APPENDICES

APPENDIX A: GRADUATION BRIEF

5660

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy". Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Arts
initials: B.L.T. given name: Bente
student numbe
street & no
zipcode & cit
countr
phone
emai

Your master programme (only select the options that apply to you):
IDE master(s): IPD | DfI | SPD
2[nd] non-IDE master:
individual programme: - - (give date of approval)
honours programme: Honours Programme Master
specialisation / annotation: Medisign | Tech. in Sustainable Design | Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Holly McQuillan dept. / section: MF
** mentor: Caroline Kroon dept. / section: DfS
2[nd] mentor:
organisation:
city: country:

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Exploration of 2D to 3D transformation of woven textile-form volumes

project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 23 - 02 - 2022

30 - 09 - 2022 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

COVID-19 brought already existing, but suppressed under the companies growth, weaknesses to the surface. This resulted in the slow transition from mass production to on-demand production. Brands have to become stronger in real engagement with the customers' demand. Brands are moving from bulk production towards demand-driven production (Unmade, n.d.) and it's mandatory to create a flexible and adaptable production process, which aligns with the 2-dimensional to 3-dimensional woven textile-forms techniques that will be explored in this project.
The end product of the TC2 digital loom is a wool-woven 3D structure, a woven textile-form. There's no need for sewing compartments together to create a finished product with this technique and a hybrid design of woven and other manufacturing techniques is also possible.
Flat- and woven textile form methods and multimorphic textiles methods(McQuillan, 2020), which consist of woven layered constructions, are used to explore the 2 dimensional to 3-dimensional volumes that could be translated to a luxury bag by Loro Piana. All wool garments and products are finished with a treatment on the yarn, weave or product to maintain its quality and create a certain 'look and feel'. The effect and sustainable impact of these treatments and finishes on the aesthetics and the construction of the woven textile-form and their behavioural relationships will be addressed. Treatments and finishing pre- and post-production will be explored and tested, all the exploration topics will be addressed in an iterative process and by this holistic approach, the outcome will consider all the key factors of the Zero Waste Design Thinking for woven textile-form (McQuillan, 2020).

The TU Delft, specifically Holly McQuillan's research, is one of the main stakeholders. The knowledge from her PhD thesis (McQuillan, 2020) will be a huge contributor to this graduation project. Same for the knowledge and skills for digital weaving (on the TC2 loom) to create the desired techniques to explore 2D to 3D volumes.

Loro Piana is one of the main stakeholders and they value tradition and innovation which inspire the company's uncompromising vision of quality (LVMH, 2022). Sustainability for Loro Piana (Falovo, 2021), consists mainly of programs to safeguard the animals and their habitats. Loro Piana is a vertically integrated company, which allow them to control the quality of its product from design to distribution, which allows an innovation in production technique like this.
Other stakeholders are production facilities of textiles, yarns and garments. The current procedures in the production of garments are far from circular, a lot of knowledge can be gained and innovations should be implemented for these stakeholders. Most textiles end up in landfills and then we're not only talking about the textile that transforms to waste during the production process. A lot of garments don't even see the consumer and go straight to landfill and the numbers are shocking. In this project, I will be addressing this huge problem, from a Zero Waste Design perspective and explore these transformable volumes that also create opportunities for on-demand production.

In this graduation project, I'll take the journey towards zero waste fashion design and circular fashion design, by exploring the possibilities of 2-dimensional to 3-dimensional transformation of wool woven volumes. This exploration will create opportunities for luxury bag design by Loro Piana. But it's also create a starting point for using this technology on other garments and create a larger contribution towards a fashion industry that has a zero waste vision.

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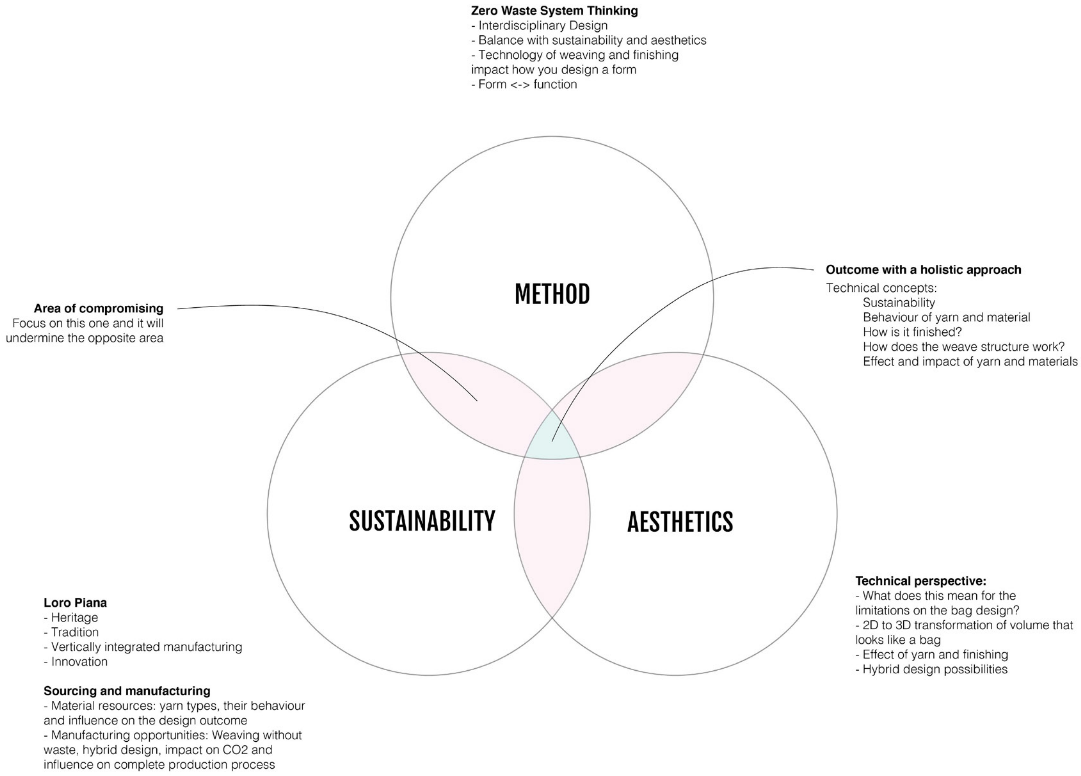


image / figure 1: Relationship method, sustainability and aesthetics

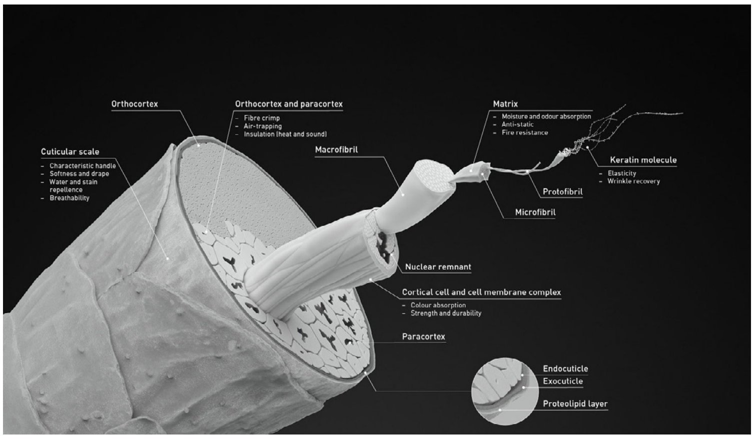
image / figure 2: Developing concepts process for woven textile-forms

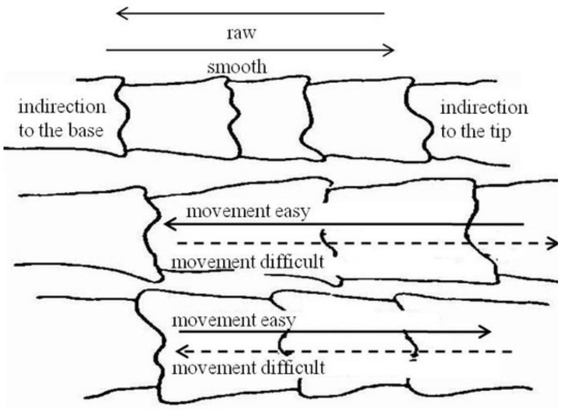
APPENDIX B: WOOL FIBRE

Wool fibre architecture

There are two types of wool fibres, see figure 20. First of all, worsted fibres, having longer, stronger and finer fibres, specifically used for suits. Second, woollen fibres, having shorter and broader fibres, used for felted wool, like overcoats.

The surface of a wool fibre is made of overlapping cuticles, very different form the smooth surfaces of synthetic fibres. In figure X,X and X the surface shows the cuticles, with untreated wool these scales cause wool to felt and become thicker and more fibrous during washing. Using this property intentiously it can create texture and wind resistance and advantageous for a range of temperatures because moisture vapour penetrates beneath the scales, allowing the fibre to 'breathe'.





Wool is a complex biological fibre consisting of proteins, known as keratins, in the category of mammal hair. It has a heterogenous composition where protein is made up of amino acids and acidic carboxyl groups, which are responsible for flexibility, elasticity, resilience, wrinkle recovery properties, dirt and fire repellant properties and absorbing moisture and dyes.

Wool fibre - moleculair level

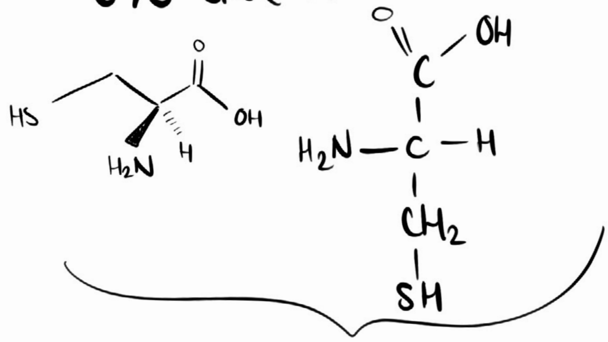
Wool consists keratin, water, dirt, fat and suint (lanolin). The keratine consists of Cystine molecules (Babu, 2019, Zhang et al, 2018), giving it the keratin, protein nature of wool. These molecules contain sulfur atoms that form disuphilde bridges between two cysteine molecules. These disulphide bridges are sensitive to heat and alkaline pH, enhancing the factors needed for felting to occur established by using warm water and detergent next to friction by mechanical factors needed. The movement of the fibres away from their parallel direction explained from a chemical science perspective therefore shows the need for water and soap for felting to occur next to the mechanical need of friction.

