2369 GWP

Thermo hanf hemp insulation
74.16m³
1012 GWP

Rothoblaas transpir breather
0.27m³
73GWP

Eqitone Fibre Cement
6.39m³
6960 GWP

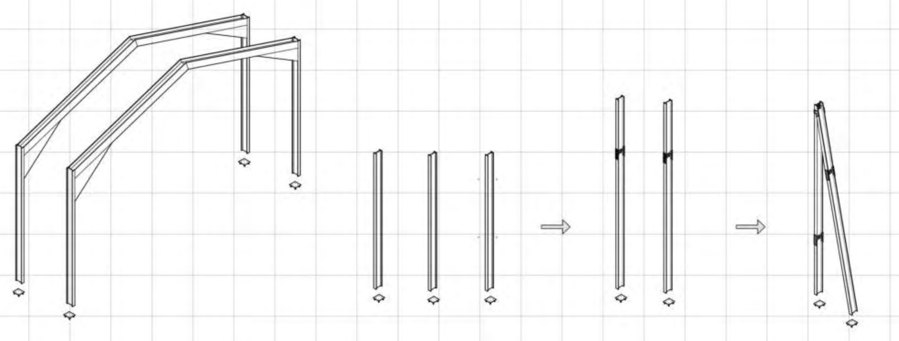
Glulam beams
1m³
53 GWP

Plasterboard
5.73m³
1341 GWP

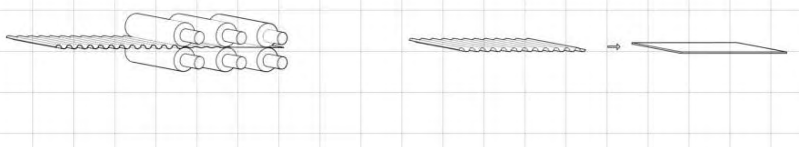
Gutex thermoroom
24.42m³
-3269 GWP

Medite OSB3
7.98m²
17833 GWP

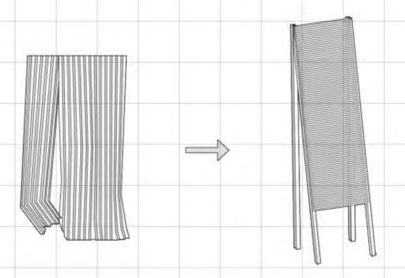
Kore XPS
6m²
15284 GWP



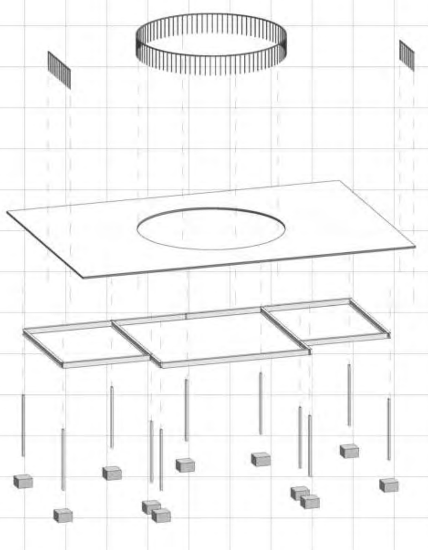
Steel Re-Use
Use of splice plate



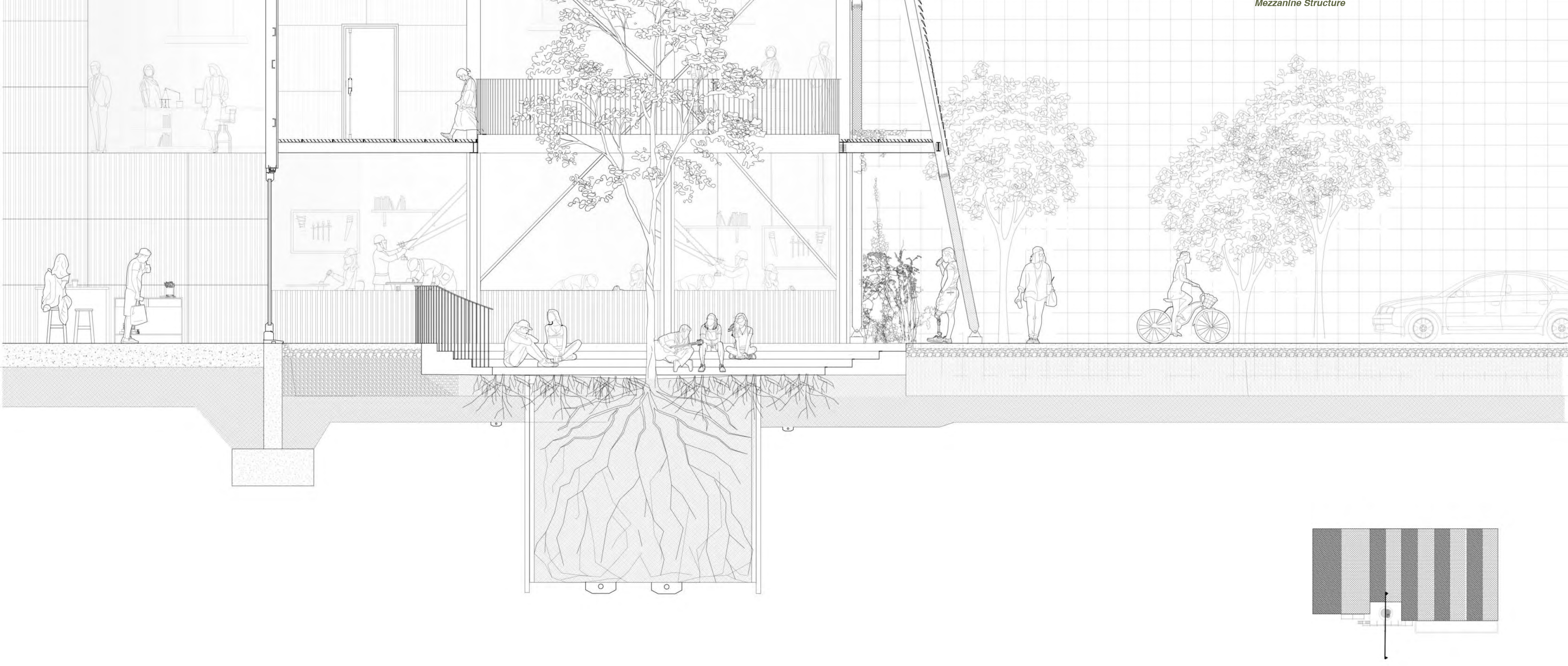
Steel Corrugated Cladding Re-Use
Rolling of corrugated into fins.



Cladding removed from mezonlene level



Mezzanine Structure



Group 2:

Senan Barrett (A), Jake Coleman (A), Kelly Conway (AT), Alec Greene (AT), Emily Ho (A), Fola Oki (AT), Gavin Tierney (AT).

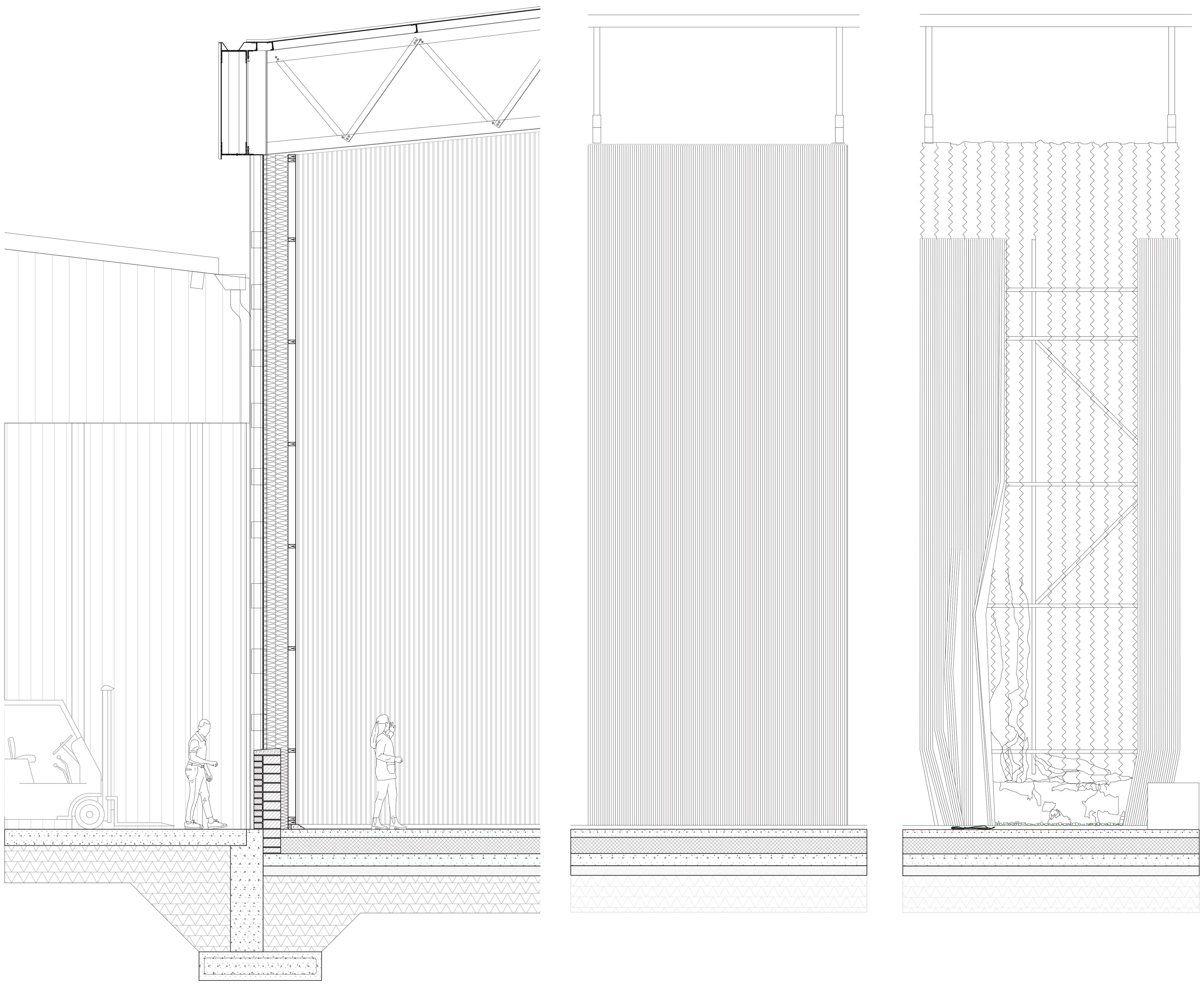
Abstract:

During this project, our group responded to the brief with a primary goal of retaining existing materials and structural elements of the Broombridge Design and Construct building. Our design proposal allowed us to repurpose existing cladding, incorporating it to a lean-to external deck. This will serve as a ventilation strategy for health and safety concerns in the workshops. Responding to this health concern, we were able to incorporate a sense of welcome and community to the existing industrial feel to the units. To ensure that the design is responsive to the use and conditions of the environment, the front entrance has been fully glazed and incorporates dynamic louvres.

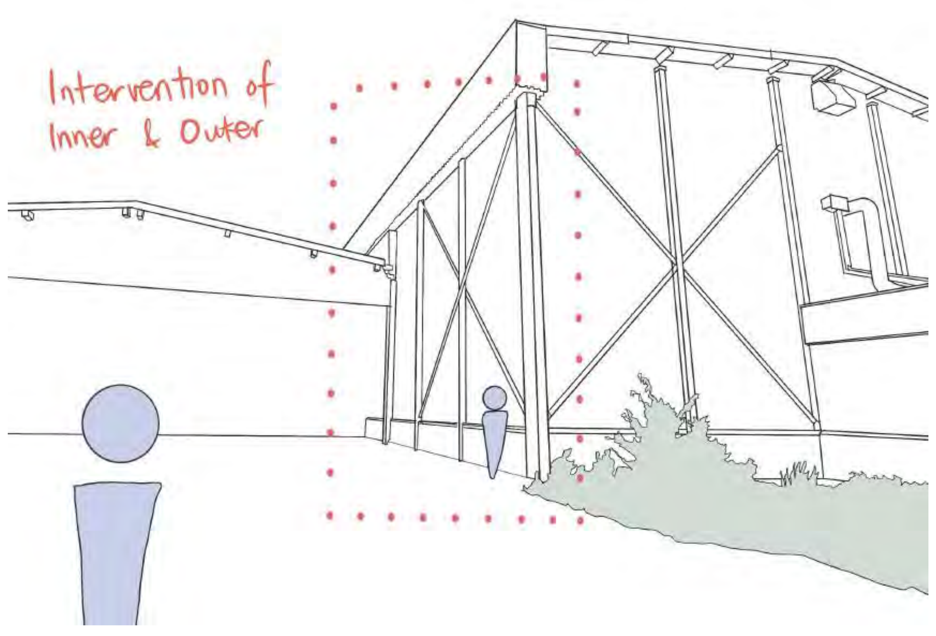
BROOM BRIDGE DESIGN + CONSTRUCT

Group 2
Emily Ho
Jake Coleman
Senan Barrett
Fola Oki
Gavin Tierney
Alec Greene
Kelly Conway

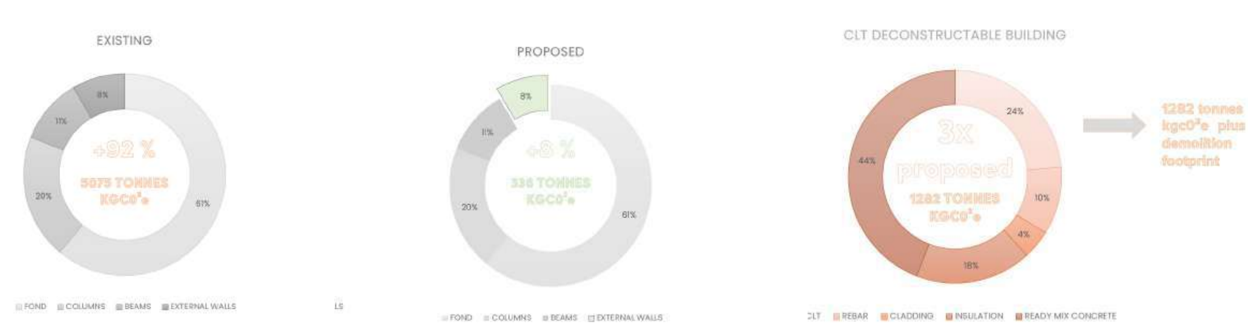
Interrogating retention and reuse and how minimal intervention with an existing structure can still result in a considered architectural output. Responding to communities that will interact and experience the building, the familiar form of the building is retained and remains a landmark for the community it has been an anchor in for the last 60 years.



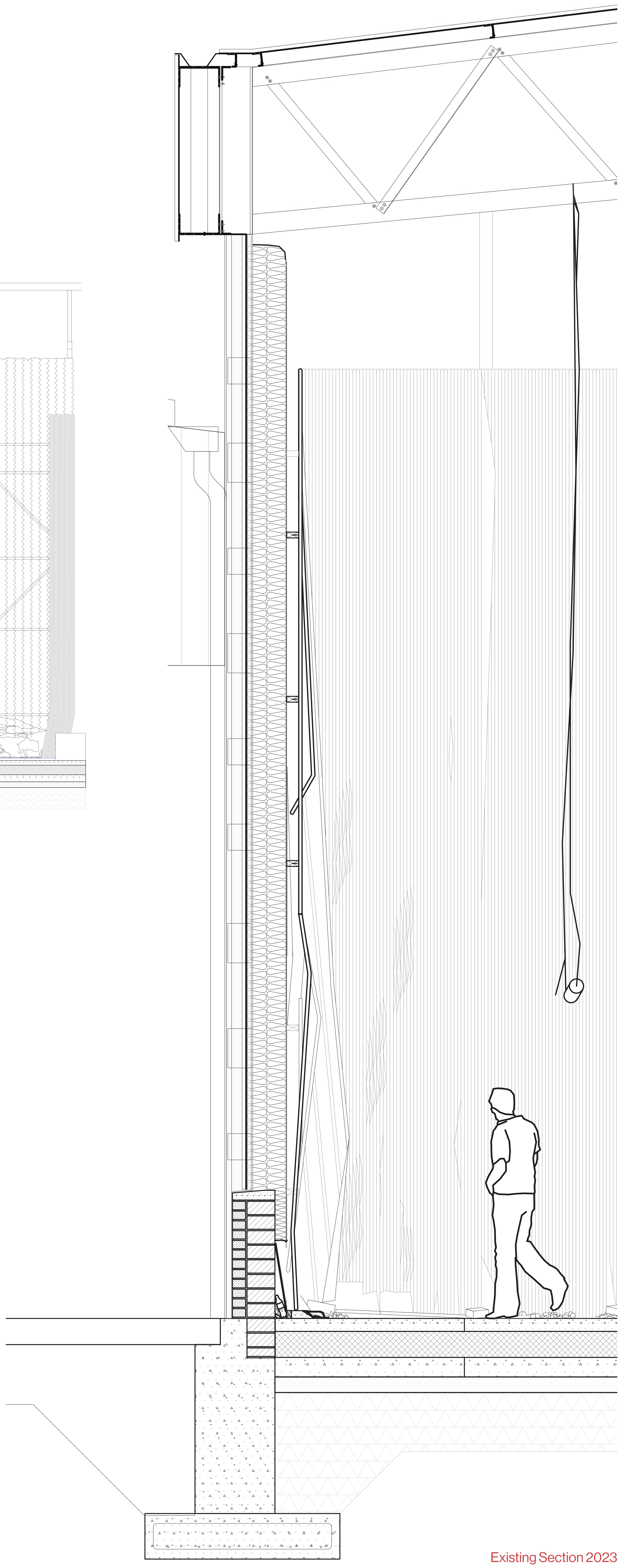
Existing Section (1970s)



In understanding the building and interrogating what can be retained, the carbon sequestered in the proposal amounts to **92%** of the existing built fabric on-site.
The proposal maintains and uses as much of the existing structure and envelope as is practicable.

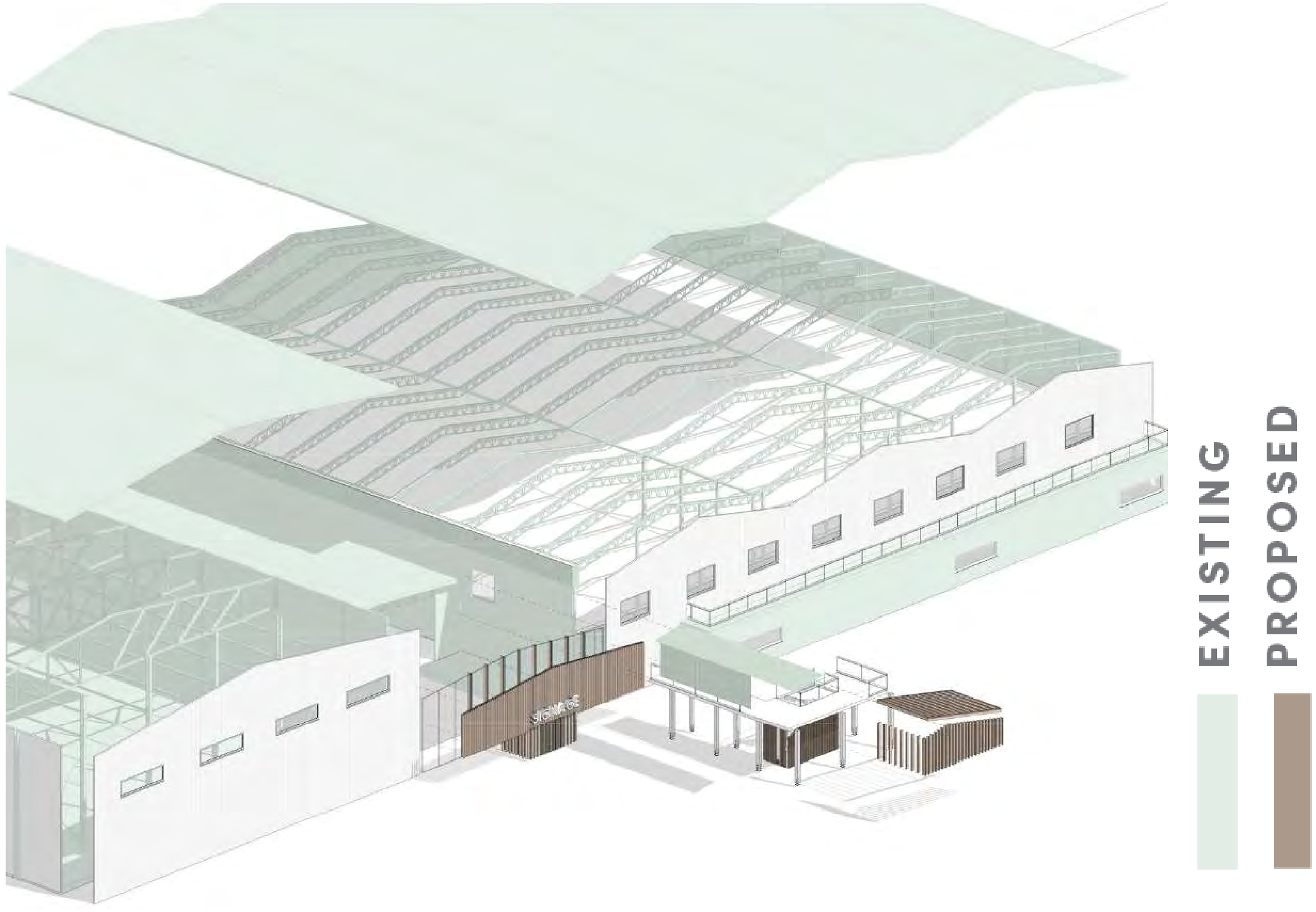


Embodied Carbon Analysis



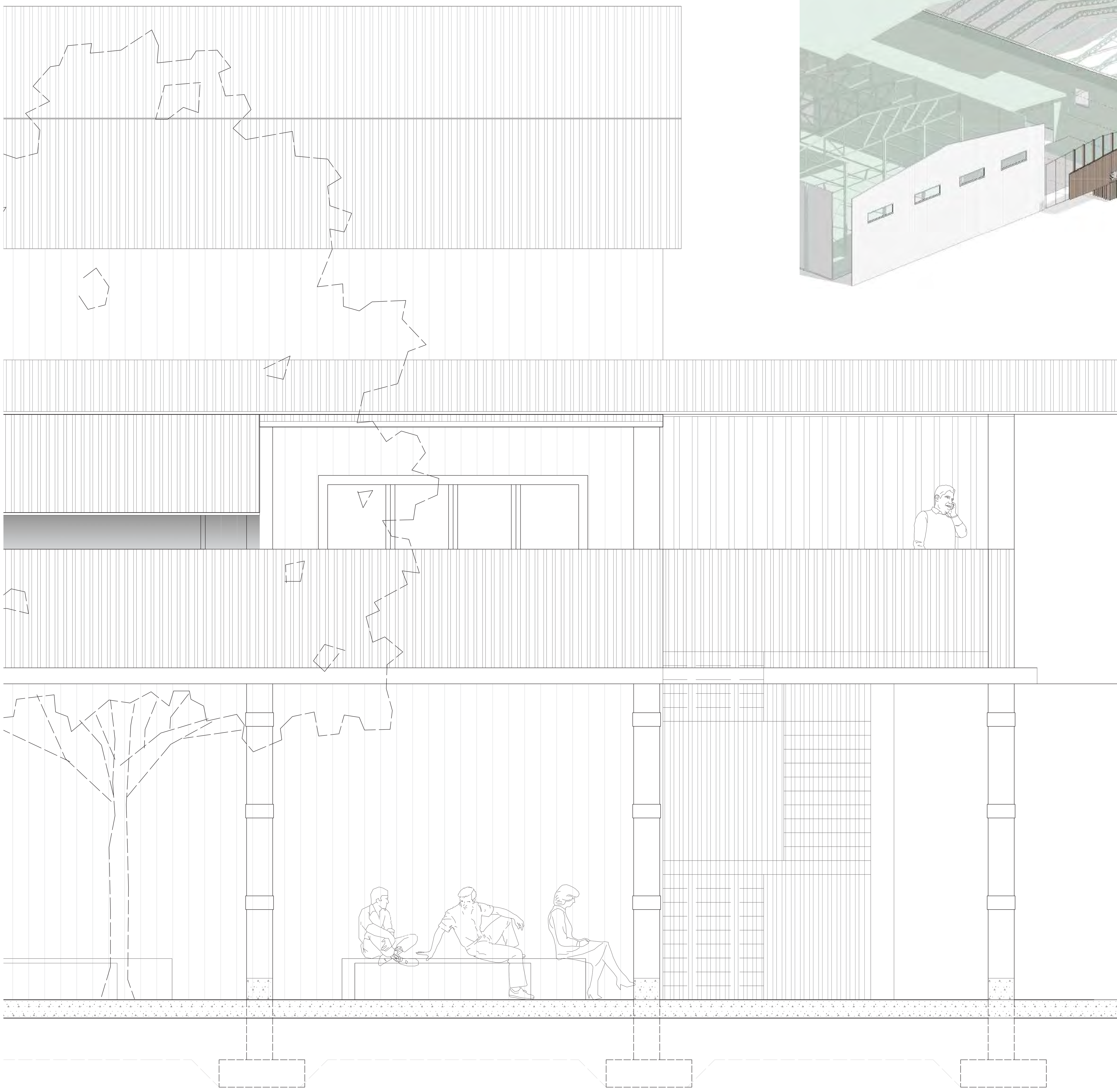
Existing Section 2023

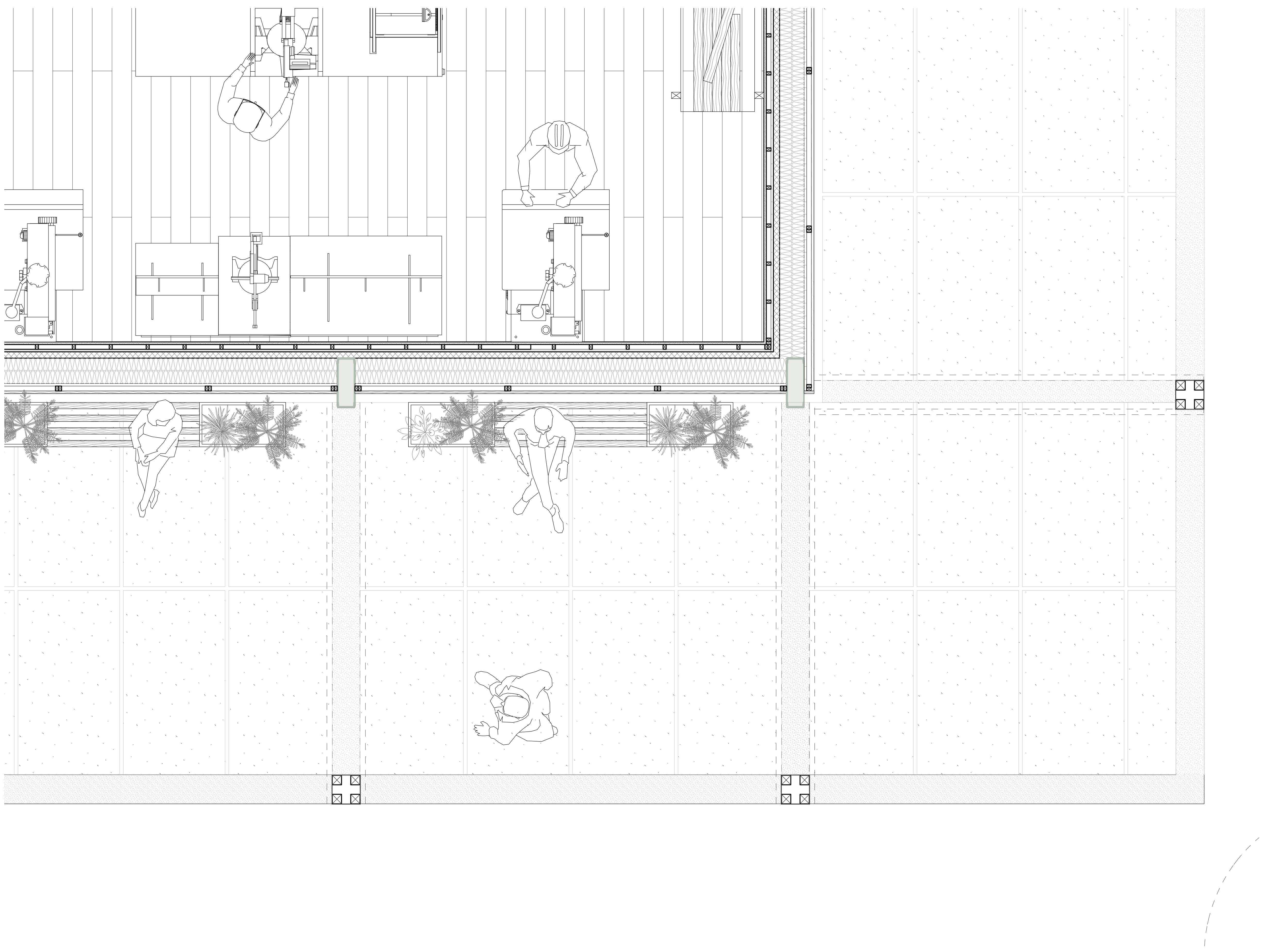
DESIGN + CONSTRUCT



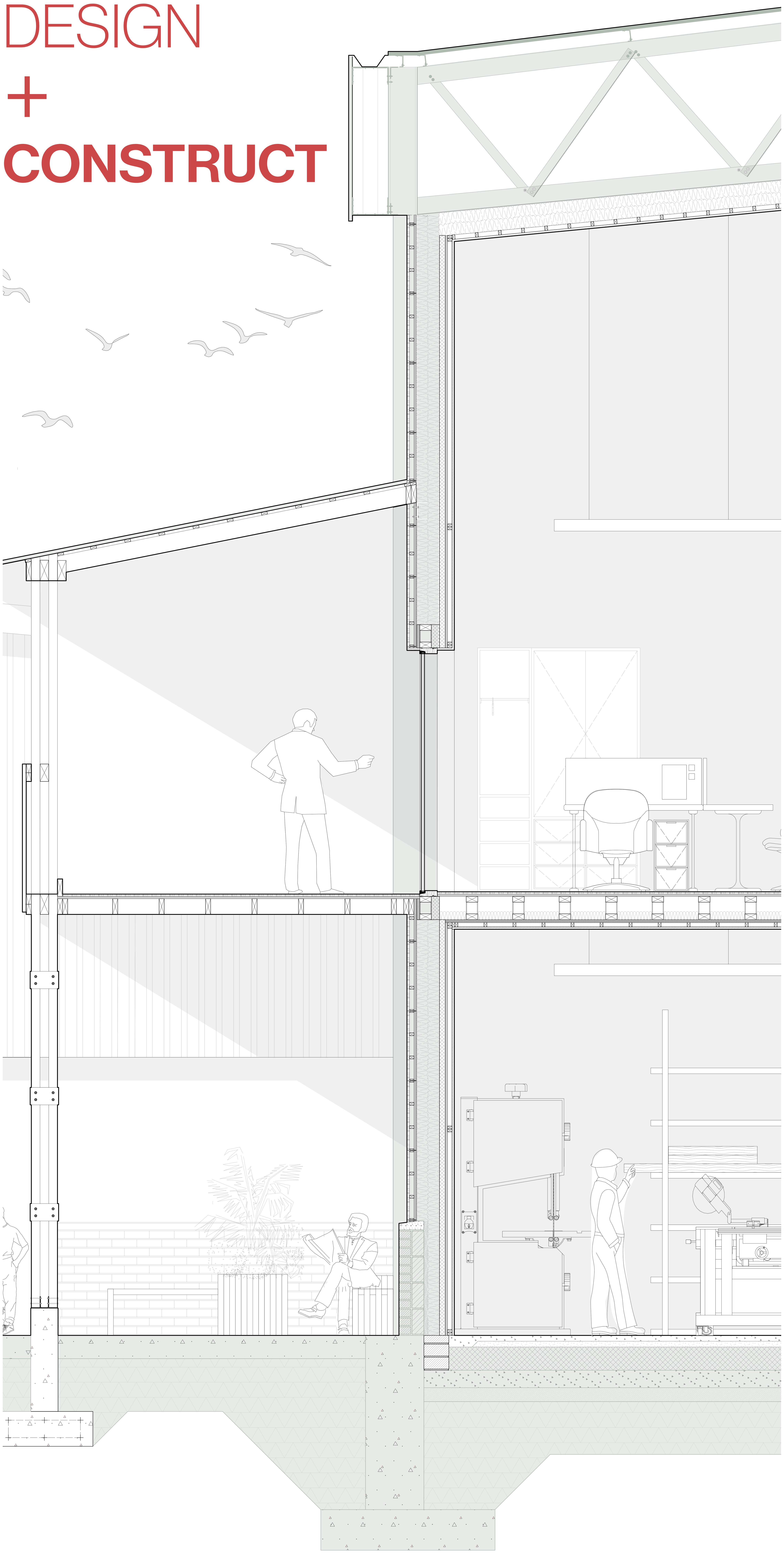
Early concept renders below helped to inform the interaction we sought to provide from between all users of the building.

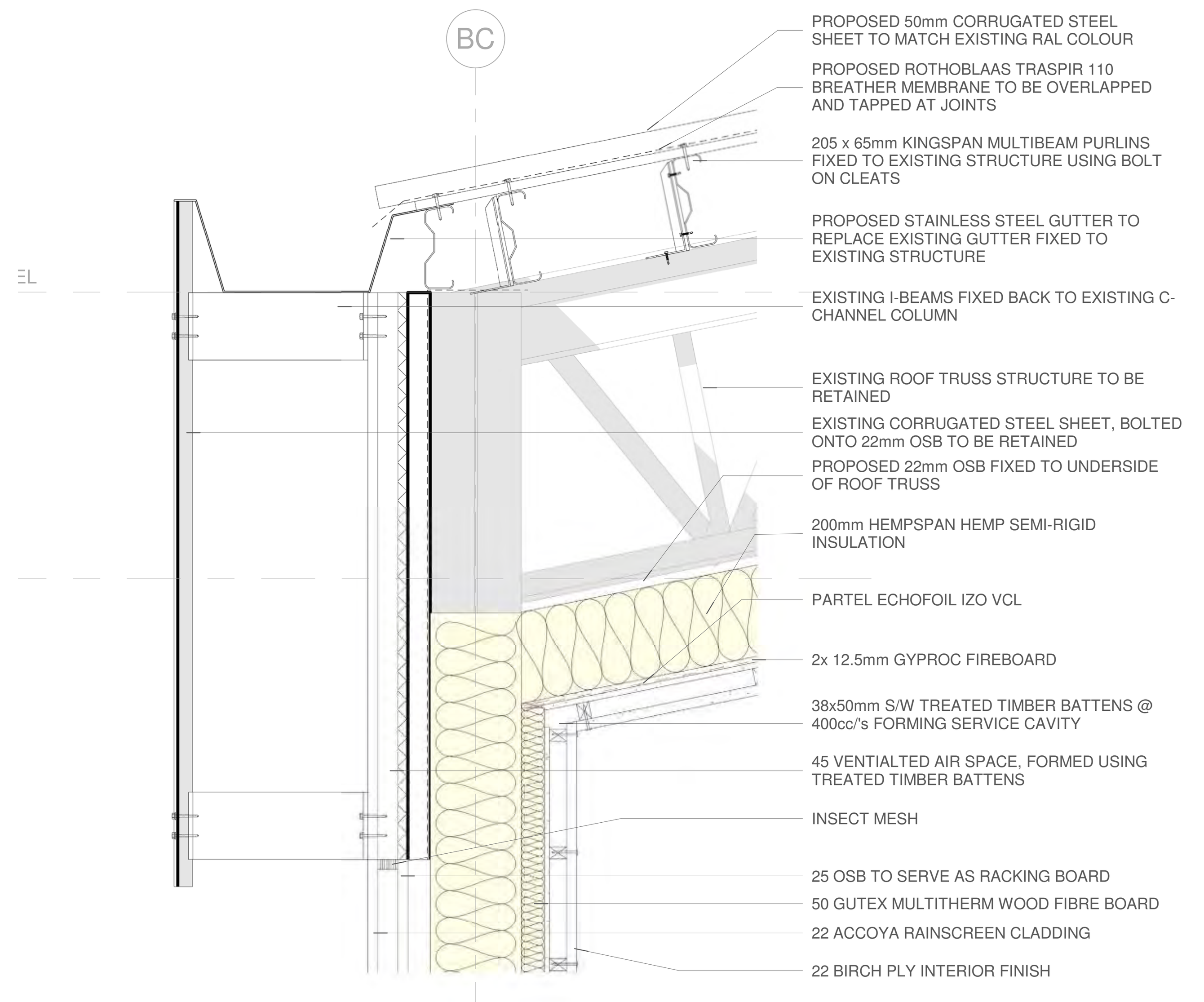
A particular emphasis on how local residents will use and interpret the building was key in order to make the proposed building integrate into its context.





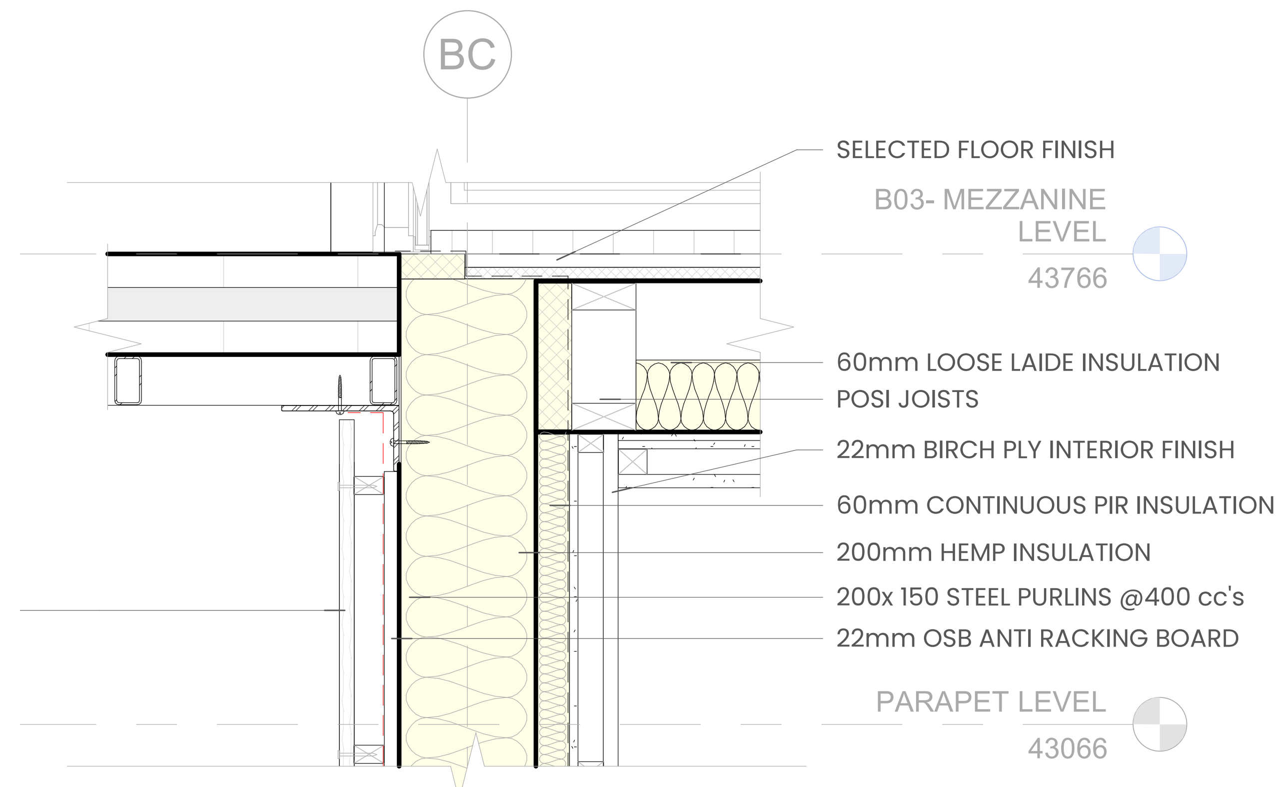
DESIGN + CONSTRUCT





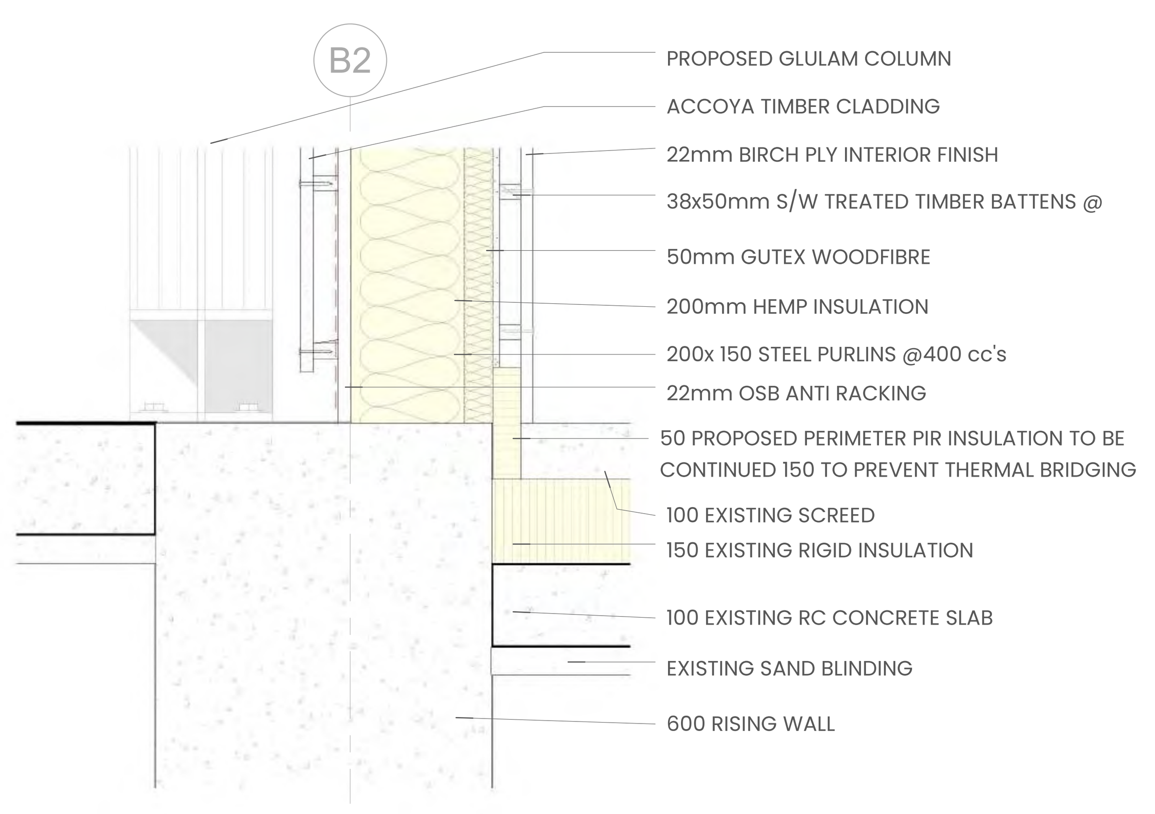
Wall Build-up:

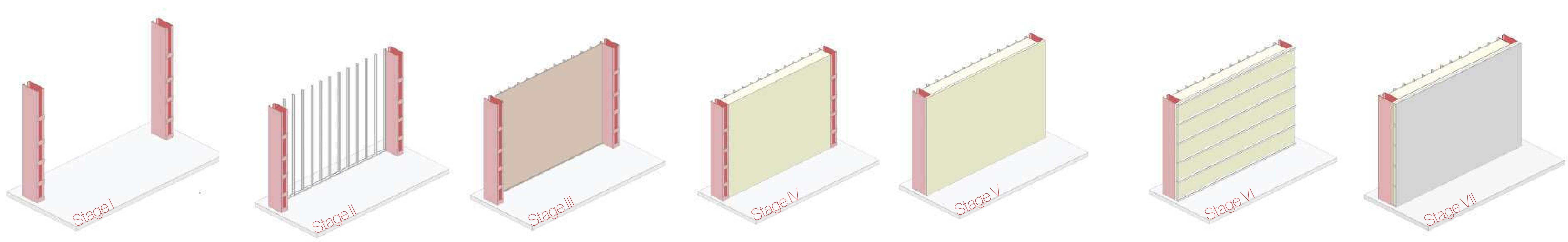
22 accoya timber cladding on
38 s/w treated timber battens & counter battens fixed to
400 x 200 existing steel columns
22 OSB racking board
100 steel purlins @ 450 cc's
60 continuous mineral wool insulation
75 service cavity
22 birch plywood internal finish



Roof Build-up:

Proposed 50mm corrugated steel sheet to match existing ral colour
Proposed rothoblaas traspir 110 breather membrane to be overlapped and tapped at joints
205 x 65mm kingspan multibeam purlins fixed to existing structure using bolt on cleats
Proposed stainless steel gutter to replace existing gutter fixed to existing structure
Existing beams fixed back to existing c channel column
Existing roof truss structure to be retained
Existing corrugated steel sheet, bolted onto 22mm OSB





Group3:

Dean Harte (AT), Alanah Hayes (A), Karl Jones (AT), Auryn Mahon (A), Cian Mc Loughlin (AT), Adam Power (A), Isobel Walsh (A).

