AD2 Semester 2
Public Project

Marketplace in Chepstow, GB

CONTENTS

AT2 - Mission Statement & Sustainability Strategy

"The greenest building is the one that already exists"
-Carl Elefante, AIA

The underpinning factor of my scheme, will be the **use, and retrofitting** where necessary, **of its' surrounding context.**

My scheme will work with an **existing public square, with concrete-based installations** whose qualities **can be used as load bearing walls**, to bring **structural stability** to my design as well as reflecting the **historical fabric of Chepstow**.

The construction of my building must be sustainable - specifically using **locally sourced materials** with **low embodied carbon.** The **impact at the end of the material's life** should also be **low.**

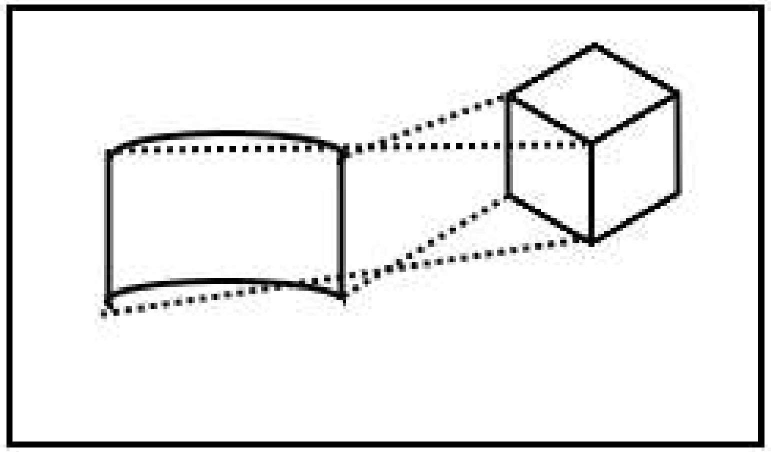
The key goal of the scheme's fabric will be to **meet the RIBA Challenge 2025** energy balance target - in this context, it is a **maximum of 75 kWh/m2/yr.**

My scheme should not just satisfy all Approved Document-based regulations, but it should also **meet comfort standards - specifically CIBSE Guide A, EN 17037, and EN 16798-1.**

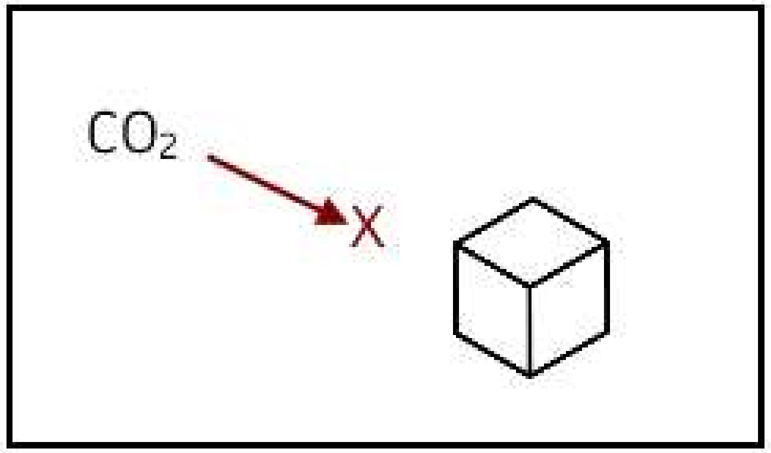
Finally, as **little mechanically forced ventilation** as possible should be used, instead utilising **passive strategies** like cross-ventilation.

SUSTAINABILITY STRATEGIES

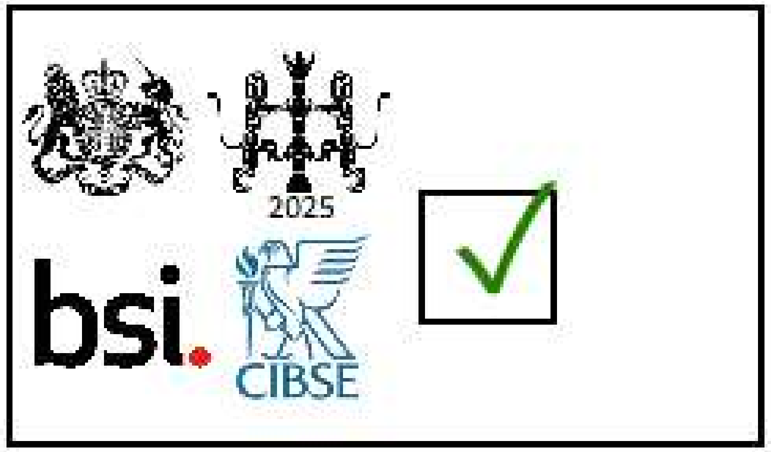
1. Retrofitting



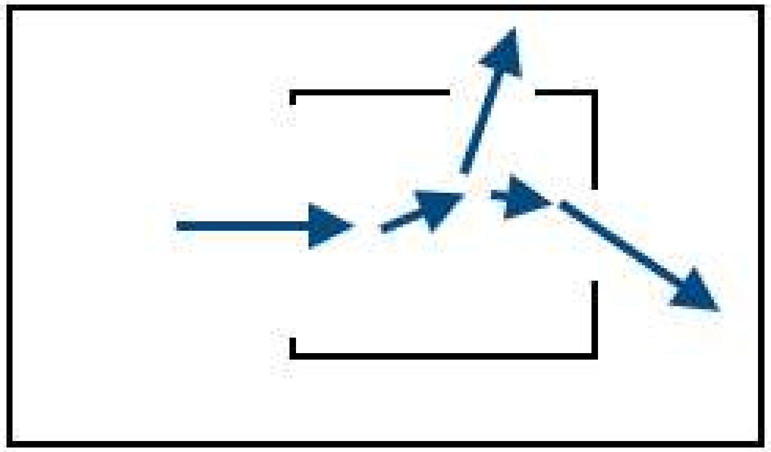
2. Low Embodied Carbon



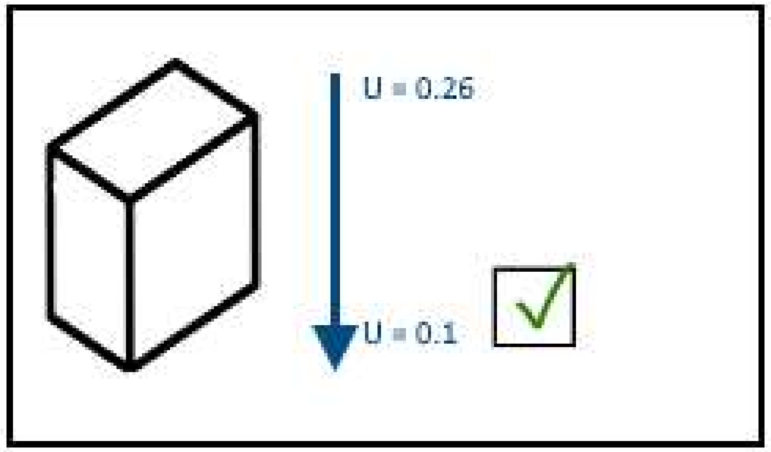
3. RIBA Challenge 2025 & other standards



4. Natural Ventilation



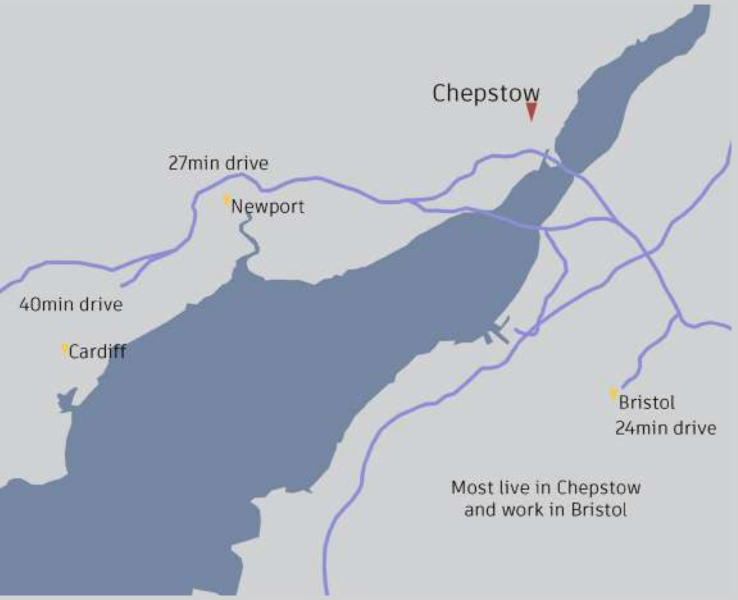
5. 'Fabric First' approach



6. Local Materials & Products

Site Analysis

Introduction: Context

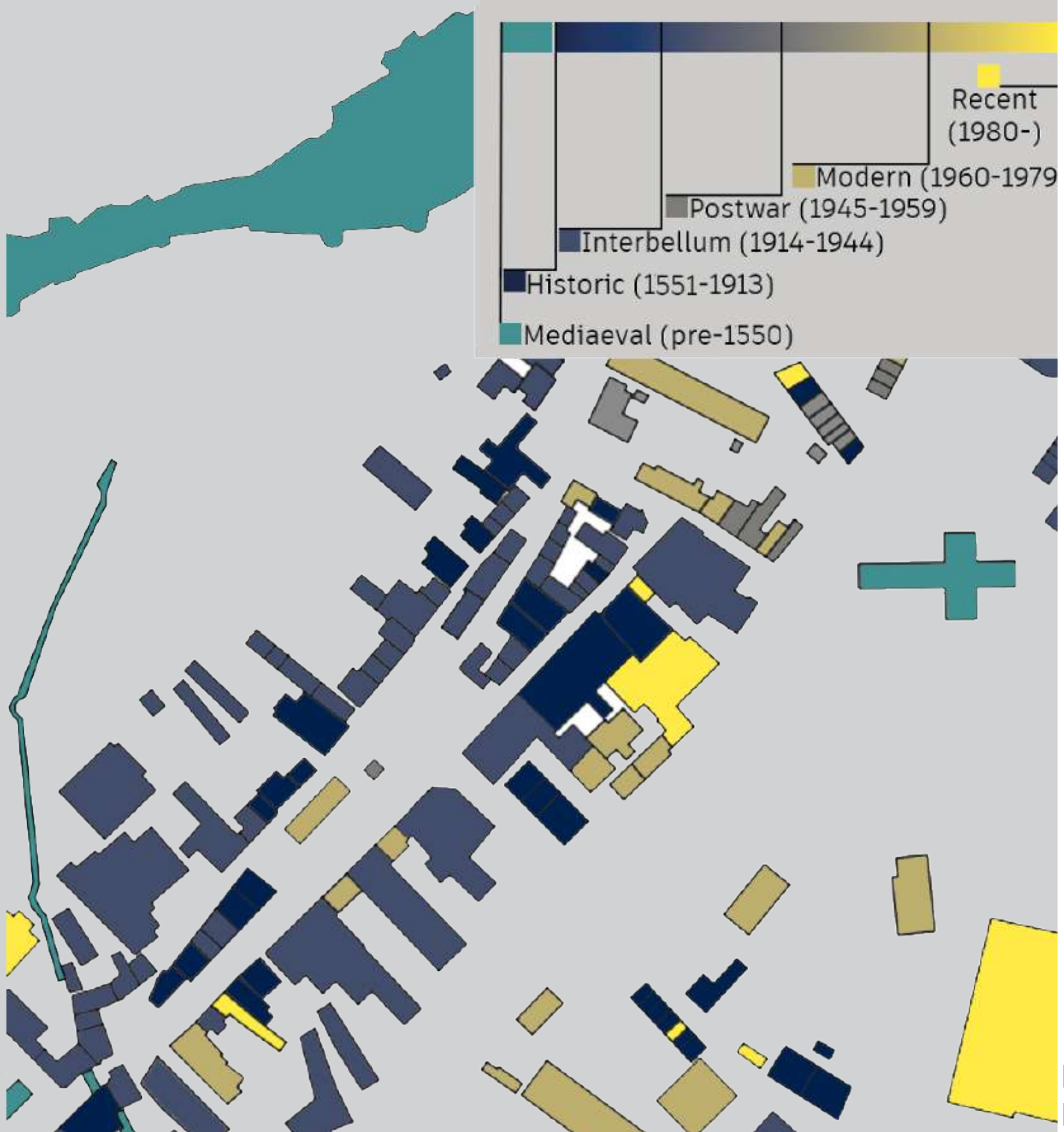


Chepstow, once known for being a trading port and shipbuilding hub, is now considered by most to be a tired and quiet town.

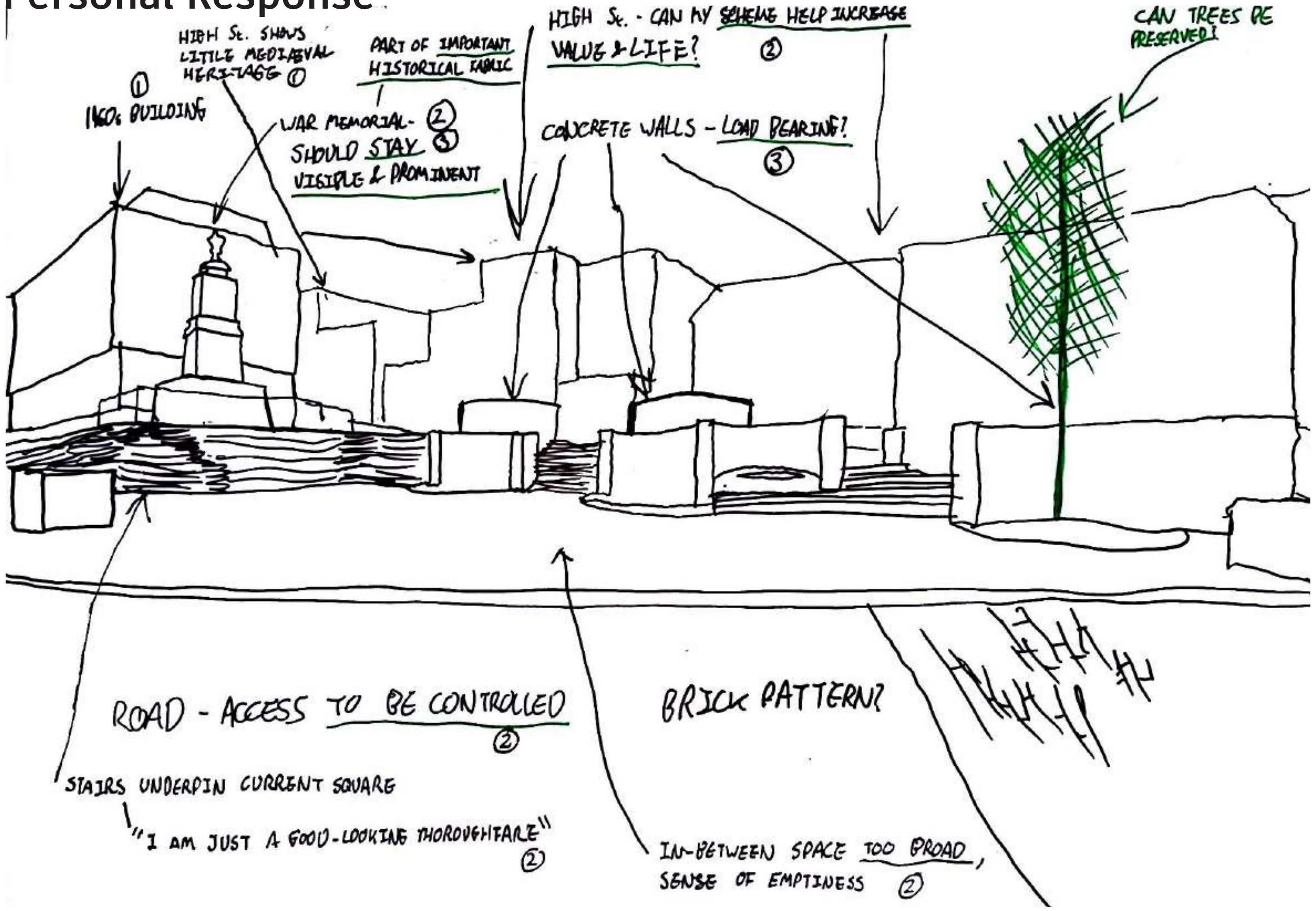
It is inhabited primarily by an older population or people working in bigger cities like Bristol.

This means that not much money is being spent in Chepstow, meaning the local economy suffers.

Historical Fabric Study



Personal Response



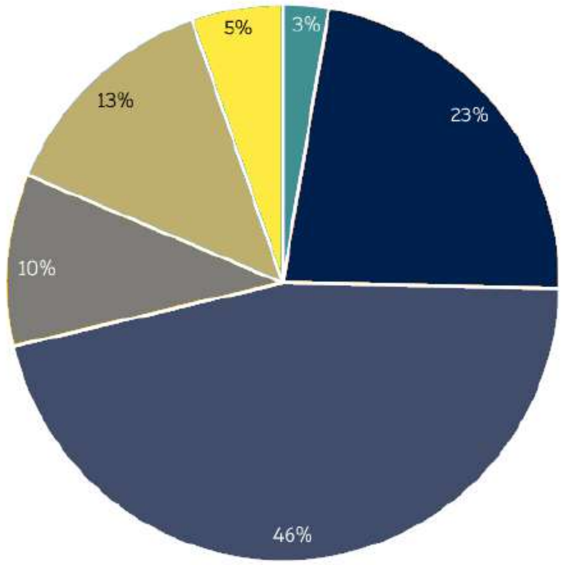
SOLUTIONS

1\. SHOW MEDIAEVAL HERITAGE

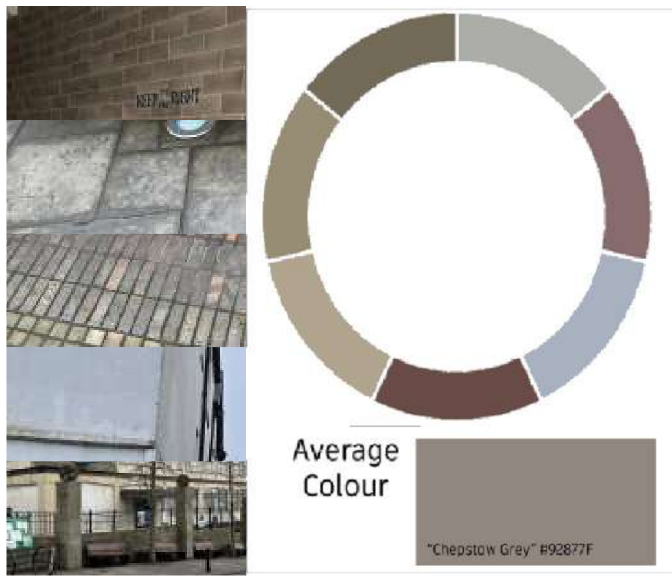
2\. MAKE SCHEME MORE THAN JUST A THOROUGH-FARE

3\. ACCENTUATE EXISTING SOLUTION POSITIVELY: NO TABULA RASA

Percentage of buildings of each era



Local Materiality & Colour Palette



1. Chepstow's centre currently appears dark and monochrome, leading to a feeling of lost life.

2. There is a lack of appreciation of the mediaeval history of Chepstow in the centre.

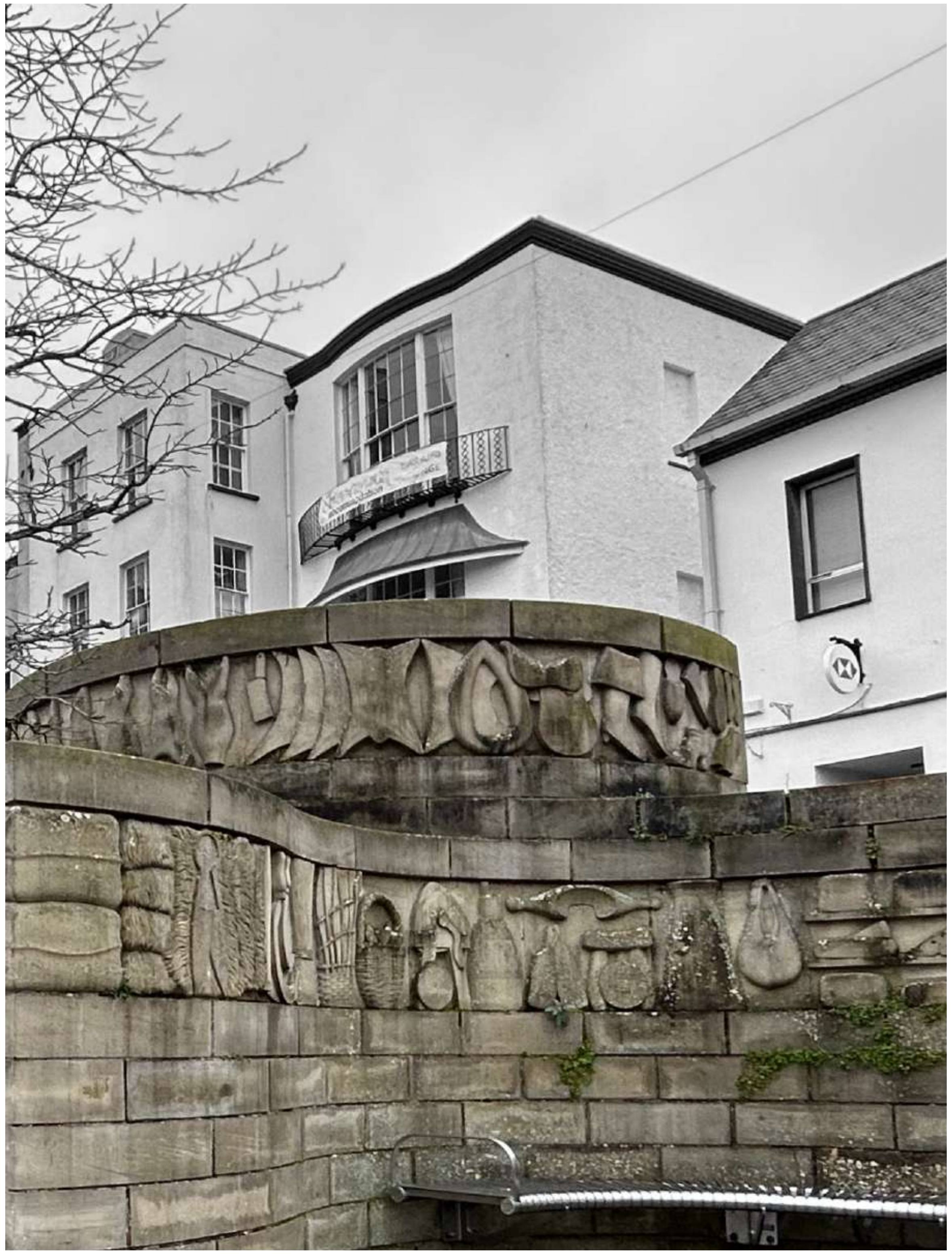
3. The town does not have much of an evening economy, and what it has is scattered throughout the high street.

Data obtained from EDINA DIGIMAP Ordnance Survey
Historical fabric data processed in QGIS Buenos Aires

Site Photographs

The site does not currently feature any significant points of interest, making it to many nothing more than a thoroughfare.

The solution that is currently present appears to serve only as a place to sit or to negotiate the topography change from one street to the next.



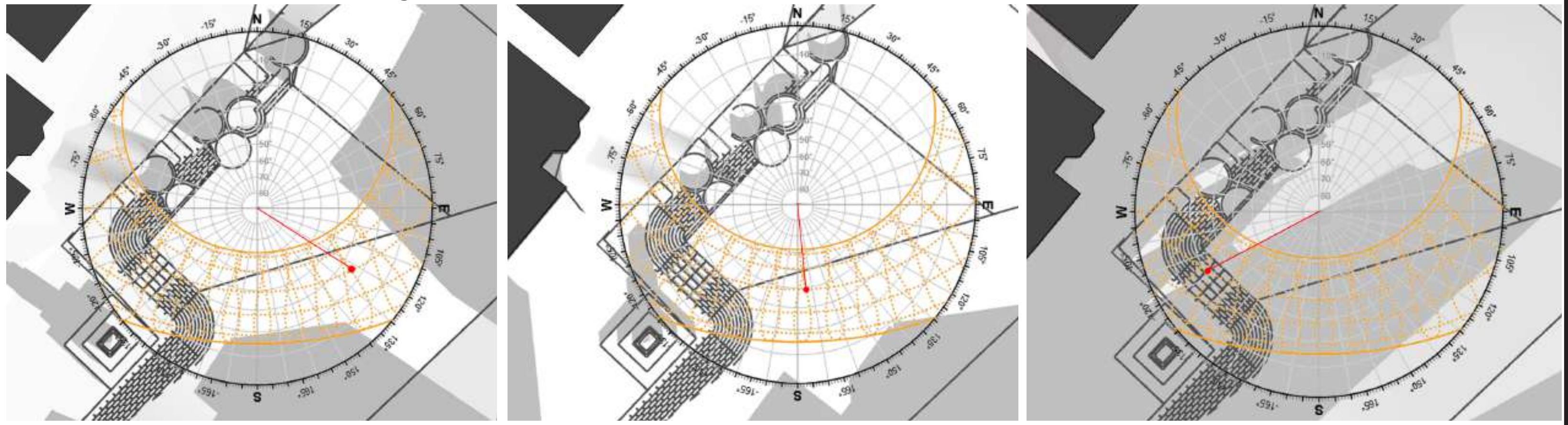
The existing solution features blocks of cast concrete with patterns that reflect Chepstow's marketplace history.

This feature is incredibly positive, and relates heavily to Chepstow's medieval feature. I therefore want to keep and accentuate these depictions in my design.

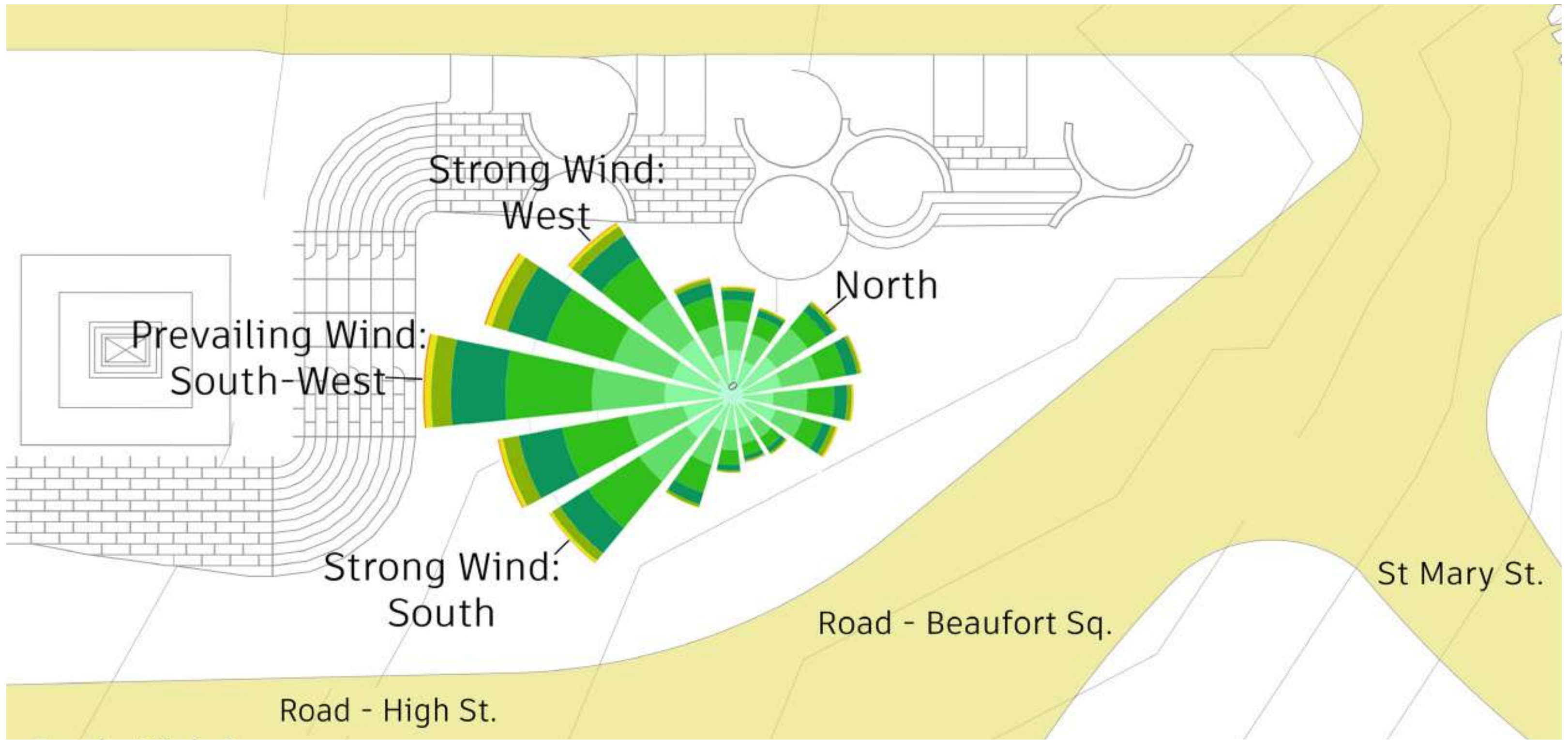
AT2 - Climatic Site Analysis

AIM - To observe site constraints and characteristics, then analyse how they will impact my design approach

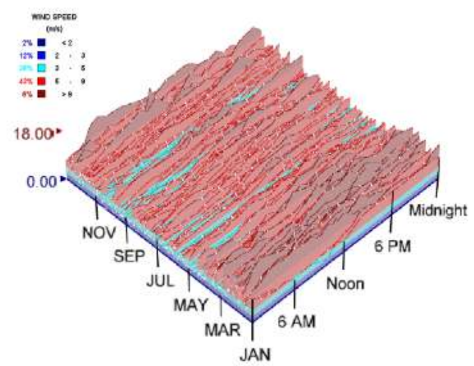
Sun Paths & Overshadowing



Wind Rose & Access Plan

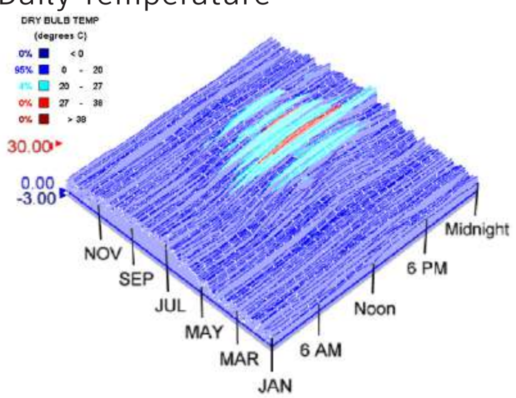


Daily Average Wind Speed

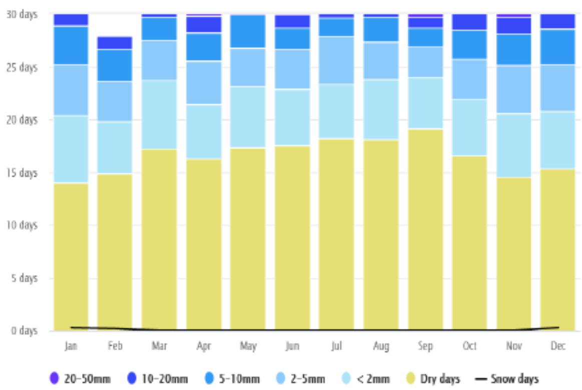


Within Comfortable Range
(>5ms-1) = 50%

Daily Temperature

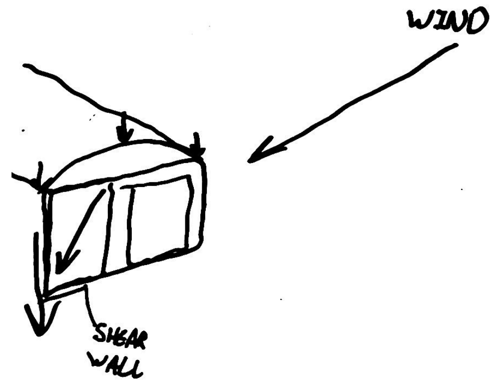


Precipitation Model Graph

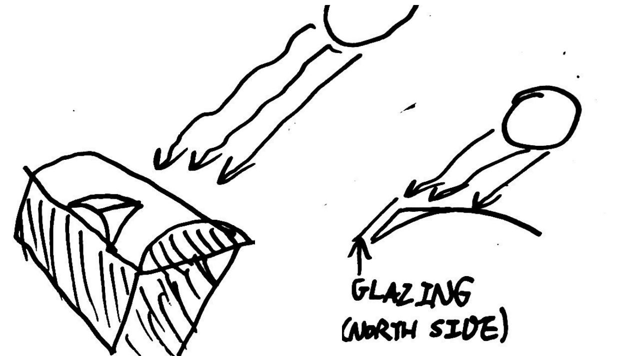


CONCLUSIONS

- **Shear walls** should form a major part of the stability structure due to **high wind speeds.**



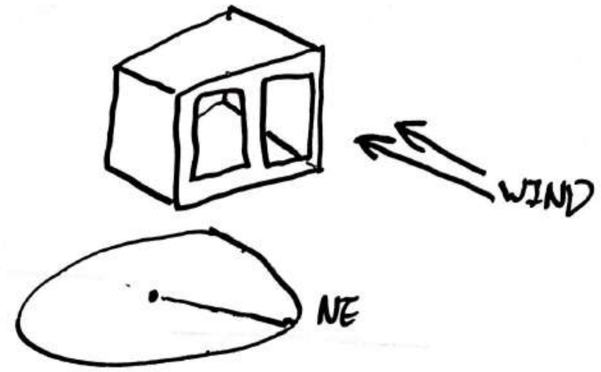
- **Skylights** are **preferable for daylighting** due to **high evening overshadowing.**



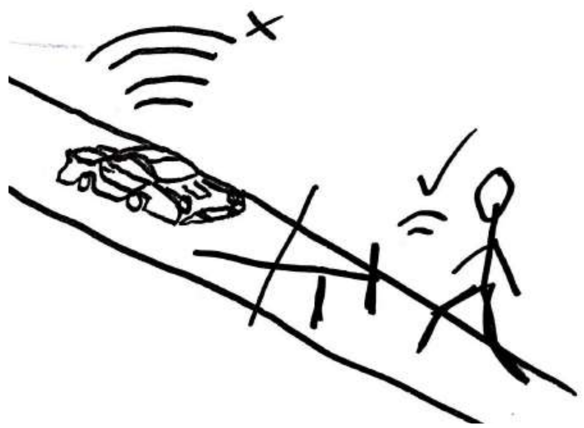
*These should go on the north face, as summer temperatures and irradiation levels are high.

- The units that can be used in the morning and mid-day, should have **south-east glazing**.