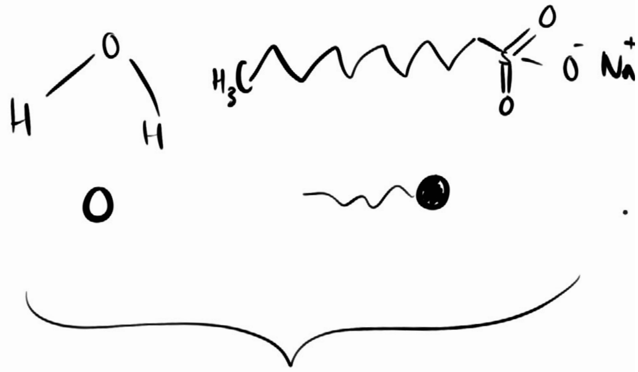
References

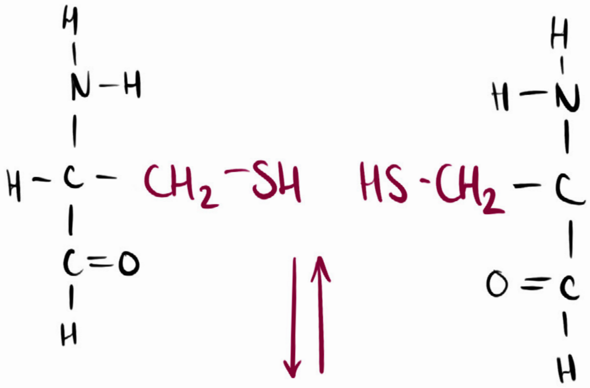
Babu, S. (2019). Chemical composition of wool fibre, chemical formula of wool, physical structure of wool. https://www.textileadvisor.com/2019/07/chemical-composition-of-wool-fibre.html

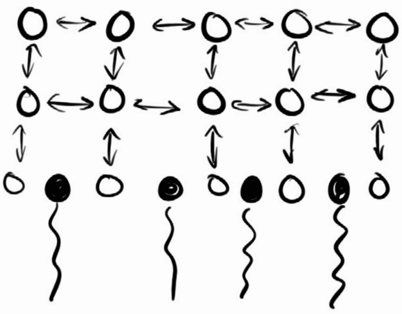
Zhang, N. Wang, Q. Yuan, J. Cui, L. Wang, P. Yu, Y. Fan, X. (2018). Highly efficient and eco-friendly wool degradation by L-cysteine-assisted esperase, Journal of Cleaner Production, Volume 192, 2018, Pages 433-442, ISSN 0959-6526, https://doi.org/10.1016/j.jclepro.2018.05.008.

CYSTEINE MOLECULE **WATER** **DETERGENT**

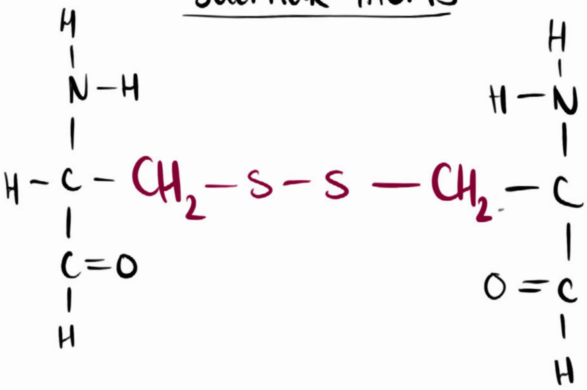








SULPHUR ATOMS



DISULPHIDE BRIDGE

↳ SENSITIVE TO HIGH TEMPERATURES & ALKALINE pH → MODIFY KERATINE STRUCTURE → FELTING

APPENDIX C: FELTING EXPERIMENT

The observations in an executed experiment by Holly McQuillan, exploring the influence of three wool yarn in a variation in number of twists per cm on the felting ability in different weave bindings. The data from this experiment is used to make a selection of weave bindings to explore their felting ability.

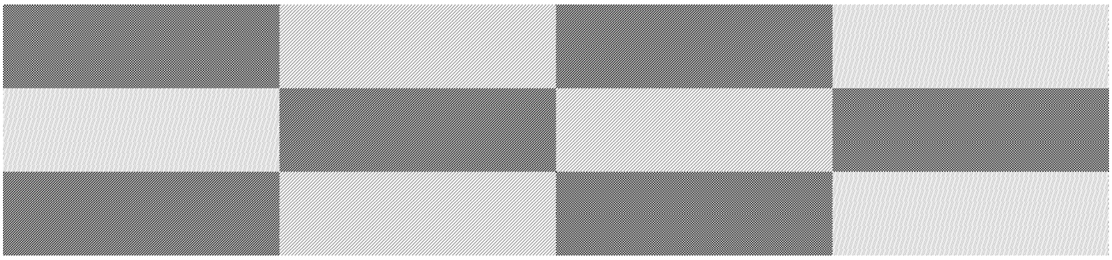
In the following experiments the yarn is the input and is programmed to exist in a weave binding, where the felting ability is explored.

I Experiment Start A - Weave structure felting ability

In this experiment the differences between weave bindings and specific float lengths within these bindings is tested on felting ability and therefore the shrinking in size.

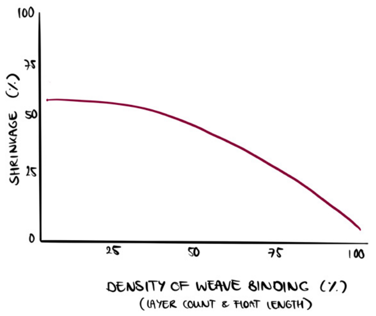
Method

Using 3 types of yarn in 4 different weave structures for a variation of test samples. Table X show the shrinkage percentages of the samples in the weft direction, this shows the shrinkage for wool. The warp is made of cotton, all samples shrunk +/- 11% in the warp direction, due to the natural shinkage of this perticular cotton after the first wash.
The loom had problems with weaving so the accuracy of these samples is questionable.



Experiment set up, results and calculations can be found here:
https://docs.google.com/spreadsheets/d/1IF5UFlMZxptMh_1akSmh_kRcueYBpwP1dowjNecRoqA/edit?usp=sharing

		Weave bindings *Shrinkage in percentage (%)*				
Yarn type	**Density**	Plain	Twill 3/3	Twill 1/7	Satin 1/11	**Notes**
Easy felt	100%	-10.7	-7.5	-37.3	-24.4	
Merino soft super knit	100%	-9.8	0	-45.6*	-15.9*	The percentage of shrinkage of twill 3/3 for this yarn type being exactly '0' is questionable.
Merino soft super lace	100%	-4.9	-5	-26.8*	-2.2*	The loom had problems with weaving so the accuracy of these samples is questionable.



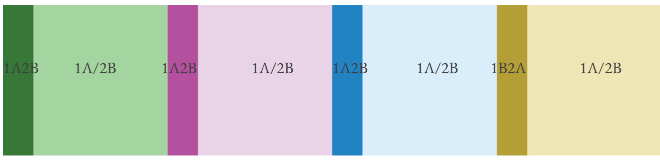
Notes

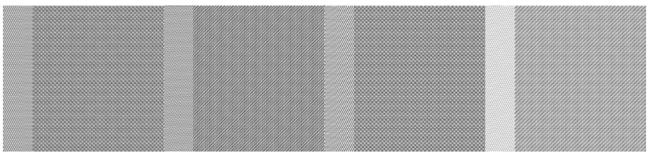
The executed experiment has some limitations because some heddles of the TC2 Jacquard loom did not perform properly. Some heddles in the middle and right side of the loom did to not move up and down properly creating longer floats which influences the shrinking ability of the woven sample, see assigned in figure X (*).

This experiment demonstrates that the weave bindings selection with different float lengths is the cause of the felting process and influences the amount of shrinking in size. Important for design implementation is the insight, that an uneven twill binding makes the woven sample curl up because of the tension difference and division of warp and weft.

II Experiment Start B - Influence layer density on felting ability

The following experiment is performed where the density decreased and therefore the space between yarns increased (cellular) Experiment XX exists of 2 types of yarn in 4 types of weave bindings, see table X. Also the interlacement of two weave bindings with the two different yarns is researched in this experiment, see table X





Experiment set up, results and calculations can be found here:
https://docs.google.com/spreadsheets/d/1n-yS43xEsuIpeu7Q1jfxqr-487m8cZdVmel9G21coHc/edit?usp=sharing

		Weave bindings *Shrinkage in percentage (%)*				
Yarn name	**Density**	Plain	Twill 3/3	Twill 1/7	Satin 1/11	**Notes**
Easy felt	50%	-37,6	–	-48.3	-	Not all bindings tested
Merino soft super knit	50%	-	-33.5	-55.2	-62.6	Not all bindings tested

These experiments show that the more space the yarns and therefore the wool fibres have, meaning the longer the floats, results in a higher shrinking percentage. However, noted must be the maximum ability of felting and therefore shortening the length of the yarn. Logically, we can understand that a yarns ability to shrink perform is a range that is not 0-100%, since it is not a dissolvement method. Nevertheless, the felting ability of a yarn also doesn't range from 0-99%, van der Vegts research observes felting of wool form a mechnical perspective, showing that over time felting reaches a maximum. Most yarns reach their maximum at 60-70% of their original length (van der Vegt, 1955).

The conclusion from these observations is the float length within the weave binding makes the wool felt and therefore shrink in size. This occurs mostly in the weft direction where each yarn has 'room' to shrink because of these floats. The shrinkage percentage in the warp direction came from the natural shrinking of cotton after the first wash. Little could come from the wool when the floats of yarns in the warp direction get attached to each other and 'pull' together, making the size in the warp direction smaller. However, in these experiments it is difficult to say for sure this factor also influenced the shrinking in the warp direction.

