



Forest Hub is a wood innovation centre bringing researches, students, businesses and local residents together to collaborate and share their passion and knowledge to build healthier and more sustainable urban city. Forest Hub also provides local community with a space to connect with nature – both indoors and outdoors along with private and spacious studios designed for multiple uses.

The concept focuses on sustainable and innovative design solutions by using Biomimicry where biological strategies are being used to improve building's energy efficiency and create a multi-sensory forest-like journey that would bring the user closer to nature.



## Sustainable

Design goes beyond sustainable material choice where it explores historical building's existing opportunities using Biomimicry to create an energy-efficient space and reduce carbon emissions. Forest Hub proposes a balanced restoration sustaining Roundhouse's historical footprint in Birmingham and treating environment with the same respect.

## Innovative

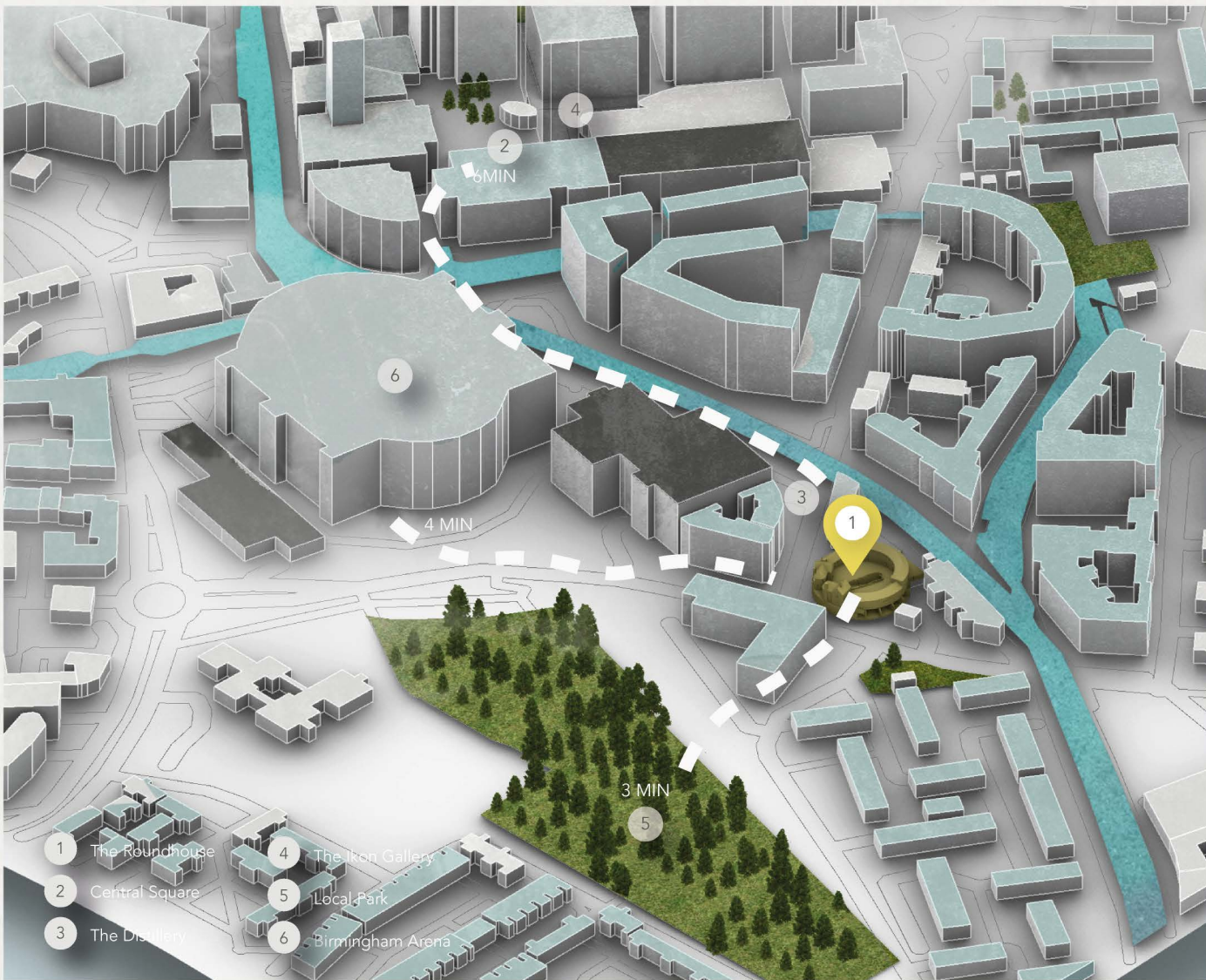
Forest Hub is an innovative space integrated with mobile application designed to educate users about sustainable wood sourcing and production as well as assure a seamless journey and experience. Additionally, it allows the users to adjust and control interior lighting to meet their needs and help creating more relaxing atmosphere and reduce stress.

## User-focussed

Design puts the user and his needs in the centre - collected data analysis helped identifying key health and performance priorities of the user in order to develop design strategies and goals that could improve users' experience and health. Combination of interactive mobile application together with biophilic design patterns helps to bring the user closer to nature.

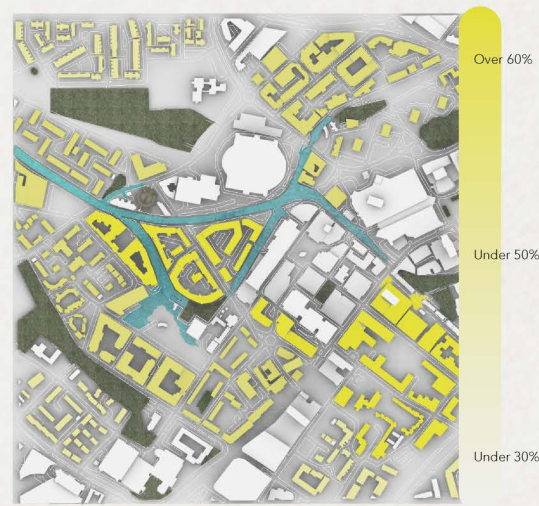






## Location

The Roundhouse is located at the junction of Sheepcote and St Vincent Streets. The site is situated near Birmingham Canal offering a range of ways to reach the premises. It is 10 minutes' walk away from train stations, shopping malls and universities.

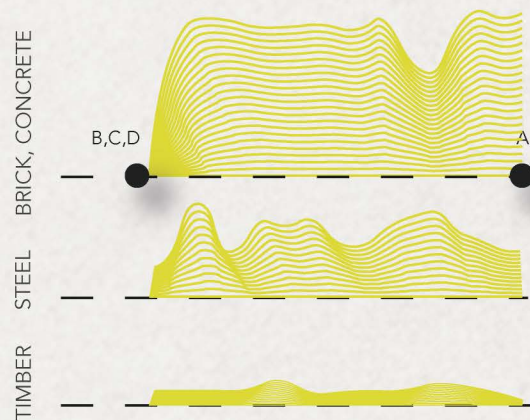


Map presenting the density and percentage of people living alone - Birmingham City Centre

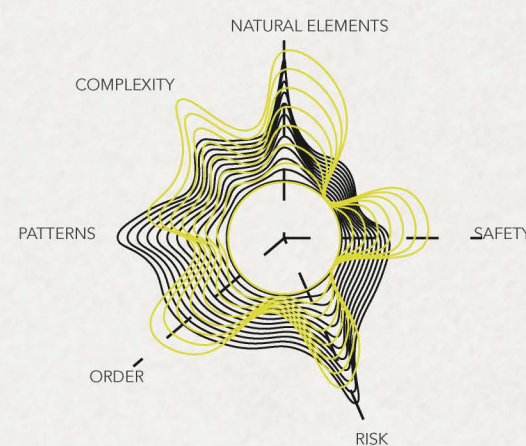
41%

of people reported feeling more lonely

The data provided by Statista Research Department (2021) and findings of my site analysis suggest that the majority of people living near Roundhouse are exposed to the impacts of the pandemic more than people living further away from the city centre - dwellers reported to feel more lonely during the pandemic than normal.



