CORE77
DESIGN
AWARDS

UN/LIMITED

Un/Limited Backpack

Un/Limited is a fully waterproof and size adjustable backpack tailored to the needs of an urban slow cyclist.

This project aims to demonstrate the unlimited and limited requirements of space and material through a daily backpack. It can both expand to accommodate unexpected items and compress to keep the backpack streamlined to allow for better mobility.

Following the design philosophy for 'design of reduction', the backpack is made of mono-material DuPont ™ Hytrel ®, which is a series of recyclable thermoplastic elastomers with different levels of hardness. This is in stark contrast to the backpacks on the market today, which are multi-material and hard to recycle.

Year: 2018
Theme: Plastics that improve with age | DuPont ™ Hytrel ®
Dimensions: 290 x 410 x (20 ~ 150) mm
Filmmaker: Hiroki Yokoyama

Industrial Collaboration with DuPont ™

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Plastics that improve with age.

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Designing products that are meant to last is the most sustainable thing an industrial designer can do, short of not designing anything at all. Considering how humans build relationships with objects can allow us to create products that will remain relevant to their user for longer. Beyond functionality, a product that shows signs of its story and relationship with its owner can create a stronger emotional connection with that object.

The object is to design a product, with DuPont material, that is sustainable and creates a genuine bond with the user. An object that improves with age and counters some of the negative attributes often attributed to plastics such as cheap, transient and unemotional. Consider the longevity of your solution but also its place in a circular economy. What is its service life, how can it be reused, recycled or repurposed when (and if) it does come to the end of its useful life?

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DUPONT® X Royal College of Art

Postgraduate Art & Design

Design for Manufacture Platform, MA Design Products

Project Brief

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Demonstrating the un/limited requirement of space and material through a daily backpack.

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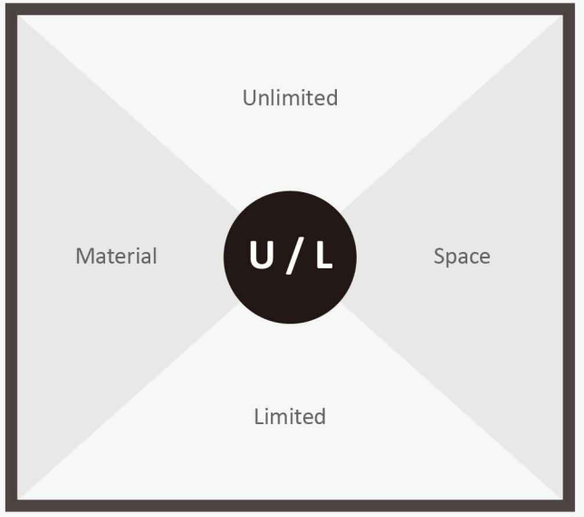

Background

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Cycling commuters in London.

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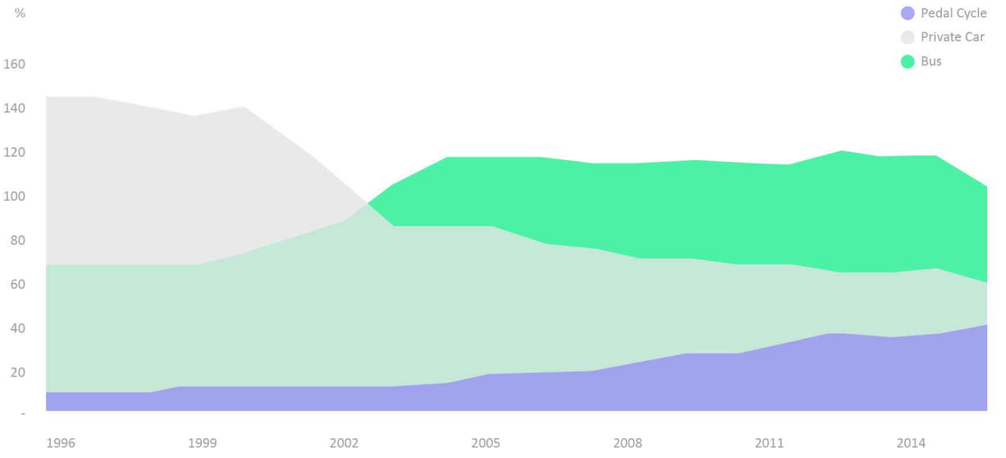

People entering central London by cycle, private car or bus during the morning peak, 1996-2015.

Cycle use increases have been higher in some urban areas: in London, for example, around 10,000 entered central London by cycle in 1996, compared to 39,000 in 2015.

Transport Statistics Great Britain, DfT. Table TSGB 0106

Cycling to work **increase.**

In 2011, urban working residents (3.2%) were twice as likely to cycle to work as rural working residents (1.6%).

Office for National Statistics, '2011 Census Analysis - Cycling to Work', 26 March 2014

Survey Highlight

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22 Cycling Commuters | May 2018 | 86.4% in London.