The float length in a weave binding is the design parameter to enable felting. By conduction more experiments a pattern in the felting behaviour of these weave bindings could be explored to increase the controllability of the felting process.

III (Ir)reversability of wool felting

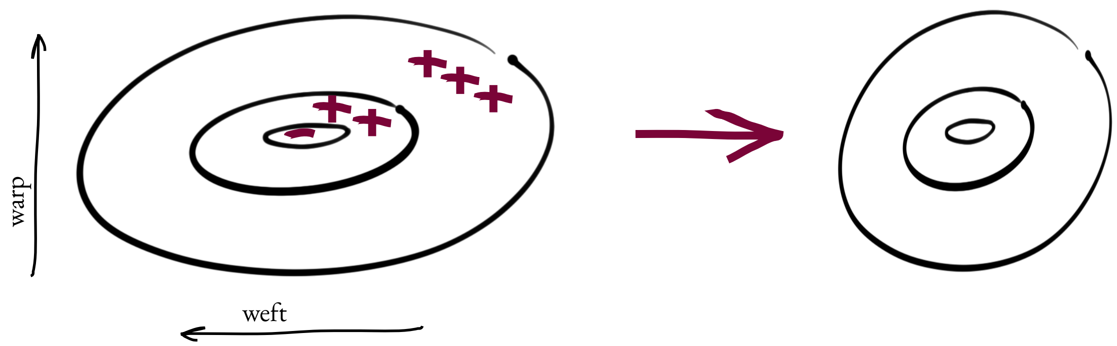
The following figures suggest that the felting properties of wool are reversible to some extend. Although this could also be seen as a stage within the change over time. In this experiment we demonstrate that the roughness and inconsistent placement of fibres, as a result of the felting process, are reversible by the application of steam and ironing. Two processes usually done in the finishing process and in the context of the consumer before wearing, ironing out the creases established by manufacturing, folding and storing of the items. Stating that its reversable is not completely right since the felting process is not undone through this application. However, the alignment and roughness of the felted textile change, change over time, it looks like we go back in the felting process, when it could also be seen as another process or extended process of felting.

APPENDIX D: IMPORTANT FOR FELTING

I.   Sizing of felting samples

Felting of wool parts in a shape design cause the elements in the shape to shrink in size and therefore the size of the whole shape decreases. By mapping the principles of felting in chapter X, knowledge about the change in size (measurements) is accumulated. The samples will decrease in size over width, the weft direction.

Experiment X: Sizing of a sample - Map of Bindings - dome/oval shape



Aim

To explore the predictability of the sizing of the samples after the felting process to increase the controllability of the sizing of the intended final shape.

Method

The test row of every weave binding will give an indication of the felting abilities of that binding. Implementing this knowledge in the weave binding construction to create the intended shape. Perfecting this shape through experimenting with the construction, width and height, and the weave bindings and the direction of placement on the loom.

Key insights

Most shrinking occurs in size in the weft direction therefore the shape ends up smaller in the width after felting. Though, all the experiments in this chapter demonstrate, that this depends on the elements around the 'felting' part, holding the 'felting' part from felting, when having a very dense weave binding (that will not felt).

Implementation for design

- Adjusting the Map of Bindings according to intended shape after felting taking into account the shrinking in size over especially the weft direction, the width.
- Using the direction of placement (weft vs warp) to create an extremer difference between the felting and non-felting areas.

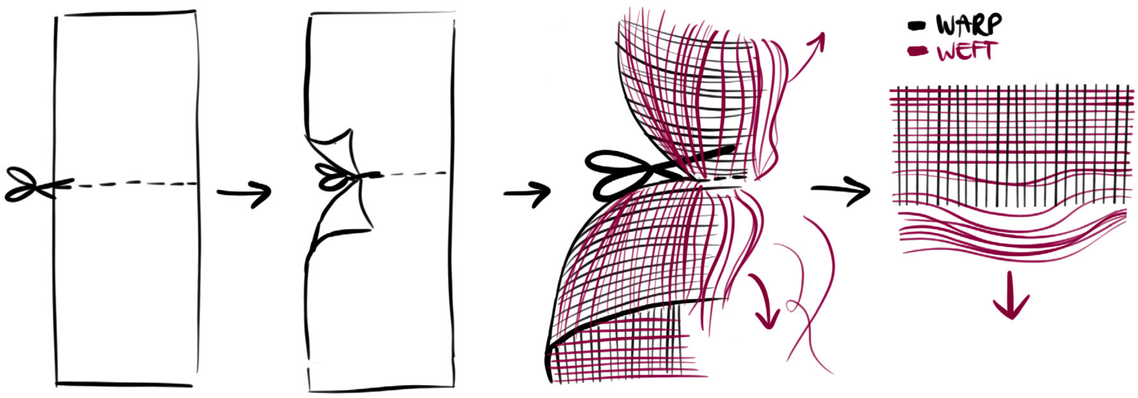
2. Warp and weft division

Weft and warp division of a felting part, see figure X, for the difference in magenta and beige weave structure. Difference between S24/1 and S1/24 is the float being on the bottom or top of the warp,. Which causes more or less felting, but als more or less protection from the warp yarns of the friction in the washing machine.

3. Finishing of samples before felting

The cloth on the loom is cut to enable experimenting with each sample separately. The very fine polyester warp causes a lot of fraying when the samples are cut in the weft direction.

Resulting in the first batch of samples in the washing machine with felted frays, very messy samples. The frays stuck onto the sample in irregular wild directions, needed to be pulled from the sample with some force, disturbing when analysing the samples and also influencing the samples and form-creation. This problem required some experimenting to prevent the samples from fraying.



ith conventional Cut & Sew methods overlocking the edges is an effective technique to stop the cloth from fraying. However, with this polyester warp it results in even more easily pulling the whole overlocked side off the sample, which will result in the same fraying problem in the washing machine.



Exploring the possibilities of sealing the sides by melting the polyester through the wool resisting the wool to fray after that seal-line. Unfortunately, this would not work because of the thickness of the wool and the because of the heat-resistance of the wool around the polyester it would take long and burn the wool. Another option would be sealing with a plastic wrap over all sides, like plastic bag sealing with heat. This would probably work for the fraying but result in using excessive amounts of plastic use, something not encouraged looking at the sustainability framing. Using a 3D printer to print a line on every sample and seal with heat afterwards would minimise the plastic use, nevertheless this would be a time consuming process due to the printer set up for every sample and the printing time.

After some experimenting with these ideas, the most effective method is to pull some wool yarns off the sample to expose the polyester which is then melted together using a lighter. For using this method the samples for the second weave batch were altered to enable enough cloth around the sample to pull away the wool yarns.


During these experiments this resulted in some yarn waste, which is not desired when designing zero-waste. However, when only having acces to a loom with a polyester warp this was necessary to enable research and experiments.

When designing with the intent to produce consumer products, this problem could be addressed and requires experimenting to minimise fraying. The use of a loom with a yarn that also has roughness and therefore the yarns of the weft and warp attach to each other, f.e. the 'hooks' on wool, would minimise fraying.

Another option would be experimenting with specific weave bindings or constructions that minimise fraying because of specific interlacements of the yarns and/or layers. A machine with shuttles enables to weave just parts of the warp rather than every weft yarn over the whole width of the warp. This results in creating finished off seams by the loom it selfs, which needs specific programming of the weave card and the loom.

Though, this fraying 'problem' is part of the aesthetic of this production method and choice of material, in the thesisthis perticular aesthetic outcome is addressed.

APPENDIX E: UNDERSTANDING LAYERS

The following research is conducted to understand layer building in woven textile-form (McQuillan, 2020)

Experiment X - Understanding layers

Aim

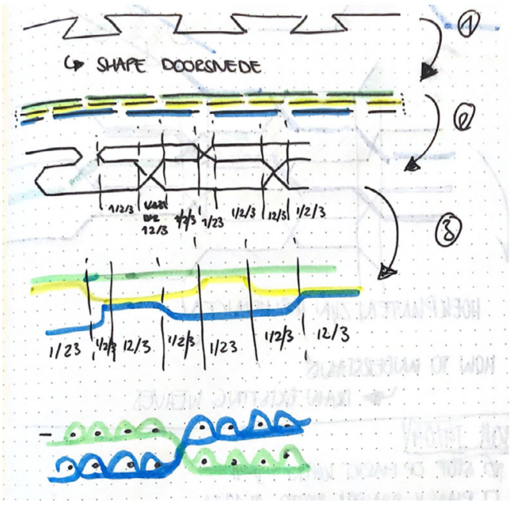
Understanding how the loom can create layers with 3D weaving.

Method

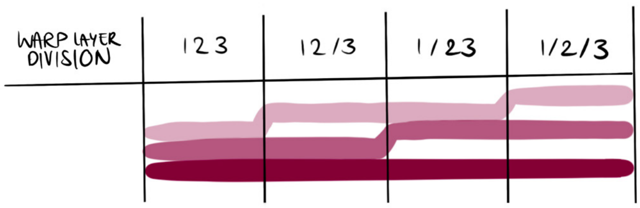
Drawing the cross section of existing layered weavings and assess how they are constructed using the map of bindings coding. Next, draw the individual yarns of a crossing of layers.