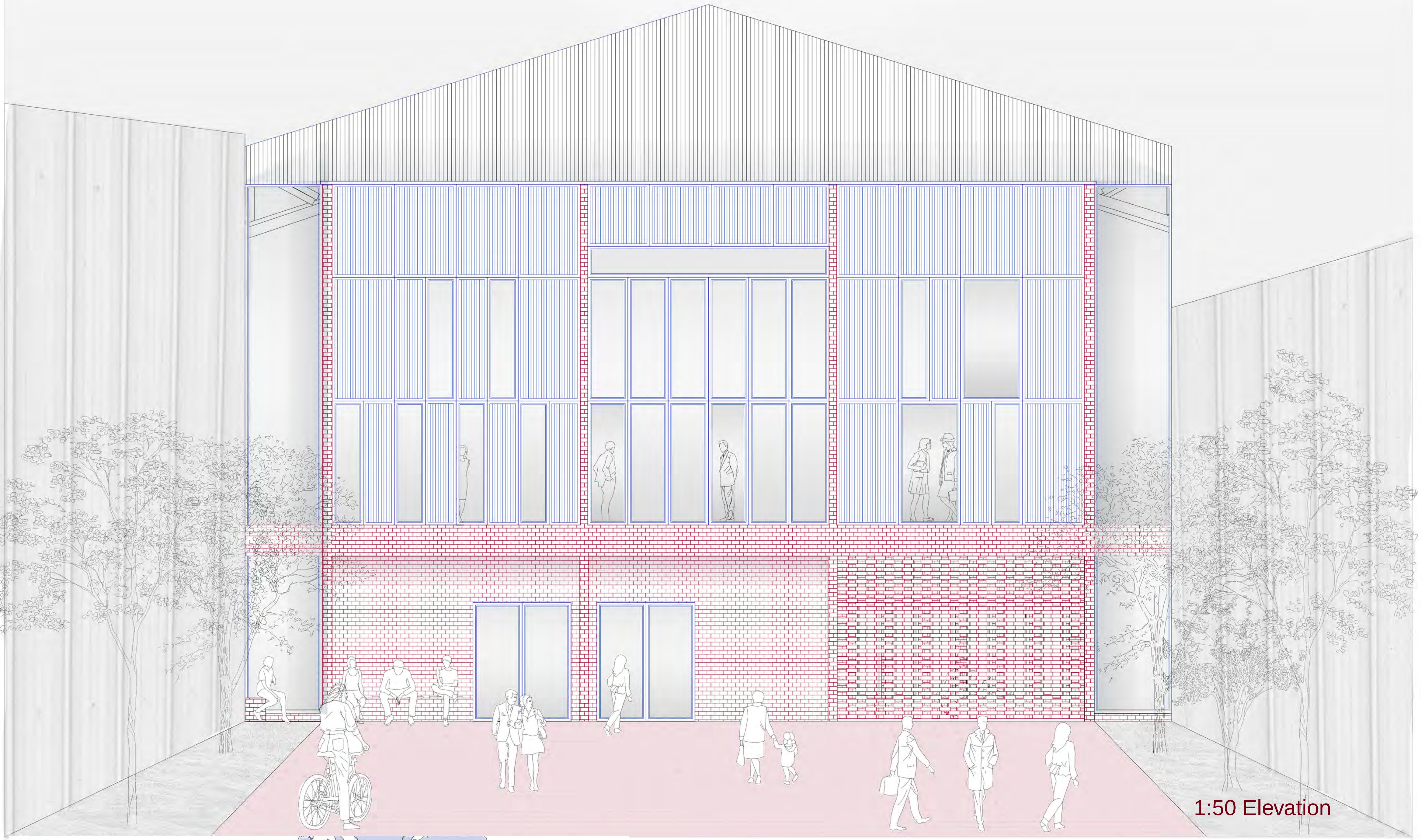
Abstract:

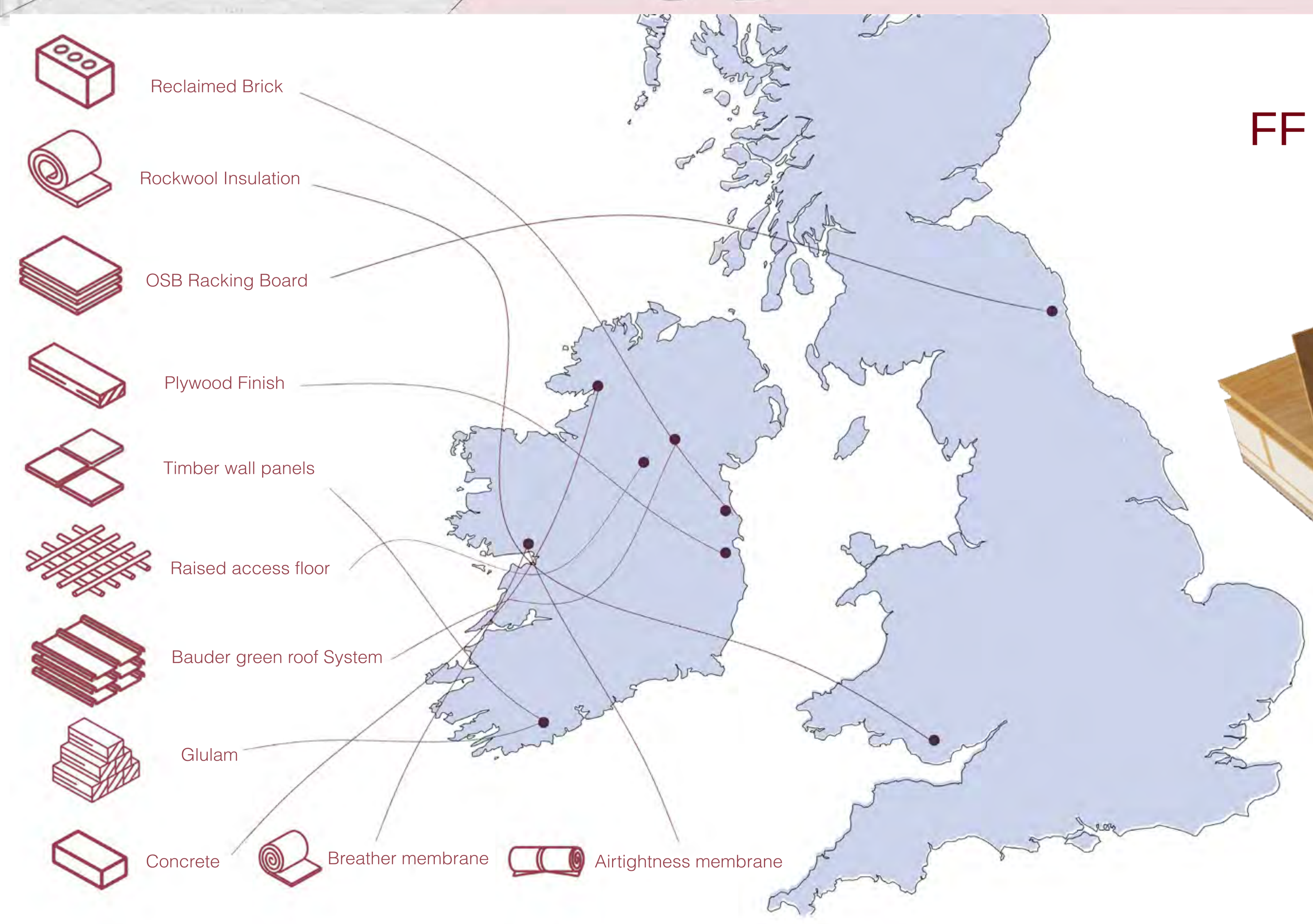
For the collaborative assignment we decided to focus on the front façade of the exhibition centre of this new development. We specifically centred around the ideas of demount-ability and recycled materials. The proposed design showcases a fixed façade on the ground floor designed using reclaimed brick and a demountable façade from the first floor up that can be taken off and replaced with multiple different panel types in order to test and review new solutions in the industry. The aim for the design is to give the building an entrance in parallel with the significance of the building and what wants to be achieved.

I

Community Facility Broombridge

Group 3

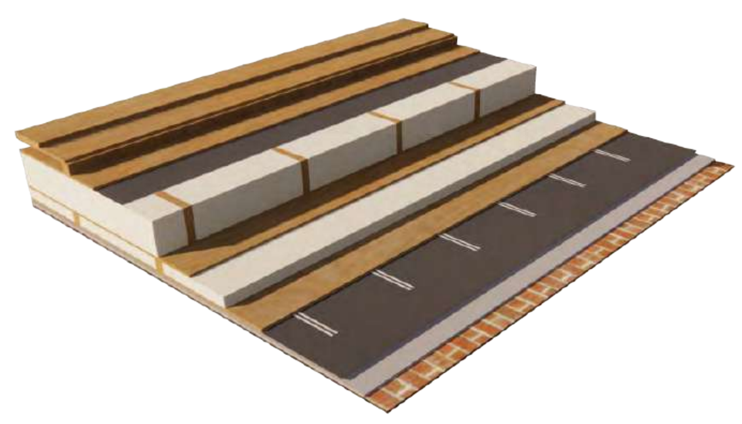




FF Wall Build-up

GF Wall Build-up

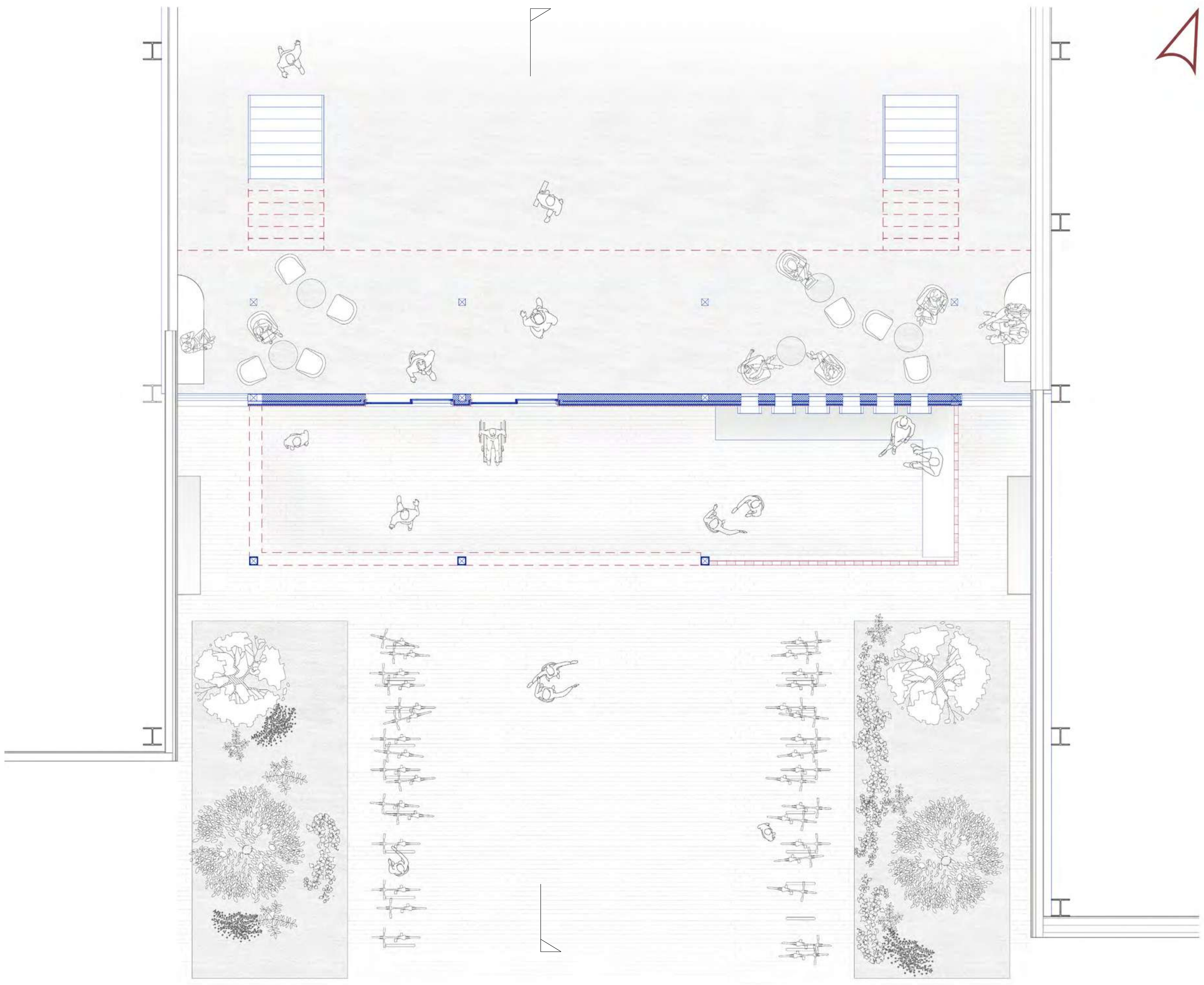
FF Floor Build-up



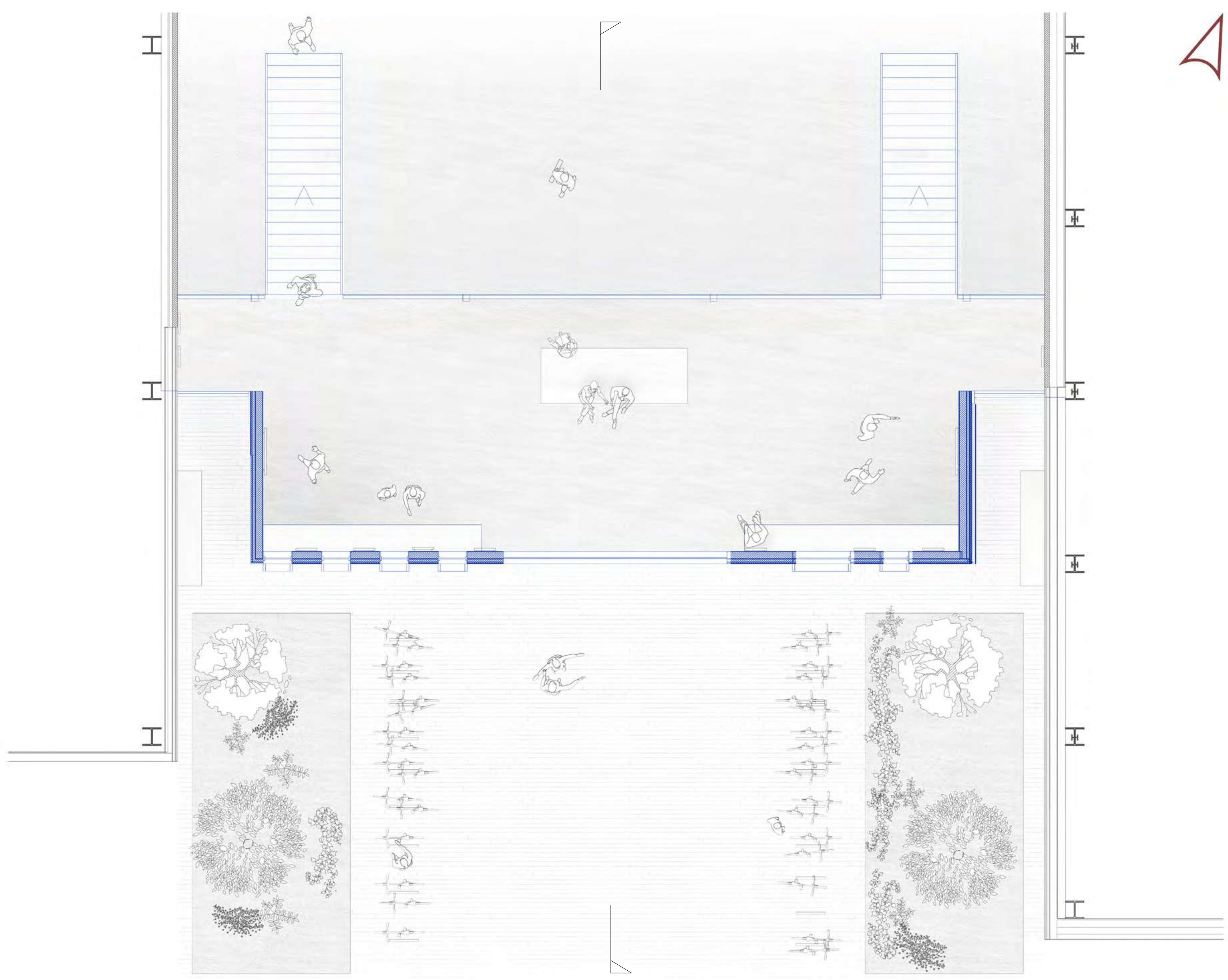
II

Community Facility Broombridge

Group 3

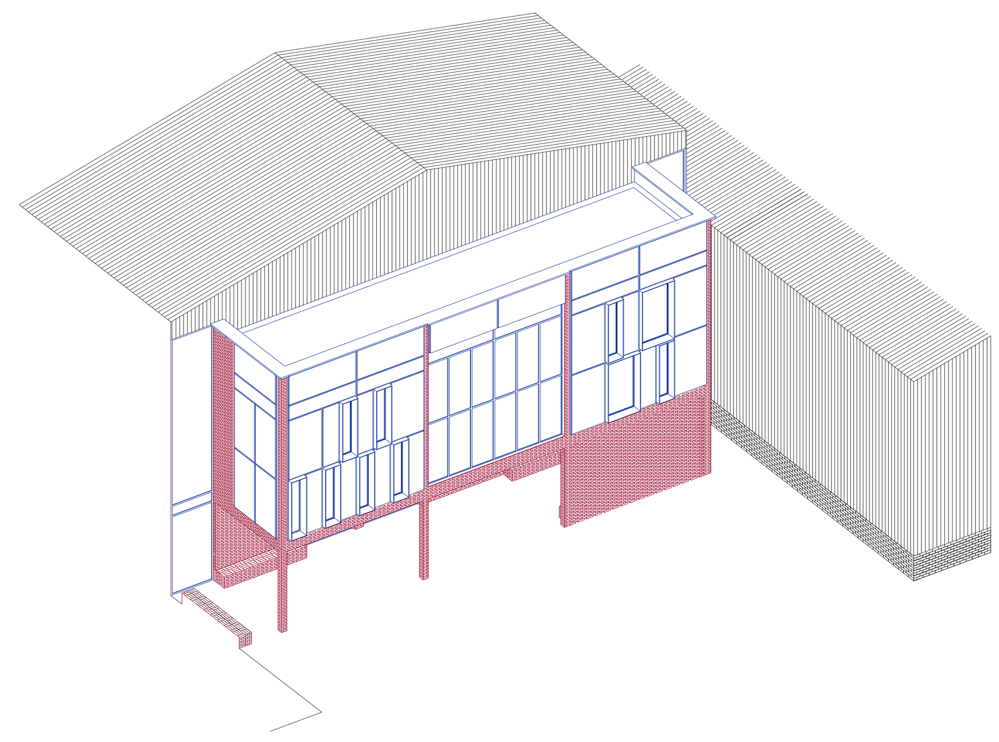


GF Plan 1:50



FF Plan 1:50

Site Plan



Axonometric

Objectives

1 - Minimize Carbon Impact Through Reclaimed and Reused Materials:

Aim to extensively utilize reclaimed and reused materials to significantly reduce the project's carbon footprint.

2 - Design for Facade Deconstruction and Disassembly:

Incorporate elements into the facade design that enable easy disassembly and deconstruction in the future. Implement modular systems and techniques that facilitate the dismantling of the facade components, emphasizing sustainability and ease of material reuse or recycling for future iterations or renovations.

3 - Create a Facade Fostering Community Interaction:

Design a facade that actively contributes to and enhances community engagement, fostering interaction among its members.

4 - Optimize Spatial Conditions for Social Interaction:

Maximize various spatial elements to encourage and facilitate social interaction, fostering a sense of community and connection within the architectural design.

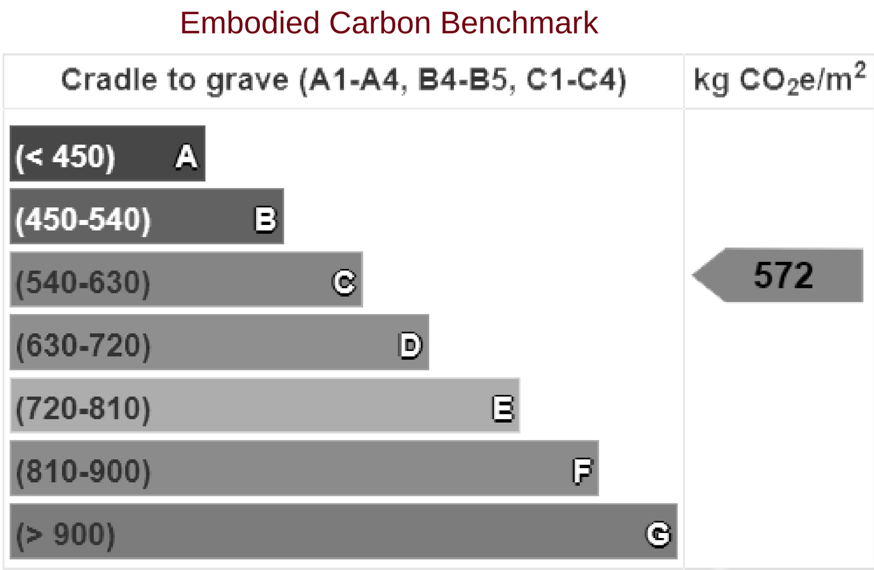
5- Deliver Work in a Cohesive and Structured Presentation:

Showcase the project's outcomes through a comprehensive and coherent layout, ensuring a clear and organized presentation of the work.

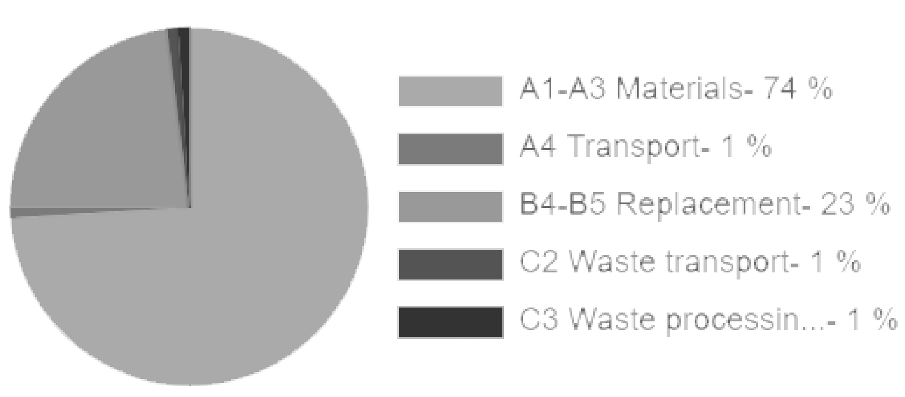
6 - Encourage Collaboration:

Promote and prioritize collaborative efforts within the team to leverage diverse perspectives and expertise for a successful and innovative project outcome.

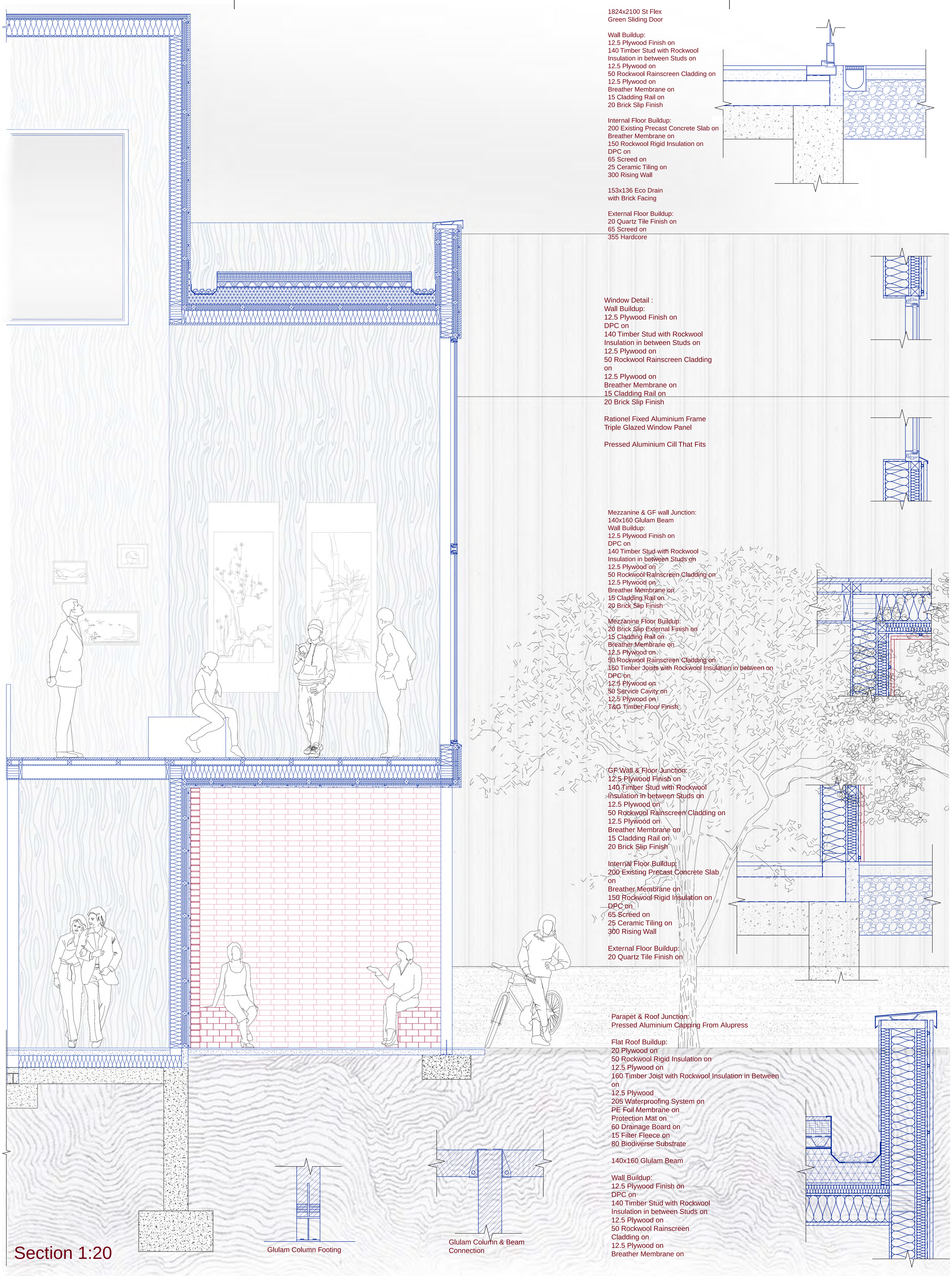
Embodied Carbon Benchmark



Embodied Carbon By Life-Cycle Stage



Community Facility Broombridge



Section 1:20

Group 4:

Sarah Carroll (A), Adam McCormack (AT), Roisin Moore (AT), Ellen, K. Sweeney (A), Nicholas Tannam (A), Ling Zhao (AT).

Abstract:

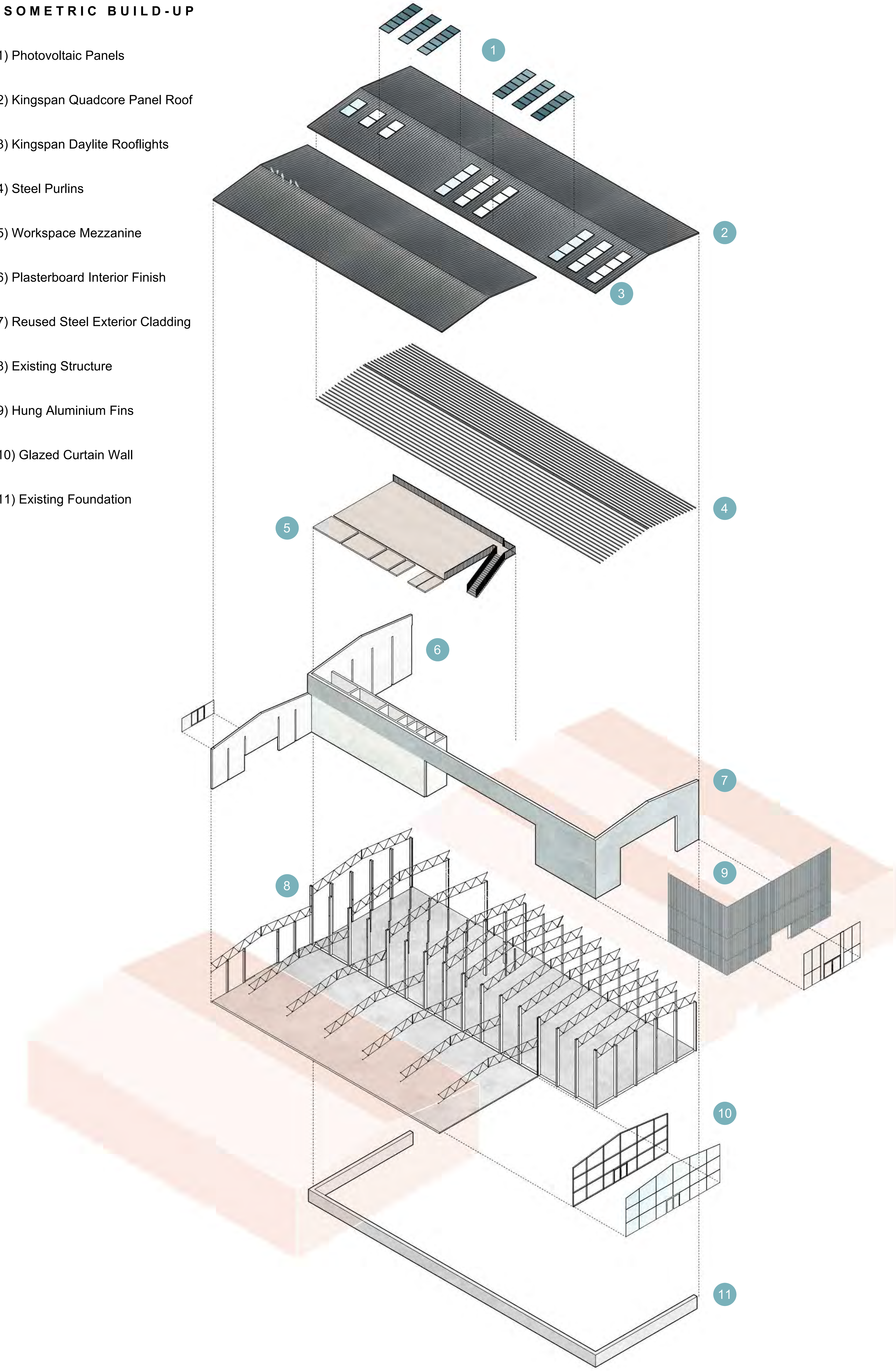
TU Dublin's Broombridge Design + Construct Centre is to serve as an innovation hub and promote collaboration and creativity. For the exterior we wanted to bring the building into the modern day while paying homage to the industrial origins of the building. Using aluminium fins as façade and curtain glazing, we connected the exterior and interior spaces through light, the aluminium fins act as louvres during the day to control and direct sunlight, while also allowing light to illuminate its surroundings at night. We strived to create a multi-purpose area, were architects, technologists, engineers, and builders can collaborate under one roof. The use of movable and rotatable partitions allows for the spaces to be consistently changed to suit their use.

ADS / TDS Broombridge Collaboration Project
MAKING: Design & Construction - Exploration & Innovation

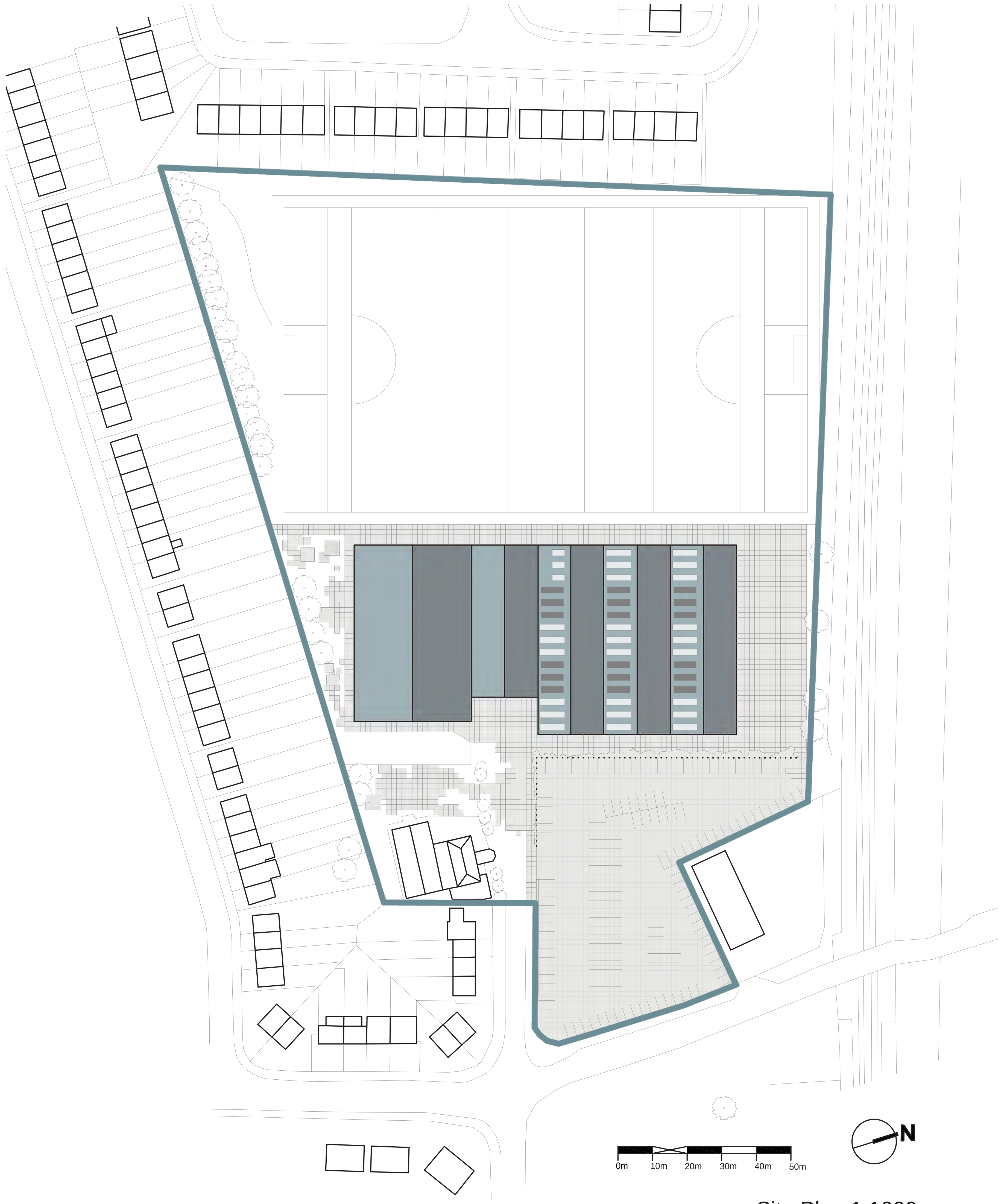
Architectural Technologists: **Adam Mc Cormack** (C20744331), **Ling Hui Zhao** (C20770769) & **Roisin Moore** (C20365816)
Architects: **Ellen Sweeney** (C18351396), **Nicholas Tannam** (C18427554) & **Sarah Carroll** (C16408412)

ISOMETRIC BUILD-UP

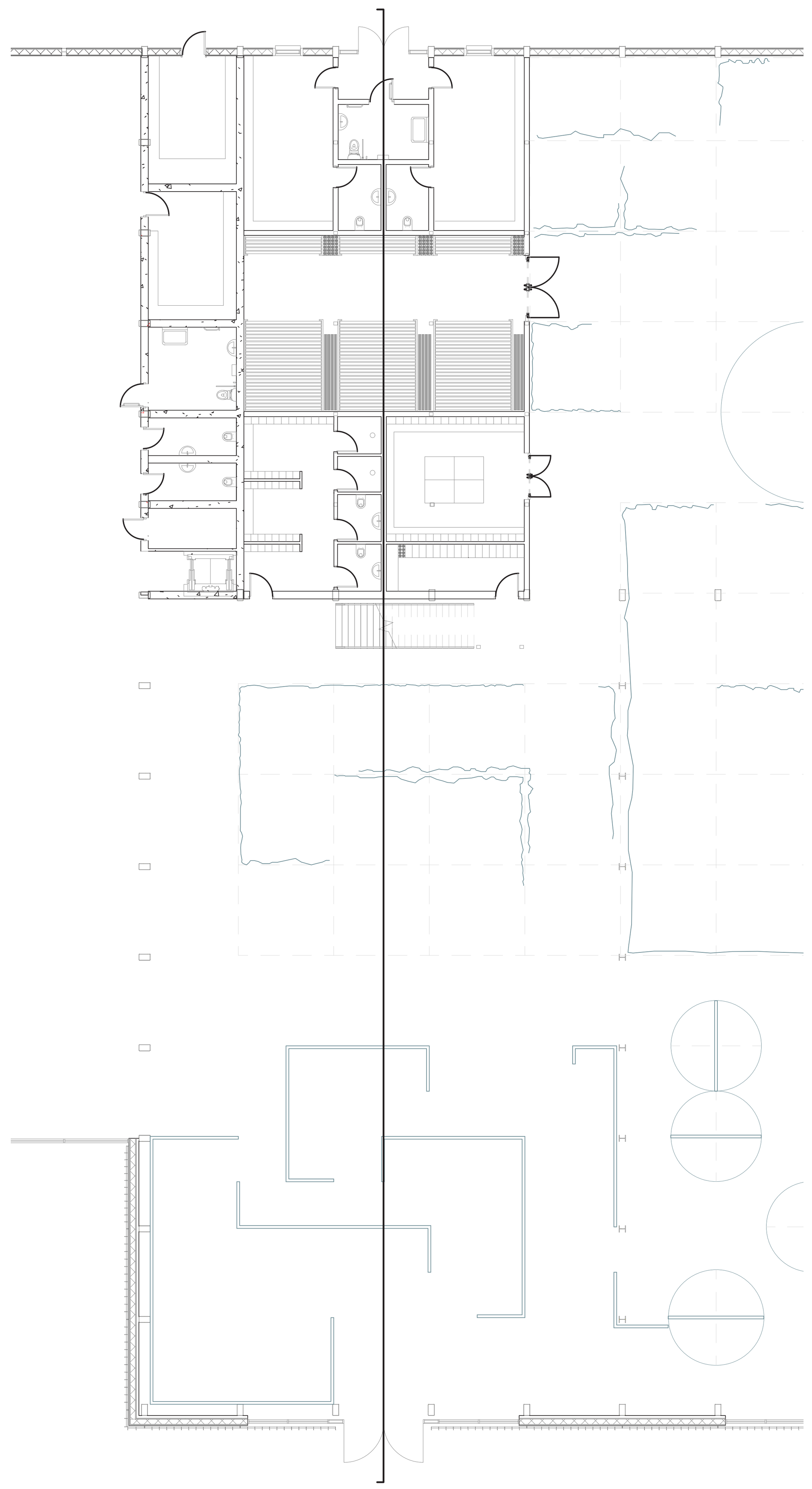
1) Photovoltaic Panels
2) Kingspan Quadcore Panel Roof
3) Kingspan Daylite Rooflights
4) Steel Purlins
5) Workspace Mezzanine
6) Plasterboard Interior Finish
7) Reused Steel Exterior Cladding
8) Existing Structure
9) Hung Aluminium Fins
10) Glazed Curtain Wall
11) Existing Foundation



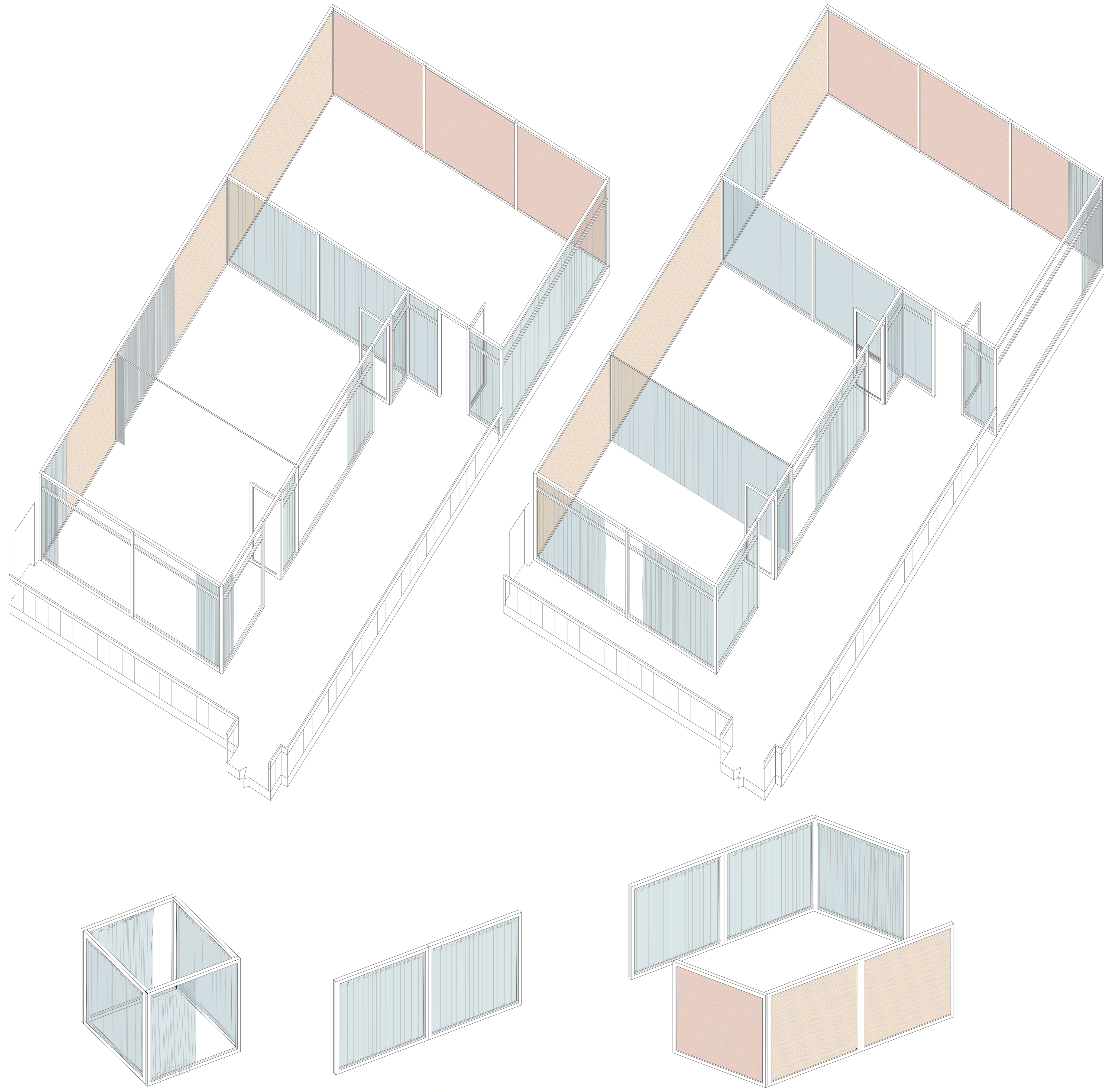
Architectural Technologists: **Adam Mc Cormack** (C20744331), **Ling Hui Zhao** (C20770769) & **Roisin Moore** (C20365816)
Architects: **Ellen Sweeney** (C18351396), **Nicholas Tannam** (C18427554) & **Sarah Carroll** (C16408412)



Site Plan 1:1000



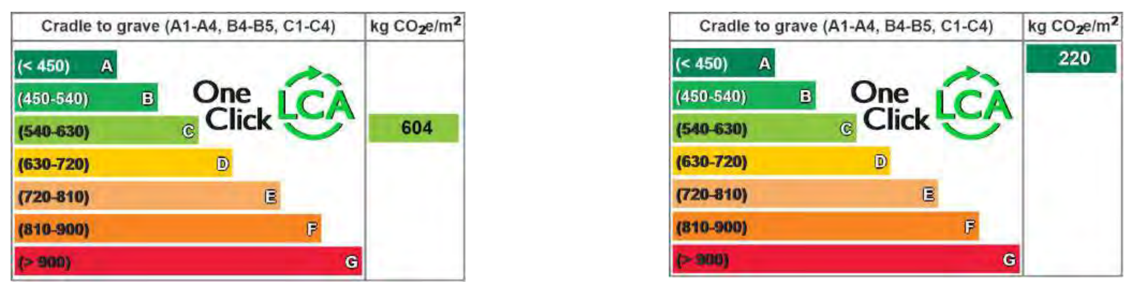
Ground Floor Plan 1:200



Partition System 1:100

Section 1:100

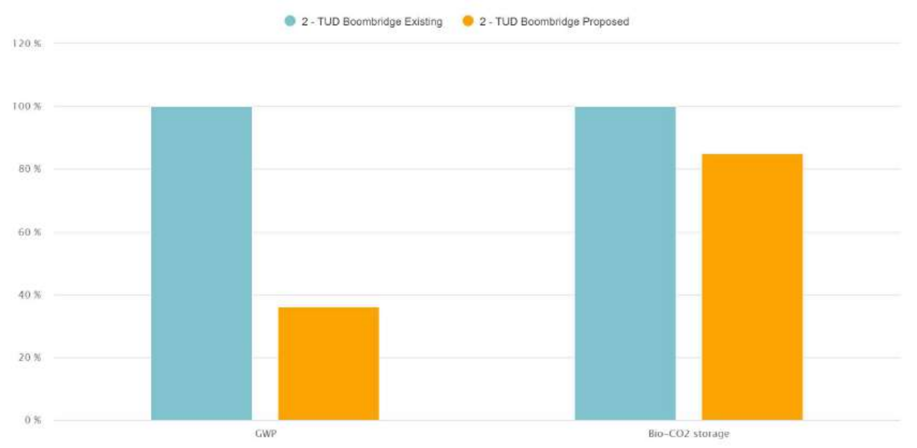
Architectural Technologists: **Adam Mc Cormack** (C20744331), **Ling Hui Zhao** (C20770769) & **Roisin Moore** (C20365816)
Architects: **Ellen Sweeney** (C18351396), **Nicholas Tannam** (C18427554) & **Sarah Carroll** (C16408412)



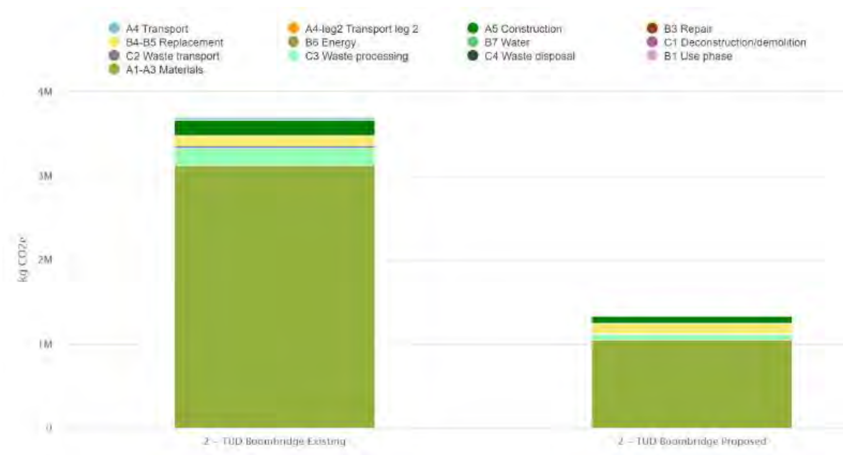
Existing vs. Proposed Building's Embodied Carbon Benchmark

Existing vs. Proposed Embodied Carbon by Life-Cycle Stage

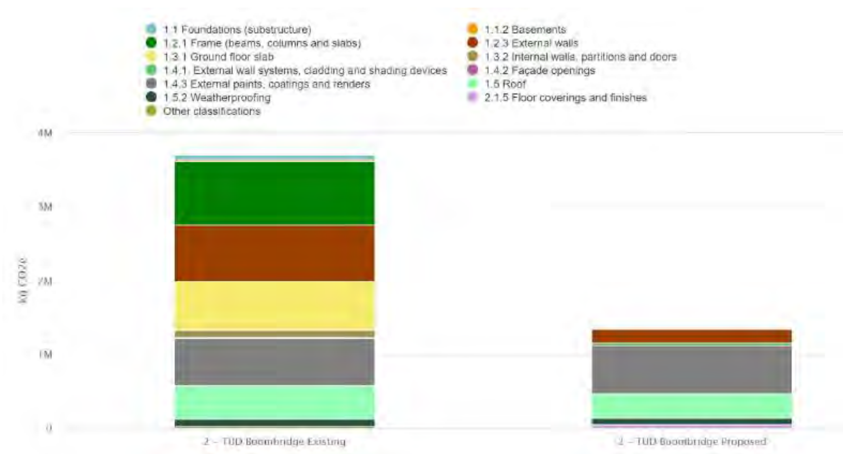
Existing vs. Proposed Embodied Carbon by Structure A1-A3