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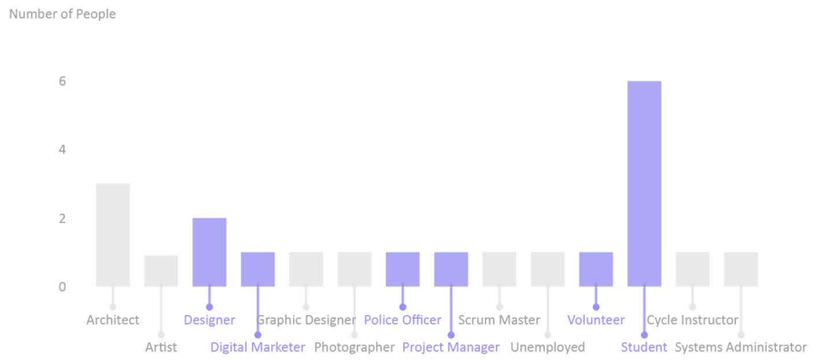
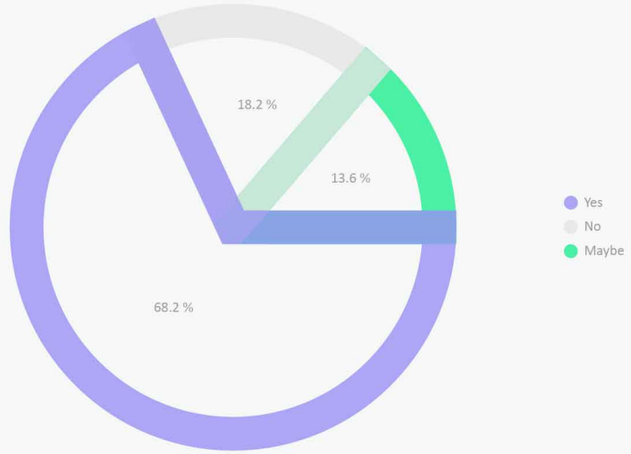
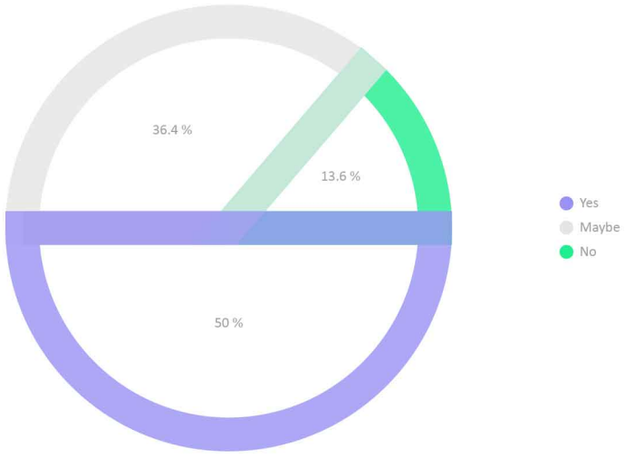
Occupation of Cycling Commuters



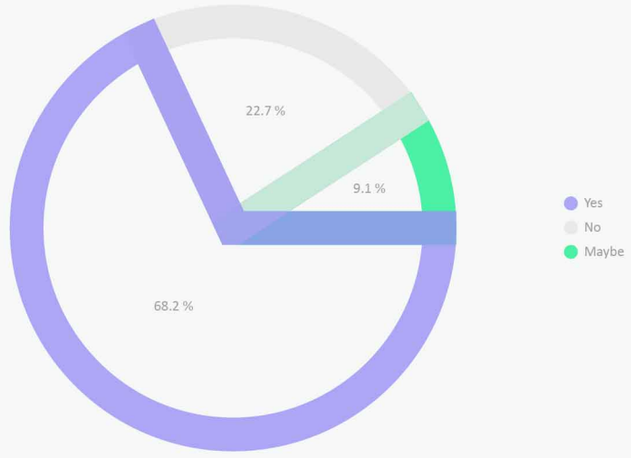
Do you sometimes need your backpack to expand for putting more things?



Is sustainability an important factor you consider when purchasing a backpack?
(e.g., using creative reused or recyclable material)



Do you sometimes need your backpack to shrink/be more compact?



Observation

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Types of bags and bicycles.

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Why backpack?

According to the survey:

> Keep bike simple and light.
> Not always need the extra storage space.
> May influence riding when passing vehicles.
> May influence cyclists to control their bikes.
> Just leave bikes when cyclists arrive their destinations.
> No worry about being robbed from baskets.

Most cyclists who need to carry stuff on their bikes for relatively short distances use a rucksack because it's convenient, easily comes with you off the bike and doesn't need any extra equipment.

John Stevenson, '13 of the best cycling rucksacks- gear carriers to suit all budgets to get you and your stuff to the office on time' in road.cc, 6 March 2018
http://road.cc/content/buyers-guide/219033-13-best-cycling-rucksacks-%E2%80%94-gear-carriers-suit-all-budgets-get-you-and

1-1 Interview

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12 cycling commters | May 2018 | London.