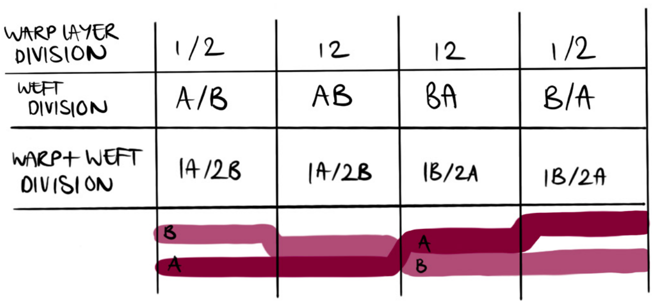
Reflection

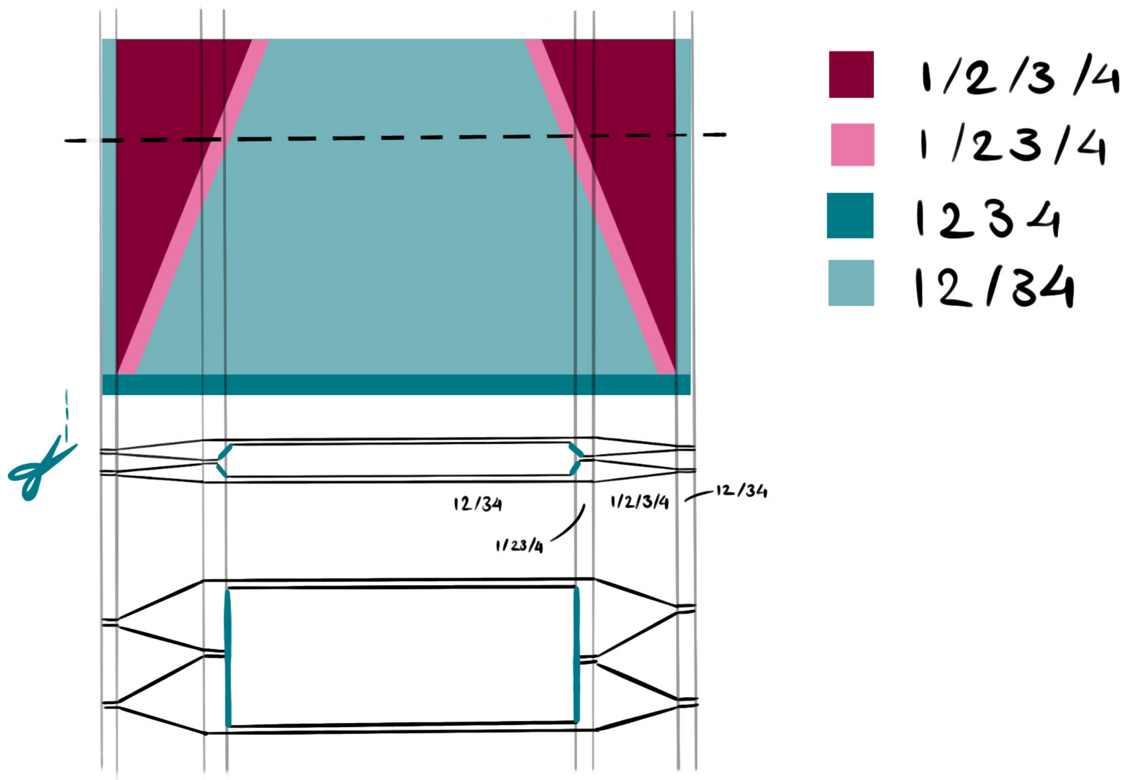
Milou Voorwinden gave me the tip to draw existing layered weavings to help me understand the layer-weave-loom relationship, see figure 34. Together with the workshop, this method definitely helped to understand which warp yarn would move up and down with every weft.



Explaining illustrations layer constructions



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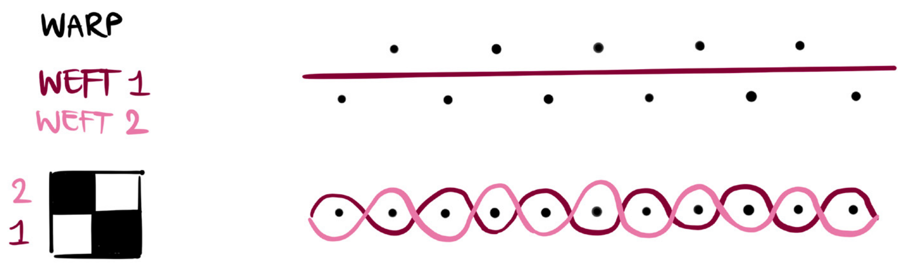
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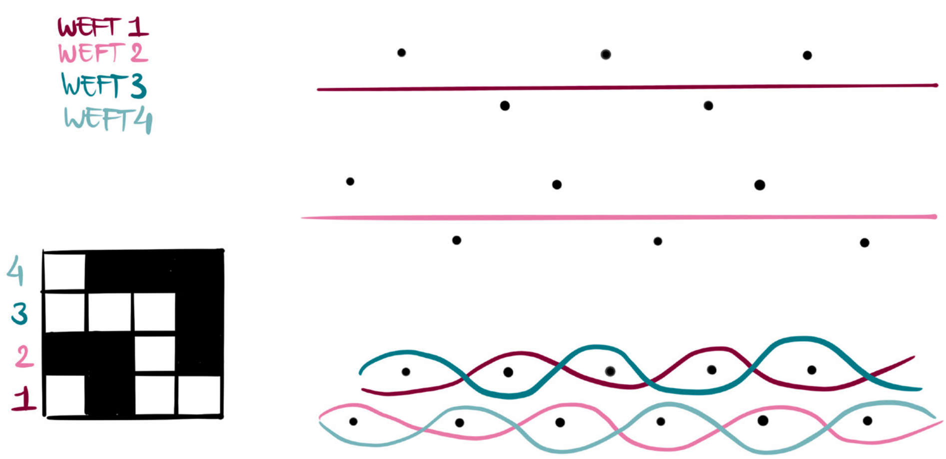
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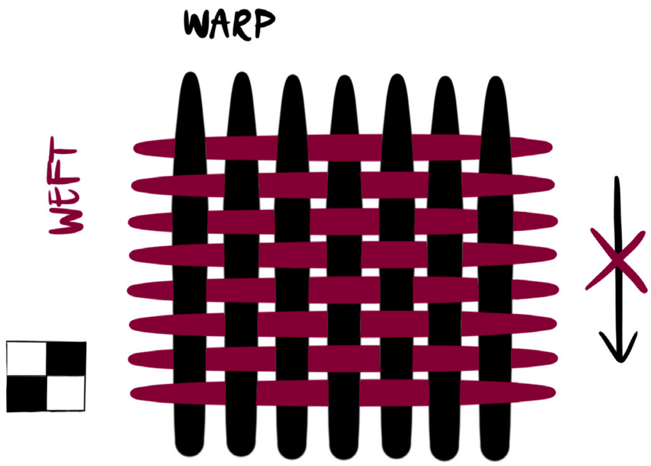
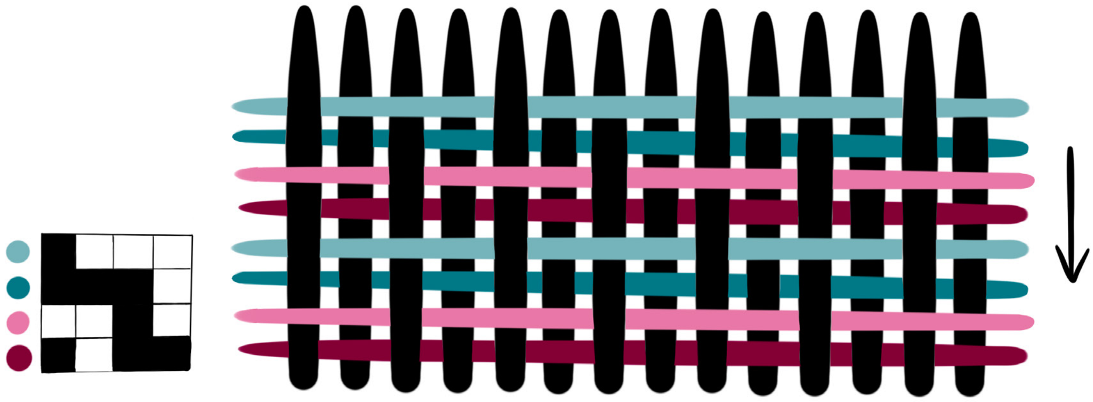
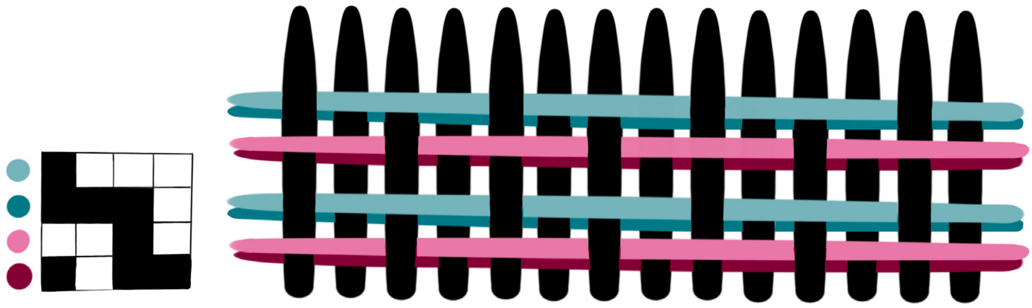
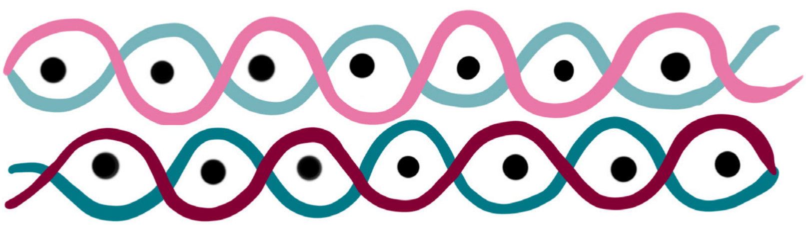

WARP
WEFT







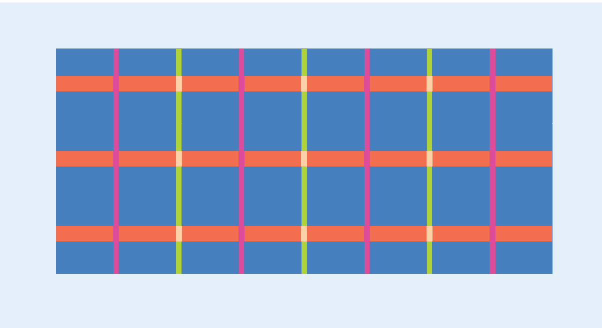
APPENDIX F: EXPERIMENTS SET UP

The following experiment set up explains how to read the specific sample names and the corresponding MoB and MoB annotations.

