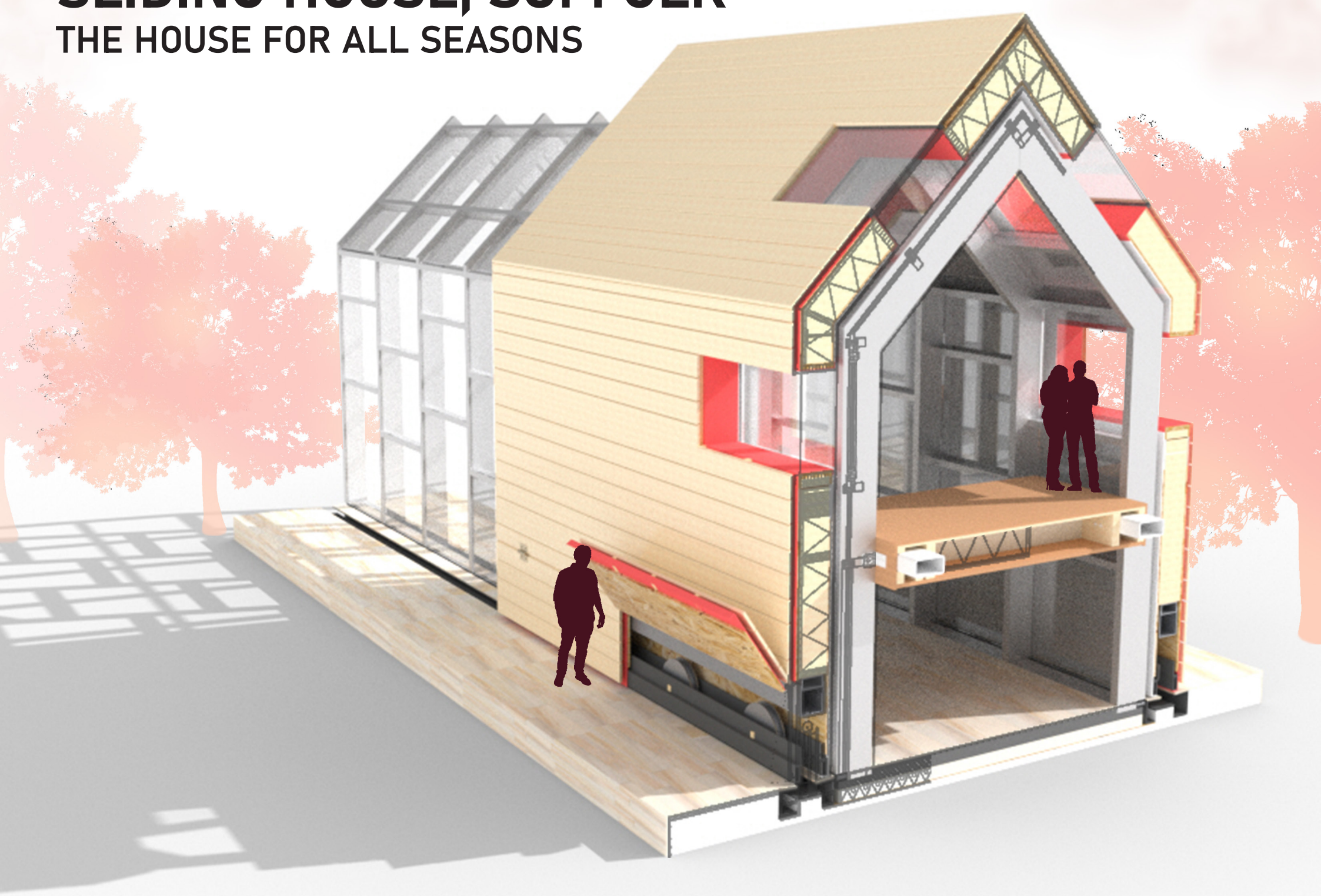
SLIDING HOUSE, SUFFOLK

THE HOUSE FOR ALL SEASONS



Student: Amy Galea
Student number: U2160084
Institute : University of Huddersfield
Module: Technology 3 - THA1240
Module Leader: Dr Ahmed Hassan

CONTENTS

STATIC FACADE **UPPER FLOOR** **SLIDING FACADE** **WHEEL MECHANISM**

Student: Amy Galea
Student number: U2160084
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SLIDING HOUSE, SUFFOLK

THE HOUSE FOR ALL SEASONS

COMMENCEMENT

COMPLETION

Ross worked as an acountant

Ross decided he had made enough money out of his city job to move to the country side.

ABOUT ROSS RUSSELL

Ross Russell contacted his old friend Alex Rijke to ask him if he could design his house

Rijke and Ross created a friendship over motorbikes

CLIENT - ARCHITECT RELATIONSHIP

Rijke and Ross did woodwork together at a Devon school

2005

1 NEW HOUSE:

Ross and his wife Sally decided they wanted to build a new home. With the main aim being it wasn't going to be any ordinary new build.

CLIENT: ROSS RUSSELL & His wire Sally

4 CONTACT ARCHITECT :

ARCHITECT: ALEX DE RIJKE
COMPANY: DRMM

Because of Ross and Alex's close relationship they where able to work together to create a strong brief tailored towards Ross and Sally's needs.

2 CHOSEN LOCATION:
SUFFOLK

PURCHASED LAND 3

AIMS

Dynamic element.

Some form of shading canopy.

Adaptability

Rural location.

CHOOSING THE LAND/ SITE

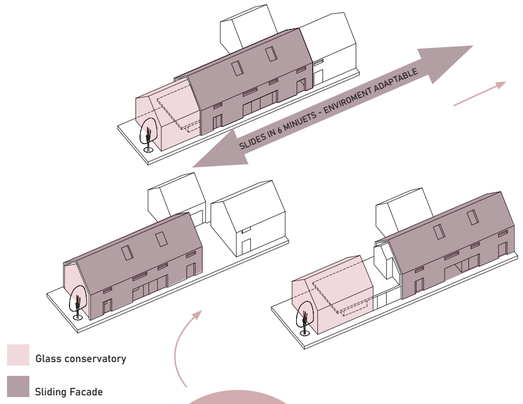
The site included a run down bungalow

Planning permission to replace the bungalow

3½ acres of land

Situated outside a village

Privacy - nobody overlooking



A kinetic shell made up of a rigid steel frame, insulated and clad with timber, complete with skylights

DESIGN AIMS

Ross and Rijke looked at the traditional farm buildings of the area and they where all turning there back to the chill of the east winds of East Anglia.

Because of this they made the conscious decision to follow suit.

The rear of the house will be finished with a red waterproof membrane that transitions into a glass conservatory at the front.

5 ARCHITECT: ALEX DE RIJKE
COMPANY: DRMM

The client Ross and sally work together with Alex and Drmm team to design the house of there dreams.

6 CONSTRUCTION - COMPLETION

After 4 years of contemplating, designing, and constructing the Sliding house was completion.

7 AWARDS

The Sliding house was shortlisted for several designs, and was awarded 2009 Grand Designs Awards Home of the Year.

Kevin McCloud described it is "one big stroke of genius, a crazy idea that isn't gratuitous but a creative response to make the building highly responsive to its environment and an extraordinary place to live." (Drmm, 2023).

2009

DESIGN CHALLENGES

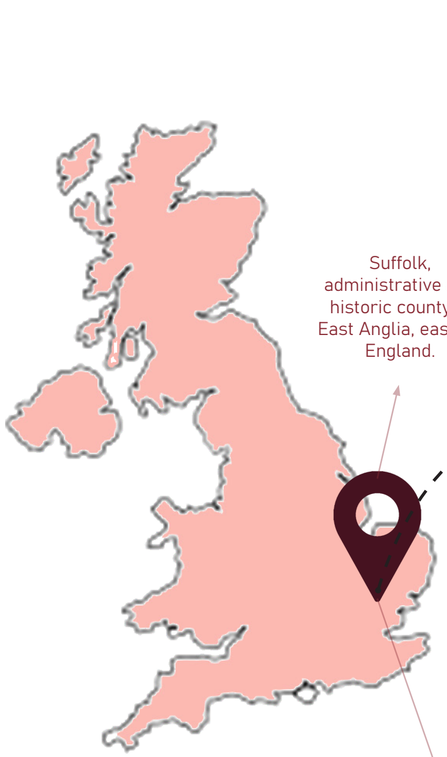
There couldn't be the traditional chimneys, TV aerials or even gutters due to the kinetic element sheltering the static building.

