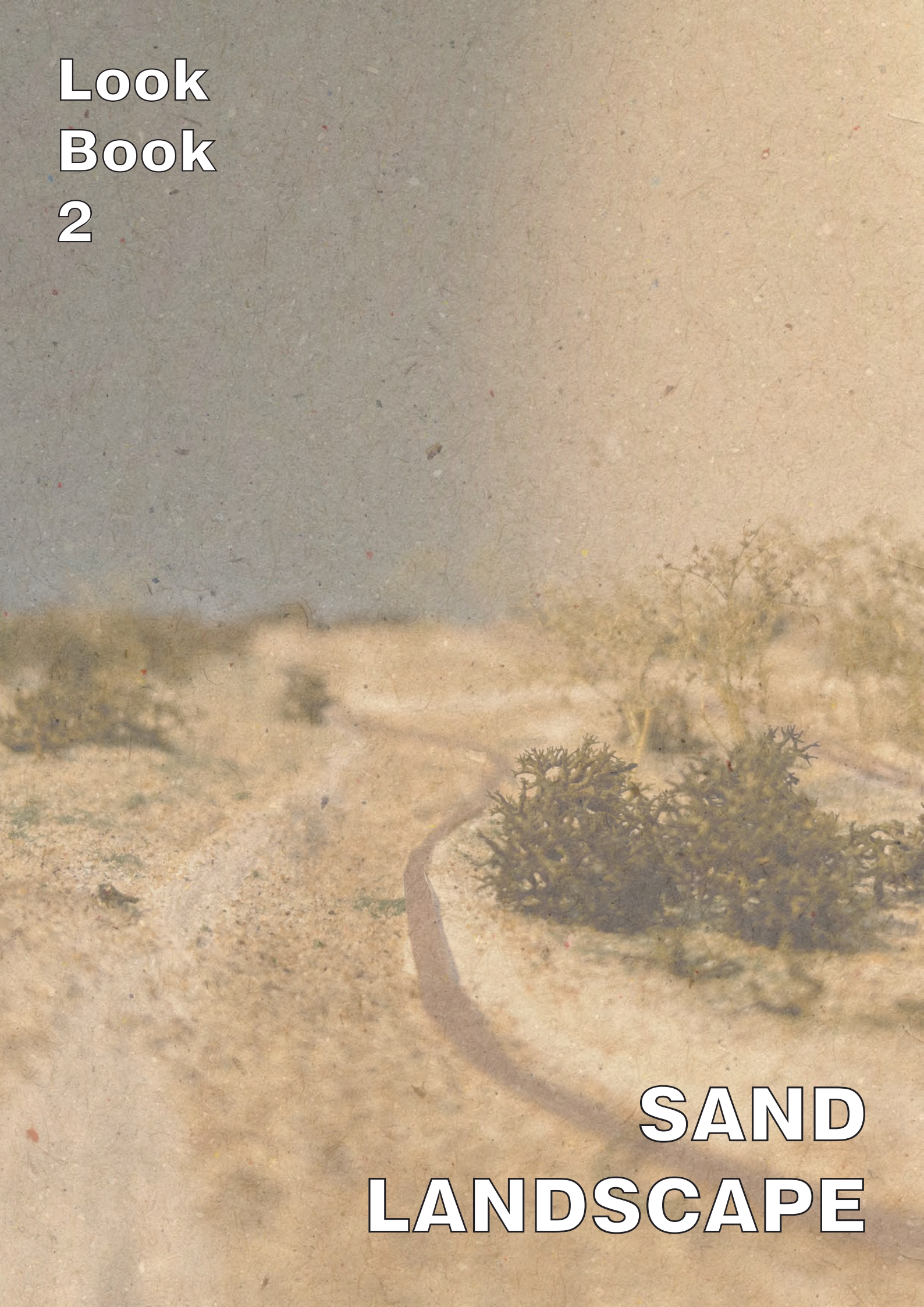
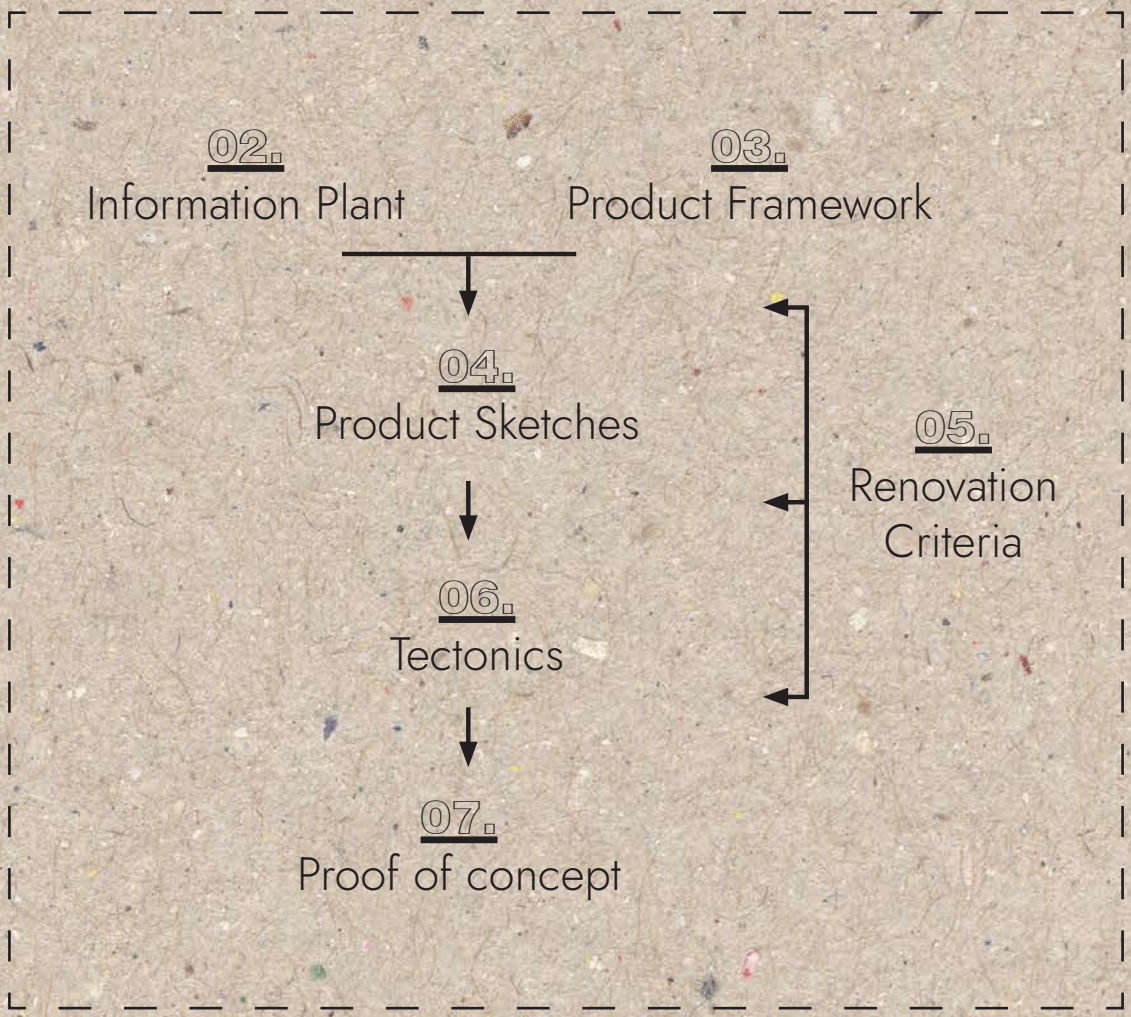
Look
Book
2



SAND LANDSCAPE

This look-book aims to provide inspiration and showcase the enormous potentials of renovation by utilizing materials that can be harvested from a specific landscape. It is essential to approach this with utmost respect for the environment, by ensuring responsible harvesting practices and minimizing any negative impact. Through this exploration, we can promote the sustainable use of hyper-local bio-based materials, discover their beauty as well as functionality, and contribute to a more environmentally conscious approach in the building industry!

CONTENT


02.
Information Plant
03.
Product Framework
04.
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Renovation
Criteria
06.
Tectonics
07.
Proof of concept

Each landscape has its own characteristics. These are explained in the model representing the dunes in Noordwijk, located next to the case-study neighborhood 'Duinoord'. Information about the landscape and vegetation was gathered based on own studies on the regional landscapes and from sources like Stichting Bouwtuin and Boom Landscapes, and applied to the case-study landscape.