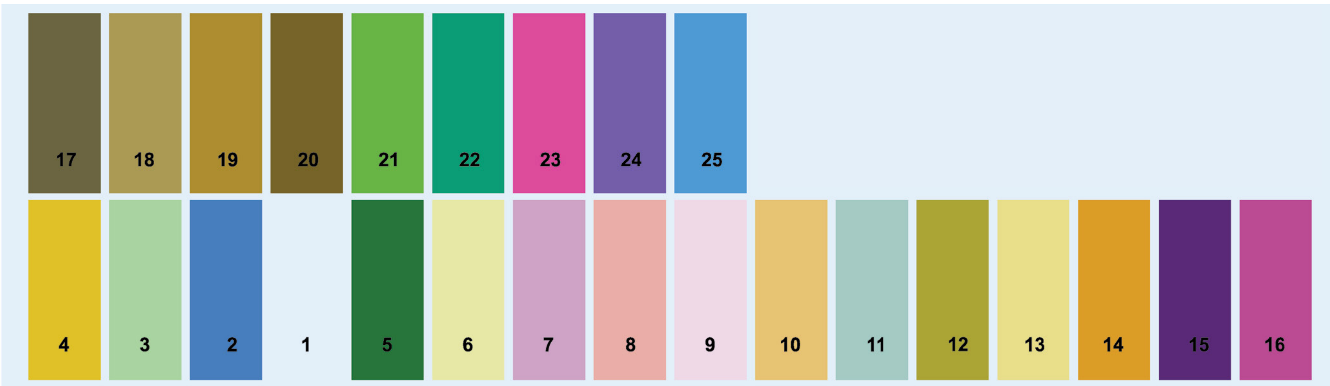
SAMPLE *batch - layer count - number*

For example:

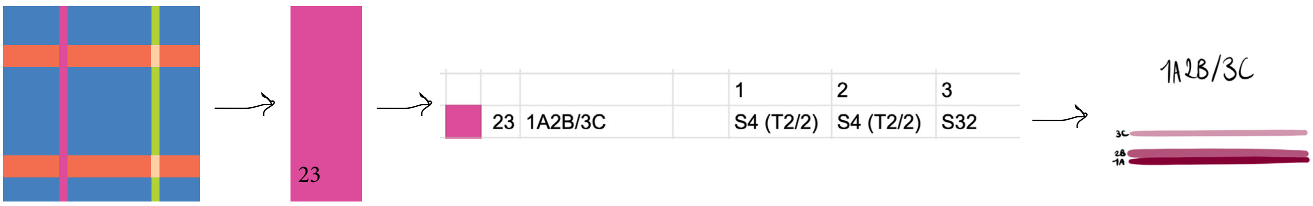
To find the information of **SAMPLE II - 3 - 5,** you'll find this Map of Bindings:



The corresponding colours of this MoB are at the bottom of the complete MoB:



The numbers in the binding numbers correspond to specific binding annotations.
For example, you want to know the binding of the pink element in this sample, which corresponds to binding number 23, via the link at the top of the MoB in this appendix, you'll follow this process:



MoB colours

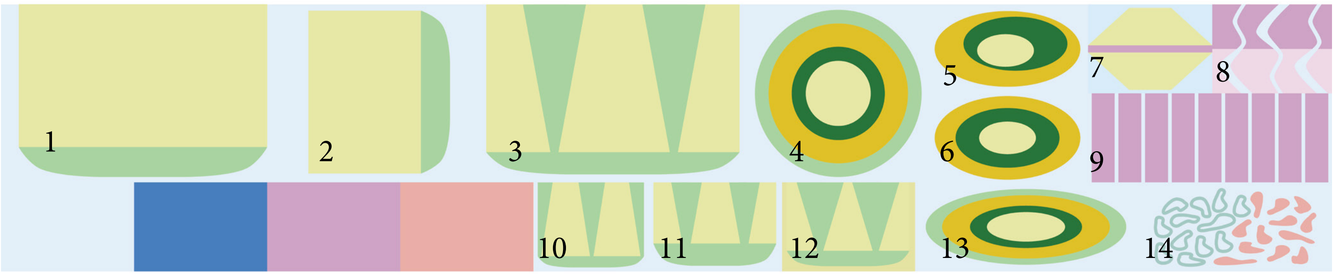
Binding number

Binding annotation as *1A/2B/3C* with corresponding weave bindings of each layer

Visualisation for using

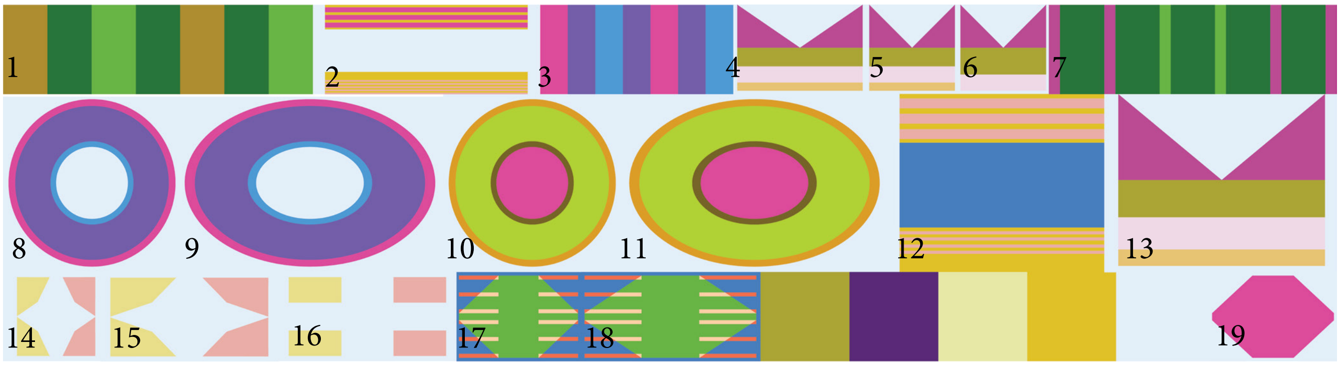
Batch I - 2 layers - MoBs

Link to MoB annotations: https://docs.google.com/spreadsheets/d/1JpxEECcPcetDf-ukX8sOAVMeckMAvAL4Wui6Id_pTHw/edit?usp=sharing



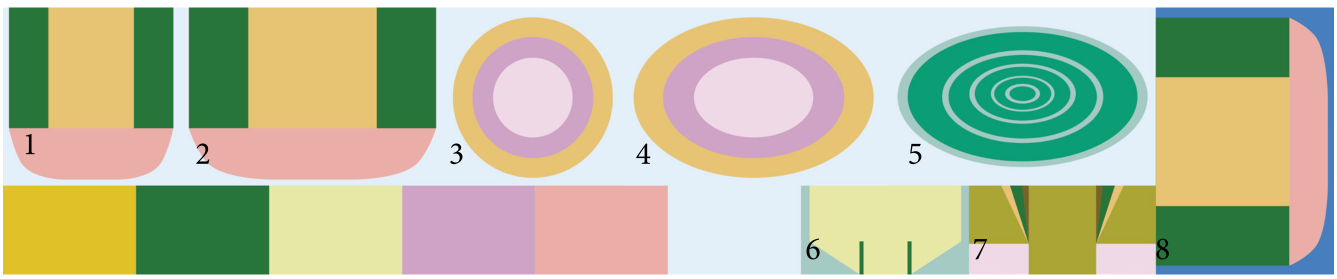
Batch I - 3 layers - MoBs

Link to MoB annotations: https://docs.google.com/spreadsheets/d/1JpxEECcPcetDf-ukX8sOAVMeckMAvAL4Wui6Id_pTHw/edit?usp=sharing



Batch I - 4 layers - MoBs

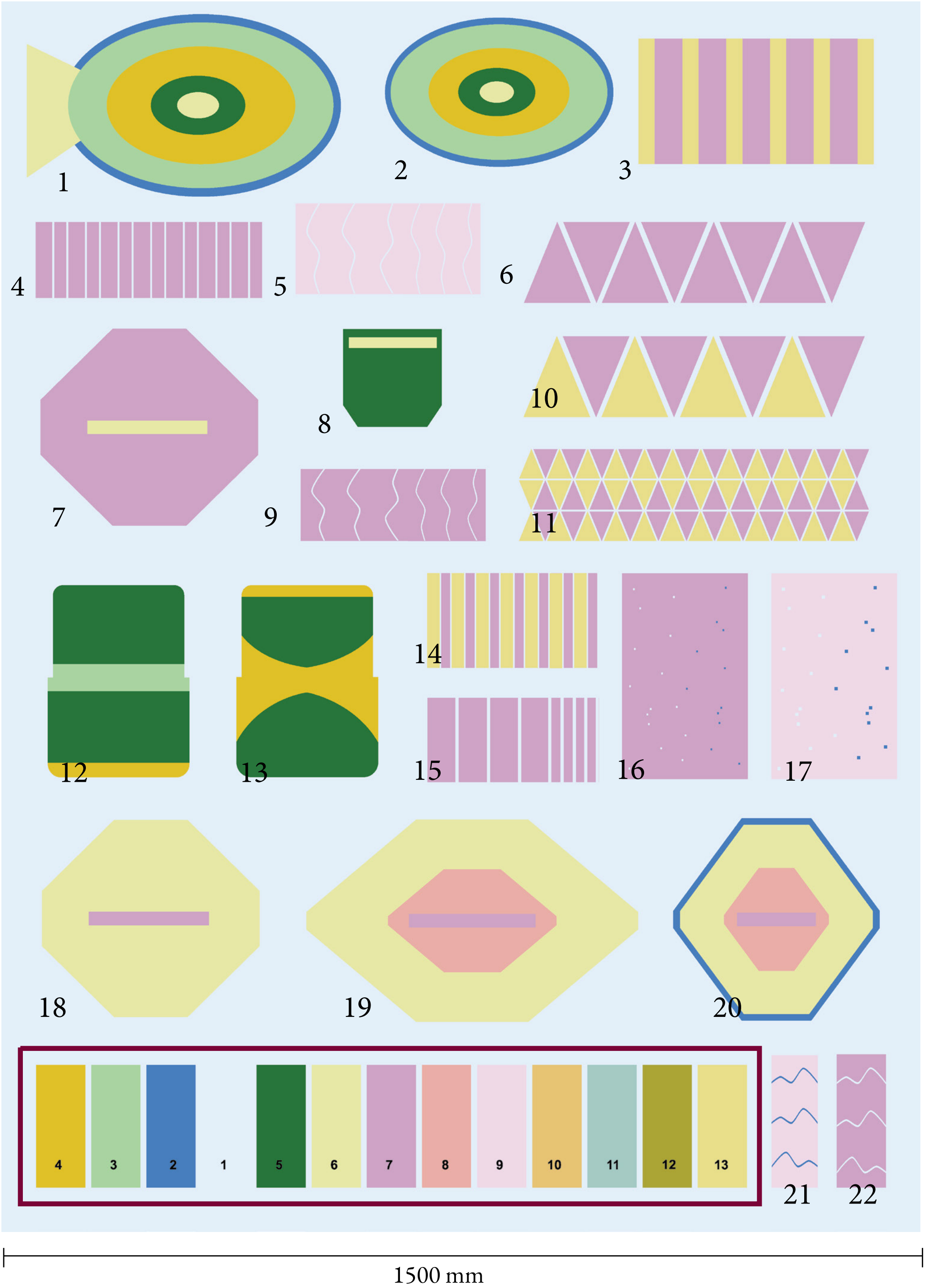
Link to MoB annotations: https://docs.google.com/spreadsheets/d/1JpxEECcPcetDf-ukX8sOAVMeckMAvAL4Wui6Id_pTHw/