The diagram above shows users' visual connection to the materials surrounding the site. I have analysed main walking/cycling routes within 10 minutes' walking ratio from the site using Google Street view. The area appeared to have a strong connection to materials such as brick, steel and concrete, and very little amount of timber.



I have also explored how the city patterns, exposure to noise and natural elements could effect users' emotional journey. Using the same technique, I walked through the main streets around the site to understand what the key elements are that connect the user to the route.

1/4

of adults living in West Midlands are experiencing mental health issues

Nearly a quarter of adults living in West Midlands are experiencing mental health issues.

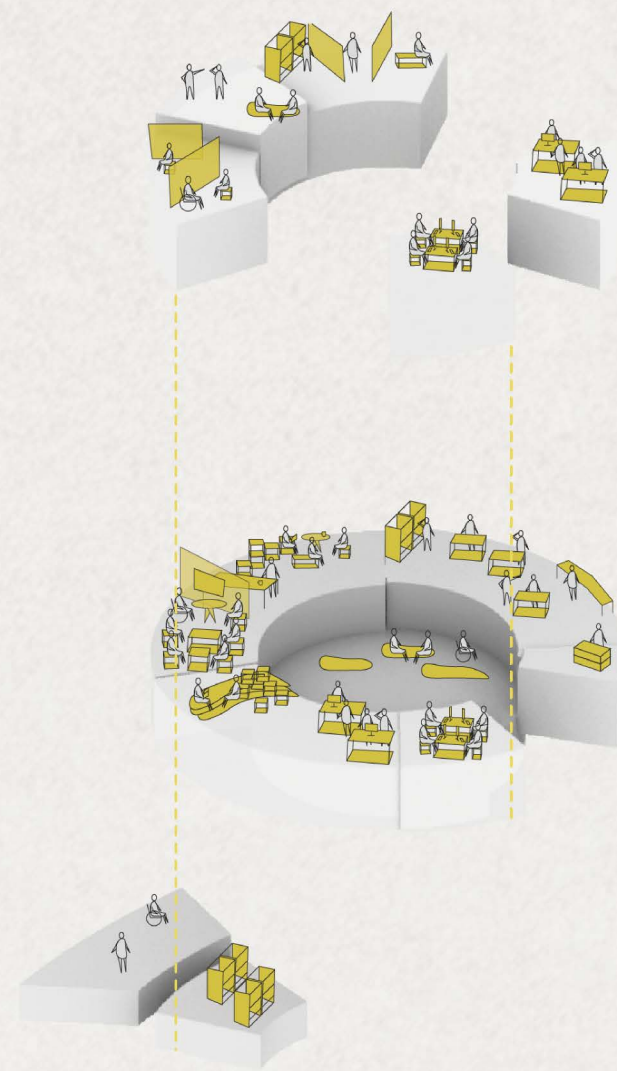
The ONS well-being survey show that the well-being rate of Central Birmingham is below the national average.

Inequalities of urban dwellers and limited access to green spaces have been exposed by COVID-19 pandemic.

There is an urgency for good quality of green spaces to improve residents' health and well-being - learning, recreation, exercise.

## Bringing user closer to nature

With evolving urbanization humans continue to build themselves out of the nature. This becomes a threat to climate, biodiversity and our physical and mental health. By introducing biophilic design in our indoor and outdoor spaces we could rebuild relationship with nature and mitigate climate change.



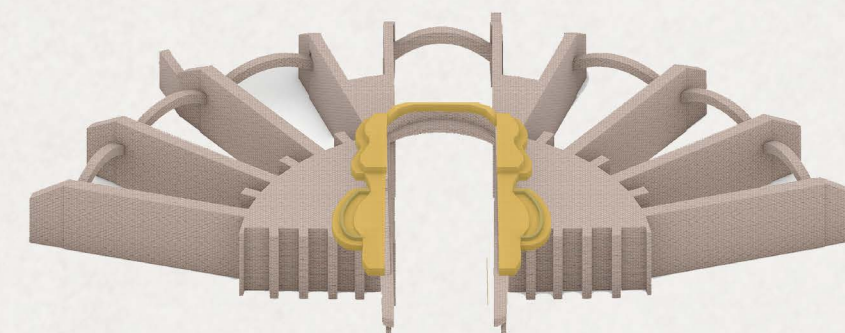
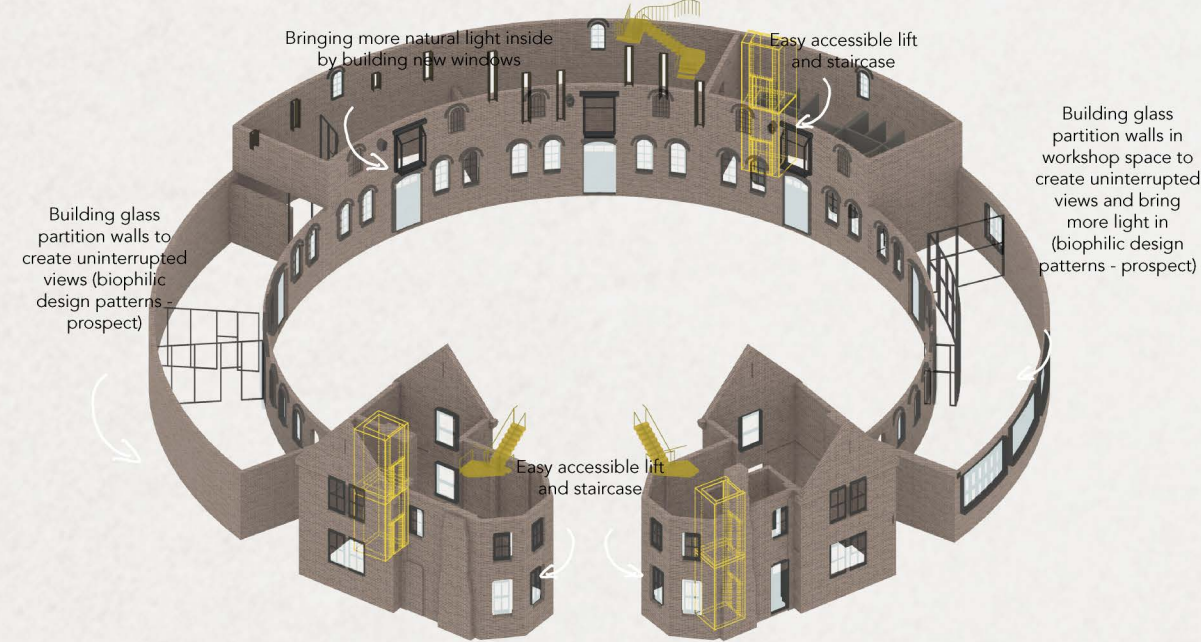
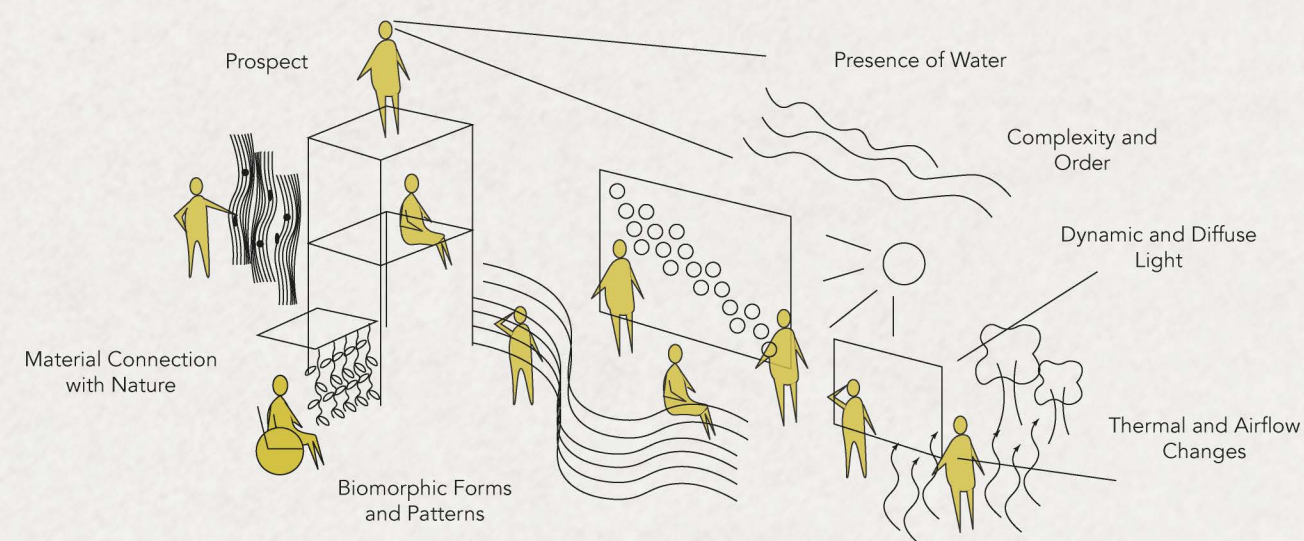
## Mimicking nature