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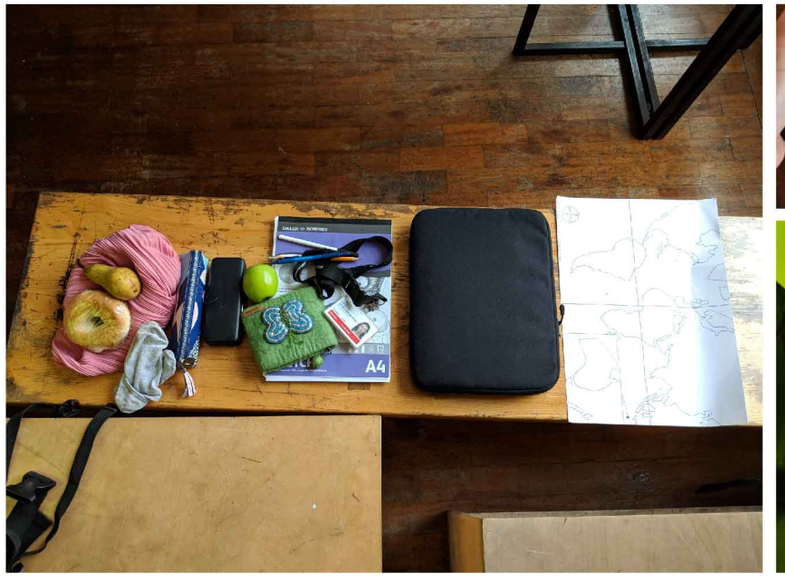
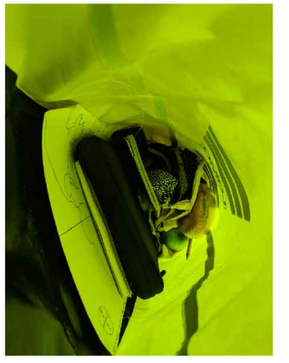




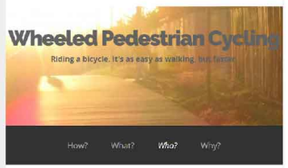
Result

> Weight: 2 - 8 KG.
> Not always full.
> Sometimes bring sportswear or spare clothes or shoes.
> Not use all pockets or compartments.
> Cycling journey: 10 - 40 minutes.
> Dress code:
- Casual: 6 people.
- Slight formal: 3 people.
- Sportswear: 3 people.

Opinion from Cyclists

Slow Cycling.

'Cycling' is sport and recreation. 'Riding a bicycle' is everyday activity. No sweat. As easy as walking, but faster.



Mark Bracey, 'Shifting perceptions: From cycling, to riding a bicycle.' in Wheeled Pedestrian Cycling, 23 August 2014
https://wheeledpedestrian.wordpress.com/2014/08/23/shifting-perceptions-from-cycling-to-riding-a-bicycle/

I used to dress up in special clothing to ride my bike. Now I just dress for the destination.

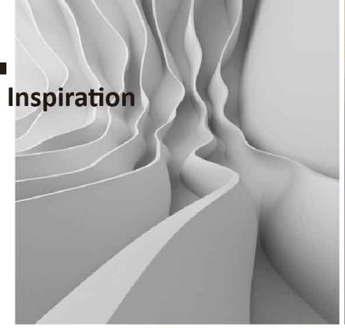
Mark Bracey, 'Who?' in Wheeled Pedestrian Cycling
https://wheeledpedestrian.wordpress.com/about-2/

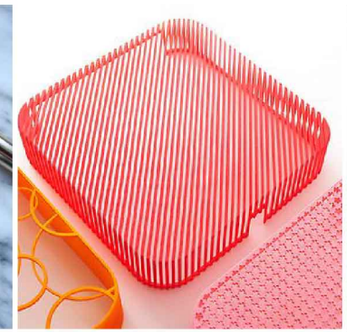
I have decided to cycle slowly as a protest against the speed monsters. I enjoy this hugely. I wait obediently at lights, taking the opportunity to study the architecture around me.

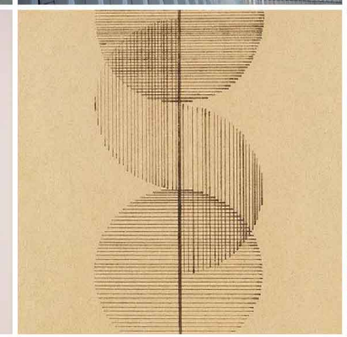
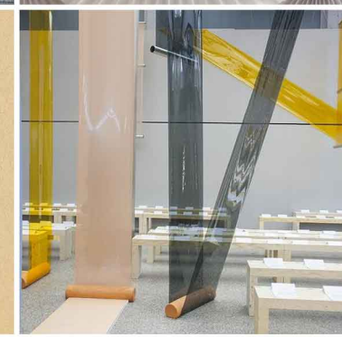
Tom Hodgkinson, 'THE JOYS OF SLOW CYCLING' in THE IDLER, 30 April 2018
https://idler.co.uk/article/the-joys-of-slow-cycling/