Safety considerations regarding access , door openings to the building, in-case the Kinetic shell stops moving.

There will always be an exit route to the building at any time when the outer shell is moving.

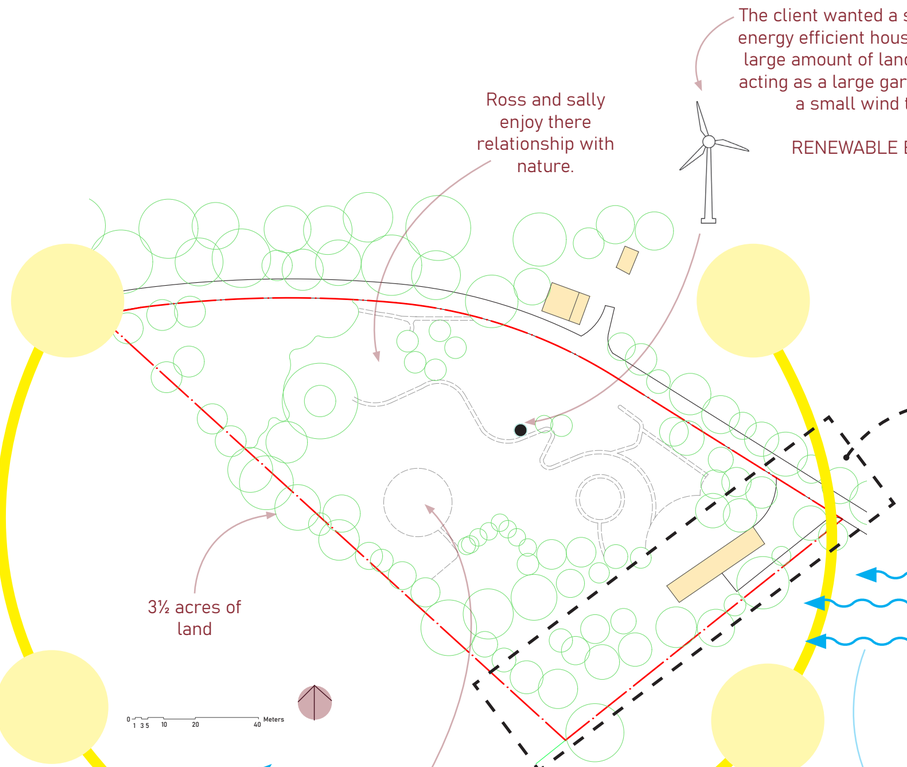
Low energy usage

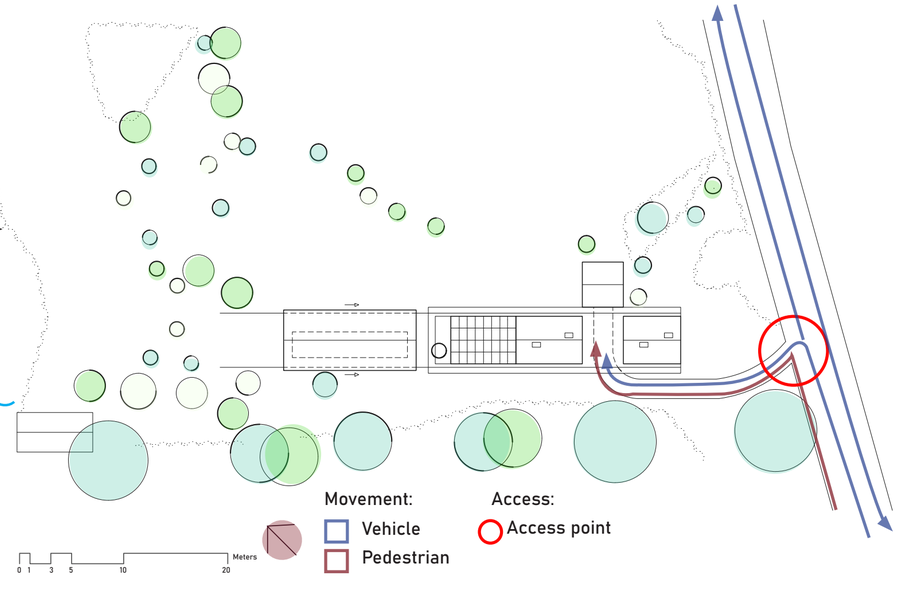
SITE IDENTIFICATION

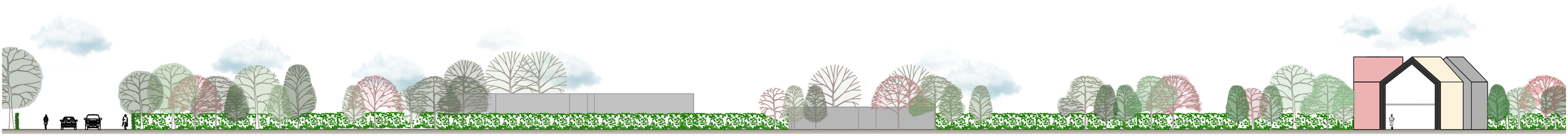


Suffolk, administrative and historic county in East Anglia, eastern England.

The site is based within a lovely rural agricultural setting, but it was restrained by stringent local planning parameters for rural development.