Height differences forming the landscape

Low bushes

Towards the beach the vegetation starts to be lower, with primary beachgrass

Patches of pine trees

01. Character Landscape

Walking through the landscape
(own model)

S1
SEAWEED

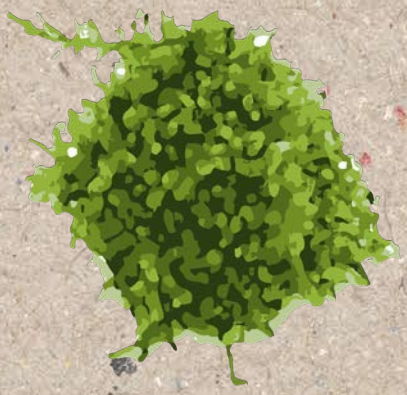
S2
WOOL

S3
SHELLS

S4
BEACHGRASS
Ammophila arenaria

S5
CONIFERS
Coniferae

S6
MOSS
Bryophyta



02. Materials information

While studying the landscape, various bio-based materials were discovered that hold great potential. The following are the most promising materials for use in construction purposes.

S1
SEAWEED

Used for:
Insulation
Cladding
Natural binder

Algea are a group of photosynthetic organisms, ranging from microscopic single-celled organisms to large seaweeds. They play a big role in marine ecosystems by producing oxygen, providing food and habitat for other organisms. In the Dutch coastal areas, different types of algea can be found including green, brown and red algea. One of the most abundant ones that canoften be found washed ashore is the Fucus vesiculosus, also know as 'bladder wrack'. This species have distinctive air-filled bladders. Together with some of the other algea species, bladderwrack has the potential to be used as a natural insulating material, natural binder, or cladding (Britannica, 2023).

Space Requirements:
15 tonnes/ha (1)

Growing time:
6-8 weeks (2)

Insulation properties:
-

Thickness:
-

1: (Menzies, Brook, & Parker, 2021)
2: (FAO, n.d.)

S2
WOOL

Used for:
Insulation

Sheep grazing is a common and effective method to manage vegetation and prevent the overgrowth of new saplings. By grazing on the vegetation, they prevent the overgrowth of fast-growing species, allowing a diverse range of plants to flourish. In this way, sheep can contribute to the preservation of biodiversity (van Deutekom, 2020). The sheep must also be sheared every year. Wool has high insulating values and is therefore perfect to use in the building industry as insulating material. It is an efficient moisture regulator, and is resistant to mold (Isolena, 2023).

Space Requirements:
-

Growing time:
1 year

Insulation properties:
Lambda = 0.034-0.042 W/mK (1)

Thickness:
*189 mm**

1: (Isolena, 2023)

S3
SHELLS

Used for:
Insulation
Cladding

Found along the Dutch coast, but also inlands in the sand landscape shells are the hard protective layer created by the animal or organism living in it. As it died, the soft part decomposed and the shell washed ashore. Most found shells are the cut through shell, saltwater clam, cockle, mussels and baltic clam (Ecomare, 2023).

Space Requirements:
-

Growing time:
-

Insulation properties:
Lambda = 0.106 W/m.K (1)

Thickness:
*250- 300 mm**

1: (Grasso, 2021)

S4

BEACHGRASS

Ammophila arenaria

Used for:
Weaving-

Beach grass also called marram grass is found along coasts worldwide. It plays a role in stabilizing dunes and preventing erosion. The plant possesses specialized adaptations so it can thrive in harsh coastal environments. Because of the narrow leaves, water loss is reduced and the long root system can effectively bind sand which prevents displacement by wind or water. Because of these characteristics beach grass is of high ecological importance by providing a habitat for organisms and being a natural buffer against flooding and storms (Britannica, n.d.).

Space Requirements:
-

Growing time:
-

S5

CONIFERS

Coniferae

Used for:
Insulation
Cladding

Pine trees are characterized by the tall and slender. They can be found in various regions, but particularly in the sandy areas in the northern and eastern parts of the country. Pinewoods play a role in preserving groundwater levels and preventing soil erosion. The roots of the trees help stabilize the sandy soils found in these forests. Many pine forests are monocultures and consist of non-native species like black larch, norway spruce, and douglas fir. Current efforst are made to make the forests more natural with native tree species such as beech, birch, and oak (Compendium voor de Leefomgeving, 2015). Pine wood is very versatile and can be used for various purposes such as cladding and in a shredded form used as insulation.

Space Requirements:
-

Growing time:
20-50 years
(to reach full height) (1)

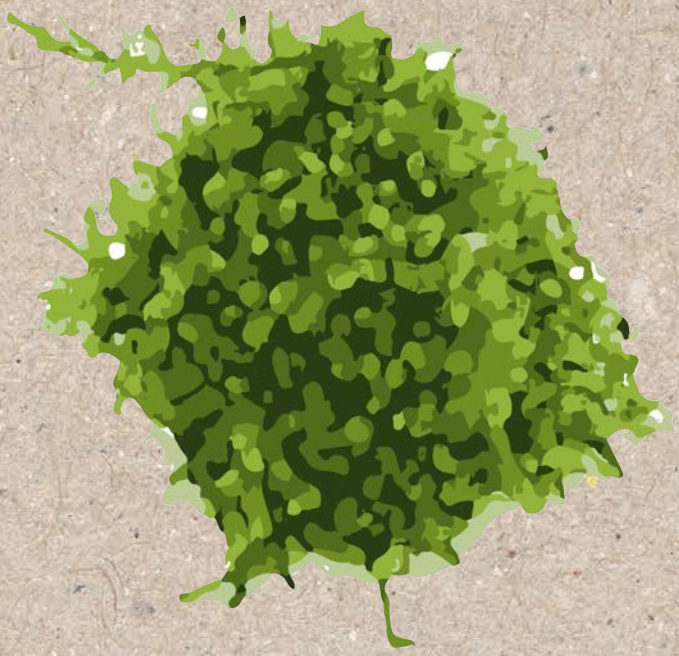
Insulation properties:
Lambda = 0.038 W/mK (2)

Thickness:
*171 mm**

S6

MOSS

Bryophyta



Used for:
Cladding

Mosses are small and have a lack of true roots. Their ability to retain water and to tolerate dessication allows them to grow and thrive in sandy and nutrient-poor conditions prevalent in the dune systems. Next to this, mosses contribute to moisture retention, temperature regulation, erosion control and provide a micro habitat for a multitude of organisms (Britannica, 2023).

Space Requirements:
-

Growing time:
-

** Estimated thickness based on R= 4.5 m2K/W*
*** If left blank, no information available*

The process of converting vegetation into a building material follows a structured approach, which involves three key steps leading to the creation of a final building component.

03. Production framework

PROCESSING | initial process after harvesting

BAILING

CUTTING

PRESSING

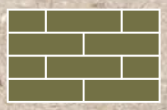
WEAVING

SHREDDING

COMBING

SUPPORT | putting the products on the facade

SUB-STRUCTURE



ON FACADE

BETWEEN

BOX

FRAME

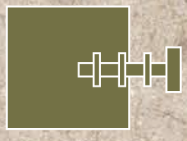
ATTACHING | attachments that are needed in the process

CLAMPING

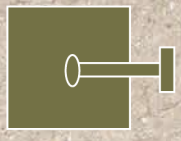
GLUEING

TENSIONING

BINDING



SCREWING



NAILING

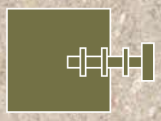
LOCKING

INSULATION

MATERIAL	PROCESSING	SUPPORT
SEAWEED 		BOX
WOOL 	COMBING	BETWEEN
	COMBING, SHREDDING	BOX
PINEWOOD 	SHREDDING	BOX
	SHREDDING, PRESSING	ON FACADE
SHELLS 	SHREDDING	BOX

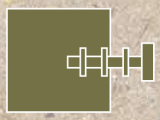
ATTACHING

FRAGMENT



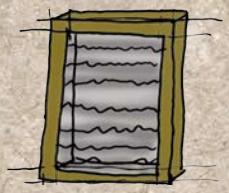
SCREWING

Seaweed in a box

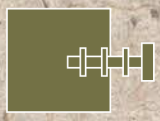


SCREWING

CLAMPING

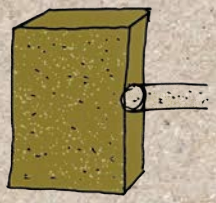


Wool stuffed between support elements

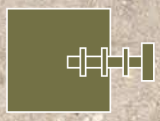


SCREWING

LOCKING

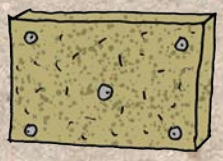


Wool blown into a box

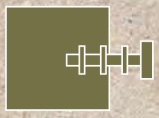


SCREWING

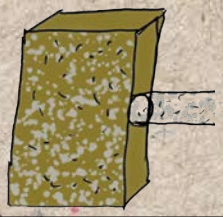
LOCKING



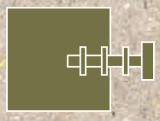
Woodfibers pressed into a mold



SCREWING



Woodfibers blown into a box



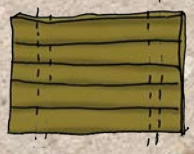
SCREWING

LOCKING

Shells blown into a box

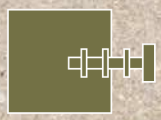
CLADDING

MATERIAL	PROCESSING	SUPPORT
SEAWEED 		SUB-STRUCTURE
	SHREDDING	PRESSING
		SUB-STRUCTURE
PINEWOOD 	CUTTING	SUB-STRUCTURE
	CUTTING	SUB-STRUCTURE
	CUTTING	SUB-STRUCTURE
	CUTTING	FRAME
	CUTTING	FRAME