THE IDLER
IDLE THOUGHTS ONLINE COURSES LIVE SHOP ABOUT JOIN U
THE JOYS OF SLOW CYCLING

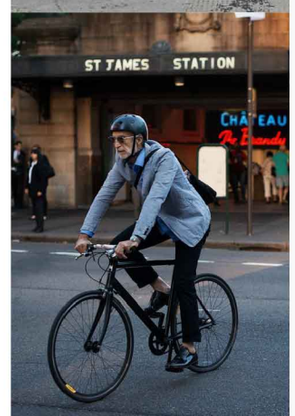
Form Inspiration





Audience



- > Enjoy commuting by cycling.
- > Not a speed monster.
- > Prefer unisex style.
- > Care about responsible consumption and production.
-

Selected Material Properties of DuPont ™ Hytrel ®

-
> Recyclable.
> Elasticity.
> Wide ranges of hardness.
> Waterproof.
> Standard plastic production methods.
-

DuPont ™ Hytrel®:
A Thermoplastic Elastomer Engineered for Versatile Performance. Hytrel® combines the flexibility of rubber with the strength and processability of thermoplastics.

http://www.dupont.com/products-and-services/plastics-polymers-resins/thermoplastics/brands/hytrel-thermoplastic-elastomer.html

Material Exploration

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01 - 03 | Visiting DuPont ™ Innovation Center in Geneva.
04 - 05 | Simulating elastic structure by paper.
06 - 07 | Sheet material in different thickness, hardness and texture.
08 - 13 | Casting for suitable thickness and hardness.
14 - 15 | Simulating elastic structure by sewing sheet material.
16 - 17 | Trying patterns of back cushion by post sewing machine.
18 | Welding sheet material.
19 | Simulating elastic structure by 3D printing NinjaFlex.

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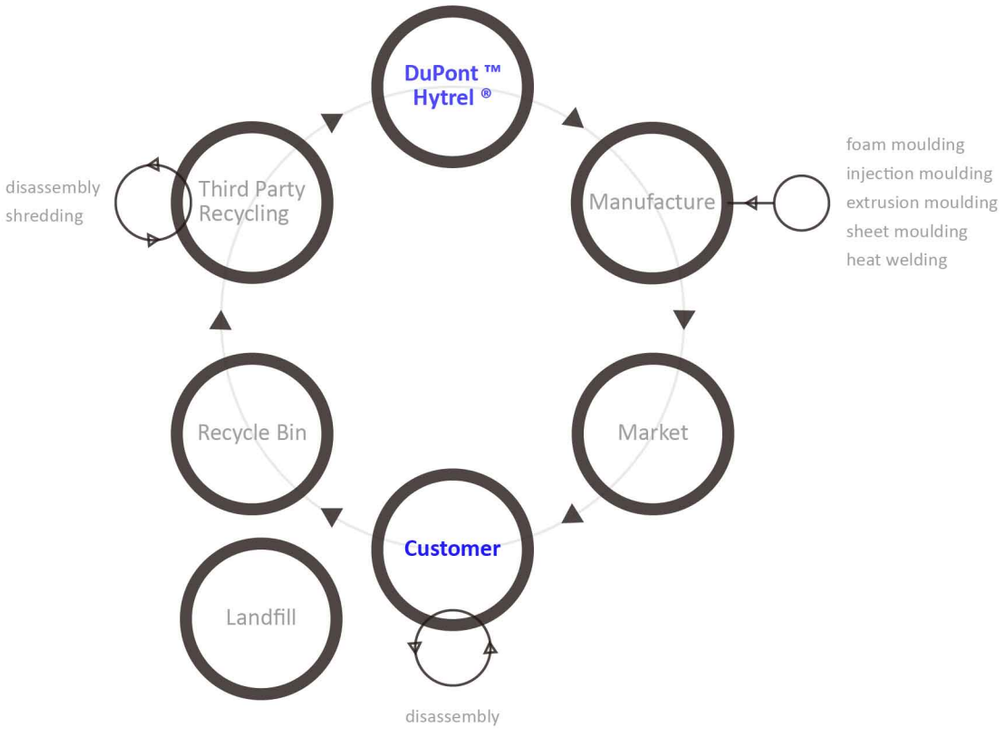
Recycle System



Material Exploration Summary

Design Criteria

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According to the previous research,

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> Self-expanding-and-contracting structure.
> Sustainable.
> Fully waterproof.
> Easy to clean.
> Casual and formal.

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Production Plan

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Mono-material
DuPont ™ Hytrel ®

-

- Hard | Injection Molding | Buckle, Zipper.
- Shore 70A | Injection Molding or Sheet Molding | Main Body, Belt.
- Foam | Foam Molding | Pocket, Laptop Compartment, Cushion.