Batch II- 2 layers - MoBs

Link to MoB annotations: https://docs.google.com/spreadsheets/d/1JpxEECcPcetDf-ukX8sOAVMeckMAvAL4Wui6Id_pTHw/edit?usp=sharing

MoB number

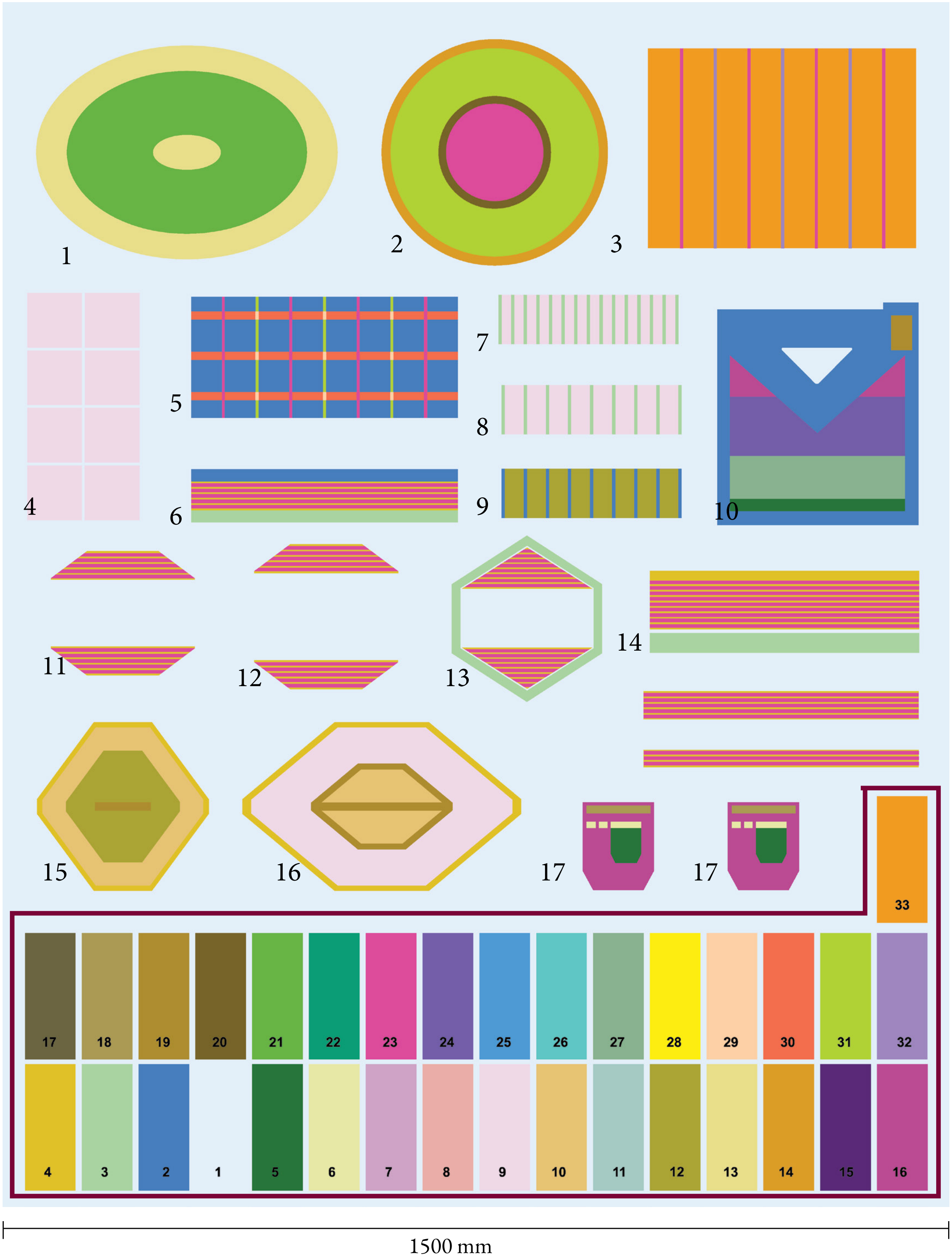


Binding annotation

Batch II - 3 layers - MoBs

Link to MoB annotations: https://docs.google.com/spreadsheets/d/1JpxEECcPcetDf-ukX8sOAVMeckMAvAL4Wui6Id_pTHw/edit?usp=sharing

MoB number

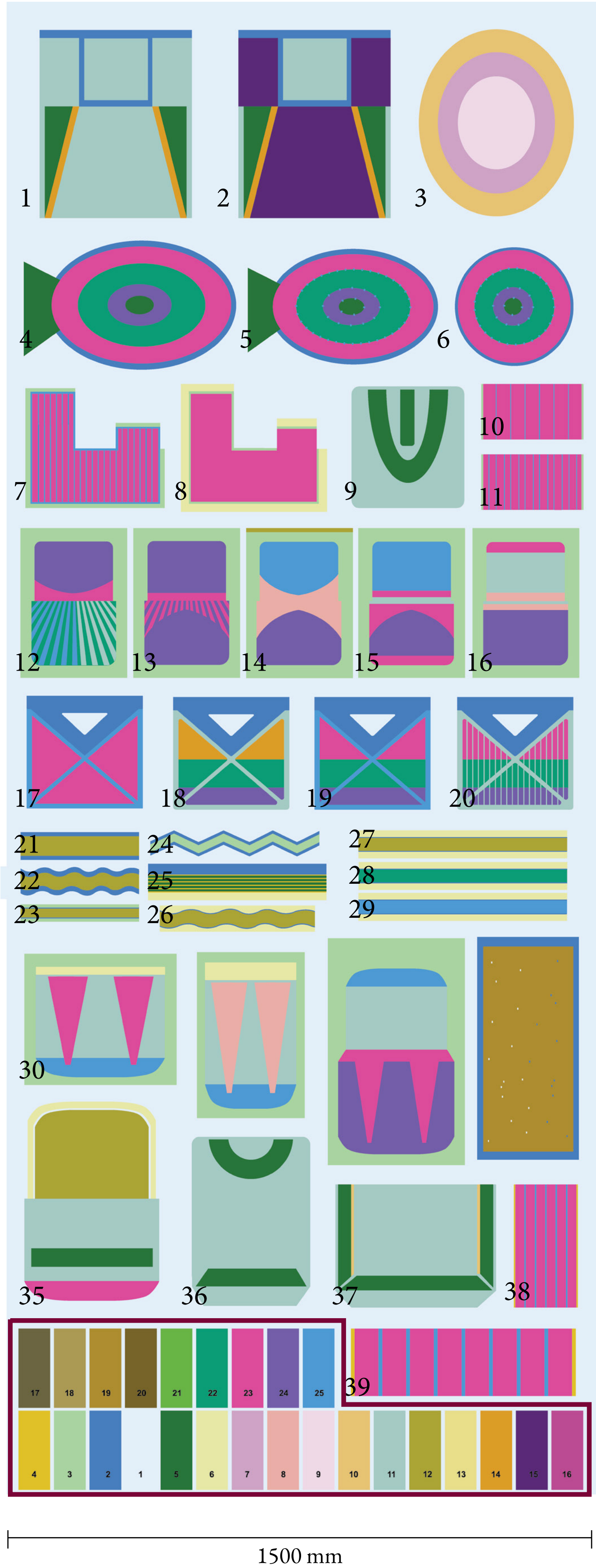


Binding annotation

Batch II - 4 layers - MoBs

Link to MoB annotations: https://docs.google.com/spreadsheets/d/1JpxEECcPcetDf-ukX8sOAVMeckMAvAL4Wui6Id_pTHw/edit?usp=sharing

MoB number

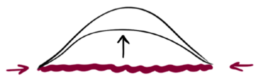
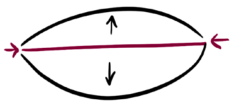
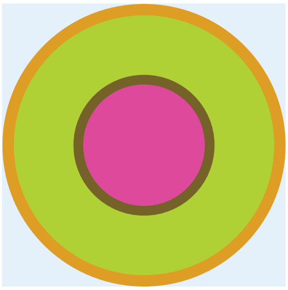
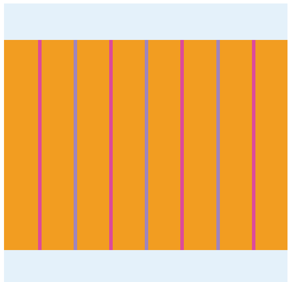