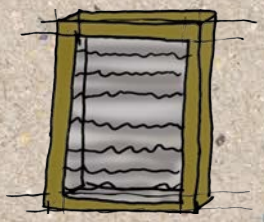
ATTACHING	FRAGMENT	
BINDING		*Unprocessed seaweed on substructure*
LOCKING		*Seaweed tiles*
NAILING		*Wooden vertical slats*
LOCKING		*Wooden horizontal slats*
LOCKING		*Vertically cutted treetrunks*
CLAMPING		*Horizontally cutted treetrunks*
CLAMPING		*Wooden shingles*

CLADDING

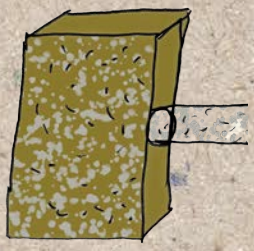
MATERIAL	PROCESSING	SUPPORT
SHELLS 	 SHREDDING	 SUB-STRUCTURE
MOSS 		 SUB-STRUCTURE

ATTACHING		FRAGMENT	
 GLUEING			*Shells glued on wood*
 SCREWING			*Moss panel*

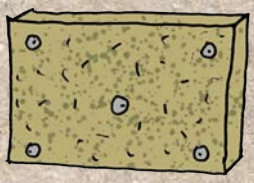
Seaweed in a box



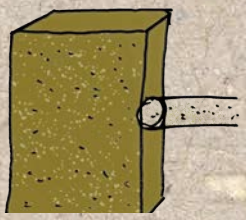
Wool stuffed between support elements



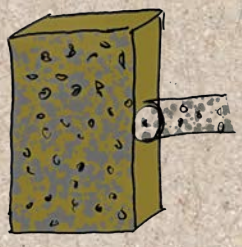
Wool blown into a box



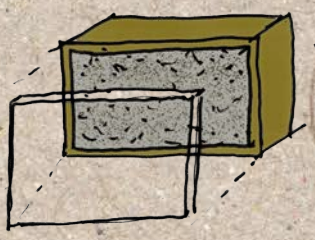
Wood fibers pressed into a mold



Wood fibers blown into a box



Shells in a box



Shells in box

04. Product Sketches

Cladding

Unprocessed seaweed on substructure

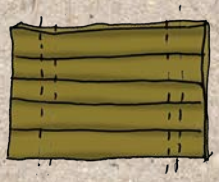
Wooden shingles on sub-structure

Seaweed tiles

Shell and wood facade panel

Wooden vertical slats nailed

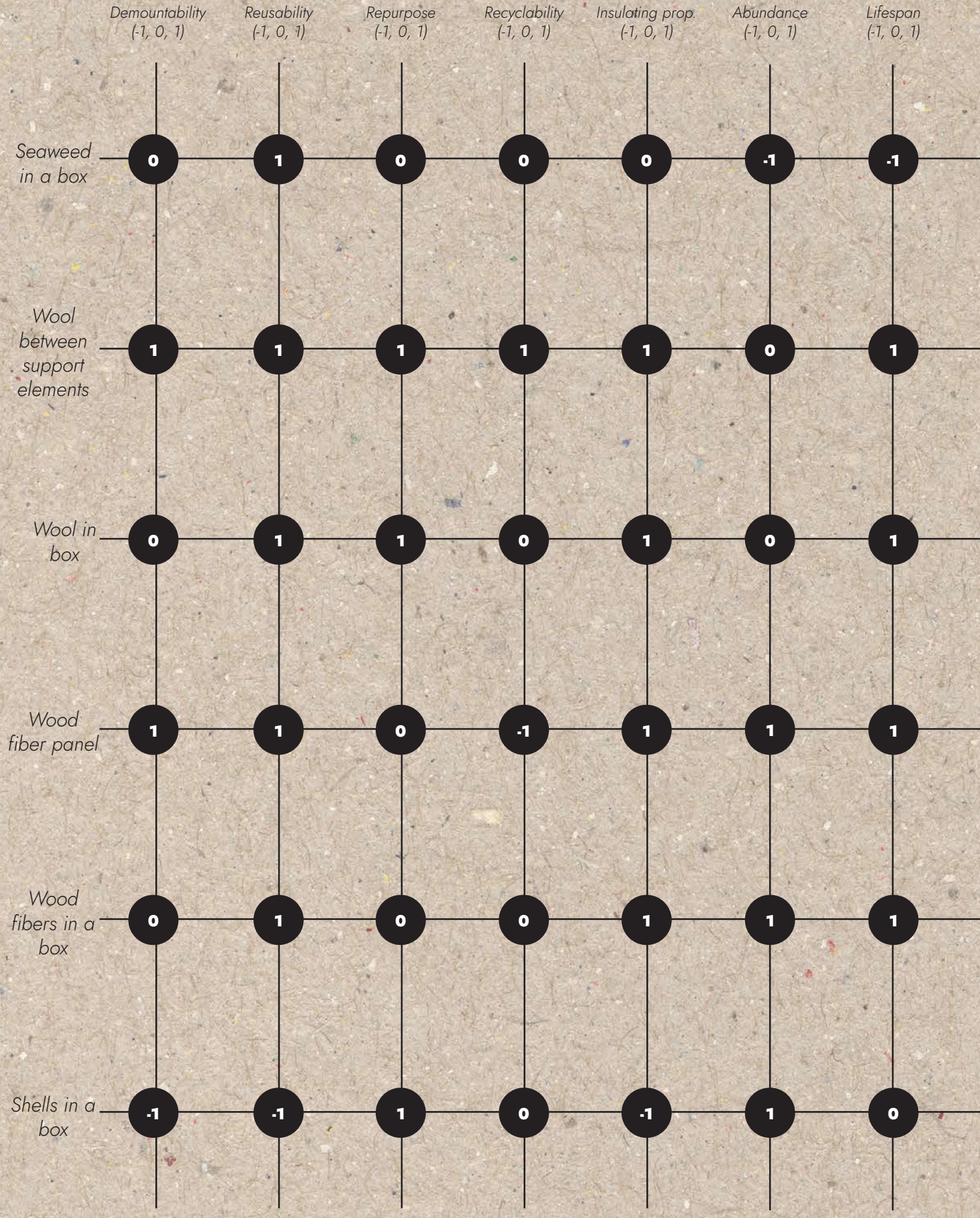
Moss panel



Wooden horizontal slats on substructure

Horizontally cutted treetrunks in box

Vertically cutted treetrunks on substructure



05. Renovation criteria

TOTAL

-1

6

4

4

4

-1

The different options can be evaluated based on factors that are important for sustainable renovation. The Pugh chart method can be employed to assign scores ranging from -1, 0, or 1 to each option. This scoring serves as a rough estimation of their performance in relation to the chosen criteria.

Scoring

1. Demountability (take away from the facade)
-1: The element can not be taken away from the facade
0: The element can be taken away from the facade, but requires more work
1: The element can easily be taken away from the facade

2. Reusability
-1: It is hard to re-use the element as insulation after use
0: It is possible to re-use the element as insulation after use, but with less quality
1: It is possible to re-use the element as insulation after use