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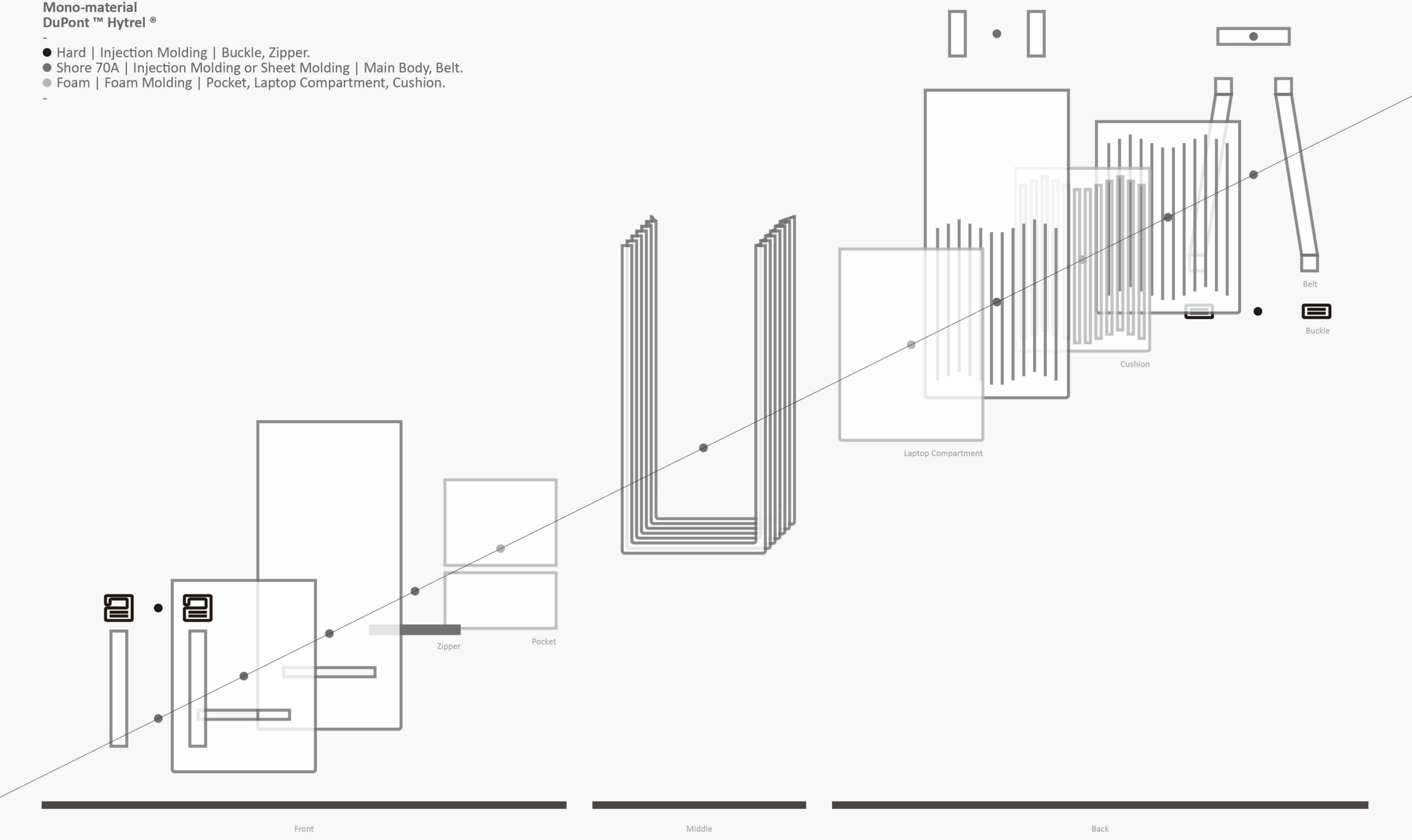