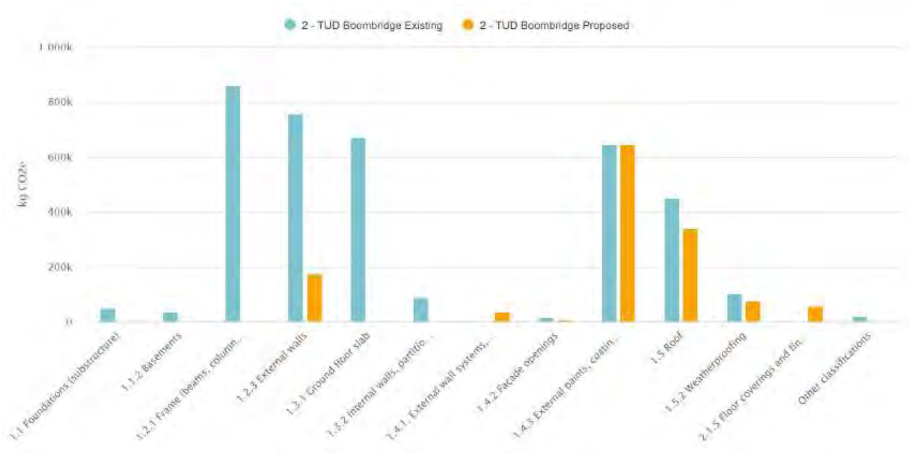
Existing vs. Proposed - Levels of Carbon Life-Cycle for all Impact Categories



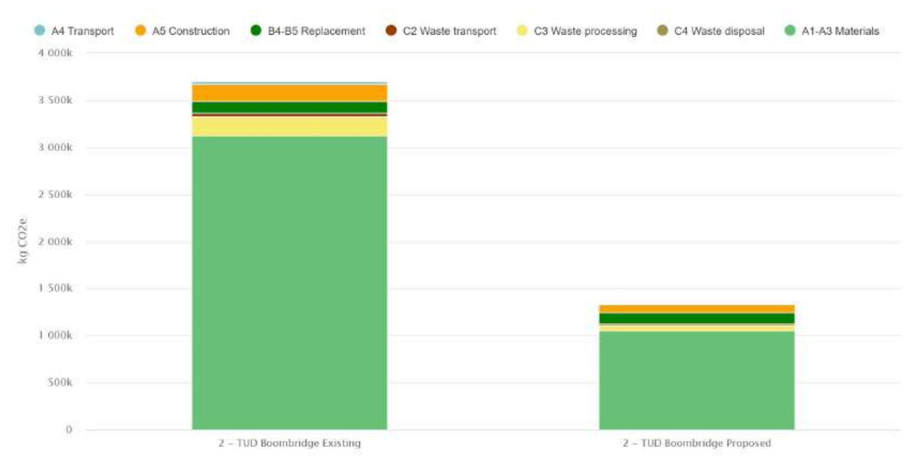
Existing vs. Proposed - Levels of Carbon Life-Cycle by Life-Cycle Stages



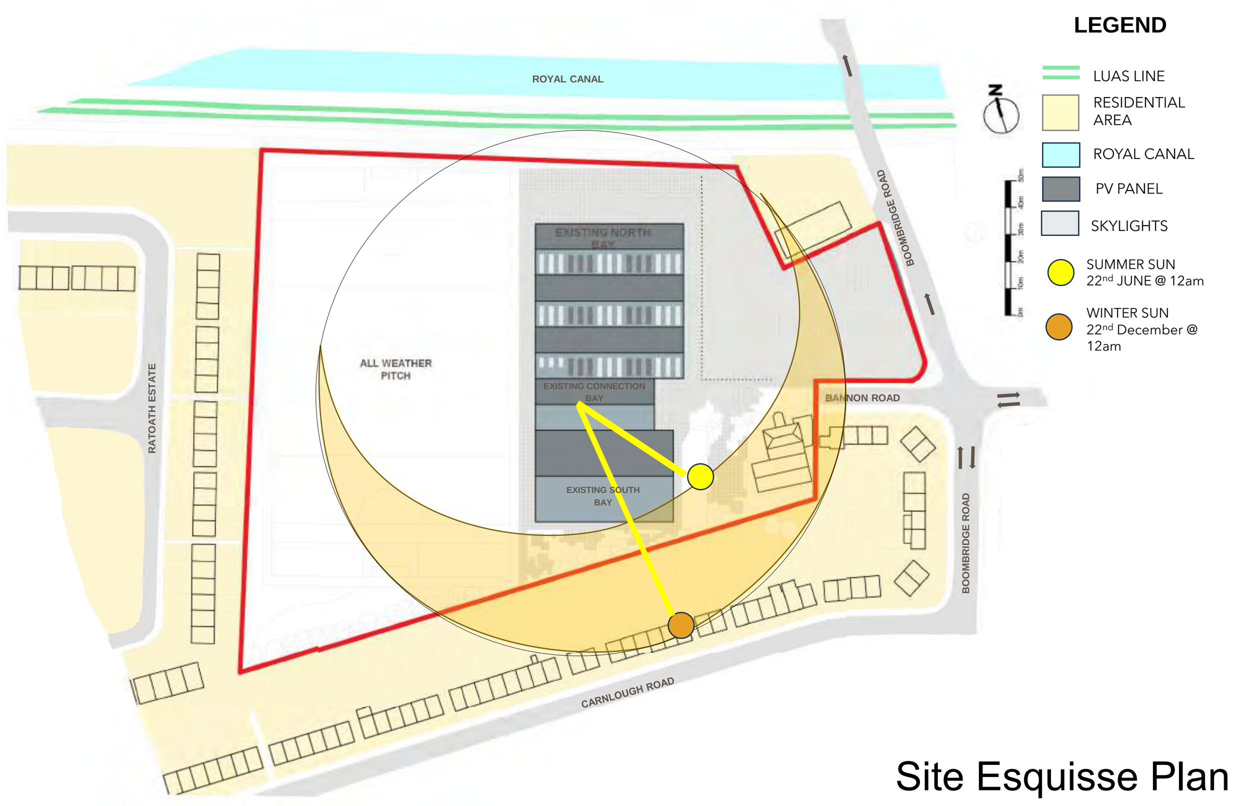
Existing vs. Proposed - Levels of Carbon Life-Cycle by Elements



Existing vs. Proposed - Levels of Carbon Life-Cycle of Building Elements

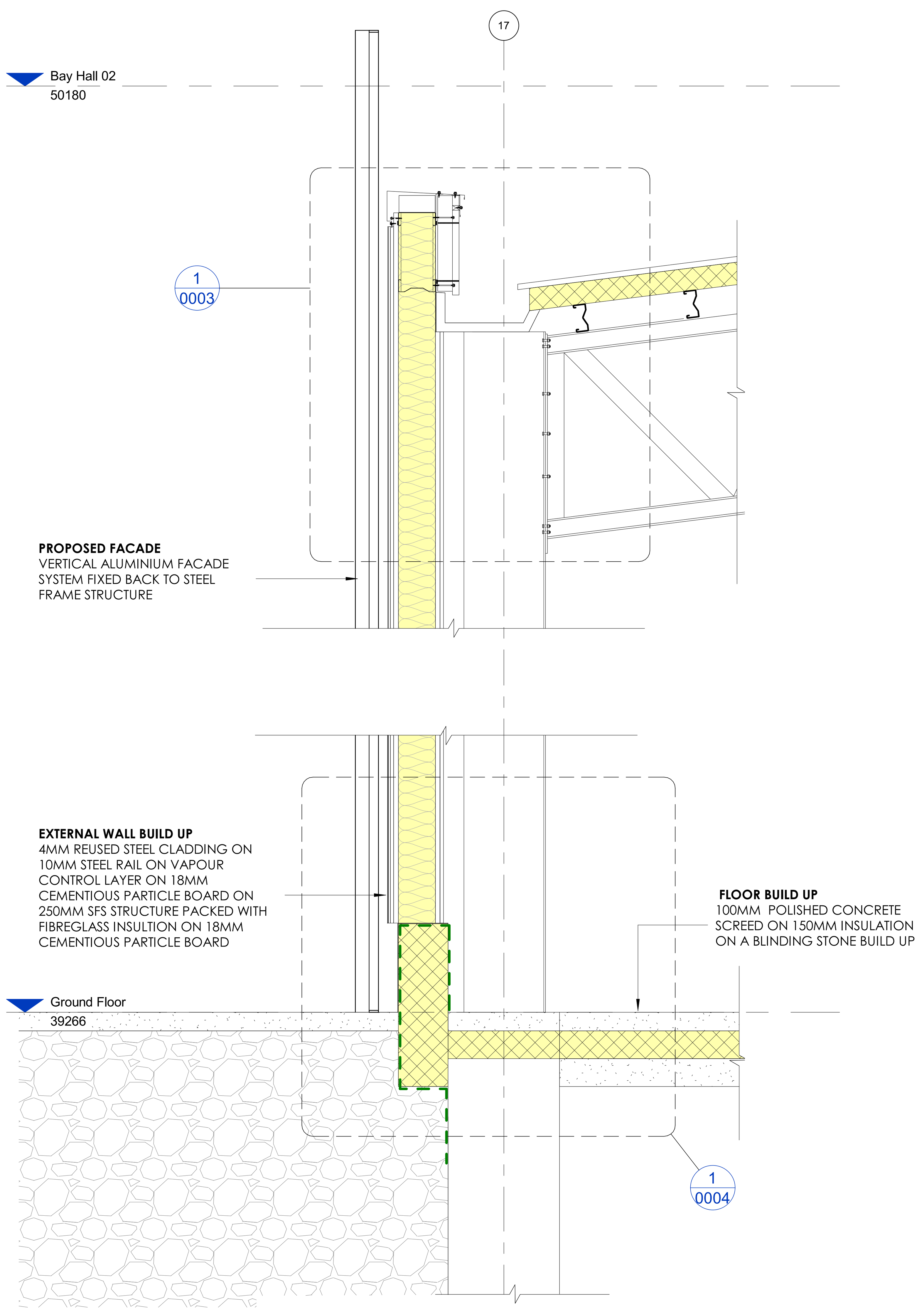


Existing vs. Proposed - Levels of Carbon Life-Cycle for Elements & Life Cycle Stages

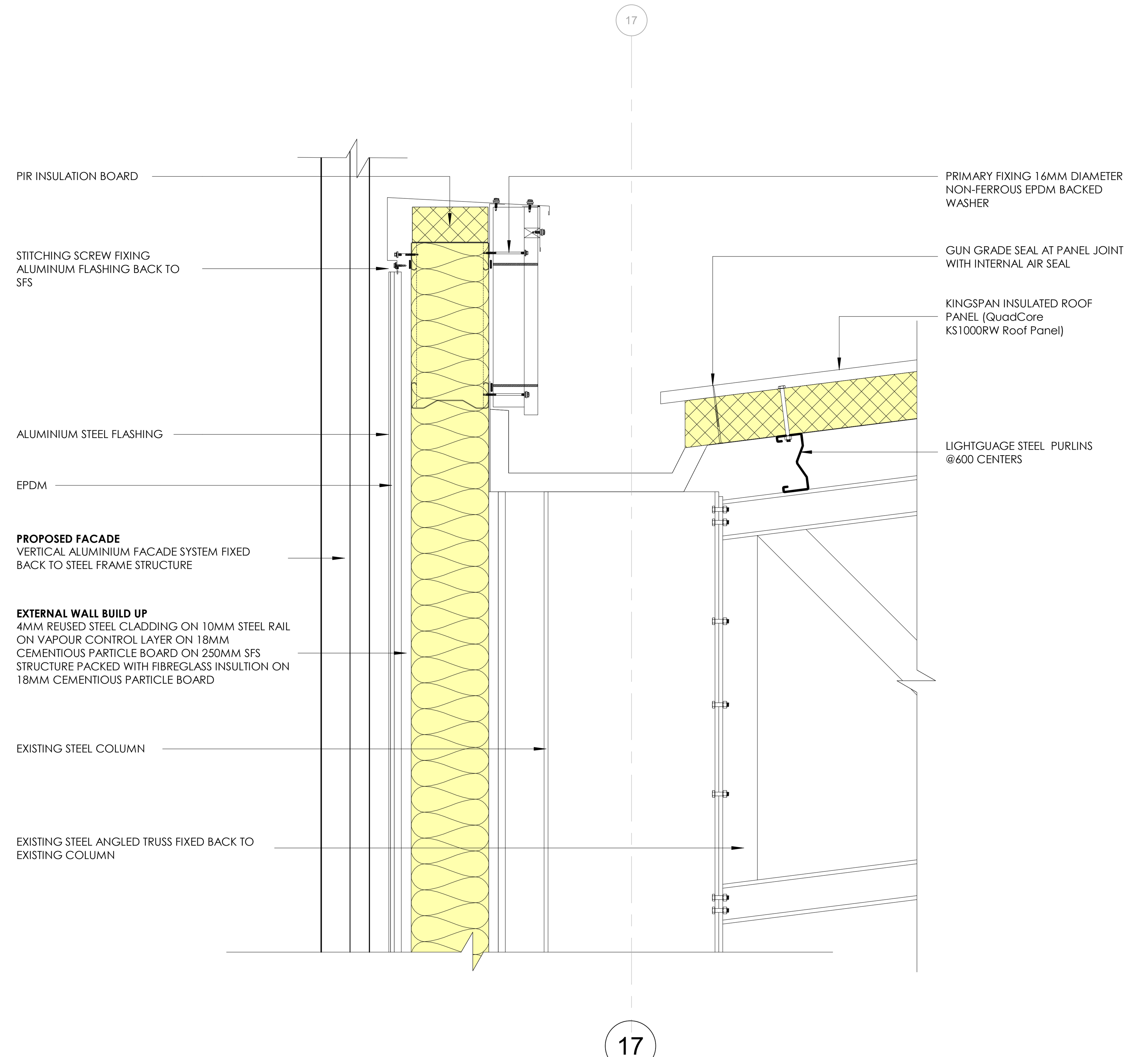


Site Esquisse Plan 1:1000

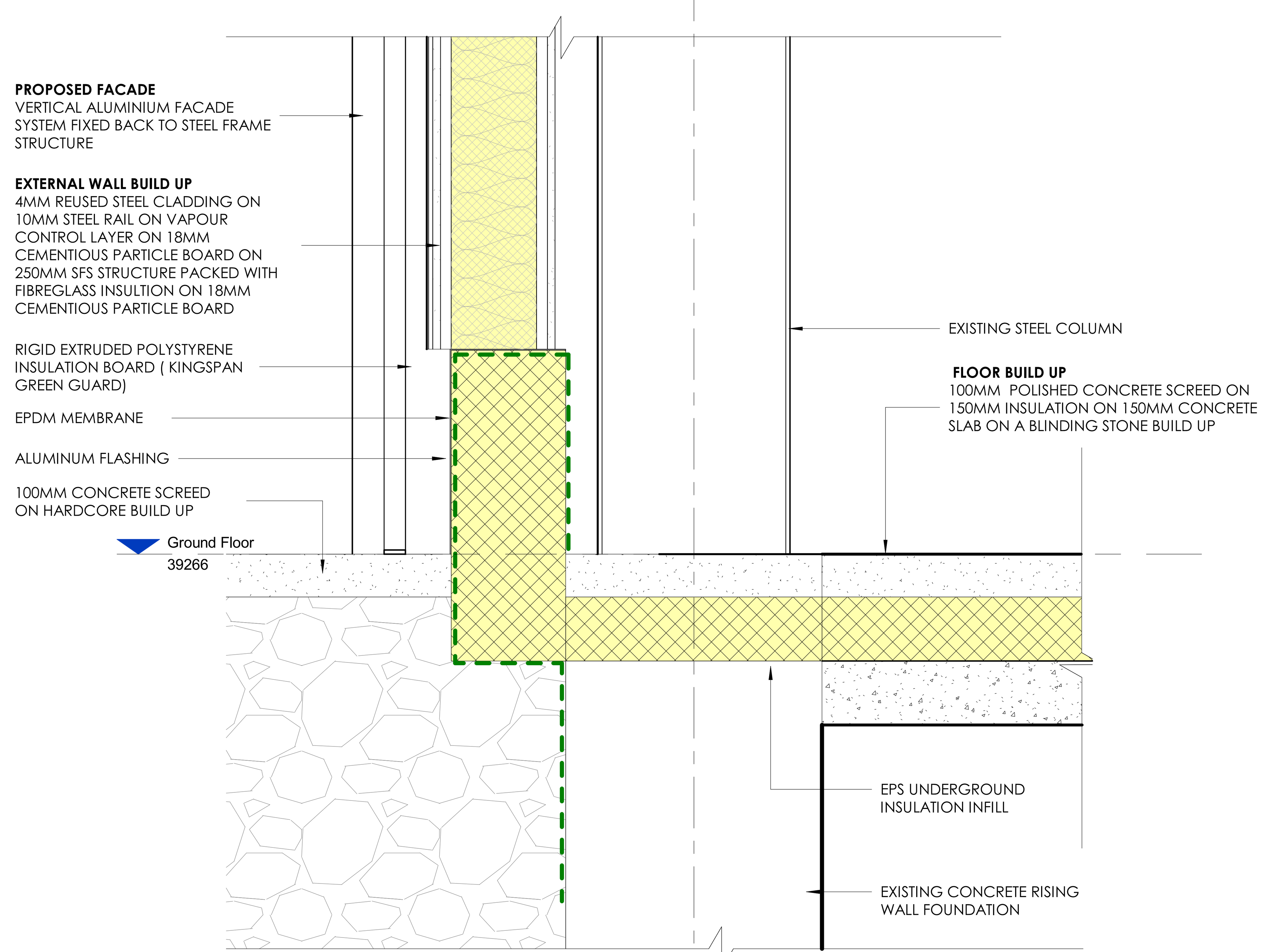
13



Wall Detail 1:20



Roof Eaves Detail 1:10



Foundation Detail 1:10

Group 5:

Conor Levingston (AT), Luke, P. MacGabhann (A), Stuart Medcalf (A), Zak, A. Moran (AT), Katie O'Donnell (A), Milica Stankovic (AT), Cormac Stott (A).

Abstract:

The design intent of the Broombridge project was to incorporate the old Irish technique of construction and the Meitheal methods which was explored through the transition from an external to an internal environment through a new façade. Our objective for the construction was to reuse as many existing materials and components as possible, and choosing new materials that are as sustainable as possible. We avoided high embodied carbon materials or reused the already existing ones and proposed new methods and non-traditional materials to help bring across our design intent while staying conscious of our environmental impact.

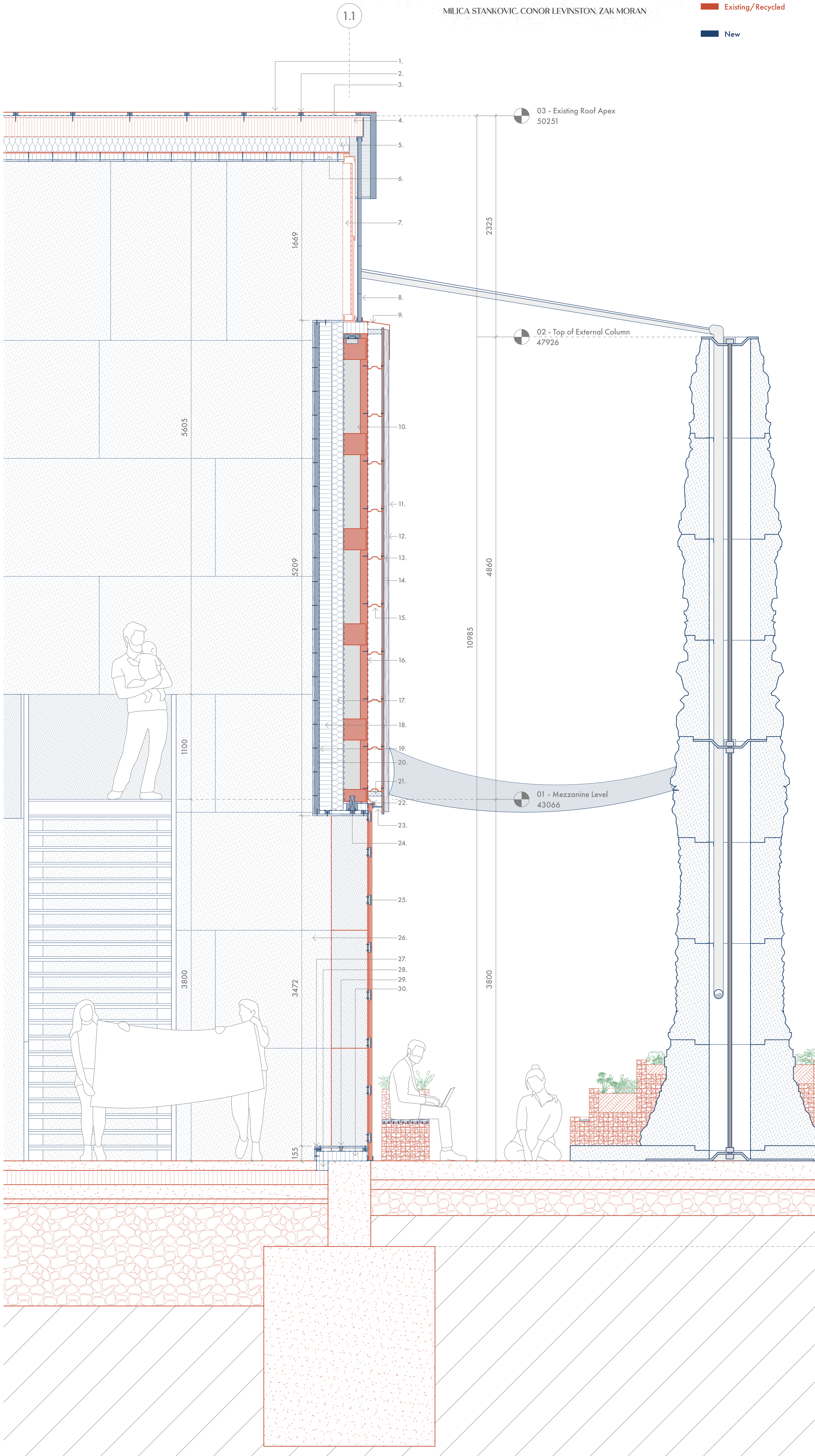
MEITHEAL

CORMAC STOTT, KATIE O'DONNELL, LUKE MAC GABHANN
STUART MEDCALF

MILICA STANKOVIC, CONOR LEVINSTON, ZAK MORAN

Existing/Recycled

New



1. New Roof Cladding - overcladding from re-used aluminium wall panels
2. 50x35mm treated SW timber counter battens @600 c/c fixed to existing roof purlins
3. DPM over existing roof under counter battens
4. Existing insulated Roof Panel containing asbestos to be kept and be over-clad with re-used original wall panels
5. 160mm Hemp Biowall Insulation (0.038 W/mK) to be fitted between existing roof purlins on internal side of existing roof
6. 65mm Gutex Thermoflex Insulation (0.036 W/mK) applied to underside of the roof purlins to prevent cold bridging through purlins junction
7. Existing 1.8m Deep Steel Roof Truss - C-channel top and bottom chords with L-angle webs
   All existing steel structure to be painted with intumescent paint in early stages of works
8. 40cm Rodeca Mullti-wall Sheets 10 Layer Polycarbonate Panels (U- 1.0 W/sm2K)
9. Pressed Aluminium Flashing Re-used from aluminium wall panels on site
10. Existing Column Steel Primary Structure - 2no. C-Channels 205mmx75mmx4mm with welded plate connections forming 380mmx205mm box beam
    All existing steel structure to be painted with Intumescent paint in the early stages of works
11. Nordic Facades Nordisk Profil Woodfac Closed Panel System
12. Vertical 50mmx50mm Accoya Timbers
13. 95% Recycled Aluminium Backing Sheet
14. Woodfac Panel vertical aluminium cladding rails
15. Re-used existing horizontal aluminum cladding rails
16. Breather membrane (Solitex WA or e/a) - wrapped around columns onto external side of Hemspan biowall insulation
17. 120mm Gutex Thermoflex Insulation (0.036 W/mK)
18. 130mm Gutex Thermoflex Insulation (0.036 W/mK)
19. Airtightness membrane (Intello or e/a)
20. 50mm Service cavity created using 50mm x 35mm vertical counter battens
21. Fire Stop
22. Angled pressed aluminium cavity tray
23. Anti-pest mesh
24. C24 170mm x 47mm joist supported on steel angles fixed to each column - to span 3595mm to allow for fixing of birch plywood reveals and supply support to insulation of the reveals
25. 40cm Rodeca 4 Layer Polycarbonate SaveEnergy Panels (U- 1.4W/sm2K)
26. Internal wall & roof finish is 18mm Birch Plywood
27. 155mm Stepped feature along the internal side of Polycarbonate curtain wall to allow thermal continuity and also to house low energy uplighting LEDs - finished in 18mm Birch plywood and fixed with 50x35mm treated counter battens
28. 120mm Gutex Thermoflex (0.036 W/mK) Perimeter Insulation
29. Low energy LED uplight
30. 50mm Gutex Thermoflex Insulation (0.036 W/mK) for thermal continuity - note the purple dash indicates a line of DPM under the insulation & the blue dash indicates the air tightness barrier

Roof Construction
Re-used corregated aluminium wall panels on counter battens on DPM on Existing asbestos Roof structure on C- channel purlins with 150mm Hemspan Biowall Insulation (0.038 W/mK) on 120mm Gutex Thermoflex (0.036 W/mK) fixed to purlins on 20mm Birch Plywood wall finish

Nordic Facades Nordisk
Profil Woodfac Closed Panel Cladding System Nordisk Profil Woodfac Panel (Vertical 50mmx50mm Accoya Batten) on 95% recycled aluminium backing sheet hooked onto vertical cladding members fixed to existing cladding rails on primary steel column with 120mm Hemspan Biowall Insulation (0.038W/mK) between columns with a Breather Membrane (Solitex WA or e/a) wrapped around columns and onto external face of Biowall Insulation. The internal face of column is clad with 130 mm Gutex Thermoflex Insulation (0.036 W/mK) to eliminate any thermal bridges and faced with an air tightness membrane (Intello or e/a). This is then faced internally with a 50mm service cavity with 18mm Birch plywood finish.

Exterior Colonnade
Freestanding pillar made from rough-quarried Wicklow Granite segments with a cylindrical 435mm cavity cut vertically through the centre, with smooth faces at the top and bottom, and male-female joints cut. These segments are stacked, with a steel plate at the top, centre, and bottom of the pillar through which a post-tension rod is threaded and tightened. Pillar surrounded by sculptural planter/seating elements made from concrete and blockwork material recovered on site following demolitions and excavation of perimeter floor screed wrapped by a gabion cage using recovered wire material from existing wall insulation. Steel half pipe spans from the roof gutter to RWDP within the pillar cavity to steel half pipe through a drilled hole in the stone segment suspended above planter element as part of Rainwater Management Strategy. Lightweight mesh fabric shading element spans from drilled hook in exterior of stone pillar to facade

Polycarbonate Curtain Wall System
40cm Rodeca Mullti-wall Sheets 10 Layer Polycarbonate Panels (U- 1.0 W/sm2K) clerestory glazing, 40cm Rodeca 4 Layer Polycarbonate SaveEnergy Panels (U- 1.4W/sm2K) at base

Floor Construction
100mm concrete screed on 150mm insulation on 150mm reinforced concrete slab on sand blinding on stone hardcore base

Foundation System
Cast-in-place concrete 1.5m - 3m deep strip foundation system with narrow concrete cast-in-place rising wall which supports the structural columns above

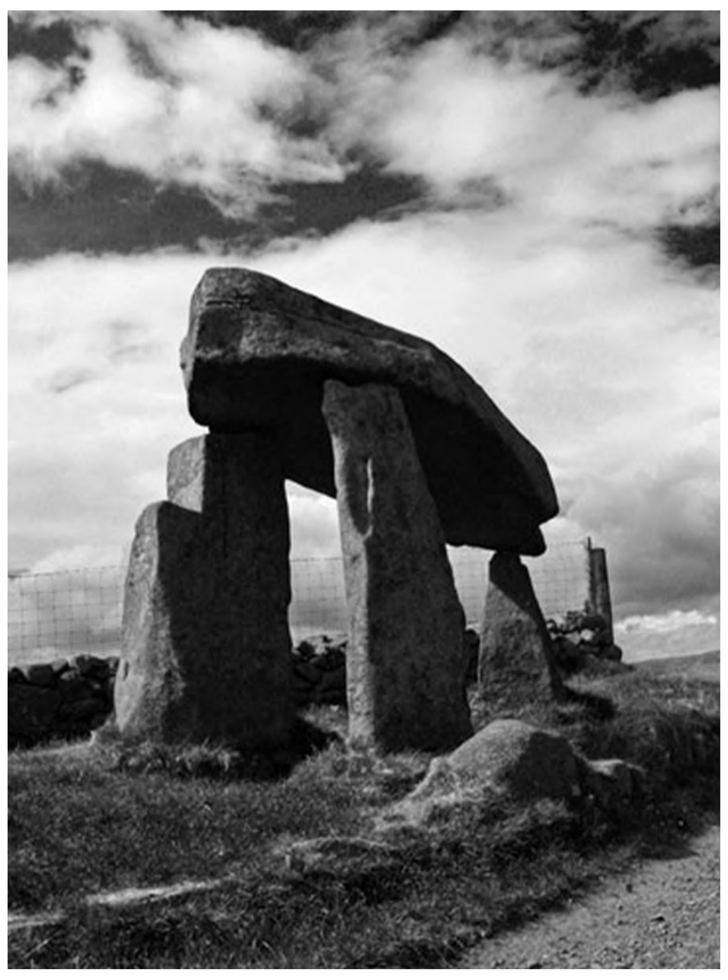
External Ground Slab
Slab is existing and its build up is only an approximate assumption

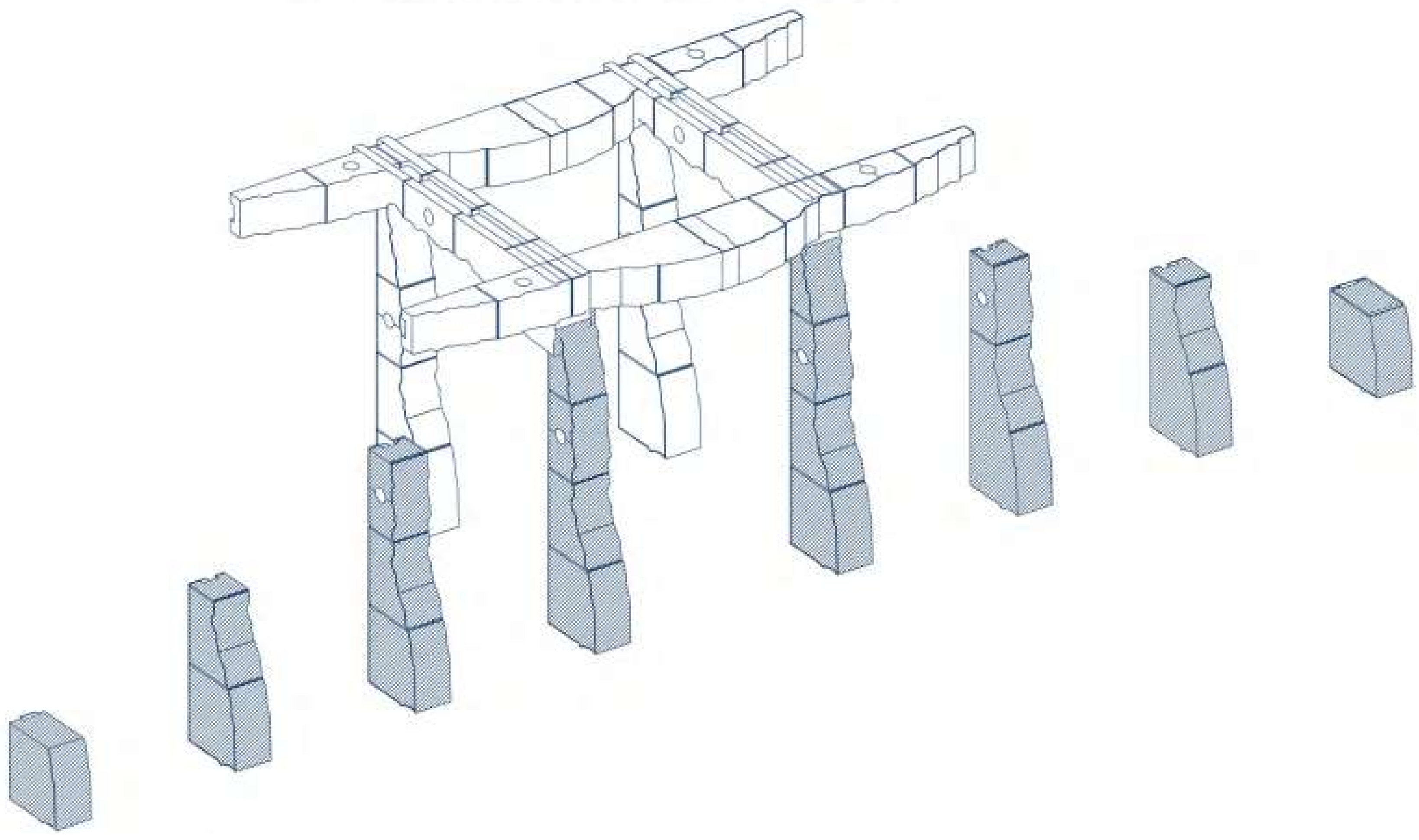
Internal Mezzanine
Modular freestanding internal structure made from spruce and plywood elements held together with bolts, easily dismountable and adaptable

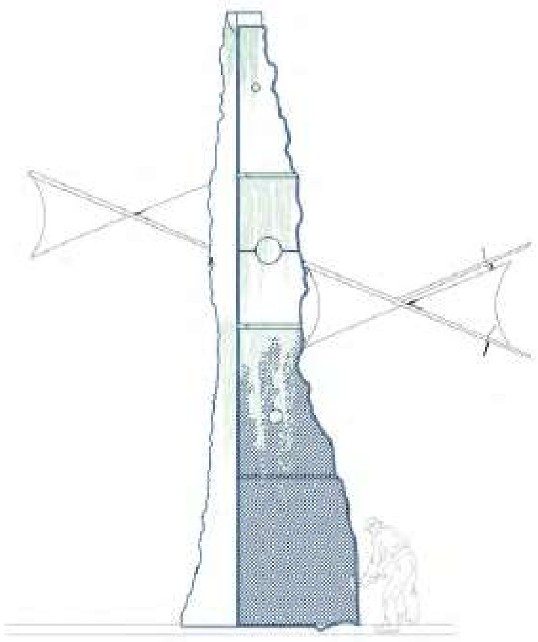
MEITHEAL

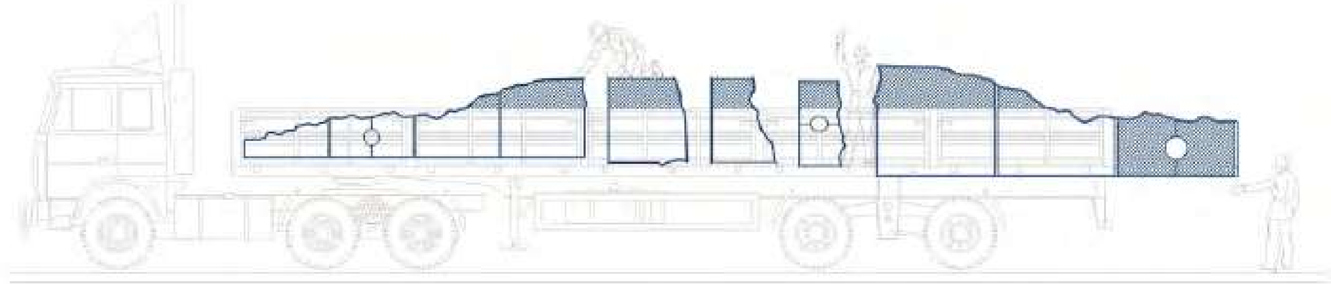
CORMAC STOTT, KATIE O'DONNELL, LUKE MAC GABHANN
STUART MEDCALF

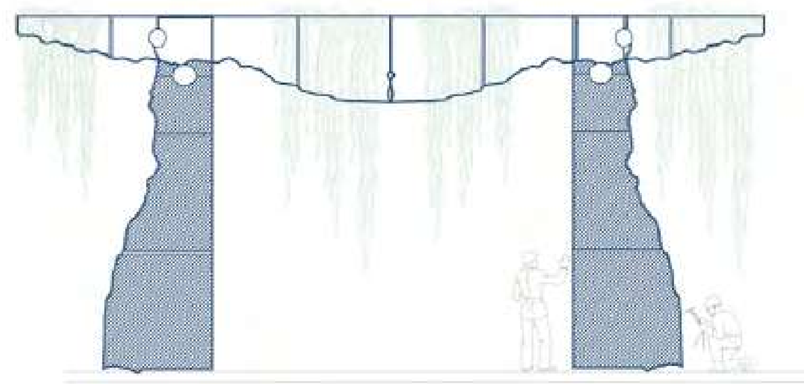
MILICA STANKOVIC, CONOR LEVINSTON, ZAK MORAN

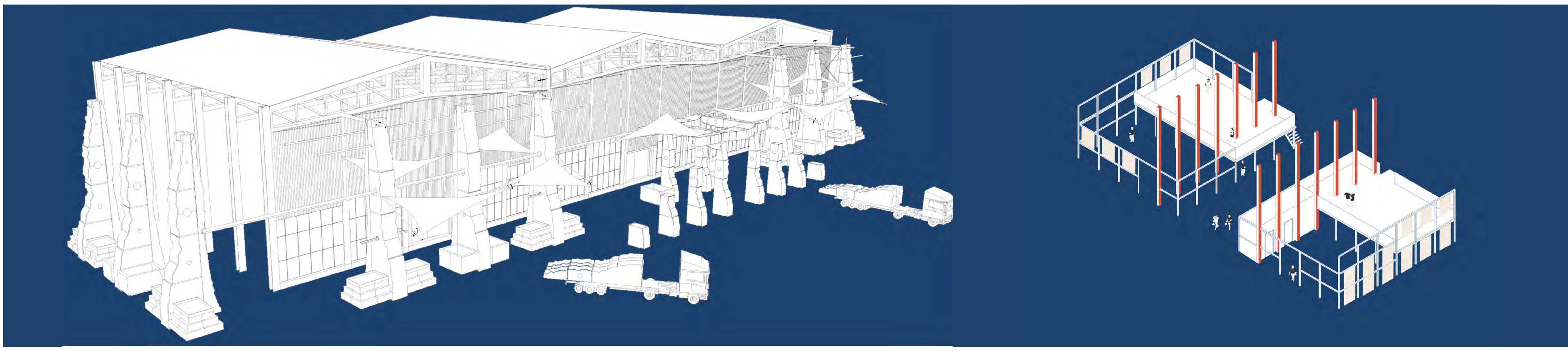


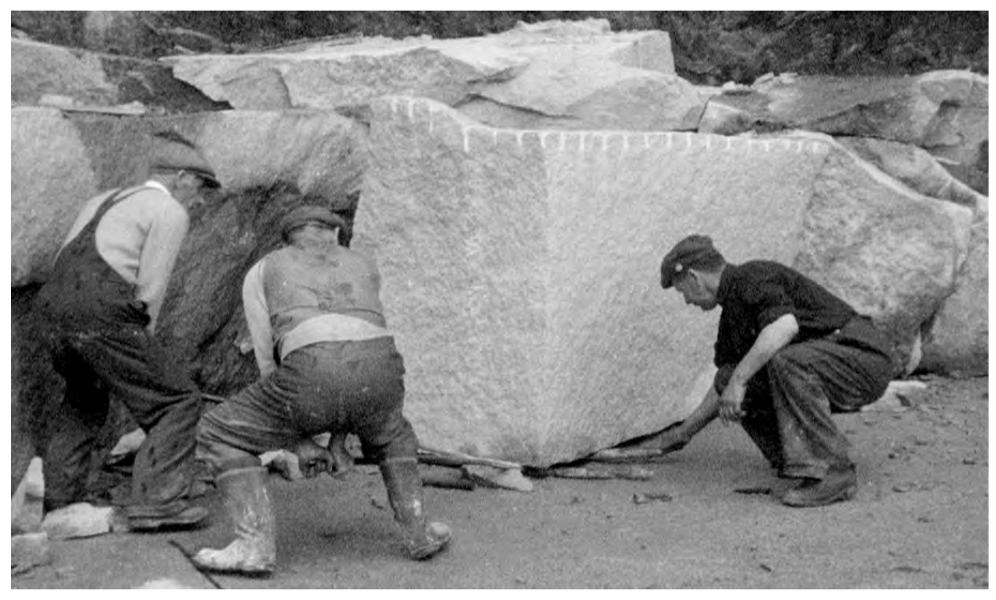


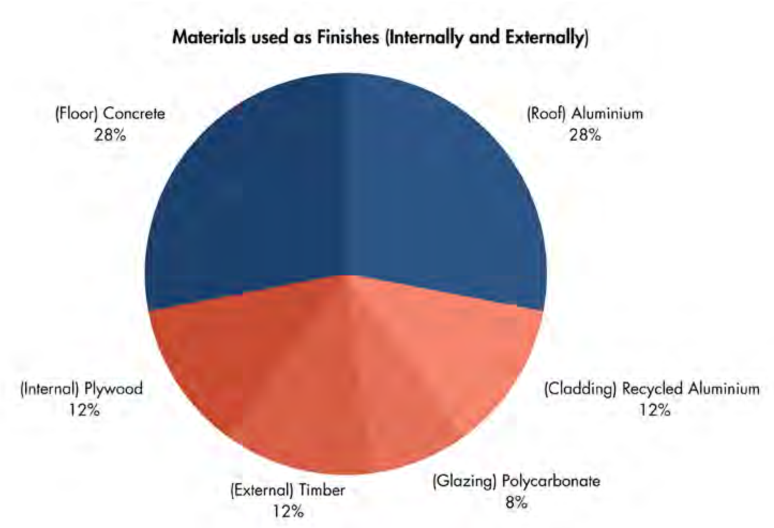


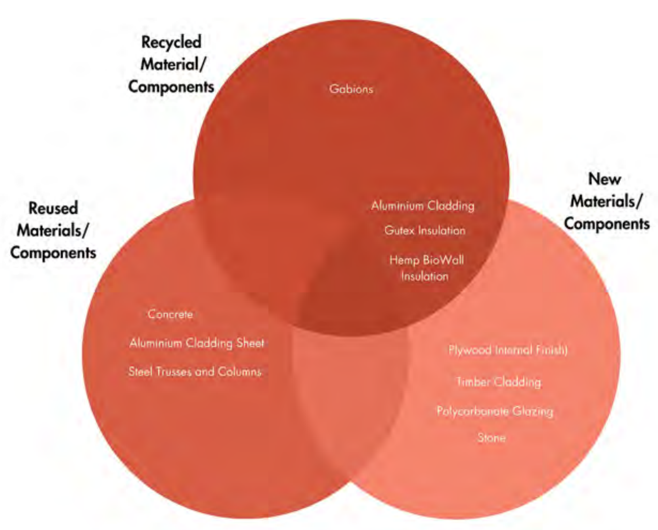


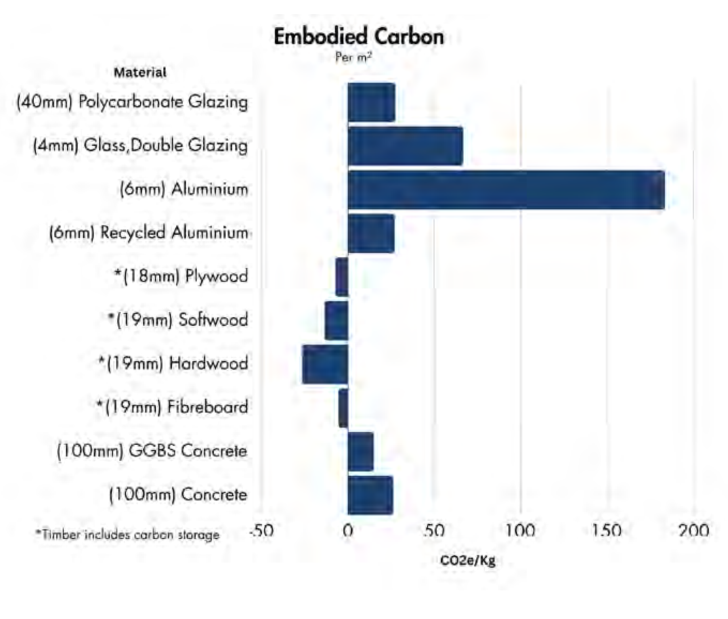


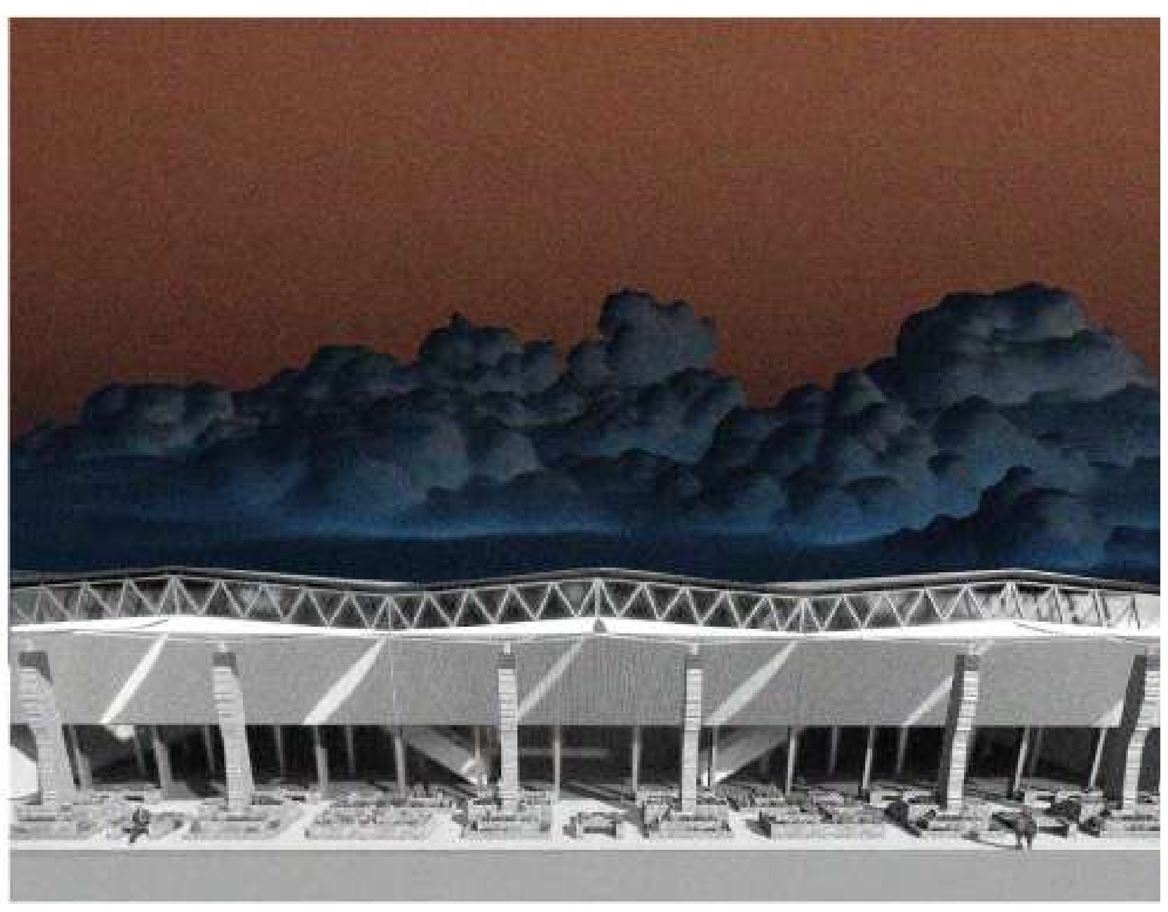








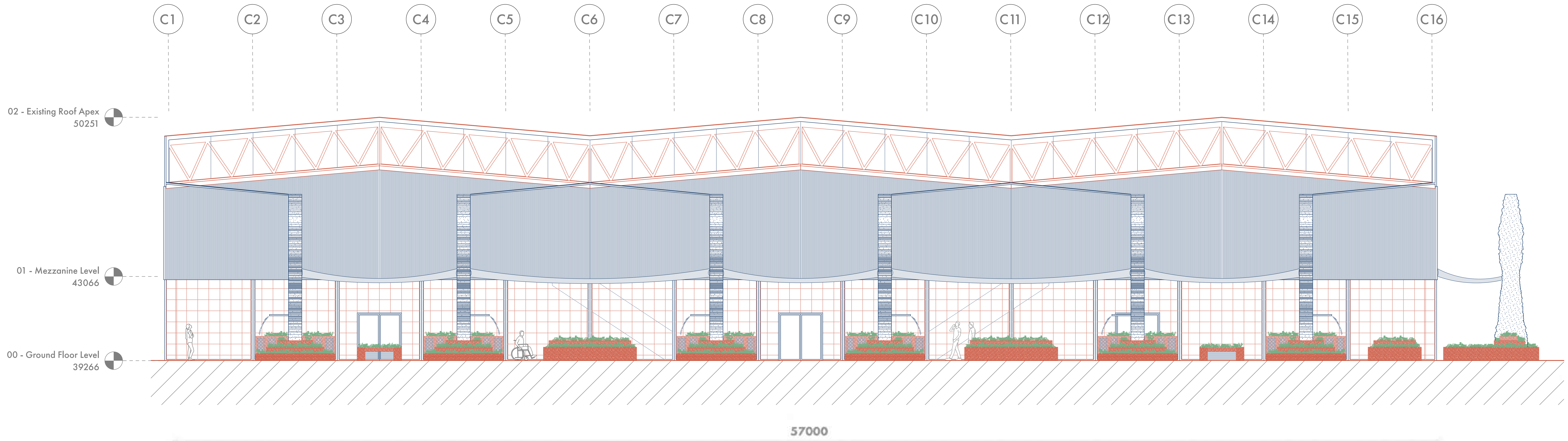


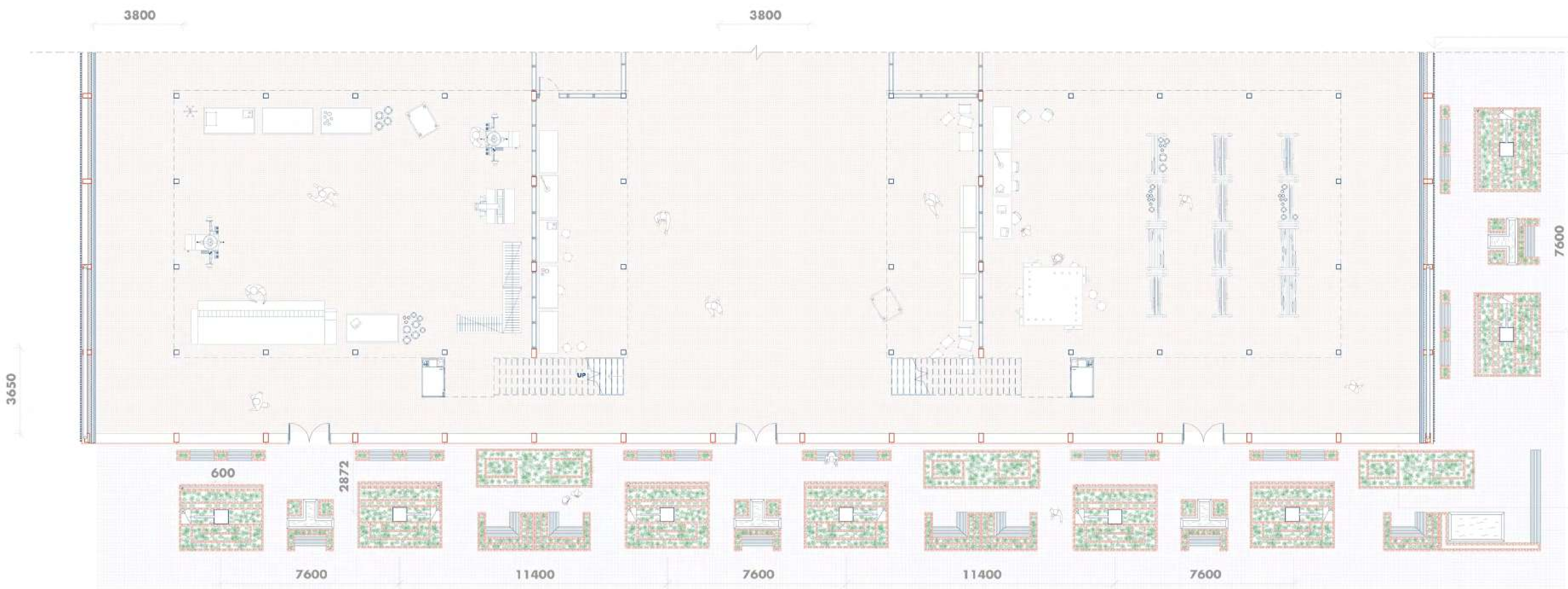


MEITHEAL

CORMAC STOTT, KATIE O'DONNELL, LUKE MAC GABHANN
STUART MEDCALF

MILICA STANKOVIC, CONOR LEVINSTON, ZAK MORAN





Nordisk Profil Woodfac Panel (Vertical 50mmx50mm Accoya Batten) on 95% recycled aluminium backing sheet hooked onto vertical cladding members fixed to existing cladding rails on primary steel column with 120mm Hemspan Biowall Insulation (0.038W/mK) between columns with a Breather Membrane (Solitex WA or e/a) wrapped around columns and onto external face of Biowall Insulation. The internal face of column is clad with 130 mm Gutex Thermoflex Insulation (0.036 W/mK) to eliminate any thermal bridges and faced with an air tightness membrane (Intello or e/a). This is then faced internally with a 50mm service cavity with 18mm Birch plywood finish.