Biomimicry plays a key role in the design by forming the concept, informing material selection and most importantly it is being used to solve problems within the building and create more healthy environment for humans.

Applying principals and key functions of the tree canopy to create the building's own micro-climate and strategy that would help regulate temperature and humidity levels as well as provide a comfortable and safe space.

## Biophilic design

A use of biophilic design patterns can help solve social and health-related problems of the user and overall community. Different patterns offer various positive impacts associated with humans' mental and physical health including stress relief, increased comfort and a feeling of safety, or a positive impact on mental health.



## Key Interventions



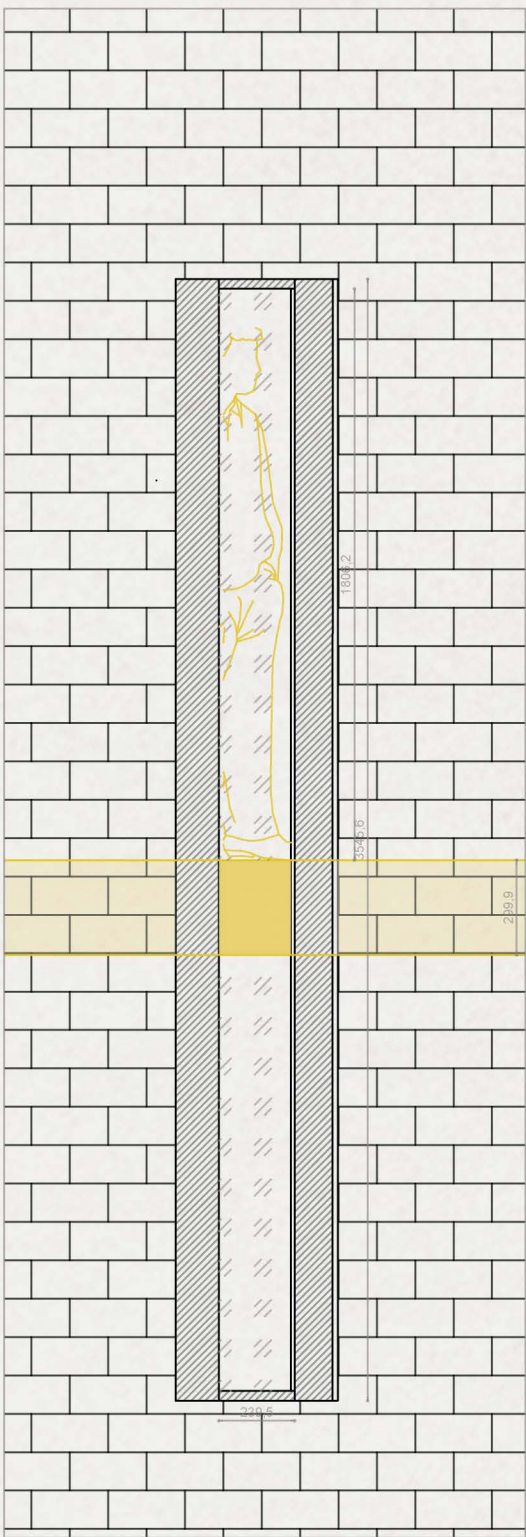


# Bringing more natural light indoors

New double-glazed windows will be built on the building's south facade. Window frames will vary in size - double-height windows will be placed near the new staircase to create continuing views while approaching the first floor.

Single-height windows will be placed on both upper ground and first floor framing the views of canal.

Glazed balconies with a 500mm depth timber platform will overlook the courtyard and let the user enjoy private and exiting spaces filled with warm afternoon sun.