Welding Assembly

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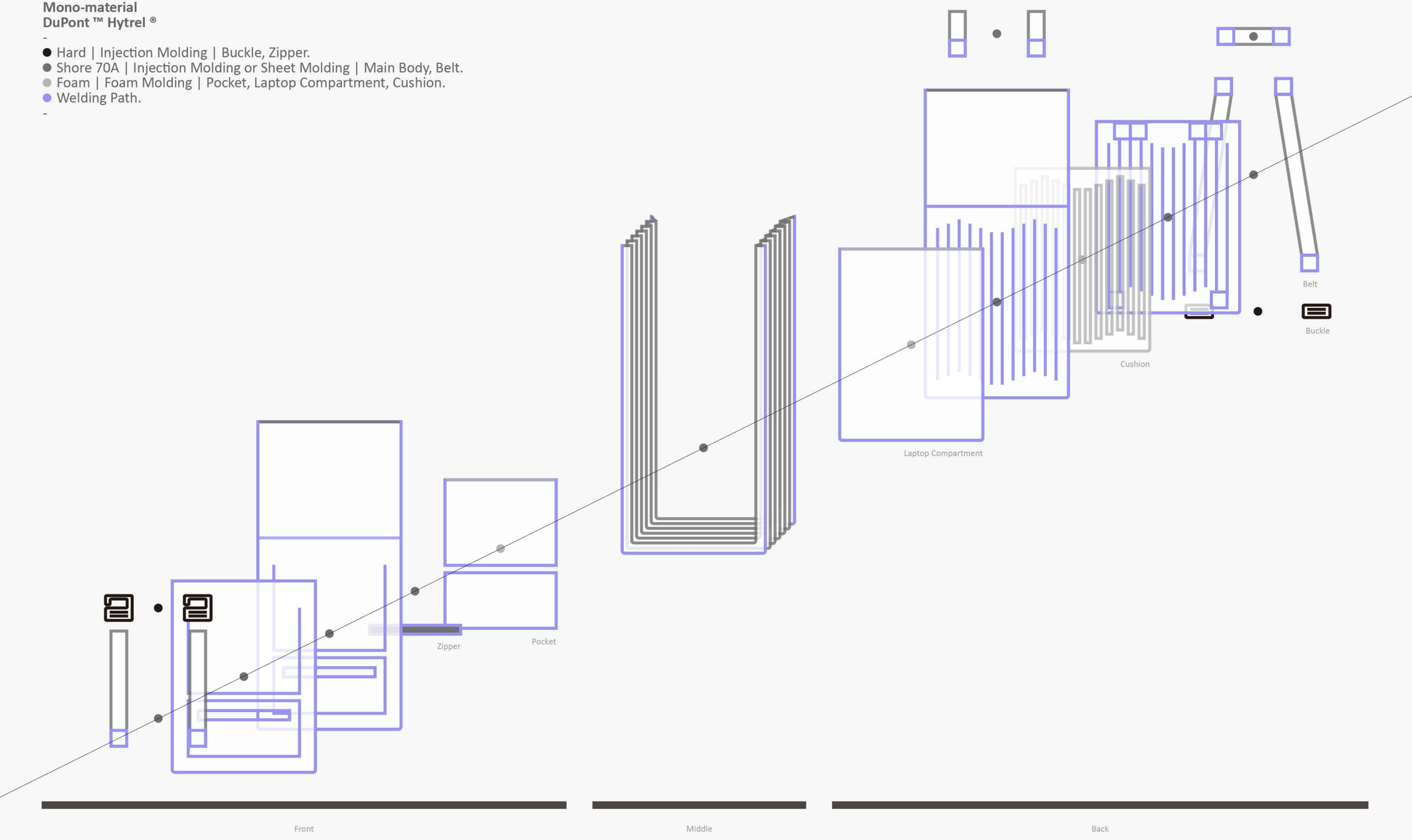
Mono-material
DuPont ™ Hytrel ®

-

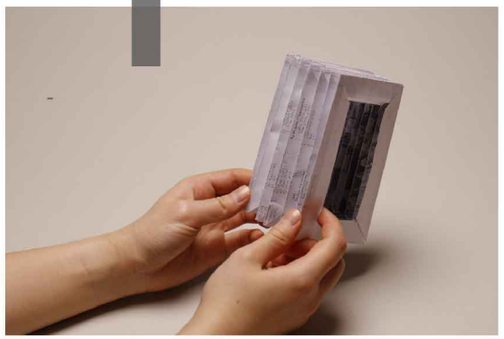
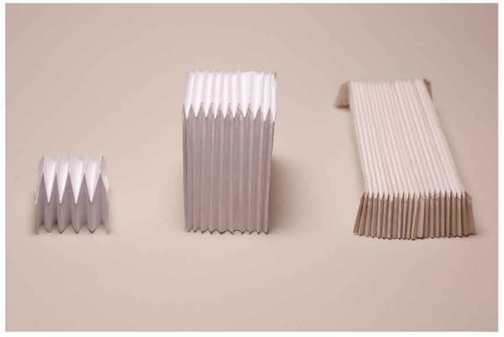
- Hard | Injection Molding | Buckle, Zipper.
- Shore 70A | Injection Molding or Sheet Molding | Main Body, Belt.
- Foam | Foam Molding | Pocket, Laptop Compartment, Cushion.
- Welding Path.

-

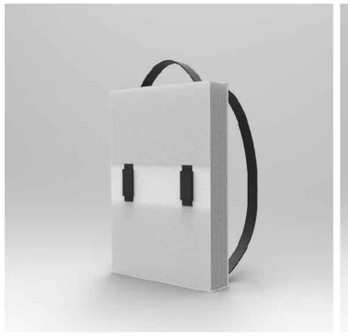


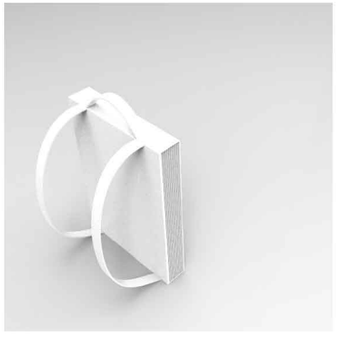
Prototype

1

▲ Simulating concertina movement by paper.