Polycarbonate Curtain Wall System UV Plastics UVFA-FSE-S 7-layer Polycarbonate plug pattern Curtain Walling System (U- 1.1W/sm2K)

Group 6:

Anna Kehely (A), Evin Lawlor (A), Alex McGuiness (A), Liam McKenna (AT), Patrick Moscu (A), Anastasia Petrova (AT), Jack Vaughan (AT).

Abstract:

Our architect's design proposal focused on reuse. Through collaboration and site surveying, we agreed upon the reuse of the metal cladding of the building as a finish. The facade windows were to incorporate a mixture of two main shading systems. One is a horizontal folding louvre system; the louvres are to be made using the reused metal cladding. The other system was a vertical folding shader which also uses reused metal cladding as its cover. The metal cladding used is to be taken from cutting the window opes and from the roof (to be replaced).

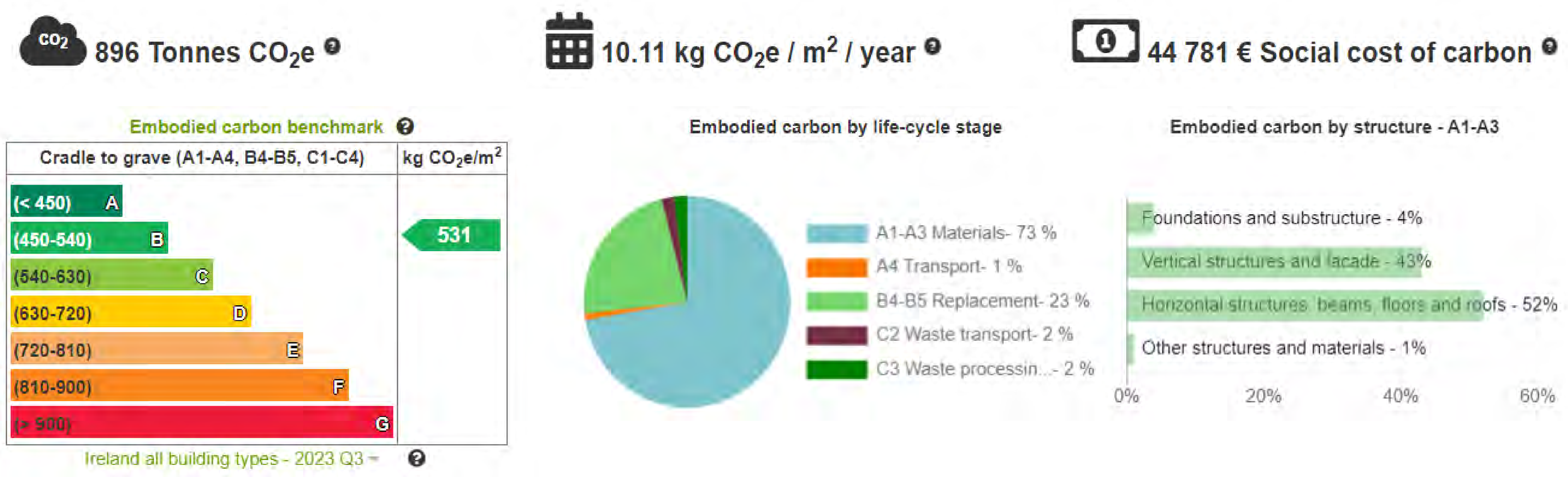
The Minibeasts Of Broombridge

The focus of our strategy is limited to the important space either side of the building's façade.
We chose to base our project on the design and construct part of the TU Dublin Broombridge brief.
The key aspects of our proposal are the reuse of materials and incorporation of animal habitats.
To express this intention we have used colour in our drawings to distinguish new materials, **recycled materials** from the site, **existing materials** and **animal and human occupation**.

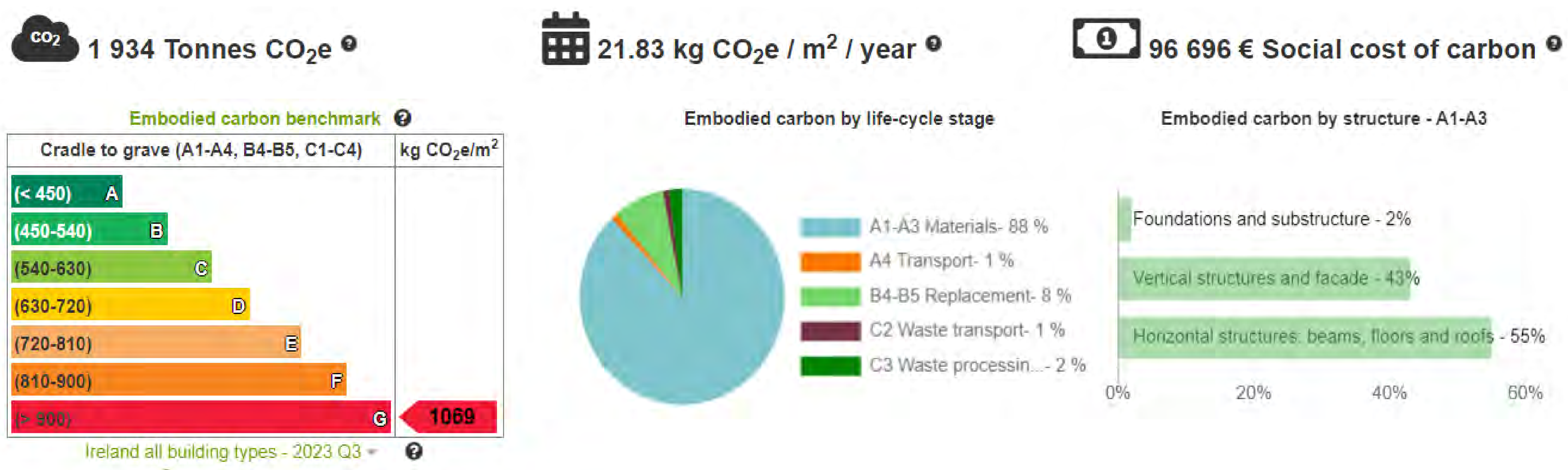
The U-Value of the wall build up is 0.15 W/m2K. The U-Value of the floor build up is 0.13 W/m2K. The U-Value of the roof build up is 0.16 W/m2K. These comply with TGD part L.

Alex McGuinness - Anna Kehely - Evin Lawlor - Patrick Moscu
Anastasia Petrova - Jack Vaughan - Liam McKenna

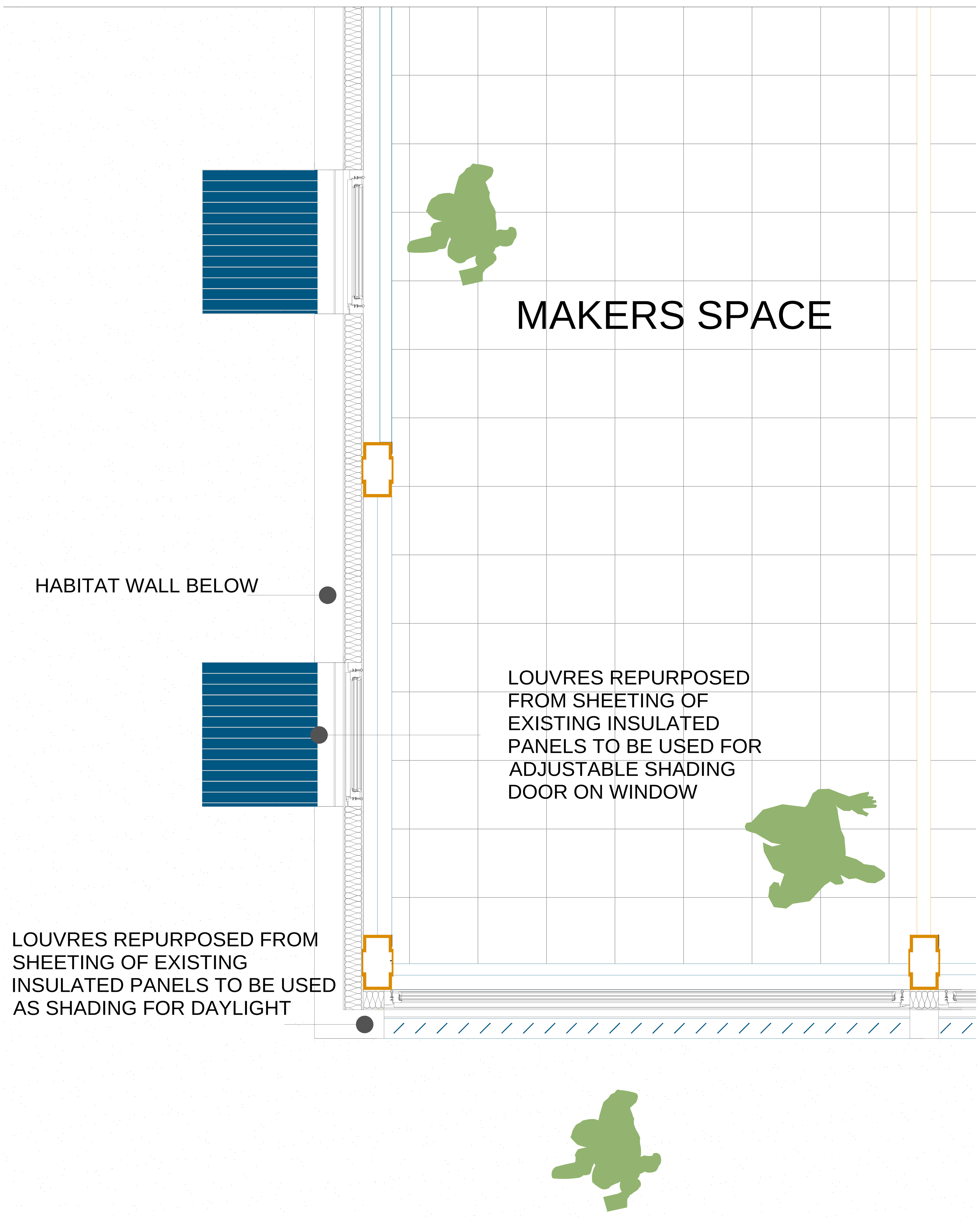
Key Plan



Proposed LCA

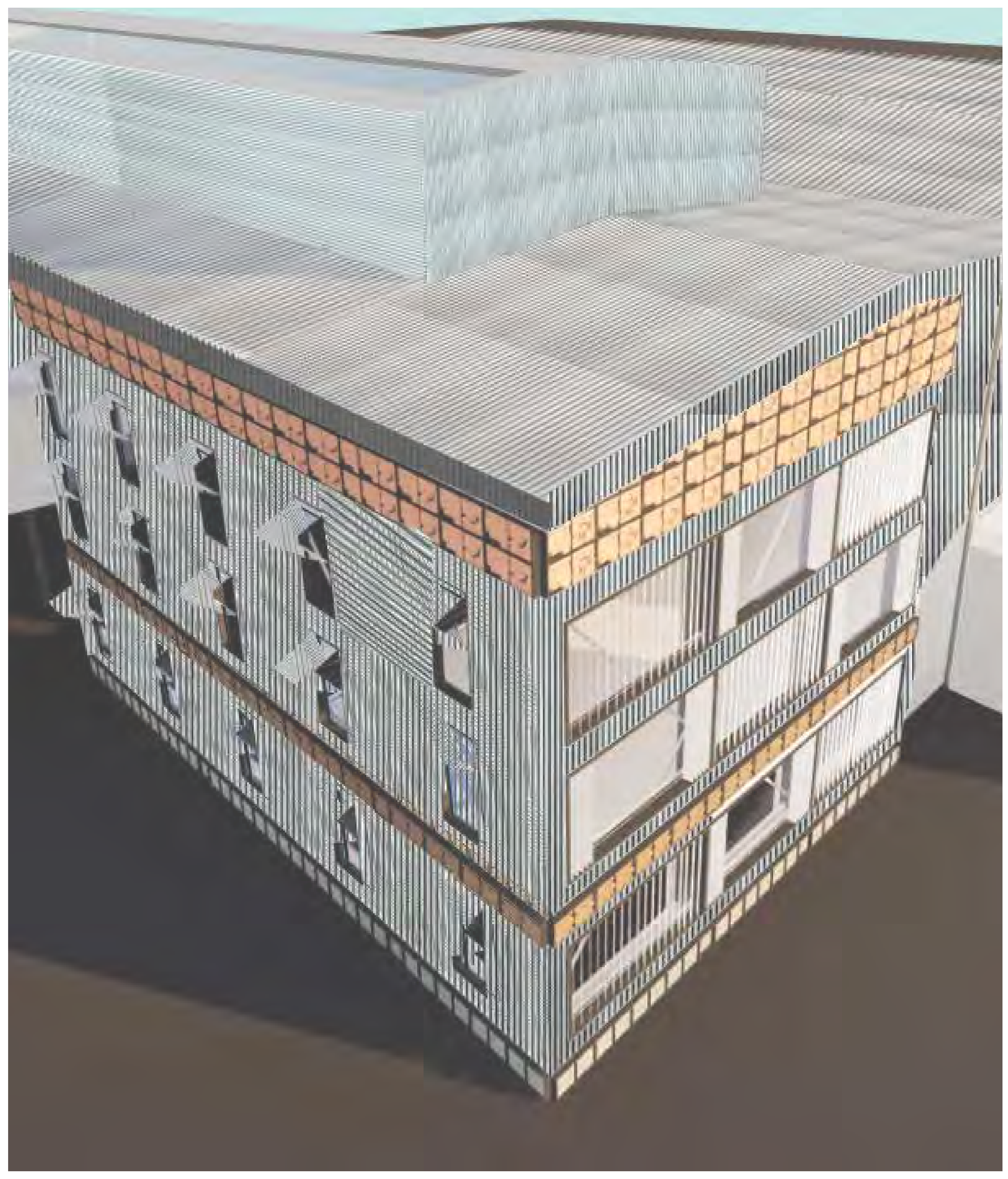


Exisiting LCA



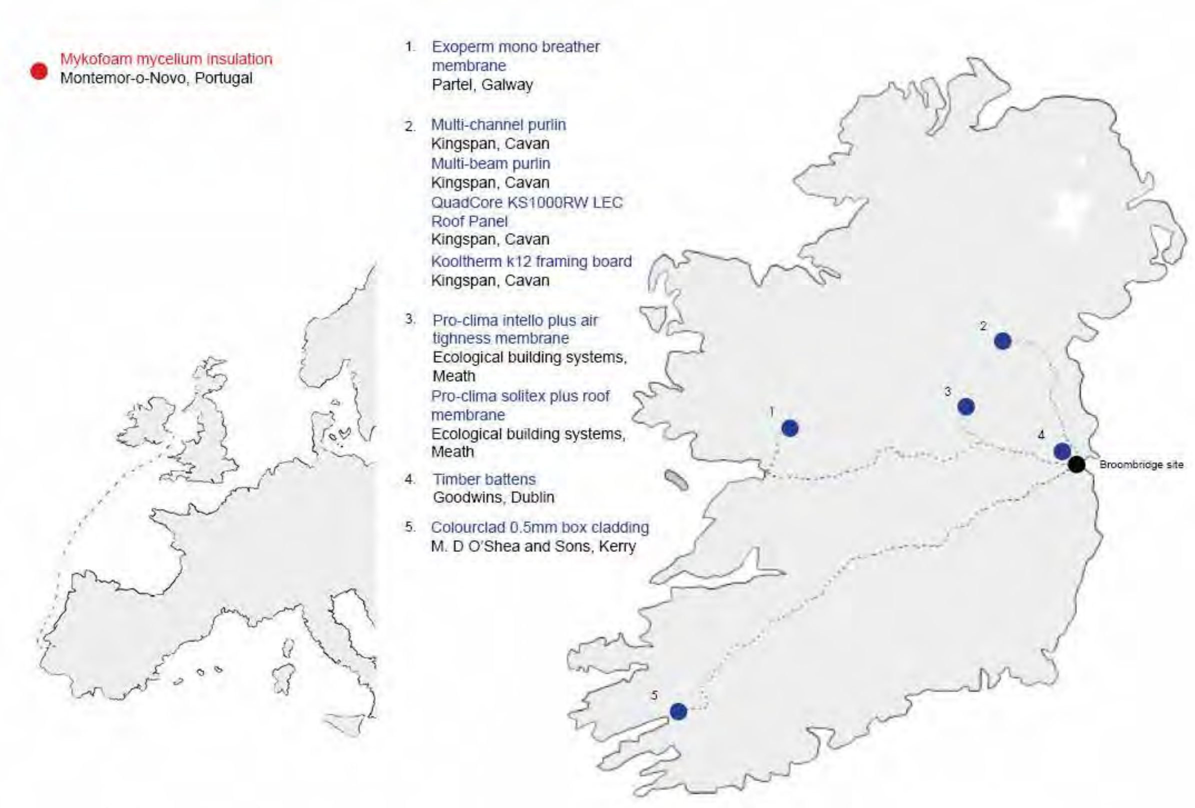
1:20 Plan

3D Renders



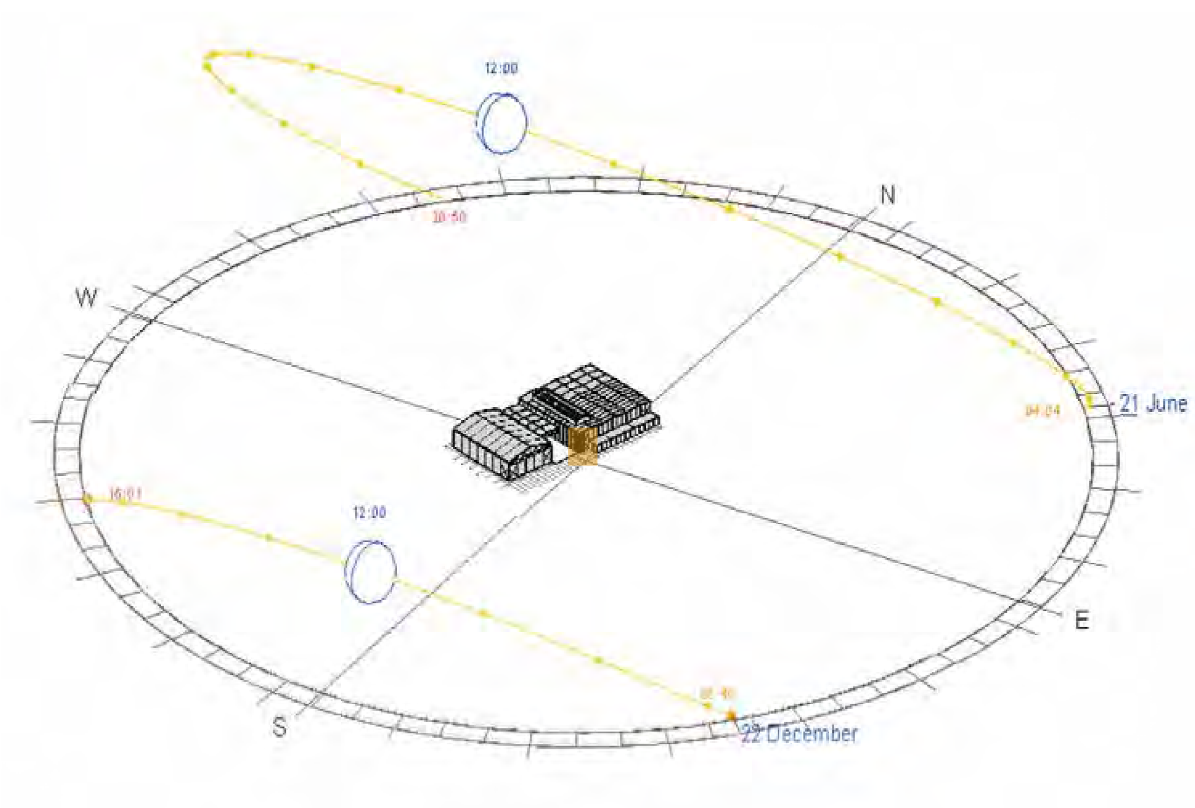
3D Renders

3D Renders

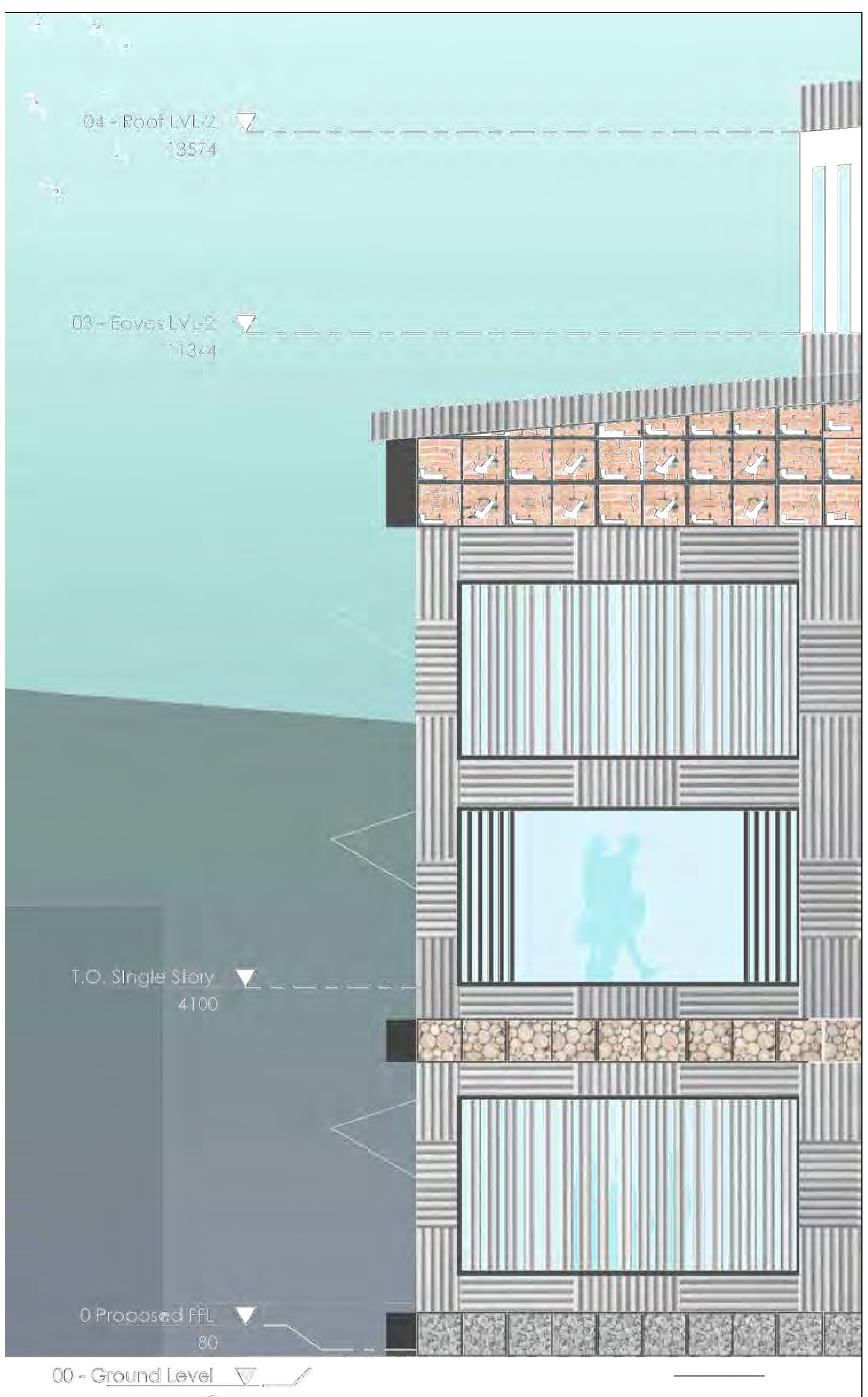


Material Mapping

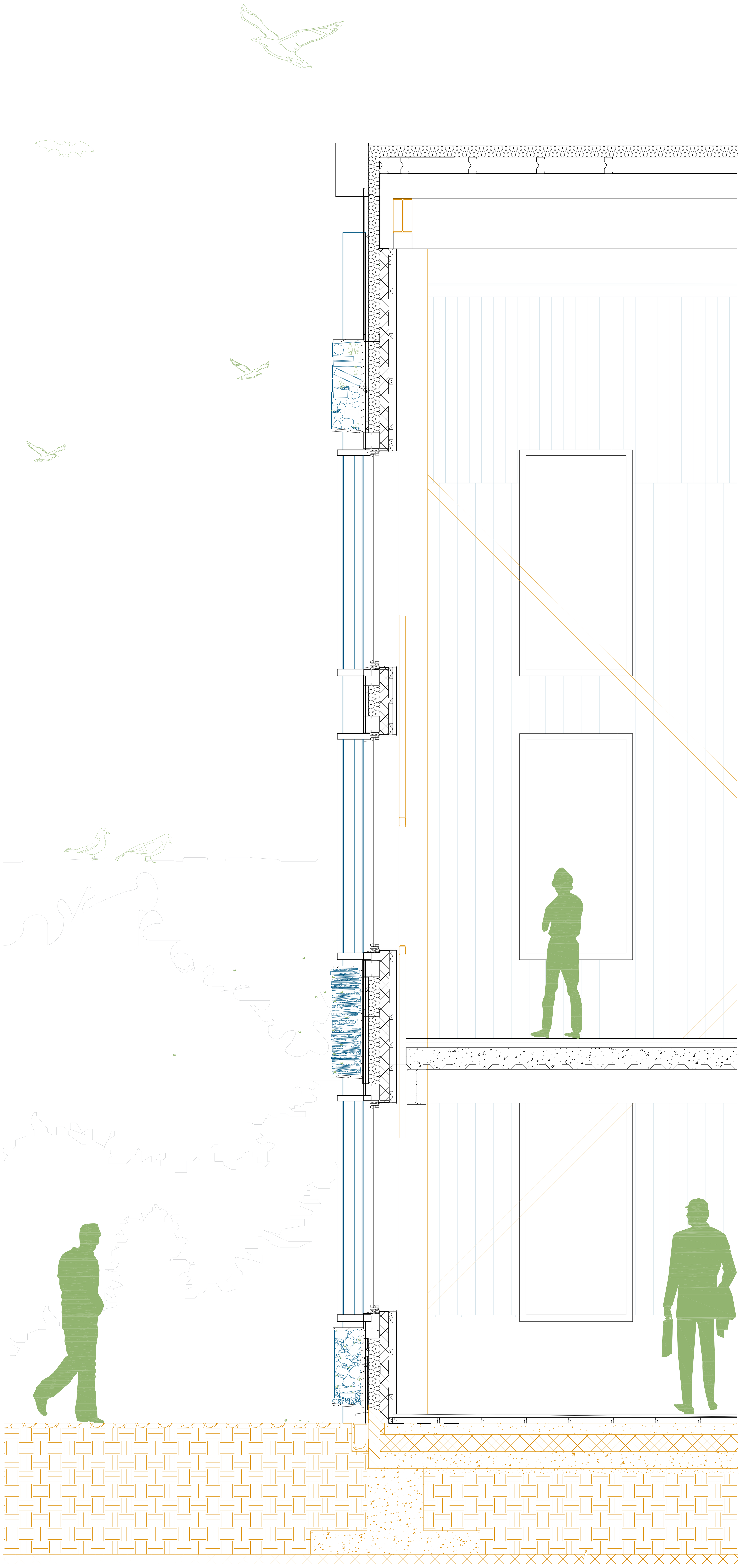
Day Light Section Diagram



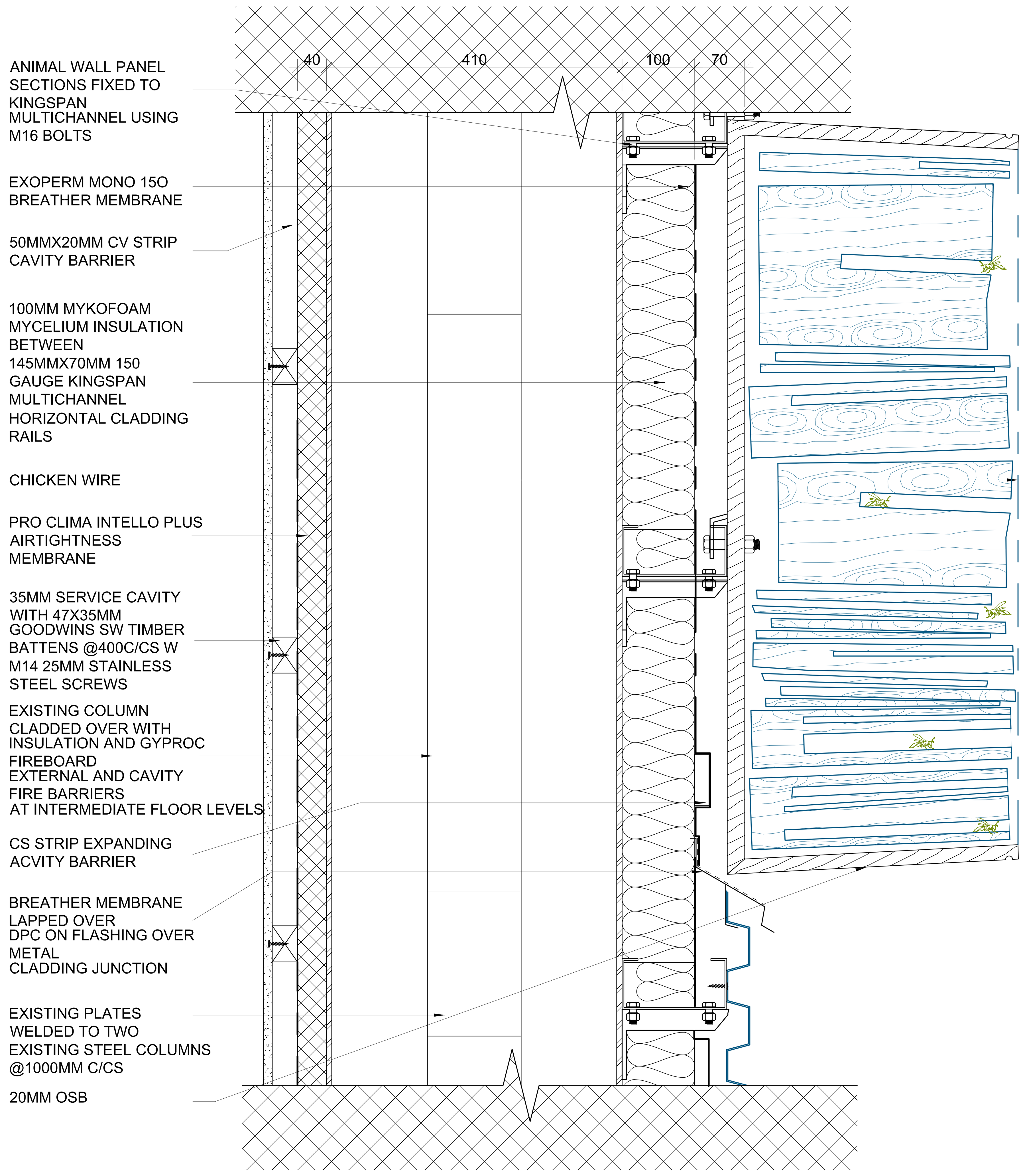
Summer and Winter Solstice

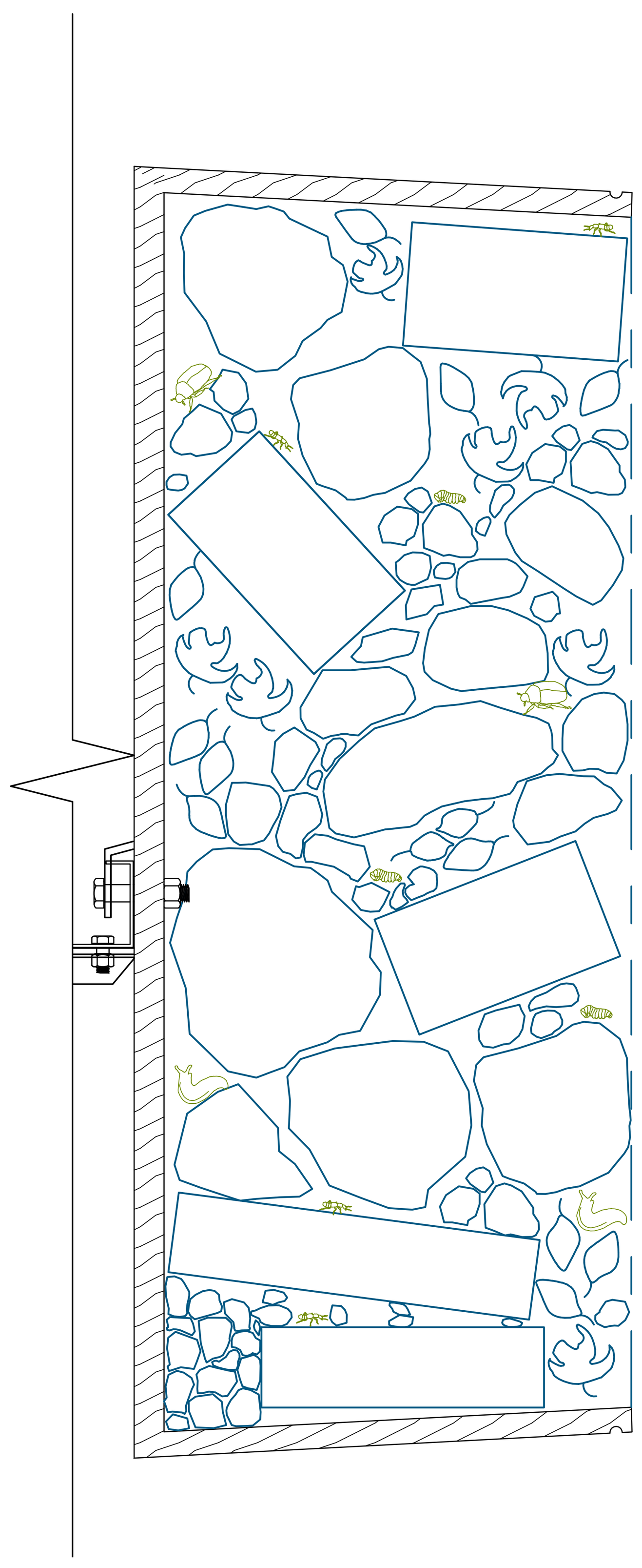


Elevation Of Bay @ 1:50

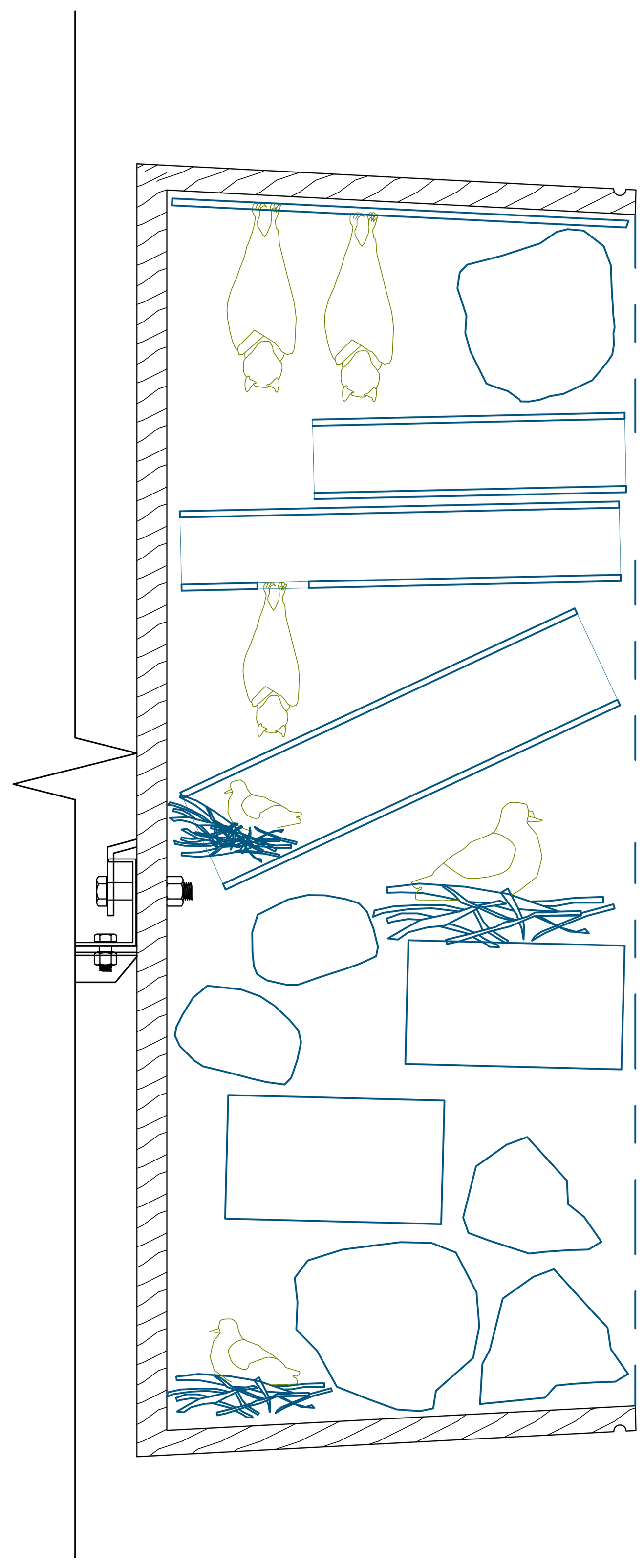


1:20 Section



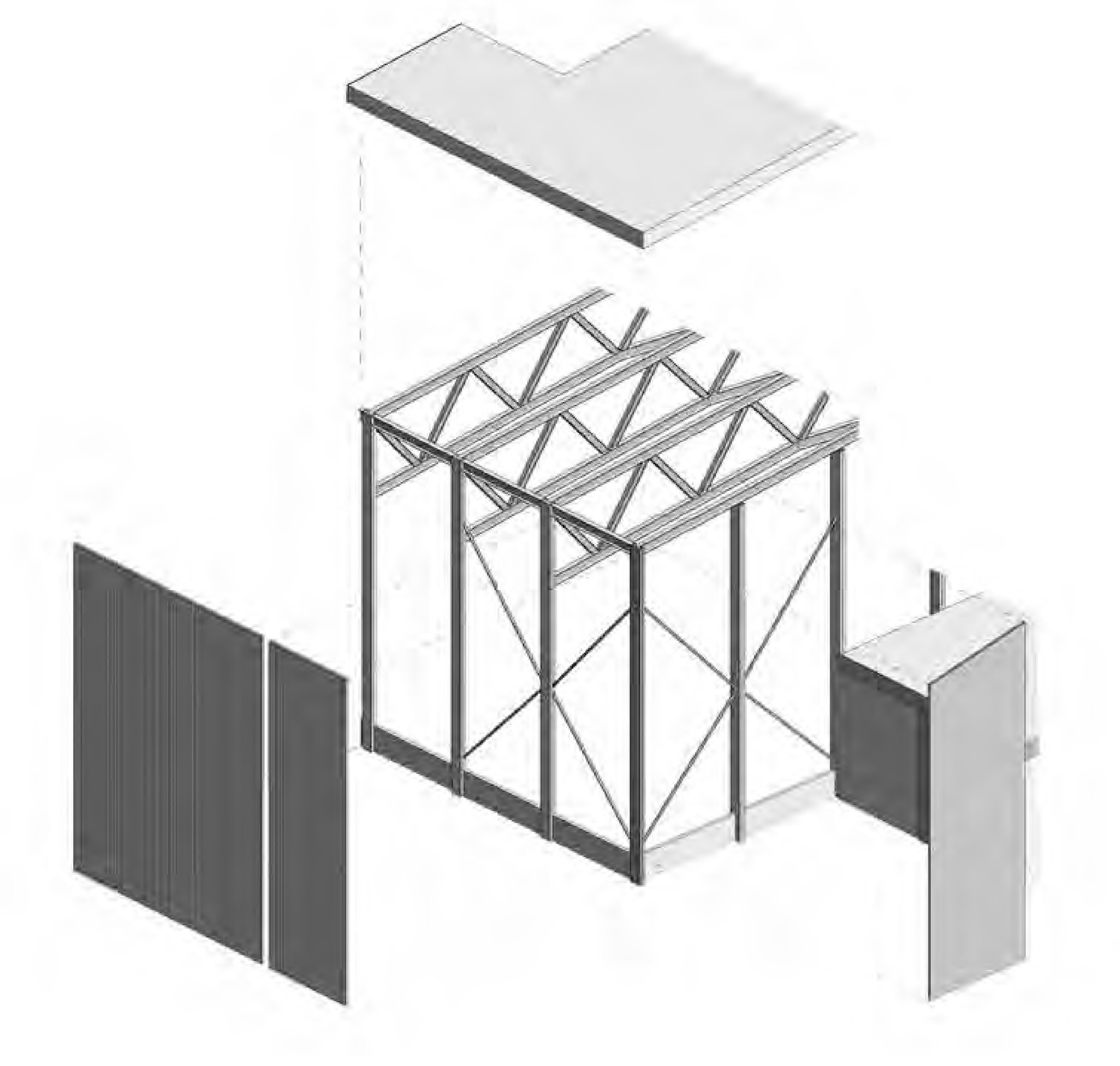


1:5 Detail Through Bottom Row Habitat Wall
Designed for insects and the minibeasts of Broombridge
Using rubble, blocks, leaves