Binding annotation

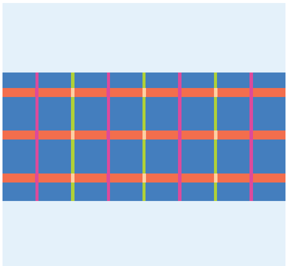
1500 mm

APPENDIX G: EXPERIMENTS

For the documented analysis and processes of all the experiment, follow:
https://docs.google.com/document/d/1M5Mfq8GUZpVcwbFxYms68rc0MPQTNasV0jqj2WftjTk/edit?usp=sharing

SAMPLE (batch-layers-number)	SAMPLE I-3-10	SAMPLE II-3-3
		
		
Map of Bindings		
EXPLORATION Change in size Change in texture Change in firmness Change in texture	EXPLORATION Change in form Change in texture	EXPLORATION Change in size Change in form Change in firmness Change in texture
INFORMATION Other samples Process Result intented effect	INFORMATION I-3-11, II-3-2 Felted with washing bag Result: ++	INFORMATION Felted without washing bag Result: ++

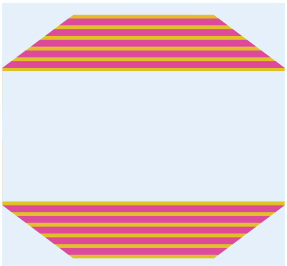
SAMPLE
II-3-5



EXPLORATION
Change in form
Change in firmness

INFORMATION
I-3-17/18
Felted with washing bag
Result: ++

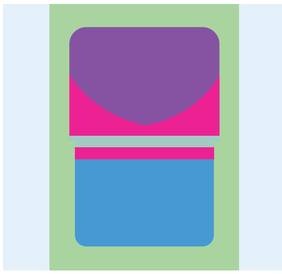
SAMPLE
I-3-2



EXPLORATION
Change in form
Change in texture

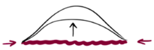
INFORMATION
I-3-11/12/13/14
Felted with washing bag
Result: ++

SAMPLE
II-4-12



EXPLORATION
Change in size
Change in form
Change in firmness
Change in texture

INFORMATION
II-4-12/13/14/15/16
Felted without washing bag
Result: ++



SAMPLE
II-4-28

EXPLORATION
Change in firmness
Change in texture

INFORMATION

Felted without washing bag
Result: ++

SAMPLE
II-4-28

EXPLORATION
Change in firmness
Change in texture

INFORMATION

Felted with washing bag
Result: +

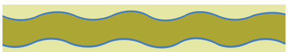
SAMPLE
II-4-29

EXPLORATION
Change in firmness
Change in texture

INFORMATION

Felted with washing bag
Result: -

SAMPLE
II-4-26



EXPLORATION
Change in firmness

INFORMATION

Felted without washing bag
Result: -

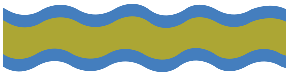
SAMPLE
II-4-23

EXPLORATION
Change in firmness

INFORMATION

Felted with washing bag
Result: -

SAMPLE
II-4-22

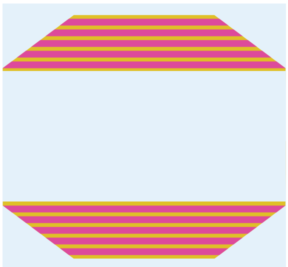


EXPLORATION
Change in firmness

INFORMATION

Felted without washing bag
Result: ++

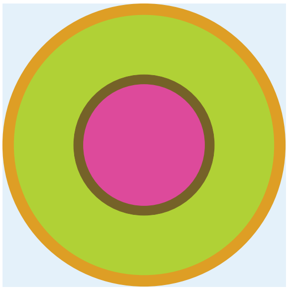
SAMPLE
II-3-14



EXPLORATION
Change in firmness
Change in texture

INFORMATION
I-3-11/12/13/14
Felted without washing bag
Result: ++

SAMPLE
I-2-5



EXPLORATION
Change in firmness
Change in texture

INFORMATION

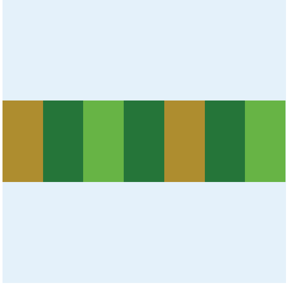
Felted with washing bag
Result: +

SAMPLE
II-2-9

EXPLORATION
Change in firmness
Change in texture

INFORMATION
II-2-5, I-2-8
Felted with washing bag
Result: -

SAMPLE
I-3-1



EXPLORATION
Change in size
Change in texture

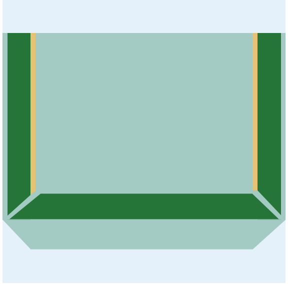
INFORMATION
I-3-7
Result: -

SAMPLE
II-4-9

EXPLORATION
Change in size

INFORMATION
II-4-1/2/36, II-3-17
Result: -

SAMPLE
II-4-36



EXPLORATION
Change in size
Change in form
Change in firmness
Change in texture

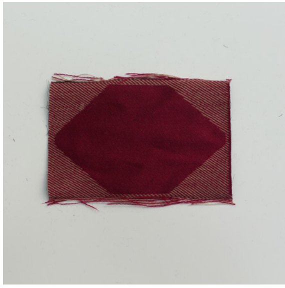
INFORMATION

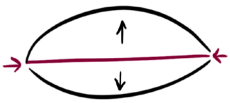
Result: ++

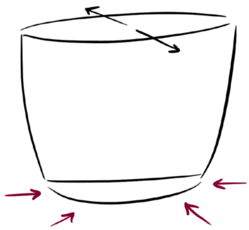
FORM CREATION

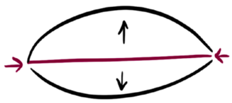
FORM CREATION

FORM CREATION





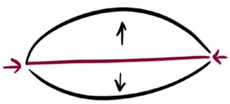


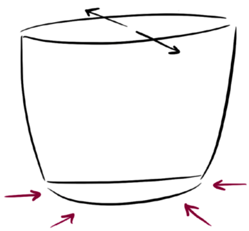


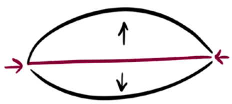
FORM CREATION

FORM CREATION

FORM CREATION







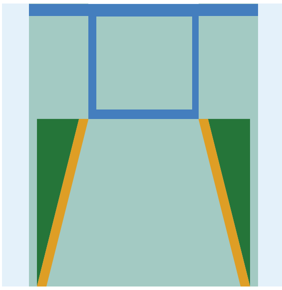
SAMPLE II-4-35

EXPLORATION
Change in size
Change in form

INFORMATION
Batch II 4 layers

Result: -

SAMPLE II-4-16

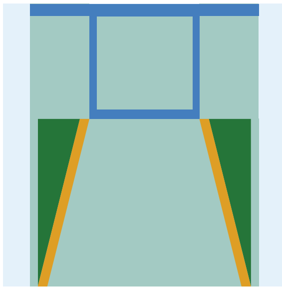


EXPLORATION
Change in firmness
Change in texture

INFORMATION
Batch II 4 layers

Result: ++

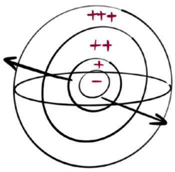
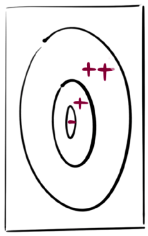
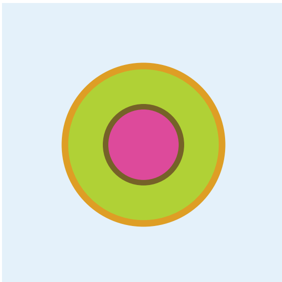
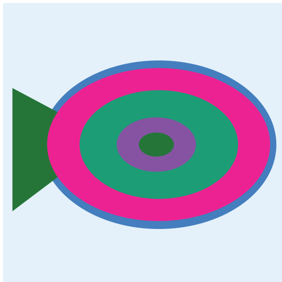
SAMPLE II-4-1



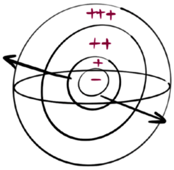
EXPLORATION
Change in firmness

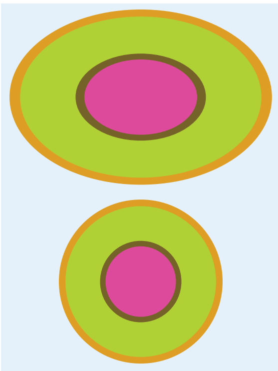
INFORMATION
Batch II 4 layers

Result: ++

SAMPLE (batch-layers-number)	SAMPLE II-3-3	SAMPLE II-4-4
		
		
Map of Bindings		
EXPLORATION Change in size Change in texture Change in firmness Change in texture	EXPLORATION Change in size	EXPLORATION Change in size Change in form Change in firmness Change in texture
INFORMATION Other samples Process Result intented effect	INFORMATION I-3-? Felted without washing bag ++	INFORMATION II-2-1 Felted without washing bag ++