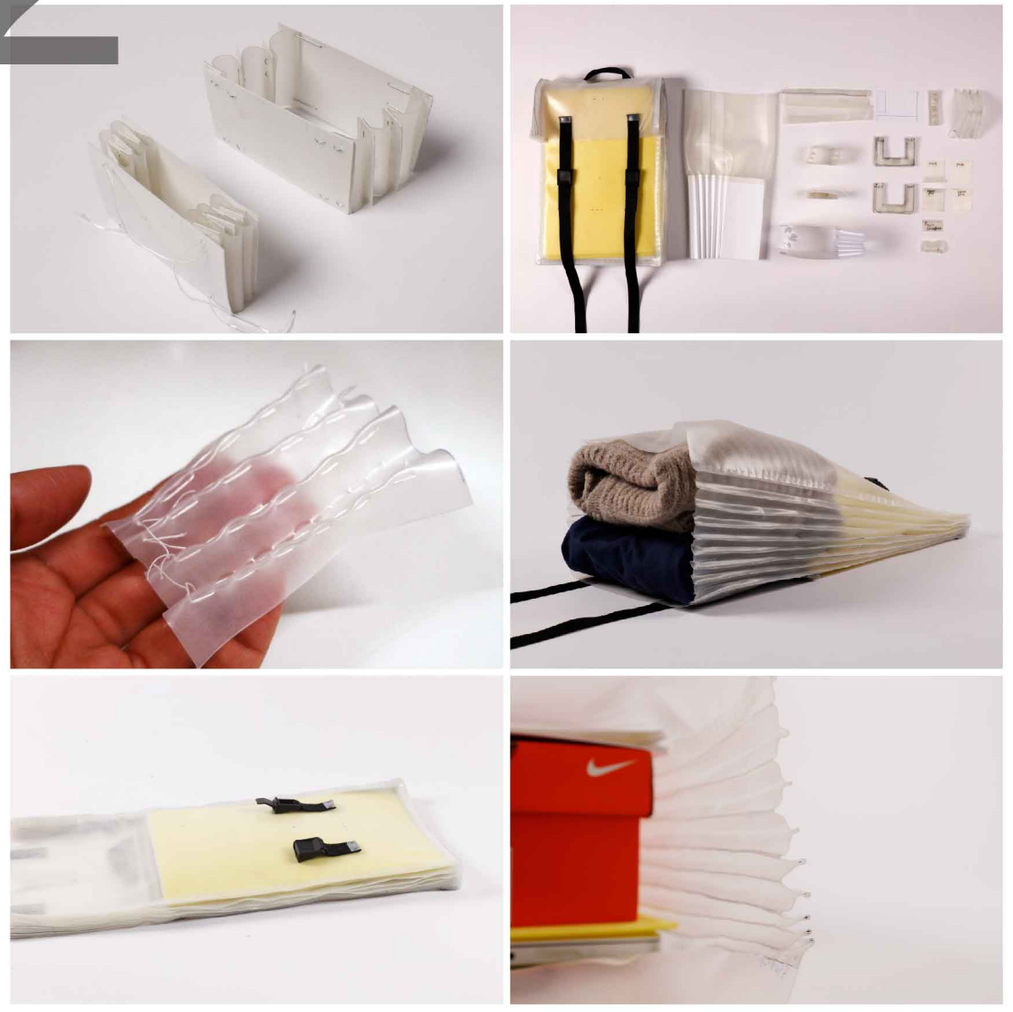


▲ 3D rendering and initial colour plan.

▲ Concertina structure made by paper.