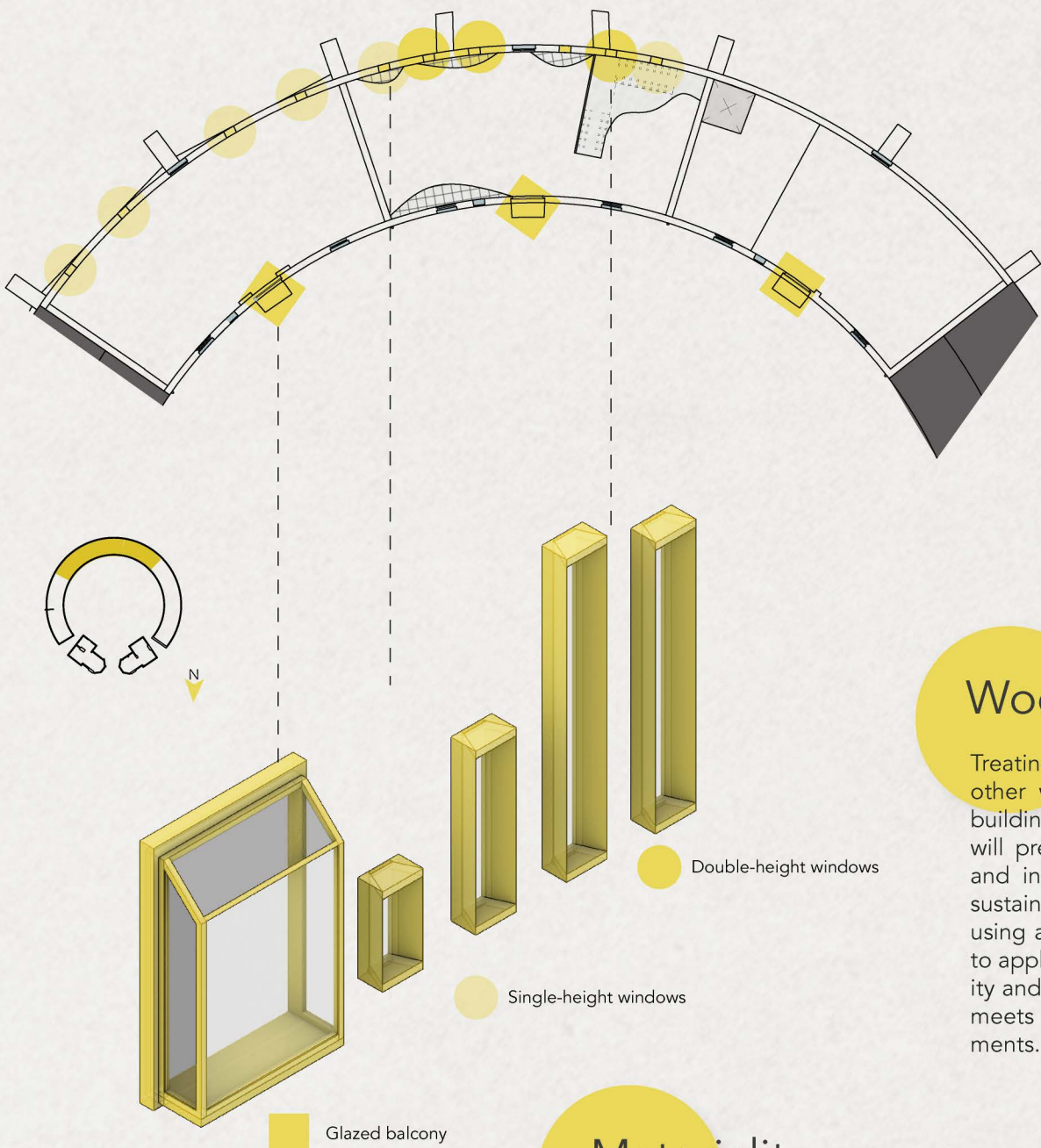
External South Facade Elevation. Double-height window (not to scale)

# Controlling incoming light

Window frames were designed and shaped to have a more narrow opening to the outside to help control direct sunlight coming through the windows during hot summers. The changing angle of the frame will also help to defuse and spread the light more evenly creating more soft shadows.



Internal Facade Elevation. Glazed Balcony (not to scale)



# Materiality

In terms of material selection, frames will be made of reclaimed cedar wood - the frame will be treated using Japanese Yakisugi wood burning method to preserve the material and also create a darker finish - this will help the windows to harmoniously contrast with existing brick structure as well as store more heat due to its dark finish.

# Wood charring

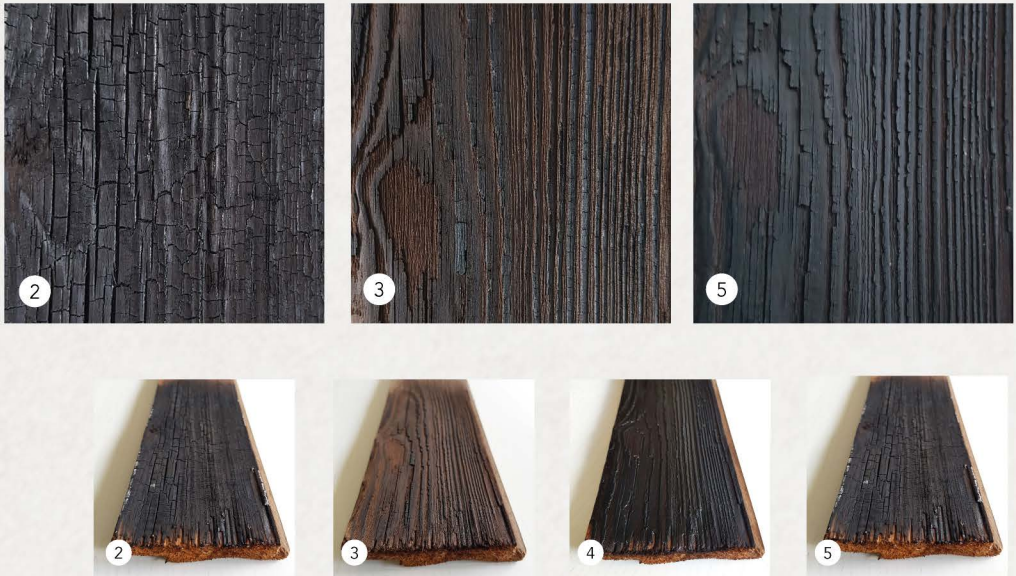
Treating wooden window frames or other wooden elements within the building using Yakisugi technique will preserve wood from fire, water and insects. This technique is also sustainable as it does not include using any toxic products and is easy to apply. It also increases the longevity and durability of the material that meets Cradle-to-cradle requirements.

# Material testing



# Outcome

Testing Yakisugi technique on cedar wood helped understanding how texture and finish of the material change. The finish of burnt wood surface looks very eye catching and dramatic, it also appears in different textures and grains creating more unique and bespoke finishes both in the interior or exterior spaces.



1

To test yakisugi technique on wood, I used a small plank of cedar wood that I sanded prior to the burning process.

2

Using a blow torch I burned cedar wood for about 5 minutes until it started charring.

3

Once it cooled down, I used a fine metal brush to remove the charcoal to prevent the wood from staining.

4

I oiled it with linseed oil and left it to try and get absorbed.

5

Once the oil absorbed, it gave cedar wood a matt finish and left no stain marks when touched.

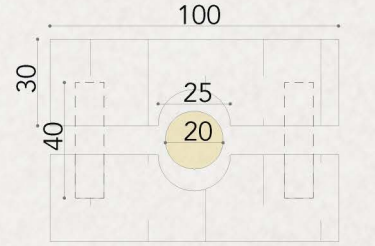


# Modular wall system

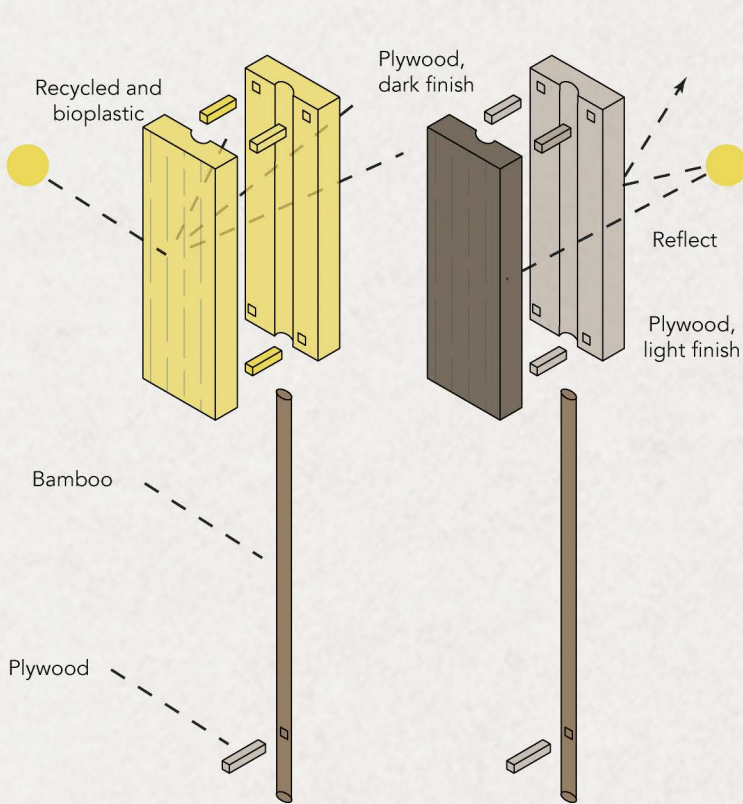
The strategy that exterior olive tree leaves use to store and reflect sun inspired me to design a modular wall system that would function in a similar way. The areas that get most exposure to sun would be treated as the tree canopies where modular wall systems would be built to help improve the energy-efficiency of the building.