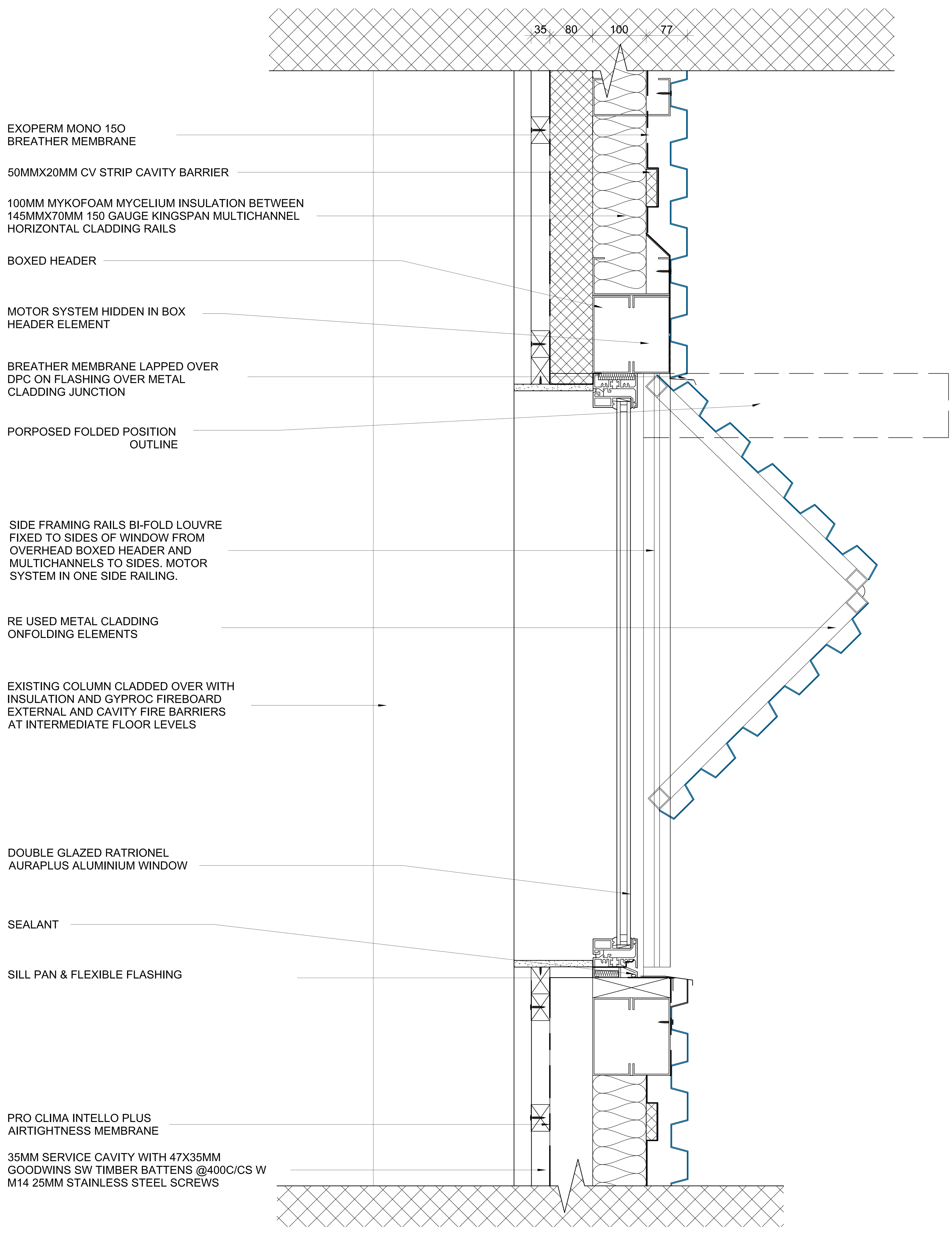


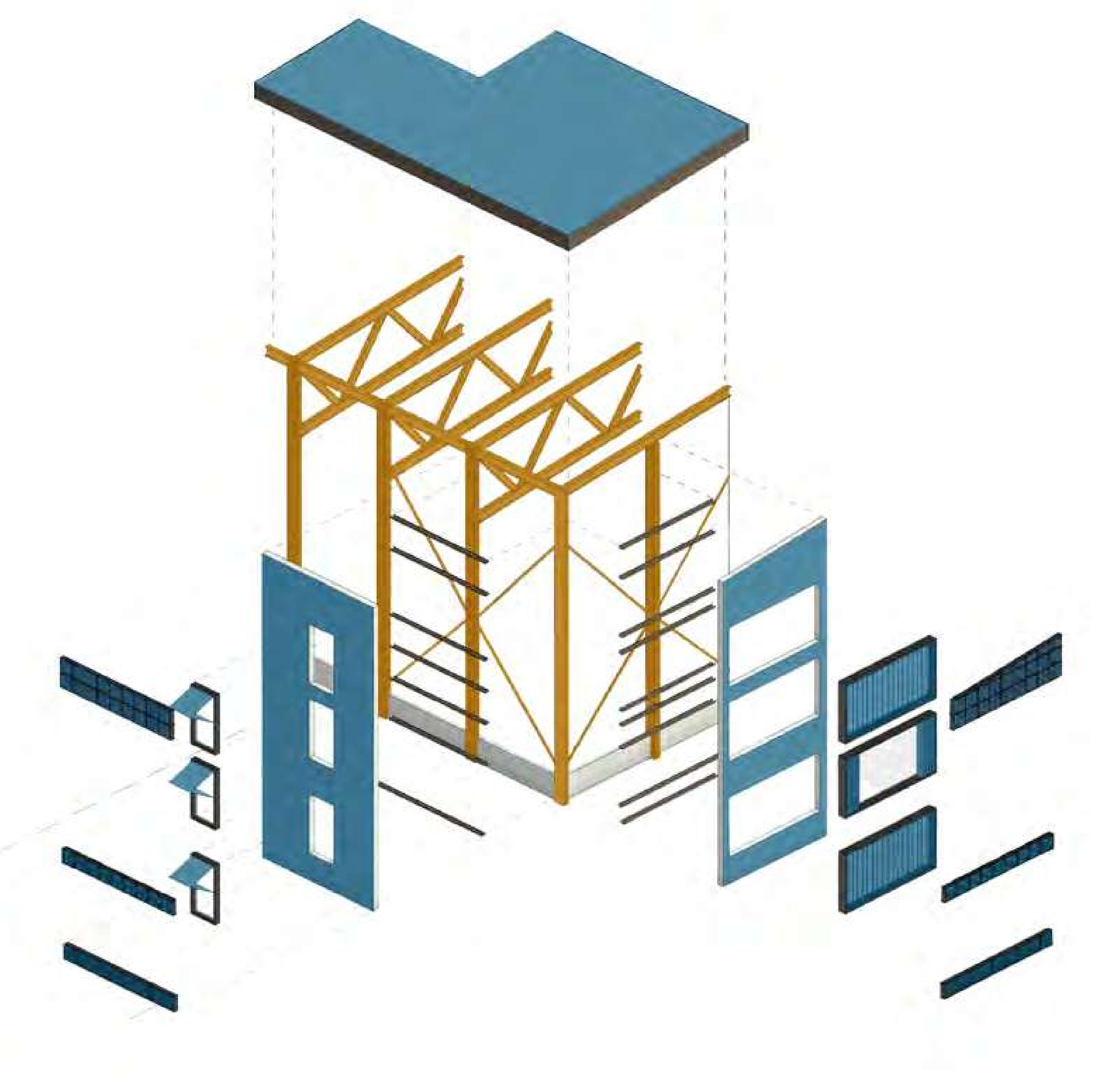
1:5 Detail Through Top Row Habitat Wall
Designed for bats and birds of Broombridge
Using rubble, pipes, blocks

1:5 Section Detail Through Middle Row Habitat Wall
Designed for flying insects and the pollinators of Broombridge
Using logs and twigs



Exploded Axonometric Exisiting





Exploded Axonometric Proposed

1:5 Section Detail Through Glazing

Group 7:

Caoimhghin Bradshaw (A), Ronan Browne (AT), Anastasia Hlibiciuc (A), James McGrath (A), Sean Molloy (AT), Ciara O'Reilly (A), Craig Wall (AT).

Abstract:

While the primary structural elements of the existing building are to be considered sound, all secondary structure, cladding and insulation was deemed unsuitable and in need of replacing. An important part of the design approach was to critique this appraisal and consider an approach that used less carbon. Looking at the brief and the site, there is a keen interest in developing a connection between all three elements of the programme: Design + Construct, the sporting facility and the community facility. There is also a strong desire to create something that would address the entrance to the building while facilitating and enhancing the other areas. For this reason, the design of an element in the central space was developed. Tiered seating and level changes were included from the beginning of the design to offer many different ways to use the large volume of the space and create opportunity to see into the other areas. This initial concept developed into the idea that the new elements of the project would act as discrete elements, an insertion into the existing fabric of the building. The core idea for this move was looking at the principles of Lacaton & Vassal: adding to and enhancing existing elements rather than demolishing and replacing them. By adding a new box that aims to provide a high level of thermal comfort, there can be less onus on the rest of the building to perform to this high standard, thus reducing the need for a deep retrofit, and all the carbon that goes into that. In addition, this insertion organises the layout of the central area and help define space. A key part of the architectural idea is to show an appraisal of the existing building and the approach to retrofitting. This is done by selecting areas of the building in various states of repair and using them to demonstrate different levels of intervention. The general approach is the do as little as possible and add elements rather than remove and consequently dump them.

SITE ANALYSIS

While the primary structural elements of the existing building are to be considered sound, all secondary structure, cladding and insulation was deemed unsuitable and in need of replacing.
An important part of the design approach was to critique this appraisal and consider an approach that used less carbon.

Looking at the brief and the site, there is a keen interest in developing a connection between all three elements of the programme: Design & Construct, the sporting facility and the community facility.

There is also a strong desire to create something that would address the entrance to the building while facilitating and enhancing the other areas.

For this reason, the design of an element in the central space was developed. Tiered seating and level changes were included from the beginning of the design to offer many different ways to use the large volume of the space and create opportunity to see into the other areas.

This initial concept developed into the idea that the new elements of the project would act as discrete elements, an insertion into the existing fabric of the building.

The core idea for this move was looking at the princples of Lacaton & Vassal: adding to and enhancing existing elements rather than demolishing and replacing them.
By adding a new box that aims to provide a high level of thermal comfort, there can be less onus on the rest of the building to perform to this high standard, thus reducing the need for a deep retrofit, and all the carbon that goes into that.

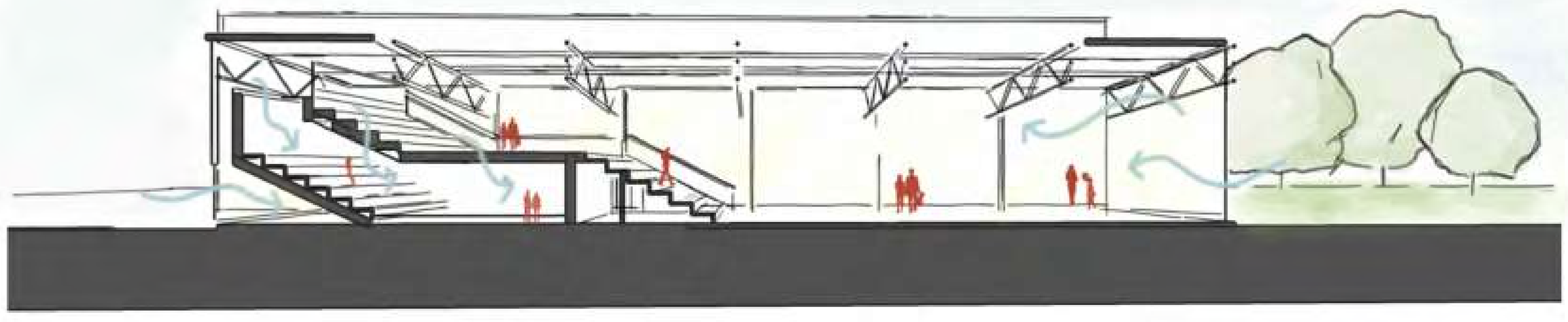
In addition, this insertion organises the layout of the central area and help define space.

A key part of the architectural idea is to show an appraisal of the existing building and the approach to retrofitting.

This is done by selecting areas of the building in various states of repair and using them to demonstrate different levels of intervention.

The general approach is the do as little as possible and add elements rather than remove and consequently dump them.

EXISTING CENTRAL AREA



CONCEPT SKETCH

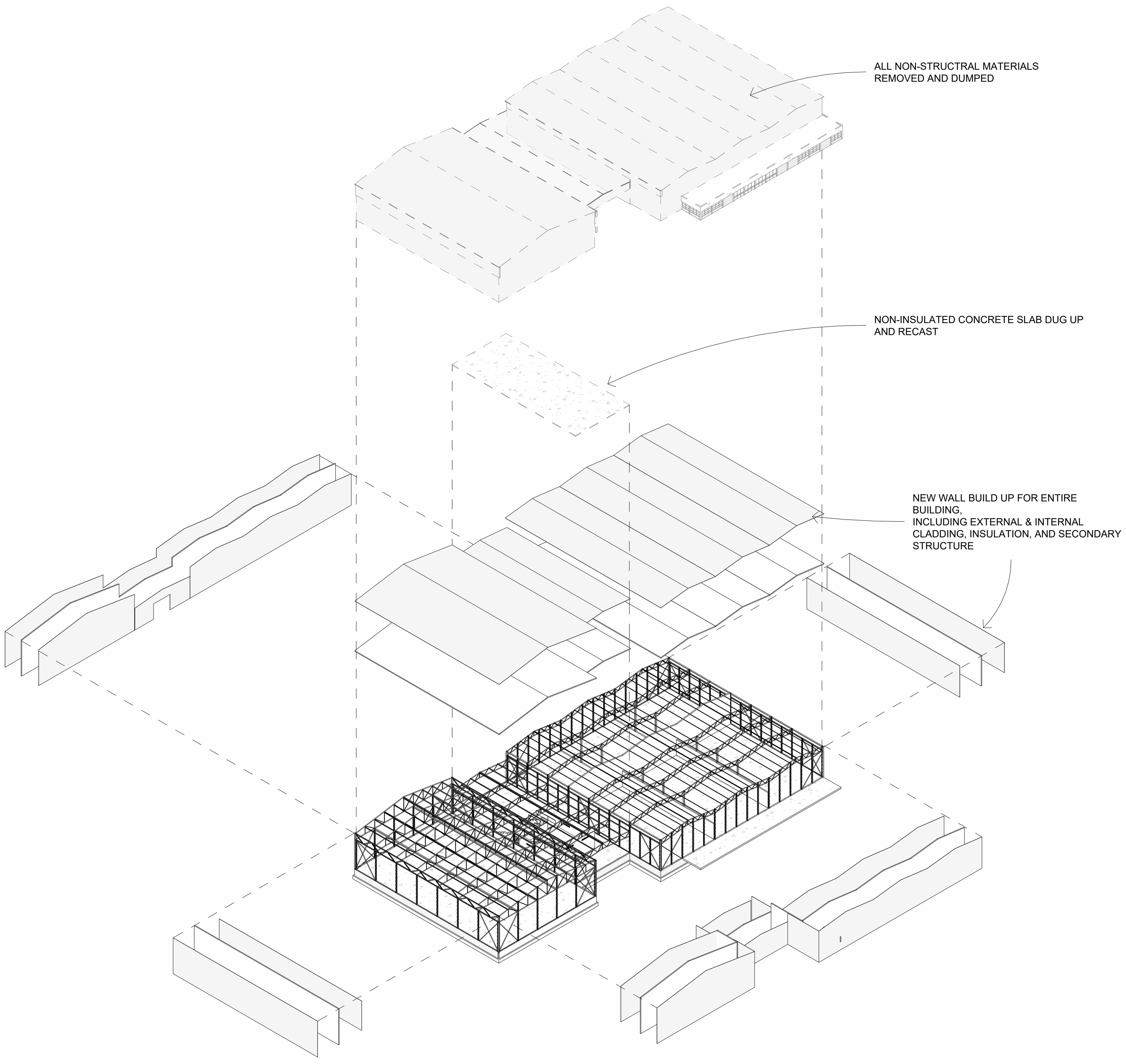
MATERIAL SOURCING

BARRETT'S GROVE, AMIN TAHA

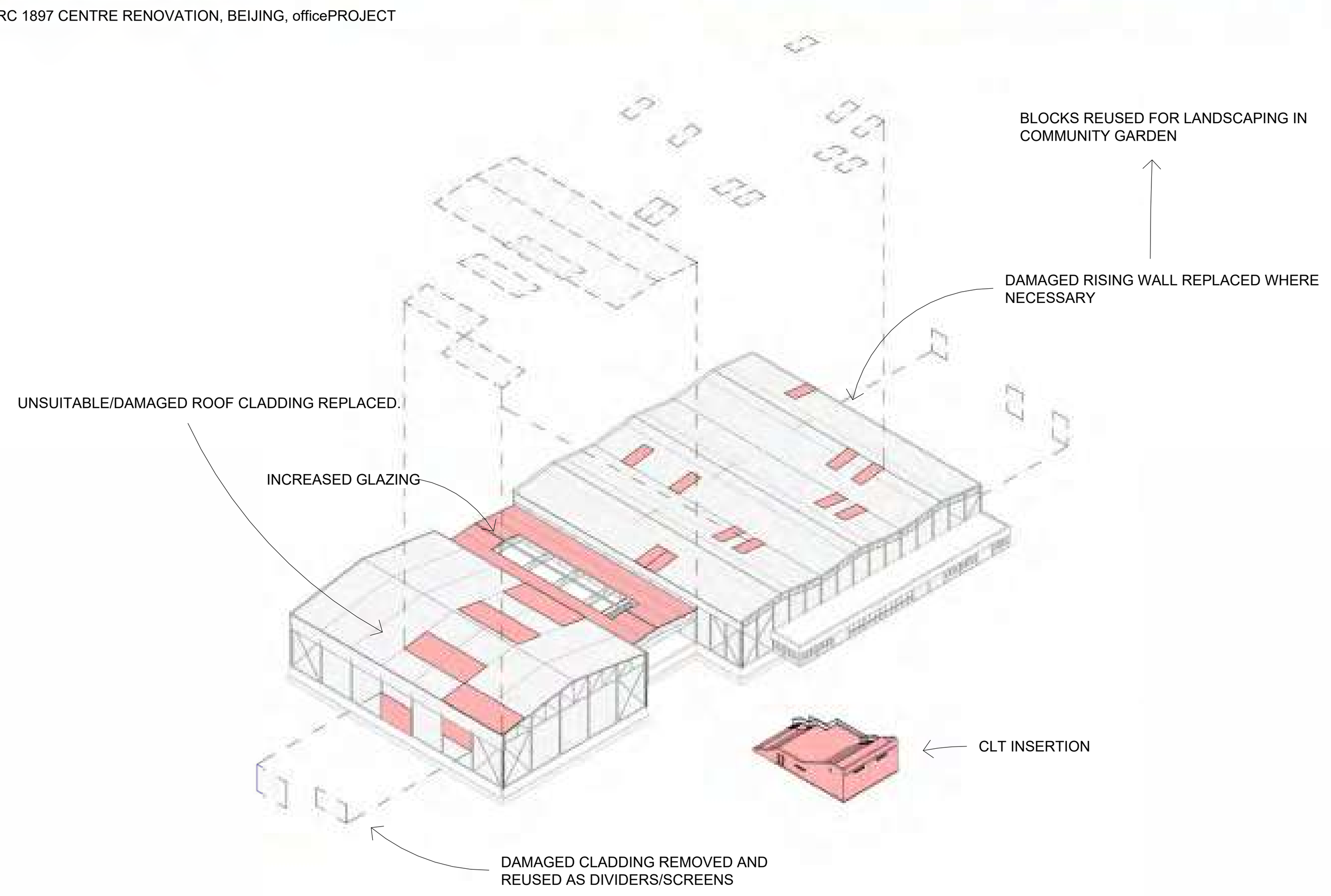
PALAIS DE TOKYO, LACATON & VASSAL

JINGYUAN COWORKING OFFICE, C+ ARCHITECTS

CRRC 1897 CENTRE RENOVATION, BEIJING, officePROJECT



DEEP RETROFIT - DIAGRAMMATIC AXONOMETRIC



MINIMAL INTERVENTION - DIAGRAMMATIC AXONOMETRIC

Fabric to be removed: 6259 tonnes CO_2e

New material added: 2509 tonnes CO_2e

8768 tonnes CO_2e

New insertion: 19 tonnes CO_2e

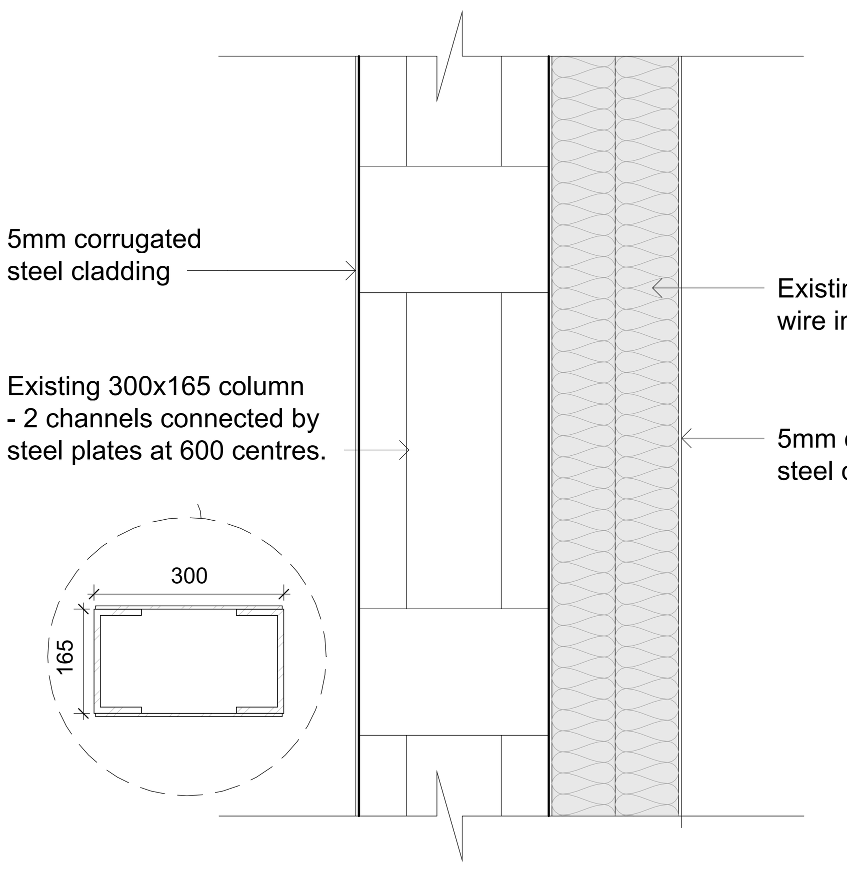
Upgrades to existing: 1837-2309 tonnes CO_2e

1837-2328 tonnes CO_2e

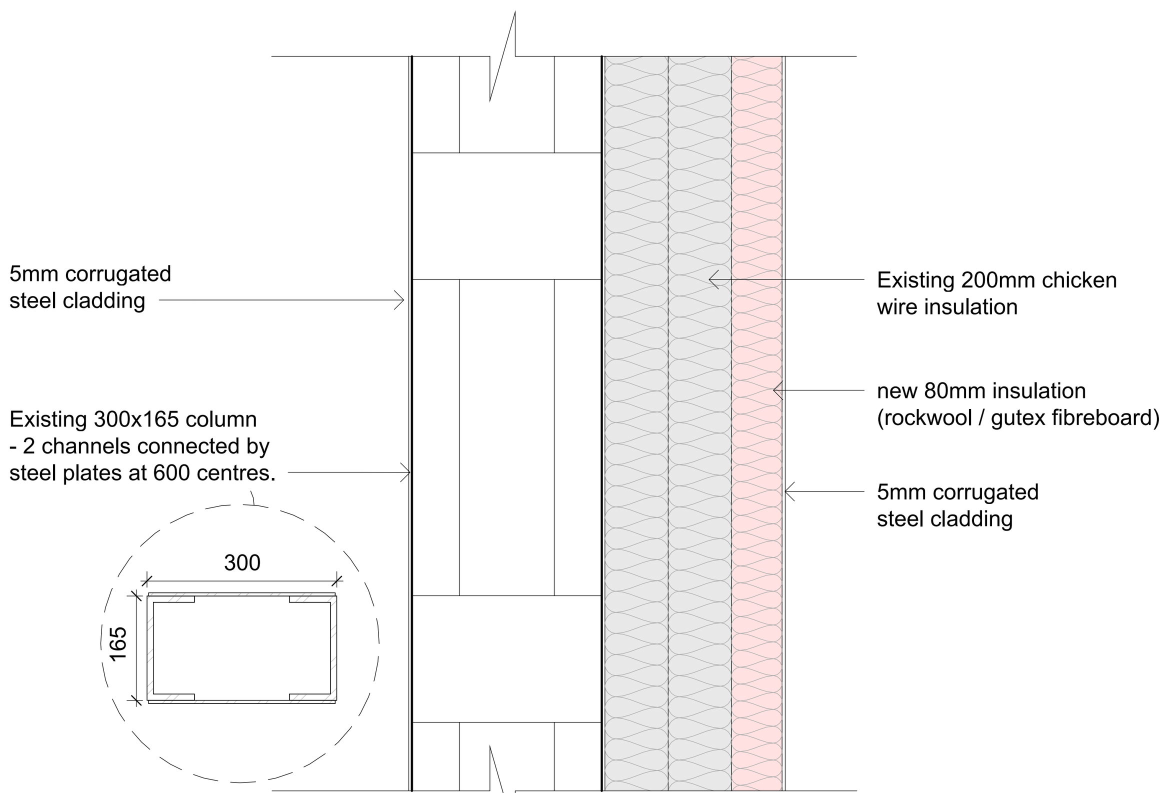
GROUP 7

Anastasia Hlibiciuc, Caoimhghin Bradshaw, Ciara O'Reilly, Craig Wall, James McGrath, Ronan Browne, Sean Molloy

MAKING: DESIGN + CONSTRUCT

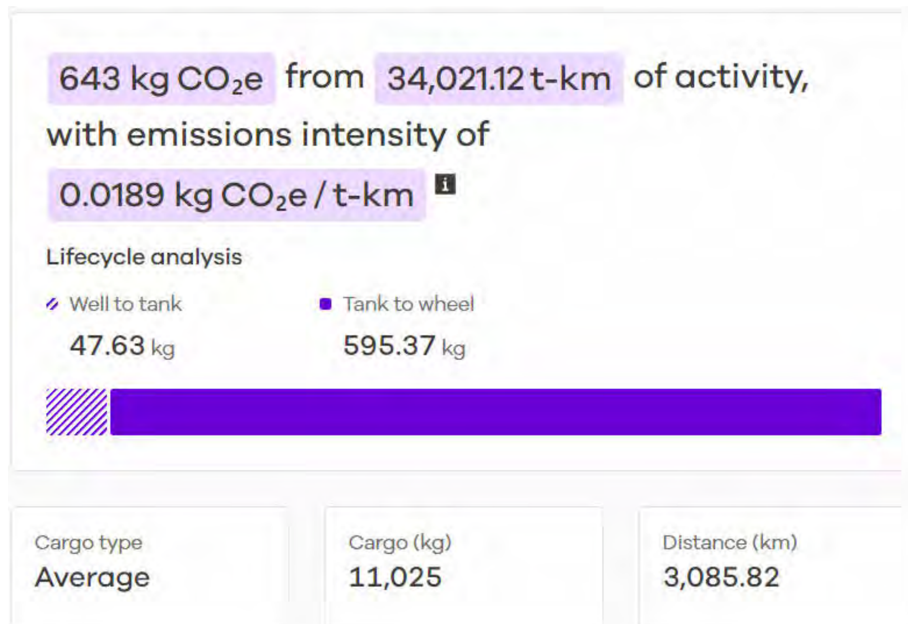


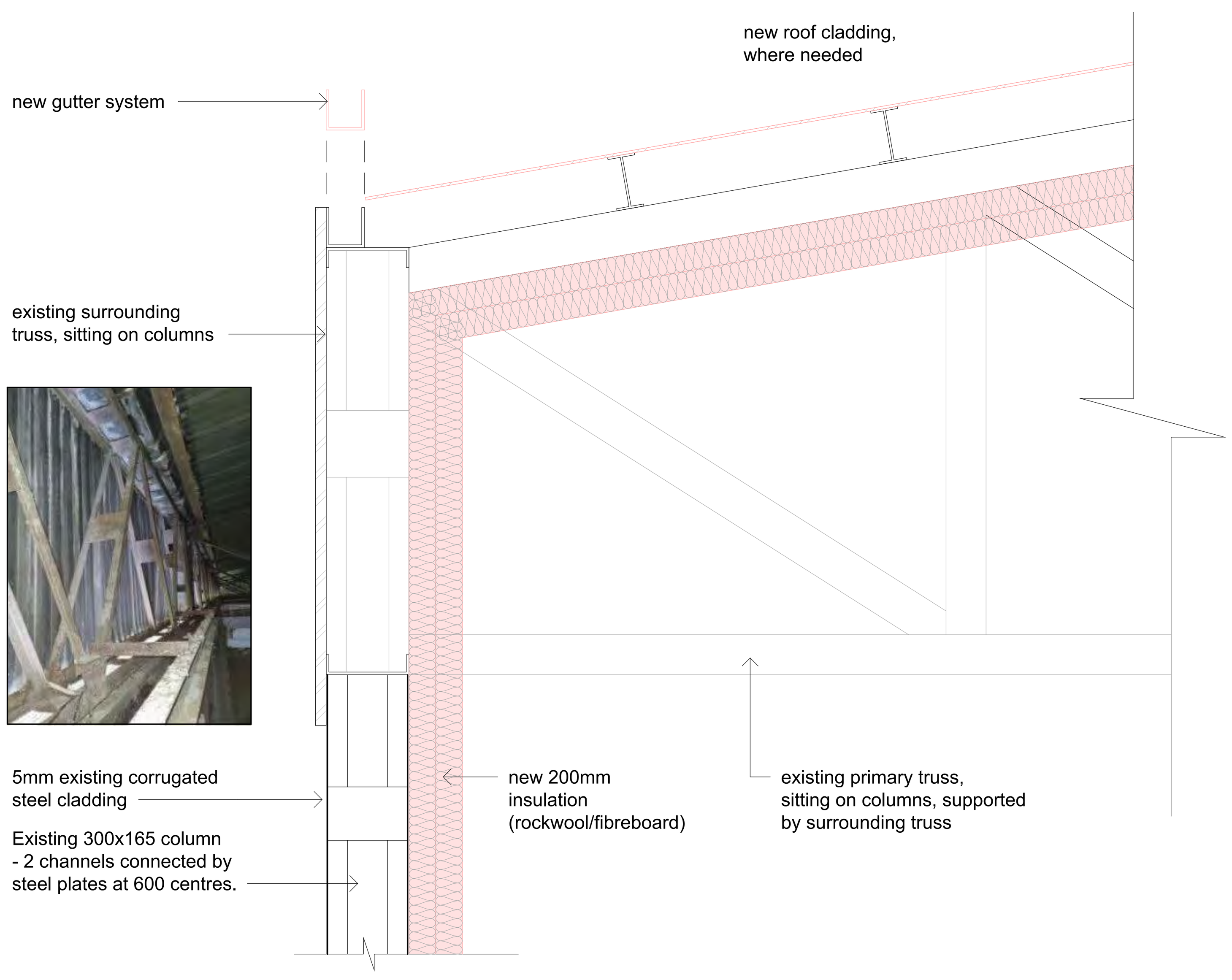
Condition 01: No Intervention



Condition 02: Minimal Intervention

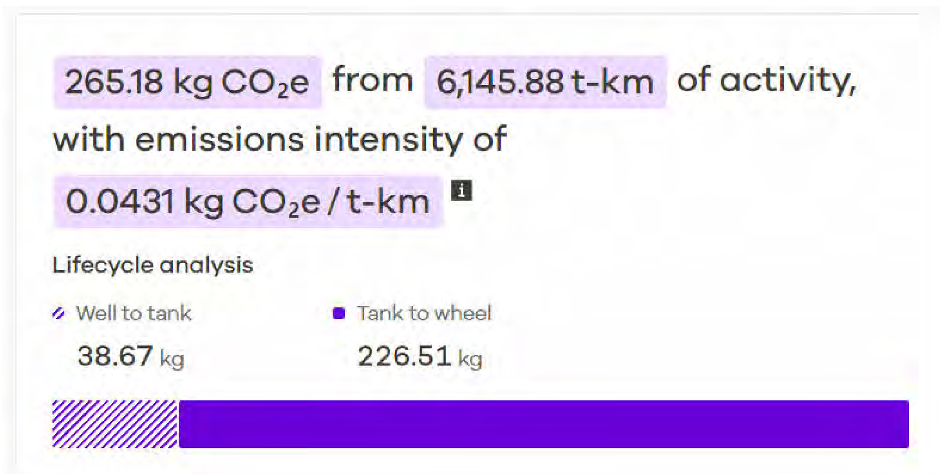
Calculated carbon of transported CLT





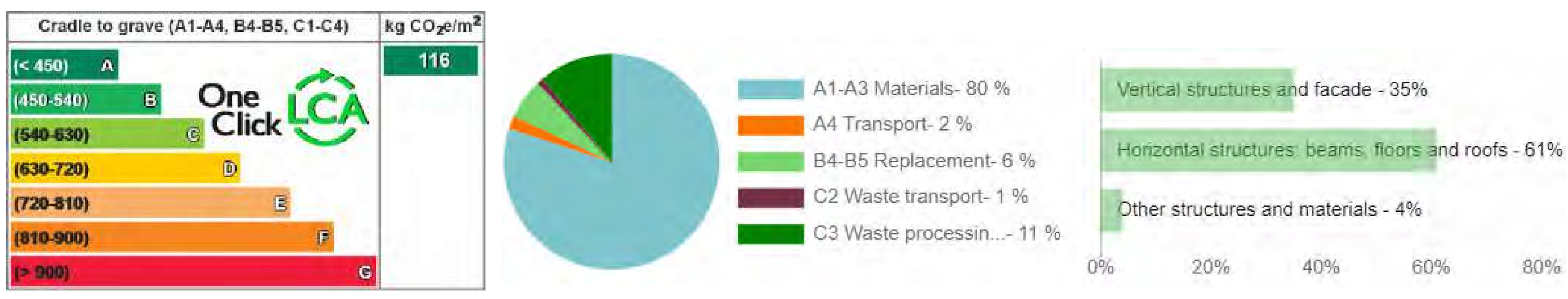
Condition 03: Moderate Intervention

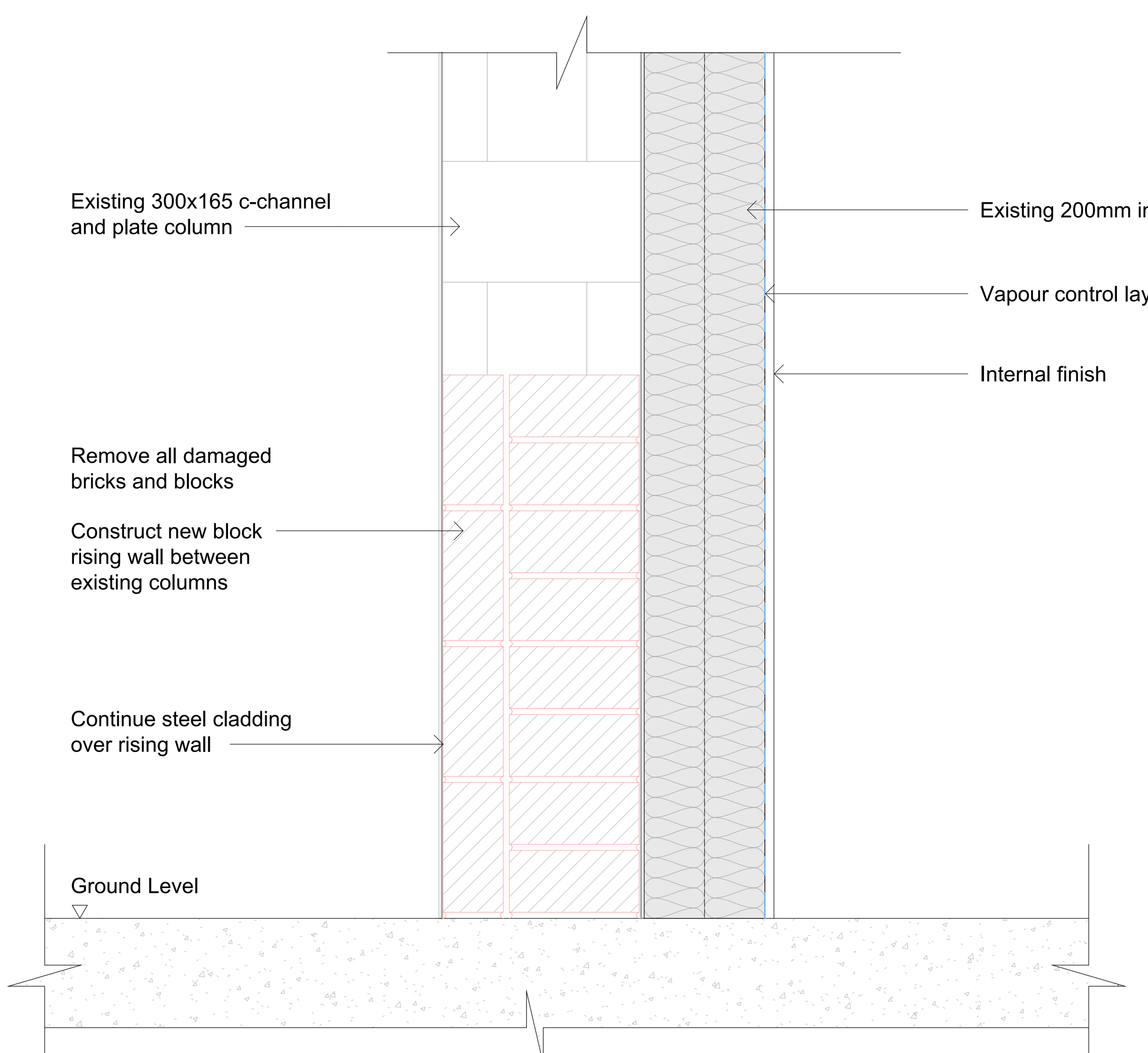
Calculated carbon of transported Gutex Thermosafe - Homogen



Calculated carbon of transported Gutex Thermowall

Oneclick LCA of CLT Insertion Lecture Hall

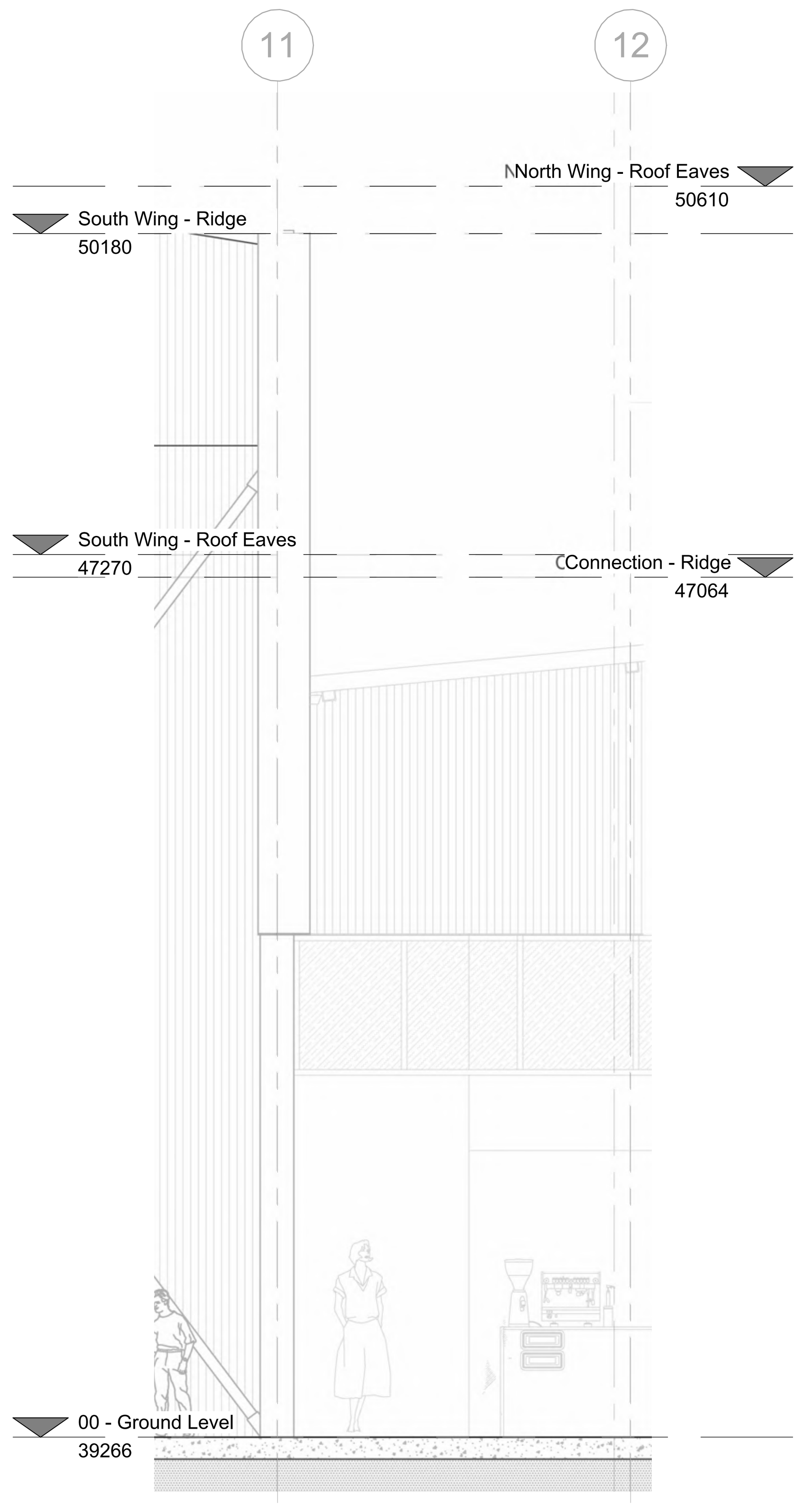




Condition 04: Severe Intervention

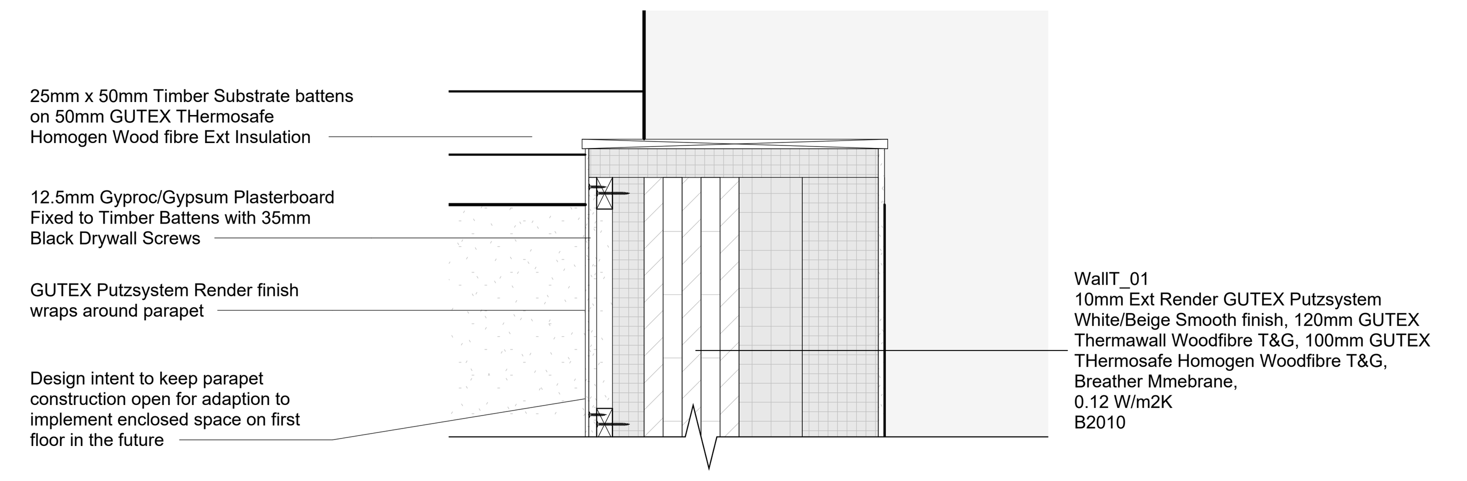
GROUP 7

Anastasia Hlibiciuc, Caoimhghin Bradshaw,
Ciara O'Reilly, Craig Wall, James McGrath,
Ronan Browne, Sean Molloy