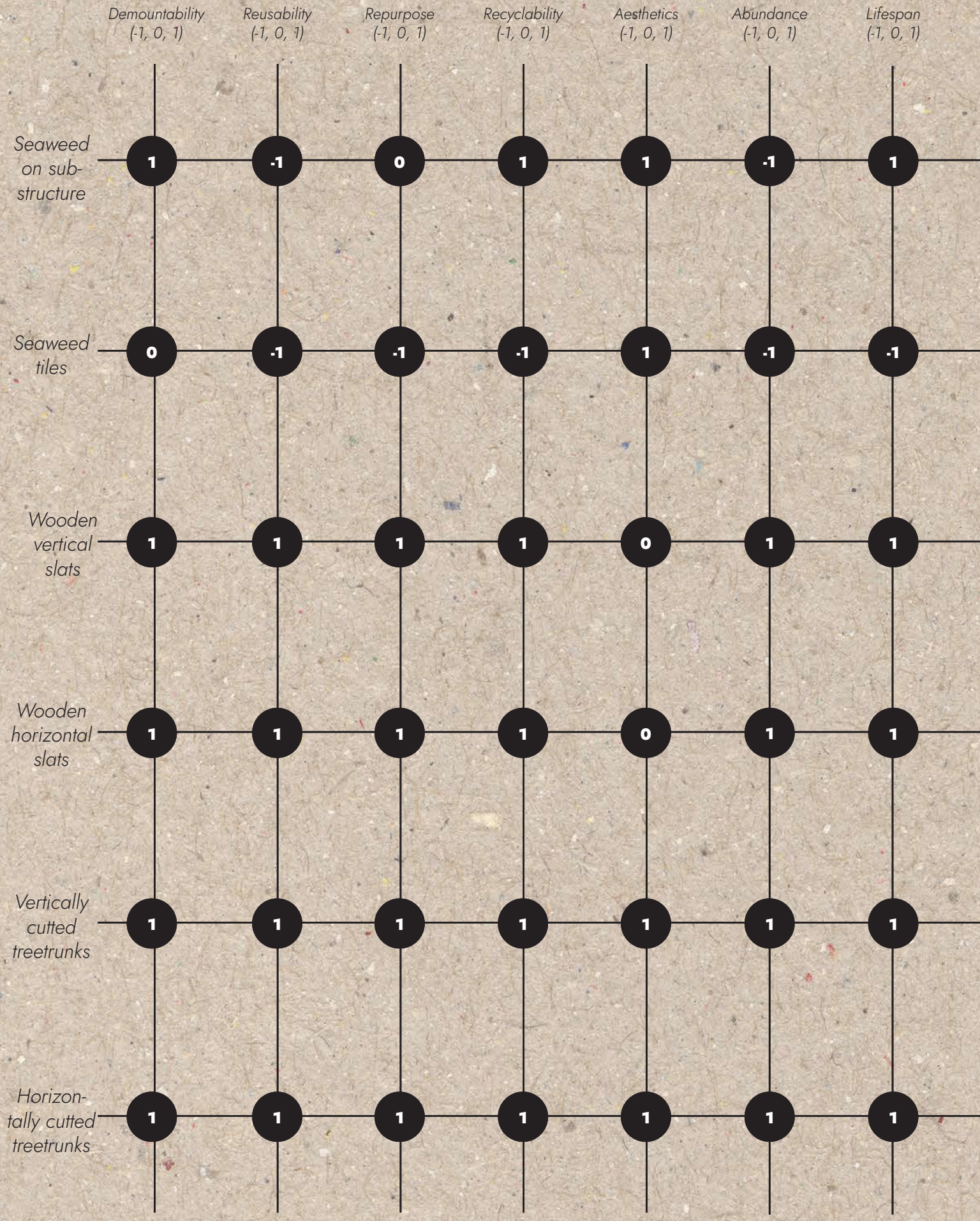
3. Repurpose
-1: It is not possible to find another purpose for the element after use
0: It is hard but possible to find another purpose for the element after use
1: It is possible to find another purpose for the element after use

4. Recyclability (take apart)
-1: It is not possible to take the whole element apart to recycle after use
0: It is partly possible to take the whole element apart to recycle after use
1: It is possile to take the whole element apart to recycle after use

5. Insulating properties
-1: The element preforms worse compared to other insulation materials
0: The element performs average compared to other insulation
1: The element performs better compared to others

6. Abundance
-1: The material is not abundant in the landscape
0: The material is present in the landscape
1: The material is abudant in the landscape

7. Lifespan
-1: The lifespan of the product is short compared to others in the category
0: The lifespan of the product is average compared to others in the category
1: The lifespan of the product is good compared to others in the category


Demountability (-1, 0, 1)
Reusability (-1, 0, 1)
Repurpose (-1, 0, 1)
Recyclability (-1, 0, 1)
Aesthetics (-1, 0, 1)
Abundance (-1, 0, 1)
Lifespan (-1, 0, 1)
Seaweed on sub-structure
1 -1 0 1 1 -1 1
Seaweed tiles
0 -1 -1 -1 1 -1 -1
Wooden vertical slats
1 1 1 1 0 1 1
Wooden horizontal slats
1 1 1 1 0 1 1
Vertically cutted treetrunks
1 1 1 1 1 1 1
Horizon-tally cutted treetrunks
1 1 1 1 1 1 1

TOTAL

2

-4

6

6

7

7

Scoring

1. Demountability (take away from the facade)
-1: The element can not be taken away from the facade
0: The element can be taken away from the facade, but requires more work
1: The element can easily be taken away from the facade

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1: It is possible to find another purpose for the element after us

4. Recyclability (take apart)
-1: It is not possible to take the whole element apart to recycle after use
0: It is partly possible to take the whole element apart to recycle after use
1: It is possile to take the whole element apart to recycle after use

5. Aesthetics
-1: The element is less aesthetically appealing compared to the other options
0: The element is averagely aesthetically appealing compared to the other options
1: The element is more aesthetically appealing compared to the other options

6. Abundance
-1: The material is not abundant in the landscape
0: The material is present in the landscape
1: The material is abudant in the landscape

7. Lifespan
-1: The lifespan of the product is short compared to others in the category
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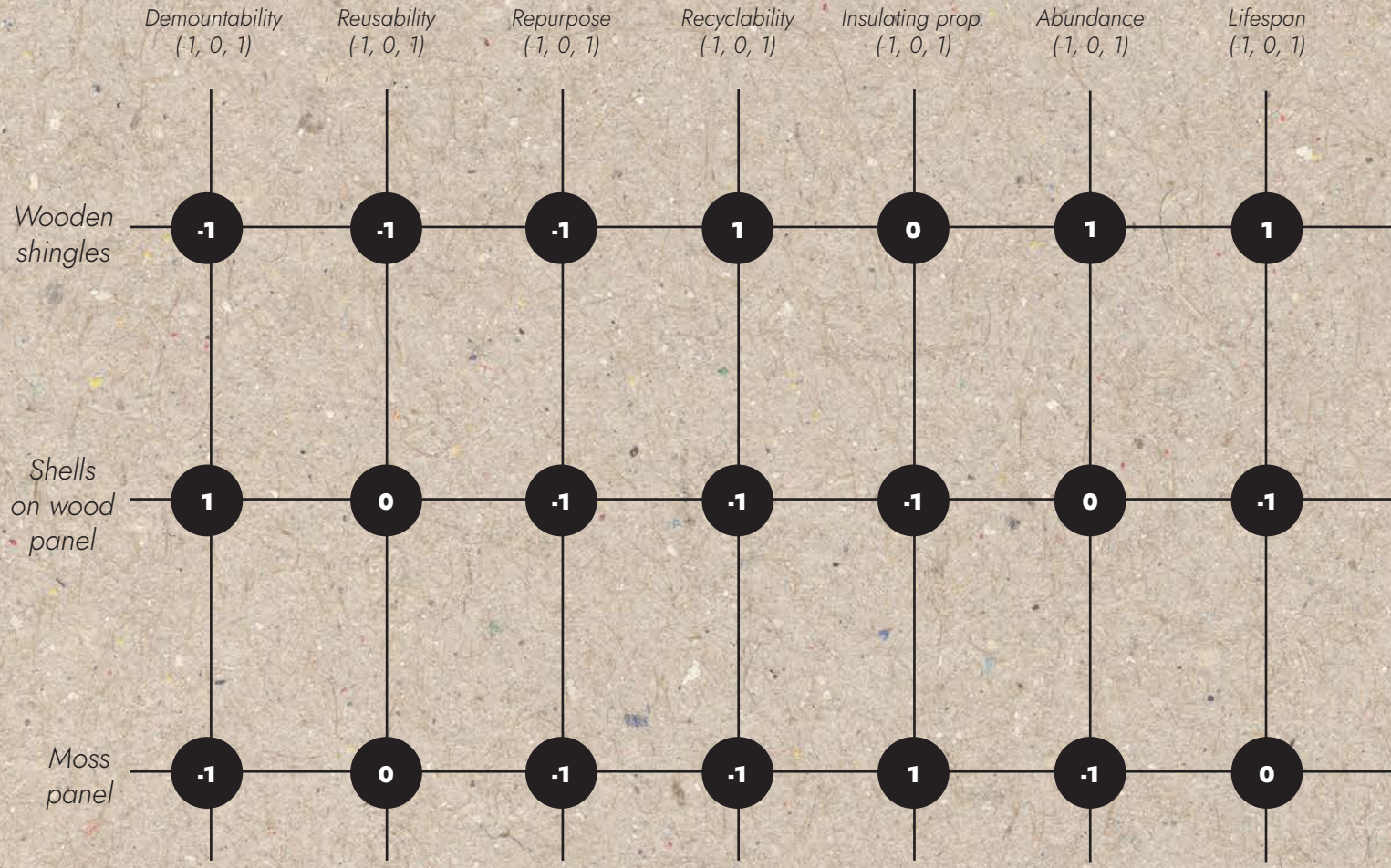
Demountability (-1, 0, 1)
Reusability (-1, 0, 1)
Repurpose (-1, 0, 1)
Recyclability (-1, 0, 1)
Insulating prop. (-1, 0, 1)
Abundance (-1, 0, 1)
Lifespan (-1, 0, 1)
Wooden shingles
-1 -1 -1 1 0 1 1
Shells on wood panel
1 0 -1 -1 -1 0 -1
Moss panel
-1 0 -1 -1 1 -1 0