# Designing for disassembly

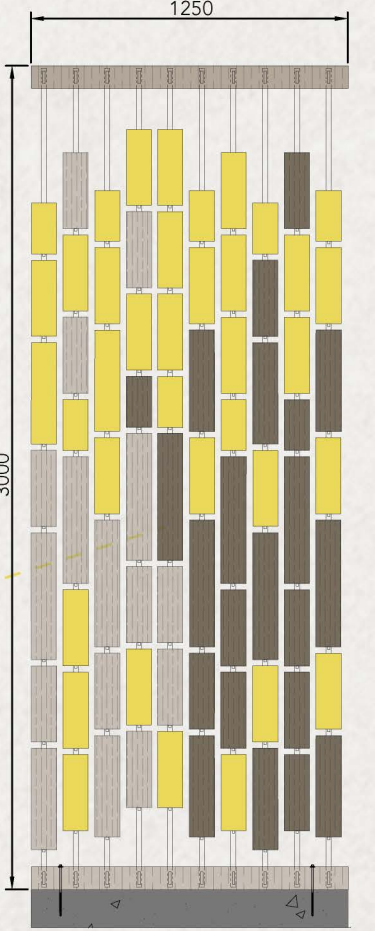
Sustainability being one of the key drivers of my project made me consider not only material choice but also waste and assembly processes. Plywood panels and frames will be cut using CNC machine and joint by using wooden joinery to meet DFD requirements.



Top View - Individual Panel (not to scale)



Joinery and Detail Drawing (not to scale)



Rendered Front Elevation (not to scale)

# Sustainable materials

The wall will be built of plywood sheets creating a frame to hold the inner structure which will consist of multiple plywood panels cut in different sized and stained in light and dark finishes to either reflect or absorb the sun light.

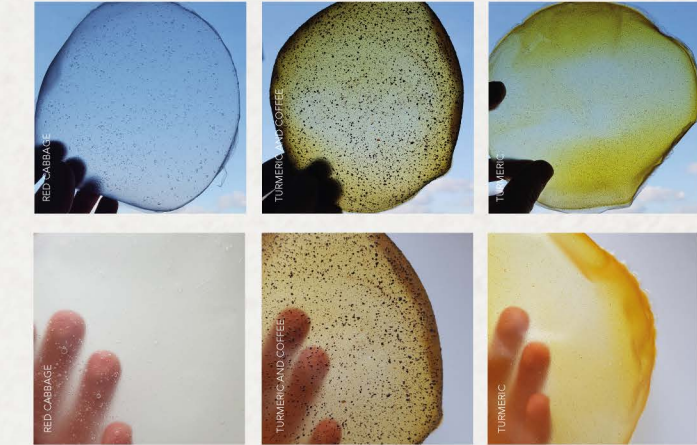
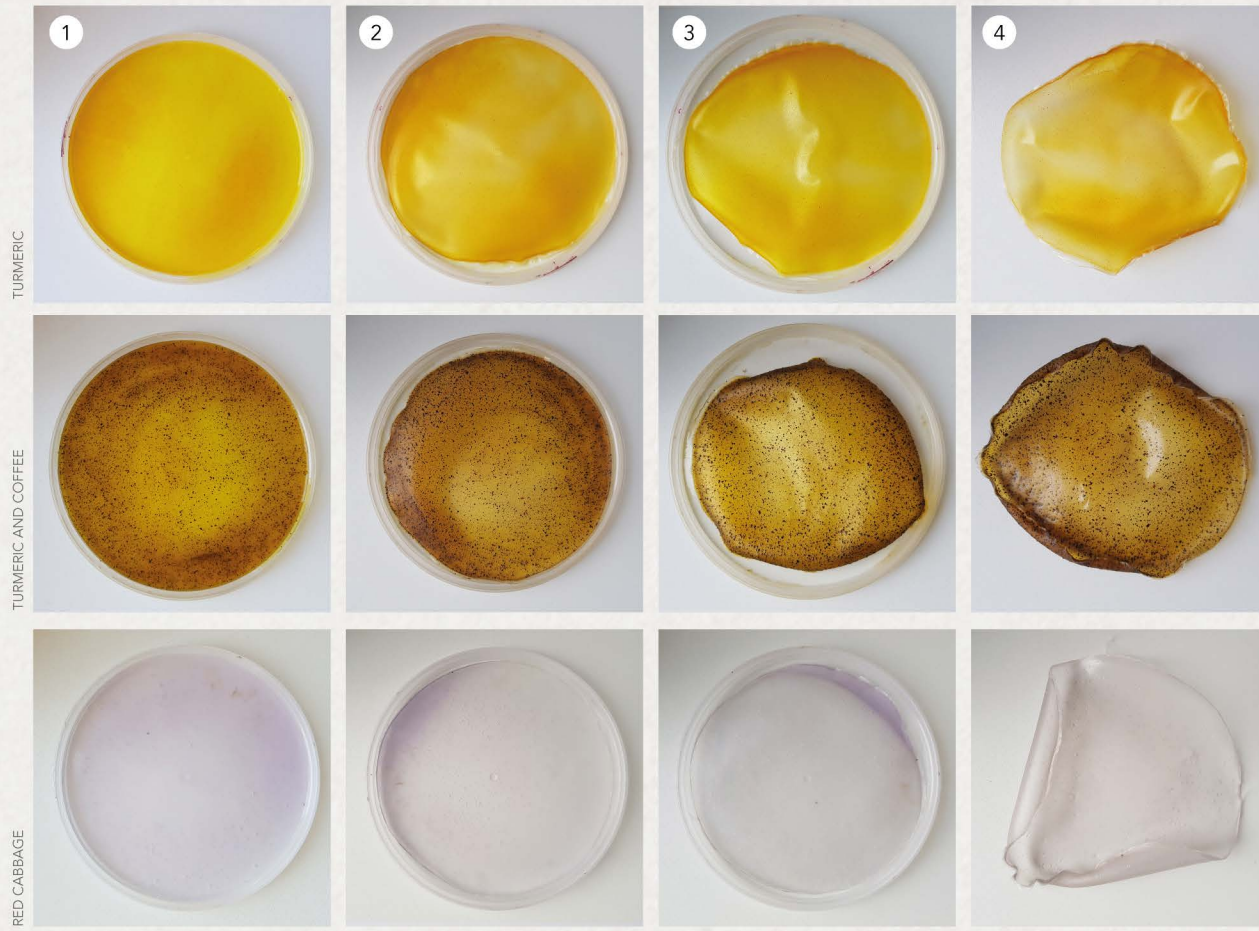
# Manipulating light

To be able to diffuse and spread any direct sunlight coming into the space translucent materials will be used. As my design focusses on sustainability and reduction of carbon emissions I looked into recycled plastic and also bioplastic that is made of renewable materials. Transparent recycled plastic will be used to diffuse incoming light to the space and provide darker spaces of the building with more light.