- Major **openings** should feature **on the north-east face** for **passive ventilation.**

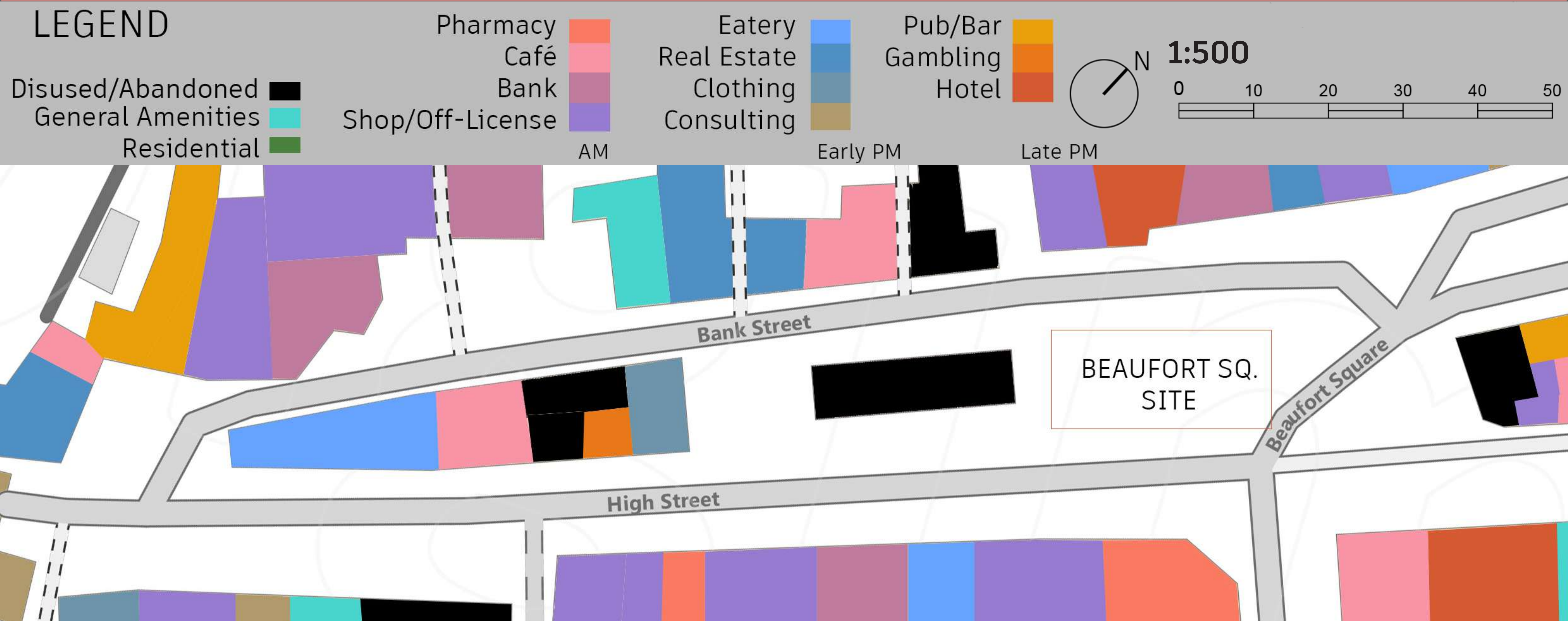


- Road access should be controlled, to allow for further pedestrianistaion and a more pleasant auditory environment.



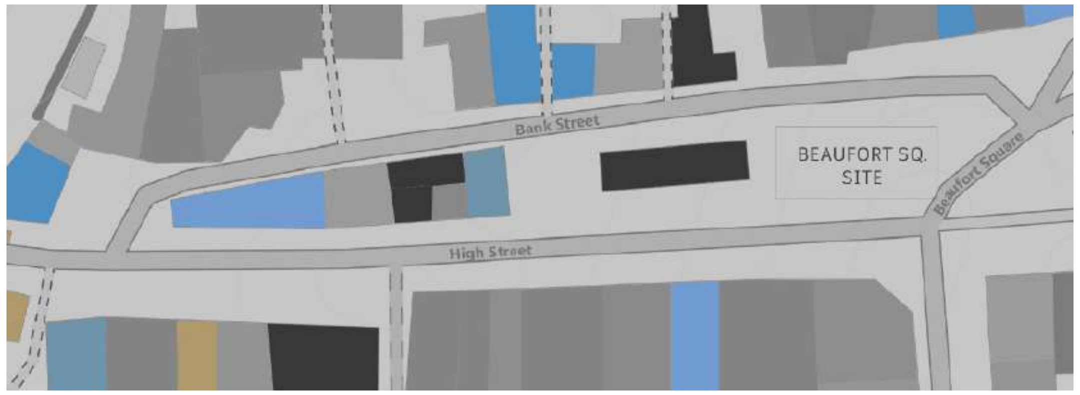
1- Data processed in Climate Consultant 6.0, using BRISTOL 2007-2021 file from https://climate.onebuilding.org/WMO_Region_6_Europe/GBR_United_Kingdom/index.html
2- Wind Rose from https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/chepstow_united-kingdom_2653256

Local Land Use Plan & Analysis



Morning

Afternoon

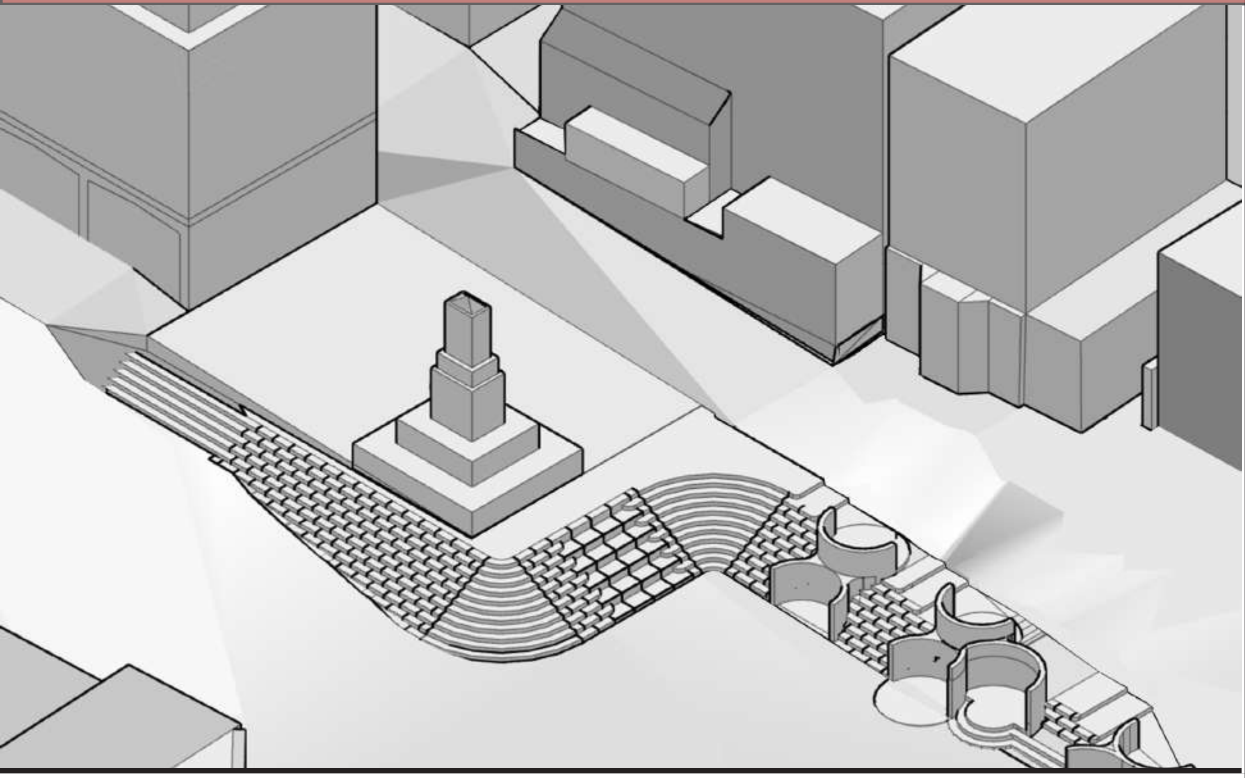


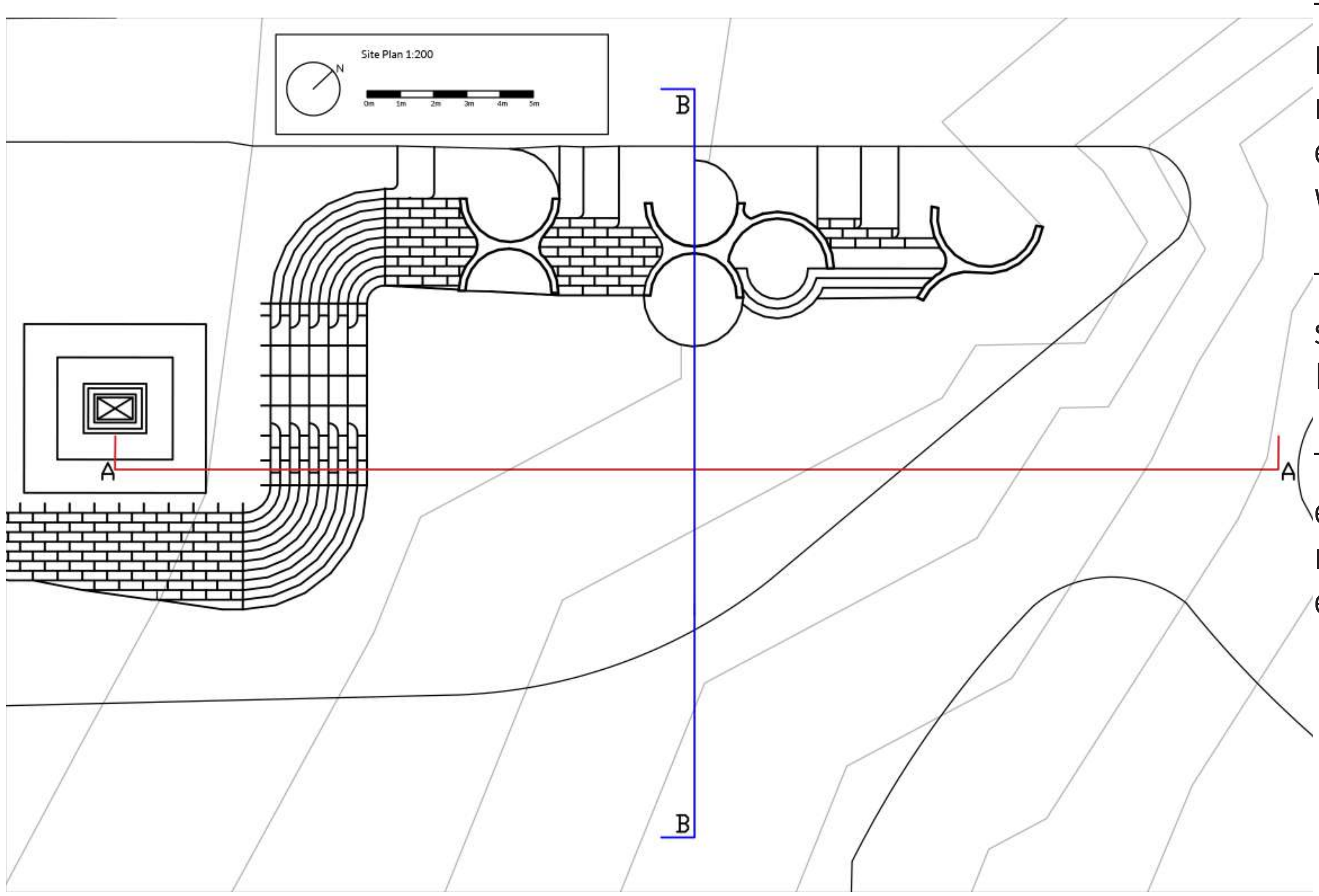
Evening

The land use plan above, accompanied by the plans of key buildings at different times of the day, tells us that Chepstow's economy is primarily focused on the morning. This sharply drops off in the afternoon, and by the evening, only seven buildings remain to serve the evening economy.

Map obtained from EDINA DIGIMAP Global

Site Plan, Model and Sections

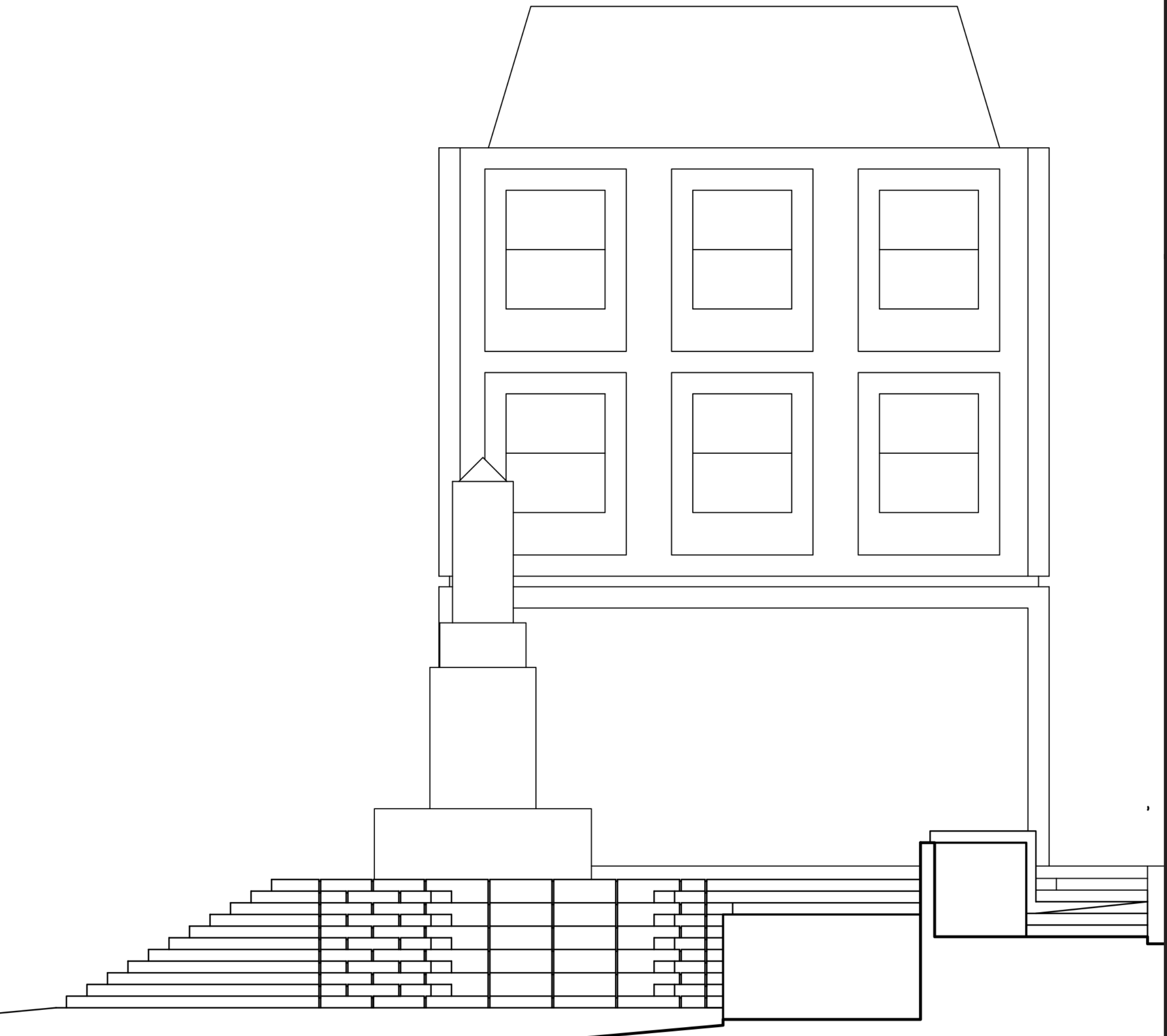




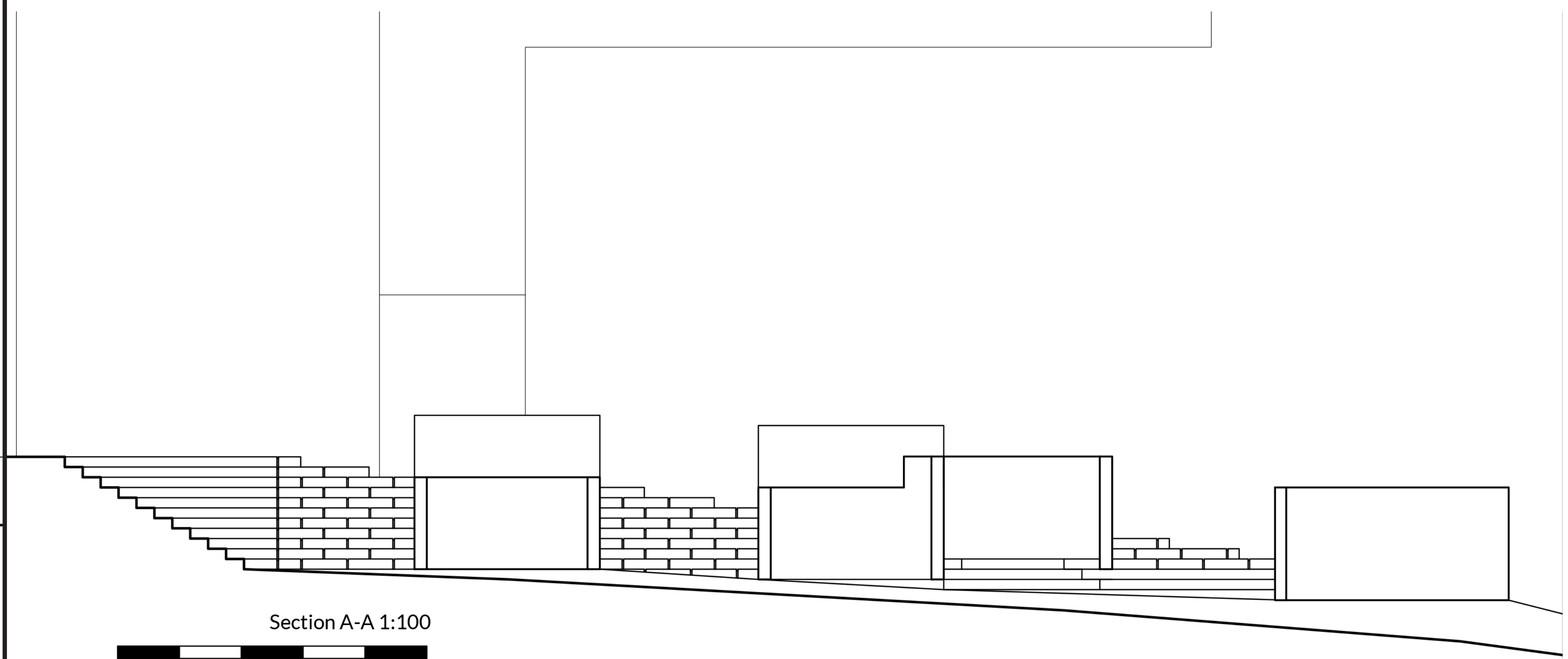
The site has a subtle but complex topography, getting steeper further northwards in A-A.

There is a consistent, shallow gradient on B-B.

The majority of the elevation change is negotiated by the existing stairs.



Section B-B 1:100

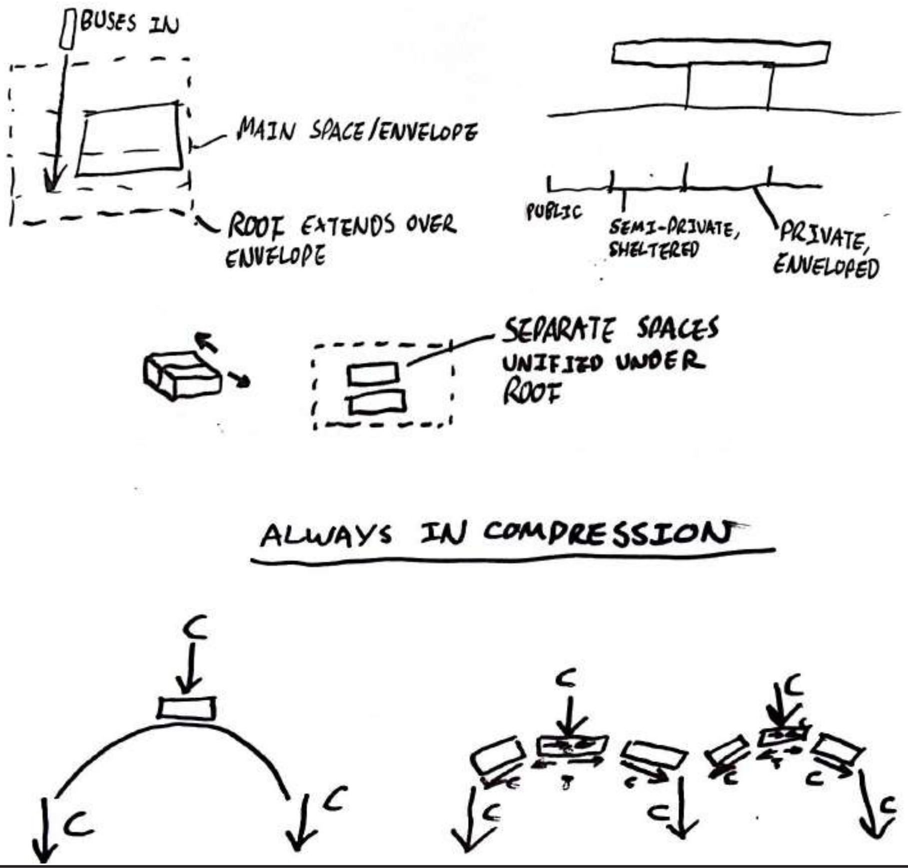


Section A-A 1:100

Precedent Analysis

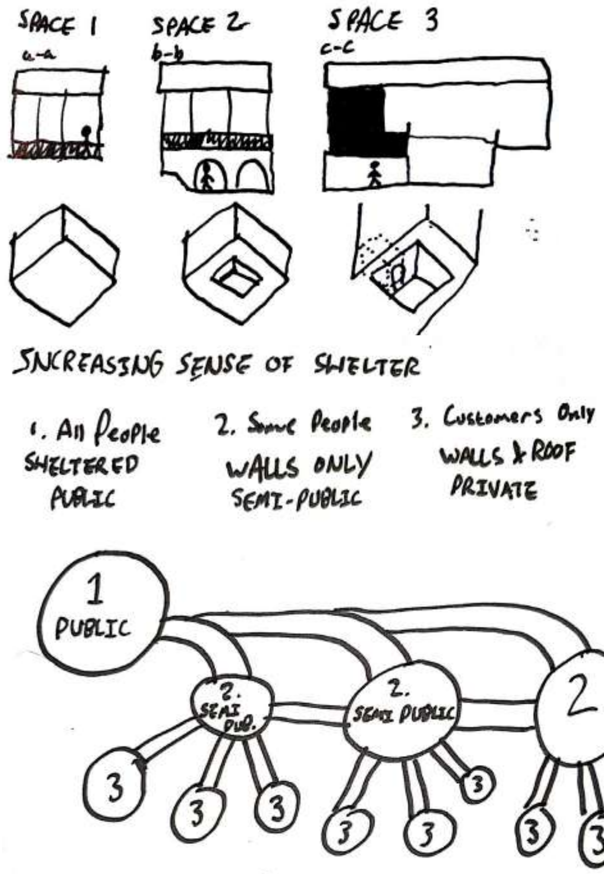
Precedent A- Salto Omnibus Terminal
Salto, UR
Eladio Dieste 1974

KEY THEMES
-Public-Private
-Unifying Spaces
-Structure



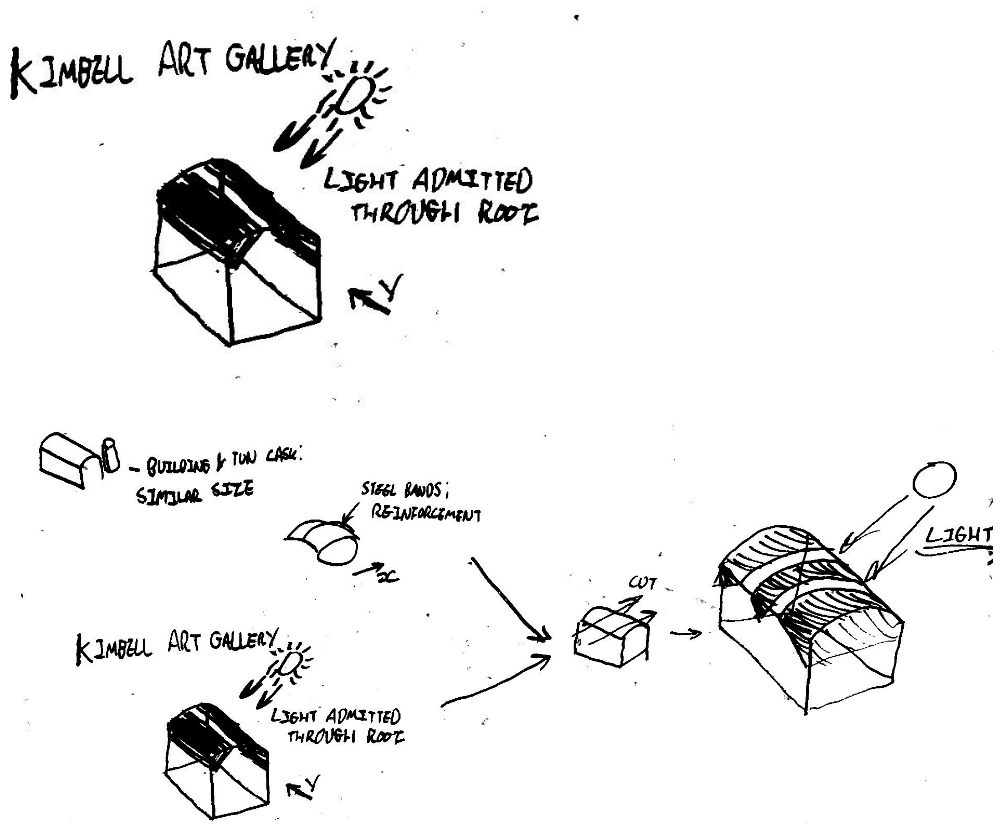
Precedent B- Covent Garden Market
London, UK
Inigo Jones 1630

KEY THEMES
-Thresholds & Proportion
-Shelter



Precedent C- Kimbell Art Museum
Fort Worth, US
Louis Kahn 1972

KEY THEMES
-Lighting
-Atmosphere



1- Silvia Montero (courtesy of Servicio de Medios Audiovisuales de la Facultad de Arquitectura, Diseño y Urbanismo de la Universidad de la República, 2006
2- Andreas Praefcke, Kimbell Art Museum, Fort Worth, Texas (2009) https://commons.wikimedia.org/wiki/File:Kimbell_Art_Museum_Fort_Worth_galleries_1.jpg accessed 2023-03-24

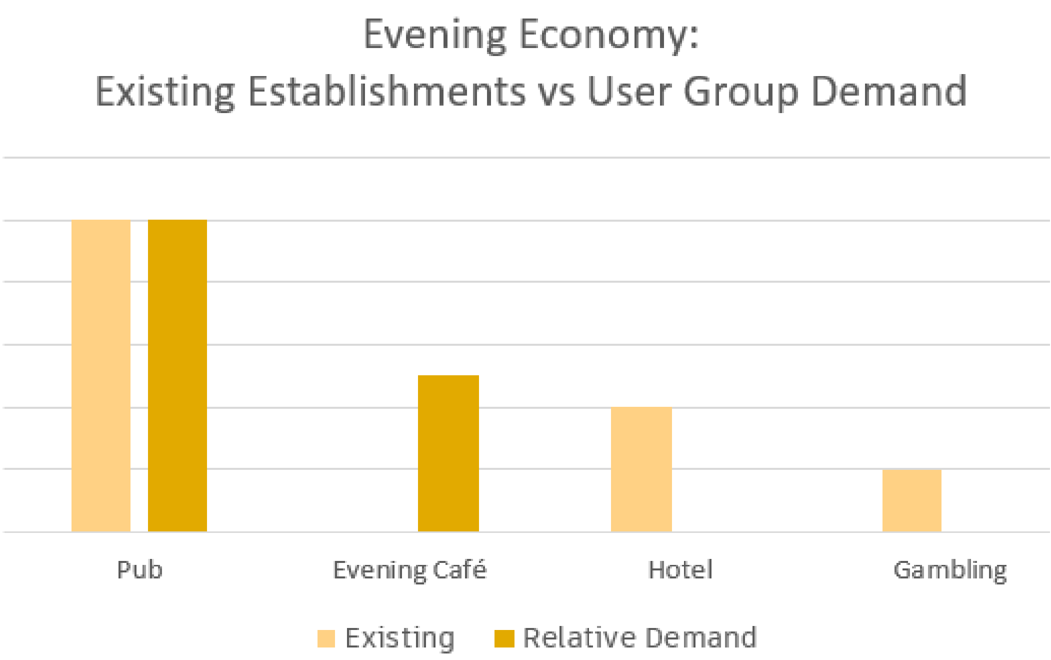
User Analysis

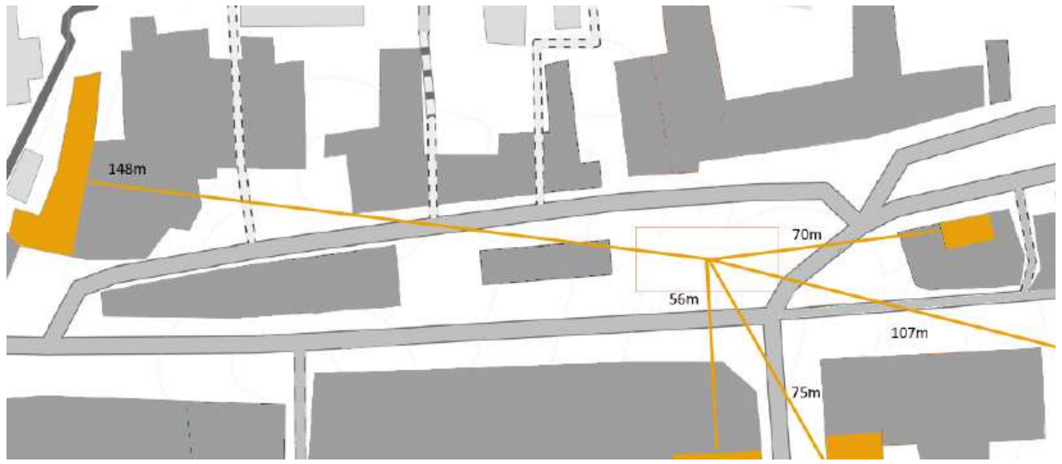
My Project's Focus-

AFTER HOURS: Evening Economy

Targeted User- LOCAL YOUTH, aged 18-30

Current Evening Economy-





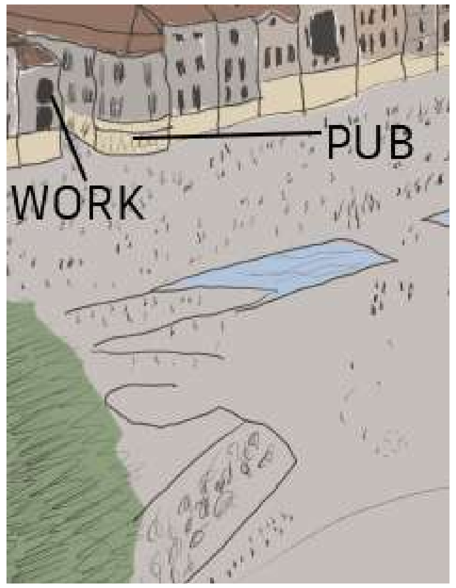
An interview with one of Chepstow's young adults

"So, what do you do after work?"

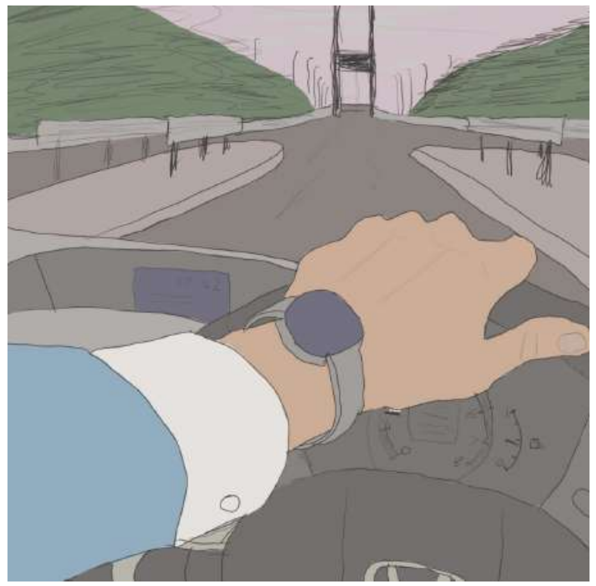
"Well, it's different to uni, that's for sure."

"Most of the time I'm too drained, so I'll just go home and have a coffee. I'd go out for one, but nowhere's open past five."

"If it's a Friday, I'll go to the pub sometimes. But the good places are where I work, so I can't be spontaneous."



"Every Friday used to be pints with the boys. But now I mostly just go home and have a takeaway. It's no fun."



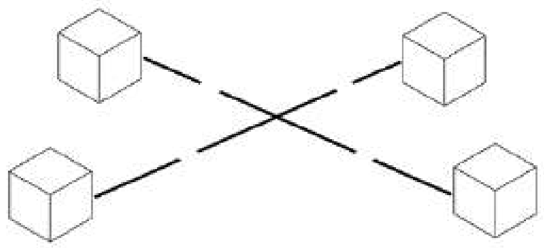
- The centre features a Betfred branch, while most 18-34 year olds prefer to gamble online.

- The focus on hotels is perhaps too great in the centre, and leads to a slump in evening activity. It is also not very useful to locals, who have homes in Chepstow.

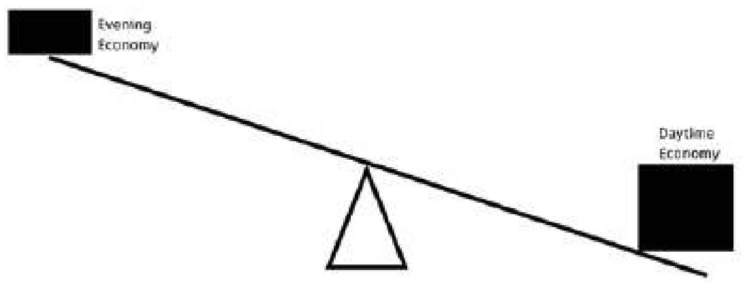
-No cafés are open past 5pm, which leads to the centre of Chepstow feeling empty and too quiet of an evening.