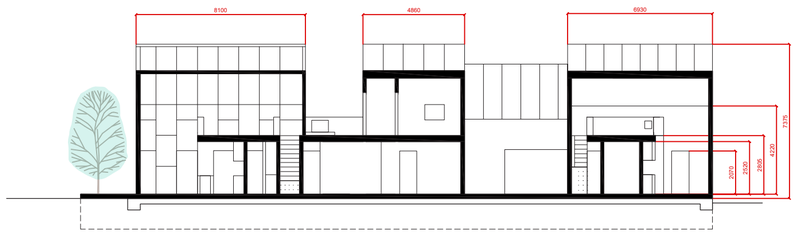




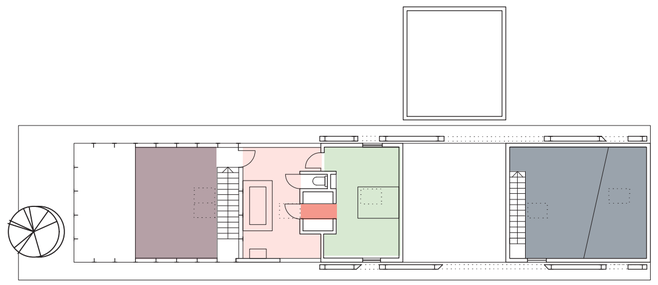


METERS 0 5 10 20 40

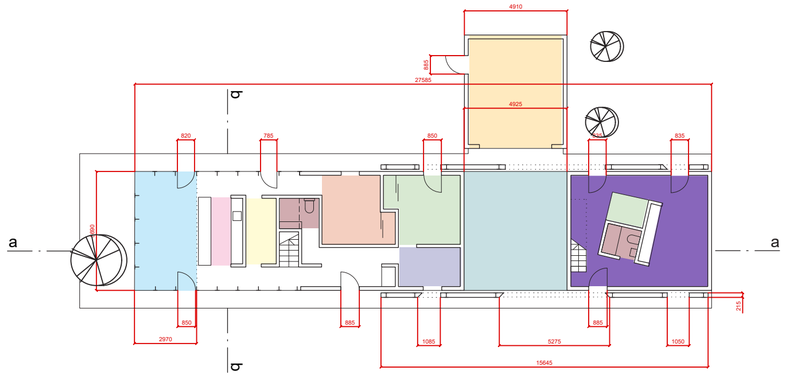
ARCHITECTURAL PLANS, ELEVATIONS AND SECTIONS



Section aa



First floor plan

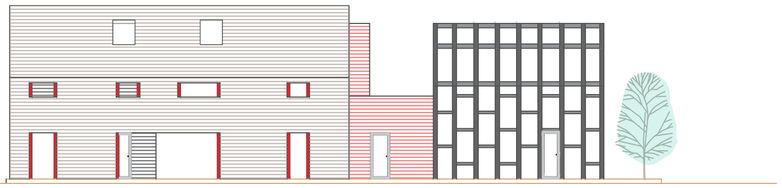


Ground floor plan

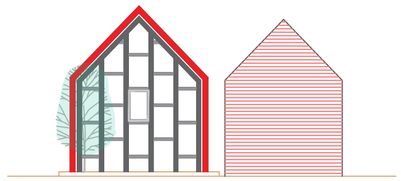
Scale 1:200

0 2000 5000 10000 15000mm

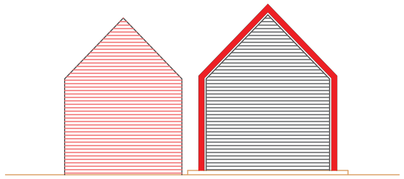
Elevation A



Elevation C



Elevation B



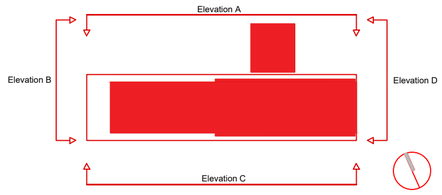
Elevation D

Scale 1:200

0 2000 5000 10000 15000mm

- Conservatory
- Kitchen
- Utility room
- Living room
- Bedroom
- Study
- Courtyard
- Garage
- Living area/ Kitchenette
- Gallery
- Open-able bathroom
- Dressing room
- Office/Living room

Project Name: Sliding house, suffolk
Ground & First floor plans, Section.
Scale: @A3: 1:200
Name: Amy Galea



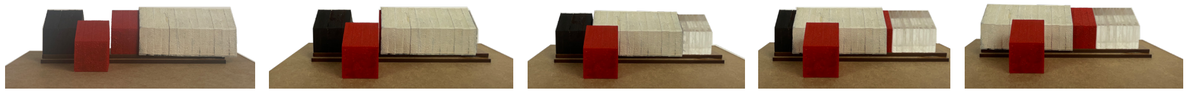
Project Name: Sliding house, suffolk
Elevations
Scale: @A3: 1:200
Name: Amy Galea

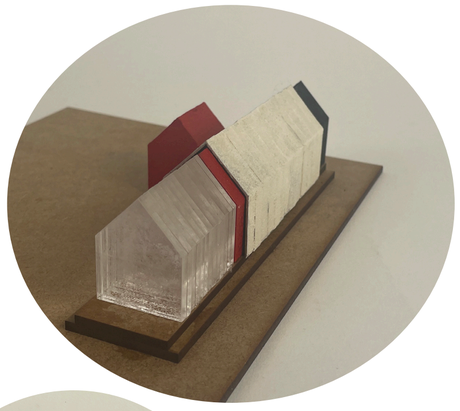
IDENTIFYING THE DIFFERENT ELEMENTS

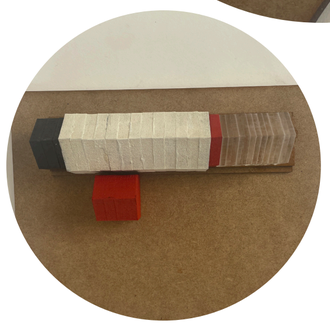
STATIC STRUCTURE

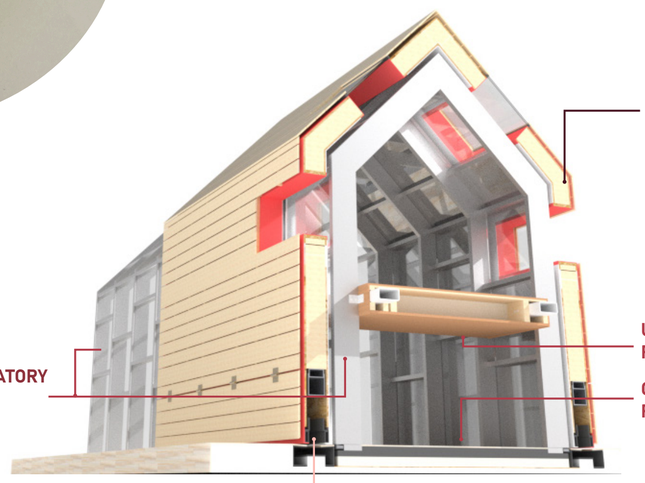
KINETIC STRUCTURE

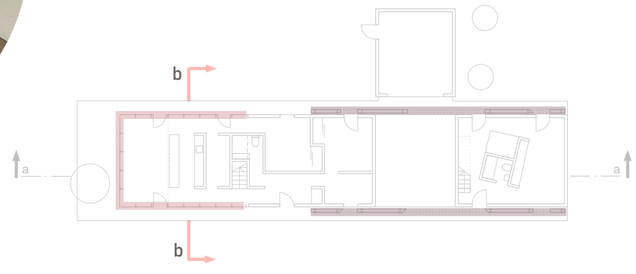
CONSERVATORY STRUCTURE











SLIDING, KINETIC FACADE LAYER:

Roof and wall construction:
18 mm larch boarding on 38/38 mm wood battens
3 mm ethylene-propylene-rubber layer on
18 mm oriented-strand board
200 mm thermal insulation
18 mm oriented-strand board
50/200 mm timber-frame structure
8mm polycarbonate sheeting

Window reveal:
3 mm ethylene-propylene-rubber layer on
32 mm oriented-strand board

Load-bearing structure:
50/200mm timber-frame structure

Load-bearing structure:
Steel A-beams 215 and 200 mm deep

CONSERVATORY FACADE:

Transom Curtain wall (Glazing)

Mullion Curtain wall (Glazing)

UPPER FLOOR:

Upper floor:
Hard wood flooring
18 mm oriented-strand board
200 mm thermal insulation
200 mm by 50 mm timber-frame structure
plasterboard

Curtain wall connection to upper floor

GROUND FLOOR:

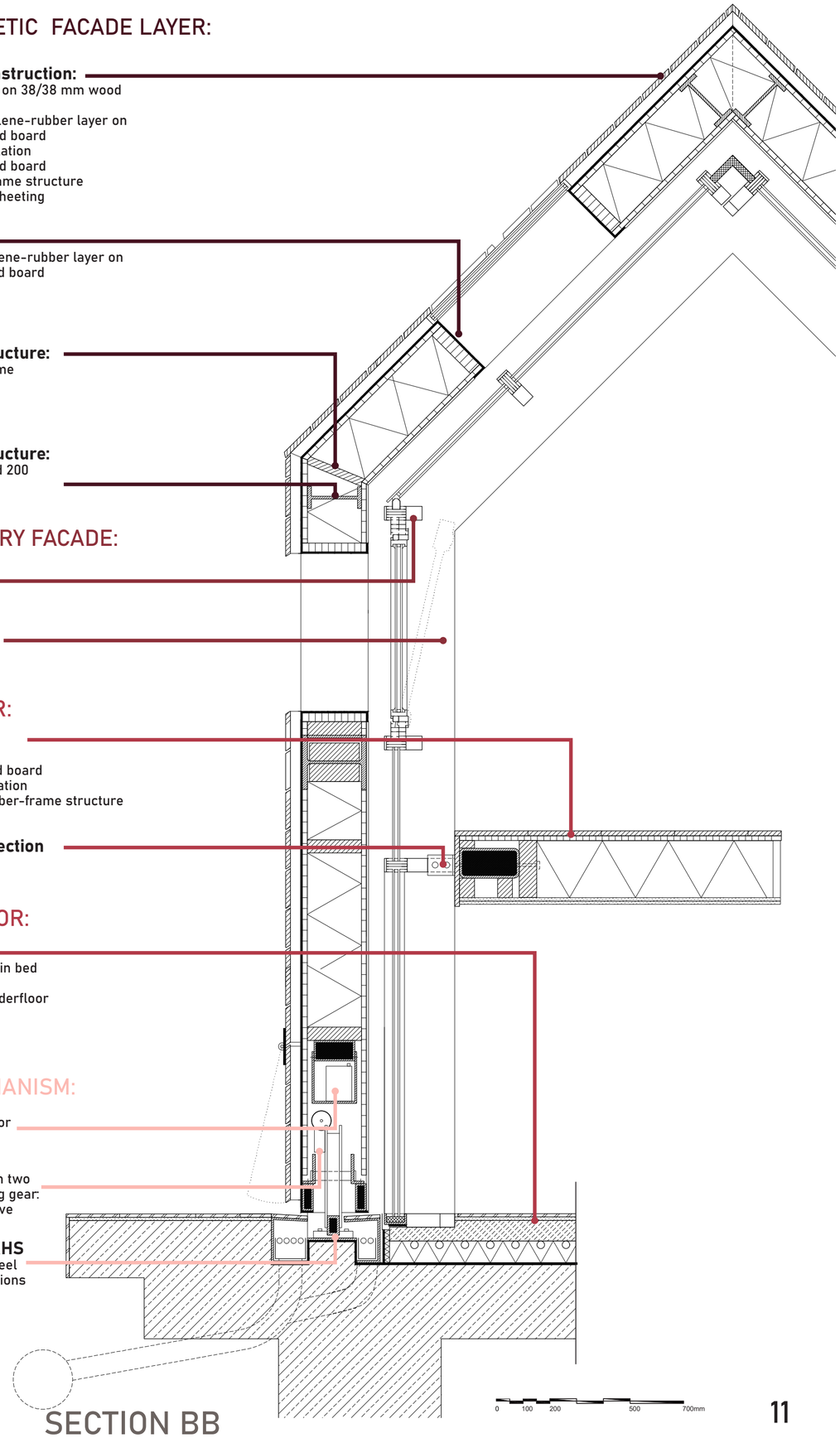
Ground floor:
12 mm quartzite slabs in bed of mortar
65 mm screed with underfloor heating/cooling

WHEEL MECHANISM:

12-volt batteries for Electric motor

Electric motor with two 12-volt batteries rolling gear: gearbox with chain drive

44/72 mm steel RHS
guide rail fixed with steel plate bolted to foundations



SECTION BB

WHEEL MECHANISM

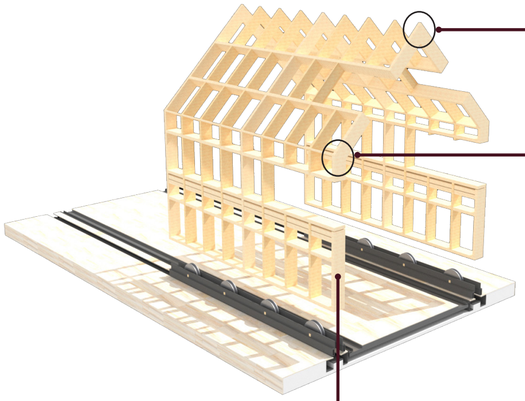
SLIDING FACADE

GROUND AND UPPER FLOOR

STATIC FACADE

SLIDING FACADE LAYER 2:

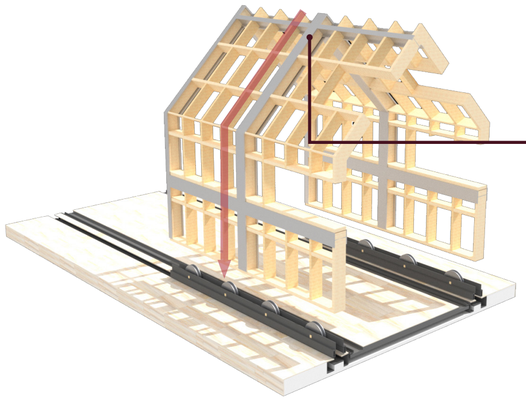
STRUCTURE SYSTEM



Timber frame connection:
Due to the limited information on the connections for the sliding house, as an educated guess they could have used;
a) mortise and tenon joint
b) Pegged Joinery

Mortise and tenon joint is favoured aesthetically, which in this case isn't a great concern. Therefore is most likely to be the pegged option is favoured for creating extra support and making it more resilient.