SAMPLE 28

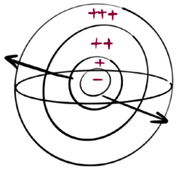


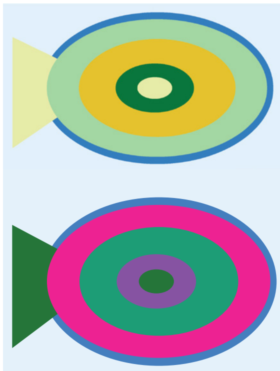


EXPLORATION
Change in size

INFORMATION
Batch I   3 layers
Felted with washing bag
Result: -

SAMPLE 29





EXPLORATION
Change in size
Change in form
Change in firmness
Change in texture

INFORMATION
Batch II   2 & 4 layers
Felted without washing bag
Result: ++

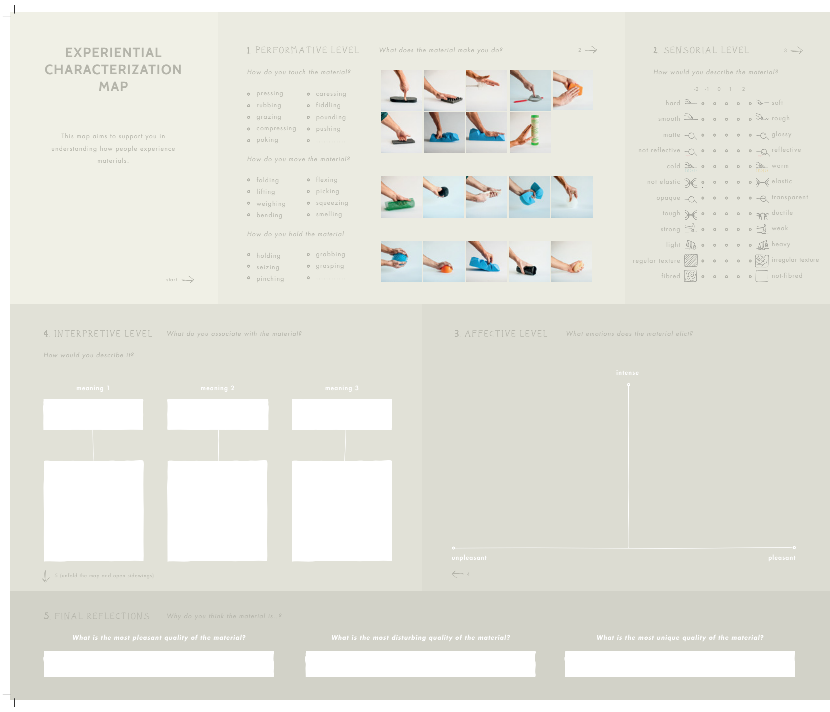
APPENDIX H: USER STUDY

Through Experiential Characterisation (Camere & Karana, 2018) the perception of the expression of these materials could be explored. In the user study described in appendix X, the experiential characteristics of these materials are explored, focusing on the interpreted meaning of these materials for consumers.

Aim

To explore the meaning of the samples, explore how people understand the sample trying to answer questions about the aesthetics. What do the material traces tell the users? Does the sample show how its made?
This user study is using Experiential Characterisation by Camere and Karana (2018) and the designated toolkit via: https://materialsexperiencelab.com/ma2e4-toolkit/

The Interpretive Vocabulary reflects the meanings associated to materials, literally how we interpret materials. Which addresses the introduced term by Karana, material traces including ageing, production etc. of objects. Note that materials is a product here and not only the material, it comes with a certain process and system it behaves in.



User study set up

3 participants (+1 participant for pilot)
3 samples
Camera: to film hands for sensorial level
Printed interpretive level paper (12x)
Printed interpretive vocabulary
Printed interpretive images

Schedule

Perform a pilot study to optimise plan and then perform 3 studies. If pilot works out can be used in study.
40 minutes per participant
5 min explain and signing informed consent form
30 min for 3 samples (10 min per sample)
5 min to explain project and more detailed reasoning for user study to discuss towards circular aesthetics assumptions.

(link to informed consent form: [https://docs.google.com/document/d/1XQIj9iVhhU12ymOVBUfmpIKMLtWAUxeV4xqeRkGbeaM/edit?usp=sharing)](https://docs.google.com/document/d/1XQIj9iVhhU12ymOVBUfmpIKMLtWAUxeV4xqeRkGbeaM/edit?usp=sharing)

Interpretive user study steps

Participants are asked to address the sensorial level to get a feeling and create emotions towards the material to later be capable of assigning meanings to the material in the next step. With a camera set up the hands of the participants are filmed to analyse and understand what the material communicates about their performative capabilities, see figure 1.

Figure 1: Filming focus for sensorial and performative level.

The Interpretive vocabulary is given and the participants are asked to assign three meanings of the list to the sample and elaborate why the words are chosen on the paper in figure 2.

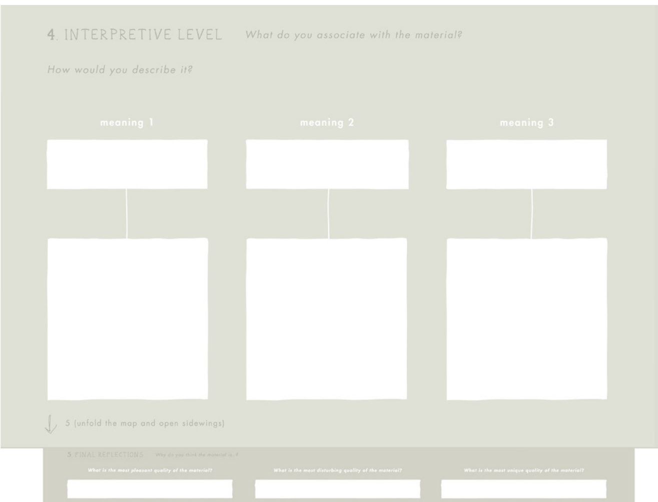


Figure 2: Interpretive level map
Figure 3: Participant fills in the interpretive meanings map

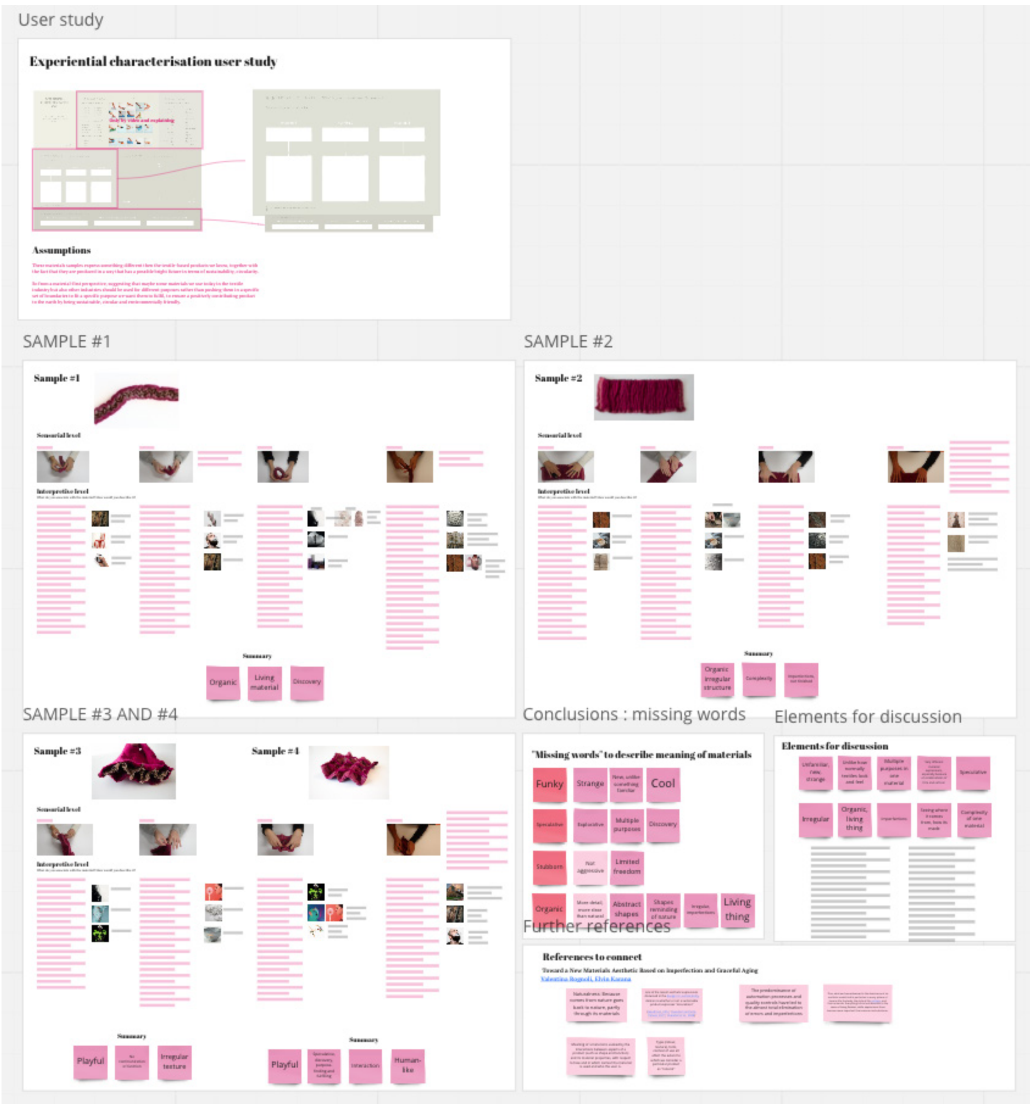
Participant will be asked to shortly vocally elaborate and facilitator asks clarifying questions.
The interpretive images are given of the chosen meanings and the participant is asked to clarify their interpretation of the meaning by choosing one or two of the images that express the chosen meaning for them.

Reflective questions after interpretive test

The participant is asked to fill in the reflective questions on the paper and to elaborate on them, facilitator will ask questions for clarifying the understanding.
What is the most pleasant quality of the material?
What is the most disturbing quality of the material?
What is the most unique quality of the material

Results and analysis of study

Answers of participants are placed in Miro to analyse and find conclusions, which can be found via:
https://miro.com/app/board/uXjVPEPDpWk=/?share_link_id=52313848321



APPENDIX I: INTERVIEW

Link to interview Janne Hoop on June 22, 2022:
https://docs.google.com/document/d/1RGflJ9PN3v8tUo-UnDKms9DTJ8pND0WntLCm-BjRQzg/edit?usp=sharing

Link to interview Troy Nachtigal on Octobre 25, 2022:
https://docs.google.com/document/d/1We_2aiB3lWgo1iYjFLMOlIzdY_YtSchI/edit?usp=sharing&ouid=108451788079571957741&rtpof=true&sd=true