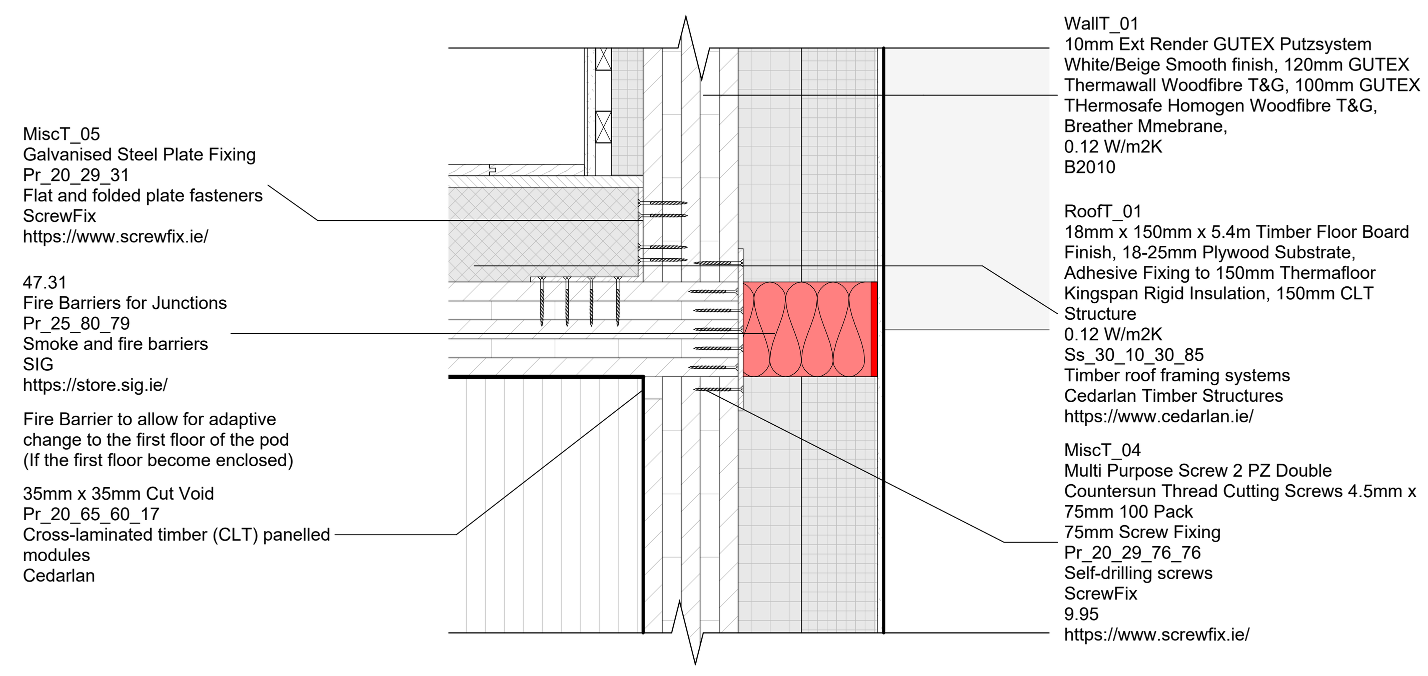
Technical Elevation

1 : 50



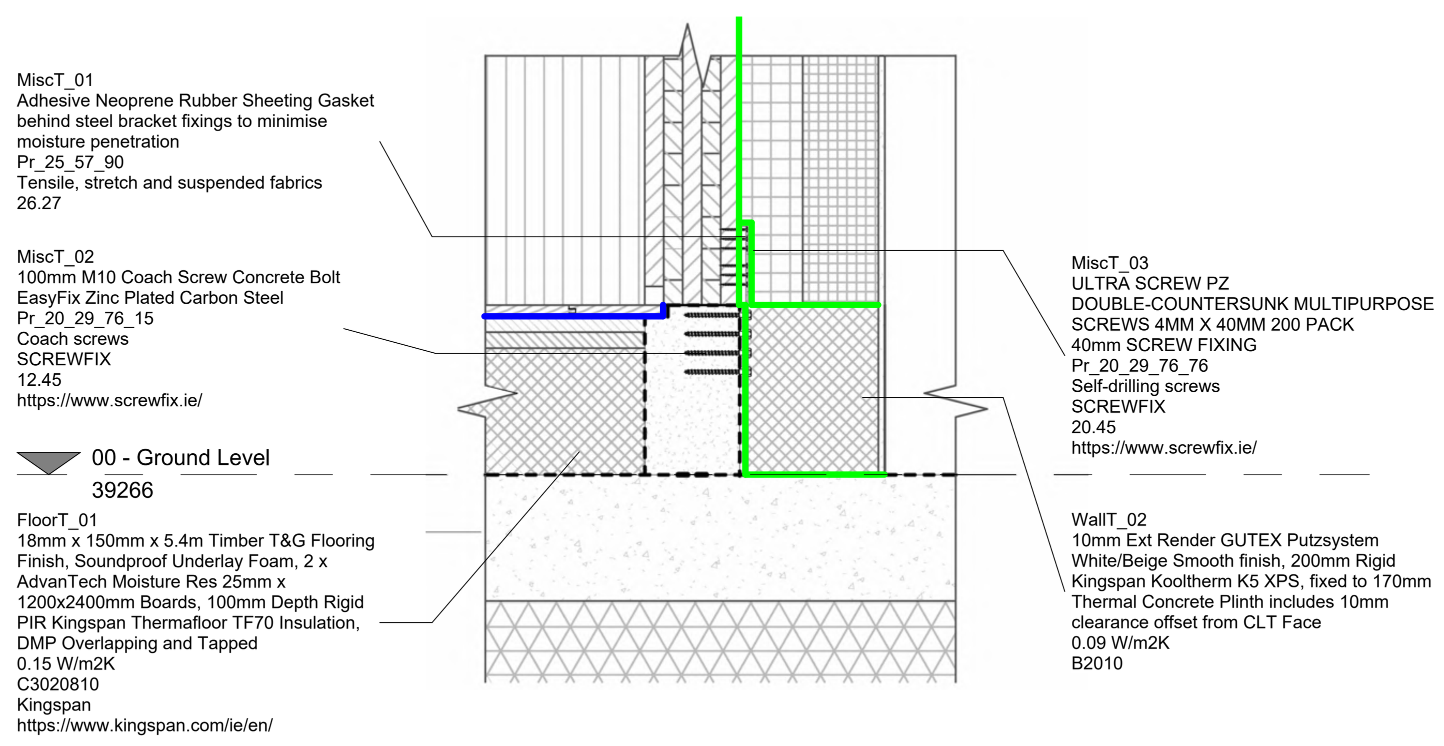
CLT-PARAPET DETAIL

1 : 10



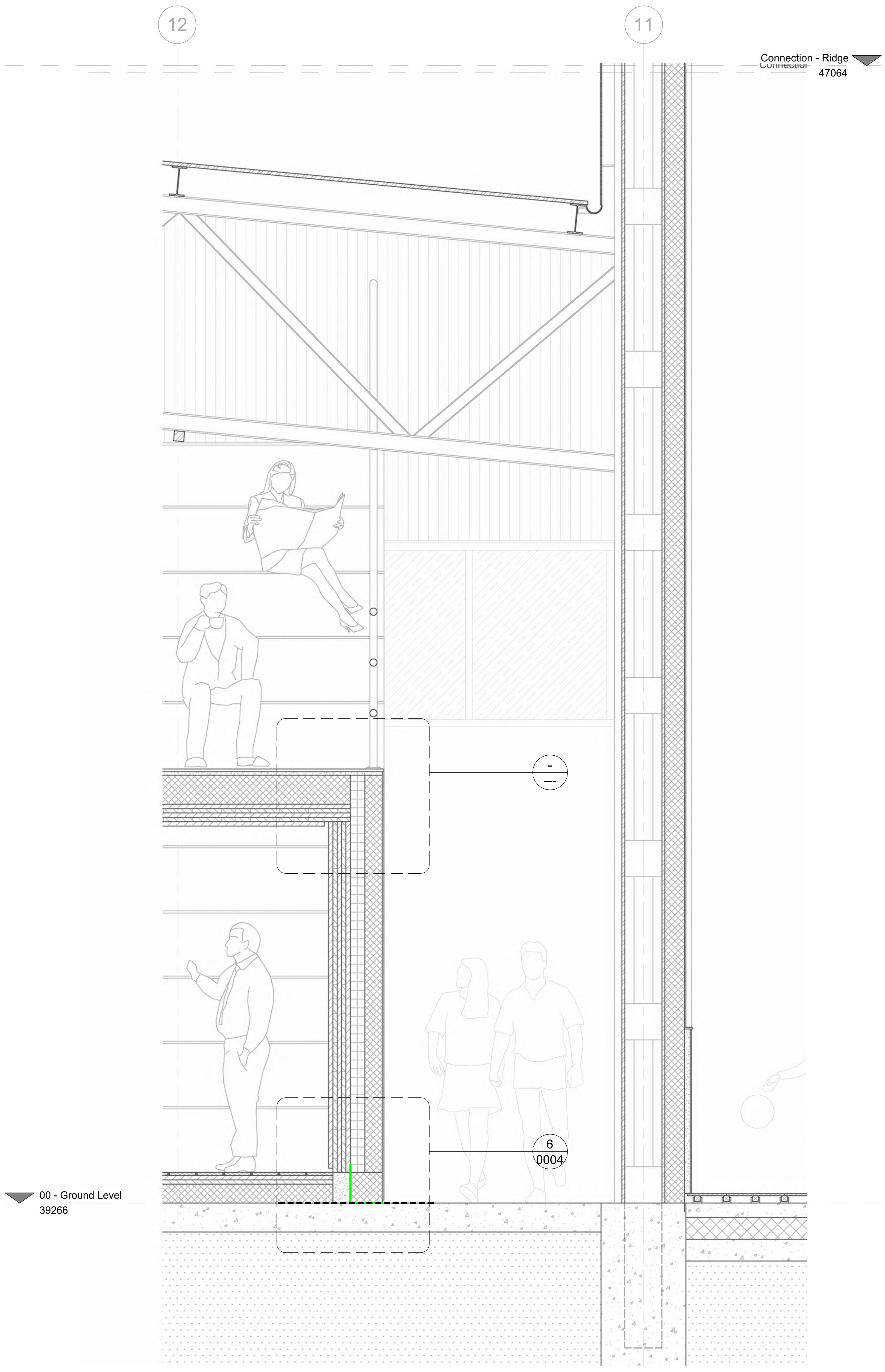
CLT-INTERMEDIATE FLOOR DETAIL

1 : 10



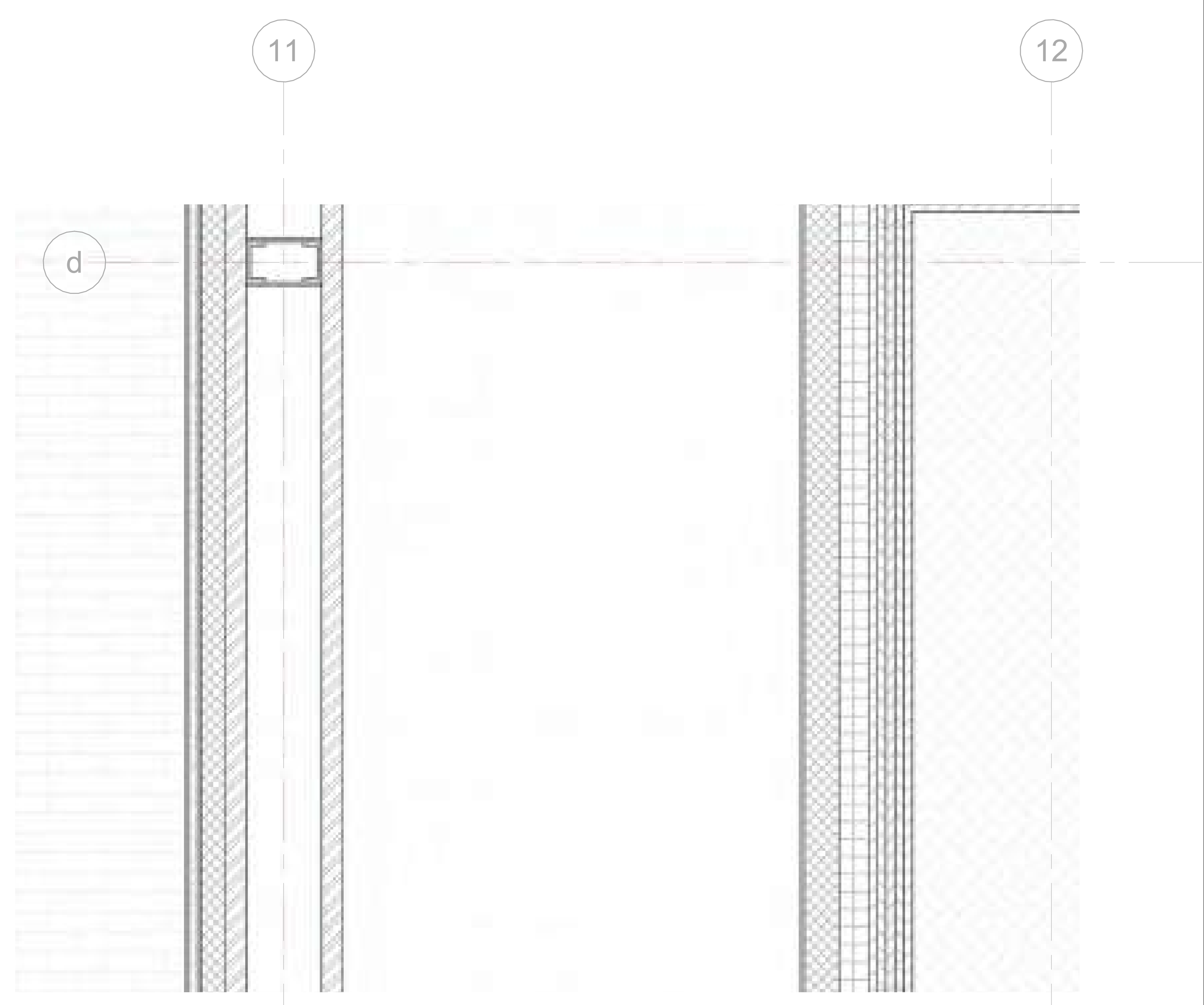
CLT-FOUNDATION-DETAIL

1 : 10



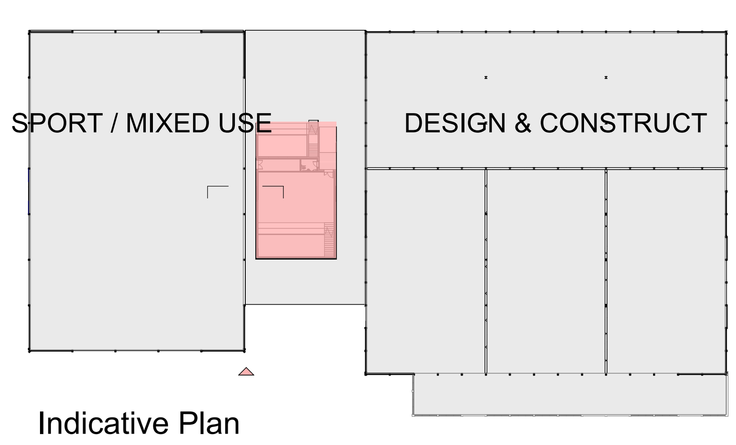
Technical Section

1 : 20



Technical Plan

1 : 20



Indicative Plan

1 : 1000

GROUP 7

Anastasia Hlibiciuc, Caoimhghin Bradshaw,
Ciara O'Reilly, Craig Wall, James McGrath,
Ronan Browne, Sean Molloy

MAKING: DESIGN + CONSTRUCT

Group 8:

Sam Carroll (AT), Jack Donovan (A), Matthew Fitzsimons (A), Kevin Gociu (AT), Luke Maguire (A), Eve Nolan (A), Roisin O'Reilly (AT).

Abstract:

The aim of the Design + Construct building in Broombridge is to reuse as much of the existing structure and materials on-site, and secondly, to make the structure as adaptable as possible, ensuring that it would remain a functional building throughout its lifespan. The test rig that we are proposing as the external face would change with those that inhabit it and becoming a learning centre for not only the students but those that pass through the building. In doing this, we hope to provide an environment in which the public and the students may continually learn about the modern methods of construction as they are exhibited on the façade.

Design + Construct - TU Dublin Broombridge

Vertical Section
Scale 1:20

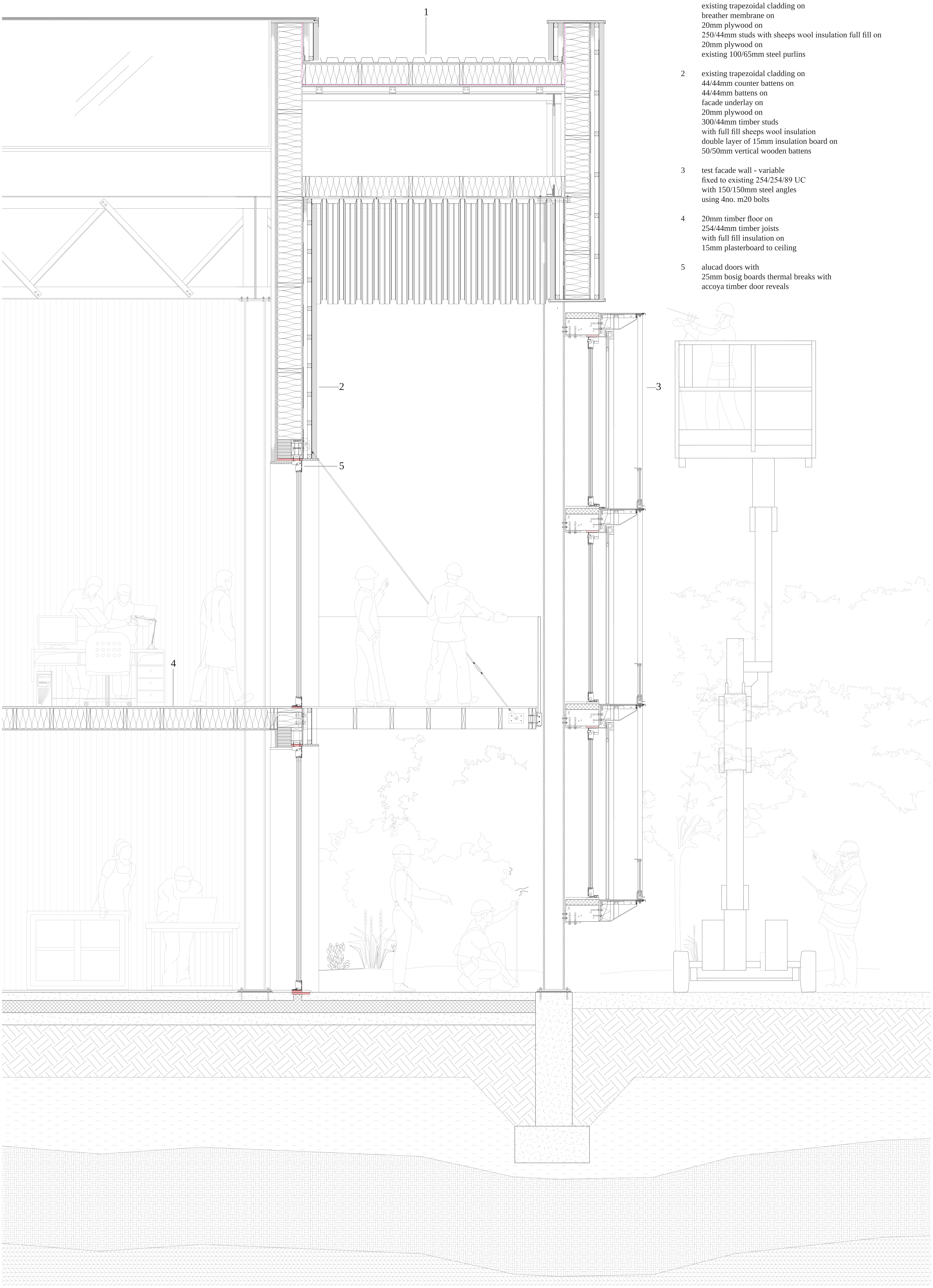
1 roof construction:
existing trapezoidal cladding on
breather membrane on
20mm plywood on
250/44mm studs with sheeps wool insulation full fill on
20mm plywood on
existing 100/65mm steel purlins

2 existing trapezoidal cladding on
44/44mm counter battens on
44/44mm battens on
facade underlay on
20mm plywood on
300/44mm timber studs
with full fill sheeps wool insulation
double layer of 15mm insulation board on
50/50mm vertical wooden battens

3 test facade wall - variable
fixed to existing 254/254/89 UC
with 150/150mm steel angles
using 4no. m20 bolts

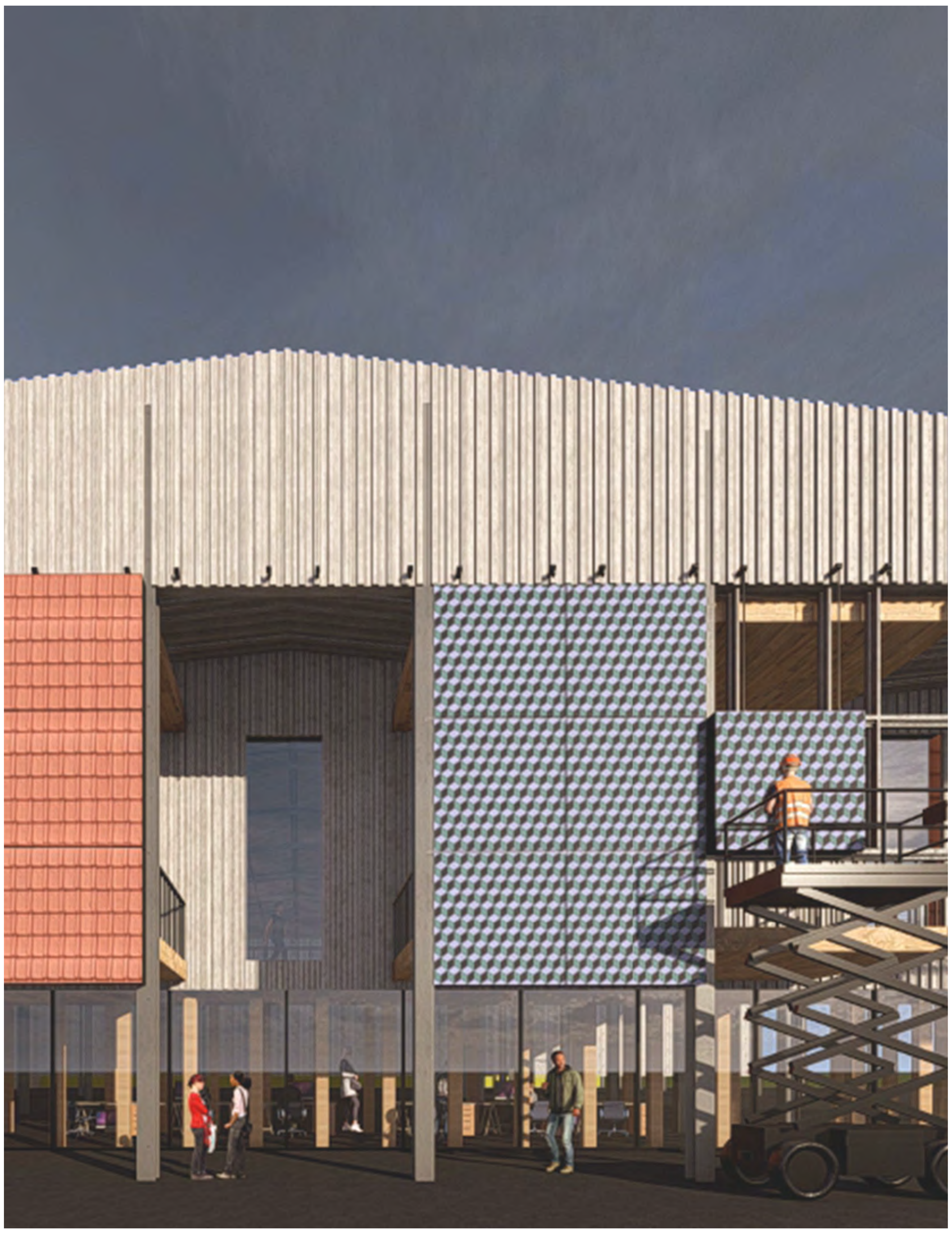
4 20mm timber floor on
254/44mm timber joists
with full fill insulation on
15mm plasterboard to ceiling

5 alucad doors with
25mm bosig boards thermal breaks with
accoya timber door reveals



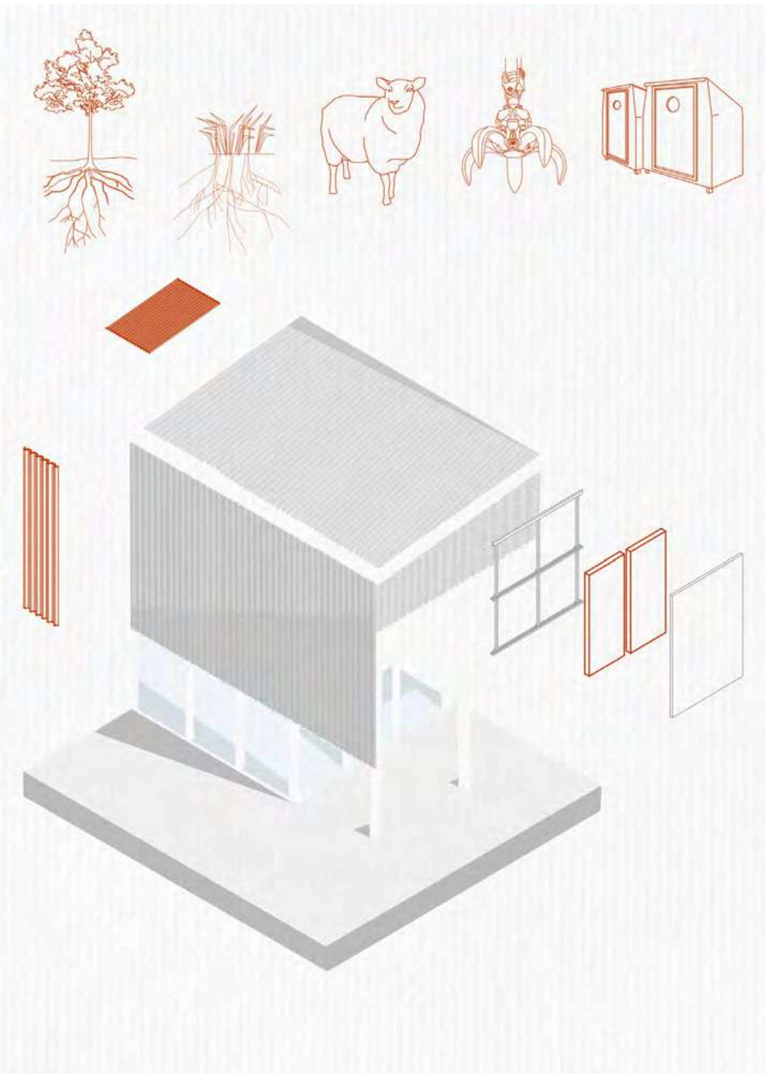
Group 8 - Architecture & Architecture Technology Members

Sam Carrol
Matthew Fitzsimons
Luke Maguire
Roisin O'Reilly
Jack Donovan
Kevin Gociu
Eve Nolan

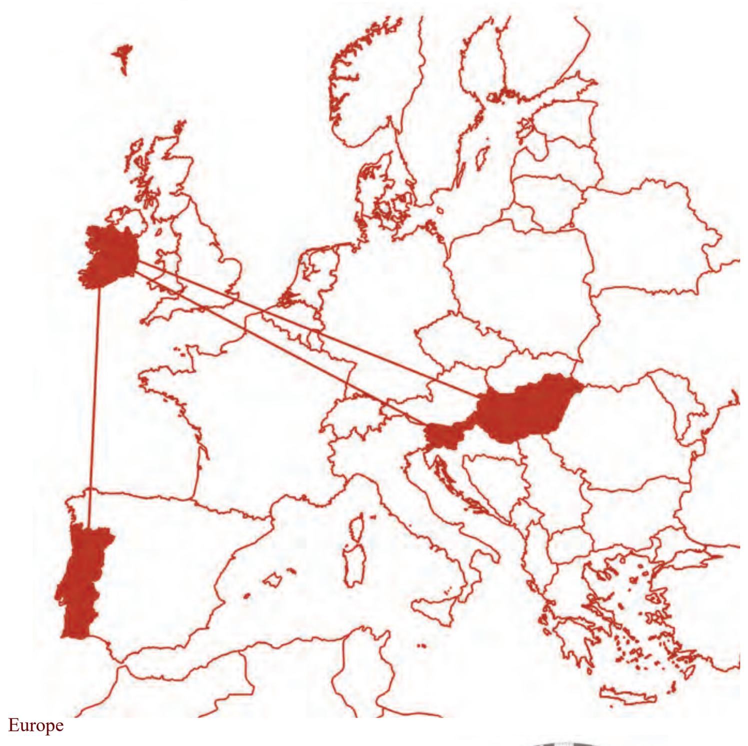


Architectural Intent

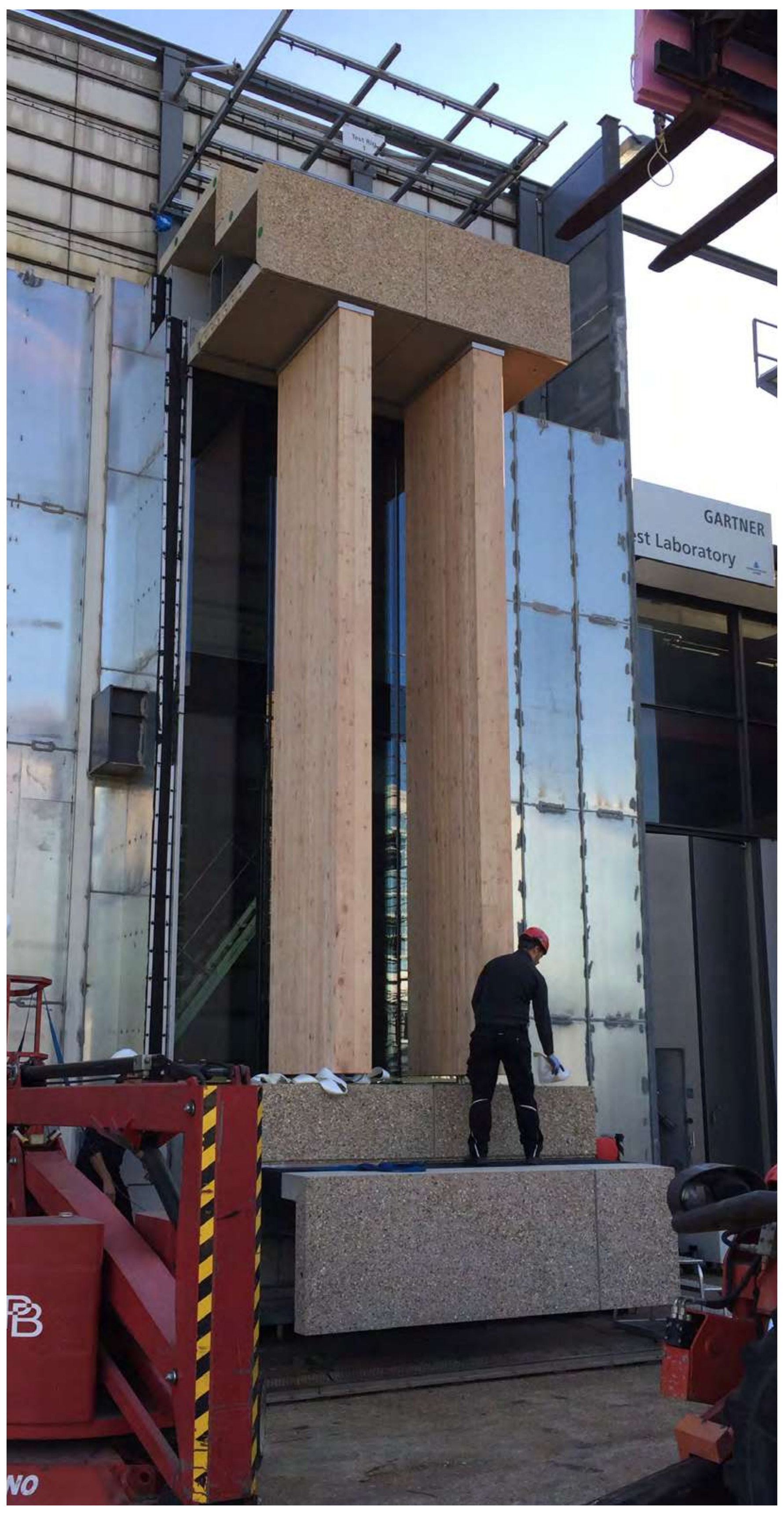
As a group we had two primary objectives from the beginning. Firstly to reuse as much of the existing structure and materials on-site, and secondly, to make the structure as adaptable as possible, ensuring that it would remain a funtional building throughout its lifespan.
We approached the building with the intent of utilising whatever possible throughout. Through a thorough investation of the building fabric, we deduced that much of the existing insulation within the panels was neither in the condition to be reused or would reach the u-values that we expected to meet within our design. With that knowledge, we investigated multiple natural forms of insulation in order to produce as ecological an approach to this refit.
In regards to adaptability, we saw the facade of this building as an opportunity which the university could seize to provide a dynamic structure. The test rig that we are proposing as the external face would change with those that inhabit it and becoming a learning centre for not only the students but those that pass the building. In doing this, we hope to provide an environment in which the public and the students may continually learn about the modern methods of construction as they are exhibted on the facade.



Material Map



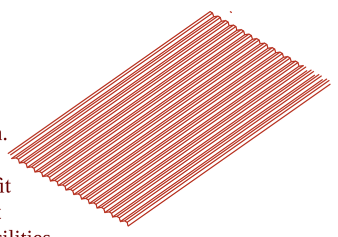
Broomsbridge site, Dublin.

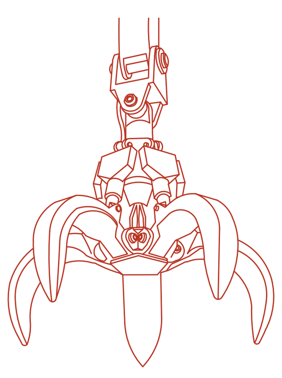


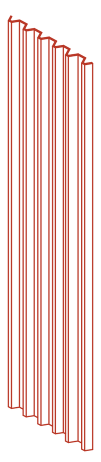
Metal Recycling:

The project plans to reuse any existing metal sheeting in good condition.

The sheets which are not fit to reuse can be recycled at nearby metal recycling facilities.







Facilities:

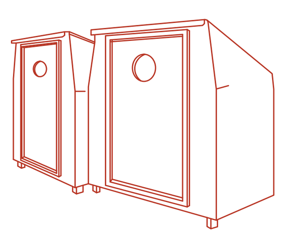
Wilton Scrap Metal
Wilton Scrap Metals Ltd,
Unit M1 Osberstown Business Park,
Osberstown,
Naas, Co. Kildare,
W91 FXP7
40km

Irish Metal Refineries
Unit 2, Duleek
Business Park,
Co. Meath,
A92 TK20
38km

Irish Metal Refineries
Unit 2, Duleek
Business Park,
Co. Meath,
A92 TK20
38km

Textile Insulation

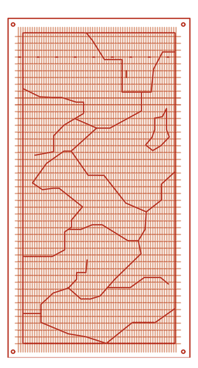
Thermal Conductivity: 0.039 WmK



Process: 40-50% of waste is polymer

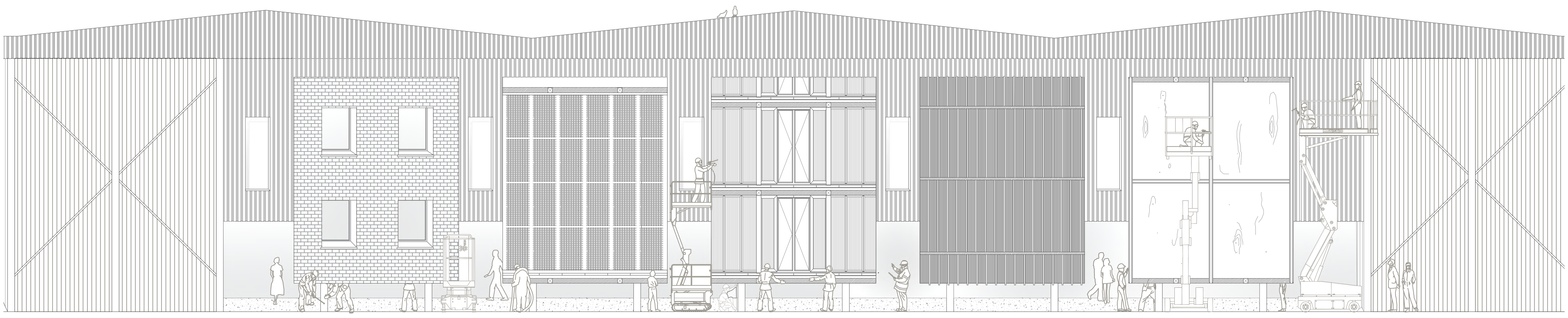
The first step - depolymerization
polymer is a long chain of atoms connected together.
To extract the atoms, the chain must be broke.

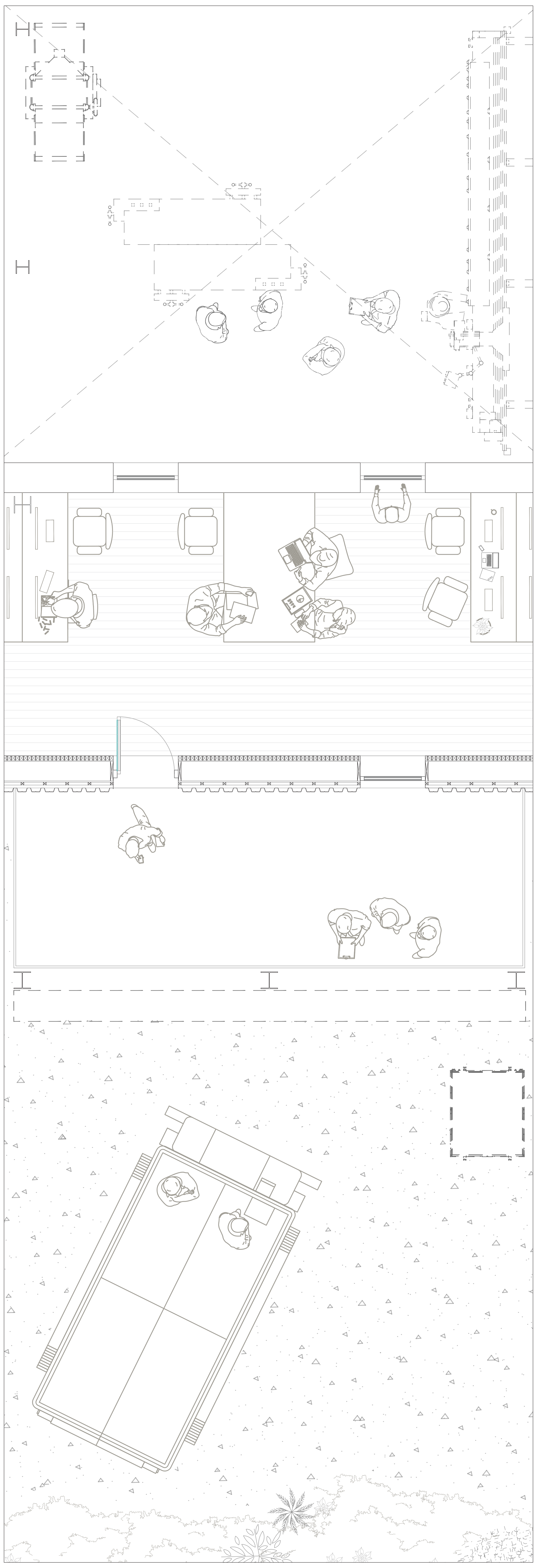
The extracted atoms are used to make a different kind of polymer chain which can be used as insulation materilal.

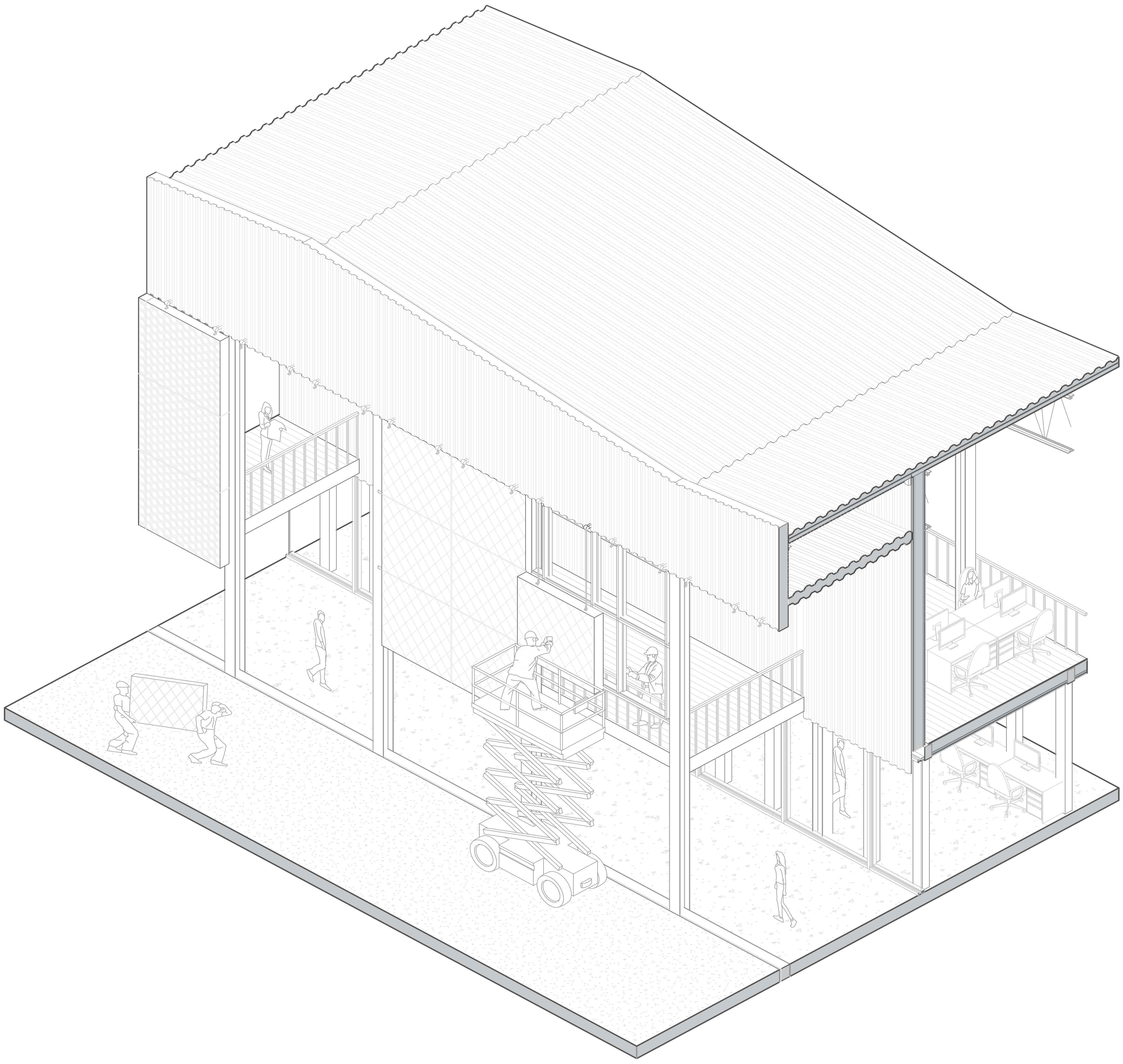


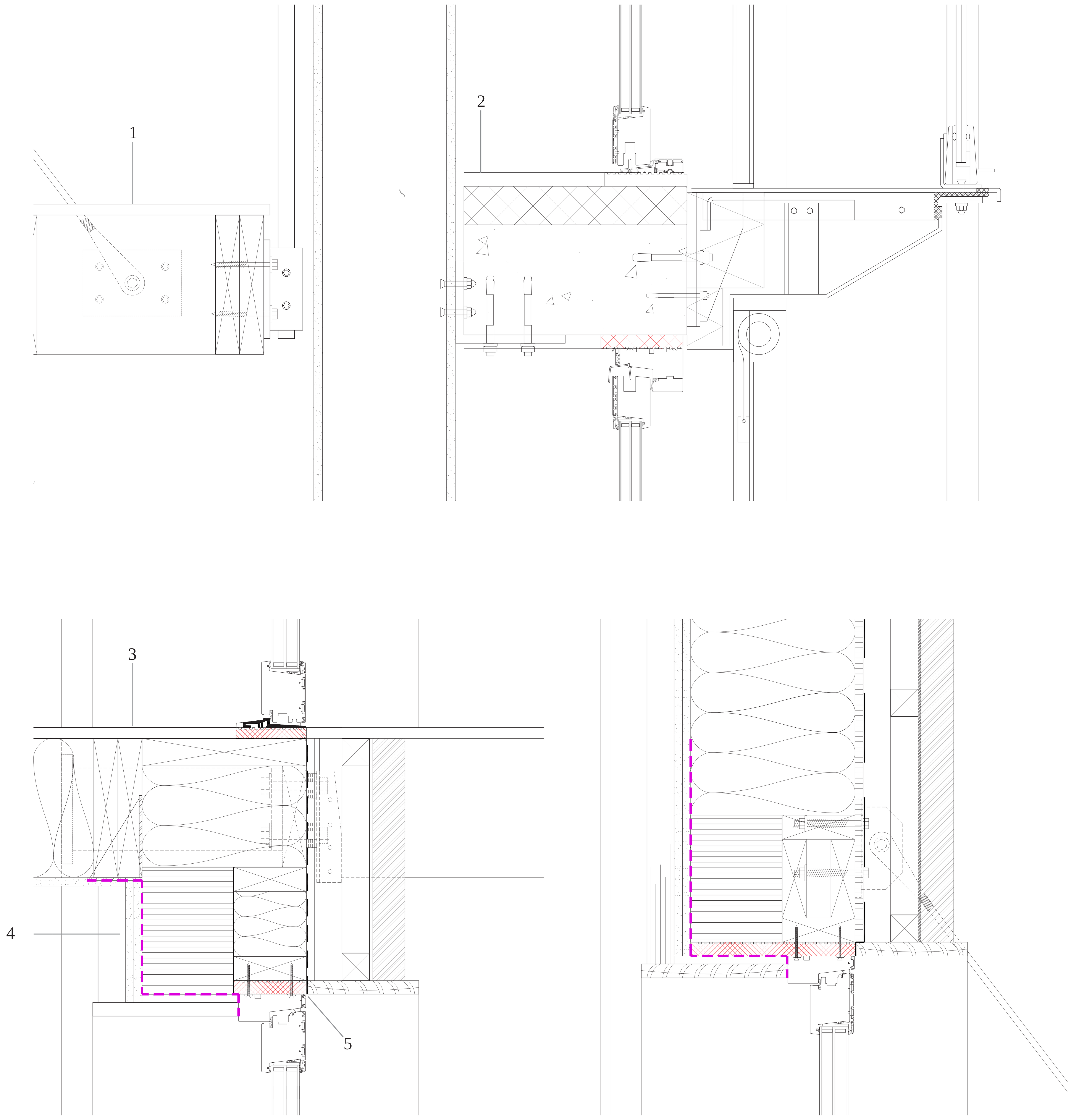
Price: free

Location: Clothes bank









Detail Section
Scale 1:5

1 mezzanine balcony
20mm timber finish on
250mm joists on steel angle

2 test facade wall - variable
fixed to existing 254/254/89 UC
with 150/150mm steel angles
using 4no. m20 bolts

3 20mm timber floor on
254/44mm timber joists
with full fill insulation on
15mm plasterboard to ceiling

4 existing trapezoidal cladding on
44/44mm counter battens on
44/44mm battens on
facade underlay on
20mm plywood on
300/44mm timber studs
with full fill sheeps wool insulation
double layer of 15mm insulation board on
50/50mm vertical wooden battens

5 bosig board thermal break over
aluminium frame door
with timber reveal

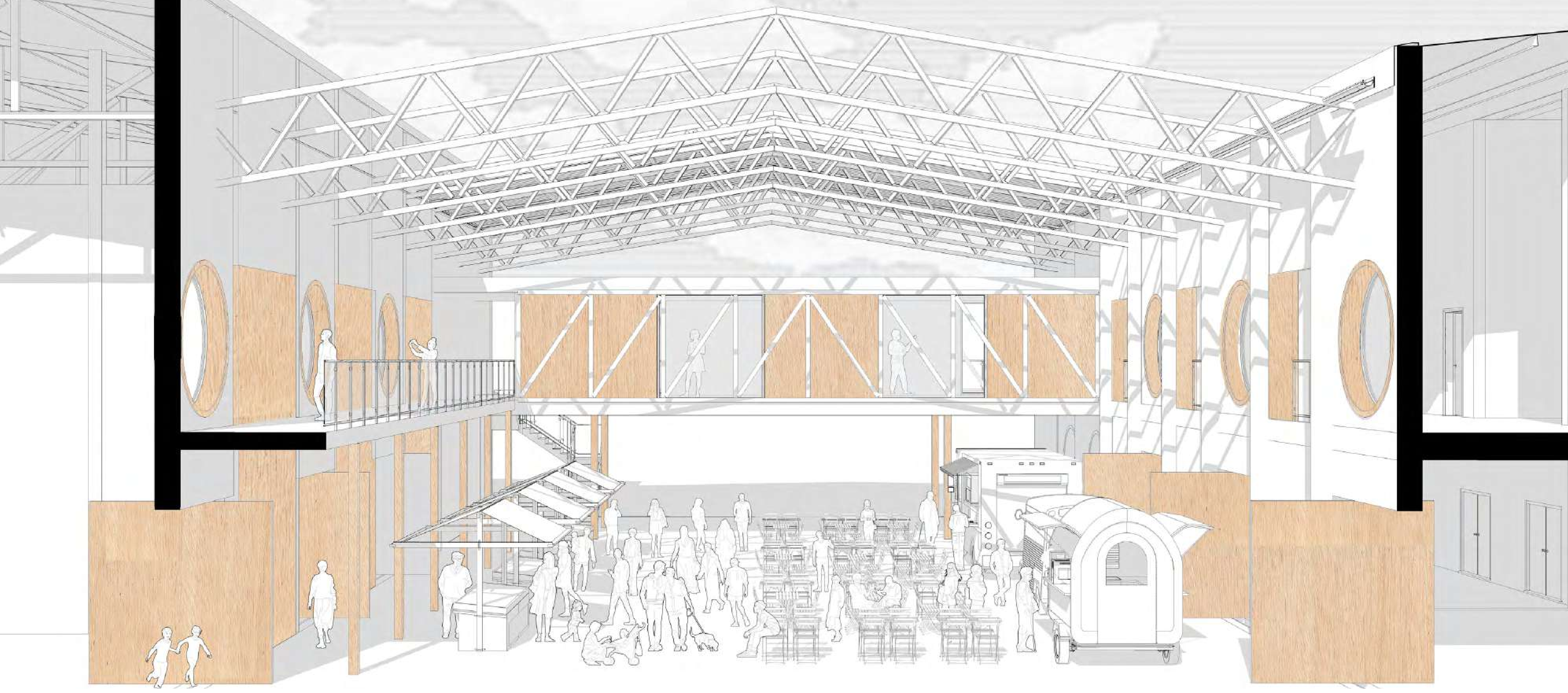
Group 9:

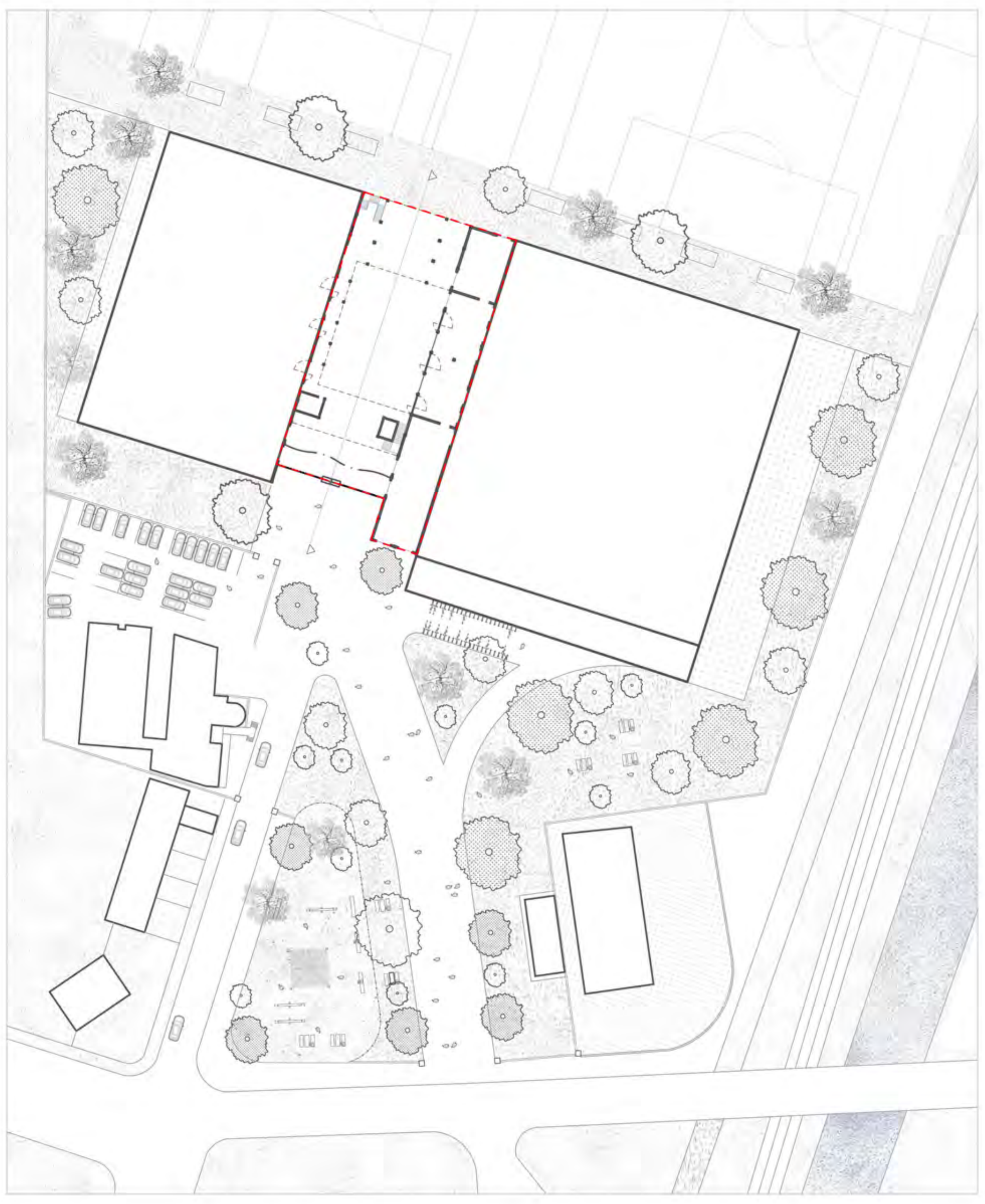
Lucia Chidovat (AT), Killian Collins (AT), Jack Hickey (A), Martyna Matys (AT), Samuel Owens (A), Ryan Pepper (A), Alyssa Valencia (A).