Key issues with evening economy

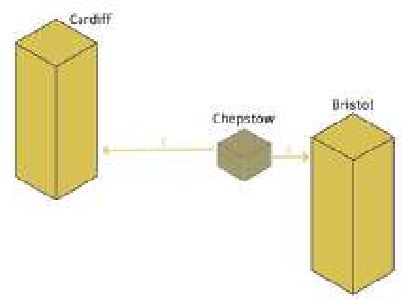
Over-Scattered



Unbalanced



Lacklustre



2- Information on preference by age group for gambling online rather than in branch obtained from https://www.gamblingcommission.gov.uk/statistics-and-research/publication/taking-a-more-in-depth-look-at-online-gambling accessed 2023-03-13

Primer - A Study of Brickwork

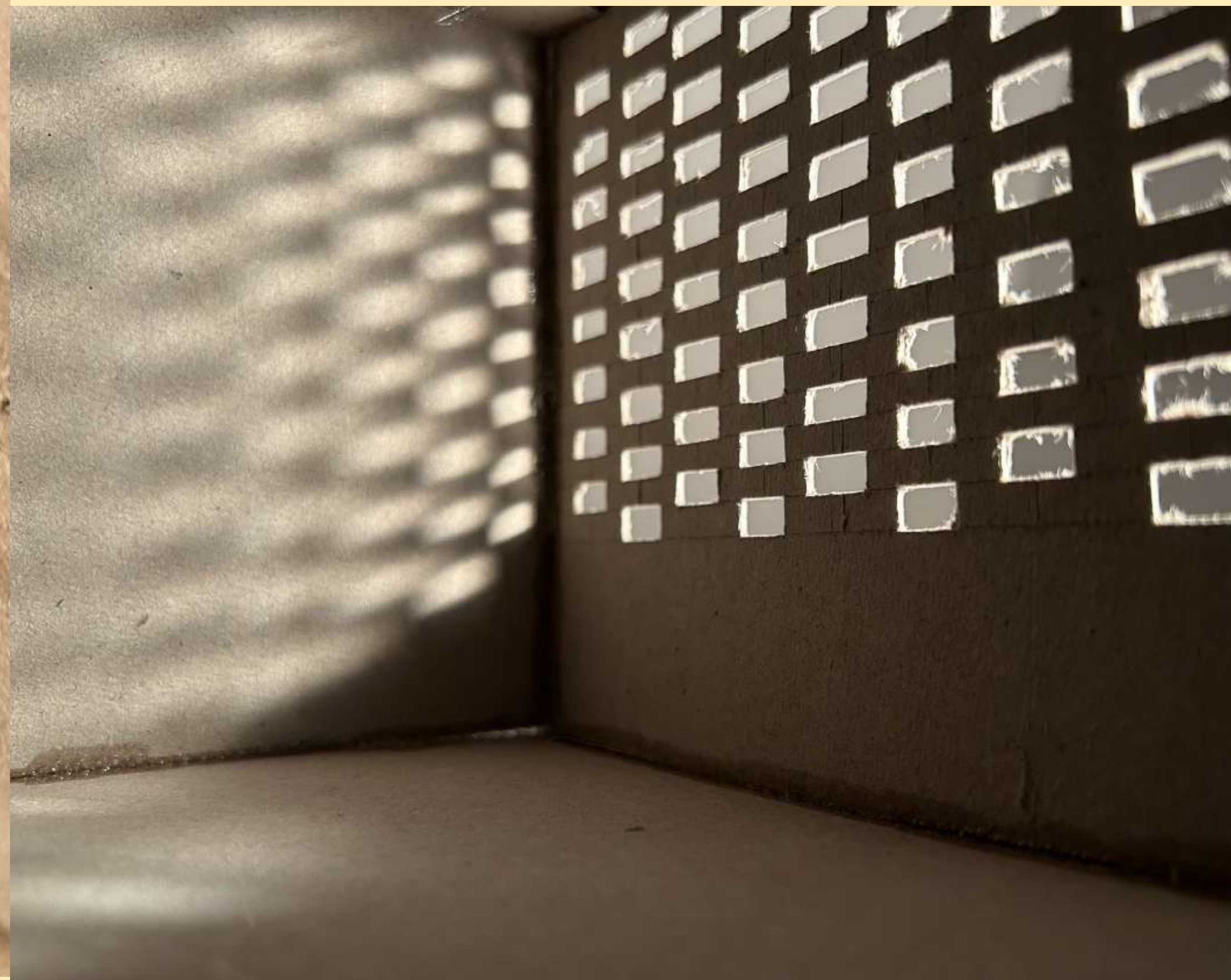
POROUS BRICK & THRESHOLDS

My primer model was informed by my first choice of precedent - Eladio Dieste and his brick forms.

To dive deeper into the materiality itself, I looked at how the bricks could be assembled, to admit light in a porous manner.

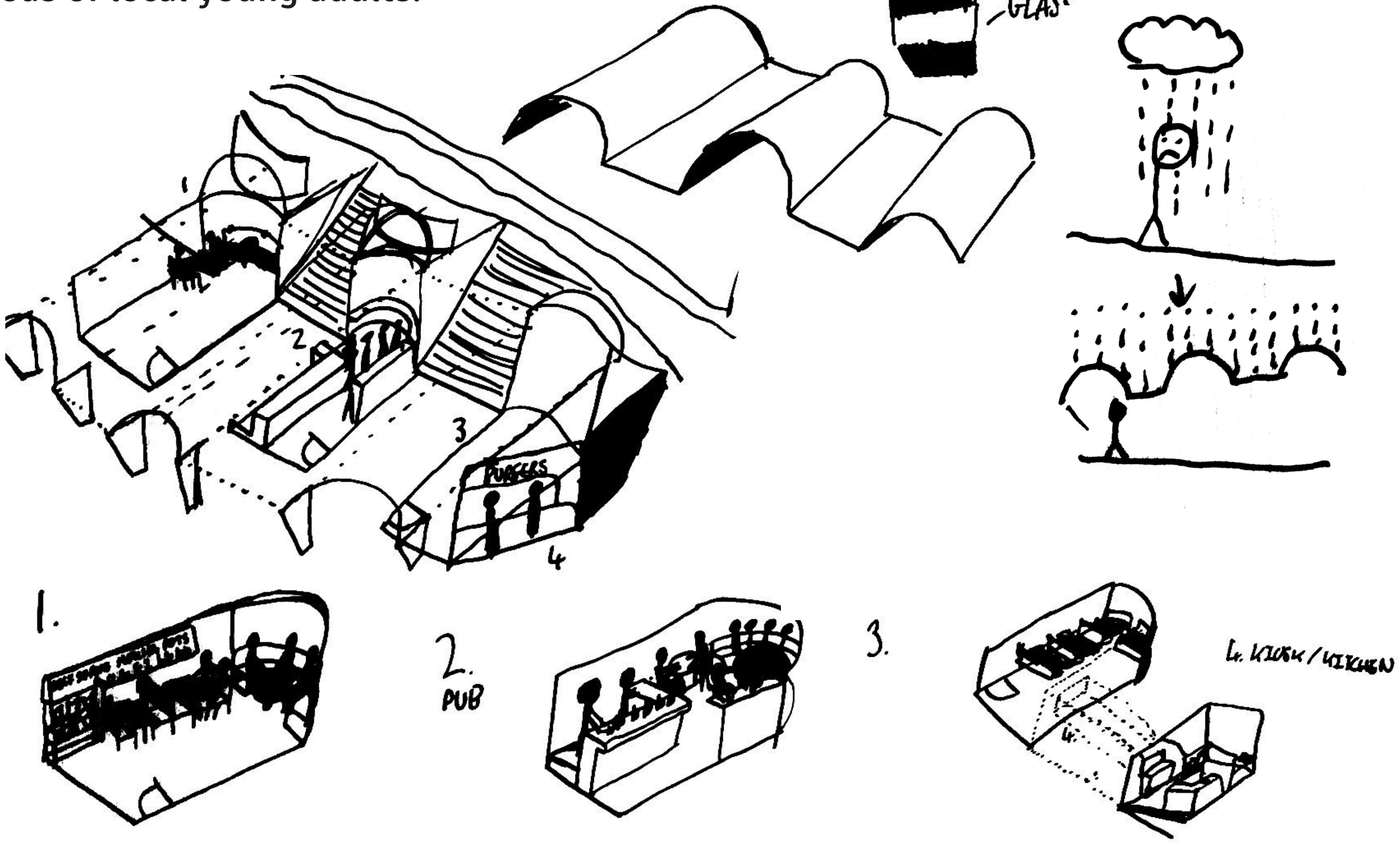
The result showed a way of creating a threshold using light and brick, in order to enforce a semi-public space between the public and private, in this case, I used existing shop fronts and created a conceptual seating space in front of them.

This also allowed me to experiment with ways of working with existing fabric - an important and underpinning part of my project's concept.

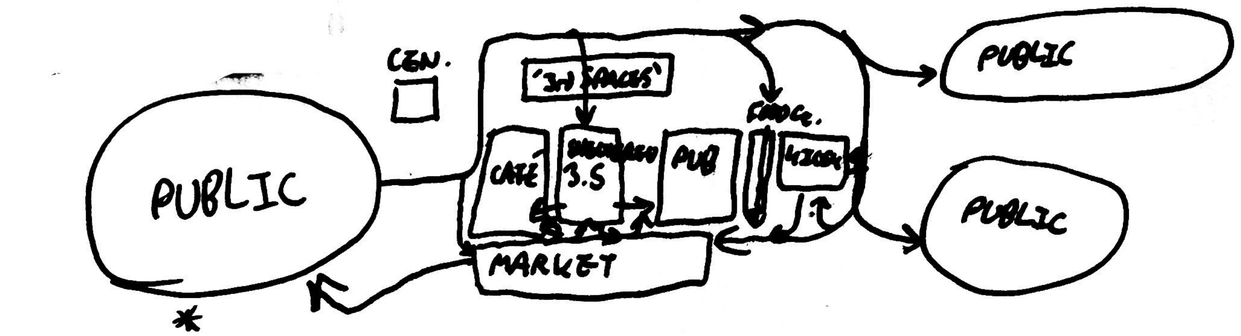


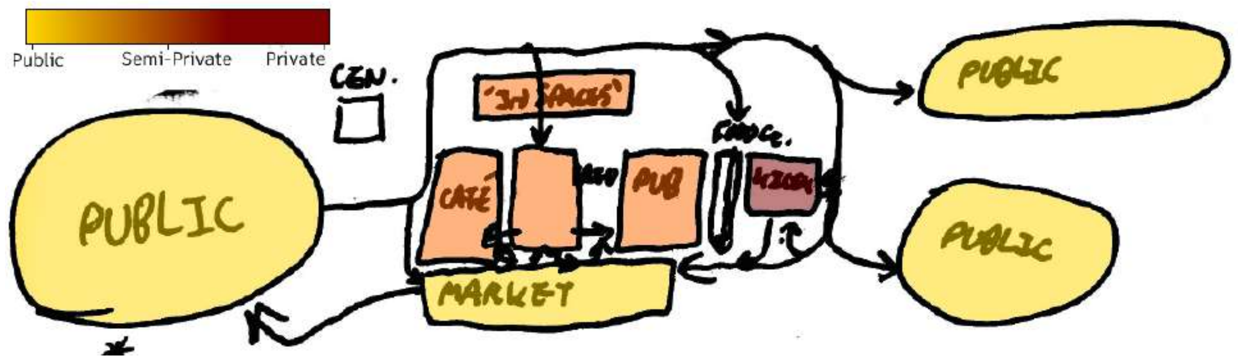
Concept Sketches

The core concept behind my project is the evening economy - and will focus on centralising this part of Chepstow's high street as well as amplifying and enhancing it, according to the needs of local young adults.

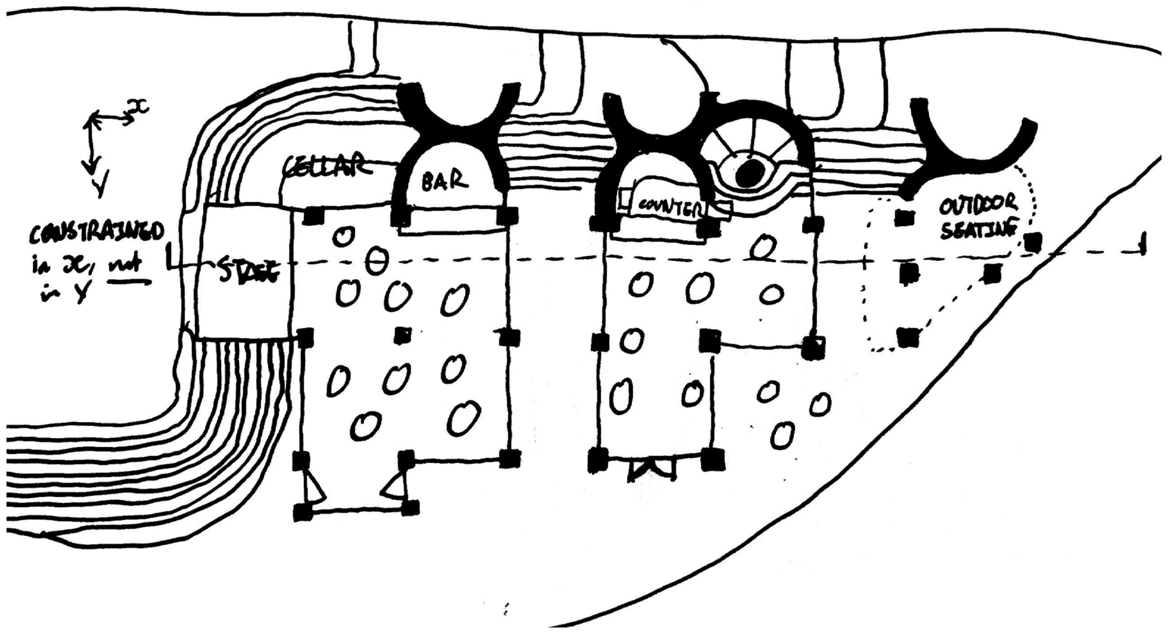


Initial Bubble/Circulation Diagrams

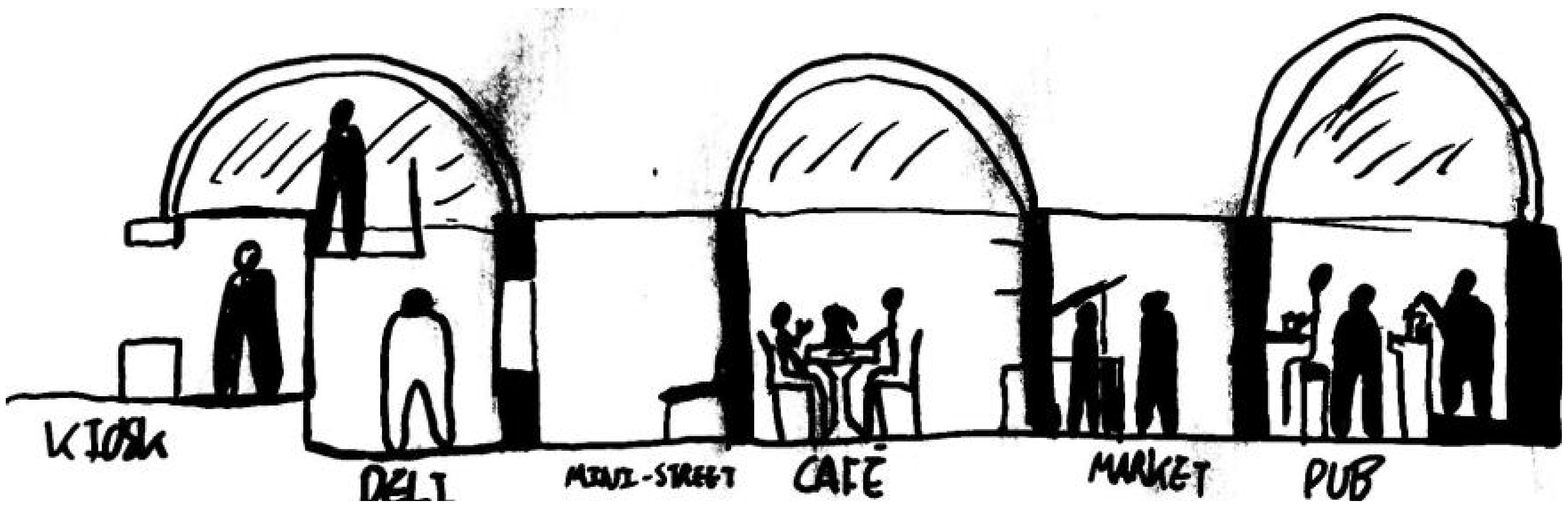




Initial Plan



Initial Section



Material Strategy

Part I
MATERIALS

THE COLOURS
OF THE WYE VALLEY

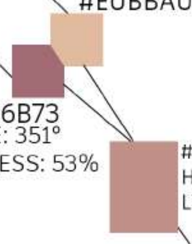
Hue is a measure of a colour's closeness to red, the warmest colour, in degrees on the colour wheel, where red is zero or 360 degrees.

Wye Valley Stone

Carboniferous Limestone

Old Red Sandstone

LIGHTNESS: 75%
HUE: 25°
#E0BBA0



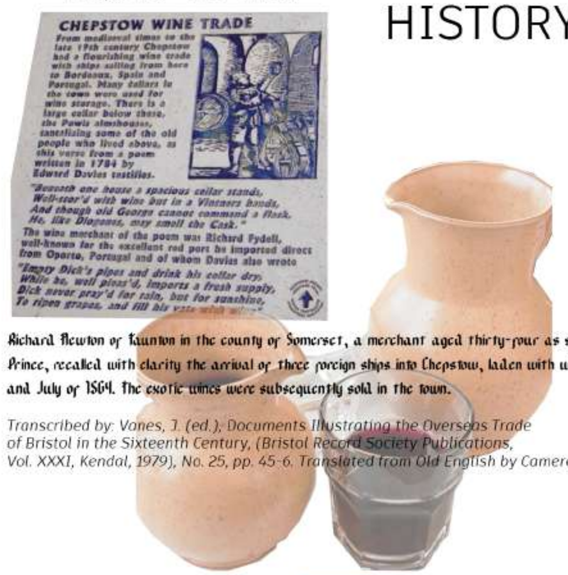
#A26B73
HUE: 351°
LIGHTNESS: 53%

#BF9188
HUE: 9.8°
LIGHTNESS: 64.1%

LIGHTNESS: 51%
HUE: 22.9°
#B9754B

Chepstow Wine Trade

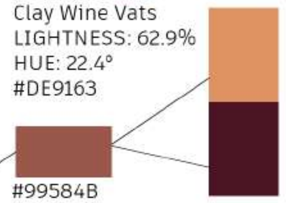
Part II
HISTORY


CHEPSTOW WINE TRADE
From mediaeval times to the late 19th century Chepstow had a flourishing wine trade with ships sailing from here to Bordeaux, Spain and Portugal. Many cellars in the town were used for wine storage. There is a large cellar below these, the Powis almshouses, tantalising some of the old people who lived above, as this verse from a poem written in 1784 by Edward Davies testifies.
"Beneath one house a spacious cellar stands,
Well-stor'd with wine but in a Vintners hands,
And though old George cannot command a flask,
He, like Diogenes, may smell the Cask."
The wine merchant of the poem was Richard Fydell, well-known for the excellent red port he imported direct from Oporto, Portugal and of whom Davies also wrote
"Empty Dick's pipes and drink his cellar dry,
While he, well pleas'd, imports a fresh supply,
Dick never pray'd for rain, but for sunshine,
To ripen grapes, and fill his vats with wine."

Richard Newton of Taunton in the county of Somerset, a merchant aged thirty-four as sworn by the Prince, recalled with clarity the arrival of three foreign ships into Chepstow, laden with wine, between June and July of 1564. The exotic wines were subsequently sold in the town.

Transcribed by: Vanes, J. (ed.), Documents Illustrating the Overseas Trade of Bristol in the Sixteenth Century, (Bristol Record Society Publications, Vol. XXXI, Kendal, 1979), No. 25, pp. 45-6. Translated from Old English by Cameron Linden Green

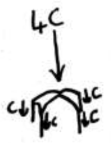
Clay Wine Vats
LIGHTNESS: 62.9%
HUE: 22.4°
#DE9163



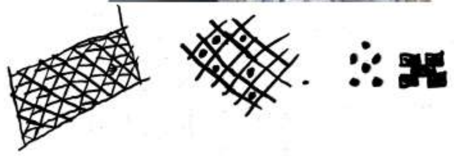
Red Wine
LIGHTNESS: 19%
HUE: 341°
#4D1426

#99584B
LIGHTNESS: 44.7%
HUE: 10°

Chepstow Castle
Mediaeval Wine Cellar



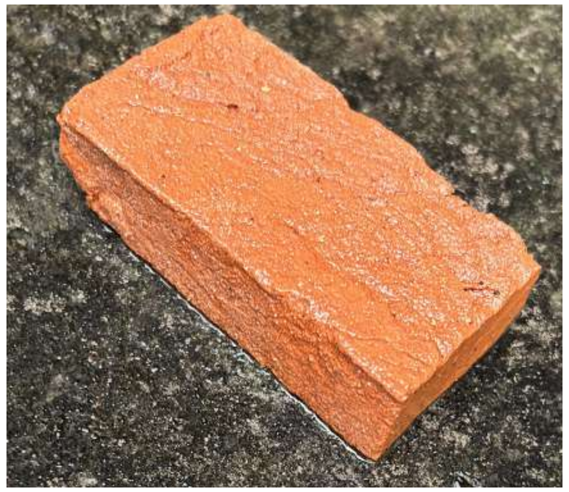
Arches - Eladio Dieste



Porous Brick

Saltó Bus Terminal

Brick is a material that **provides a sense of warmth** beyond paint - which can flake and fade. **The colour is permanent, not ephemeral.**



The colour of brick is made more vibrant by rain - which is common in Chepstow. This brings a further sense of warmth.

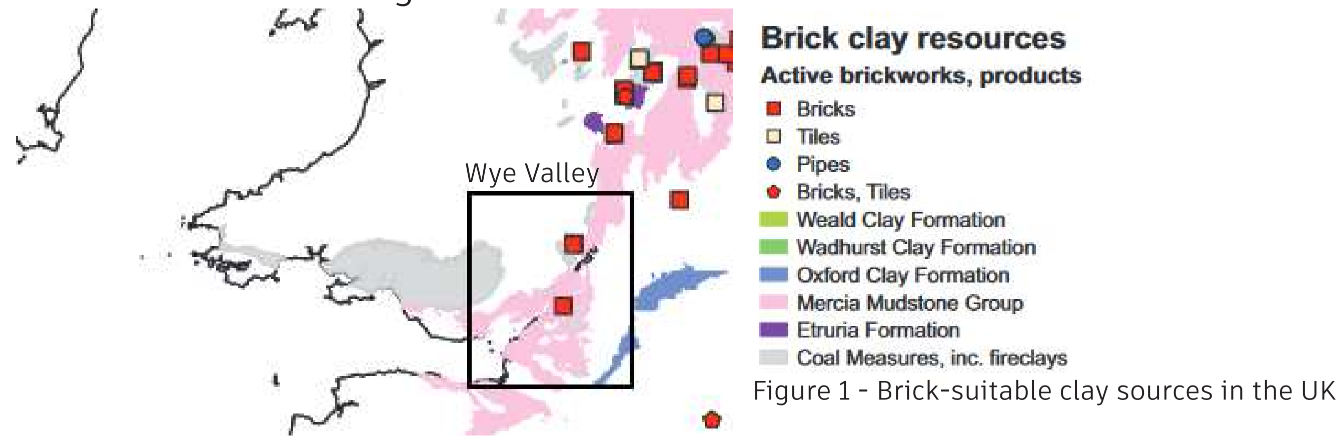
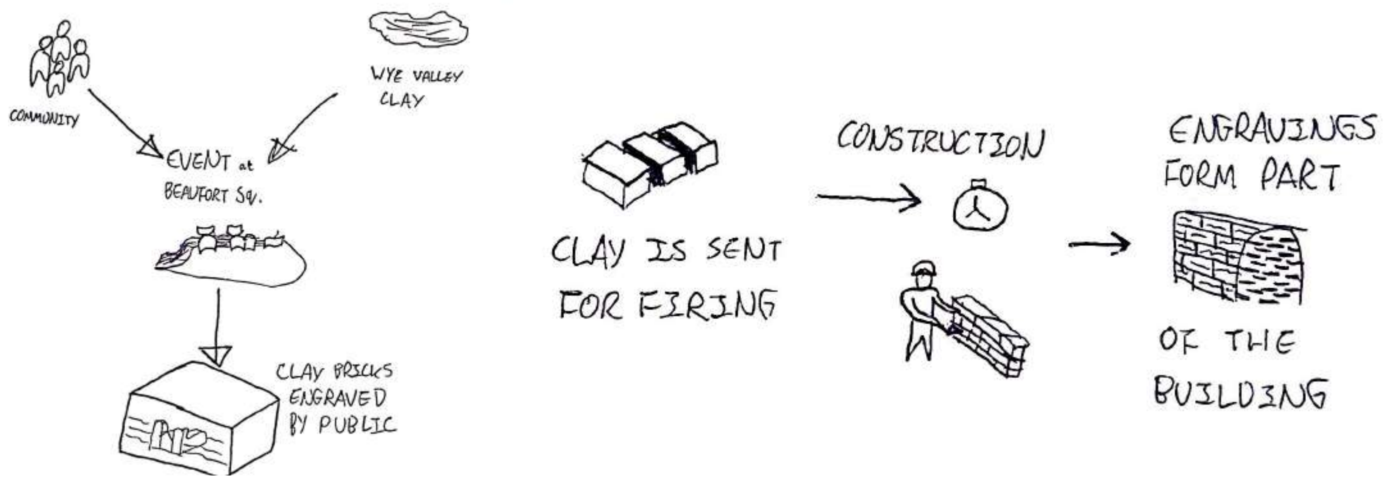


Figure 1 - Brick-suitable clay sources in the UK

UK clay is generally acceptable for use in bricks, including that found in the Wye Valley.



A community aspect can therefore be incorporated - whereby locals to Chepstow engrave designs into the clay before it is sent off to be fired.

1- Information on bricks & their production obtained from https://www2.bgs.ac.uk/mineralsuk/download/planning_factsheets/mpf_brickclay.pdf accessed 2023-03-29
Figure 1 from the same place, p7

AT2 - Materials

AIM - To determine a building fabric that is sustainable, thermally sound, and that overall supercedes regulations and meets the targets set out in the Mission Statement.

Assemblage ratings - BRE Green Guide

Wall - Brickwork, plywood sheathing, insulation between timber framing, plasterboard on battens, brick slips

NB: The roof will have the same construction, in line with the conceptual language.

Overall Rating	Climate Change	Water Extraction	Mineral Extraction	Ozone Depletion	Human Toxicity	Freshwater Toxicity	Land Toxicity	Waste	Fossil Fuels	Kg CO2 equivalent (60yrs)
A+	A+	A+	A+	B	A+	A+	A	A+	A	55.0

Floor - Ceramic mosaic tiles

Overall Rating	Climate Change	Water Extraction	Mineral Extraction	Ozone Depletion	Human Toxicity	Freshwater Toxicity	Land Toxicity	Waste	Fossil Fuels	Kg CO2 equivalent (60yrs)
A+	B	A+	A+	A+	A+	A+	A+	A+	A+	52.0

Hardwood has marginally better sustainability scores, however ceramic tiles match the language of my scheme better - so it is an acceptable compromise to use these instead.

Material Property Analysis

	Bricks	Thermofloc	Plywood	Glulam Timber Frame	Plaster- board (Gyproc Fireline)
Distance from Chepstow	1km	331km	177km	122km	14km
Sustainability	EN 15804 Compliant	‘natureplus’ Certified	PEFC Certified	FSC Certified	Recyclable by manufacturer
Fire Safety	Euroclass A1	Euroclass B-s2d0	Euroclass B	Euroclass D-s2d0	Euroclass A2
Thermal Resistivity (mK/W)	0.752-0.909	26.3	6.67	7.14	4.17
Water Absorption	6%	3%	36.9%	11%	5%

*See Brickwork for properties of brick slips attached to plasterboard.

1- Brickwork information sourced from https://www.wickes.co.uk/Marshalls-Red-Perforated-Engineering-Brick---215-x-100-x-65mm/p/252223 accessed 2023-03-28
2- Thermofloc information sourced from https://www.thermofloc.com/en accessed 2023-03-28
3- Plywood information sourced from https://www.fraserstimber.com/products/sheet-materials/plywood/fire-retardant/1220-x-2440mm-luminfirepro-euro-class-b-eucalyptus-plywood-detail.html accessed 2023-03-28
4- Glulam information sourced from https://www.bucklandtimber.co.uk/ accessed 2023-03-28
5- Plaster information sourced from https://www.british-gypsum.com/products/board-products/gyproc-fireline-125mm#documents accessed 2023-03-28
6- Glass information sourced from https://www.kjmgroup.co.uk/products/windows/triple-glazing accessed 2023-03-28

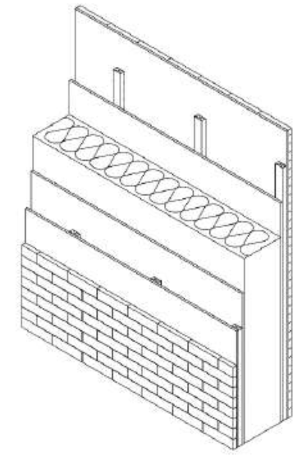
U-values (Initial Assemblages)

APPROVED DOCUMENT L2 - SPECIFICATIONS:

Wall - 0.26 W/m2K
Floor - 0.22 W/m2K
Roof - 0.2 W/m2K
Window - 1.6 W/m2K

Wall & Roof - MUST BE BELOW 0.2W/m2K

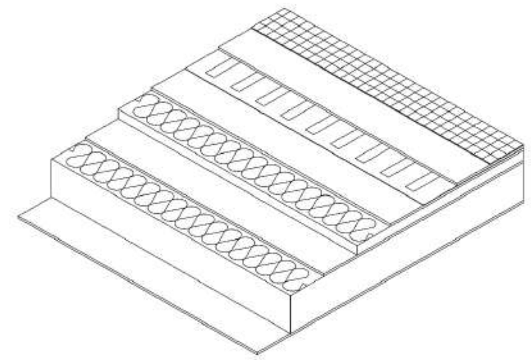
Material	Resistivity	Thickness (mm)	R-value (m2K/W)
Outside Air Layer	-	-	0.12
Brickwork	0.752	102.5	0.077
Vapour Control Layer	0	-	0
Plywood Sheathing	6.67	12	0.08
Thermofloc	26.3	50	1.32
Plywood Sheathing	6.67	12	0.08
Thermofloc	26.3	150	3.95
Plywood Sheathing	6.67	12	0.08
Battens	0.038	25	0.001
Plasterboard	4.17	12	0.05
Brick Slips	0.909	25	0.023
TOTAL	N/A	400.5	5.78



INITIAL U-VALUE = 0.173W/m2K
FINAL U-VALUE = 0.125W/m2K*

Floor

Material	Resistivity	Thickness (mm)	R-value (m2K/W)
Outside Air Layer	-	-	0.12
Ceramic Tiles	0.00625	4	0
Chipboard Deck	0.106	12	0.001
Underfloor Heat Mat	N/A	2	0
Plywood Sheathing	6.67	12	0.08
Thermofloc	26.3	50	1.32
Plywood Sheathing	6.67	12	0.08
Thermofloc	26.3	200	5.28
Plywood Sheathing	6.67	12	0.08
TOTAL	N/A	304	6.96



U-VALUE = 0.137W/m2K

Window

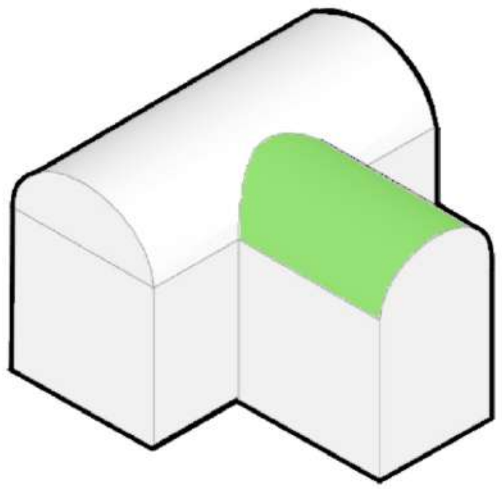
Chosen window-
KJM Group 44mm Triple Glazing

U-VALUE = 0.50 W/m2K

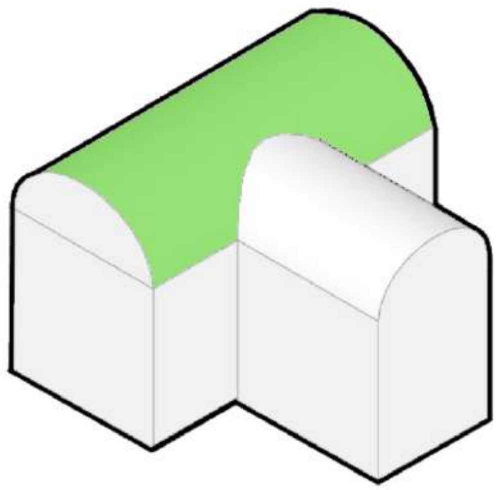
***CHANGES:**
- I have substituted Thermofloc for Sheeps Wool - it can be sourced locally, has higher sustainability credentials, and a better thermal resistivity value. This will bring down the U-value to meet the RIBA 2025 challenge, and improve my building’s sustainability.