TOTAL

0

-3

-3

Scoring

1. Demountability (take away from the facade)
-1: The element can not be taken away from the facade
0: The element can be taken away from the facade, but requires more work
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-1: The lifespan of the product is short compared to others in the category
0: The lifespan of the product is average compared to others in the category
1: The lifespan of the product is good compared to others in the category

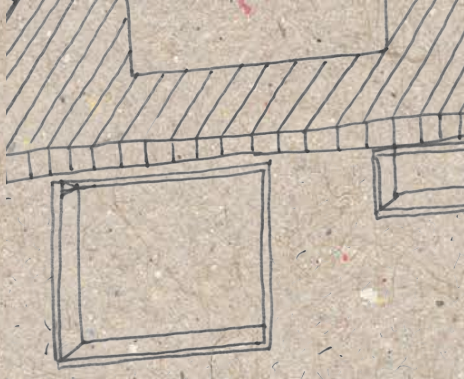
Once various vegetation options have been identified, they can be combined in different variations on the facade. These combinations can be explored through various layouts and arrangements. This section showcases a range of these possibilities and provides conceptual sketches to illustrate what they could look like.

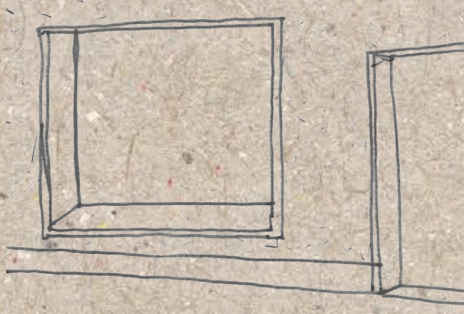
MOZAIC

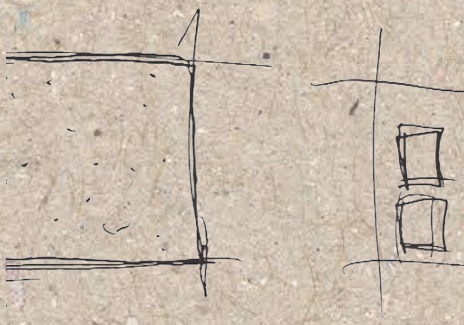
HORIZONTAL

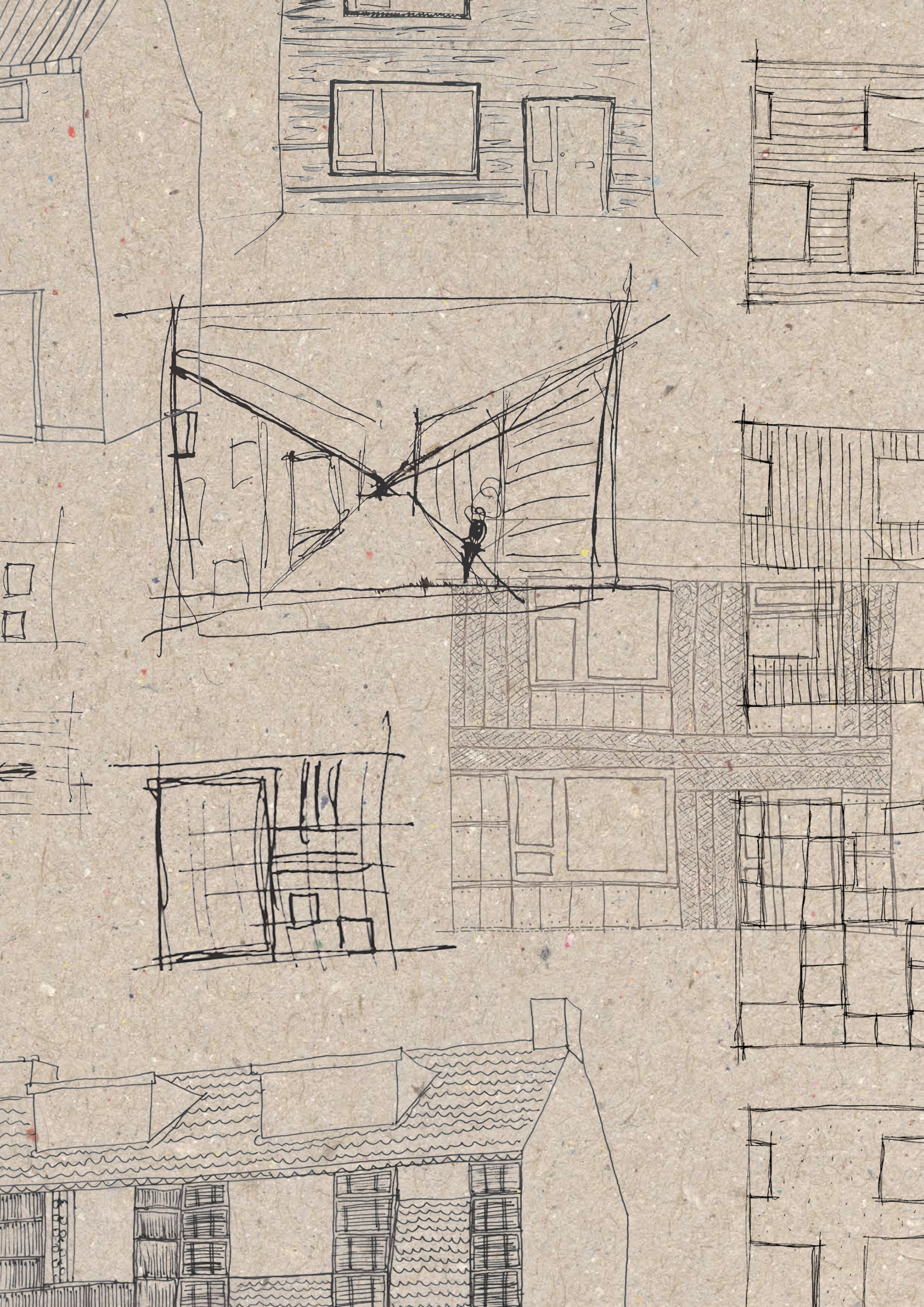
SURFACE

VERTICAL



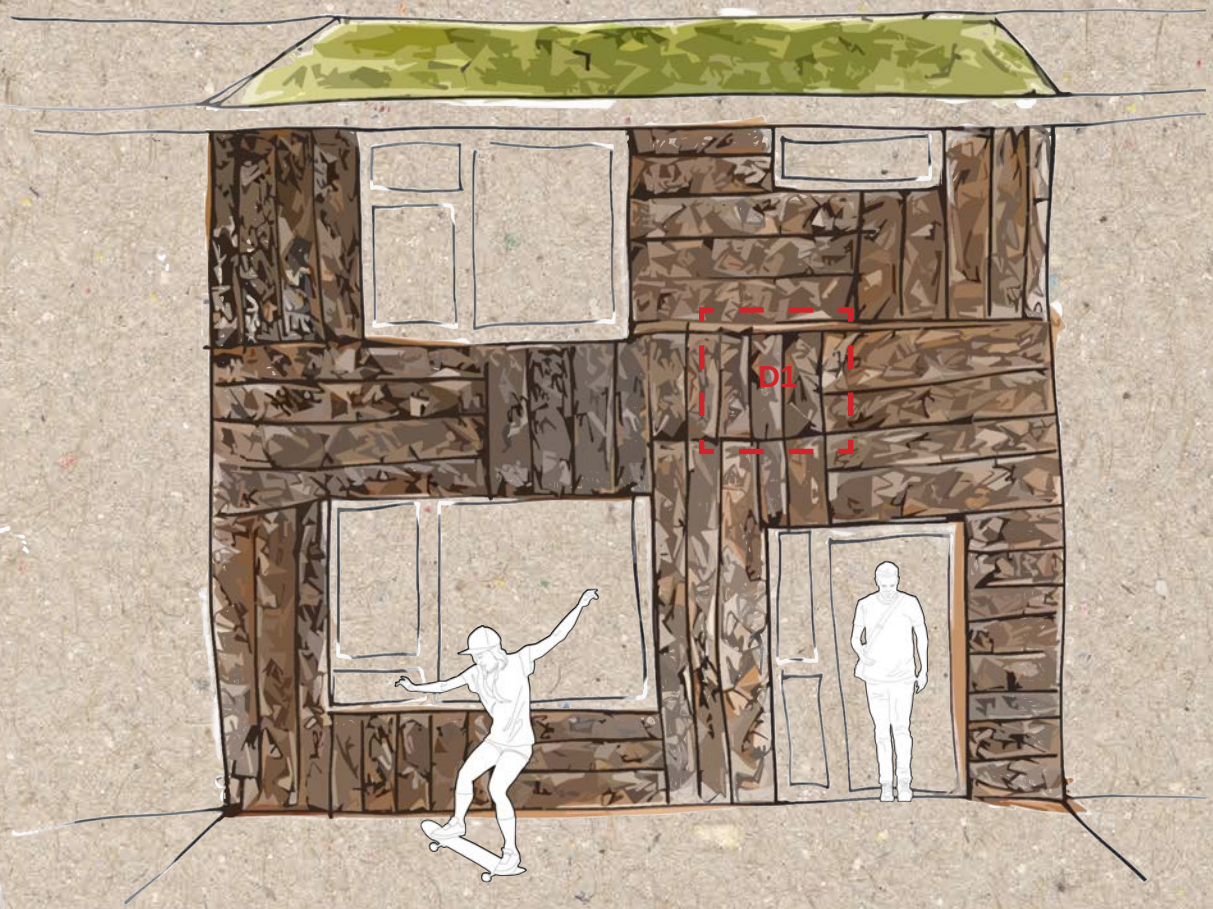






SURFACE

‘Seaweed home’

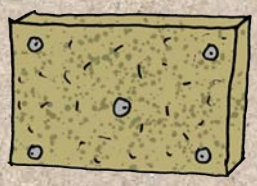


Unprocessed seaweed on substructure

Seaweed in a box

HORIZONTAL

‘Between sea and forest’



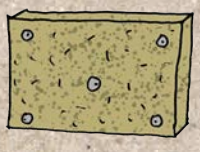
Wood fibers pressed into a mold

Wooden vertical slats nailed

Unprocessed seaweed on substructure

MOZAIC

‘In the forest’



Wood fibers pressed into a mold

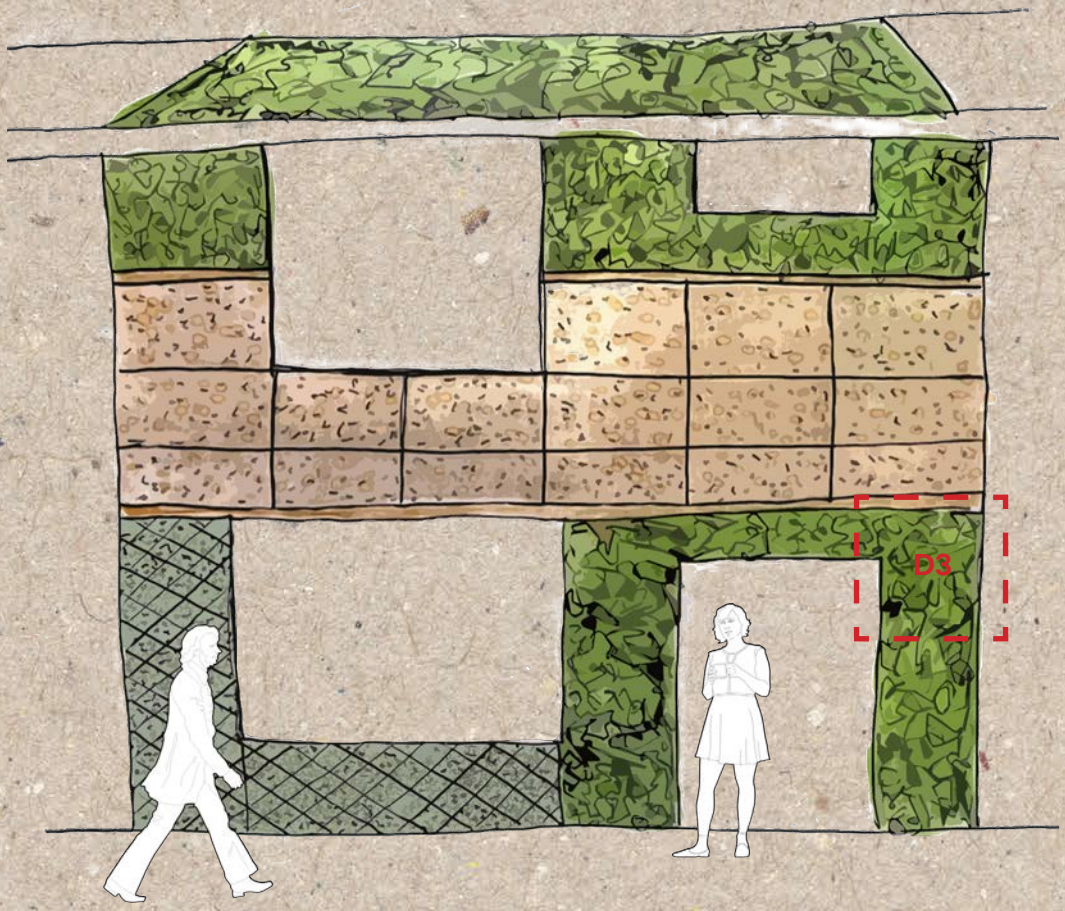
Wooden shingles on substructure

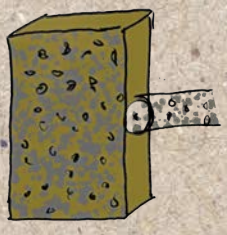
Horizontally cutted tree trunks in box

Vertically cutted tree trunks on substructure

VERTICAL

‘Experimental’