Abstract:

Our design concept is based on integrating everyone in the community through the flow between internal and external spaces. Two first floor bridges offer a warm and quiet area to study and engage whereas the ground floor courtyard presents a sheltered space for students to interact and explore what's around them. The retractable roof and kinetic façade present the opportunity to use the courtyard all year round using a counterweight and pull system. The technologists focused on ensuring thermal envelopes meet required u values and eliminate possible thermal bridging and moisture penetrations. The outcome of recycling a large amount of existing material and using sustainable products while offering a long-life cycle was presented with the low total GWP, which was calculated and visualised using BIM technologies.

DESIGN + CONSTRUCT
TEAM 09





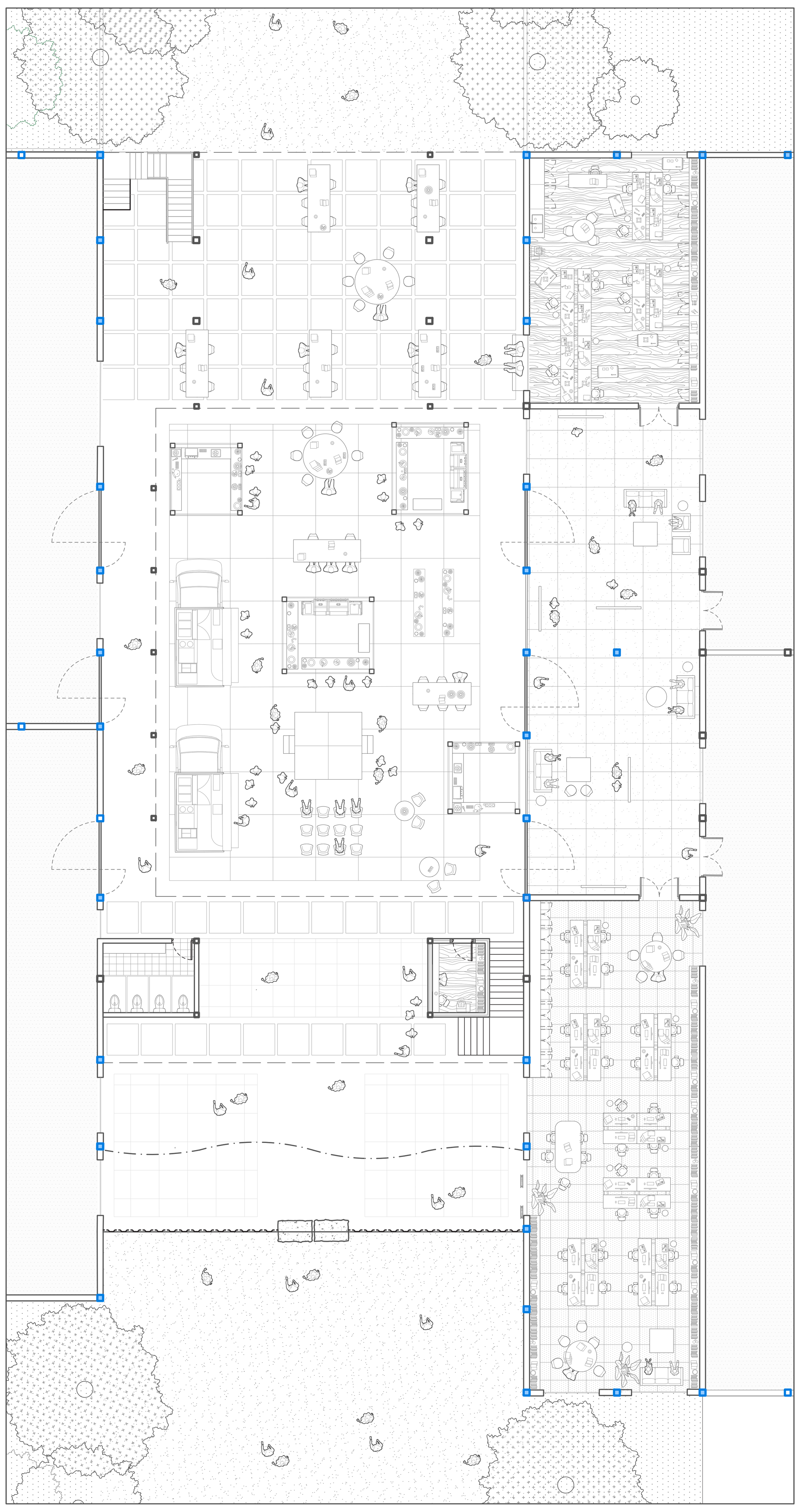
SITE PLAN 1:1000

Porosity/community/connection.

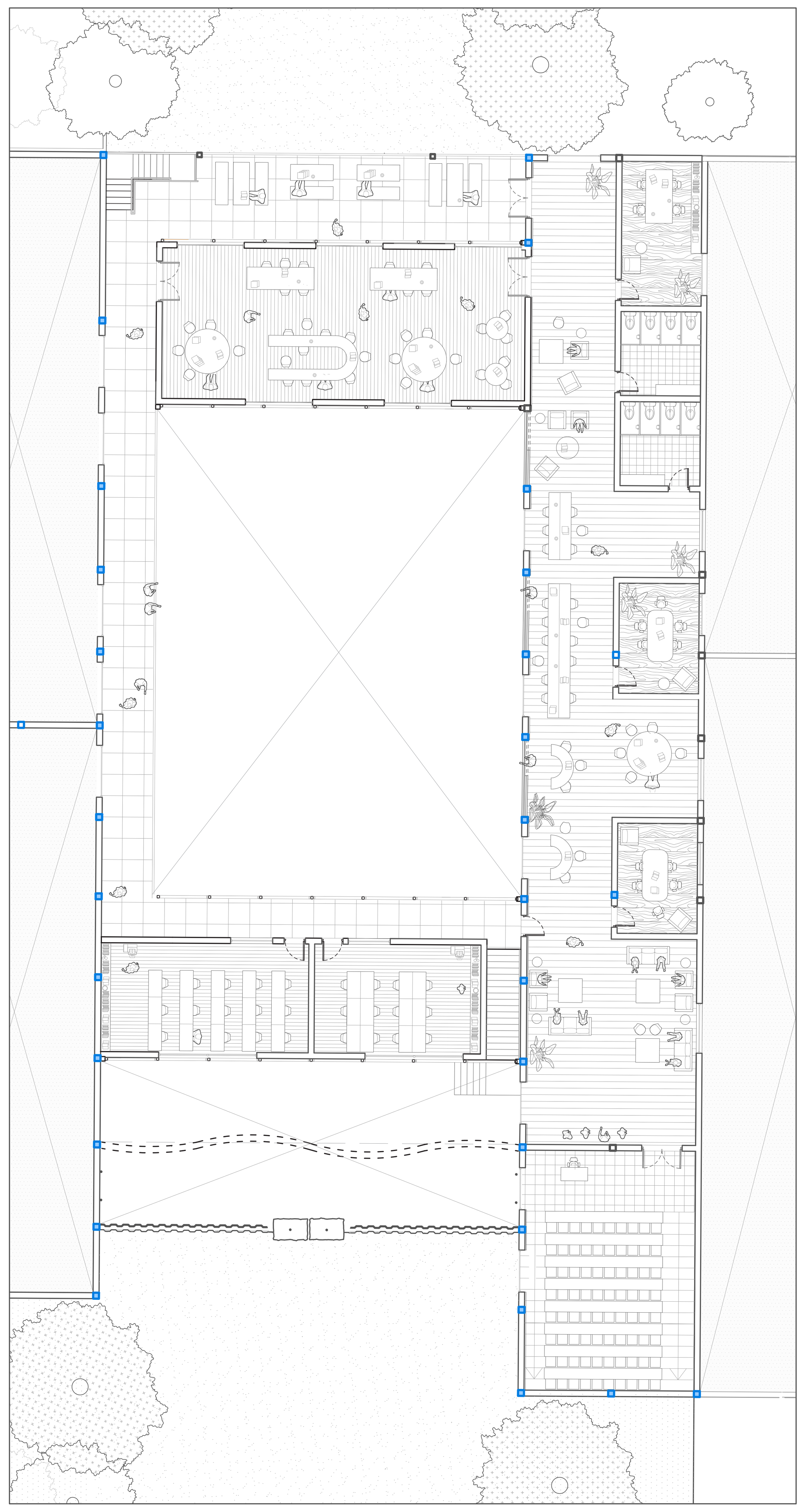
Our primary site strategy punctures the building to create a walkable courtyard to activate the community center by creating a threshold space. We have reorganized the site to create a better visual connection to the luas stop as well re routing people to enter through our entrance.

The project seeks to connect the pitch, design + construct and the sporting facility as a whole. Leading everyone through one entrance activates our community courtyard creating opportunity for intermingling and participation. Our proposal includes the addition of two simply supported mezzanines that form transition and learning spaces above with the idea of compression and release to give hierarchy to our courtyard. We have taken a small portion of the threshold to design + construct and the boundary line to the sports center to create spaces that overlook the courtyard to further encourage engagement, feeding in to the courtyards open nature and flexibility.

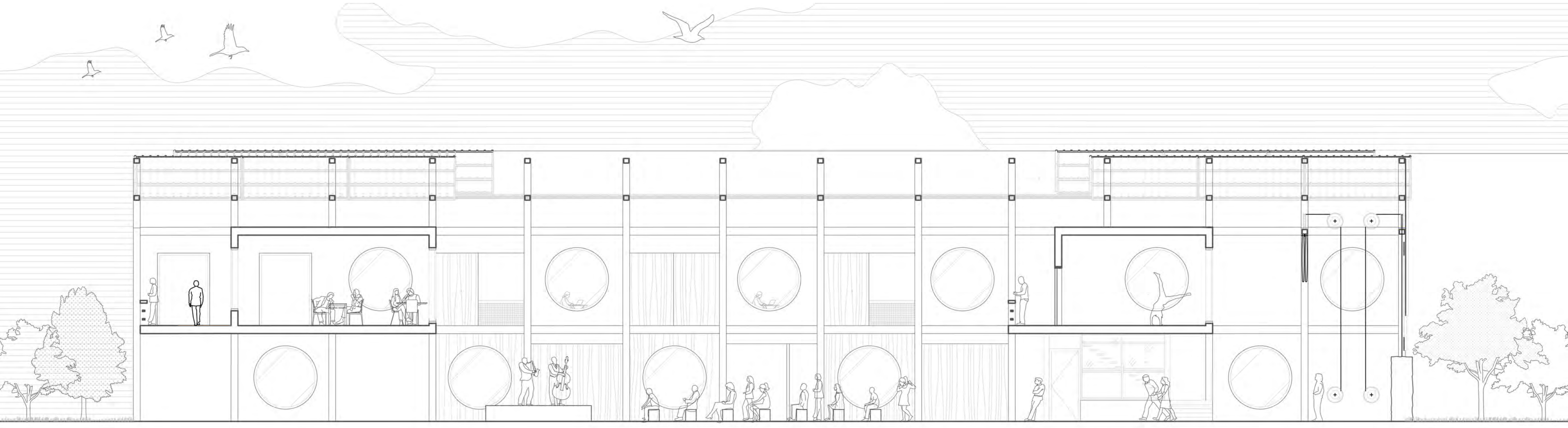
We have formed adjustable aspects within our design in order to give TUD a building that transforms and adapts for multiple uses.



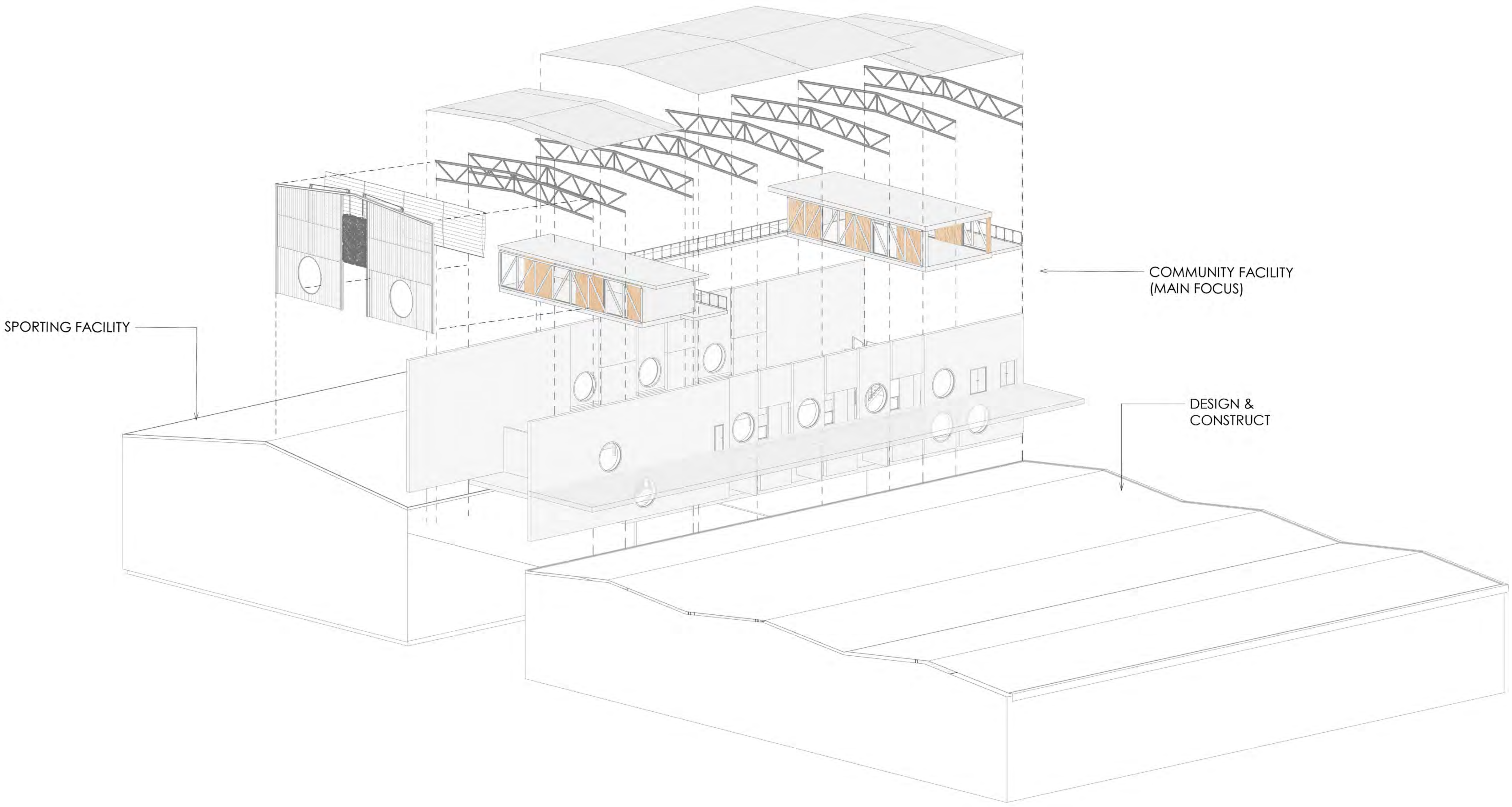
GROUND FLOOR PLAN 1:100

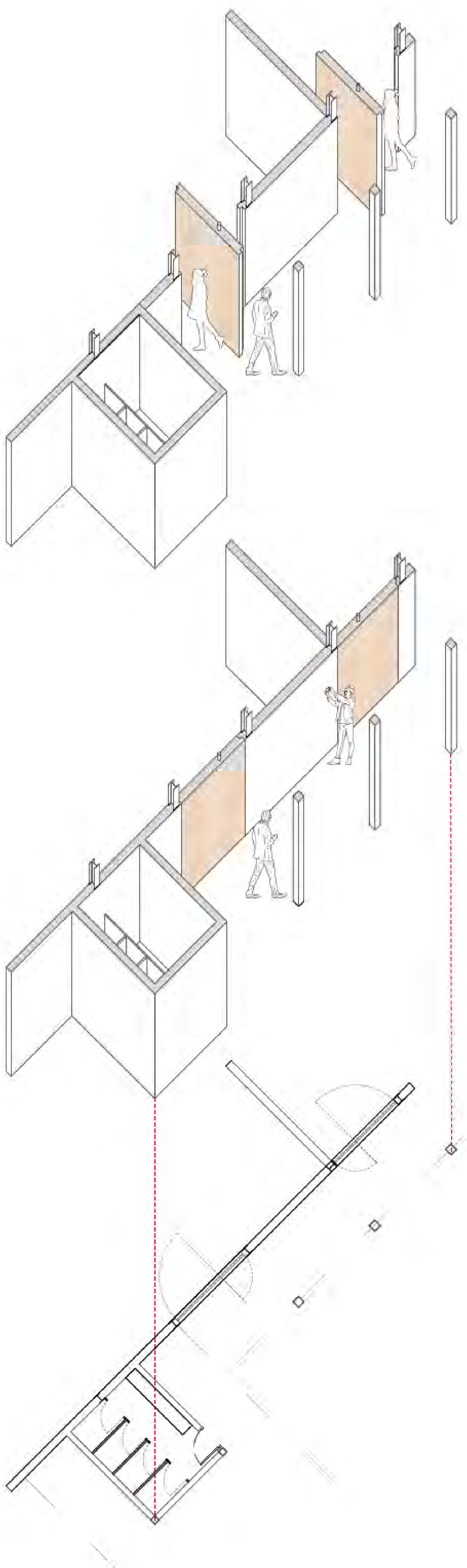


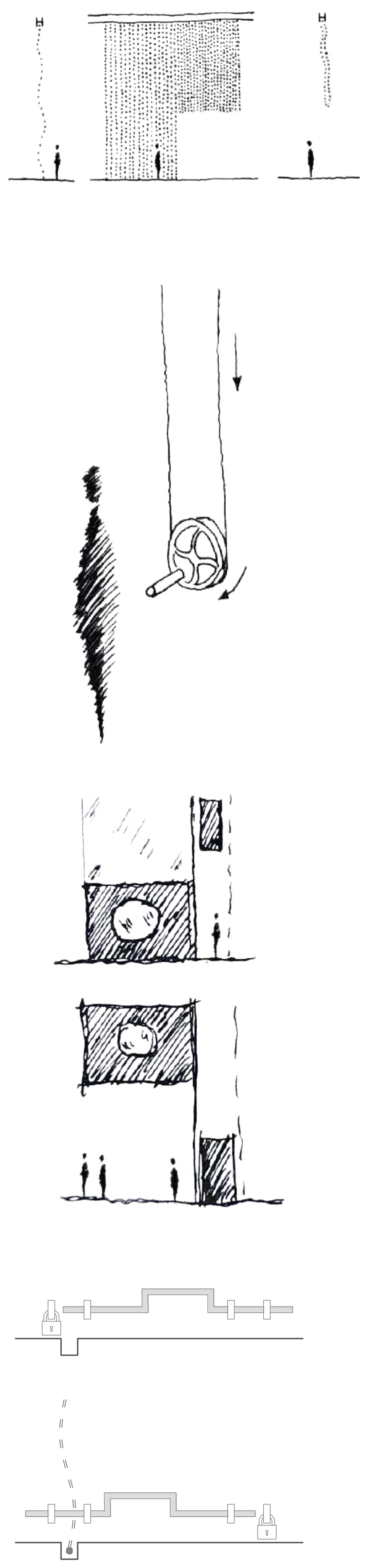
FIRST FLOOR PLAN 1:100



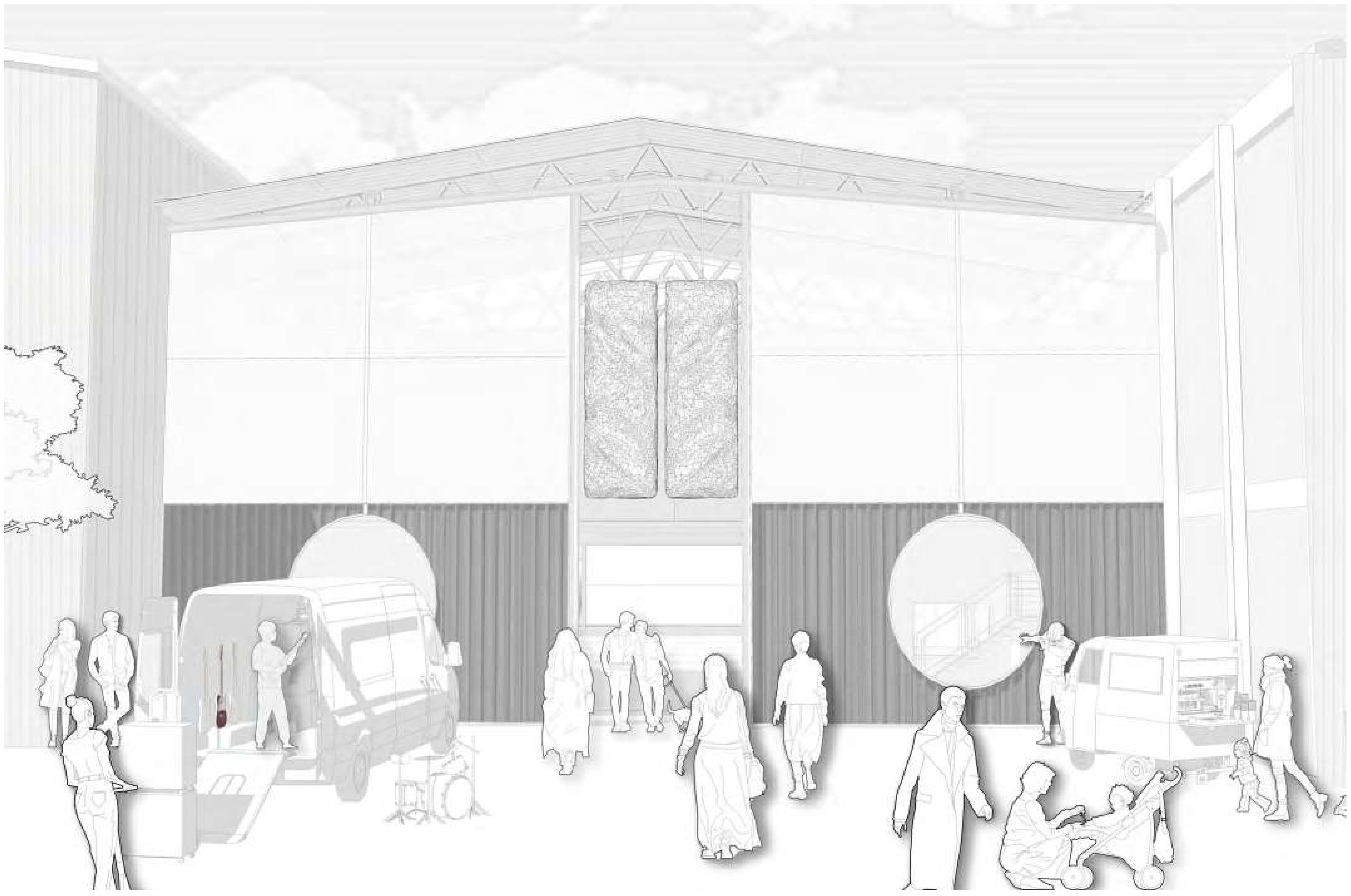
SECTION BB 1:100

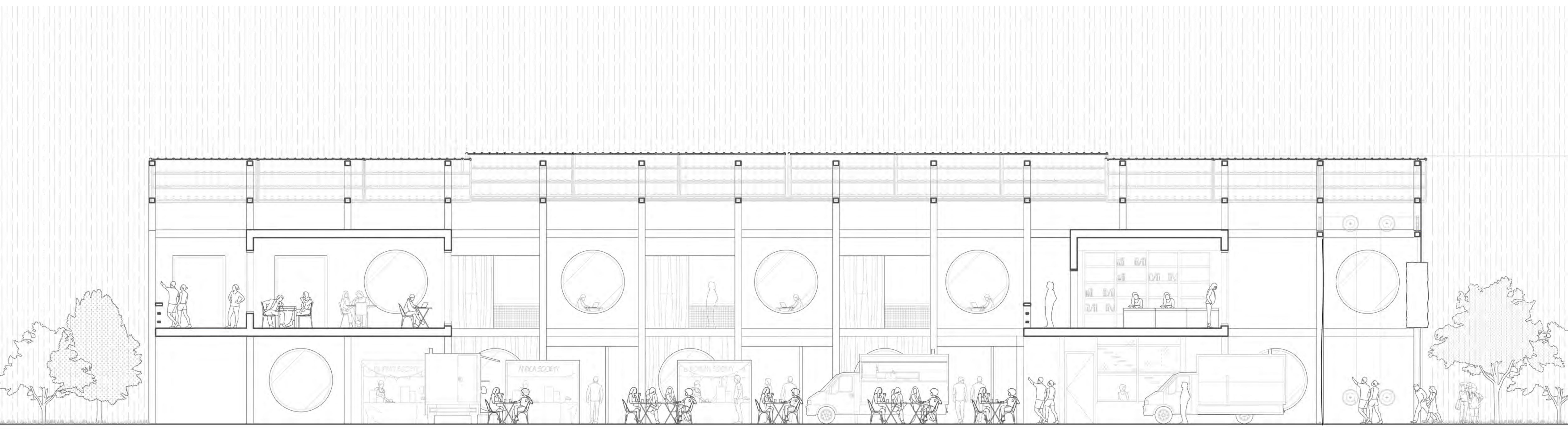




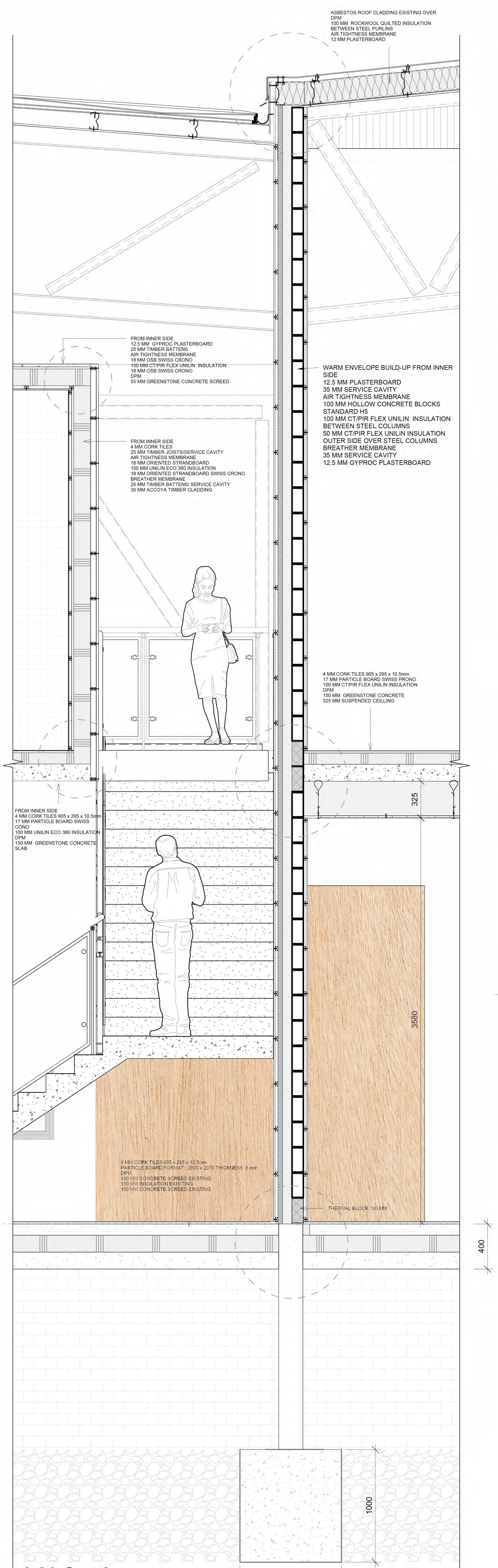


REVOLVING DOORS AXO

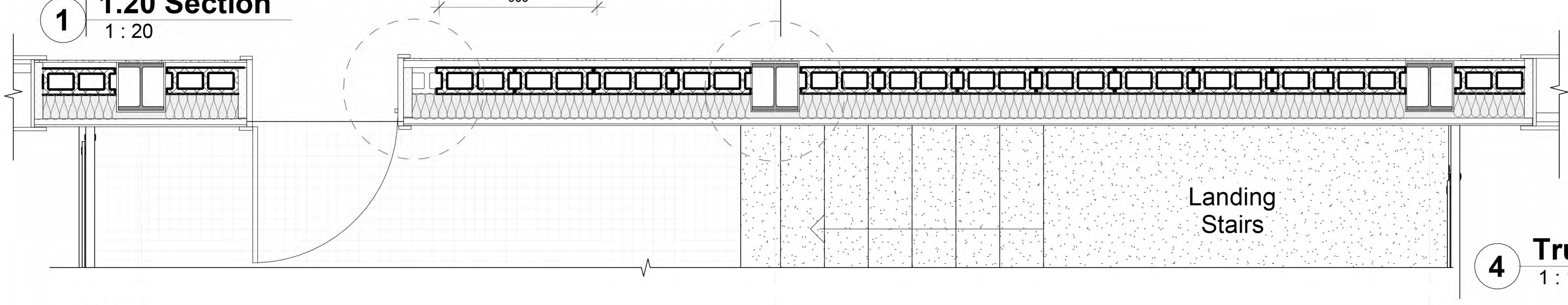




SECTION BB 1:100



1 **1.20 Section**
1 : 20

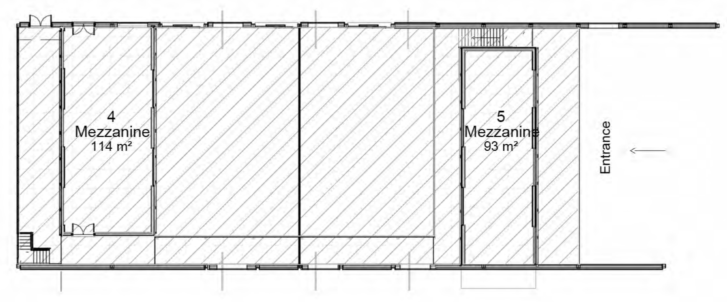


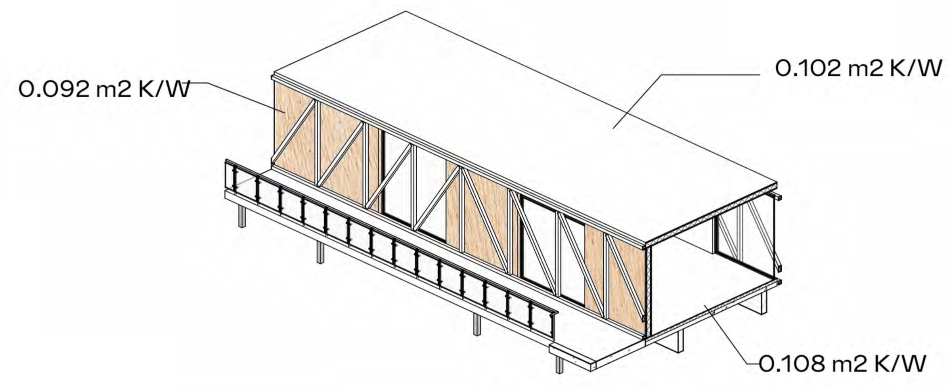
2. **Plan**
1 : 20

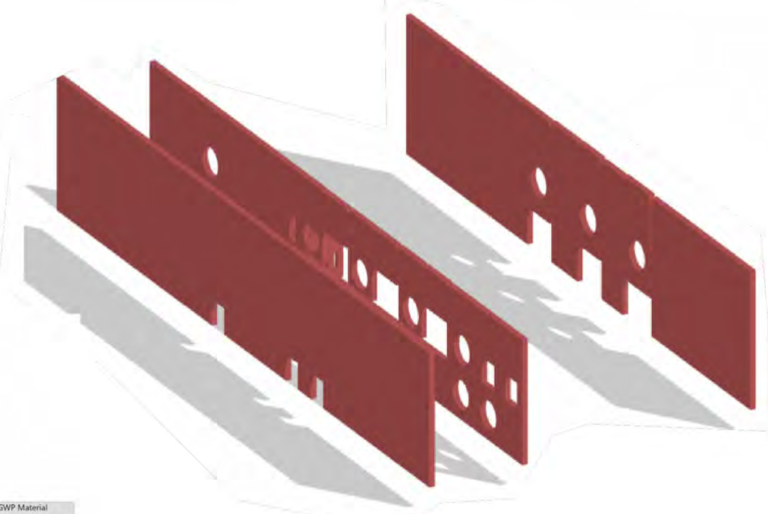
LCA CALCULATION VALUES A1-A3

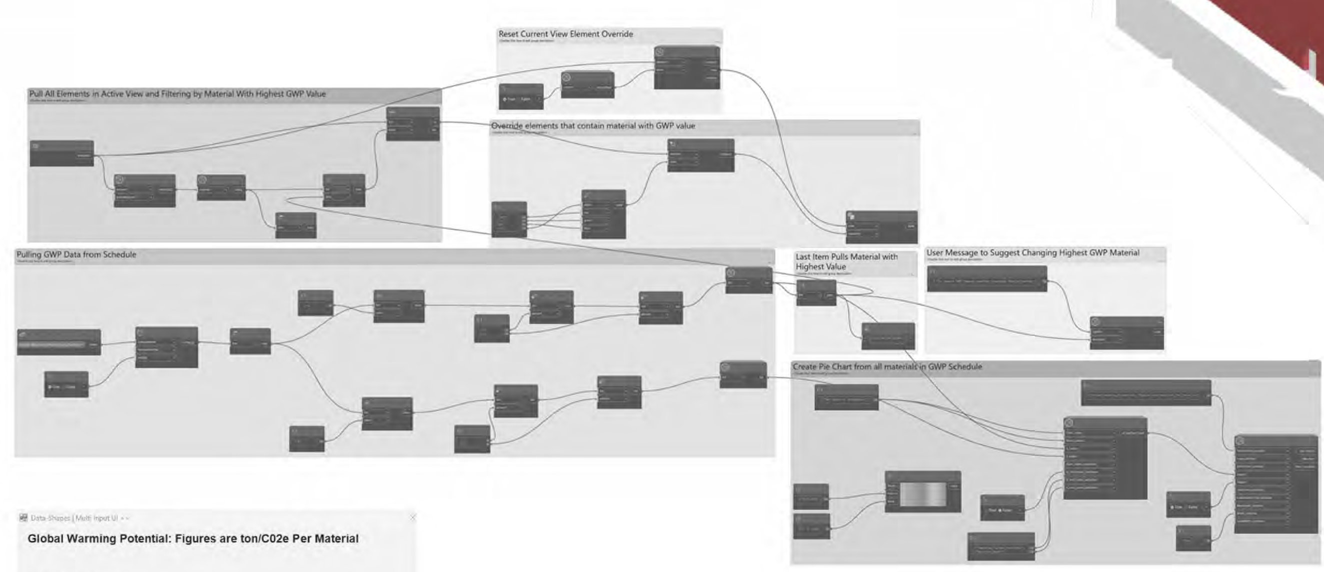
Material	Density kg/m3	Embodied Carbon
Ground Floor:		
Cork Finish	300	-2.74
Particleboard	686.8461538	0.6643
PIR Insulation	35	11.83
DPM	1050	0.221666
Concrete 50% GGBS	1440	0.4748
Roof:		
Concrete 50% GGBS	1440	0.4748
DPC	1050	0.221666
OSB	603.1255931	-0.813
PIR Insulation	35	11.83
OSB	603.1255931	-0.813
Timber Studs	742.1111111	-1.286
Plasterboard	668	3.8
Wall:		
Steel Truss	7850	2.76
Birch Panels	650	5.89
Timber Battens	742.1111111	-1.286
OSB	603.1255931	-0.813
PIR Insulation		
OSB	603.1255931	603.1255931
Timber Studs	742.1111111	-1.286
Cork Wall	300	-2.74
Structure:		
Steel - Hot Galvanised	7850	2.76

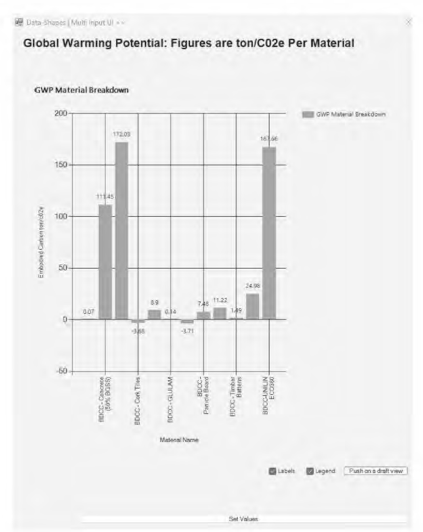
THERMAL ENVELOPE:

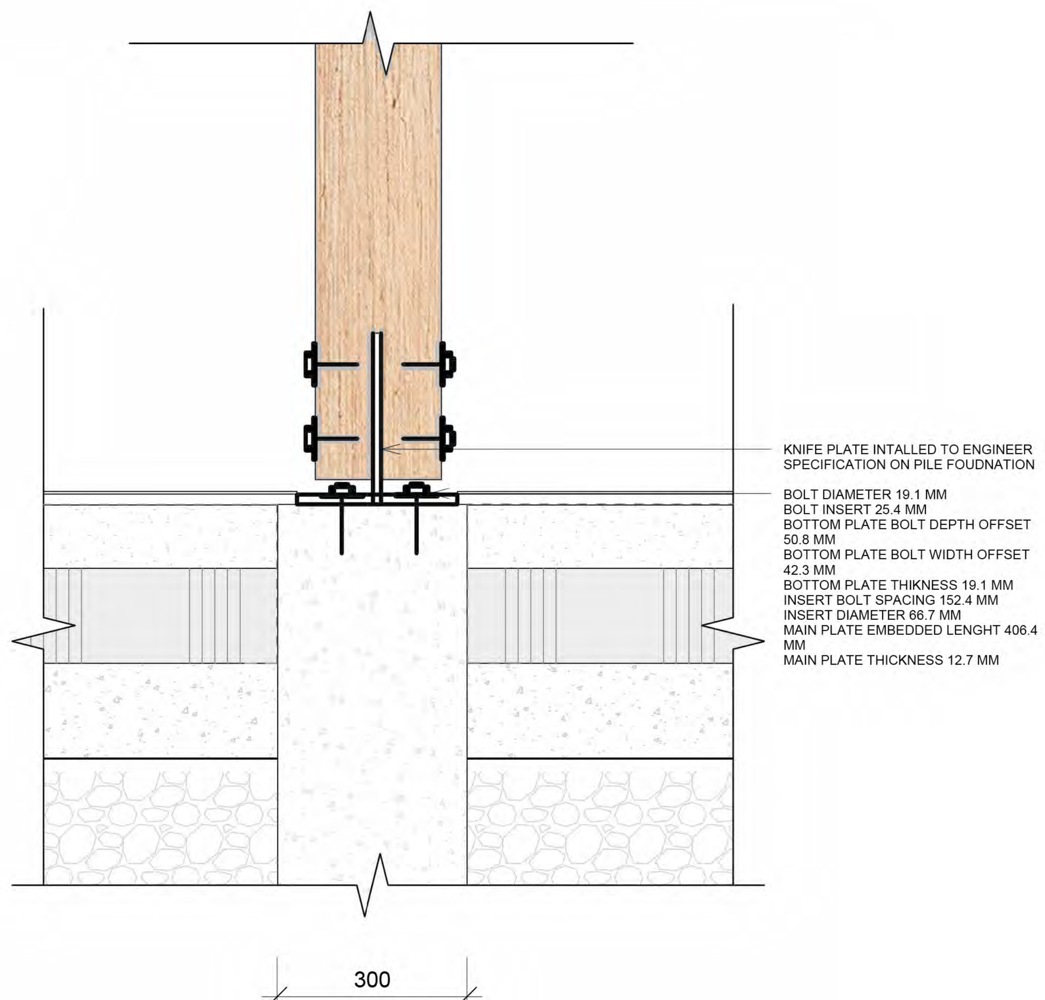




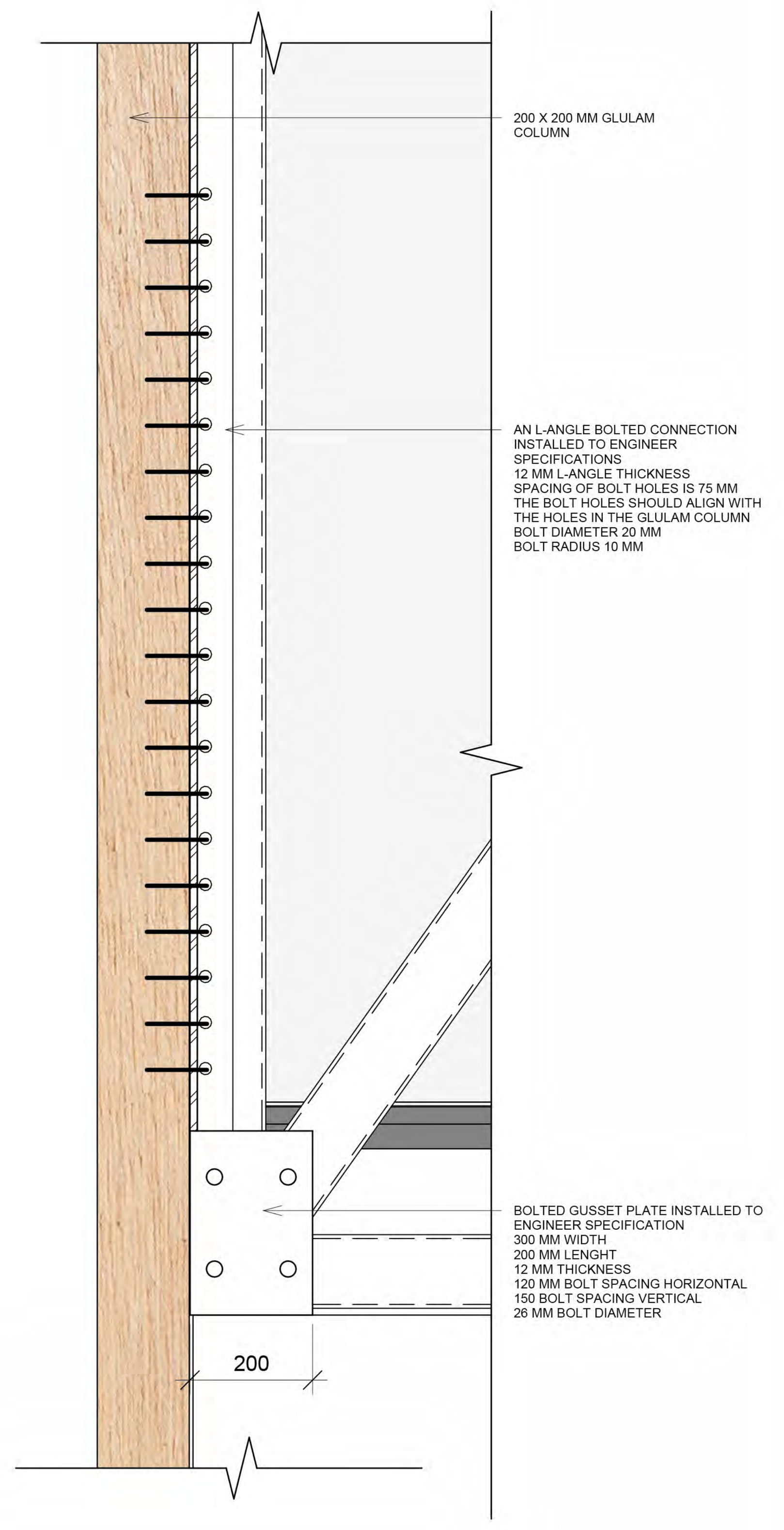








3 **Glulam Column Foundation Detail**
1 : 10



4 **Truss Connection to Glulam Column**
1 : 10

Group 10:

Aoibhe Burke (A), Conall Dillon (A), Daniel Herbst (A), Lewis Scanlan (AT), Ciaran Smith (AT), Nhu To Tao (A), Dean Tighe (AT).