STRATEGY- Space, Place and Volume

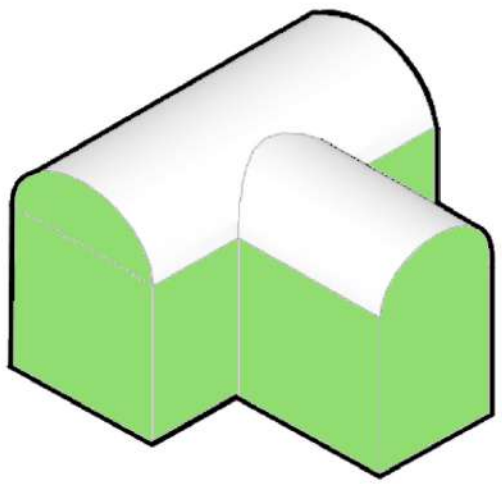
X defines PLACE

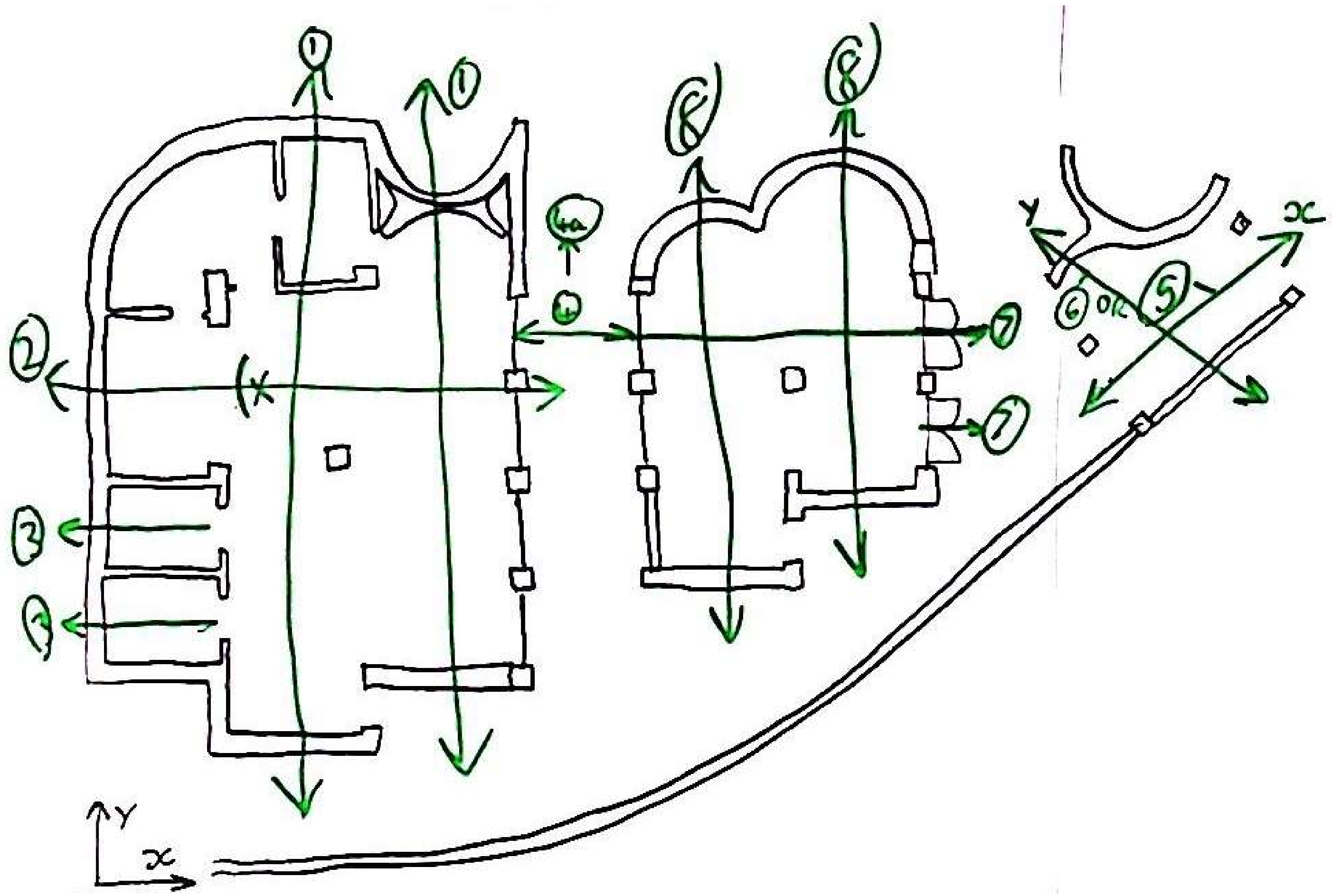


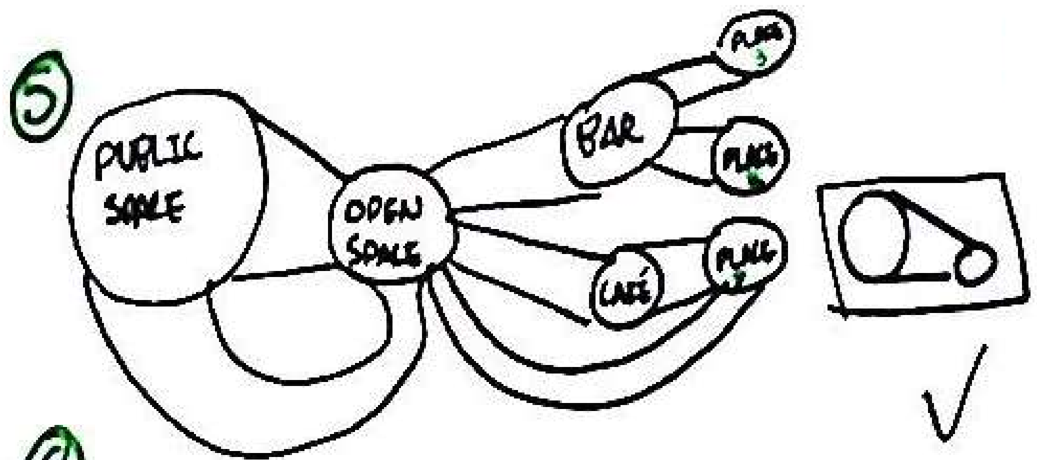
Y defines SPACE

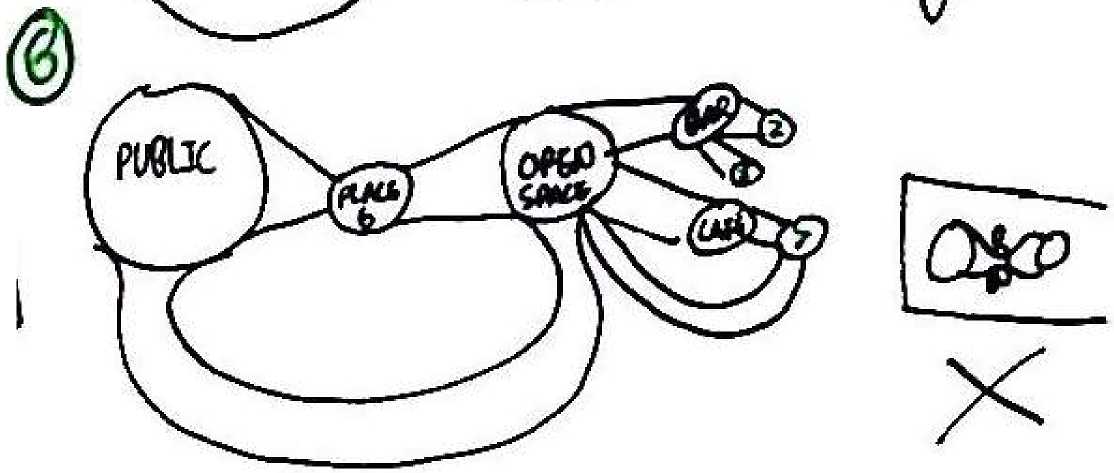


Z defines VOLUME

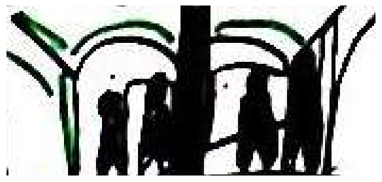




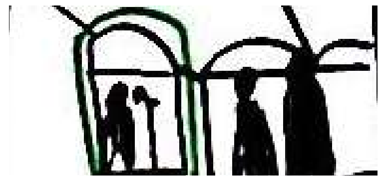




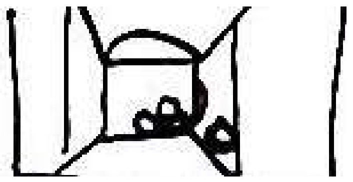
1. SPACE (Bar)



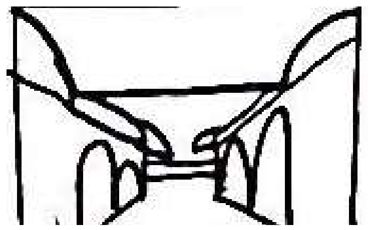
2. PLACE (Stage)



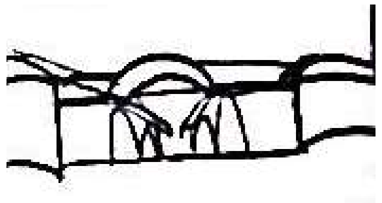
3. PLACE (Toilet)



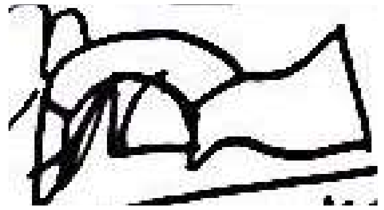
4. PLACE (Entry)



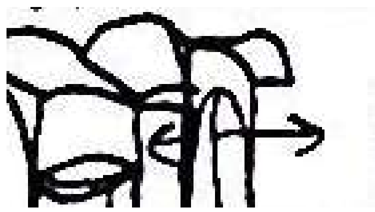
4a. SPACE (Entry)



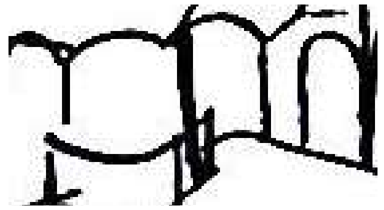
6. SPACE (Entry)



7. PUBLIC-SEMI PRIVATE THRESHOLD



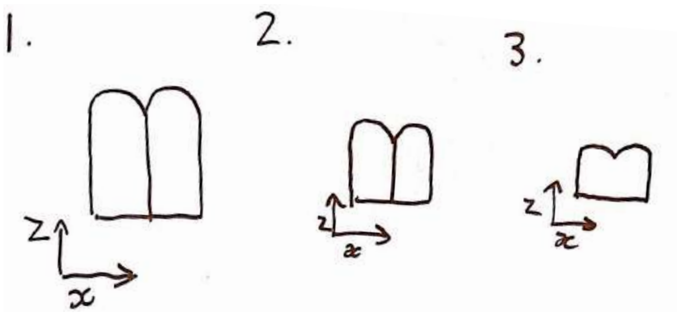
8. SPACE (Café)

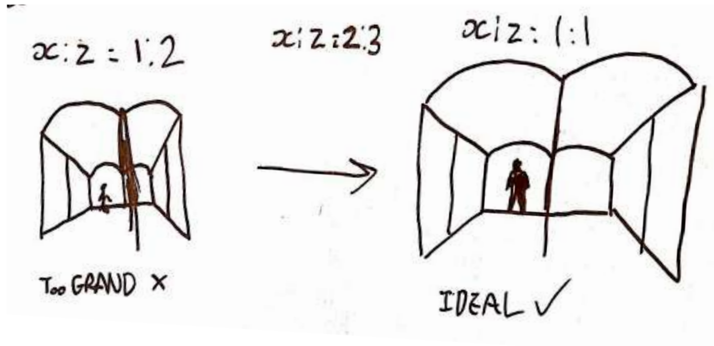


To enhance the experience of my project, I have adopted an approach with the barrel vaults that involves, in plan, two major axes - X defines a specific place or event, Y defines a larger, unified and more general space.

Places such as the east entrance could have arguably been either, so for these I studied the hierarchy of places to decide.

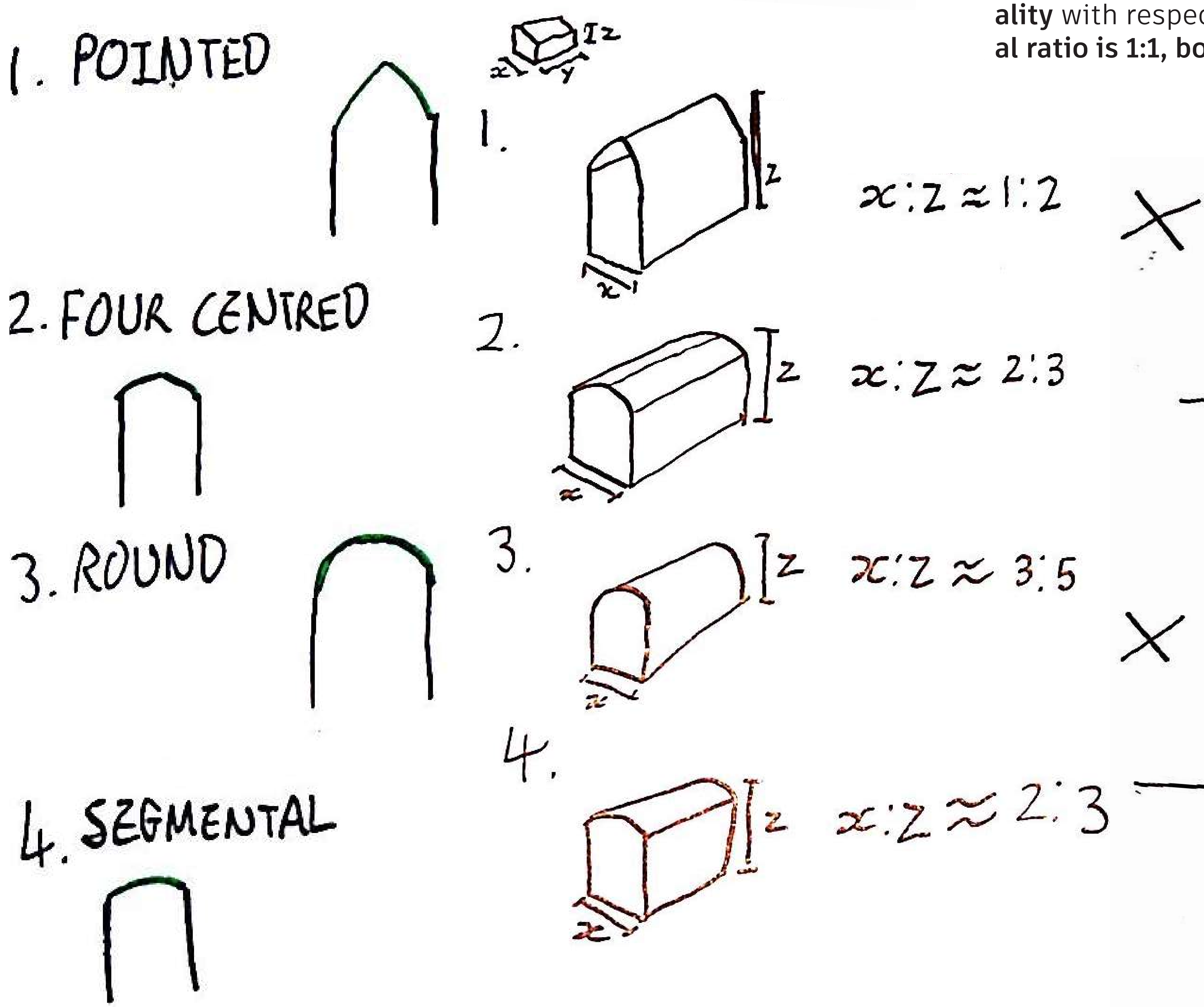
STRATEGY- Volume, Roof heights & Arch shapes

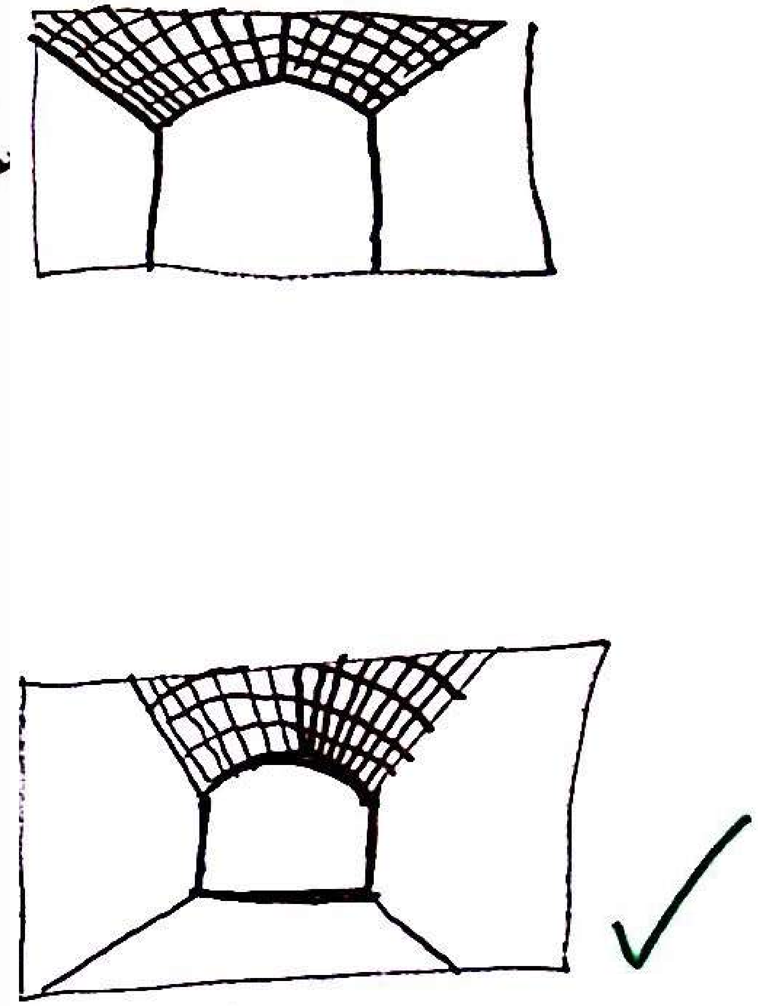




Much of the experience of my scheme will be **defined by its' volume and three-dimensional form -** and my goal is to **match the language of a wine cellar** as close as possible.

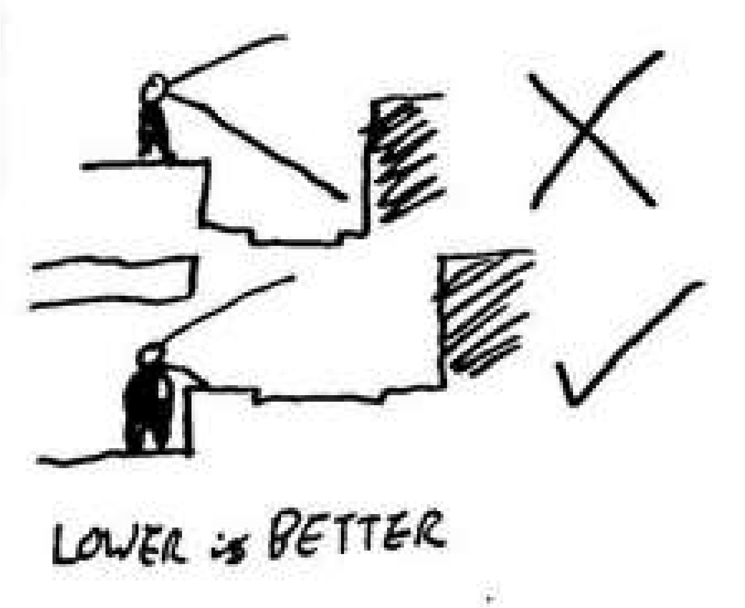
To enhance my space, I studied a **range of arch forms,** and their **proportionality** with respect to the **X and Z axes. To resemble my intent closely, the ideal ratio is 1:1, both for X:Z overall and X:Z in the shape of the arch.**





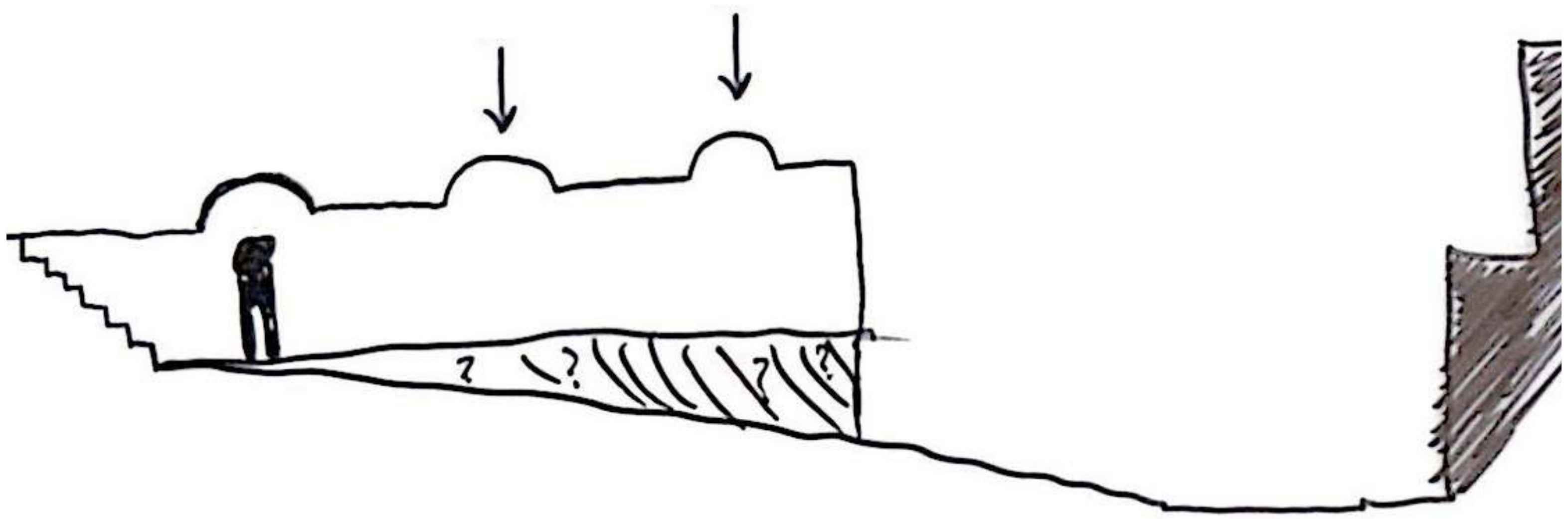
The smoother and lower form is best for my design intent - and so the segmental arch style will be the one I employ.

STRATEGY- Thresholds, Scheme Elevation and Space Requirements

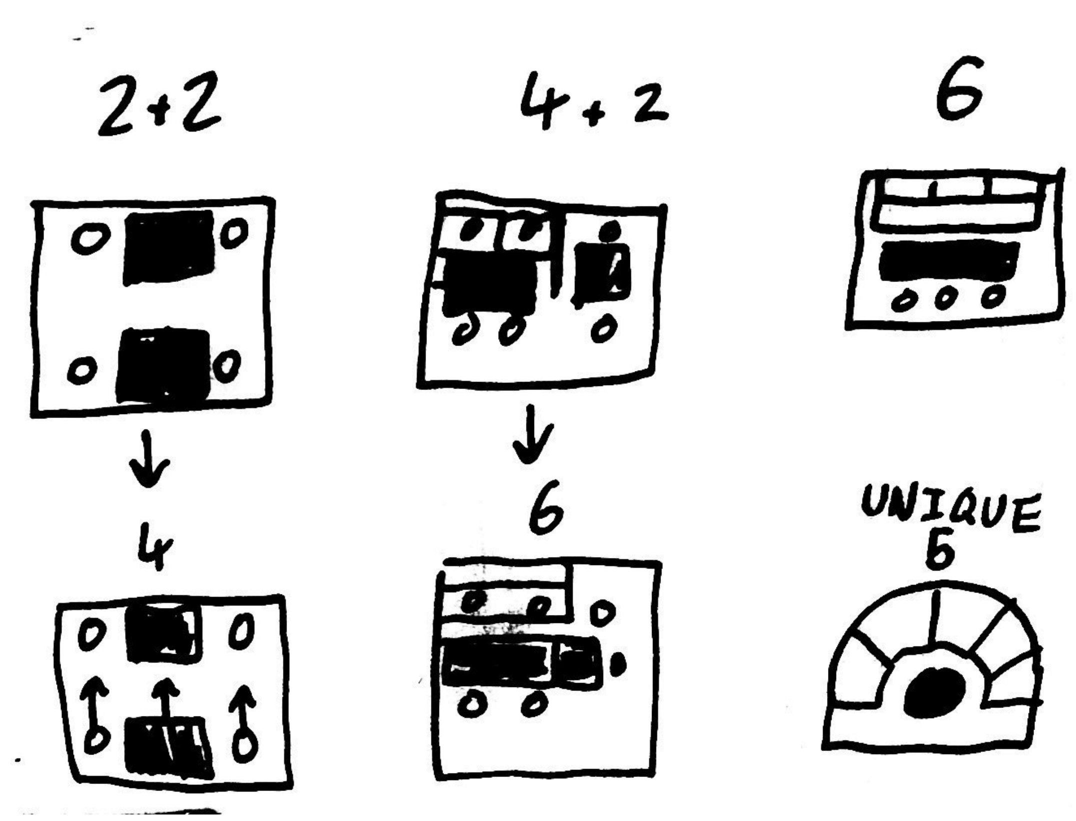


To improve the wine cellar language in my design, the lower my design went in long section, the better. This led to me designing in section further, to introduce more of a gradient to my project. To inform this, I used Approved Document M (see page 16).

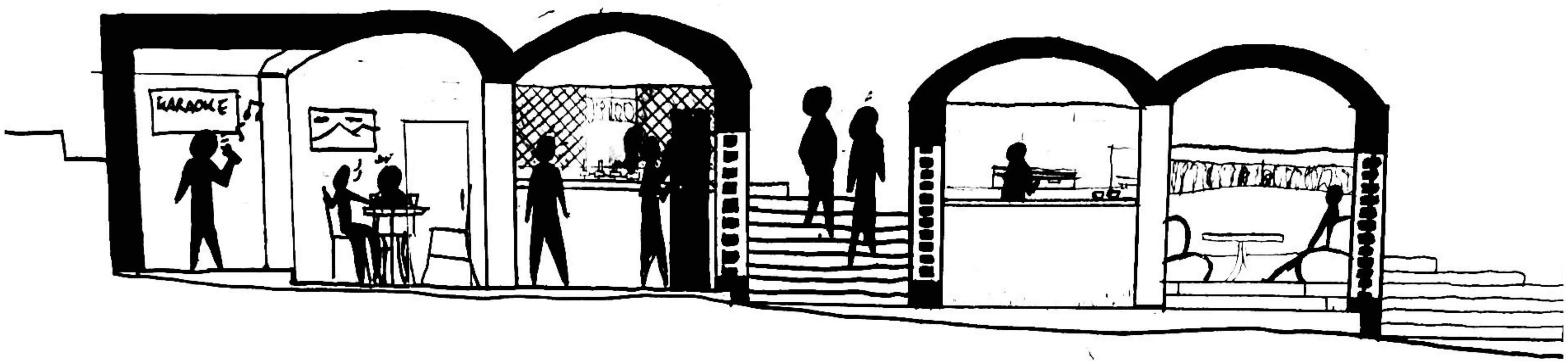
The user, as they enter my project, goes through gradually tightening thresholds - down to each individual cell of the grid, dictated by the existing curves on site.



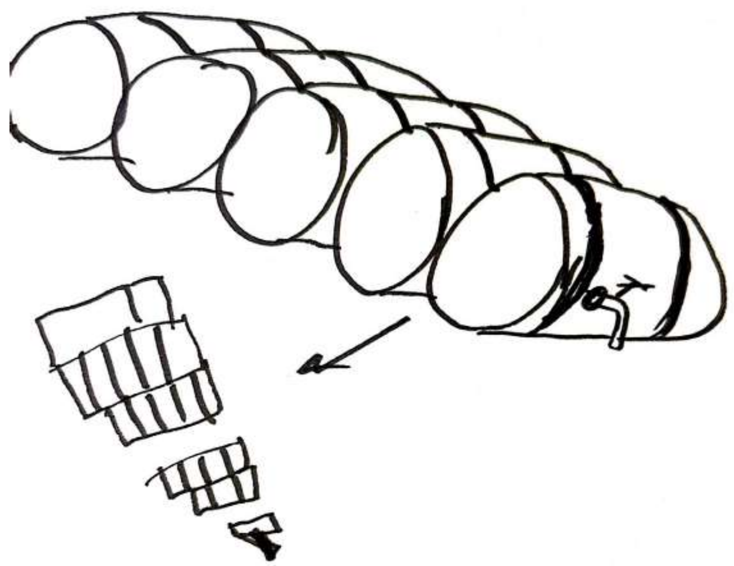
Each cell can contain the following table arrangements:



Revised Section

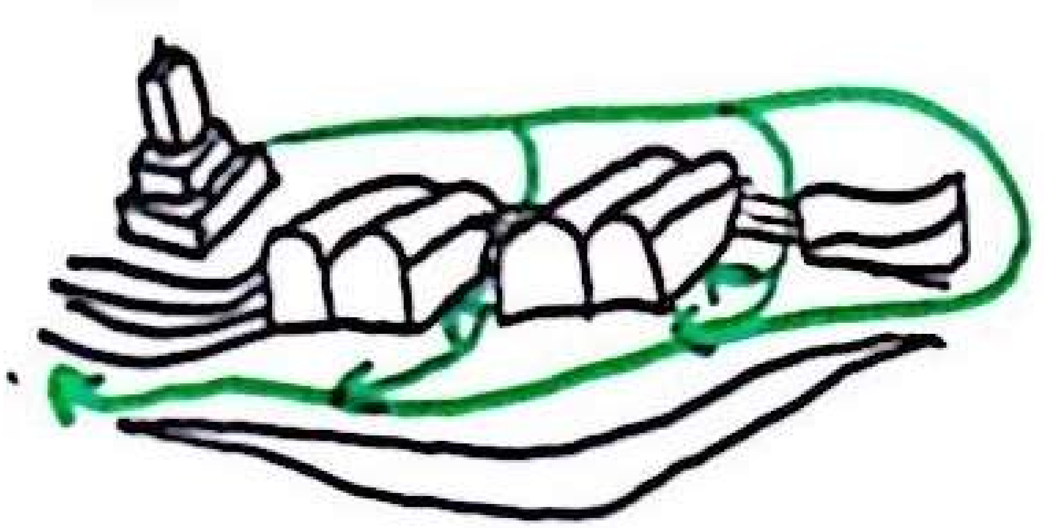


Massing Concept Sketch

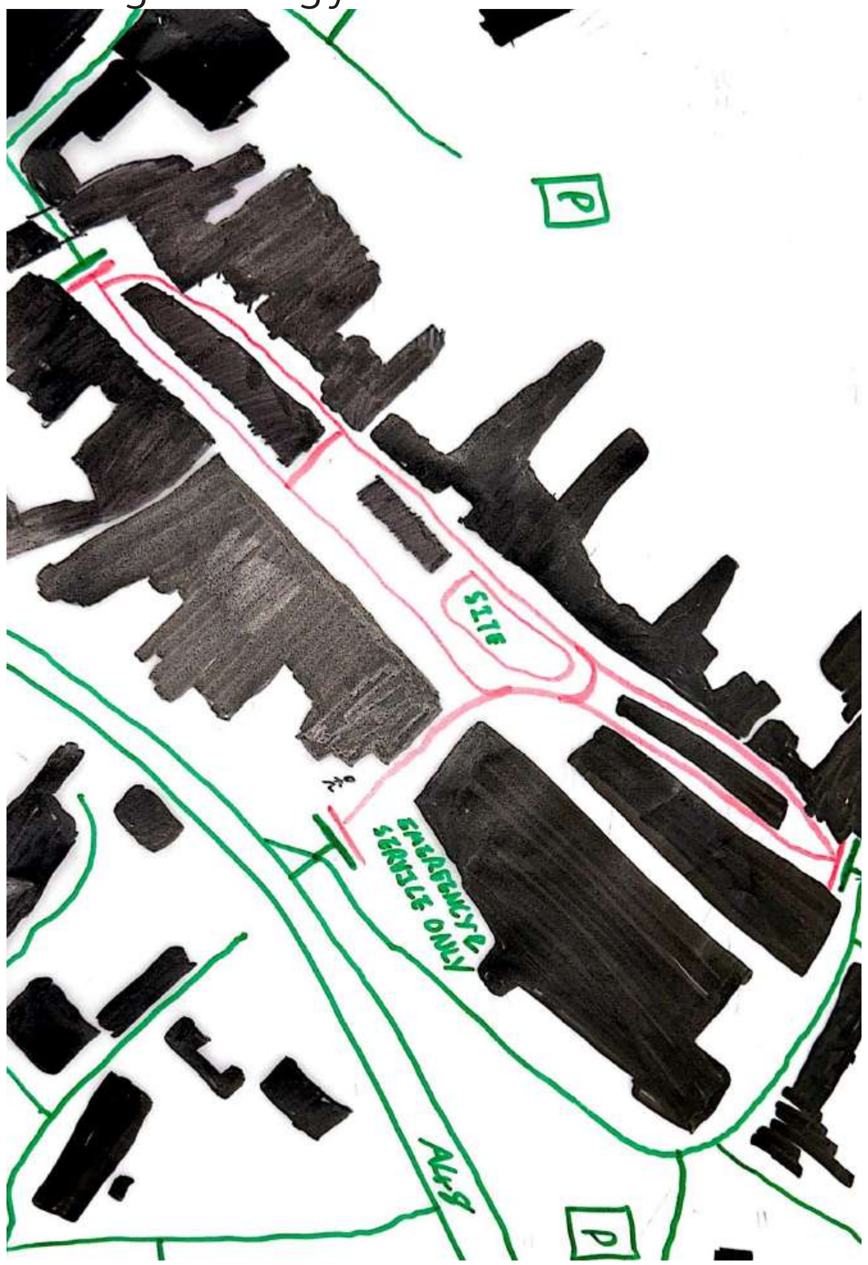


STRATEGY- Circulation and Initial Sketches

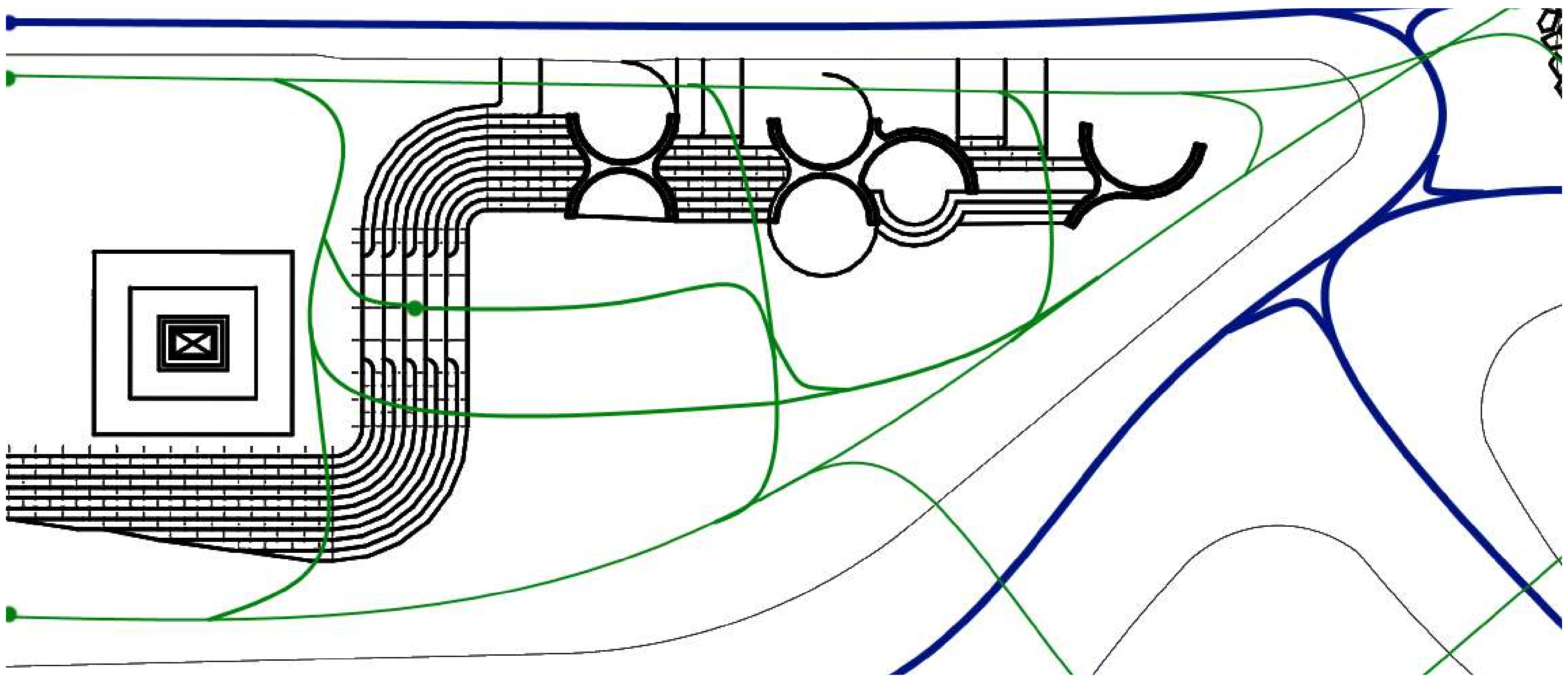
Circulation - Rough Strategy



Road closing strategy

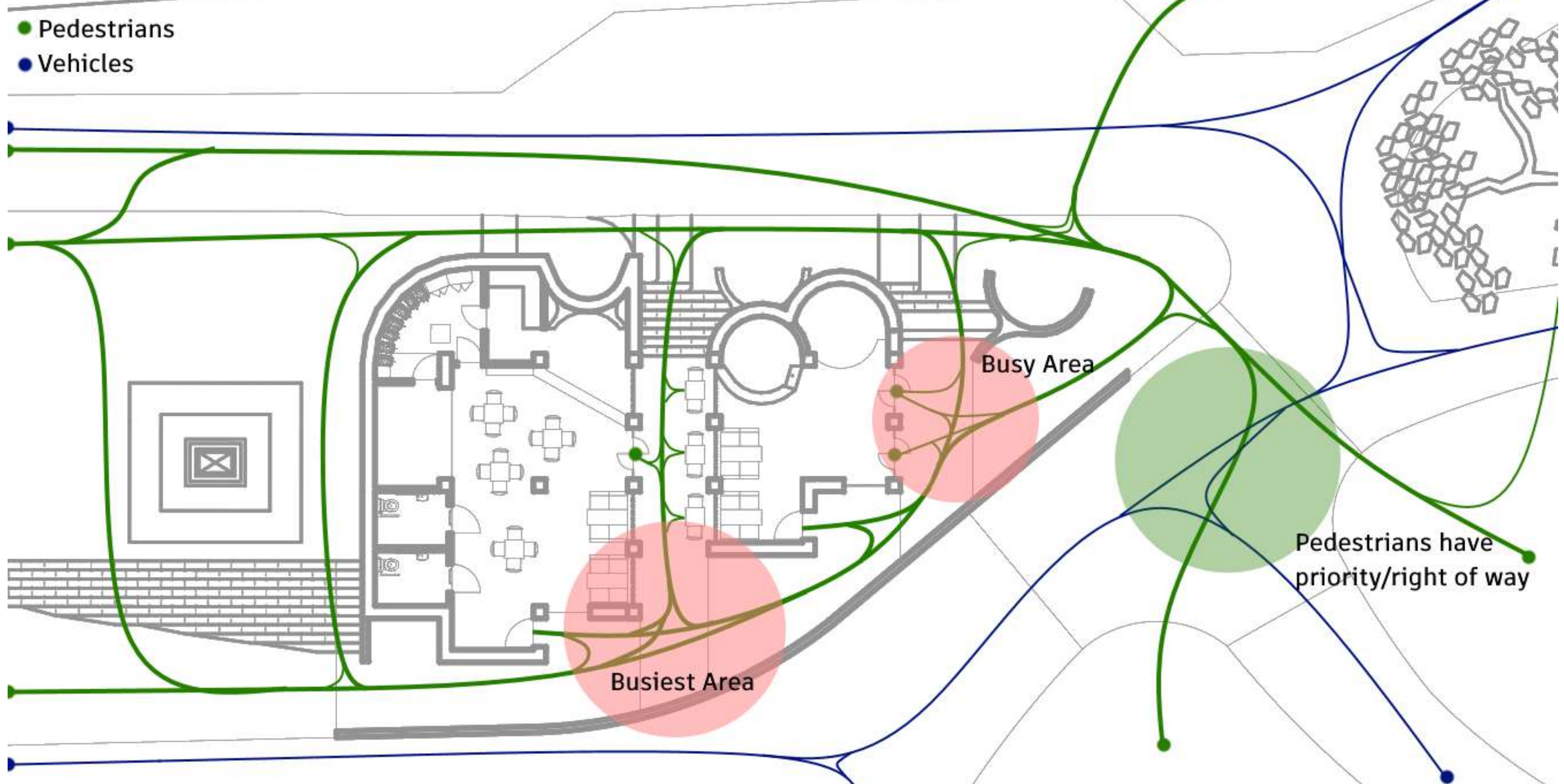


EXTERNAL CIRCULATION - CURRENT SITUATION



Currently, the square exists **solely as a thoroughfare**, and is **seldom ever busy**. There is **little sense of focus or community**, and there is no sense of it contributing to Chepstow.