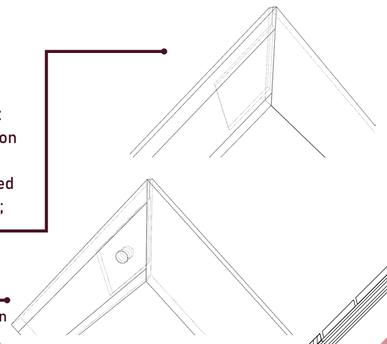
50/200 mm timber-frame structure



Steel A-beams 215 and 200 mm deep

18 mm oriented-strand board

8mm polycarbonate sheeting



18 mm larch boarding

18 mm oriented-strand board

Window reveal

200 mm thermal insulation

18/38 mm wood battens

18 mm oriented-strand board

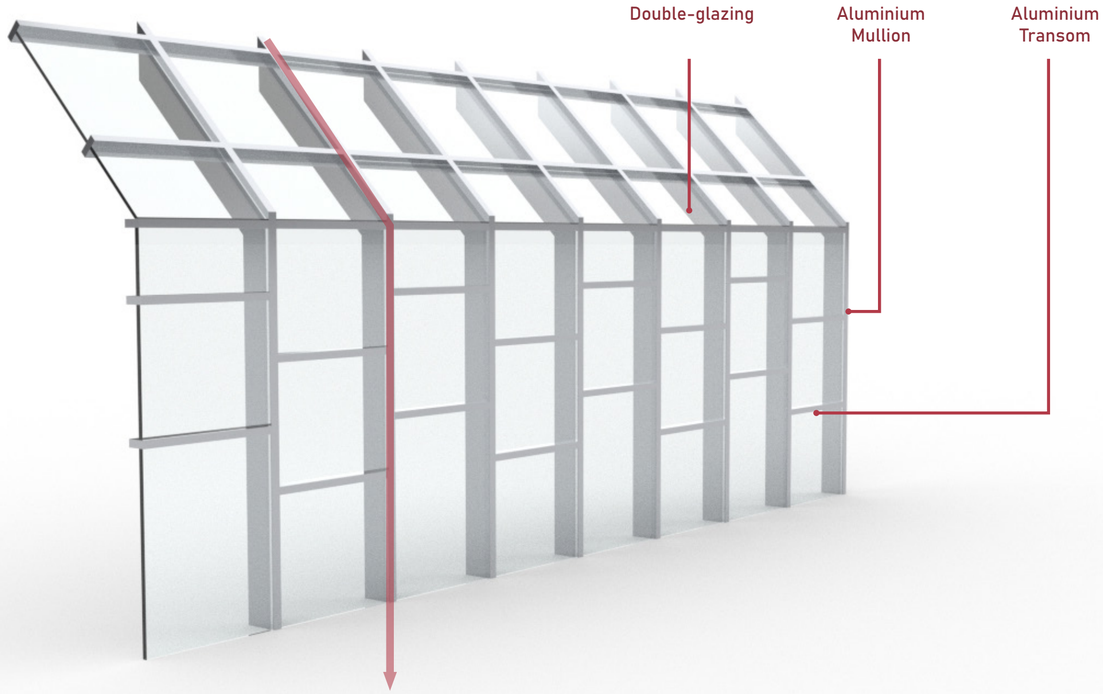
8mm polycarbonate sheeting

0 100 200 500 700mm

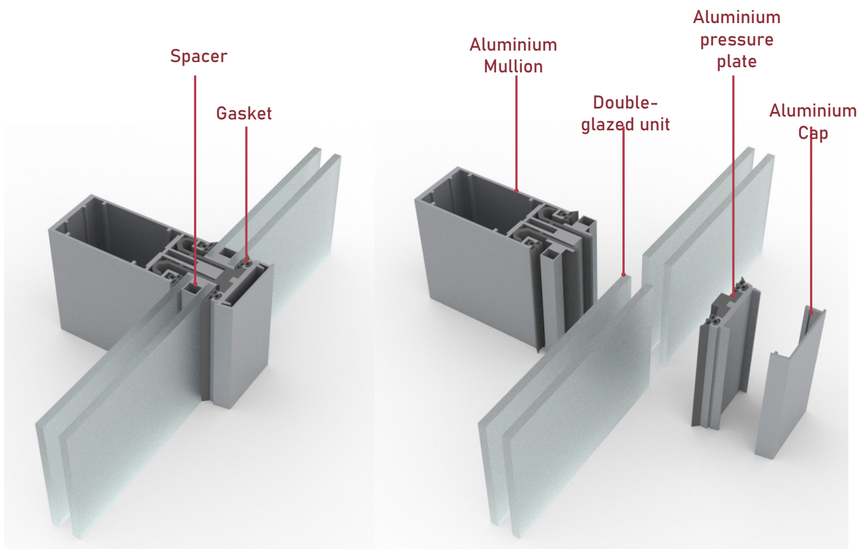
Load path

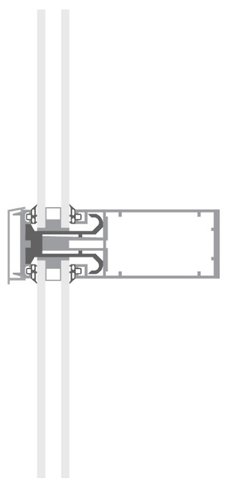
WALL AND ROOF CONSTRUCTION

CONSERVATORY FACADE :

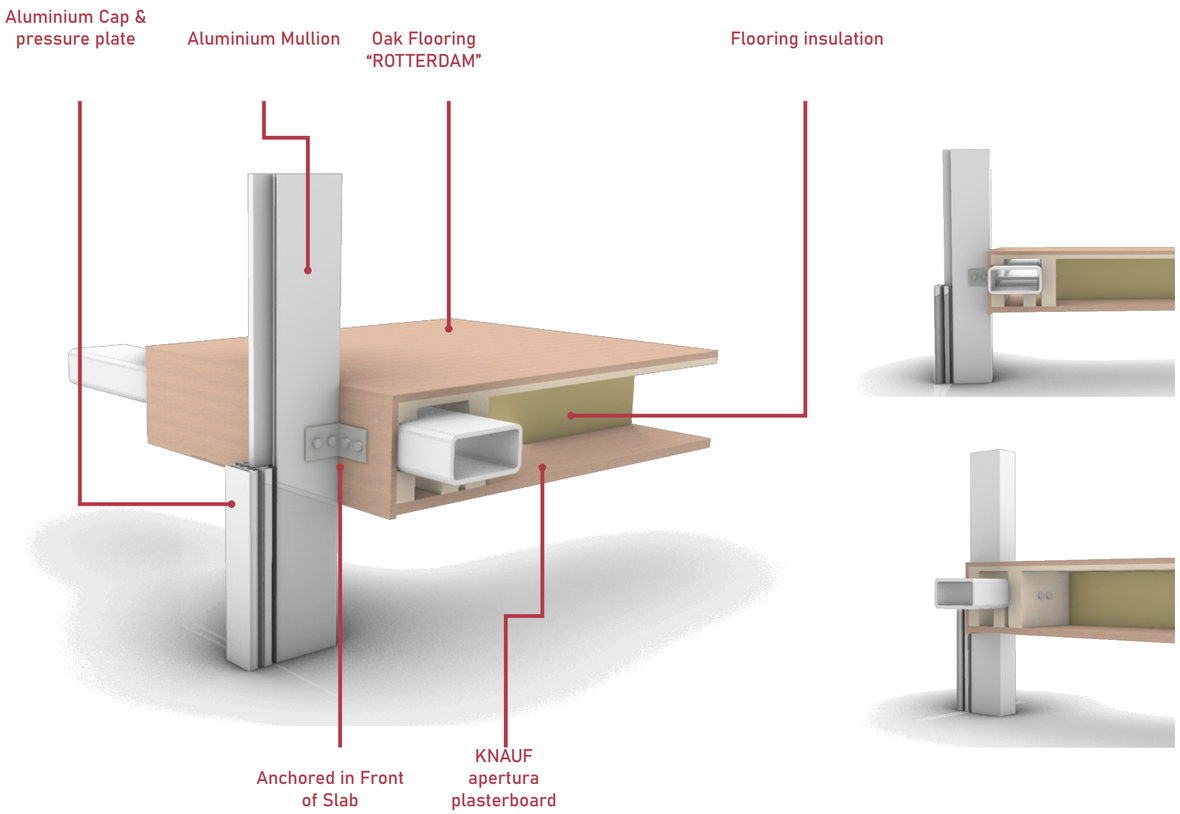


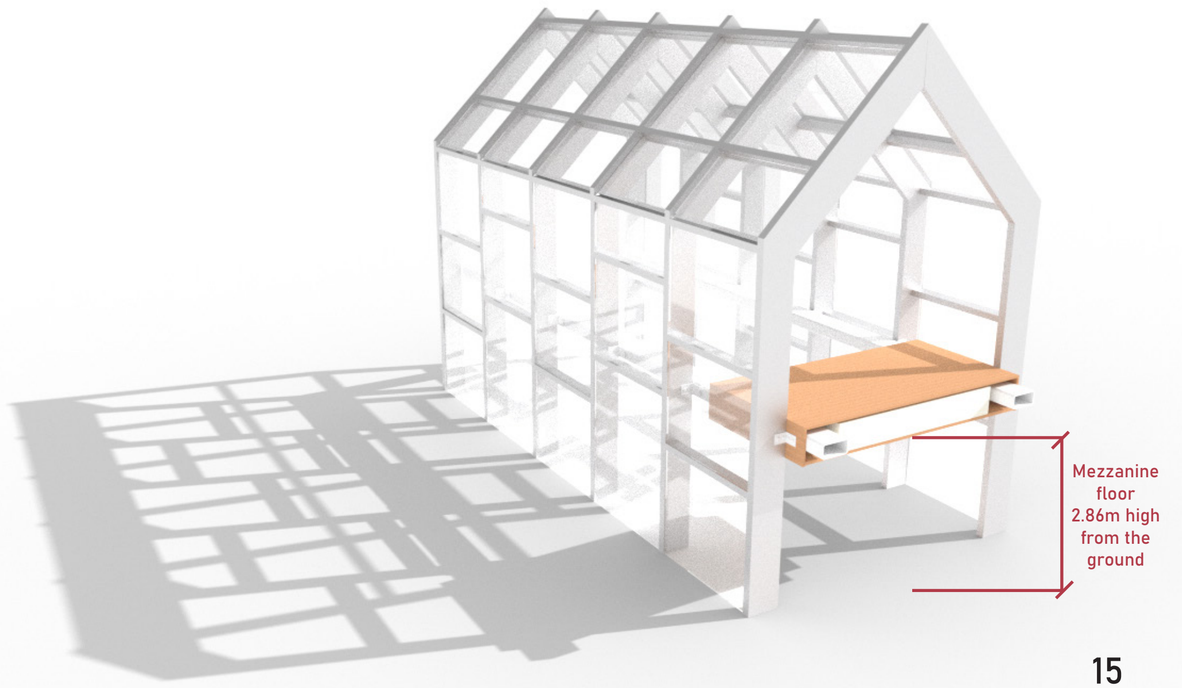
MULLION TO GLASS CONNECTION





FACADE LAYER 1 CONNECTING WITH MEZZANINE FLOOR:

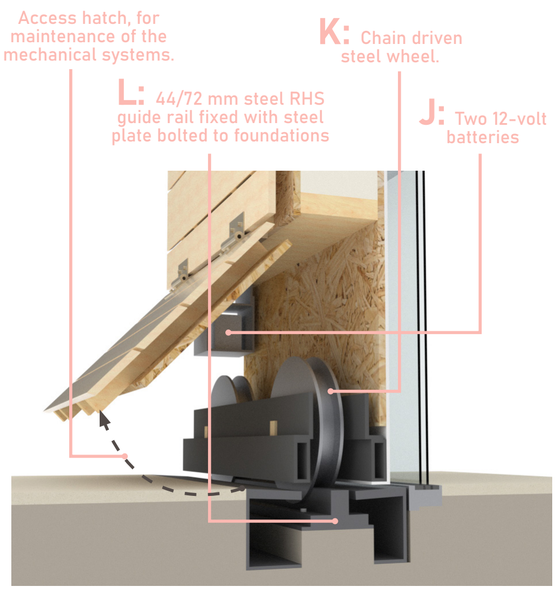


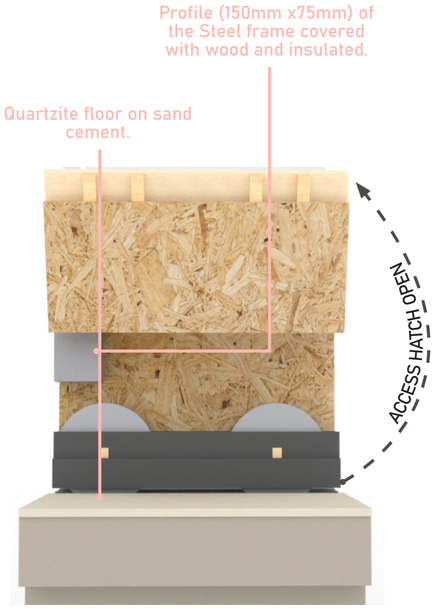


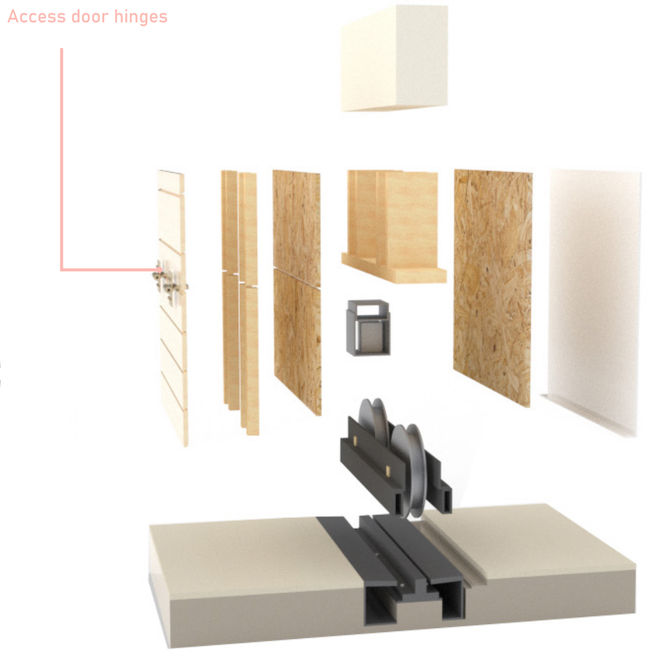
WHEEL MECHANISM AND GROUND:

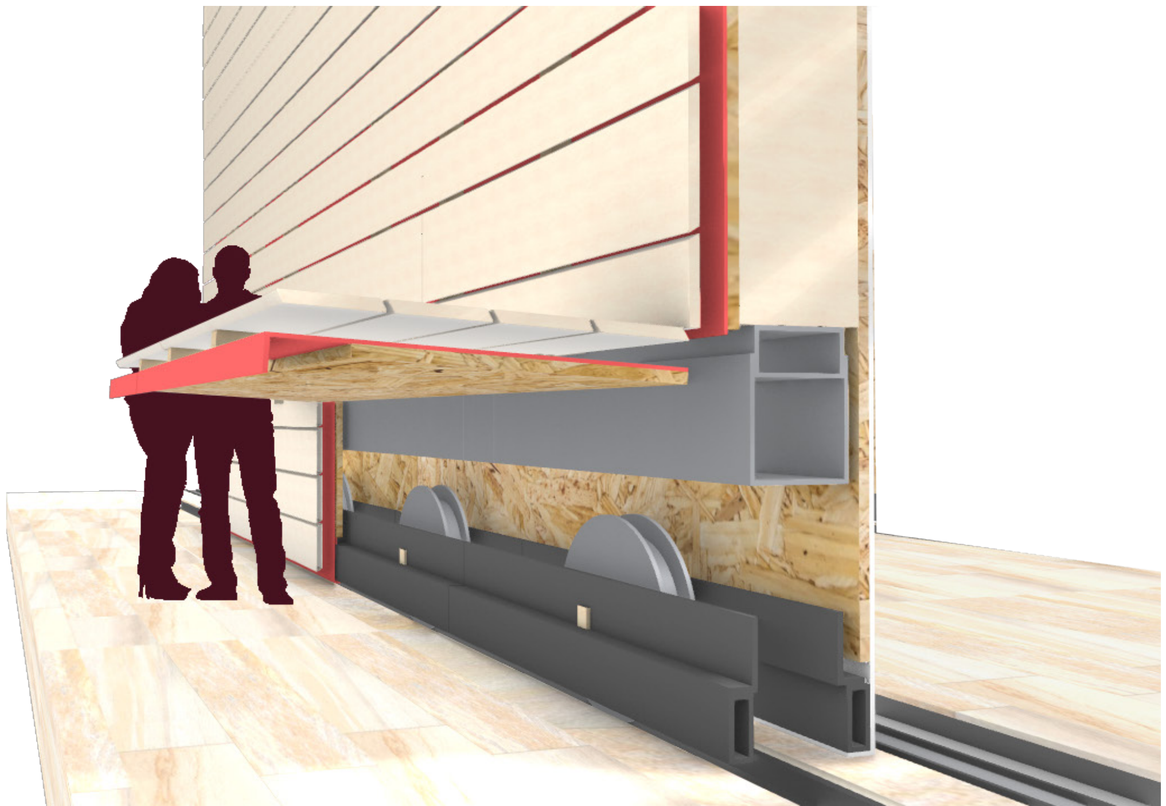
KINETIC GIF 1

KINETIC GIF 2



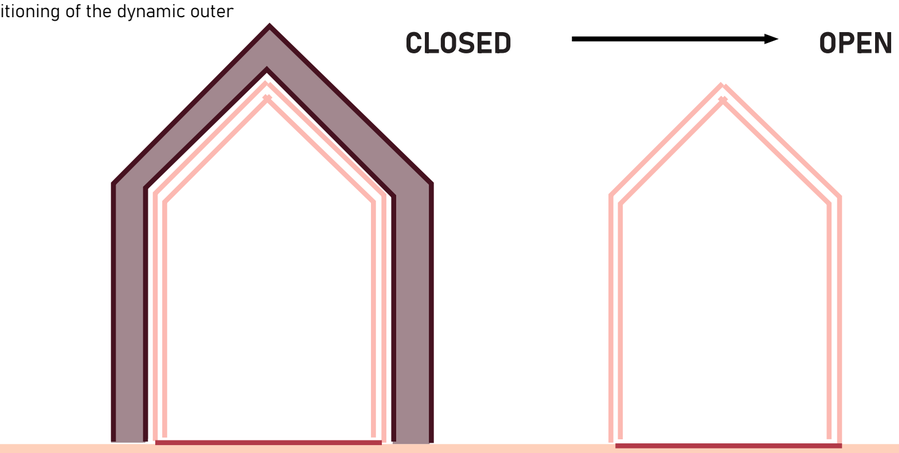






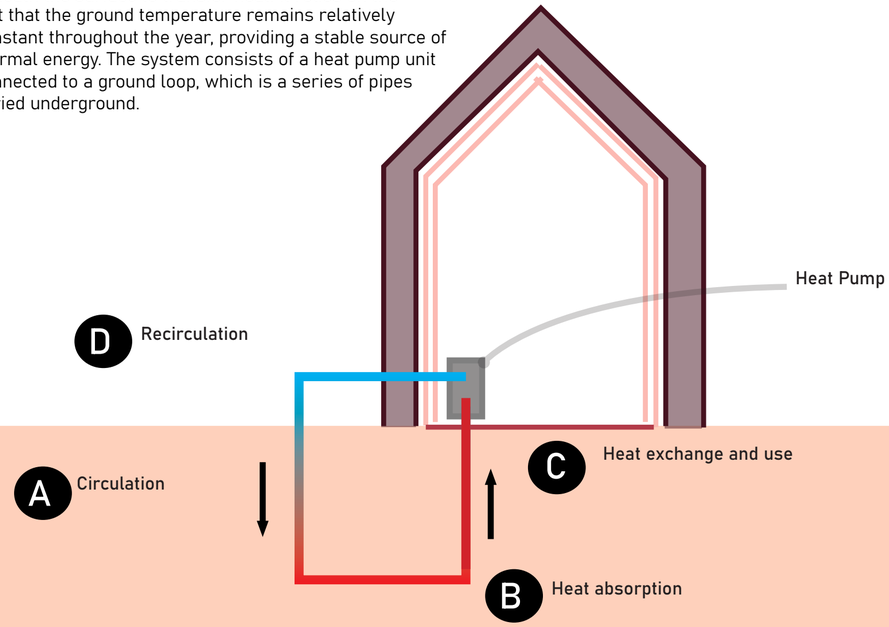
THERMAL BRIDGING:

Due to the dynamic facade, the interior thermal temperature can be adjusted by the positioning of the dynamic outer shell.



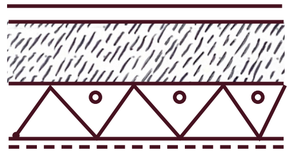
GEOTHERMAL HEAT PUMP:

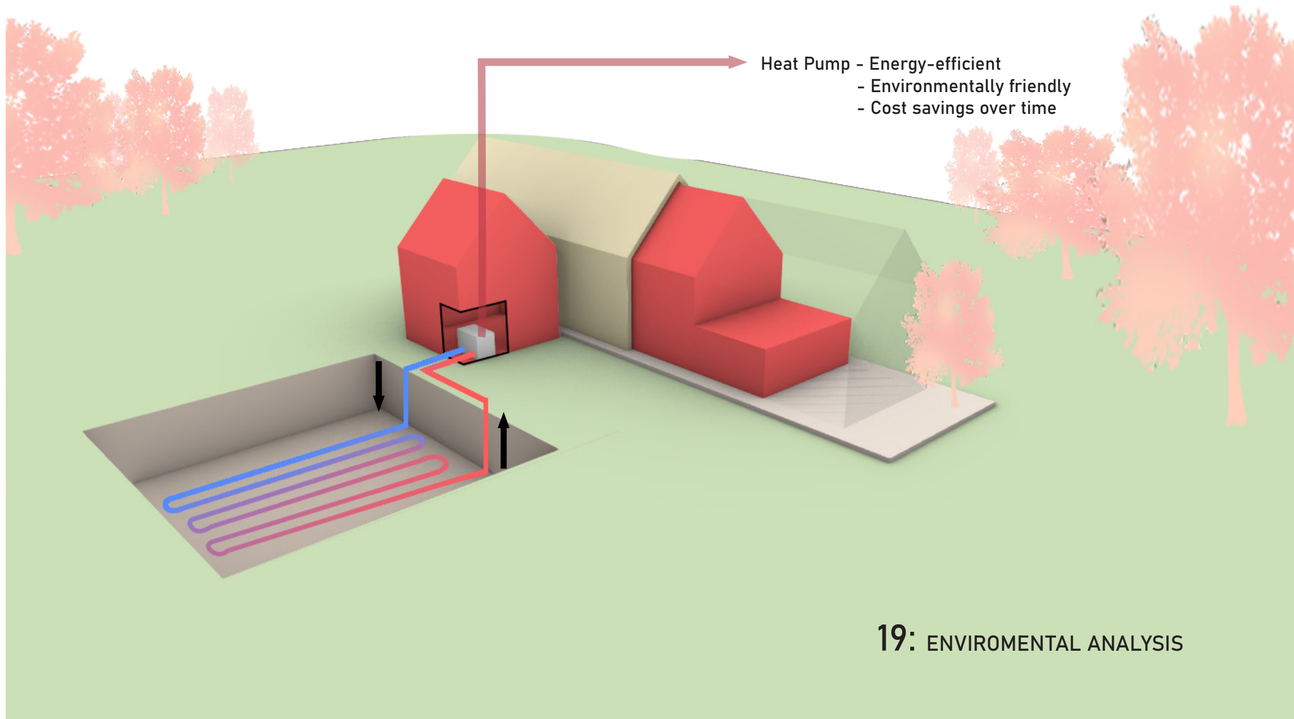
A geothermal heat pump (GHP) is a heating and cooling system that uses the Earth's consistent temperature beneath the surface to transfer heat. It relies on the fact that the ground temperature remains relatively constant throughout the year, providing a stable source of thermal energy. The system consists of a heat pump unit connected to a ground loop, which is a series of pipes buried underground.



C During the winter, the heat pump extracts heat from the ground and transfers it into the building to provide warmth. In the summer, the process is reversed, and heat from the building is transferred into the ground for cooling.

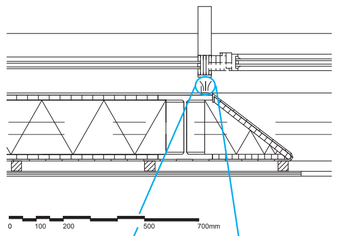
GROUND FLOOR:

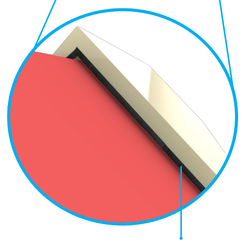




WIND PROOFING:

To stop dust and dirt from getting into the gap between the outer shell and the inner shell, there is a nylon brush that outlines all the openings as highlighted below.

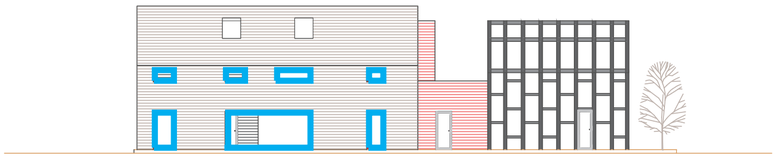




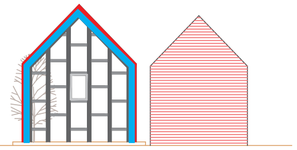
By wind proofing these gaps between the kinetic facade and the static one, there will also be an improved thermal bridging in the spaces covered by the second layer.

Openings on the dynamic facade
Where the nylon brush will be needed.