# Material testing

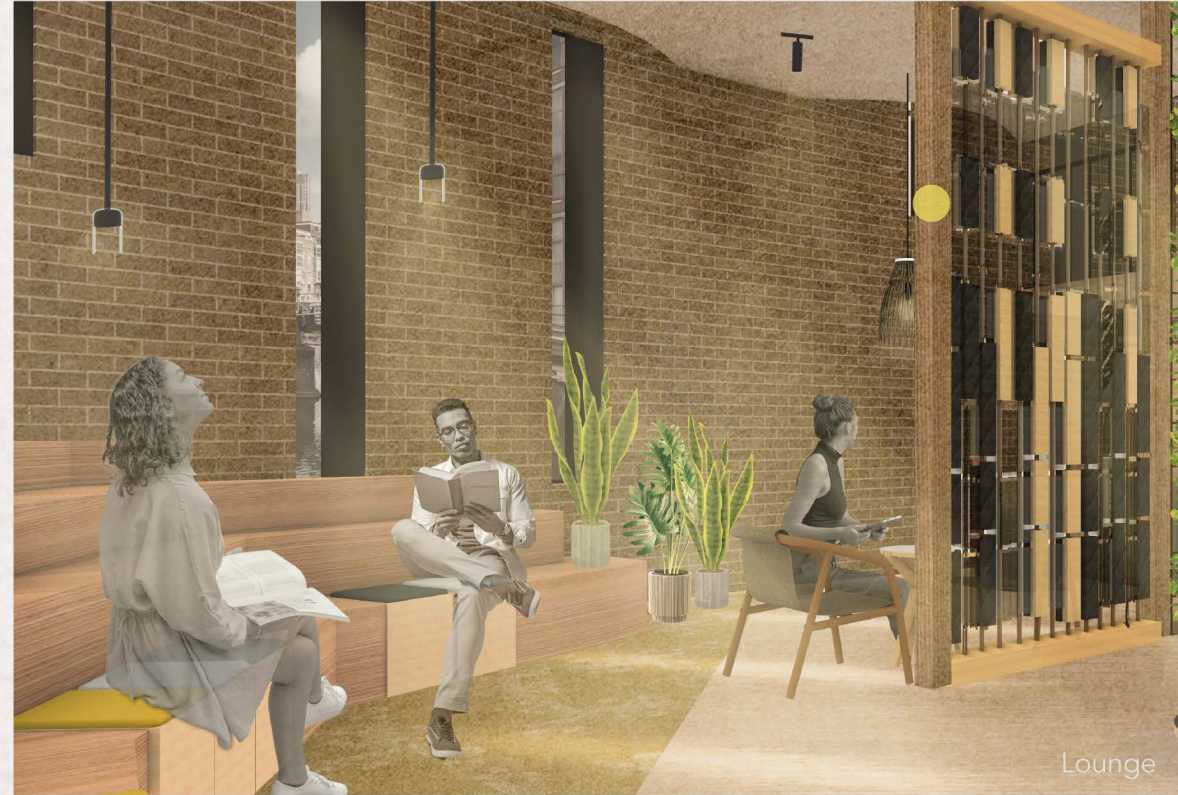
As a part of my design development, I decided to do material testing and create my own bioplastic samples to understand the material better. To create bioplastic samples I used glycerine, potato starch, gelatine and water. I also used natural dye - turmeric and red cabbage to test how colour affects the transparency of the material and diffusion of light. Food waste - coffee grounds were used to add texture and grain.

I left bioplastic to cure and dry for 24 hours. Images on the right show different stages of material curing - once the bioplastic has dried, it started to shrink and curl. Instead of forcing the material to stay flat by adding pressure on top of it I decided to let it develop naturally.



# Outcome

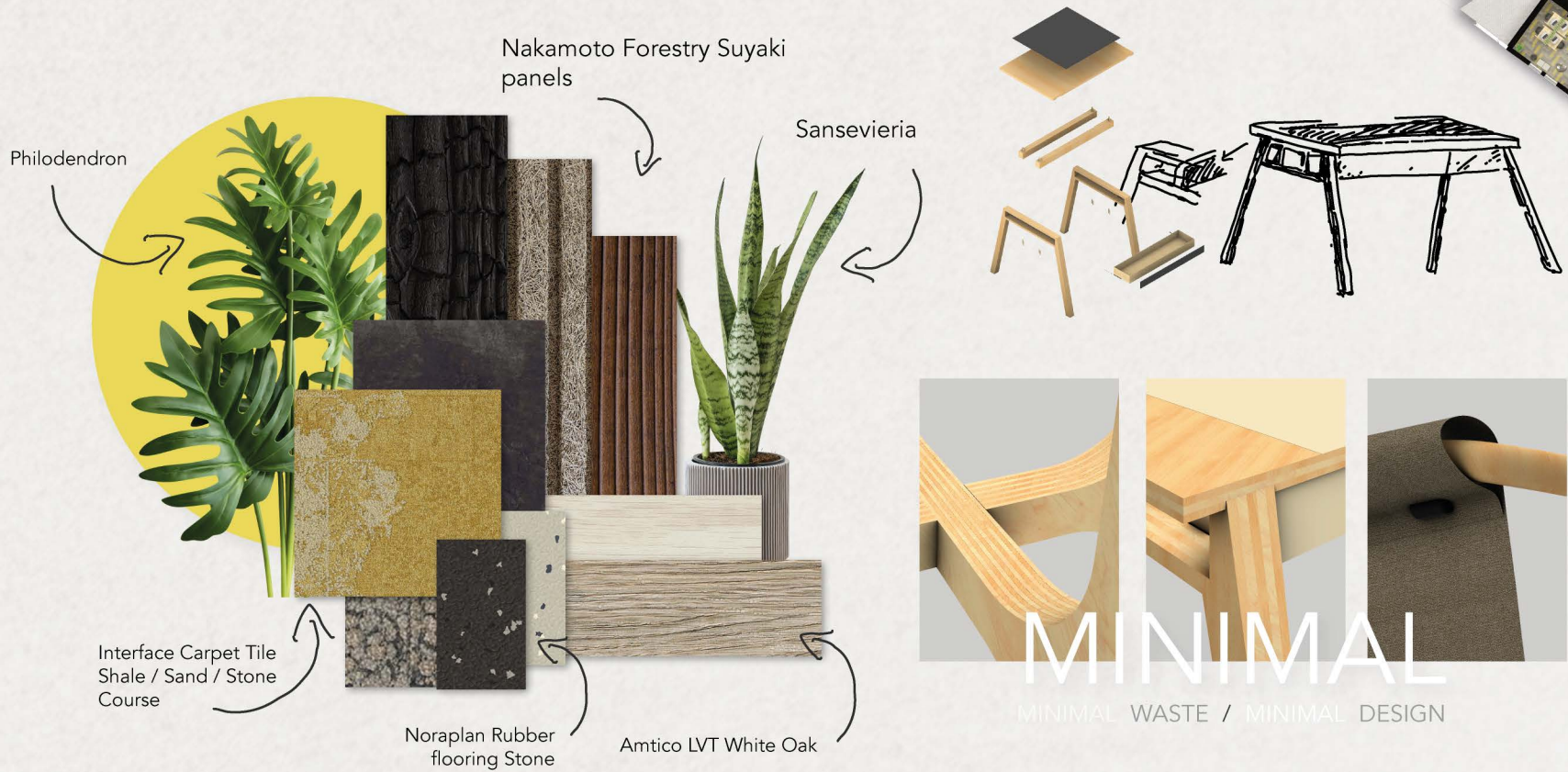
After 48 hours of drying, I then have taken the samples out of the trays - the surface on the bottom turned out to be glossy and very reflective whilst the top surface developed a more matte finish. Bioplastic turned out to be very durable and flexible at the same time - I was able to fold and bend the samples in any direction without damaging material. These thicker areas appeared to be more rich in colour and less transparent.