EXTERNAL CIRCULATION - PROPOSAL



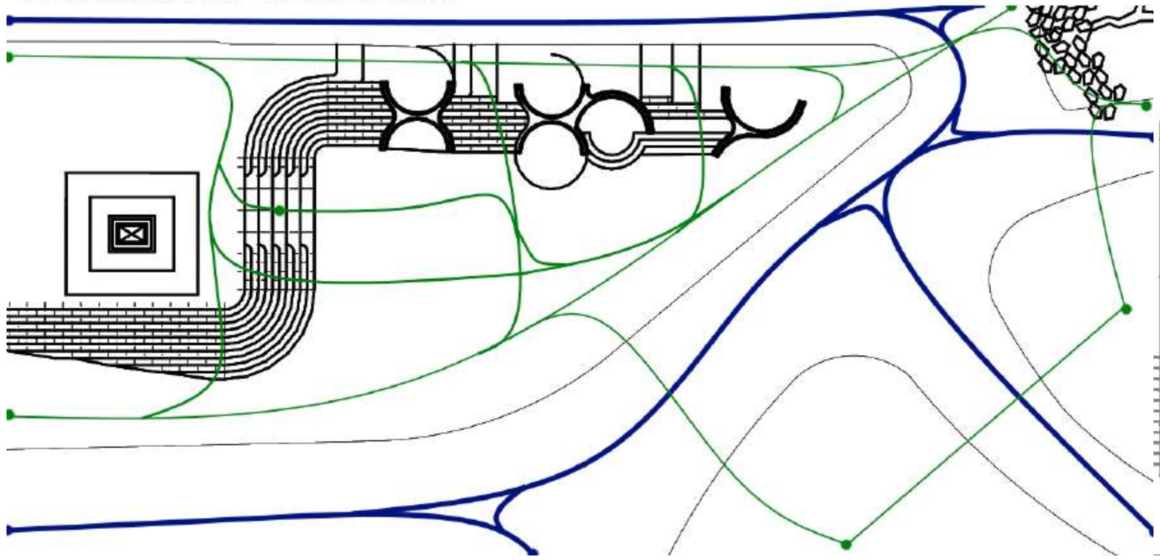
Through the **creation of focal points** for circulation as well as **implementing food/drink** and **restricting traffic**, there is a **greater sense of connection** to Chepstow, and that my **scheme is a focus for the town.**

AT2 - Space planning, circulation, accessibility

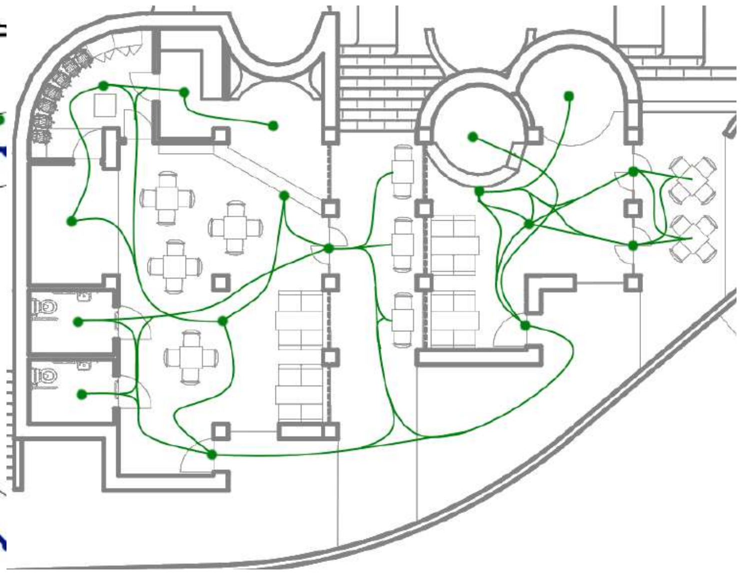
AIM - To create logically planned spaces that match and enhance the design narrative, while satisfying all concerned regulations

Circulation

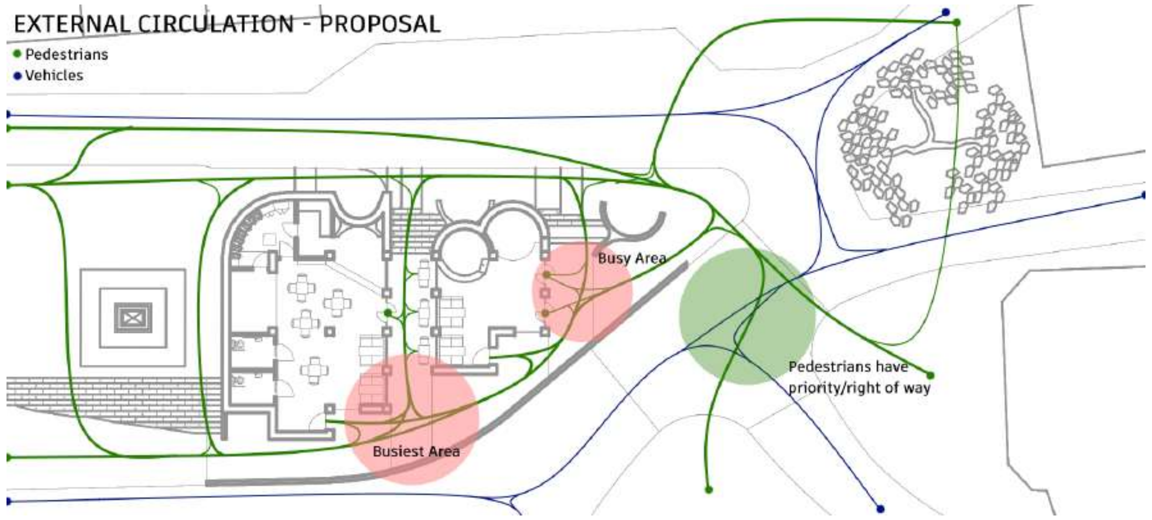
EXTERNAL CIRCULATION - CURRENT SITUATION



INTERNAL CIRCULATION - PROPOSAL



EXTERNAL CIRCULATION - PROPOSAL



Ramp Gradients in Scheme

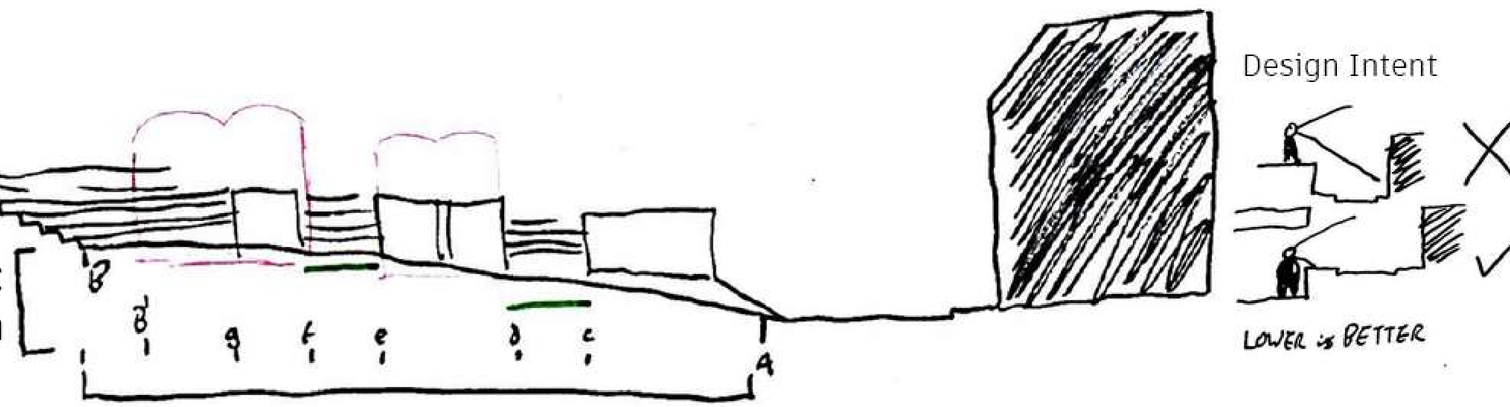
AIMS: Satisfy Approved Document M, Vol. 2, Page 19

Match design intent

Ramped Zones:	Flat Zones:	For a going of:	The gradient must be:	So the rise is:
A-c = 4.92m	c-d = 2.31m	4.92m	1:14	351mm
d-e = 6.12m	e-f = 2.17m	6.12m	1:16	383mm
f-B = 9.68m		9.68m	1:19	509mm

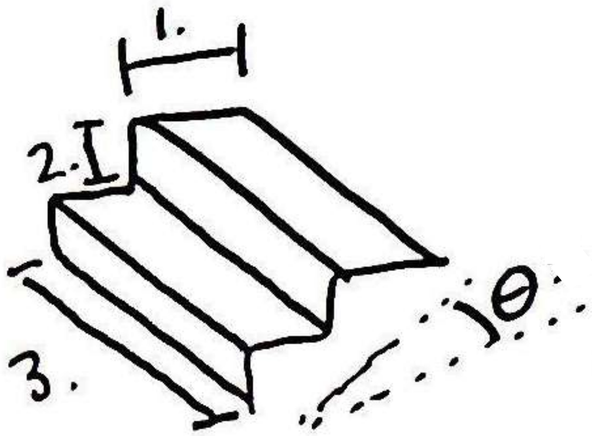
There is a small difference (30mm) between the ramp elevation change and the natural elevation change - however, this is negligible and can be negotiated by increasing the length of ramp f-B to meet the pavement.

Elevation Change: 1.27m



Existing Stairs on Site

AIM: Satisfy Approved Document M, Vol. 2, Page 22

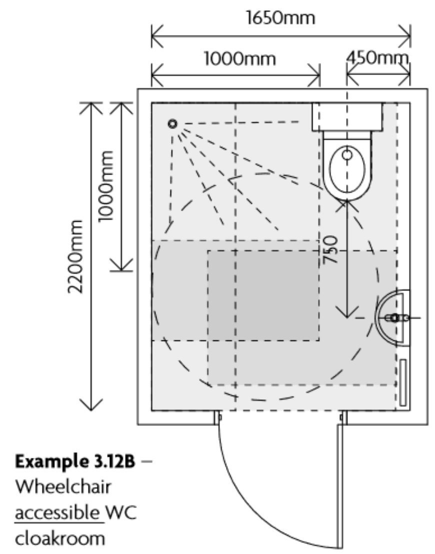


$$\theta_1 = \tan^{-1}\left(\frac{165}{290}\right) \approx 29.6°$$

	Approved Document M	Existing	Compliant?
1. Going	280-425mm	290mm	✓
2. Riser	150-170mm	165mm	✓
3. Width	+1200mm	+2200mm	✓
Θ. Angle	19.4-31.3°	29.6°	✓

Toilets - Requirements for accessibility

AIM: Satisfy Approved Document M, Vol. 1, Page 44



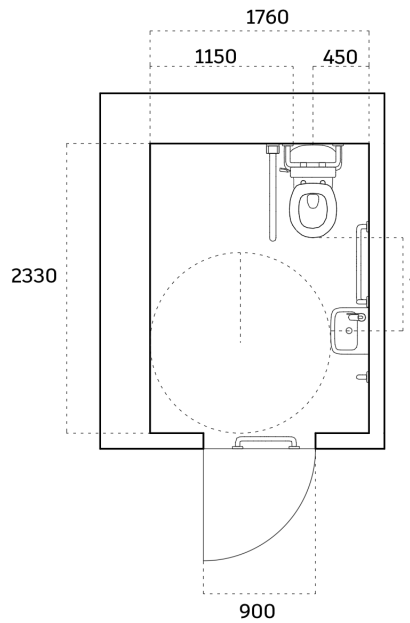


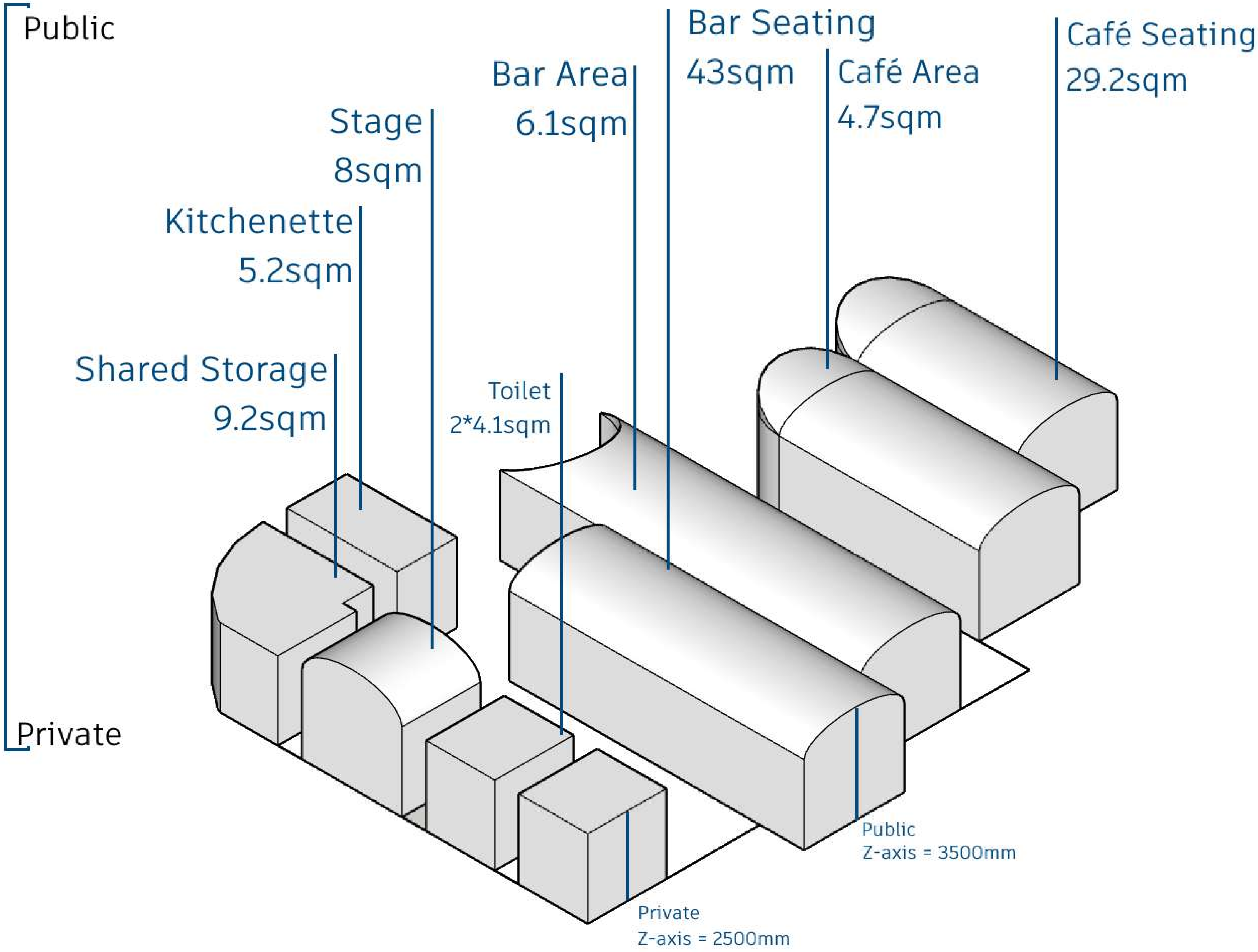
Figure 2 - ADM standard for wheelchair accessible bathrooms

1- Approved Document M, Volume 2, p19, 22
2- Approved Document M, Volume 1, p44 (Figure 2 from Example 3.12B p44)

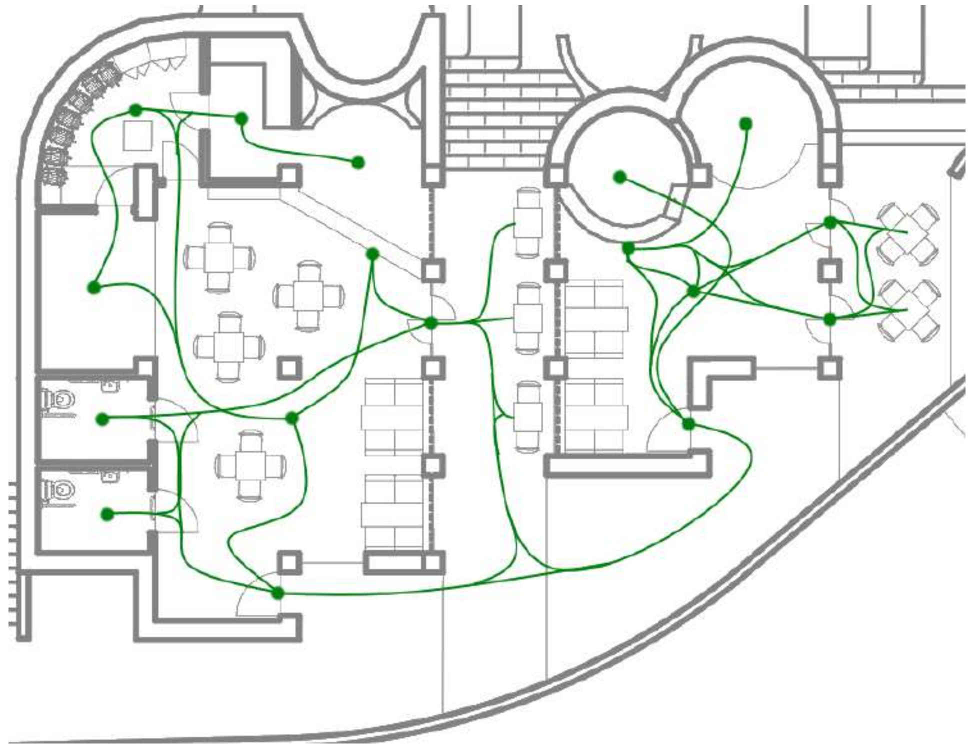
Schedule of Accommodation

To separate the more public and more private zones, I will employ the Z-axis, or sense of volume.

Private areas will not feature barrel vaults and will instead feature a more intimate atmosphere to emphasise the threshold.



Internal Circulation diagram



Maximum Occupancies

Space	Area (m2)	Max. Occupancy (Seated/Standing)
1a- Bar (Staff)	6.1	2
1b- Bar (Public)	43 (of which 16.2 is seated)	60 (26/34)
2- Kitchenette	5.2	1
3- Storage	9.2	3
4- Accessible WC	4.1	1 (2 total)
5- Stage	8	4
BAR TOTAL	75.6	70
6- Café (Staff)	4.7	2
7- Café (Public)	29.2 (of which 12.6 is seated)	41 (26/15)
CAFÉ TOTAL	33.9	43

AT2 - Fire Safety

AIM - To comply with Approved Document B (2020 amendments, Wales)

APPROVED DOCUMENT B KEY REQUIREMENTS

-The width of the escape route and exit must be >750mm when occupancy is <60. For >60, the minimum is 850mm.[1]

-For >60 occupants, 2 exits are required. Otherwise, one is sufficient.[2]

-The travel distance to the exit must be >18 metres.[3]

-Access must be provided to emergency vehicles within 45 metres of the build-ing.[4]

UNIT CLASSIFICATIONS & OCCUPANCIES

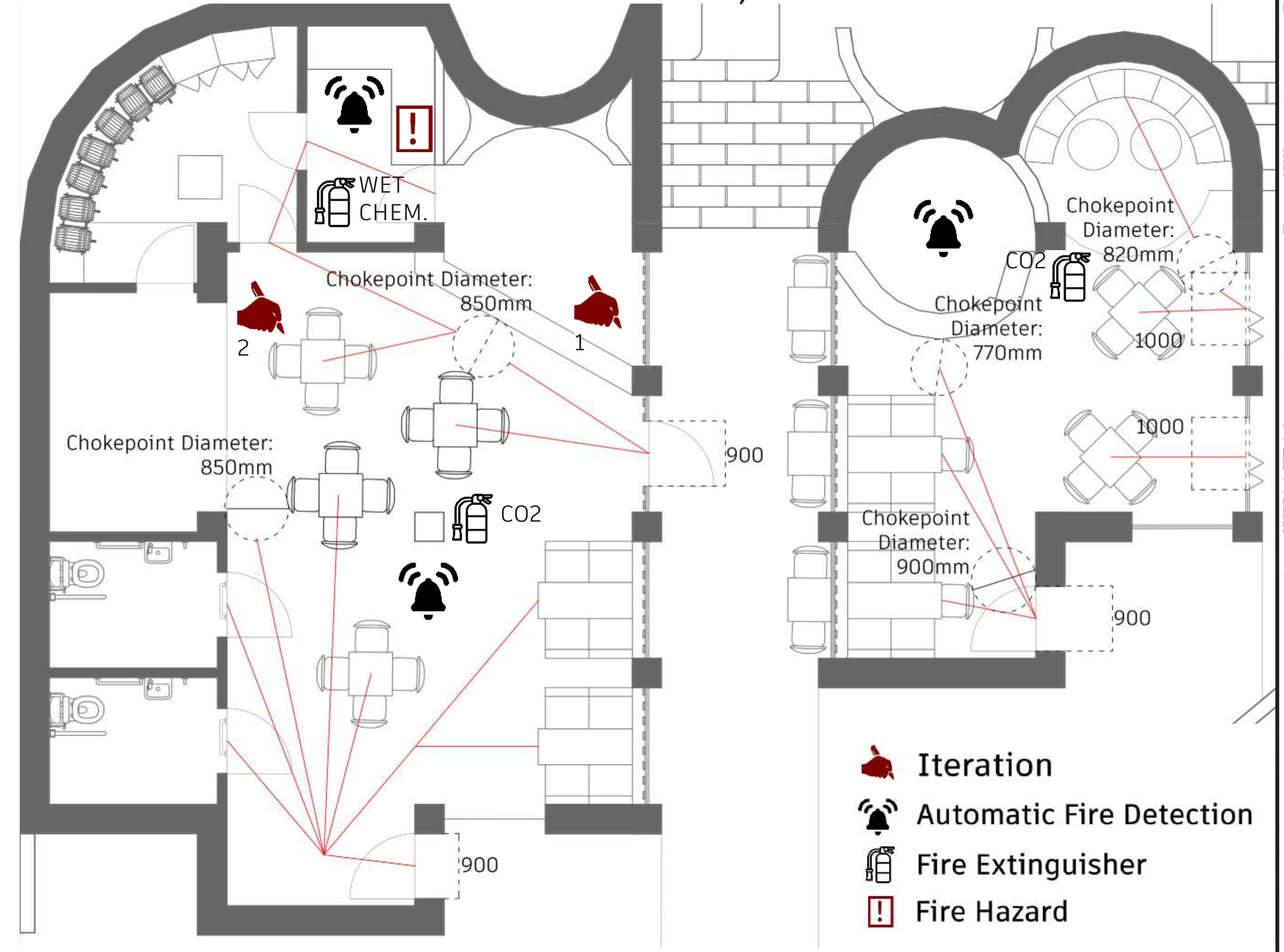
Purpose Group: 4 (Commercial & Retail: Bar and Café)

Space	Area (m2)	Max. Occupancy (Seated/Standing)
1a- Bar (Staff)	6.1	2
1b- Bar (Public)	43 (of which 16.2 is seated)	60 (26/34)
2- Kitchenette	5.2	1
3- Storage	9.2	3
4- Accessible WC	4.1	1 (2 total)
5- Stage	8	4
BAR TOTAL	75.6	70
6- Café (Staff)	4.7	2
7- Café (Public)	29.2 (of which 12.6 is seated)	41 (26/15)
CAFÉ TOTAL	33.9	43

Subcategory of Space 1b	Area (m2)	Occupancy (per ADB Table C1)
Seated	16.2	26
Serving	3	10
Gen. Standing	23.8	24

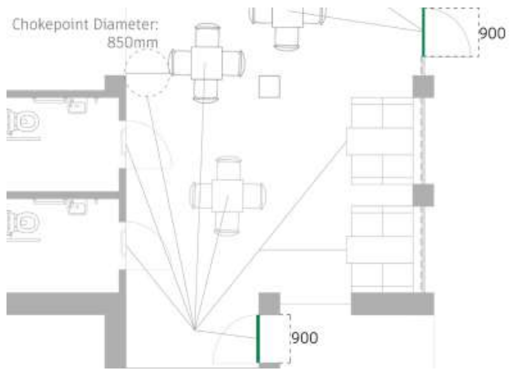
Subcategory of Space 7	Area (m2)	Occupancy (per ADB Table C1)
Seated	12.6	26
Serving	4.4	15

PLAN WITH ESCAPE ROUTES & CHOKEPOINTS, 1:150

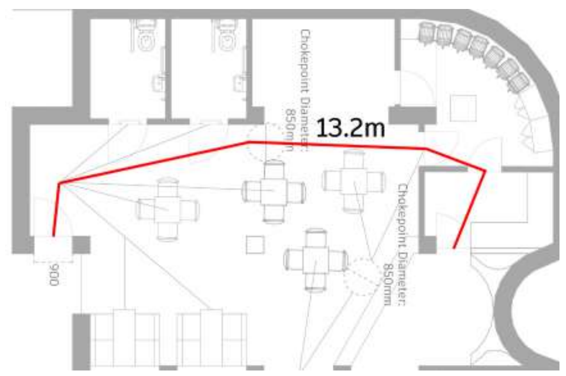


FIRE SAFETY MEASURES IMPLEMENTED

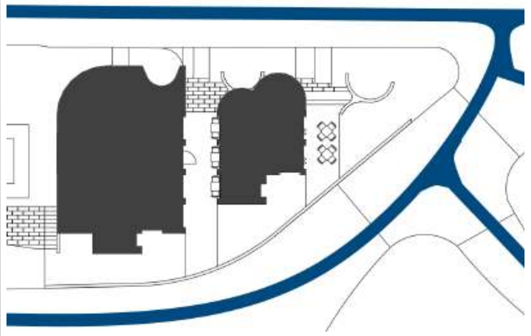
-2 exits of 900mm are provided for the bar, so there is adequate escape room if one exit is unavailable.



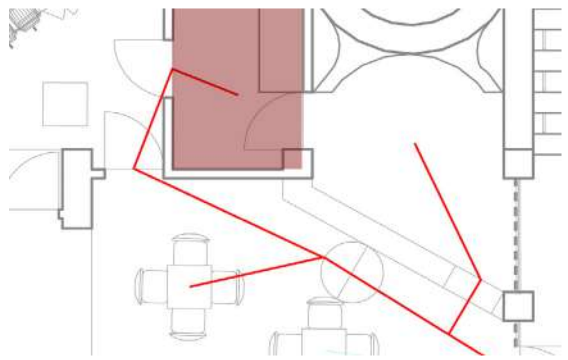
-The highest escape distance possible is 13.2 metres.



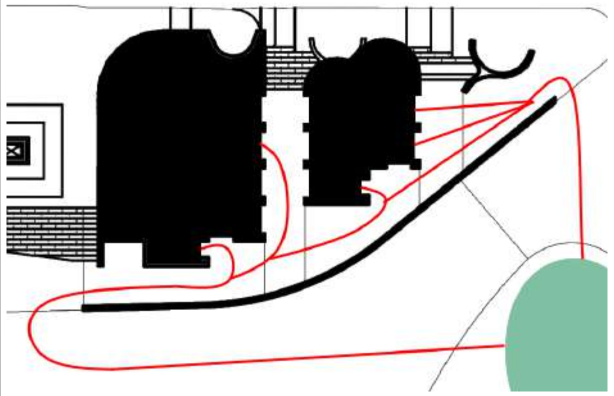
-Public roads flank the building on either side, allowing for emergency vehicle access.



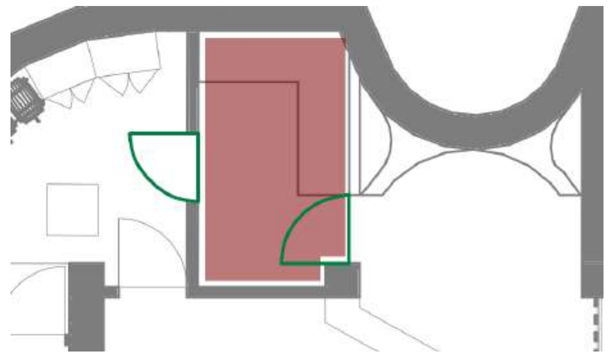
-Exits do not lead through hazard areas such as the kitchen.



-Escape from the building's fabric entirely is accessible, and assembly points are situated at a safe distance.



-The area with the biggest fire hazard, the kitchenette, is behind fire doors.



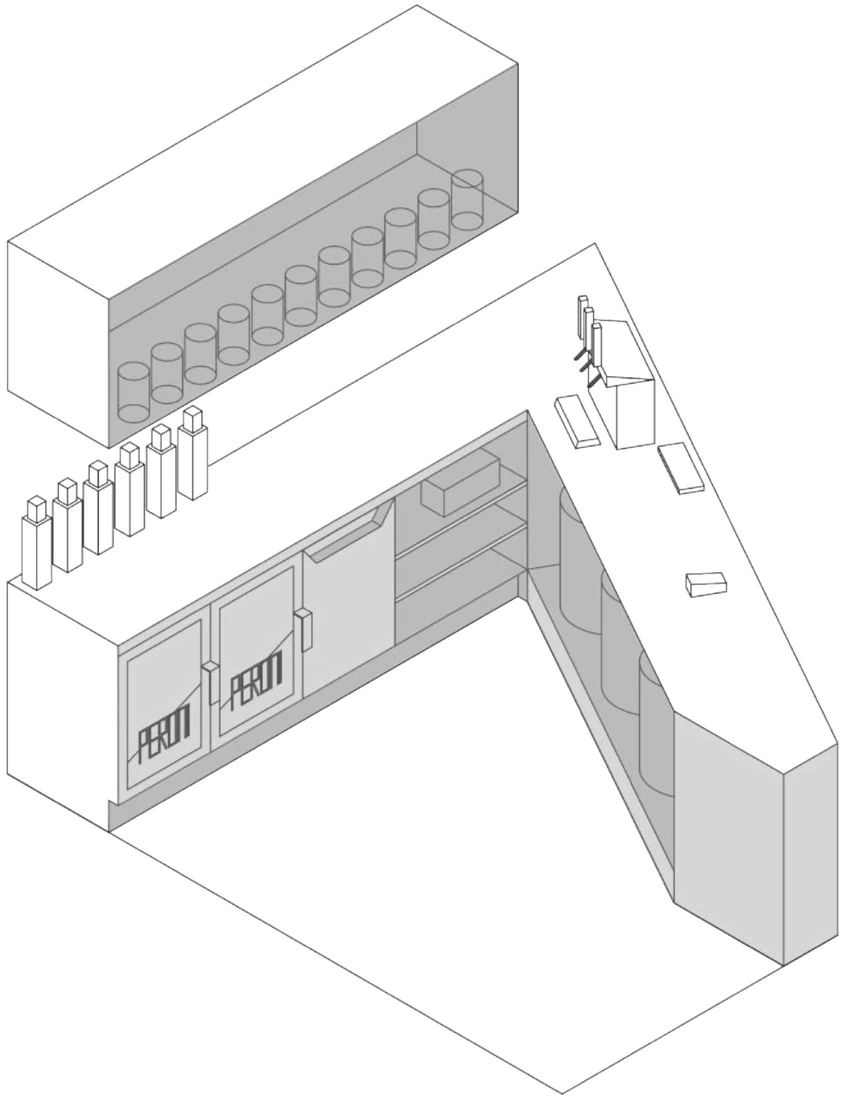
ITERATIONS-

1. To ensure safe escape, a door has been added to the bar to eliminate a dead end.
2. The table has been moved to the right to ensure all chokepoints are over 850mm.