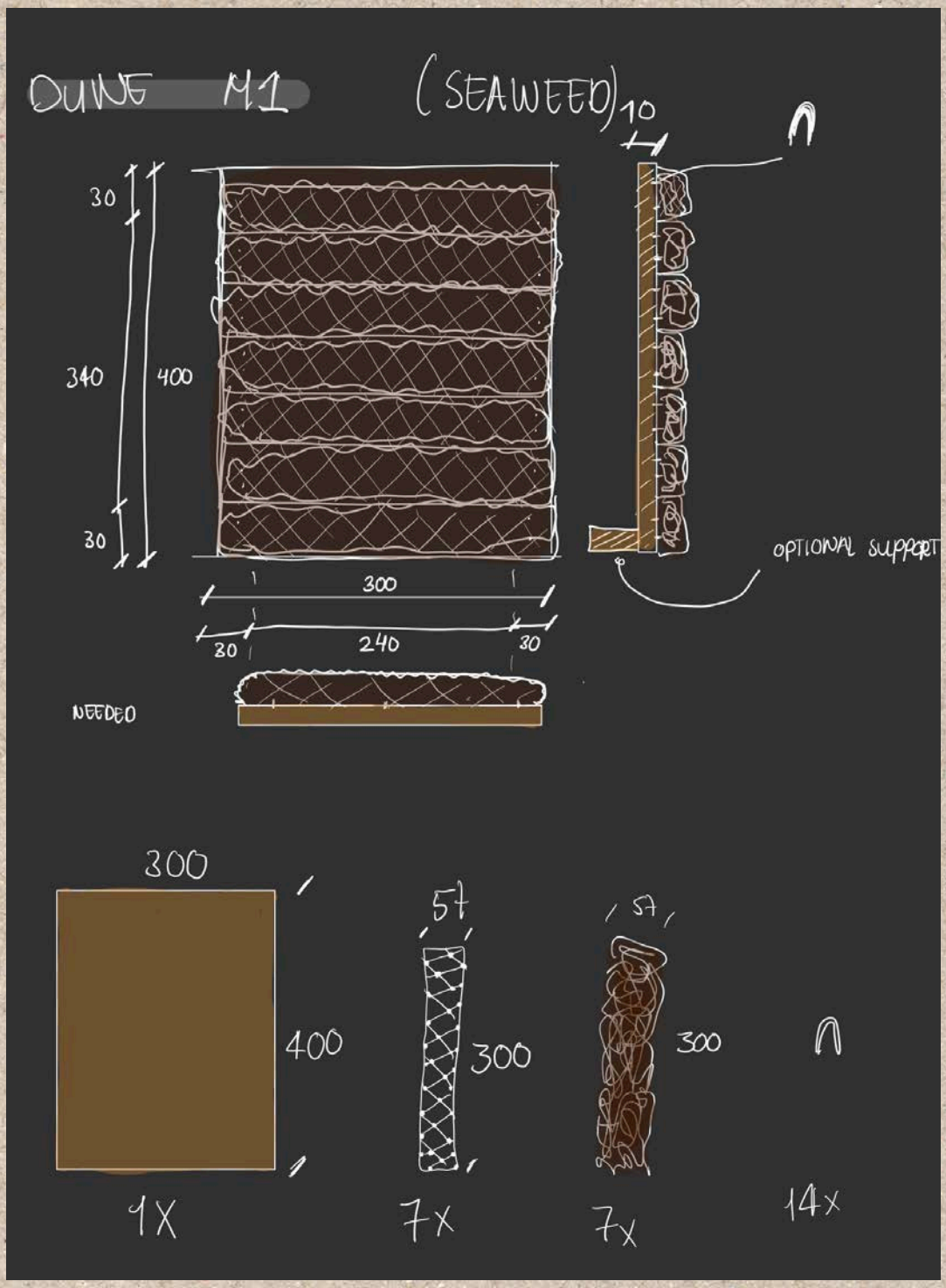




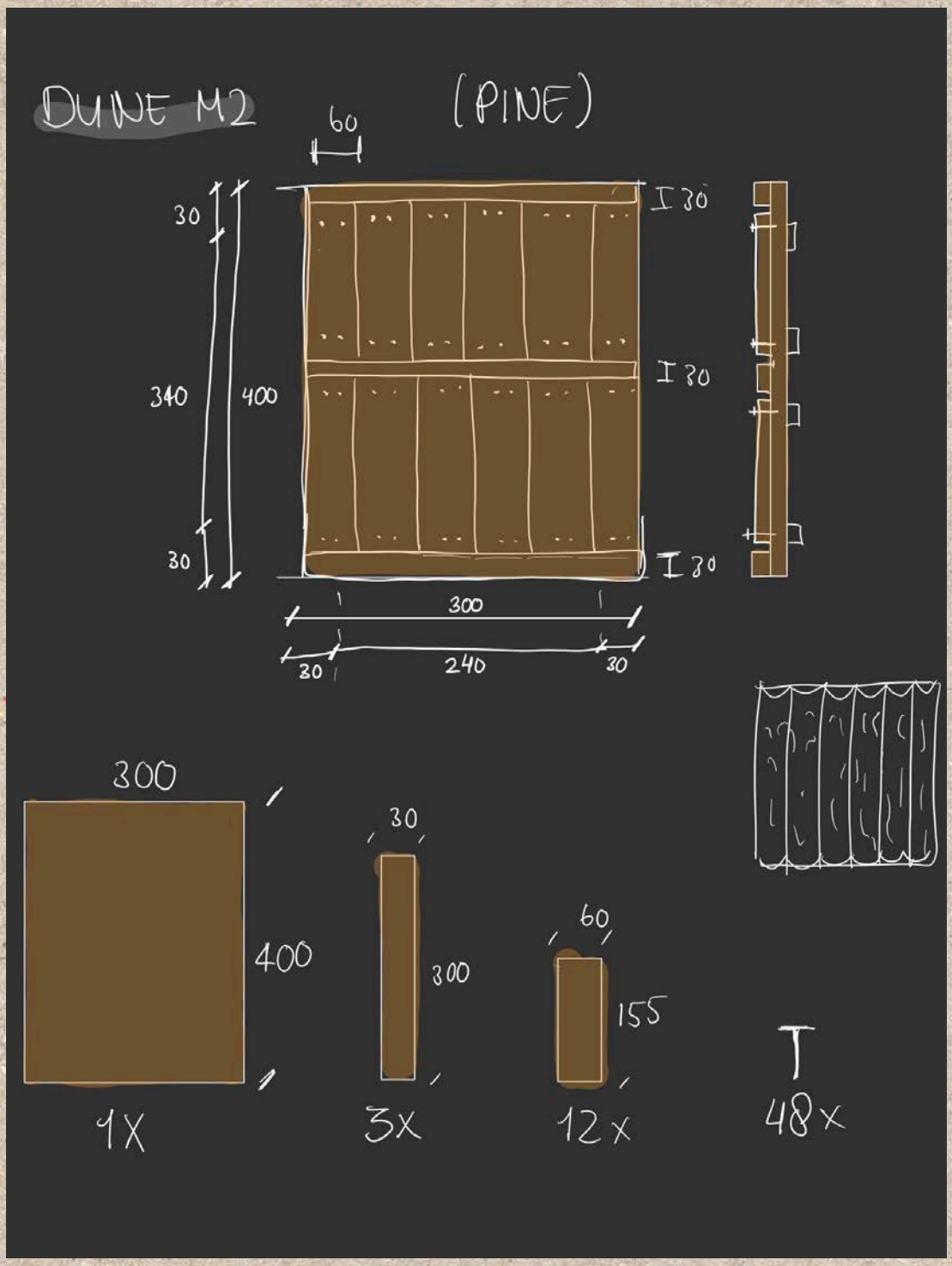
Shells in a box

Shell and wood facade panel

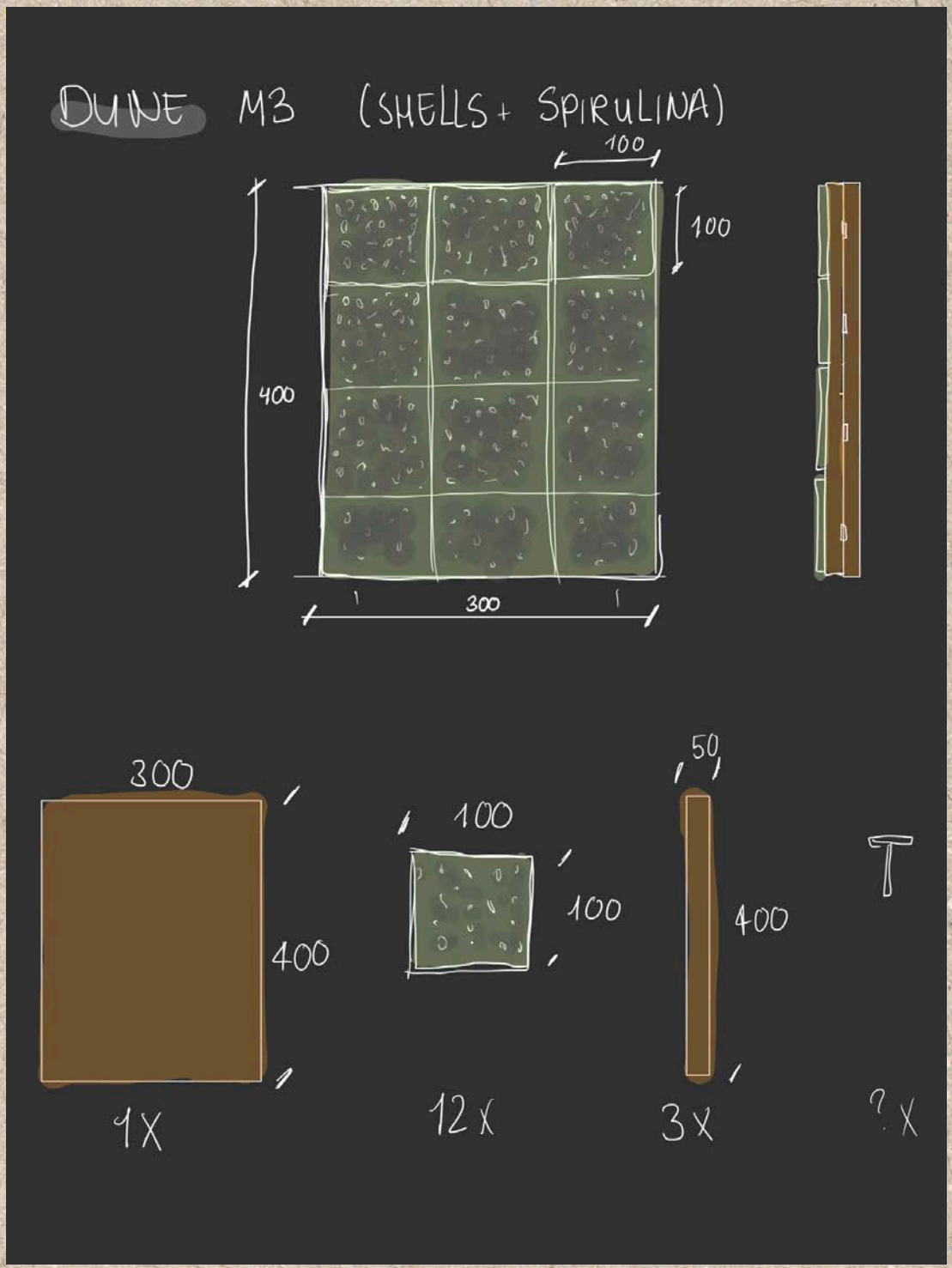
Seaweed tiles



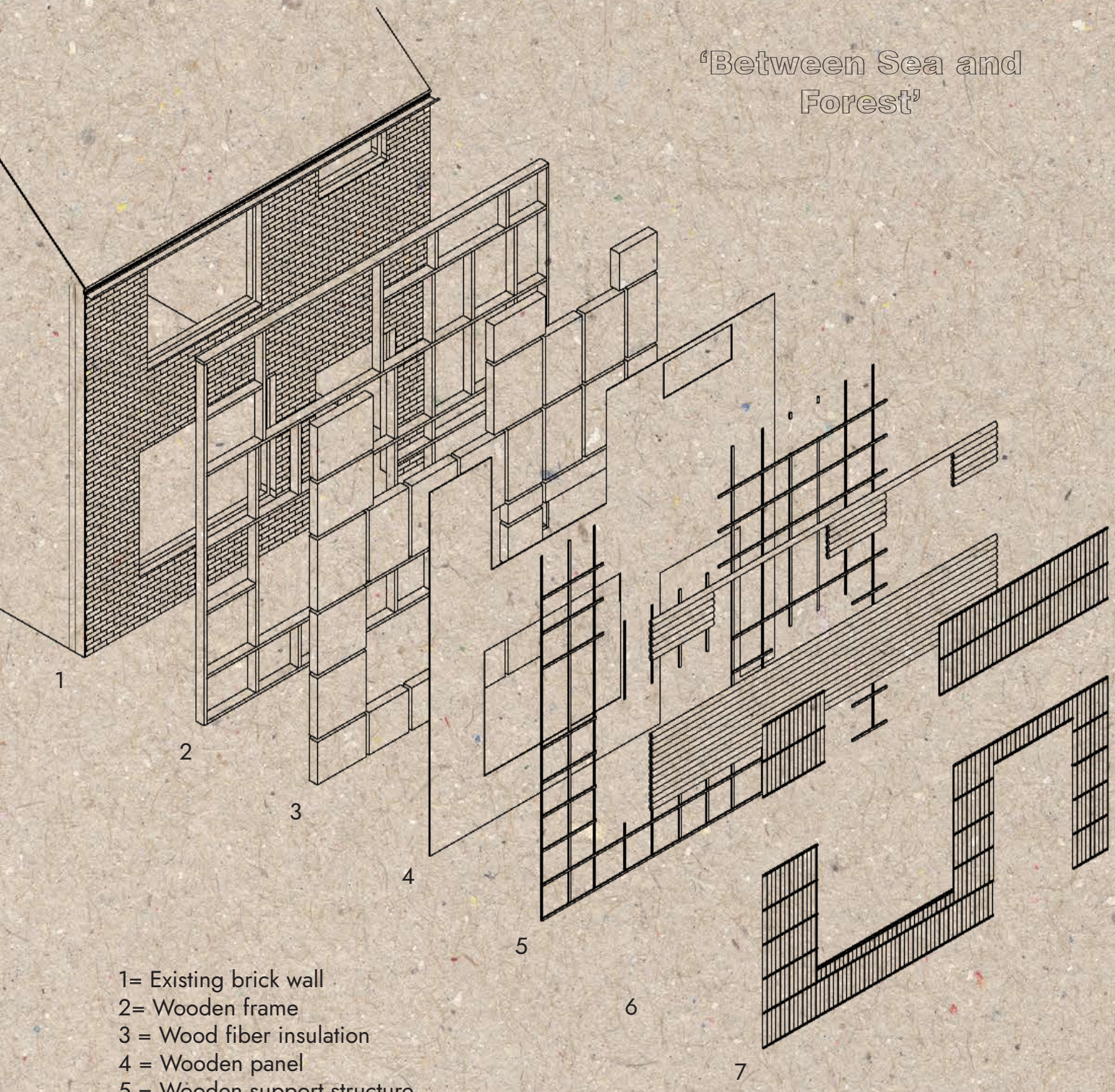
Unprocessed seaweed on substructure



Wooden vertical slats nailed

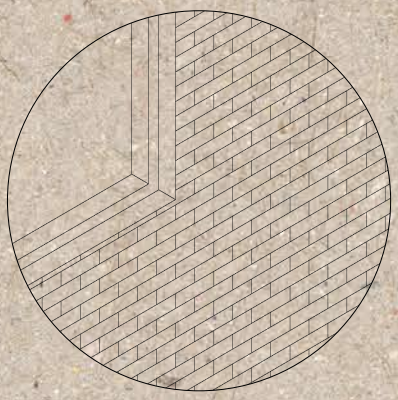


Seaweed tiles

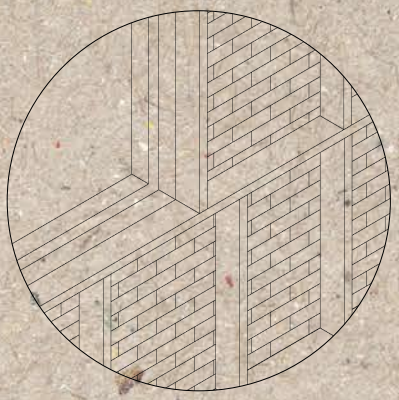


1= Existing brick wall
2= Wooden frame
3 = Wood fiber insulation
4 = Wooden panel
5 = Wooden support structure
6 = Seaweed
7= Wooden cladding

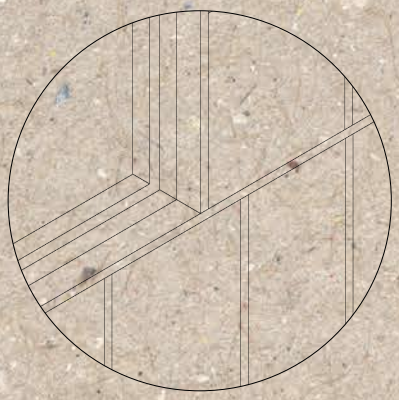
06. Proof of concept