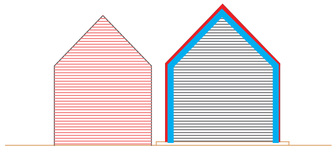
Elevation A



Elevation C



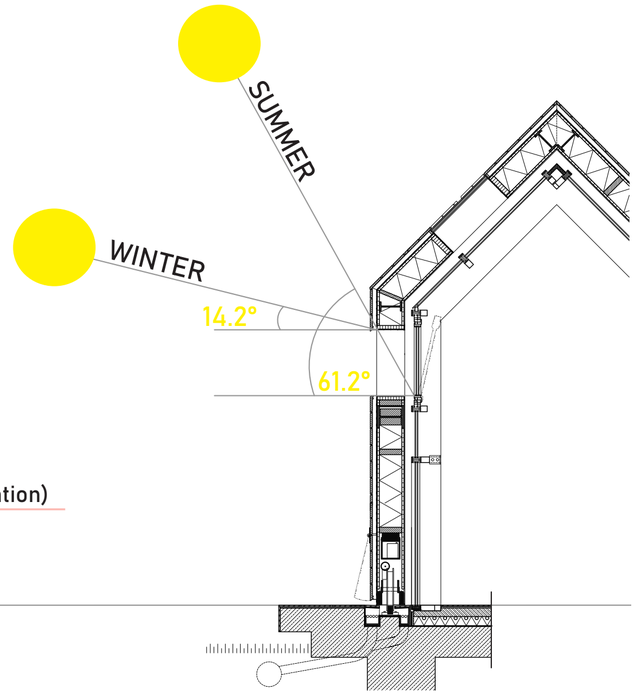
Elevation B



Elevation D

SOLAR RADIATION:

The Sliding facade created adaptable element in the sustainability of the house as well as the ability to adapt to the environment and climate. So in summer the additional facade layer can act as a shading system to control the level of solar radiation, where as at winter its function is increased the insulation.



a = 90° - (LAT +/- Solar declination)

Summer at noon 61.2° = 90° - (52.3 + 23.5)

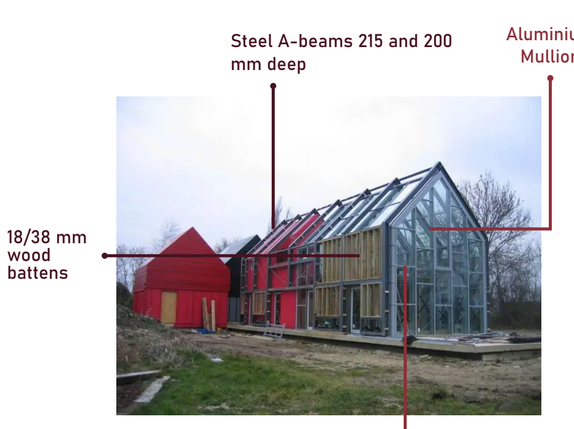
Fall at noon 37.7° = 90° - (52.3 + 0)

Winter at noon 14.2° = 90° - (52.3 - 23.5)

MATERIAL SELECTION:

MATERIAL	ADVANTAGES + Properties	DISADVANTAGES
8mm Polycarbonate sheeting	- Fire-resistant -Vandal-proof -Hard wearing -Insulating -Lightweight	-Sensitive to scratches -Can expand
Oriented-strand board	- Versatile -Cheaper than plywood (affordable) -Available in larger sheets - Good shear strength - Environmentally friendly	- Heavy - Lower moisture tolerance - Prone to swelling edges and telegraphing - Lower perceived value
Larch boarding	- Local-sources material - Durable and insect-resistant - Soft wood	- The material can warp overtime, this could add to the character but also means it might need replacing overtime.
Timber frame	- Lightweight -Similar to that of concrete, providing structural support. -Absorbs sound, Locally Sourced, Adaptable on-site. - Environmentally friendly	- Shrinkage and Swelling - Susceptible to changes in moisture SOLUTIONS: - Coatings to resist moisture
Steel structure (I-Beams)	- Robustness & Longevity. -Convenient Construction In Varied Dimensions. -Fire Resilience. -Immunity to Pests & Insects. -Resistance to Moisture & Weather.	-Thermal Conductivity. -Limited Flexibility On-Site.
3mm ethylene-prorylene rubber	- Abrasion Resistance - Excellent Chemical Resistance - Compression Set Properties - Electrical Properties - Excellent Heat Resistance - Low Temperature Properties - Excellent Ozone Resistance - Permeability to Gases - Physical Strength Properties - Excellent Water Resistance	-Flame Resistance -Oil Resistance

CONSTRUCTION PHOTOS



KINETIC PHYSICAL MODEL:

KINETIC PHYSICAL
MODEL VIDEO

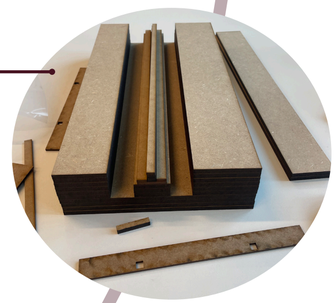
As part of this research, I opted to create a tangible, kinetic model illustrating the connection between the wheel, wall, and rail. This approach facilitated a detailed deconstruction of the construction process for this particular element. The physical model was scaled at 1:5 to accommodate the desired level of detail, enabling a comprehensive representation of material layers and durability.

- This QR code takes you to a video of the model showing its kinetic element.

PROCESS:

Create CAD file

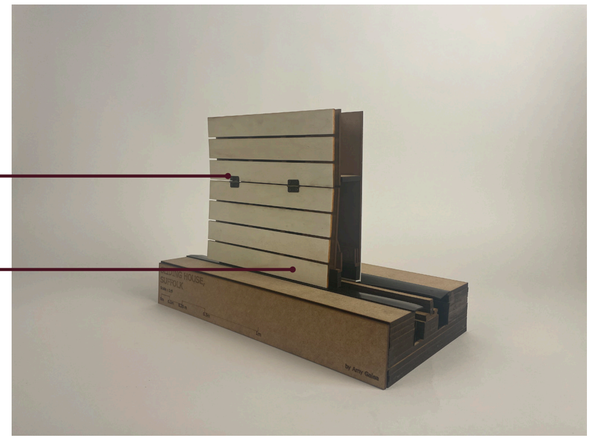
Send to
laser cutter



Compile and
check all
elements

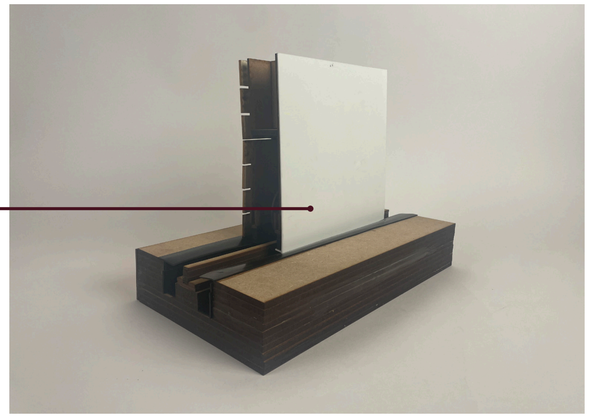
Assemble
together

COMPLETION

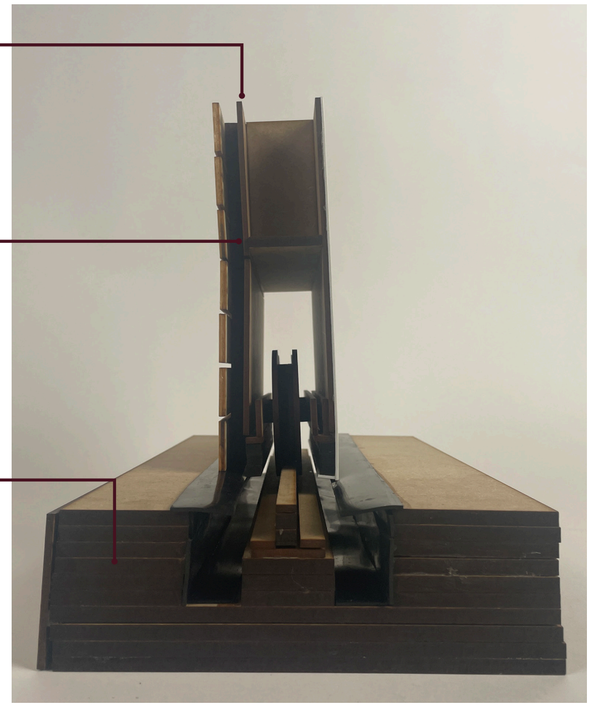


Hinges

Larch boarding:
represented using
Plywood



8mm Polycarbonate
sheeting represented
using White styrene
sheet



18 mm oriented-strand
board represent using
MDF

18/38 mm
wood
battens
represented
using MDF

Ground
represented
with layers
of MDF

GIF LINKS

KINETIC DIGITAL MODEL
GIF 1

KINETIC DIGITAL MODEL
GIF 2

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