1- Approved Document B Volume 2 2020 (Wales), Table 4, p59
2- Ibid, Table 3, p55
3- Ibid,
4-Ibid, Paragraph 17.2b p. 178

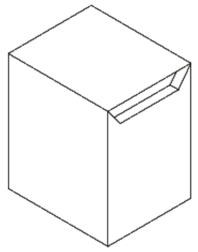
Process - Café and Bar

Bar

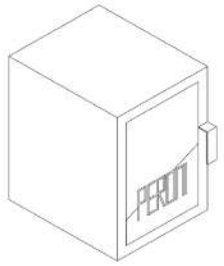


Equipment:

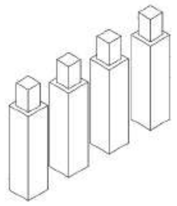
1. Dishwasher



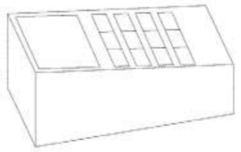
2. Drink Fridge



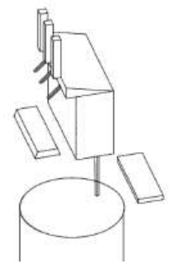
3. Assorted Spirits



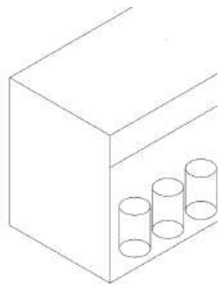
4. Point of Sale

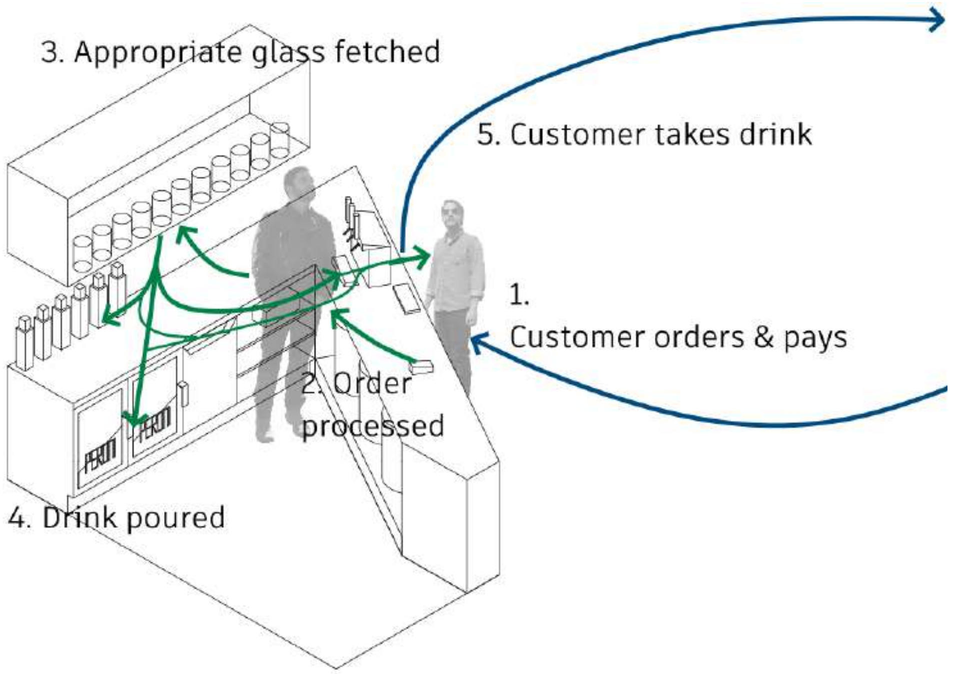


5. Taps & Kegs

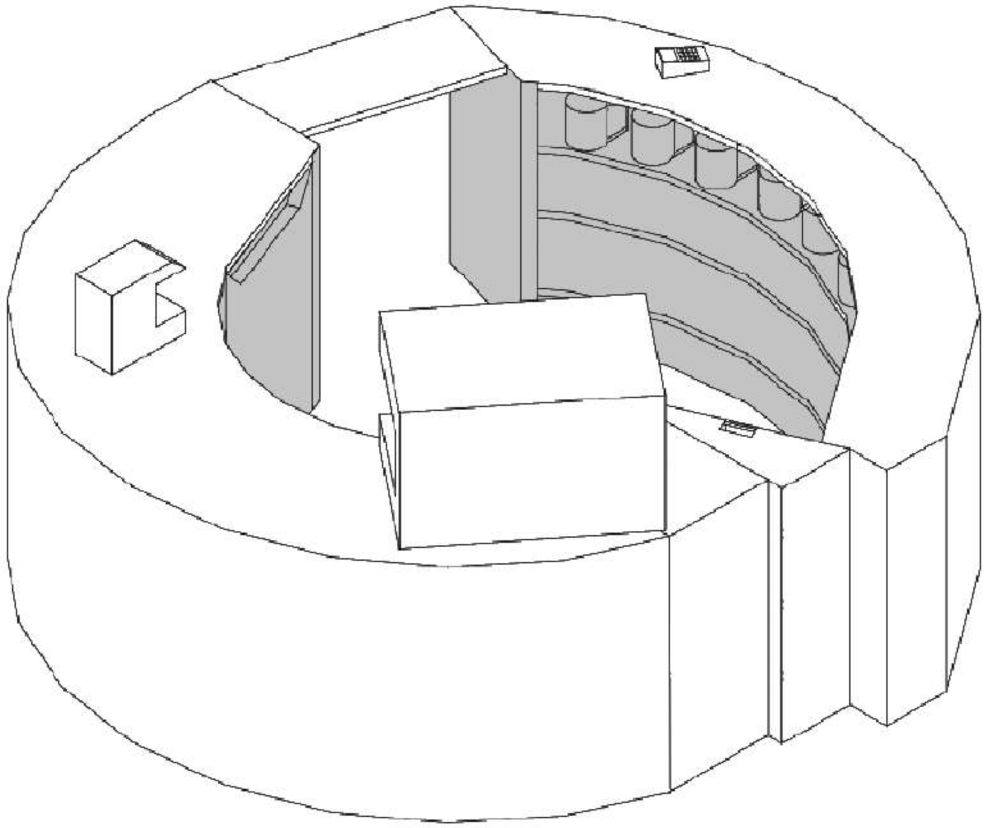


6. Glass Storage



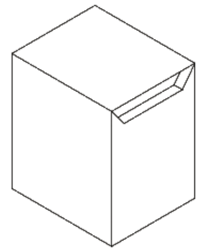


Café

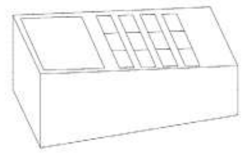


Equipment:

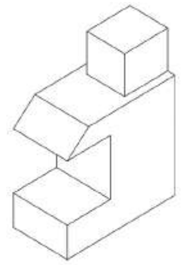
1. Dishwasher



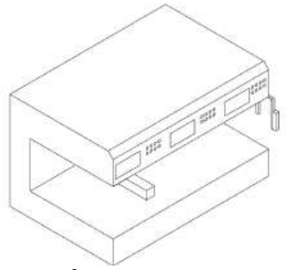
2. Point of Sale



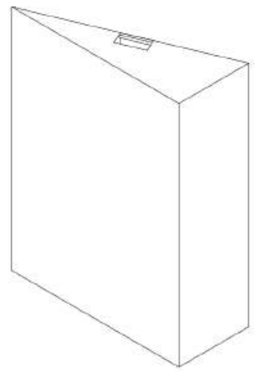
3. Bean Grinder

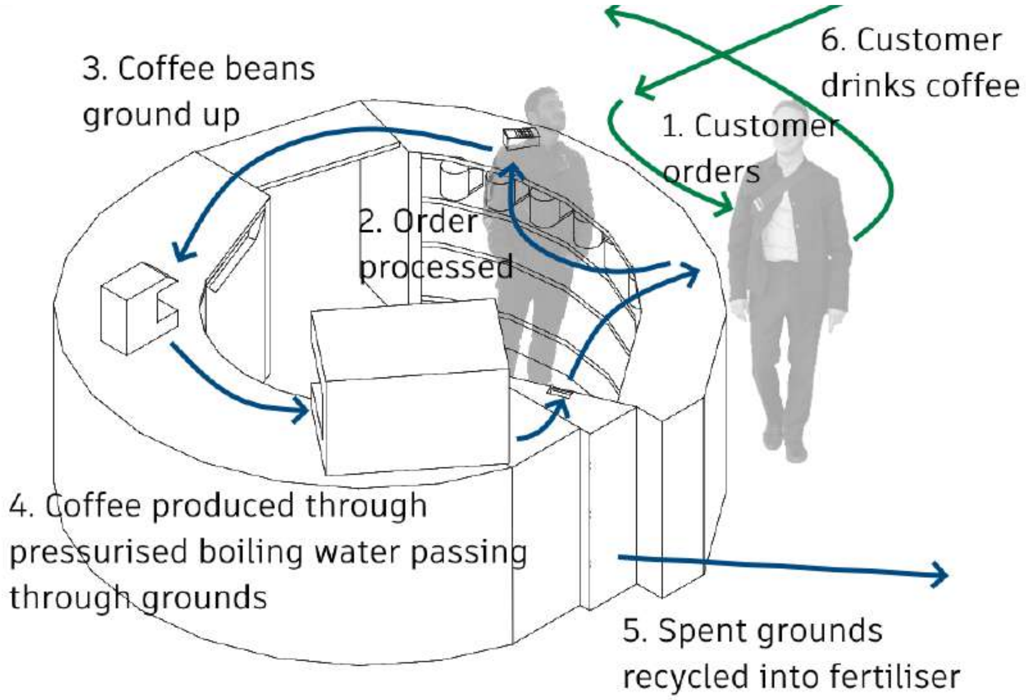


4. Espresso Machine



5. Disposal

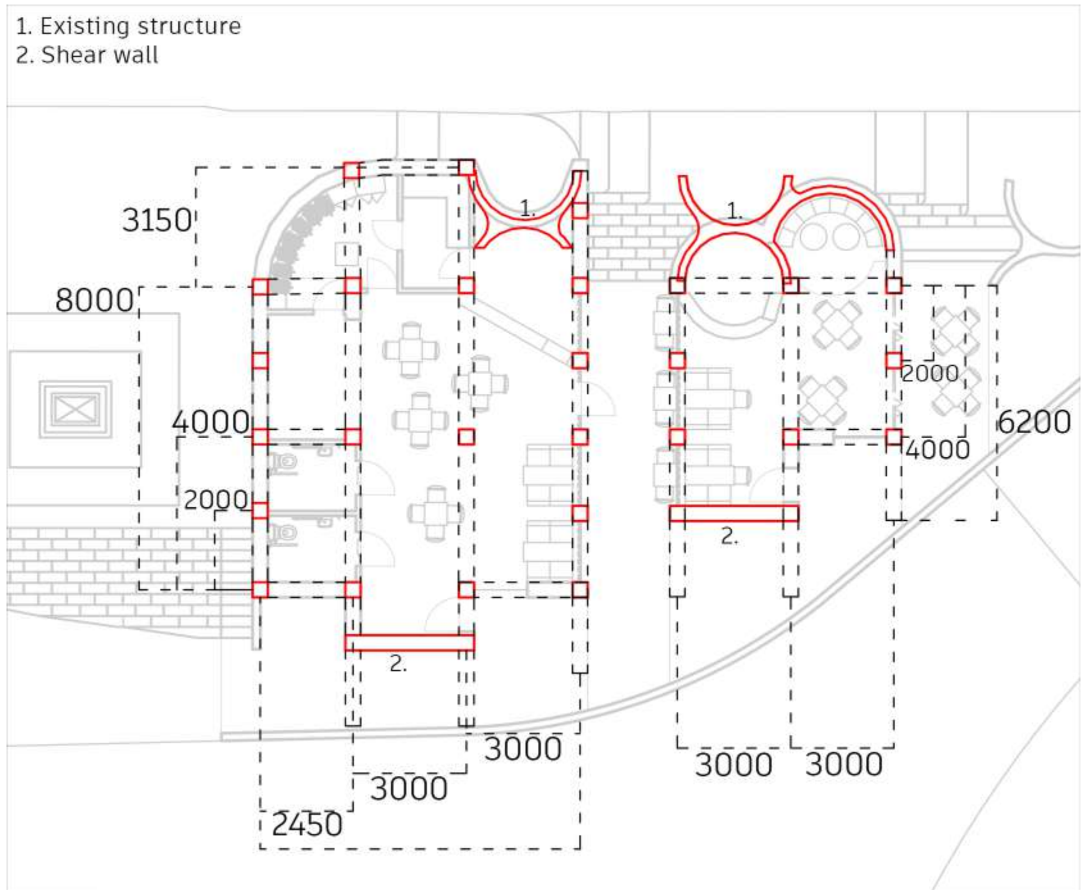


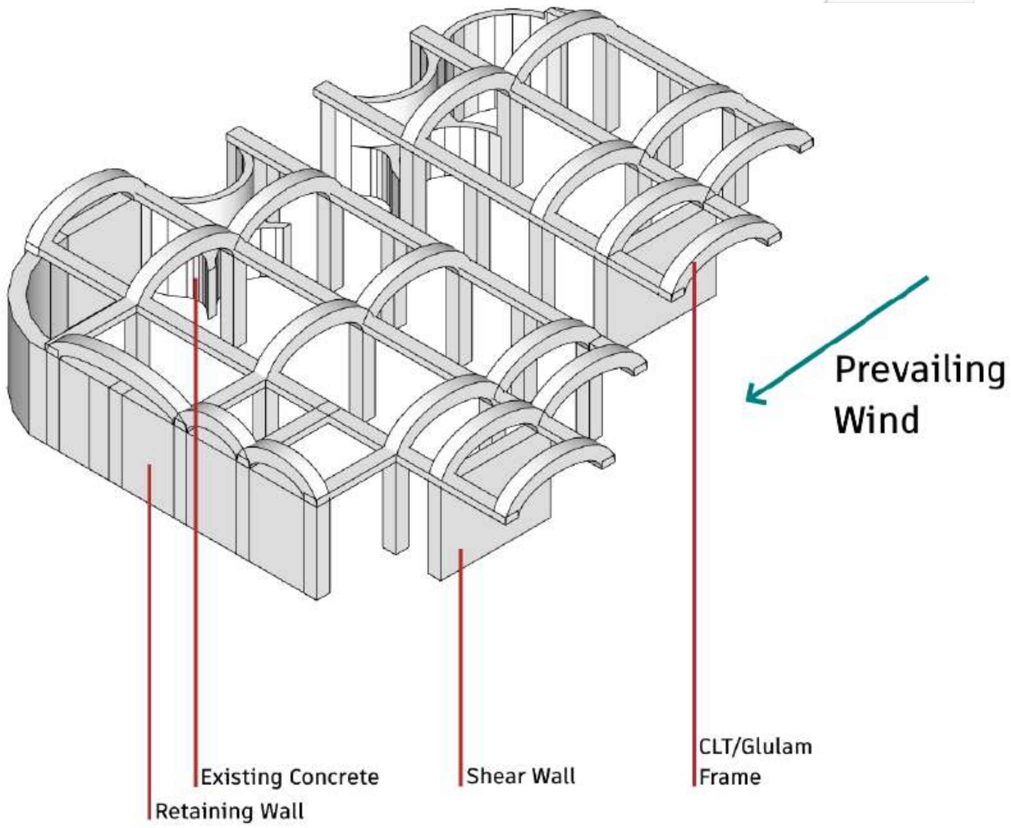


AT2 - Structures

AIM - To create a structure that supports my design intent, is sustainable, and to determine the requirements for foundations based on ultimate load.

Overview - Diagrams





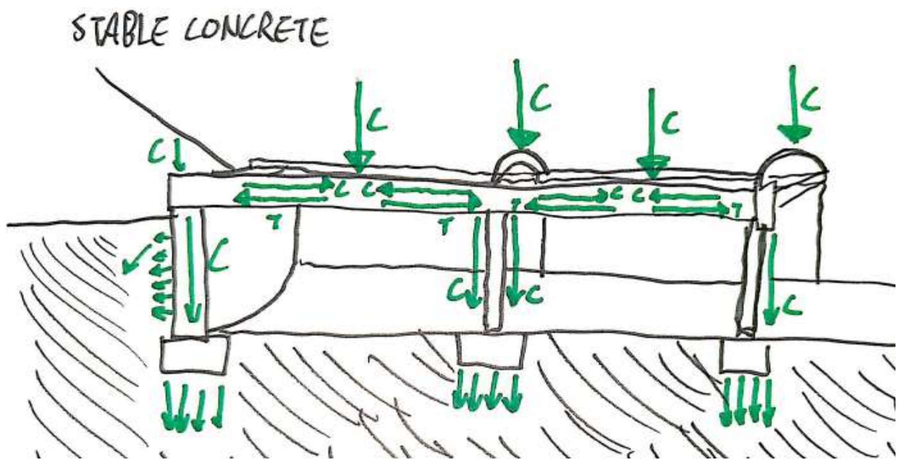
My structure will make use of a Glulam frame - this is because:

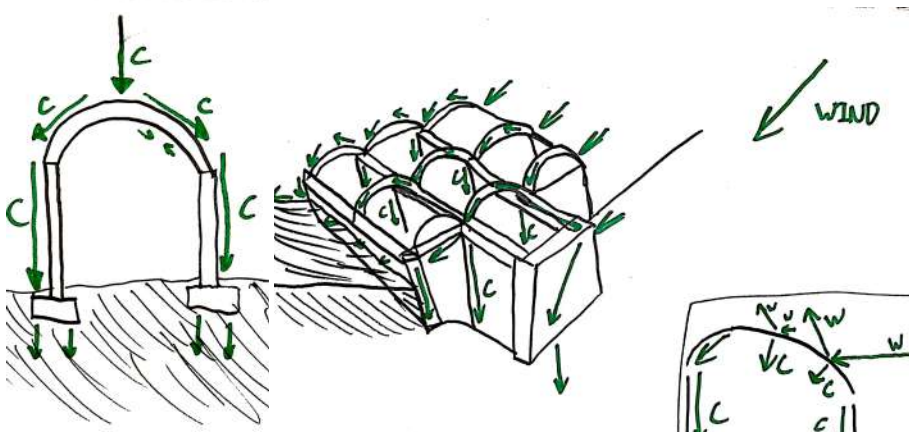
1. **It is sustainable** - Glulam is **timber-based**, and so fabricated from a **renewable** material. At the end of its' life it can be **recycled** and **used to manufacture synthetic boards**.

2. **Its' properties** - **Relative to softwood** and other timbers, it has **high bending strength** and so can **withstand a heavy material** such as **brick without buckling.**

3. **How it is manufactured** - Glulam is based on **laminating timber layers**, and so **can be formed into curves** to **match my design narrative.**

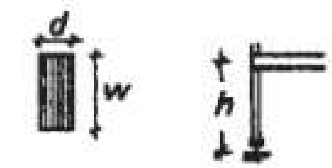
Load paths





Span/depth Calculations

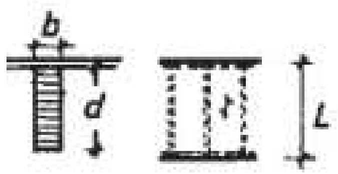
COLUMN



Typical h = 2-4m
Typical h/d = 15-30
Typical w/d = 2-3

h = 2.5m
d_{MAX} = 199mm
w = 400mm
h/d = 12.6
w/d = 2.01

BEAM



Typical d = 180-1400mm
Typical L = 5-12m
Typical L/d = 14-18

L_{MAX} = 3000mm
d = 199mm
L/d = 15.1

BARREL VAULT

Typical w/h = 2-4
Typical L = 9-30m
Typical L/w = 4-8

L_{MAX} = 15.0m
w = 3.00m
L/w = 5
w/h = 3

Ultimate Load Calculation

CATEGORIES OF USE:
Bar - C5 [Live Load = **5kN/m² over 75.6m²**]
Café - D1 [Live Load = **4.5kN/m² over 33.9m²**]

Average Imposed/Live Load = 4.85kN/m²

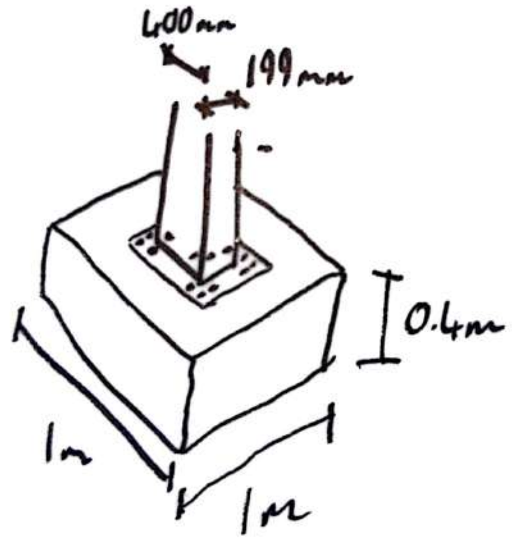
Floor Area = **109.5m²**

Wall Mass/metre = 694kg/m
Roof Mass/m² = 2,760kg/m²
Average Dead Load = 15.9kN/m²

Ultimate Load = **28.7kN/m²**

Foundation type

The ground near my scheme is **20m thick limestone**[4], which can support the load, distributed by **pad foundations**.[5]

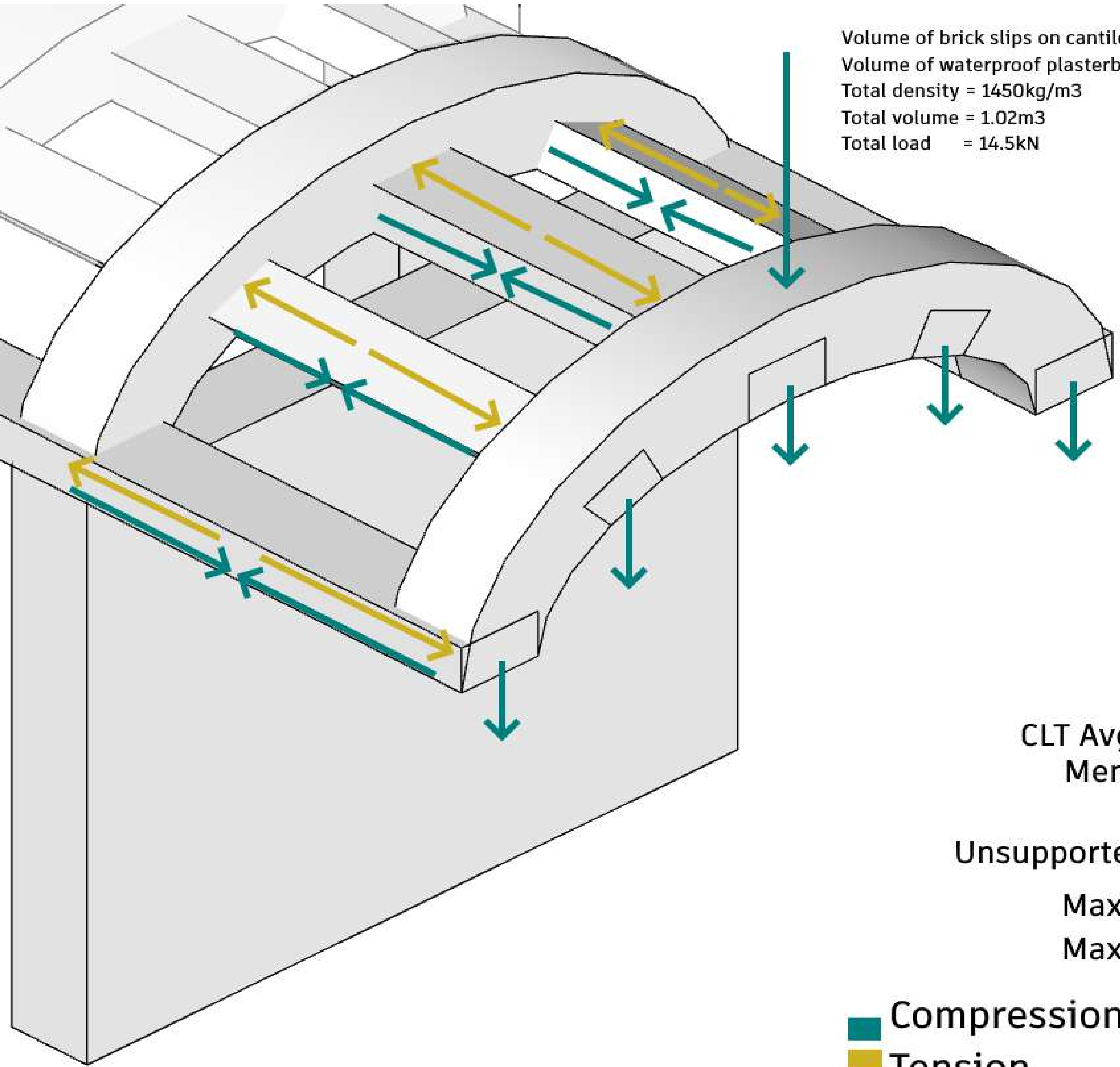


Total Foundations = 18
Area Supported/foundation = 6.08m2
Pad dimensions = 1.0x1.0x0.4m

1. Column information obtained from Littlefield, David (EDITOR). 2008. Metric Handbook : Planning and Design Data (London: Architectural Press) p. 36-17 Table XVI
2. Beam information obtained from Littlefield, David (EDITOR). 2008. Metric Handbook : Planning and Design Data (London: Architectural Press) p. 36-17 Table XVII
3. Barrel Vault information obtained from Littlefield, David (EDITOR). 2008. Metric Handbook : Planning and Design Data (London: Architectural Press) p. 36-19 Table XIX
4. Ground research carried out on https://geologyviewer.bgs.ac.uk/?_ga=2.98525532.274881144.1681310799-675241583.1681310799 accessed 2023-04-12
5. Conclusion drawn from information obtained in Structural Guidance for Architects provided by CARDIFF UNIVERSITY and MANN WILLIAMS, p49

AT2 - Structures

AIM - To ensure that my structure can withstand the cantilevering demands of my roof.

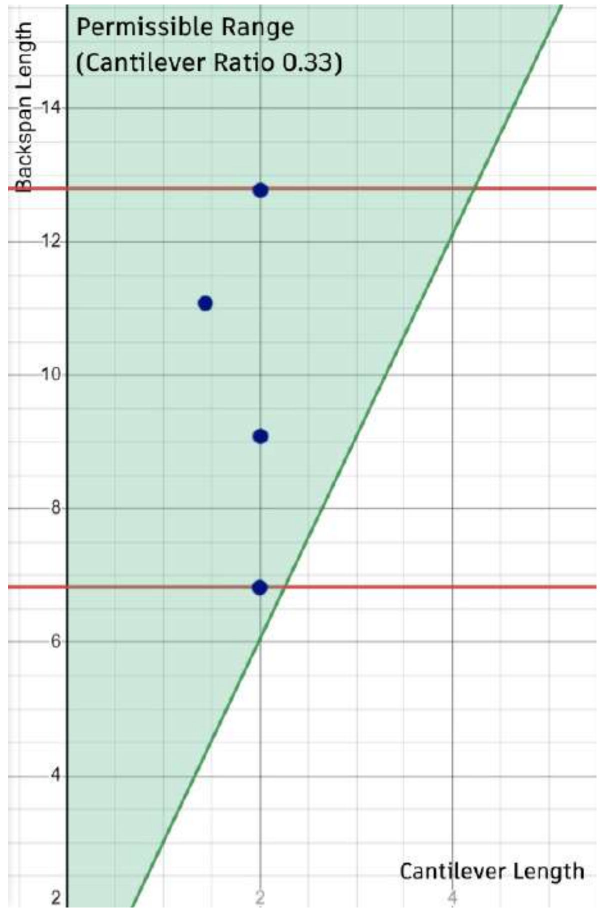


Volume of brick slips on cantilever = 0.68m3
Volume of waterproof plasterboard = 0.34m3
Total density = 1450kg/m3
Total volume = 1.02m3
Total load = 14.5kN

Backspan Range:
6.83-12.8m

Cantilever Length:
2.00m

Cantilever Ratio:
0.29 - 0.16



Moment = Load * Distance

Load = 14.5kN (2.9kN/member)
Distance = 2m

Moment = 29kNm
Moment/Member = 5.8kNm

CLT Avg. Tensile Strength = 50kN/m^3
Member Cross Section = 0.08m^2
Cantilever Length = 2m
Unsupported Member Volume = 0.16m^3

Max. Load per Member = 8kN
Max. Total Load = 40kN

Compression
Tension

1- CLT/Glulam tensile strength derived from https://jwoodscience.springeropen.com/articles/10.1007/s10086-015-1527-2 accessed 2023-04-13

Design Iterations

From Strategic Concept to Detailed Strategy

1. The wine cellar language was far better reflected for making my scheme follow the natural gradient.

2. This iteration increases the amount of shelter in my scheme, and places greater emphasis on the stage.

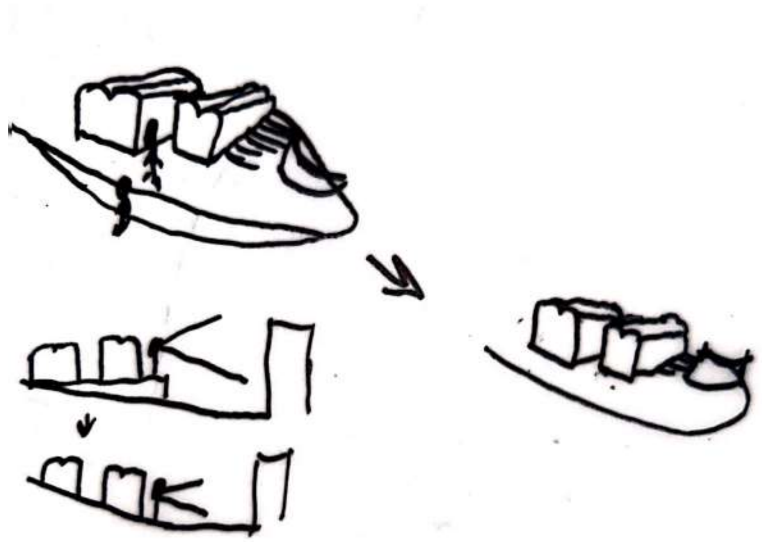
3. By adding small market stalls at the back, there is consequently a greater relationship to the town on all sides.

4. By clearing the north-east entrance, a sense of shelter and a clearer threshold is developed.

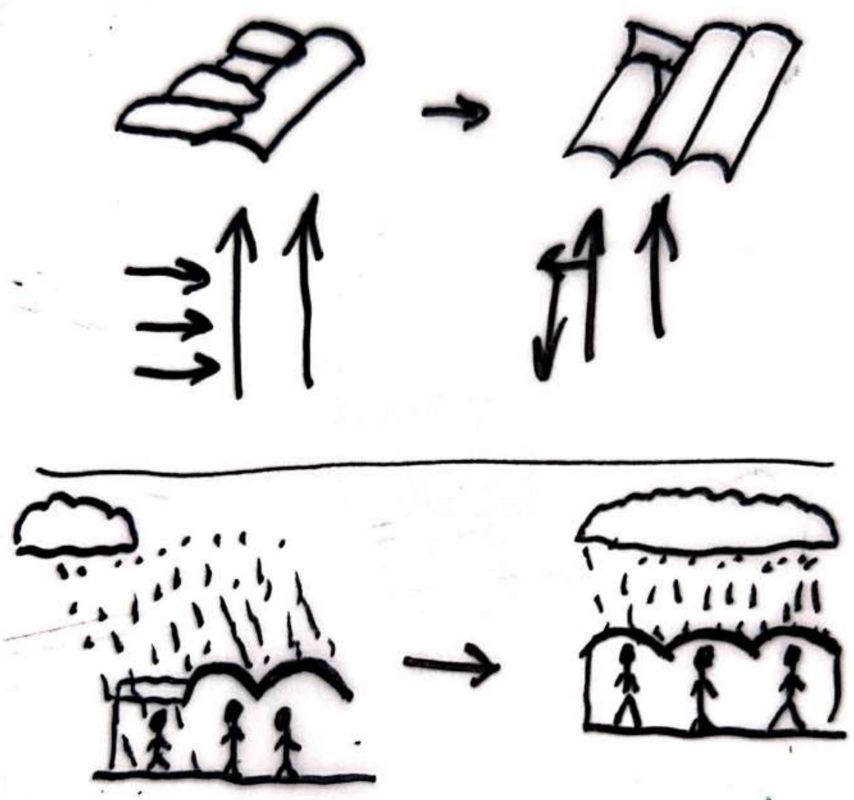
5. By opening up key parts of the boundary wall, the scheme is better connected to Chepstow and provides better circulation.

6. By adding seats to the shear walls, more positive moments are added to the in-between spaces, and they are less of a basic thoroughfare.