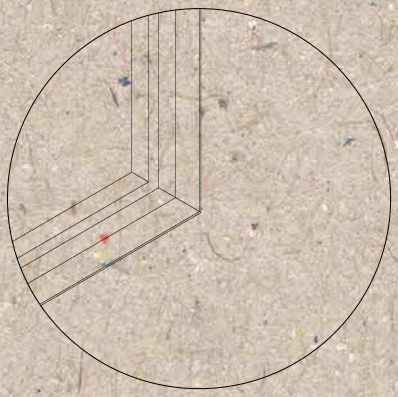
1.0 | Existing brick wall



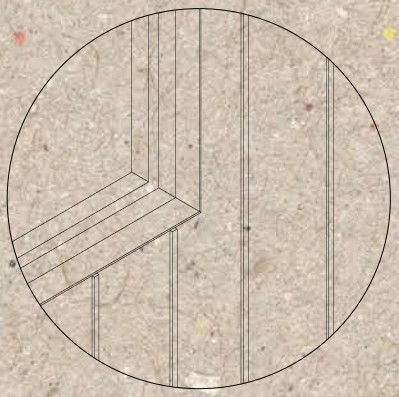
2.0 | Wooden frame



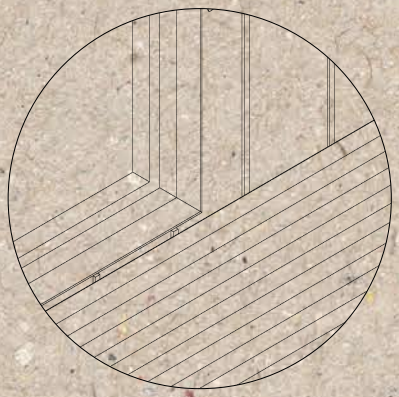
3.0 | Woodfiber insulation



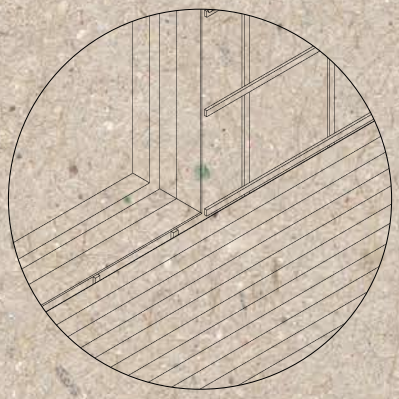
4.0 | Wooden panel



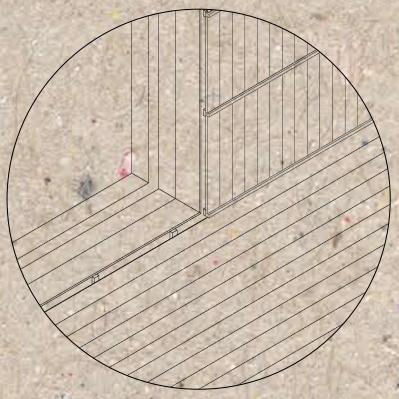
5.0 | Vertical support



6.0 | Seaweed



7.0 | Horizontal support



7.0 | Wooden cladding

07. Impression

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Look-book (2/3) as part of the Thesis Research: Bloemkoolwijken - the New Vernacular?

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