Lounge



Meeting room

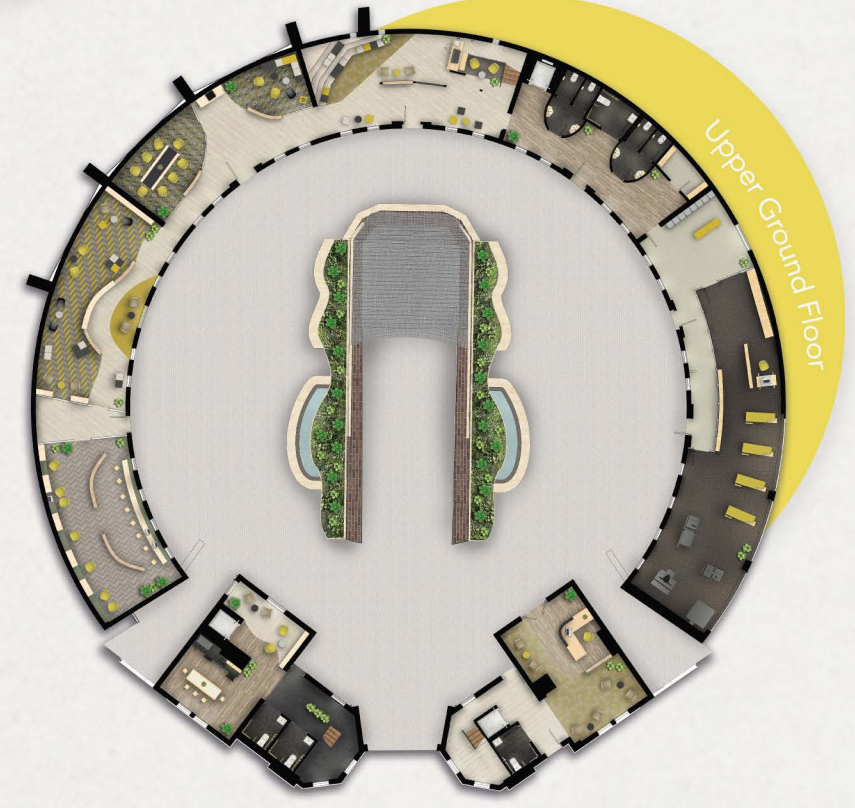


# Material connection to nature

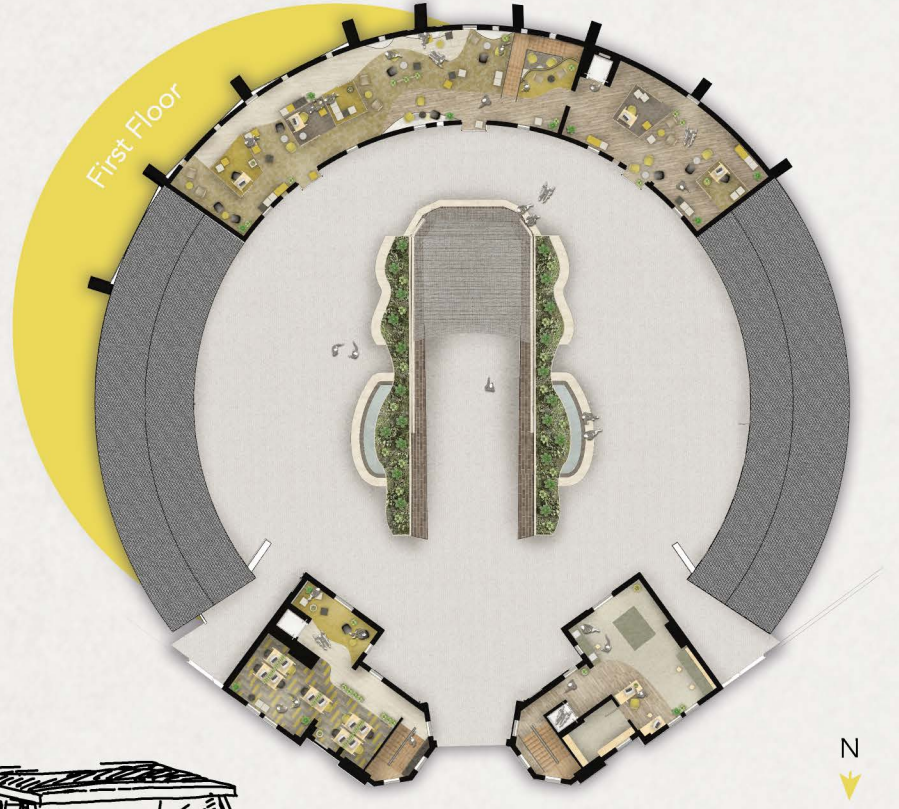
Earthy tones and woven fabric textures were used to evoke and mimic natural features with an aim to enhance the connection with nature. Panaz Highland Stretch collection products were used to create indirect connection to nature that will help the user to relax and de-stress.



# Rendered floor plans



Upper Ground Floor



First Floor

# Minimal material waste

Furniture collection MINIMAL was created following my design ethos that strongly focus on sustainability and connection to nature. Each piece of furniture has been designed using two key materials - either birch plywood or beech timber to create strong and rigid structures that last.