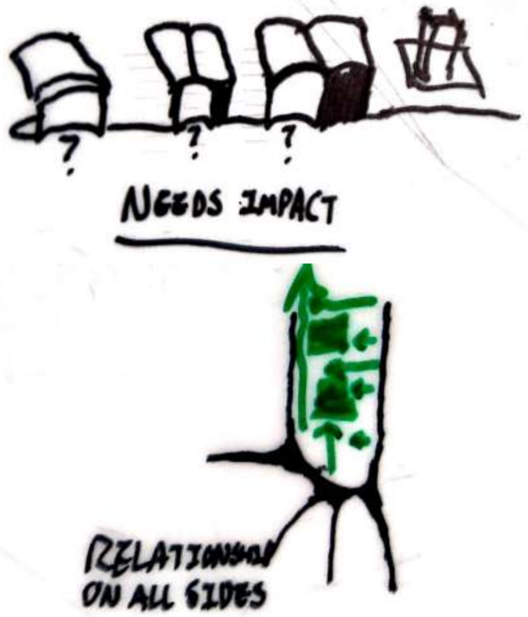
1. Flat to Gradient



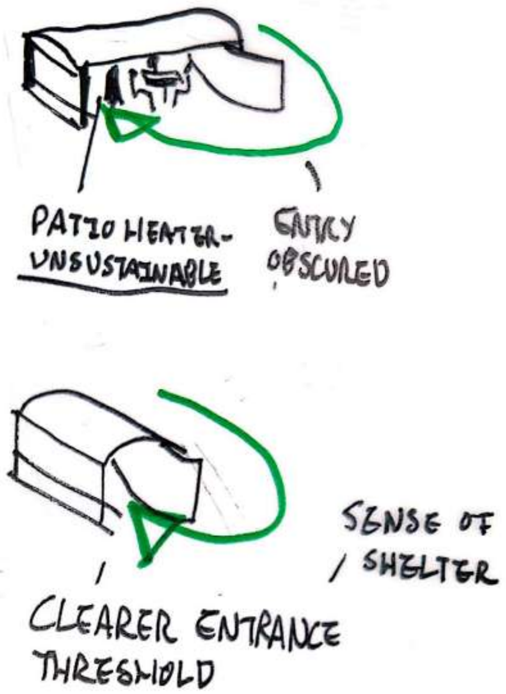
2. Roof Strategy



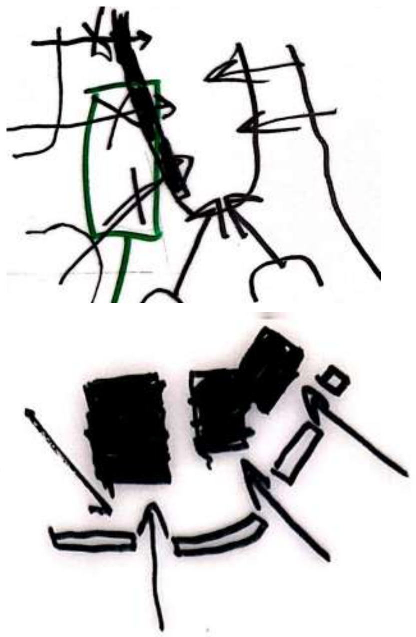
3. Markets



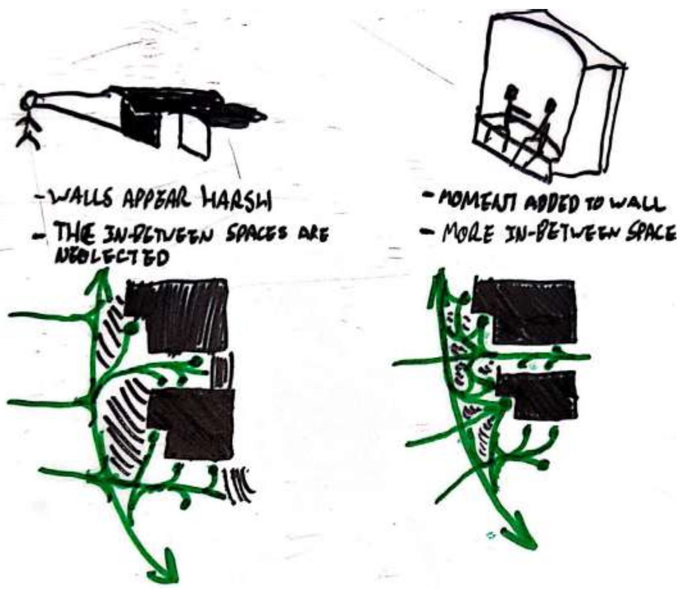
4. Entrance



5. Boundary Wall



6. Seats on Shear Walls



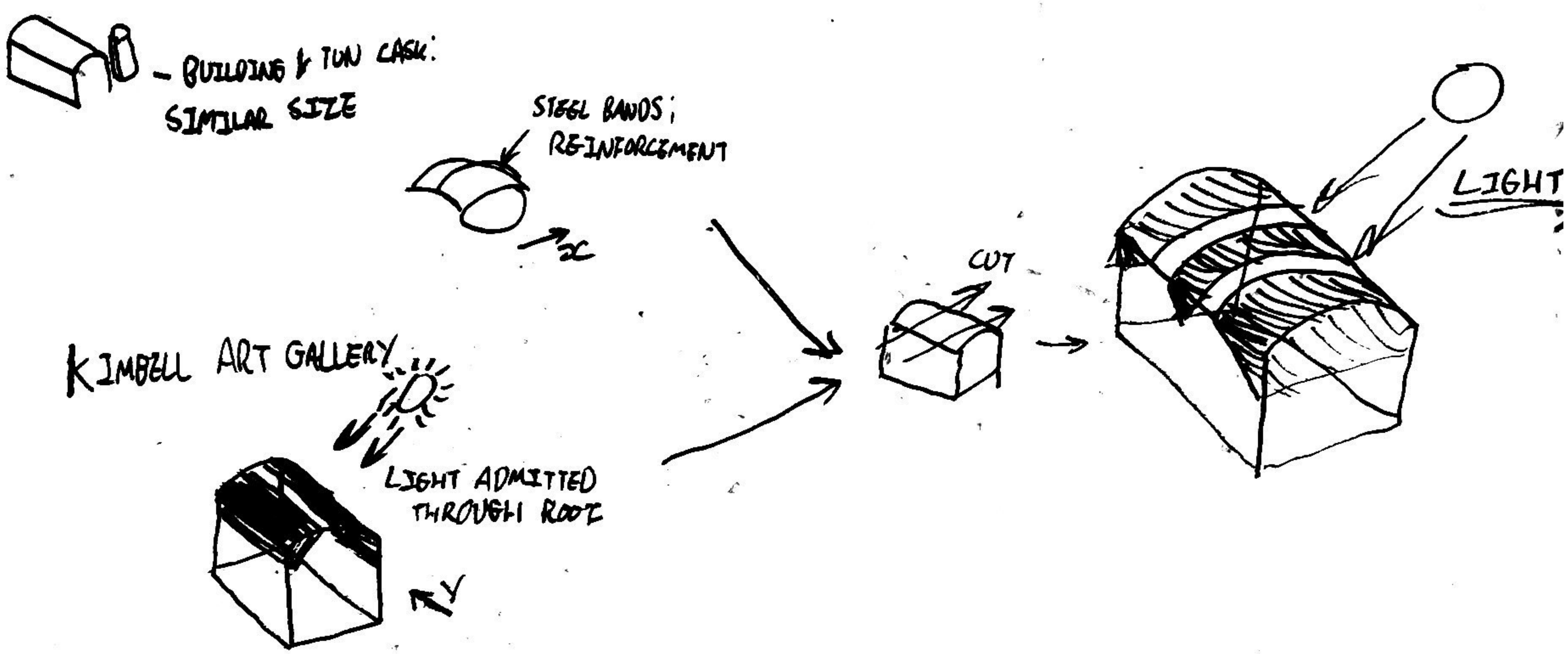
Further Precedent Study - Kimbell Art Gallery & Wine Barrels

To reinforce my design intent, I studied the form and standard sizes of wine barrels.

I discovered that they range from a size tailored for sale and small storage (Firkin, 40 litres), to a scale closer to a building (Tun Cask, 1000 litres).

The steel reinforcement can be mirrored in my design's roof, akin to the way that the Kimbell Art Gallery admits light subtly through its' roof.

This creates a sense of isolation from the world and safety while satisfying daylighting requirements.



LIGHTING STUDY - PHYSICAL MODEL & TESTING

To put my initial concept for a public space for my project to the test, I created a conceptual model in 1:20, based on my first ideas for the space.

Key points for my lighting study include:

-There must be a **language of porous brickwork**, and the way this interacts with light is **paramount to the experience** of my space.

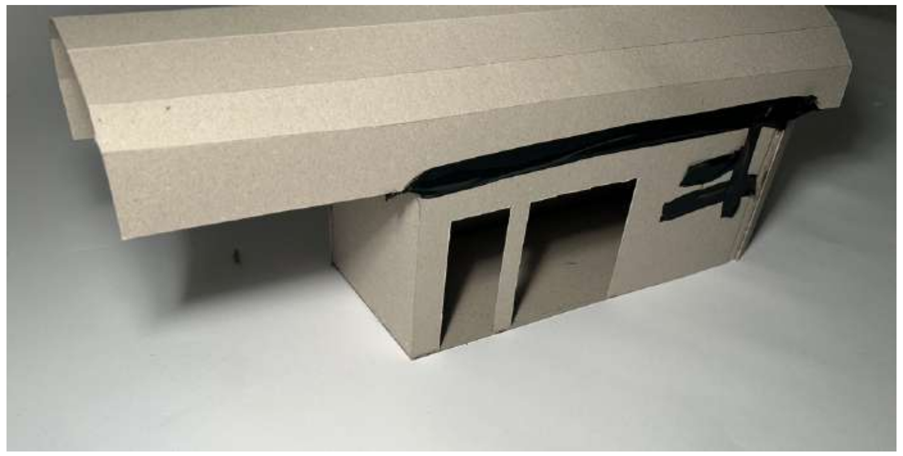
-There must be **sufficient lighting throughout** to **conform to EN 17037**, with specific minima being:

DA100 of over 95% for half of the daylight hours

DA300 of over 50% for half of the daylight hours

-The daylighting **should not make the space too open** to its' surroundings, as my **design language will focus on the language of a wine cellar**. This means that a **sheltered and protected atmosphere is best.**

CONCEPT MODEL - PHOTOGRAPHS



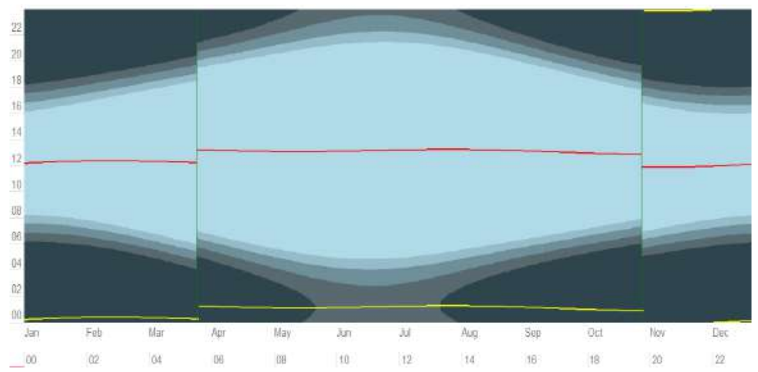
ESSENTIAL SITE INFORMATION

Latitude | 51.6421

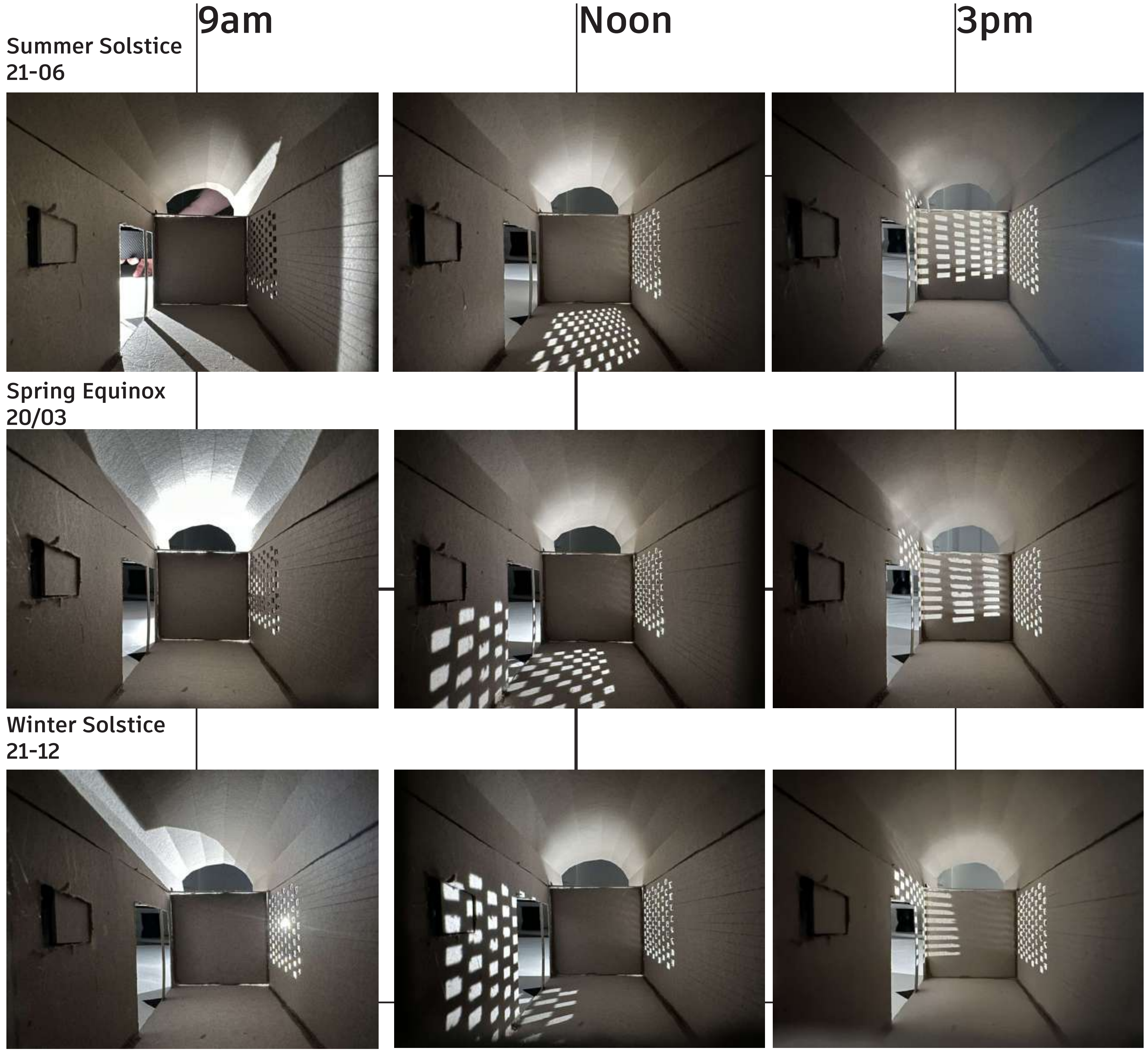
Longitude | -2.6750

Sunrise 21-06 | 3:53 AM
Sunrise 21-12 | 8:14 AM

Sunset 21-06 | 8:32 PM
Sunset 21-12 | 4:03PM



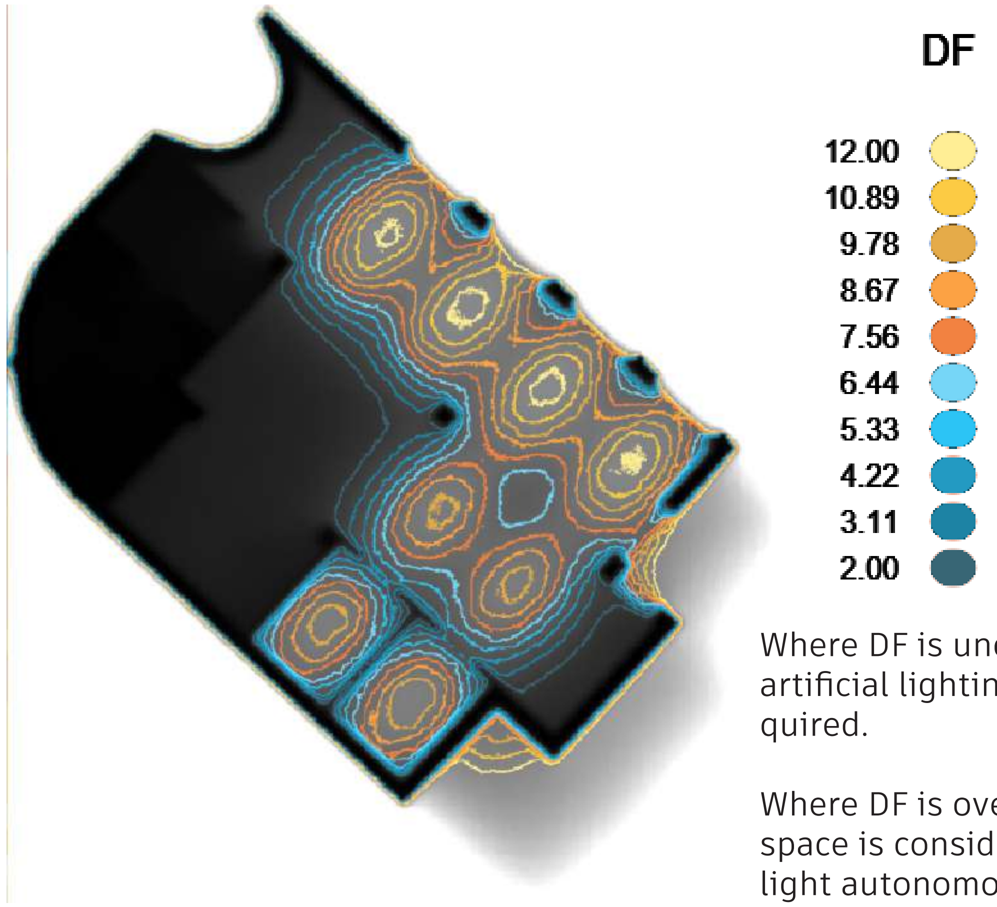
AZIMUTH (Winter-Summer Solstice)
Sunrise: 132.57 - 48.84
Noon: 178.00 - 173.96
Sunset: 231.59 - 311.17



1- Sunrise/sunset graph obtained from https://www.timeanddate.com/sun/@2653256 accessed 2023-05-04
2- BS EN 17037 Table A.1, p16

LIGHTING STUDY - DIGITAL MODEL

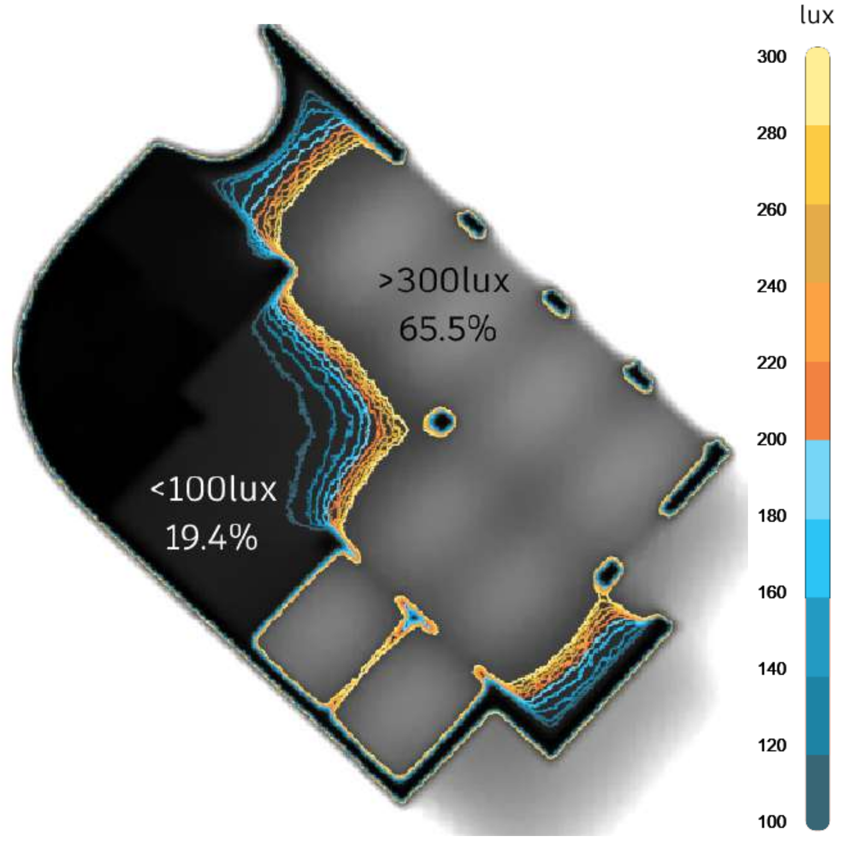
DAYLIGHT FACTOR IN PLAN



Where DF is under 2, artificial lighting is required.

Where DF is over 5, the space is considered daylight autonomous.

LUX LEVELS IN PLAN



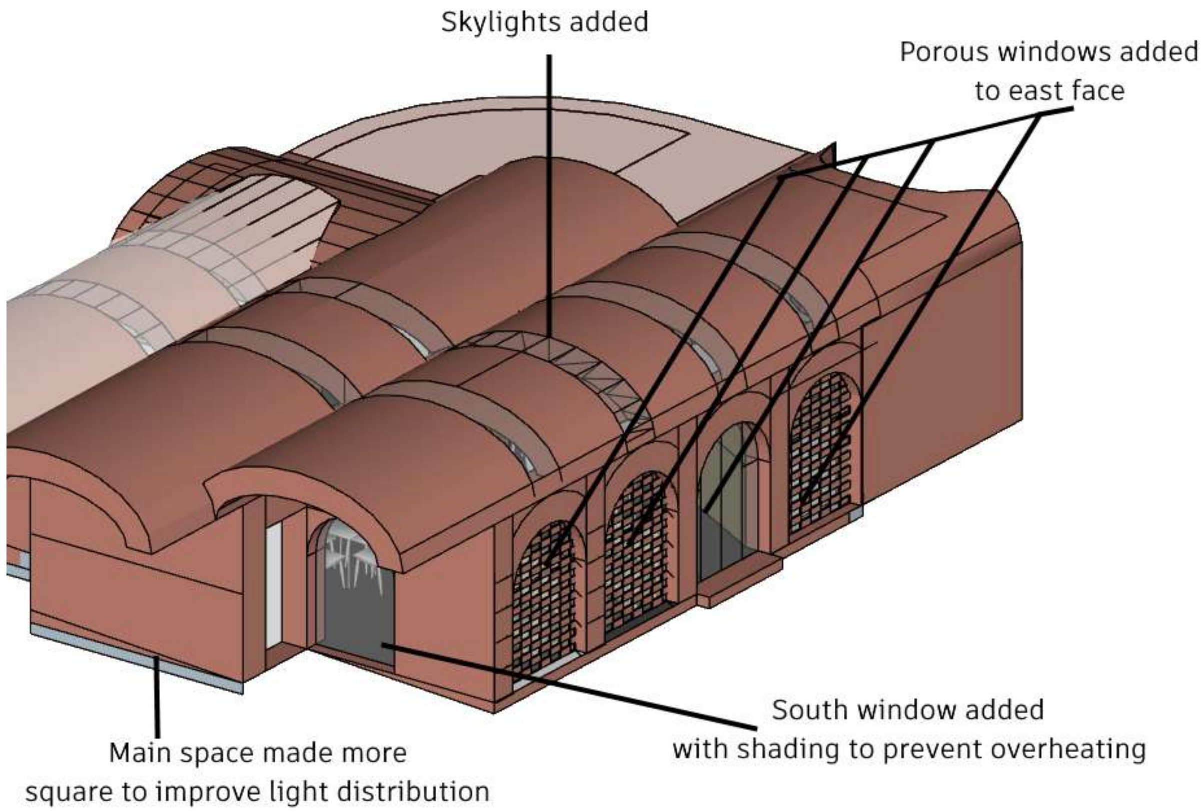
3D RENDERS

Quantitative

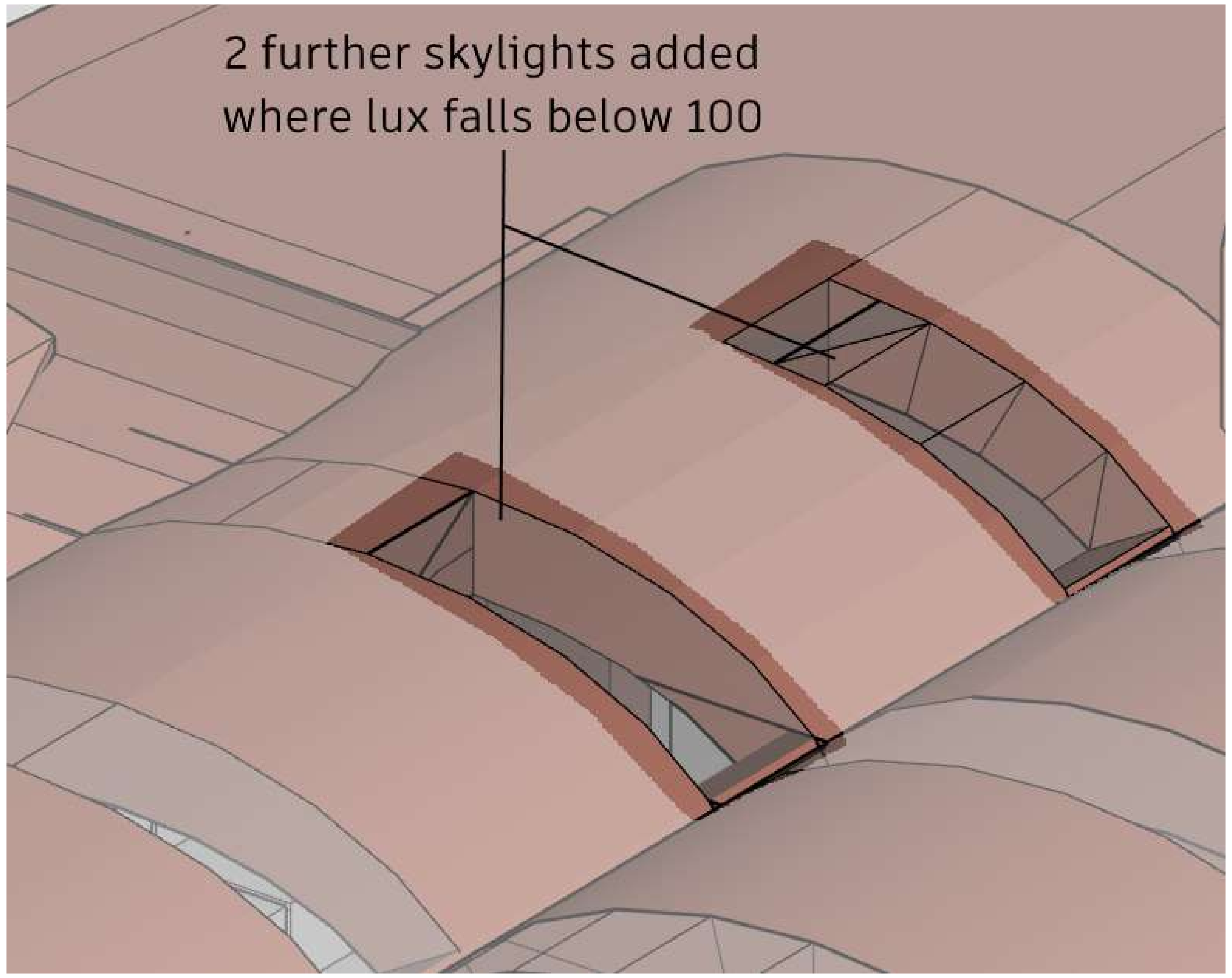
Qualitative

LIGHTING STUDY - SUMMARY

Iterations following physical model



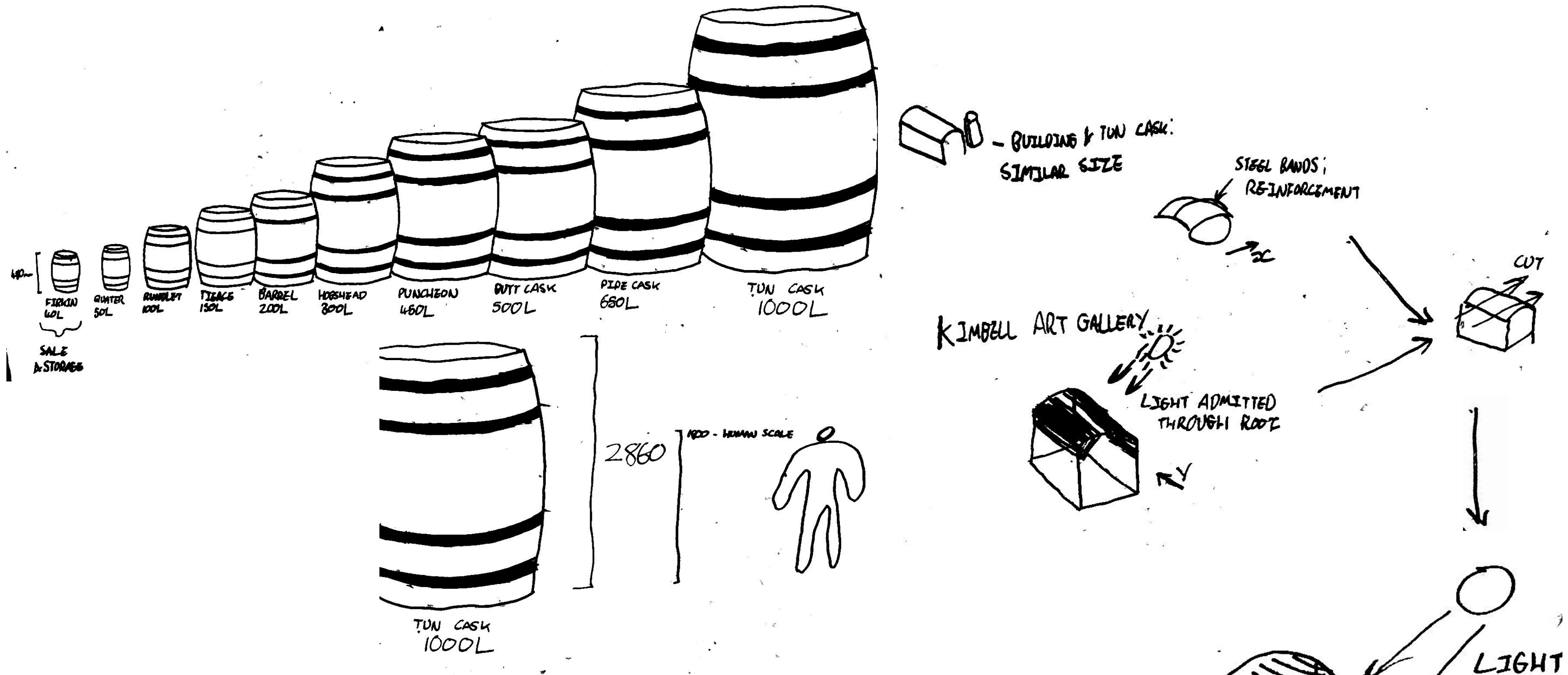
Iterations following digital model

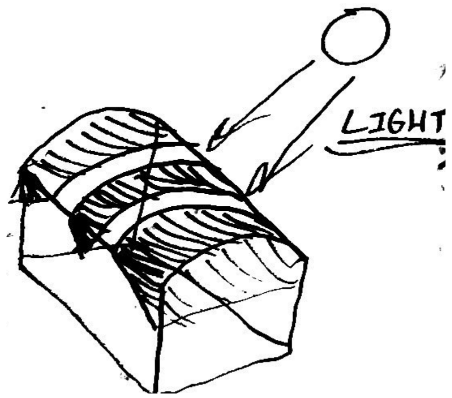


PRECEDENT USED - KIMBALL ART GALLERY

Louis Kahn, 1972

Design Language - Wine Barrels

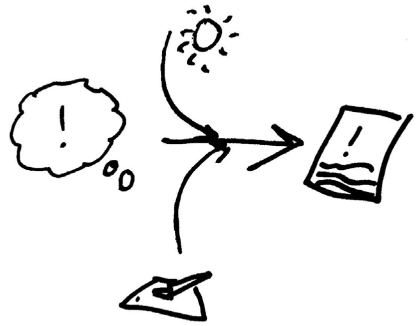




INSIGHTS INTO DESIGN FROM LIGHTING STUDY

The lighting study allowed me to observe how an initial concept idea would perform when put to the test in terms of lighting - and enabled initial design ideas to be converted into working concepts.

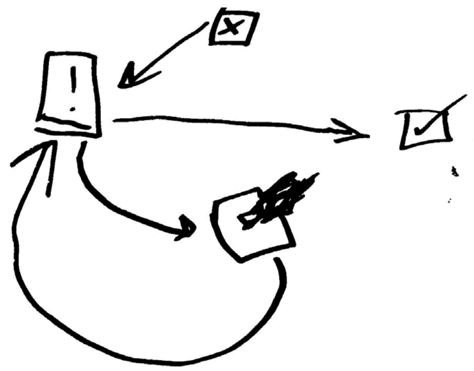
It enabled me to tactically place different ideas for windows in the places they would be best suited for ideal lighting conditions.