Abstract:

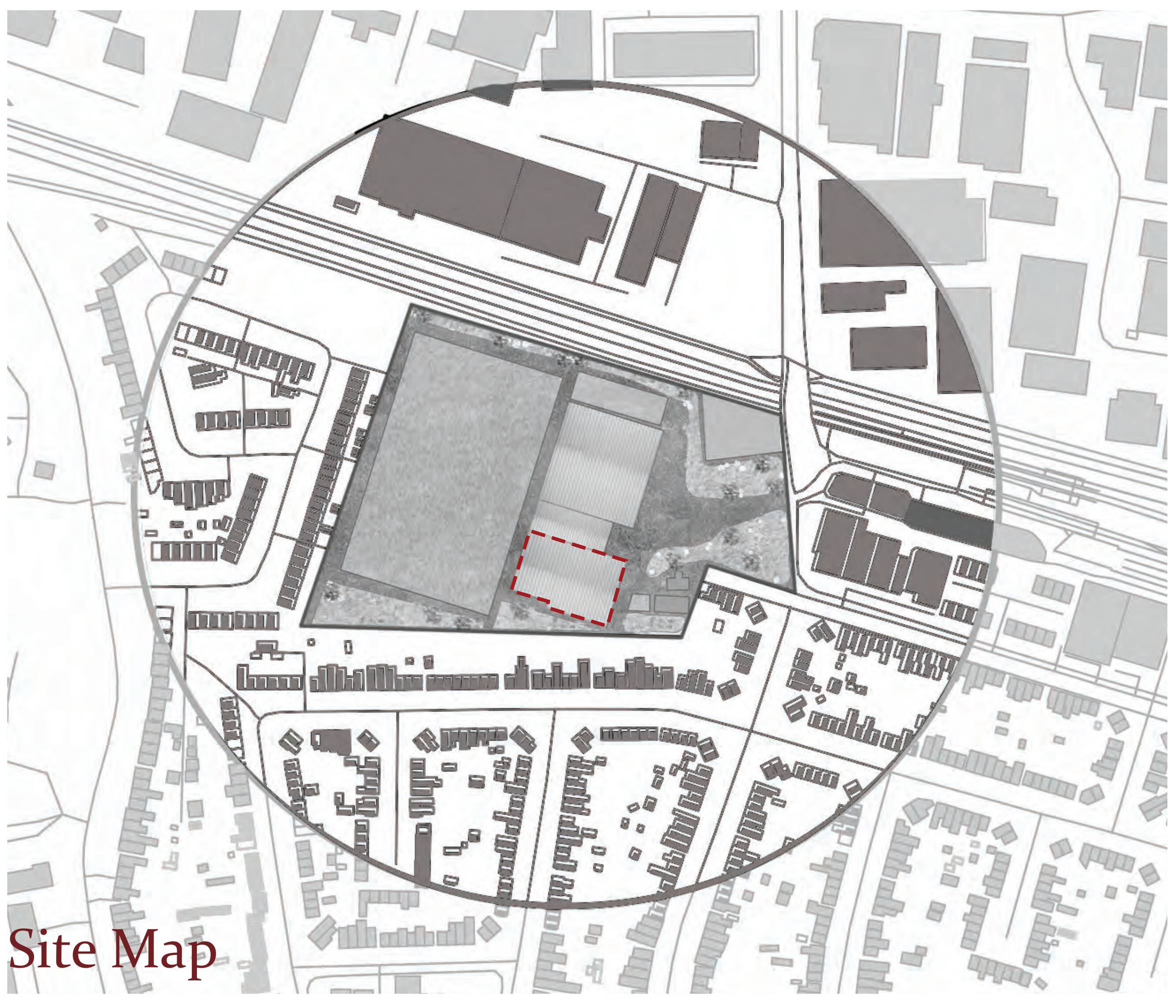
Our main objective for the Broombridge Design and Construct project was to transform the planned multi-purpose building into a thriving and permeable student facility. Our goal was to create connections and relationships with the existing community, designing a façade that was not just focused on student use but for all groups of people in the area. We carved large openings on the existing skin of the building, blurring the boundaries between the inside and outside environment. A new frame and pathway (or running track) is constructed on the external façade. The new addition elevates the building allowing it to fulfil all its new purposes. The new structure also acts as a home for new services that the existing building could not hold. We designed the running track that doubles as a huge rainwater harvesting system that can store enough water to supply all the showers, toilets and landscape in the new complex.

Design and Construct Group 10

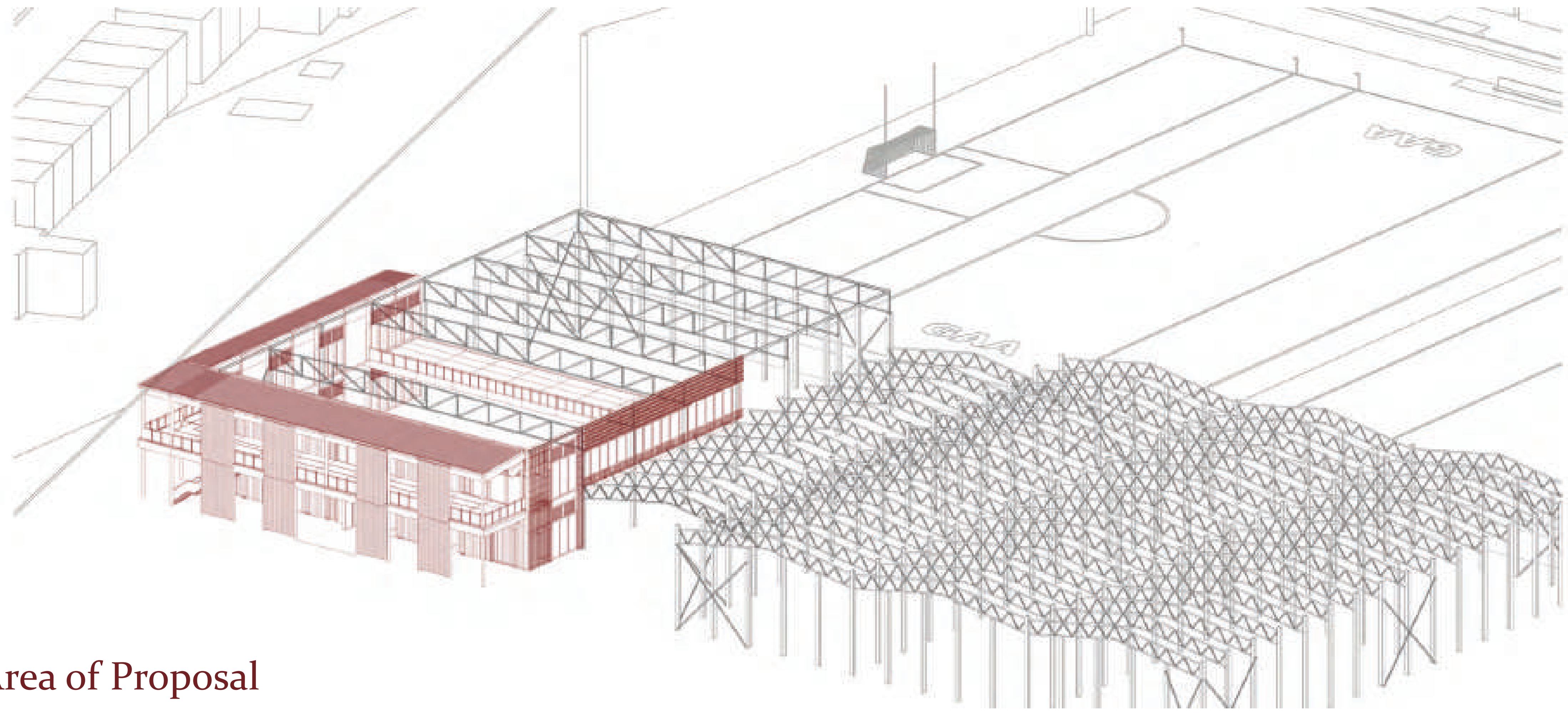
Objectives

Our main objective for the Broombridge Design and Construct project was to transform the planned multi-purpose building into a thriving and permeable student facility. Our goal was to create connections and relationships with the existing community, designing a façade that was not just focused on student use but for all groups of pe ople in the area.

We carved large openings on the existing skin of the building, blurring the boundaries between the inside and outside environment. A new frame and pathway (or running track) is constructed on the external façade. This new addition elevates the building allowing it to fulfil all its new purposes. The new strucutre also acts a home for new services that the exisitng buidling could not hold. We designed the running track that doubles as huge rain harvesting system that can store enough water to supply all the showers, toilets and landscape in the new complex.

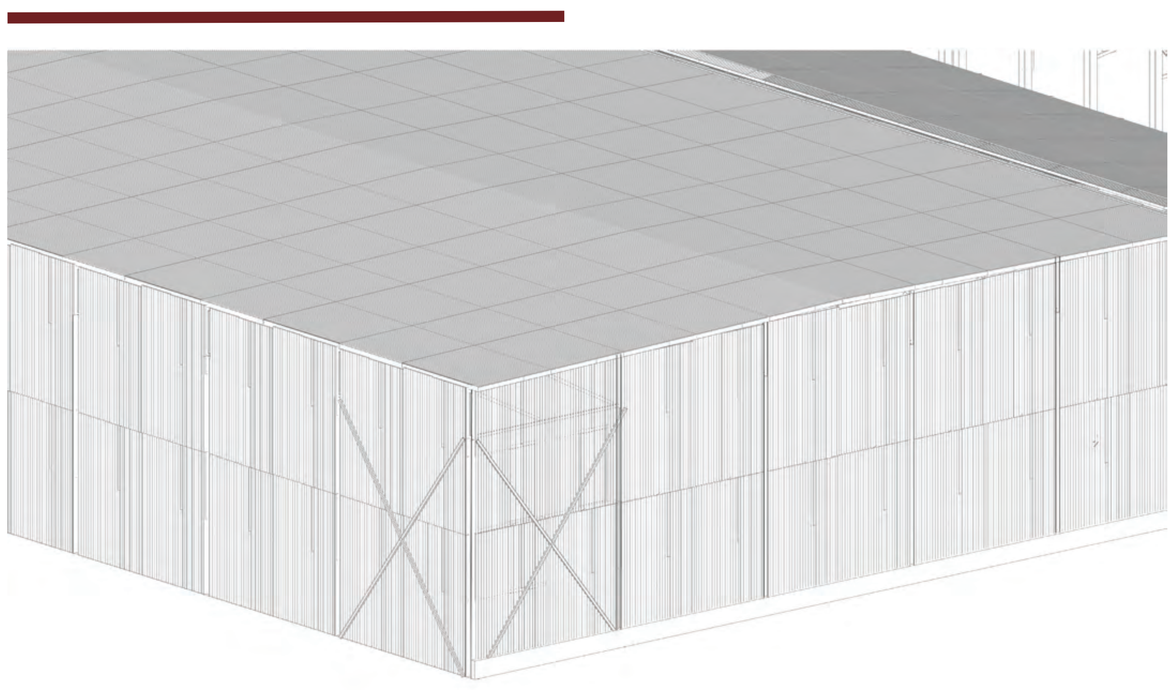


Site Map



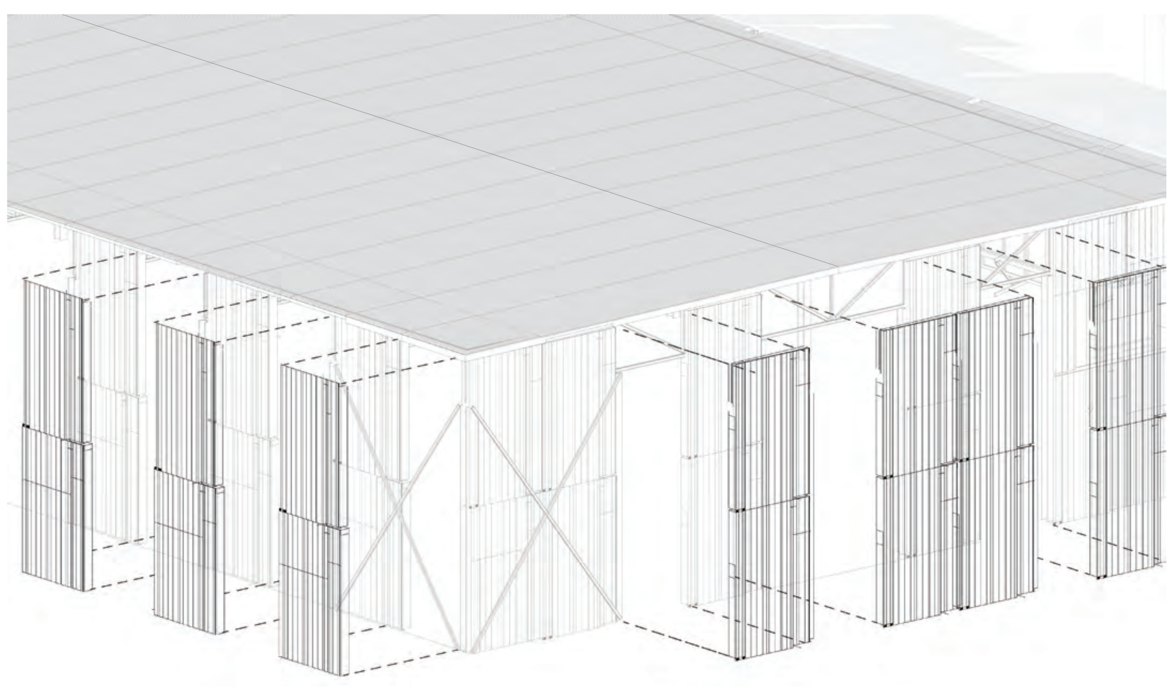
Area of Proposal

Design Process



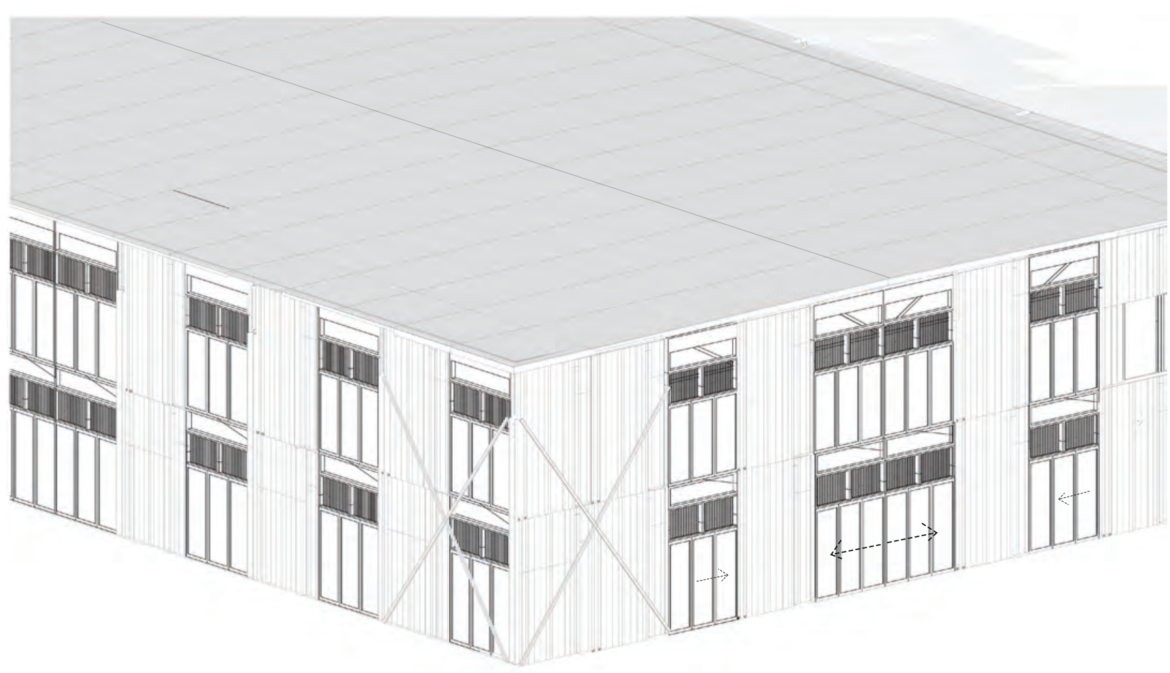
Exisitng

This current exisiting building is planned to be the multi-purpose area of the Broombridge complex. The external facade is in good condition but the internal is quiet poor. The aim is keep as much as the existing buidling while transforming it to a student facility



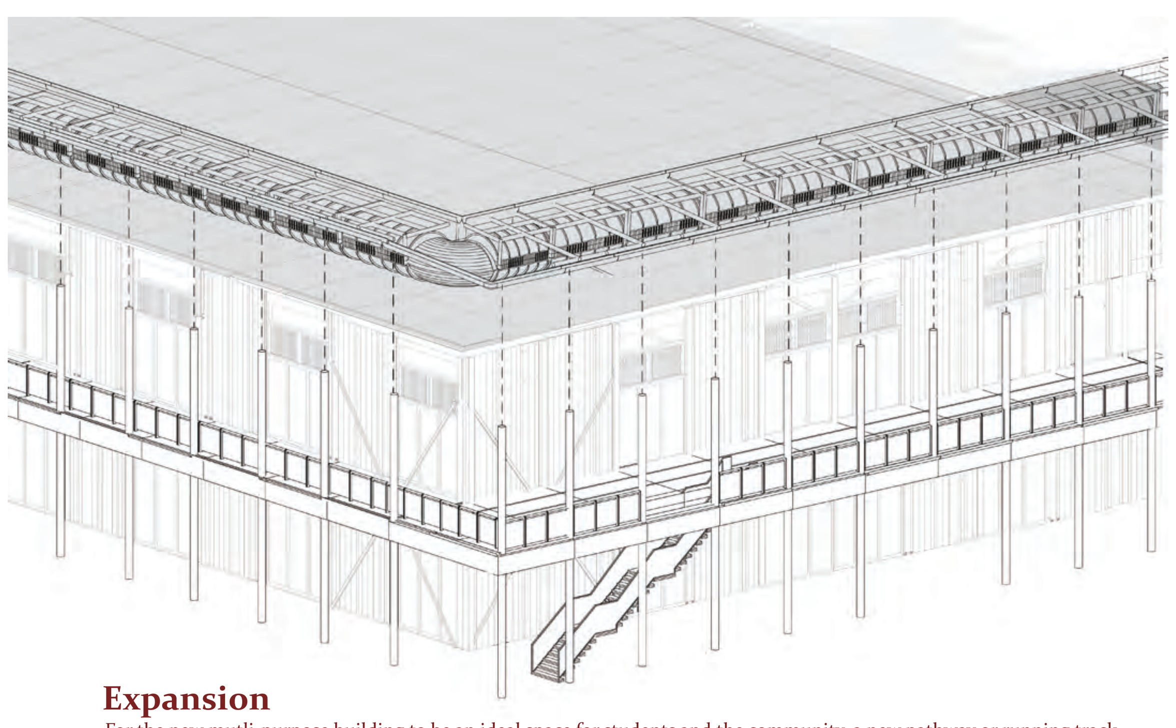
Openings

Openings for windows, venithaltion and circulation are carved out of the existing facade. The metal sheets will be kept in the shape they were cut to be resued on a new skin of the building



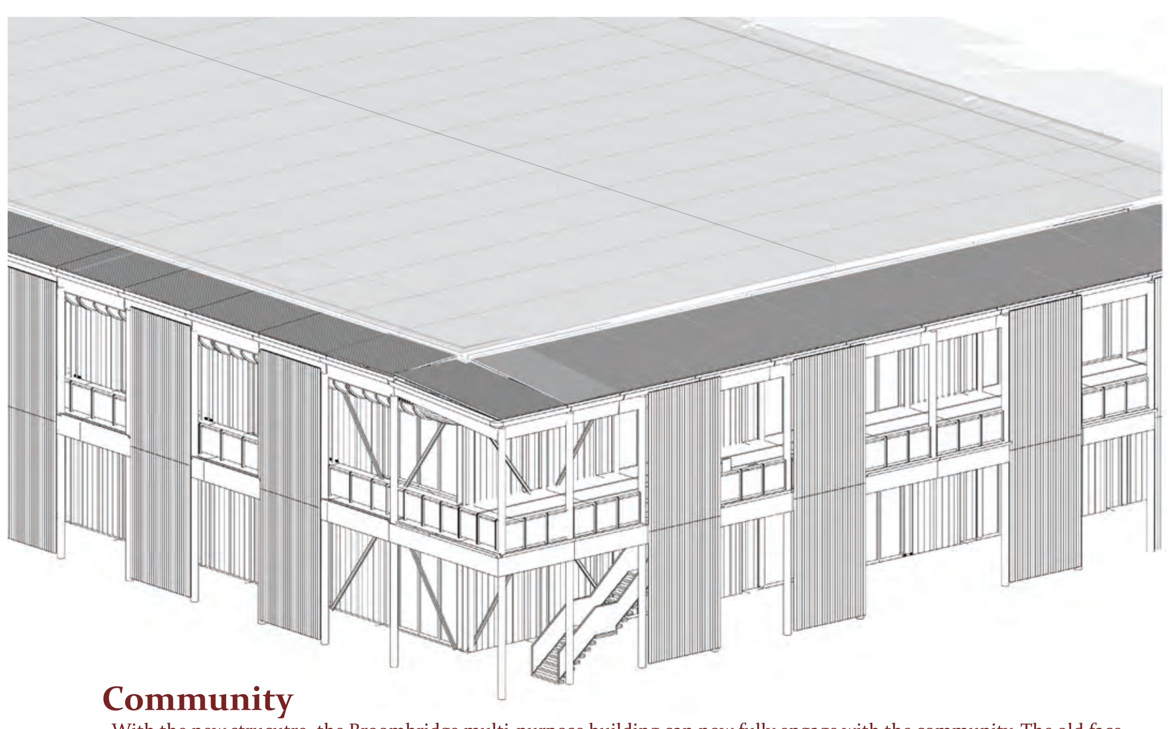
Permeability

After the openings are carved out of the facade, windows door and ventilation panels are installed. These will allow extreme permeability with the outside environment. Allowing light, air and people to flow seamlessly into building. Blurring the boundaires with the community



Expansion

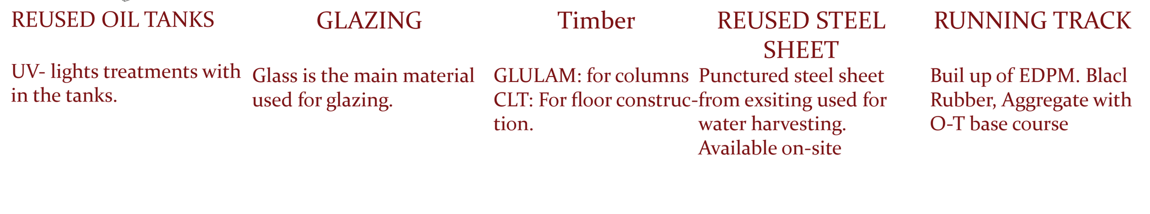
For the new mutli-purpose building to be an ideal space for students and the community, a new pathway or running track will be construted. This will allow the activties to expand into the outside envrionment. The new self-supported structure will also support rain water collection tanks that the existing strucure was not able to hold.



Community

With the new strucutre, the Broombridge multi-purpose building can now fully engage with the community. The old face panels are placed onto the new frame collecting rain water from the side of the buidling. The water collected from the walls and the roof will be distributed to all the new toilets and changing rooms in the complex and to also supply water to the new surrounding landscape

Material Breakdown



REUSED OIL TANKS

UV- lights treatments with in the tanks.

GLAZING

Glass is the main material used for glazing.

Timber

GLULAM: for columns
CLT: For floor construc-tion.

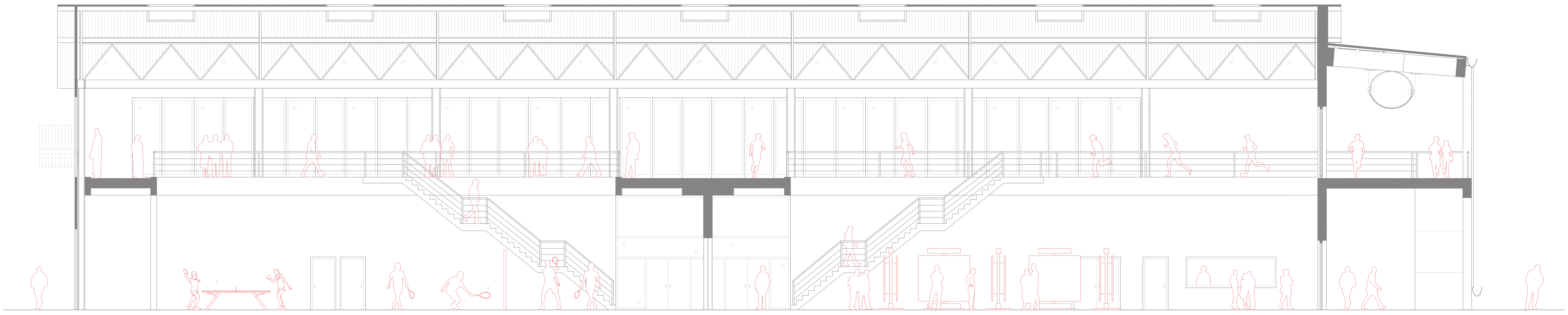
REUSED STEEL SHEET

Punctured steel sheet from exsiting used for water harvesting. Available on-site

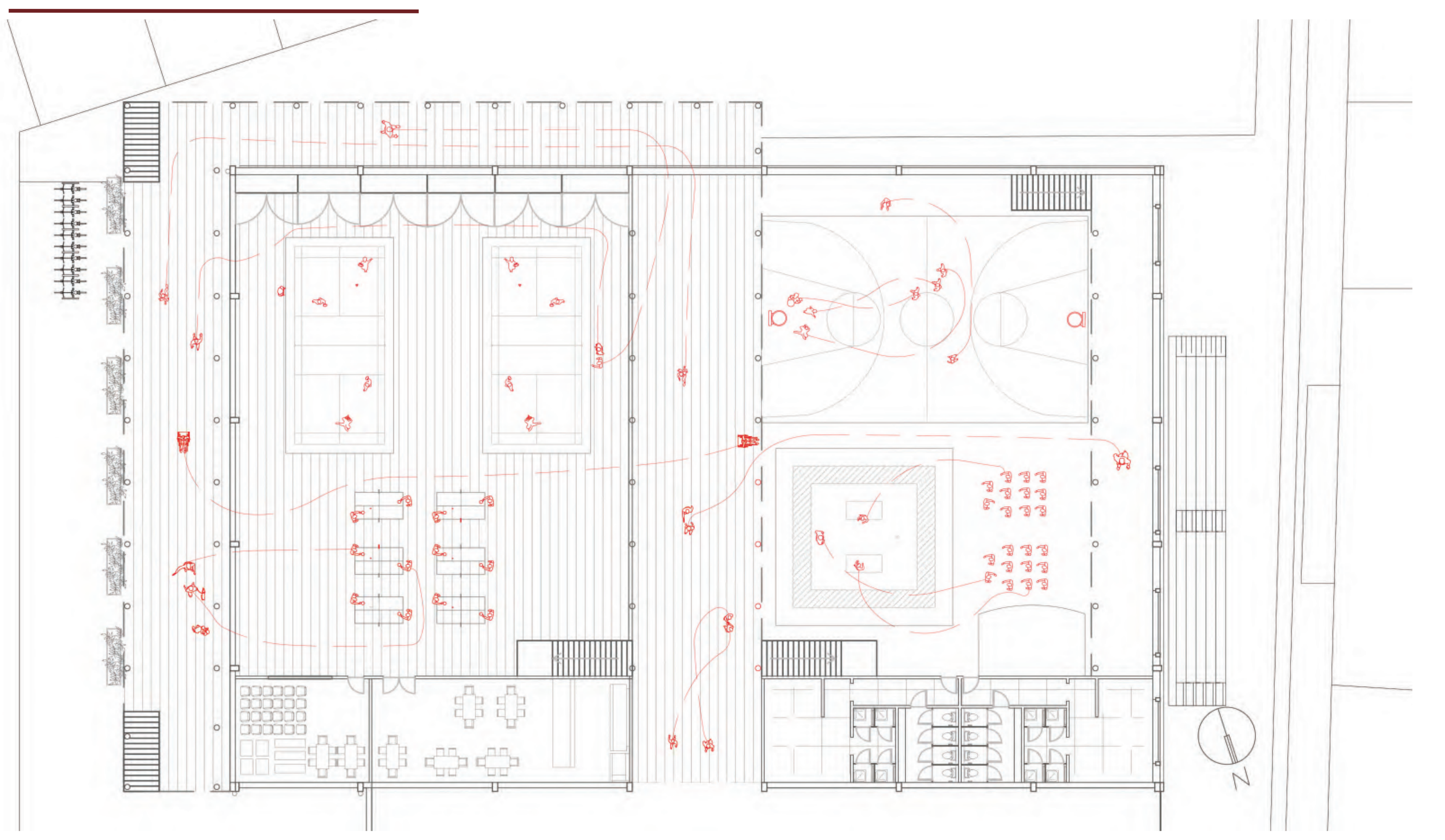
RUNNING TRACK

Buil up of EDPM. Blacl Rubber, Aggregate with O-T base course

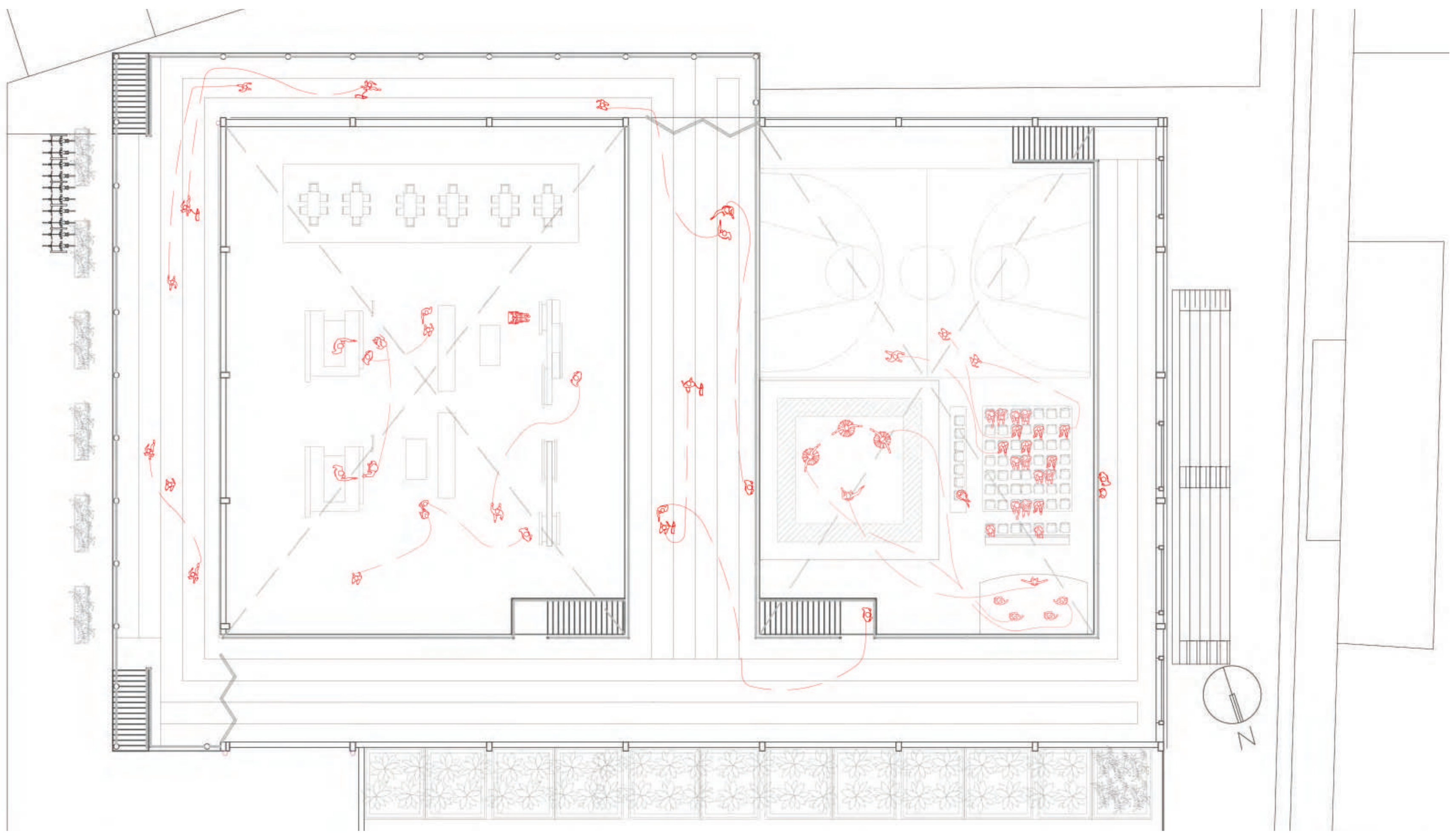
Community Section



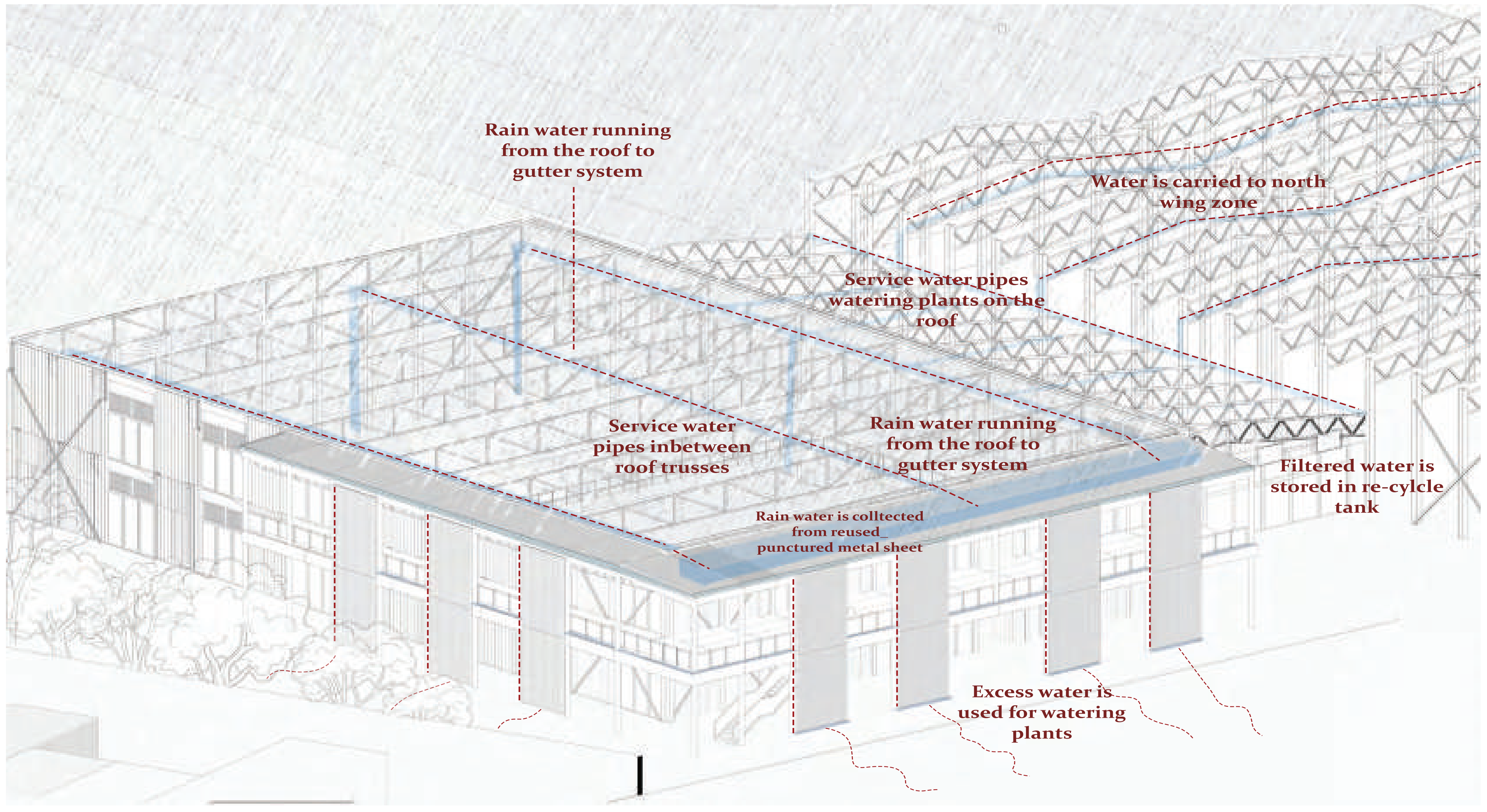
Ground Floor Plan



First Floor Plan



Harvesting Water



SHOWERS

9-11 L PER MIN
8 MIN
50 PEOPLE PER DAY

10 L x 8 MIN = 80 L x 50 = **4000 L**

SINKS

5-8 L PER MIN
10 SECS
1000 PEOPLE x 2 USES EACH

6L x 0.16 MIN = 1 L x 2000 = **2000 L**

TOLIETS

6-9 L PER FLUSH
1000 PEOPLE
2 USES EACH

7 L x 2000 = **14,000 L**

TOTAL

4000 L
14,000 L
2000 L

20,000 L - DAILY

ROOF & WALL AREA

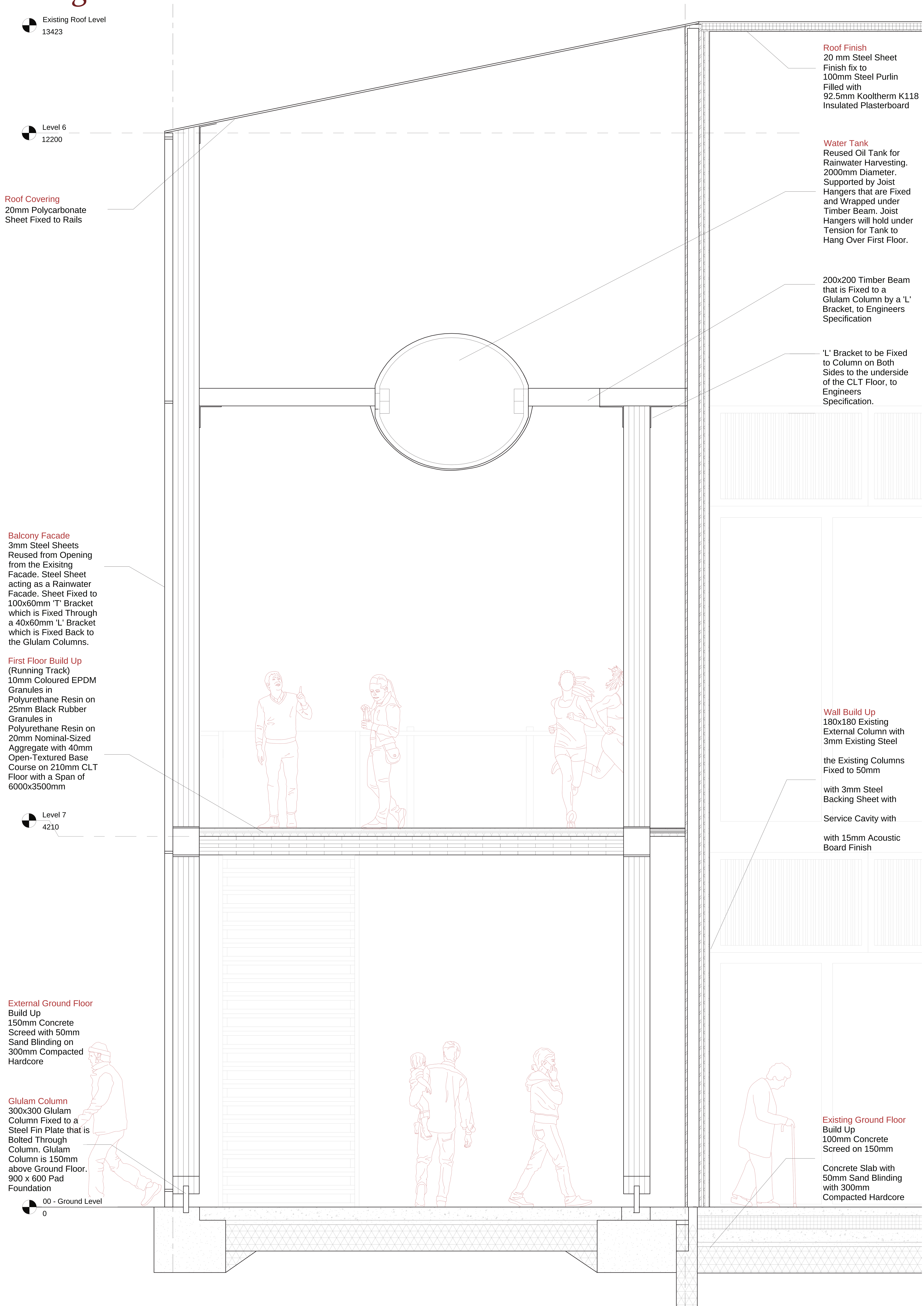
In the case of a wind speed 4 m/s or higher, the amount of harvested rainwater from the building wall could be higher than 50% of that from the building roof of the same area.

Daily Rain (Roof) = 11,884 L
3360 m2 Wall Area
5663.5 m2 Roof Area
Wall to Roof Ratio = 0.59
50% x 0.59 = 29.5%/ 2 = 14.75%

(Daily) 11,884 L x 15% = 1782.6 L
(Montly) 362, 464 L x 15% = 54, 389.6 L

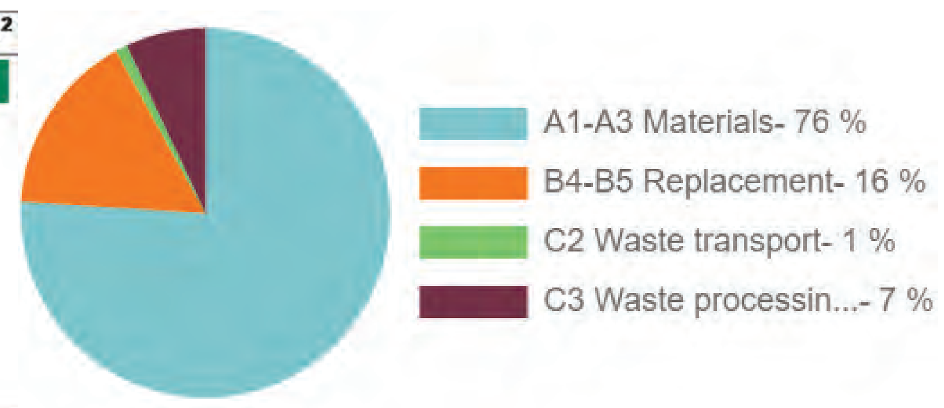
TOTAL = 4,988,309 L

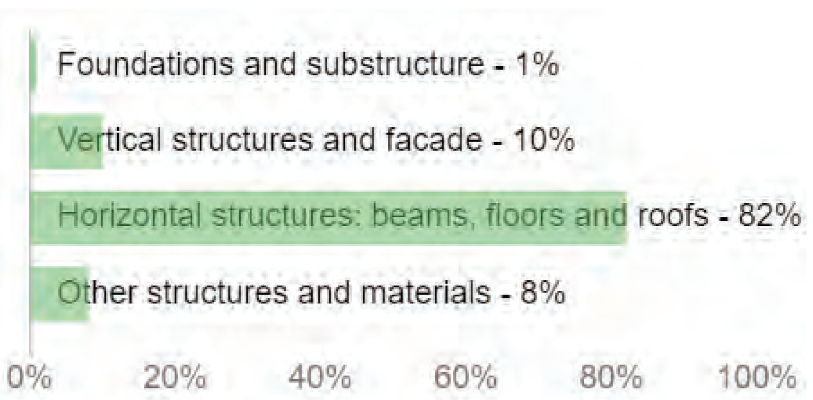
Broombridge 1:20 Section Detail



Cradle to grave (A1-A4, B4-B5, C1-C4)	kg CO_2e/m^2
(< 450) A	177
(450-540) B	
(540-630) C	
(630-720) D	
(720-810) E	
(810-900) F	
(> 900) G	

One Click LCA





OLLSCOIL TEICNEOLAÍOCHTA
BHAILE ÁTHA CLIATH

TU DUBLIN

TECHNOLOGICAL
UNIVERSITY DUBLIN