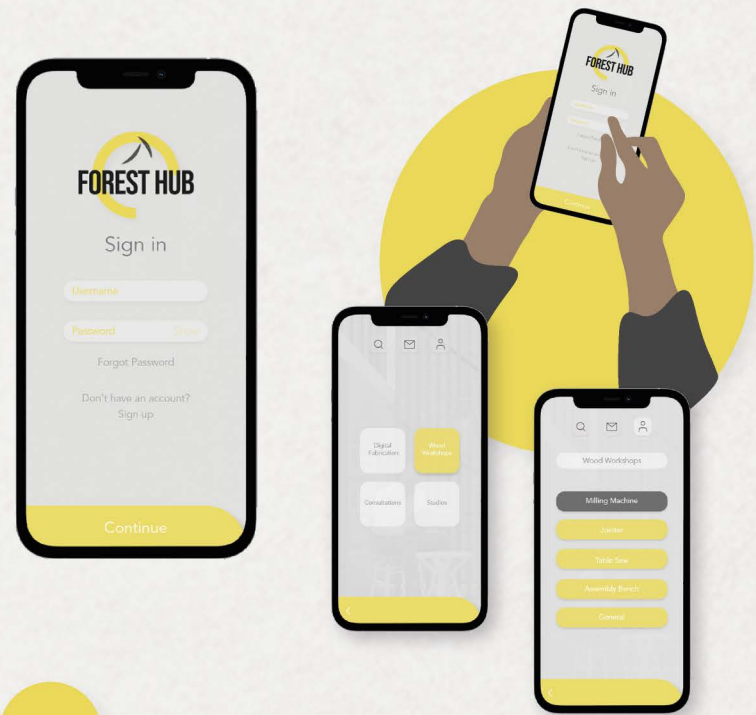




Staff kitchen



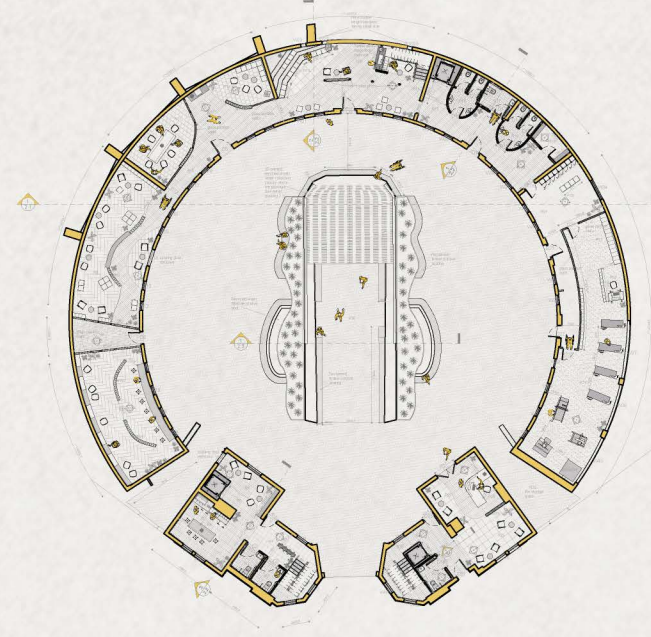
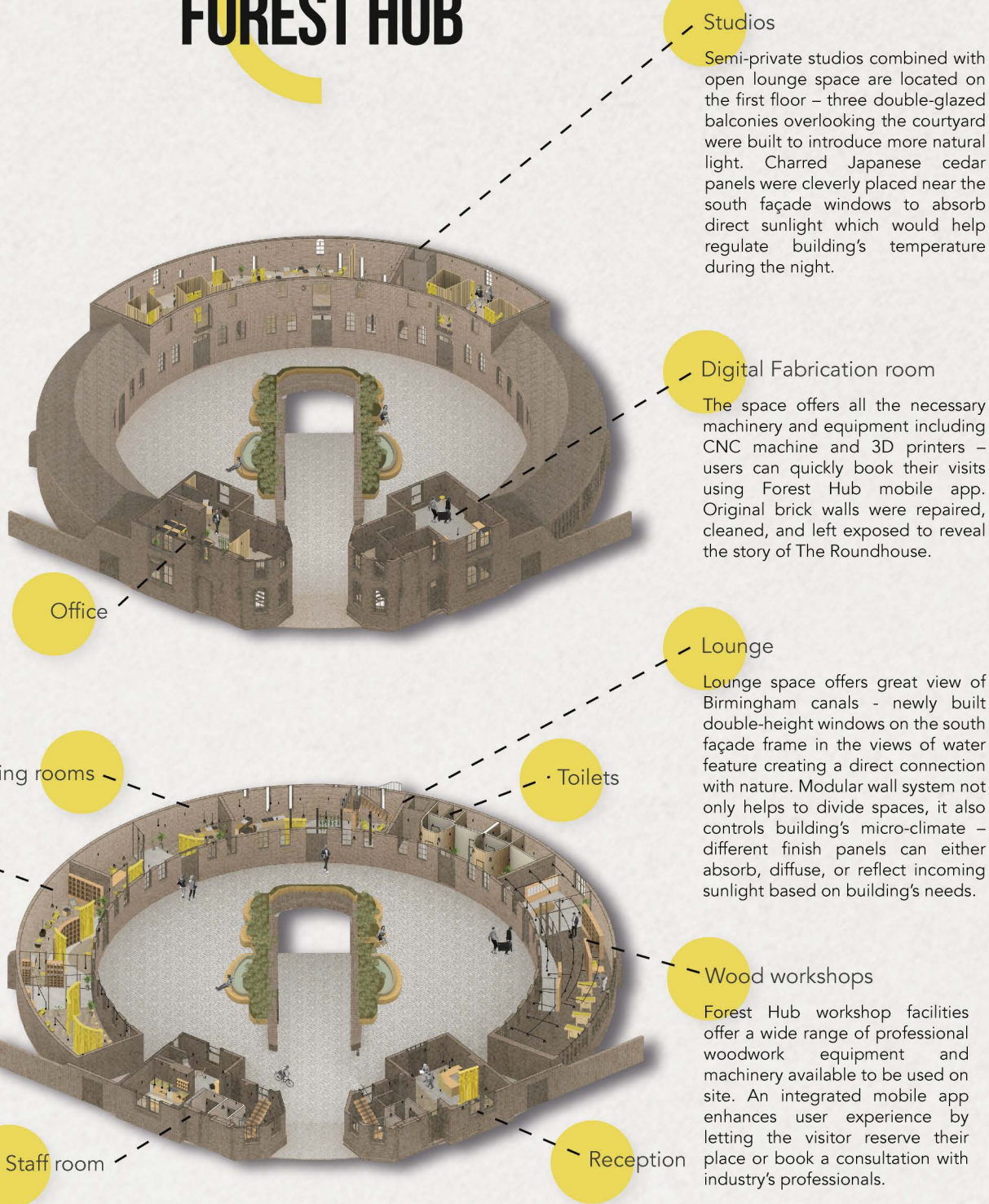
Wood workshops



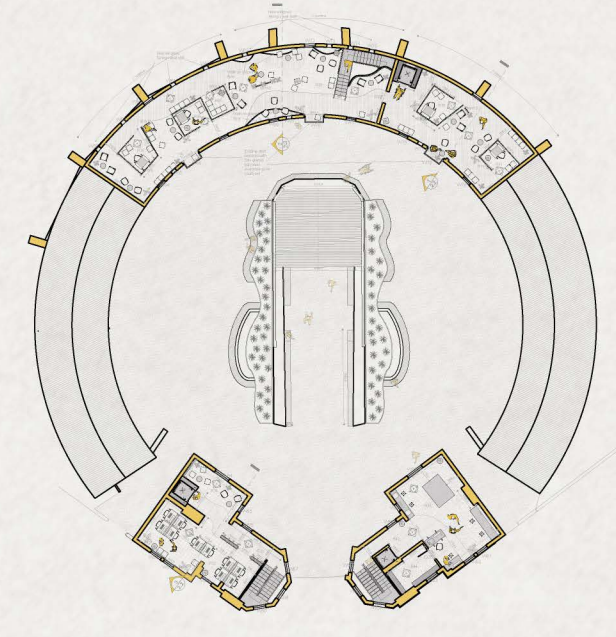
This innovative mobile app was designed to educate users about sustainable wood sourcing and production as well as assure a seamless journey and experience.



A platform bringing designers and local residents together to share their skills and knowledge and build a more resilient community. It allows the users to book their visits in advance and explore activities and events available at Forest Hub.



GA Plan - Upper ground floor (not to scale)



GA Plan - First floor (not to scale)