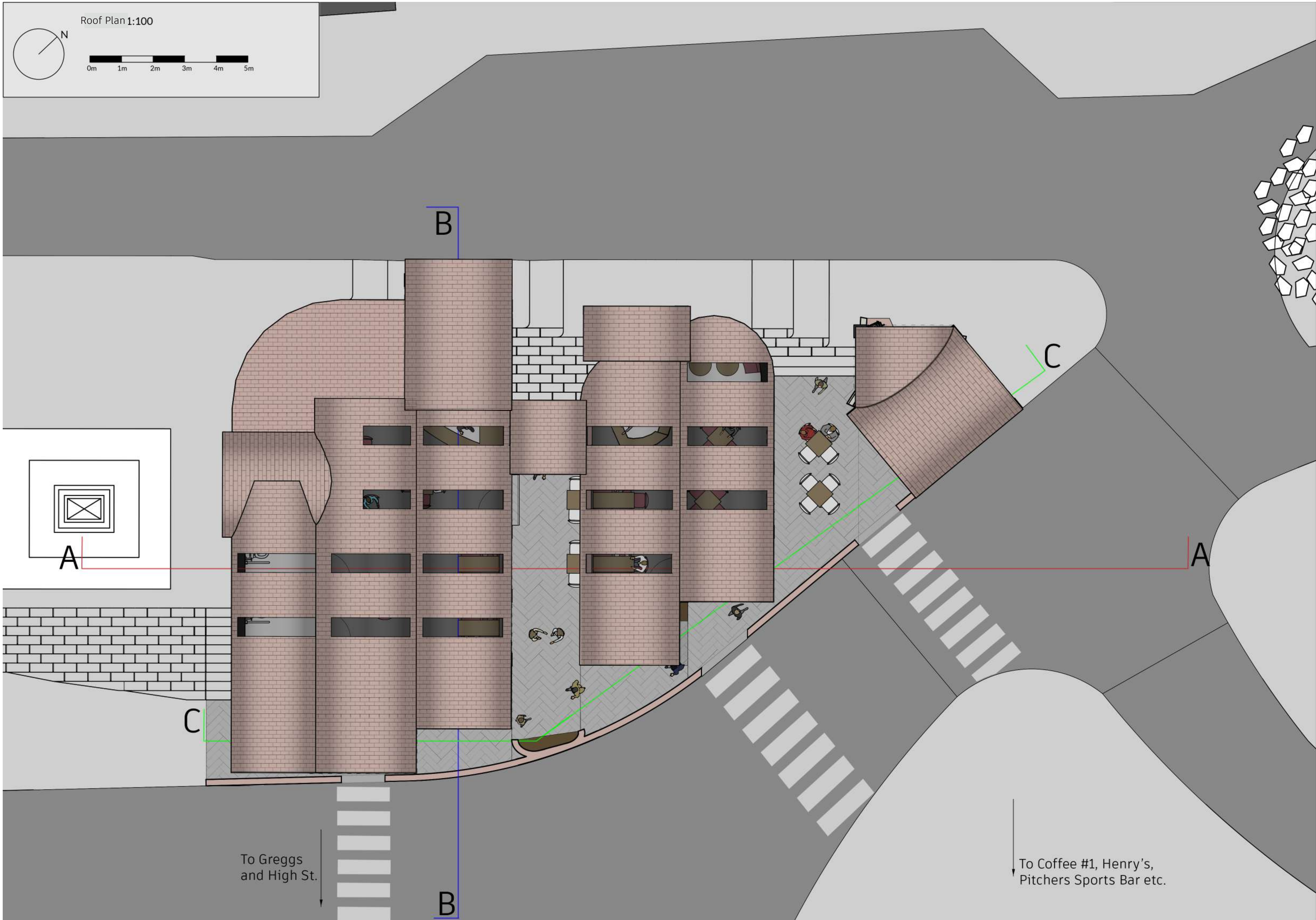


HOW THE STUDY SUPPORTS MY DESIGN

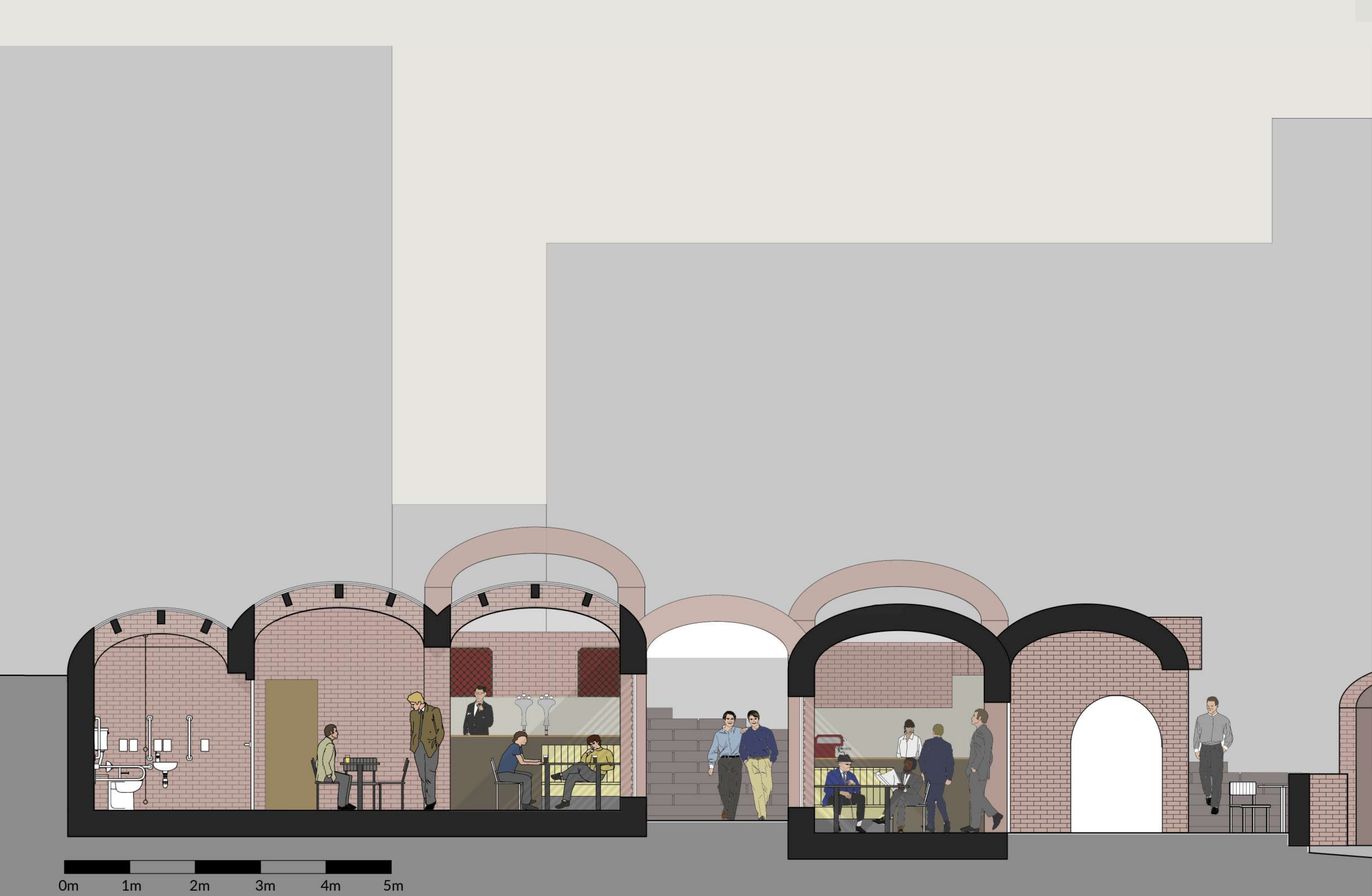
By testing my design digitally and physically, and making iterations according to issues, I can improve my design and allow it to conform to standards.

Many organisations such as CIBSE and BSI stress the importance of good lighting in buildings, therefore the lighting study aids my design in conforming to the standards set.




Roof Plan 1:100
N
0m
1m
2m
3m
4m
5m
B
B
A
A
C
C
To Greggs
and High St.
To Coffee #1, Henry's,
Pitchers Sports Bar etc.

Floor Plan 1:100
N
0m
1m
2m
3m
4m
5m
B
A
A
C
C
B
To Greggs
and High St.
To Coffee #1, Henry's,
Pitchers Sports Bar etc.



SECTION A-A | 1:50

Section B-B 1:50

Section C-C 1:100

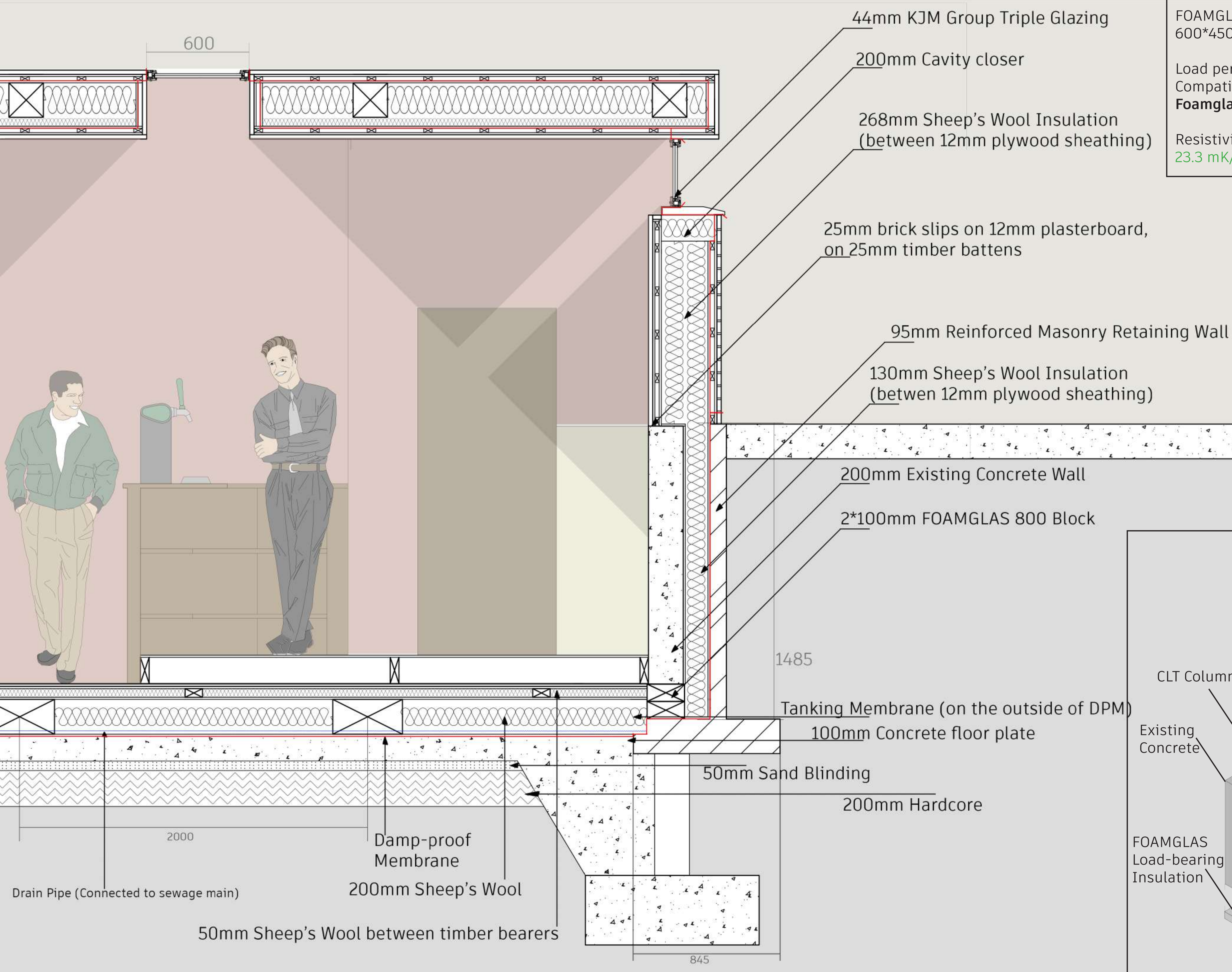
AT2 - Section B-B Detail 1:20

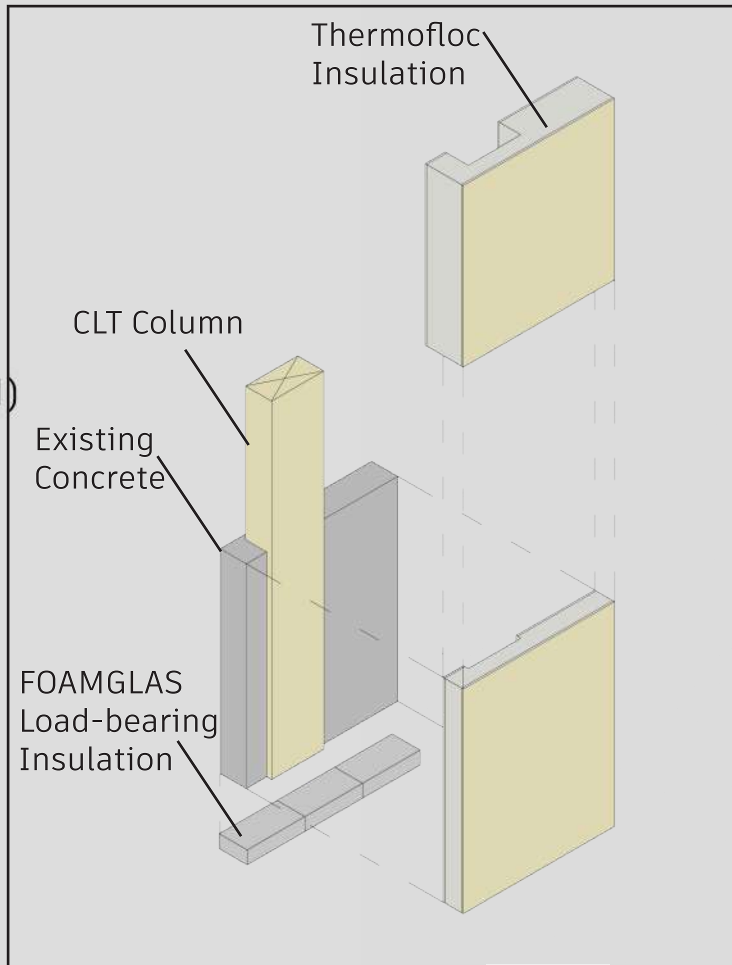
Ultimate Load = 28.7kN/m2
= **28.7kPa/m2**

FOAMGLAS Block dimensions = 600*450*100mm

Load per block = **38.7kPa**
Compatible with:
Foamglas HLB 800 Block (800kPa)

Resistivity (Thermofloc in parentheses):
23.3 mK/W (26.3 mK/W)





AT2 - Building Services

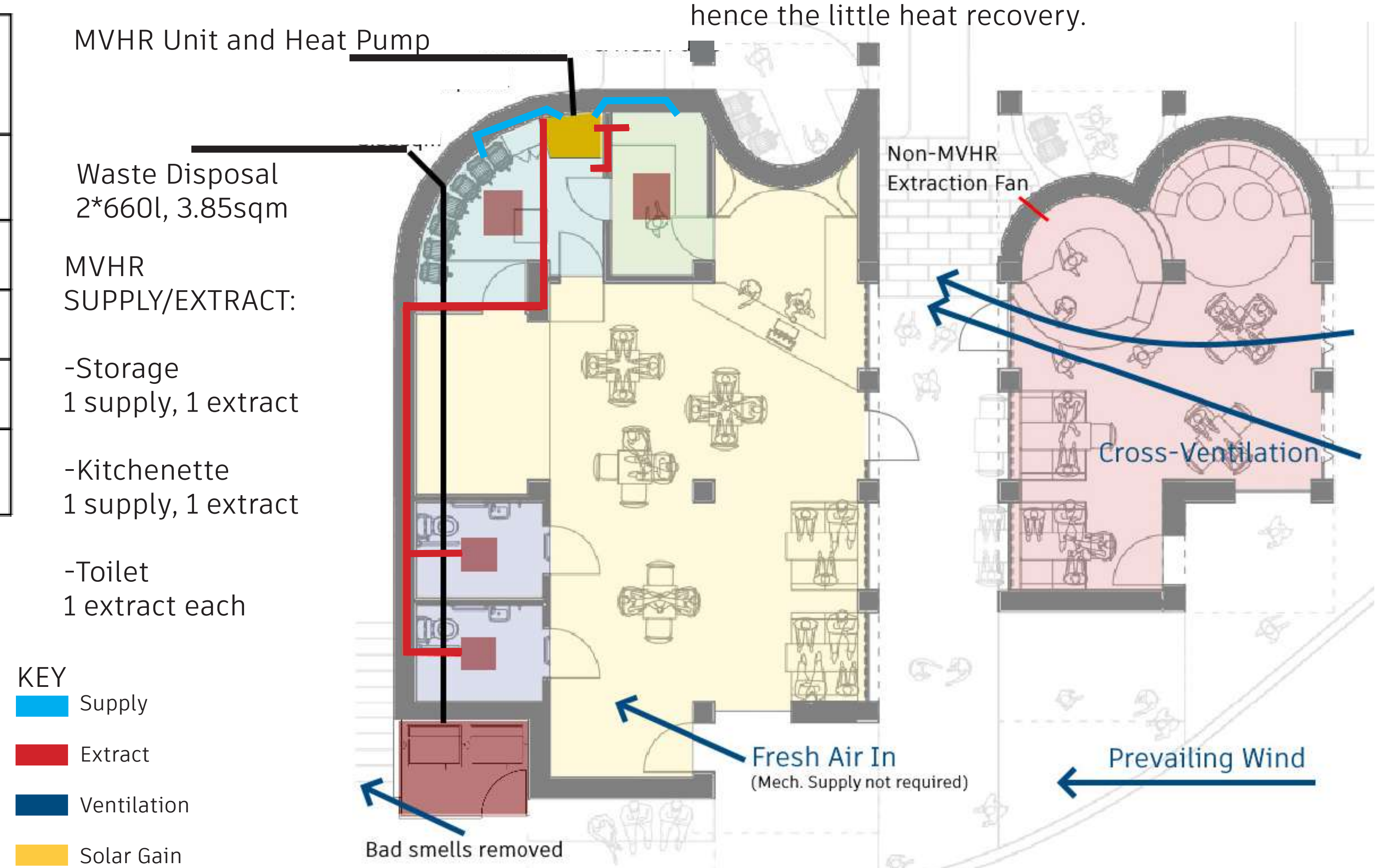
Heating demand per space

Room	Winter avg. temp (C)	Winter comfort temp (C)	Winter heating hours	Summer avg. temp (C)	Summer comfort temp (C)	Summer heating hours
Bar – General Area	7.7	20-22	3342hrs	13.2	22-25	919hrs
Bar – Kitchenette	7.7	15-18	2847hrs	13.2	18-25	813hrs
Bar – Storage	7.7	19-21	3252hrs	13.2	21-25	884hrs
Toilet (total)	7.7	19-21	3252hrs	13.2	21-25	884hrs
Café – General Area	7.7	20-22	3342hrs	13.2	22-25	919hrs

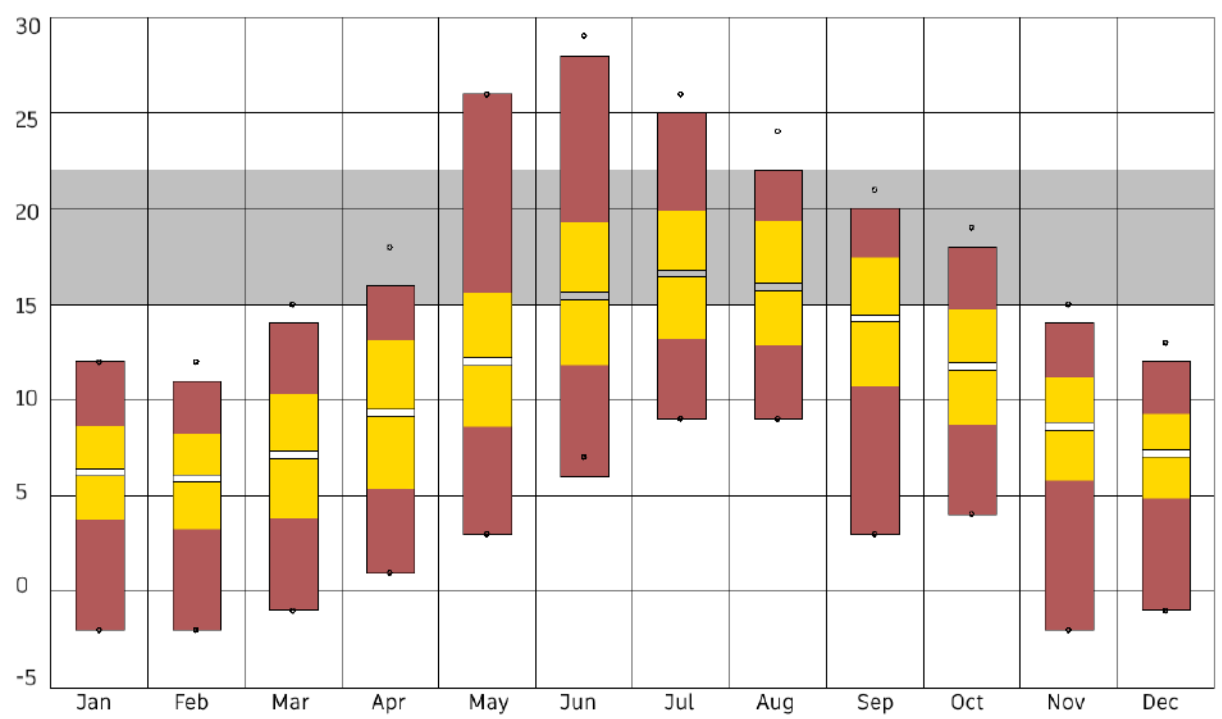
No active cooling is required in my project - if the room begins to overheat, then **purge ventilation is available** in every room (or its' neighbouring room) to **regulate the internal environment.**

Plan with services highlighted

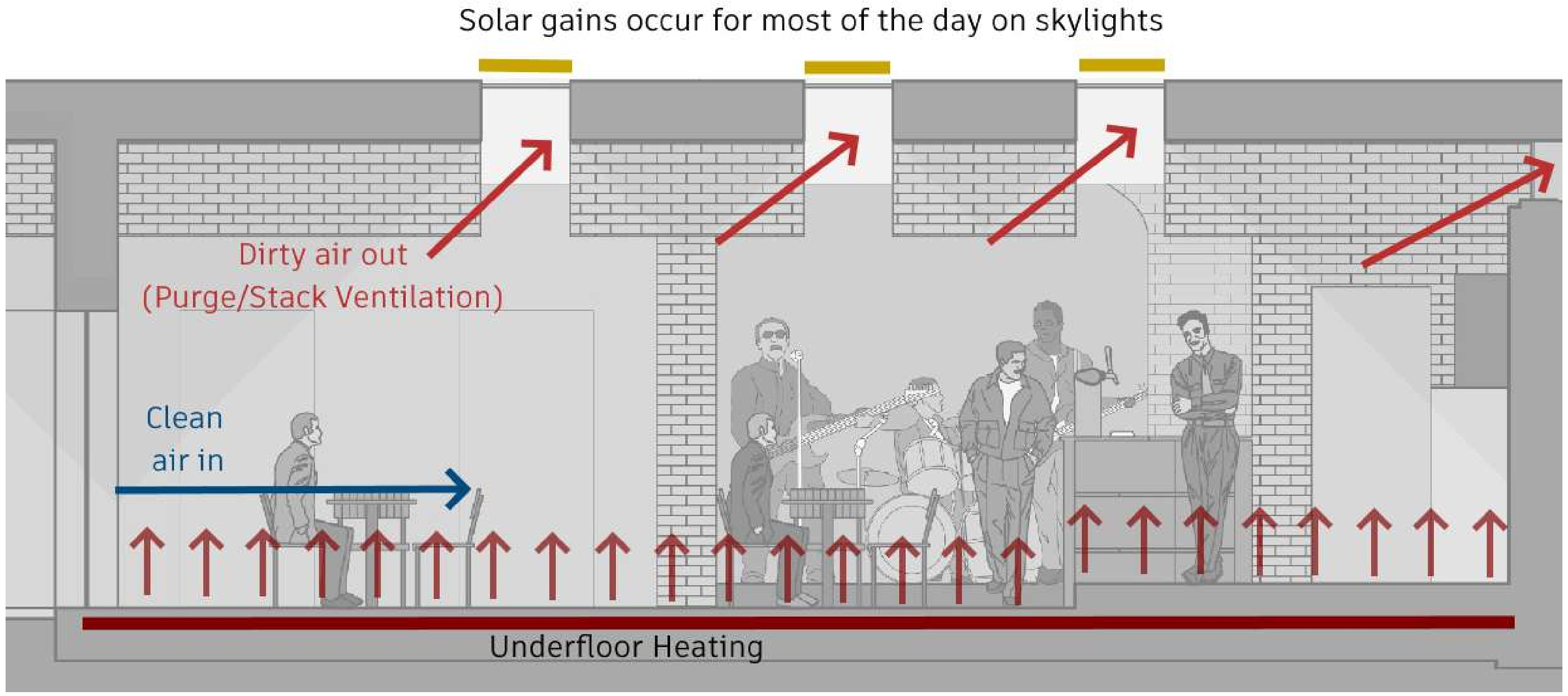
The café does not have MVHR, as the cost would not justify the little mechanical ventilation it needs and hence the little heat recovery.



Dry bulb temperature graph & comfort temperature



Section B-B with services highlighted



1-Data processed in Climate Consultant 6.0, using BRISTOL 2007-2021 file from https://climate.onebuilding.org/WMO_Region_6_Europe/GBR_United_Kingdom/index.html

AT2 - Energy Balance

AIM - To meet the RIBA 2025 Challenge for energy balance

Overall Comfort Temperature & Occupancy

Room	Volume	Max. Occupancy	Winter avg. temp (C)	Winter comfort temp (C)	Summer avg. temp (C)	Summer comfort temp (C)
Bar – General Area	169m3	66	7.7	20-22	13.2	22-25
Bar – Kitchenette	13.1m3	1	7.7	15-18	13.2	18-25
Bar – Storage	23.1m3	3	7.7	19-21	13.2	21-25
Toilet (total)	20.5m3	2	7.7	19-21	13.2	21-25
Café – General Area	97.7m3	43	7.7	20-22	13.2	22-25

Ventilation Requirements

Room	Volume	Usual Occupancy	Suggested air supply (L s-1)	Air changes per hour (ach)	Avg. dT (Summer) (C)	Avg. dT (Winter) (C)
Bar – General Area	169m3	30	300	6.39	10.3	13.3
Bar – Kitchenette	13.1m3	1	4.19	1.15	8.3	8.8
Bar – Storage	23.1m3	3	30	4.68	9.8	12.3
Toilet (total)	20.5m3	2	-	5	9.8	12.3
Café – General Area	97.7m3	28	280	10.3	10.3	13.3

Qmec = Qf + Qv - Qs - Qint - Qpv

Qf = Avg. U-value * Fabric Area * Temp. Change
Avg. U = 0.173 W/m2K
Qf = 0.173 * 489.546 * 10.85
Qf = 0.919 kWh = 3350 kWh/yr*

Qv = ACH * Volume * Temp. Change * 0.33
= (4.21 + 0.043 + 0.394 + 0.374 + 3.92)
= 8.94 kWh = 27,900kWh/yr*

Qs = * 58.55 * 0.609

$$= \left(871.7 \cdot \left(\frac{24.54}{58.55}\right)\right) + \left(828.9 \cdot \left(\frac{6.03}{58.55}\right)\right) + \left(556.2 \cdot \left(\frac{18.1}{58.55}\right)\right) + \left(9.88 \cdot \left(\frac{9.88}{58.55}\right)\right)$$

GIA = 120sqm
Café open from 0900hrs - 1900hrs (10hrs/day, 3650hrs/yr)
Bar fully open from 1500hrs - 2200hrs (7hrs/day, 2555hrs/yr)
Toilets open from 0900hrs - 2200hrs

Qint:
1met = 17.5W
Avg activity gains/person = 1.3 MET | 5.25W

Total activity gains = 0.336kWh

Activity gains/yr = 1230kWh/yr*

Use fCO2	Material	Volume in Scheme (m3)	Density (kg/m3)	Mass (kg)	A1-A3 tCO2e	Transport fCO2	Distance (km)	A4 tCO2e	Total tCO2e
0.213	Brick Slips	17.9	1700	11,678.15	6.48	0.0005	5km (LOCAL CLAY)	Negligible	6.48
0.437	CLT	25.4	720	18,293.76	7.99	0.16	1500km (DE)	2.93	10.92
0.072	Retaining Wall (75% GGBS)	13.3	2447	32,427	2.33	0.032	300km (UK)	1.03	3.36

Embodied Carbon: 6.48 + 10.92 + 3.36 = **20.76tCO_2e**
Carbon Sequestration by Timber: 1.64 * 18,293.76 = **-30.0tCO_2e**

Avg. Mechanical Energy Required: 64.3kWh/m²/yr

Overall Embodied Carbon: -9.24tCO_2e

*These values are based on opening hours, as these will be the only hours that require mechanical ventilation and heating. 10hrs/day has been used for Qf and Qint.

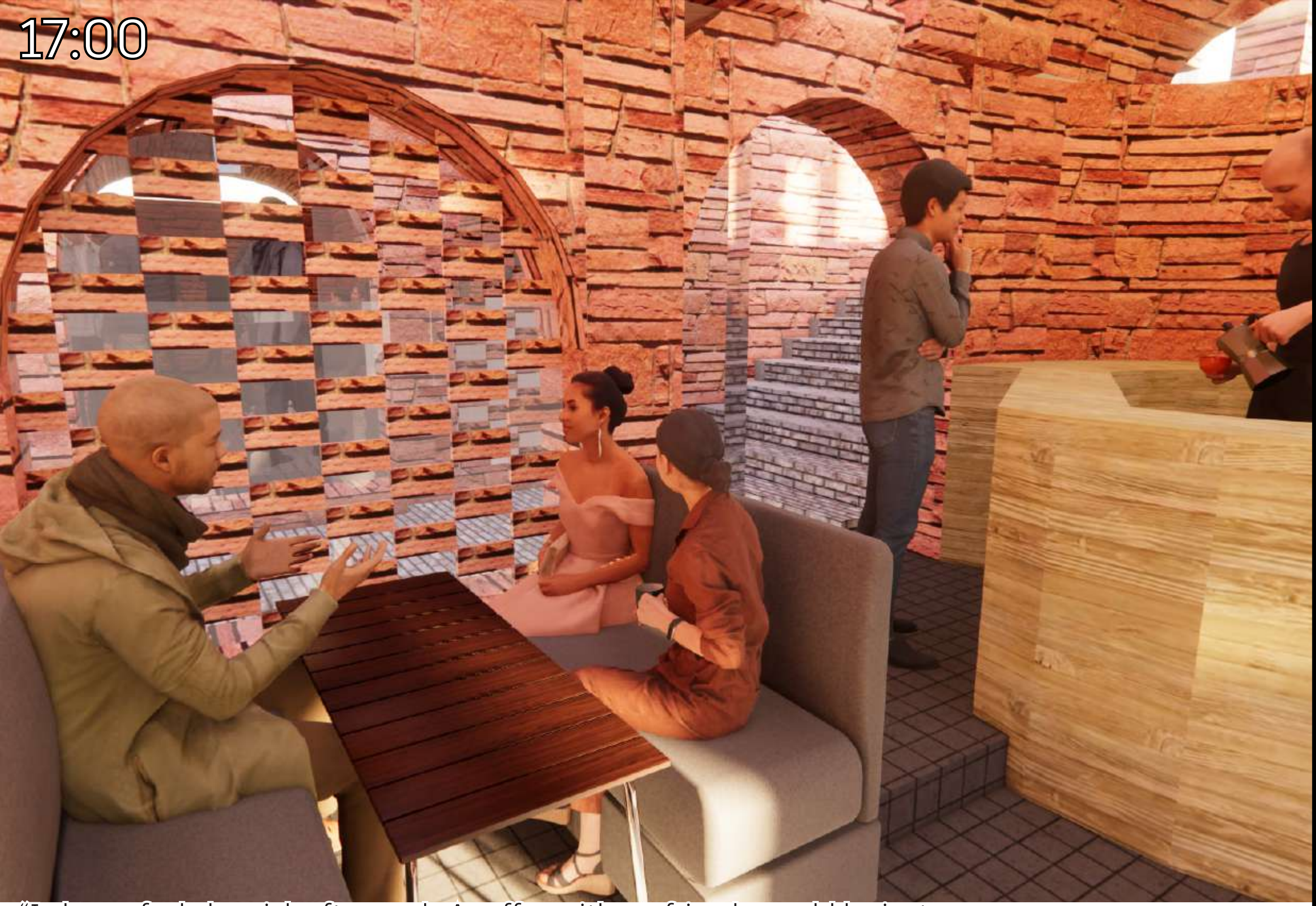
1- Data processed in Climate Consultant 6.0, using BRISTOL 2007-2021 file from https://climate.onebuilding.org/WMO_Region_6_Europe/GBR_United_Kingdom/index.html
2- Reference made to **A brief guide to calculating embodied carbon p23-27,** https://www.istructe.org/IStructE/media/Public/TSE-Archive/2020/A-brief-guide-to-calculating-embodied-carbon.pdf accessed 2023-05-08

"Products produced in and local to Chepstow need a place to be amplified - so far, there isn't really that opportunity at all."

"Somewhere to relax with friends on the rare occasion that the sun comes out would be fun."

"Work events such as wine tasting would be fun to have in Chepstow, to keep its' economy going and to promote local products."

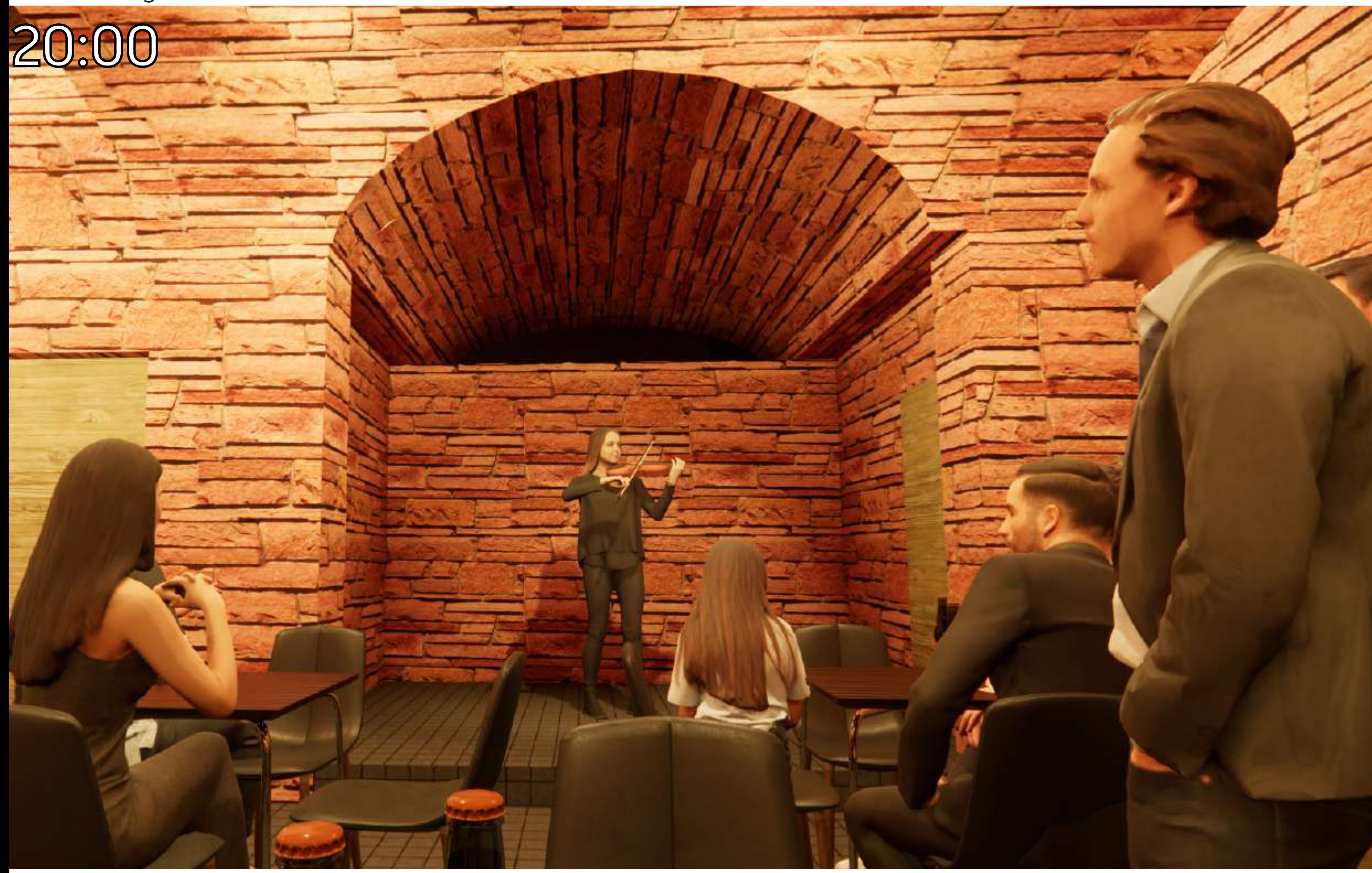
"When I visit my father in Chepstow there's not a lot to do. It'd be nice to spend more time in the town centre somewhere a bit more memorable."



"I always feel sluggish after work. A coffee with my friends would be just the right medicine."

"There's nothing better after a hard day of work, than going to the local and seeing a familiar face."

"Chepstow feels depressing and sometimes scarily quiet to walk through at night."



"In Bristol there's all sorts of places to watch talented people perform in the evenings. Chepstow doesn't have that. It's sad."

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(Slide number).(Reference on slide)

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11.2- Figure 1 from the same place, p7

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17.1- Approved Document M, Volume 2, p19, 22
17.2- Approved Document M, Volume 1, p44 (Figure 2 from same place, Example 3.12B p44)

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19.2- Ibid, Table 3, p55
19.3- Ibid,
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21.1- Column information obtained from Littlefield, David (EDITOR). 2008. Metric Handbook : Planning and Design Data (London: Architectural Press) p. 36-17 Table XVI
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