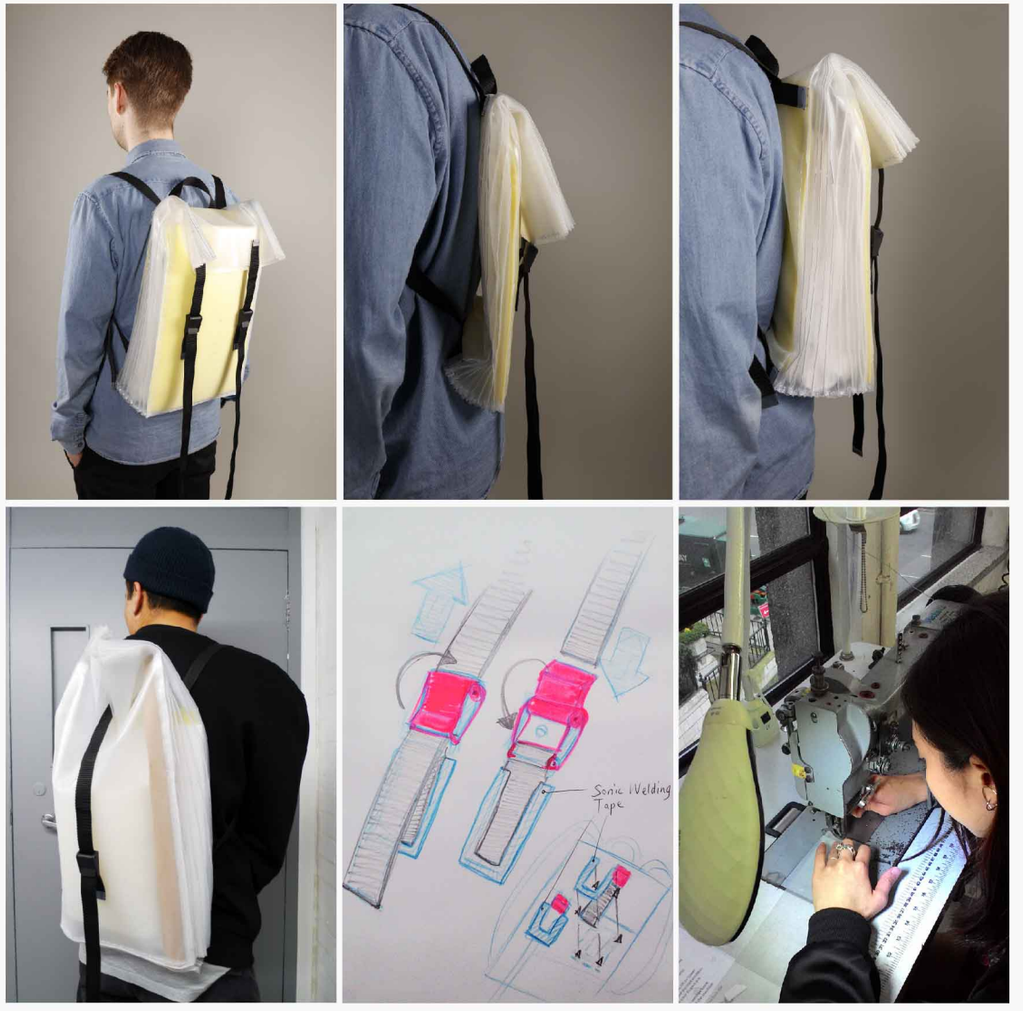
Prototype

2



▲ Exploring the self-expanding-and-contracting structure by sheet material.

▼ Translucent skin and yellow cushion.



▲ Single buckle, white cushion, long items.

Prototype

3

▲ The prototype is mainly assembled through welding, which can load 5.5kg.

Prototype

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4

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In order to ensure the precision of layers of sheet materials and avoid breaking prototypes after several tests, the following mockups are all made by sewing.

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▲ Prototype made by sewing.

▲ User testing.

▲ Load testing.

Prototype

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5/6

▲ Component weight estimate: 336.47g.

▲ Work in progress.

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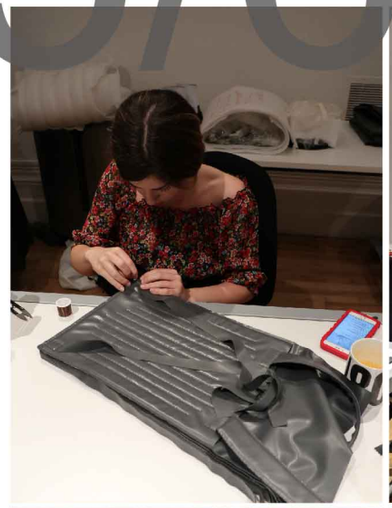
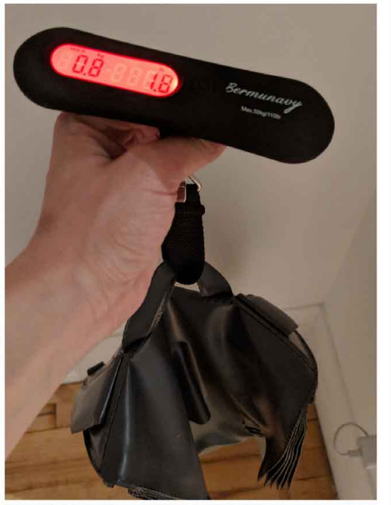
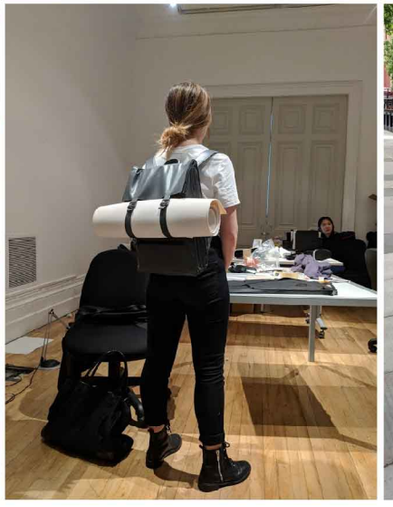
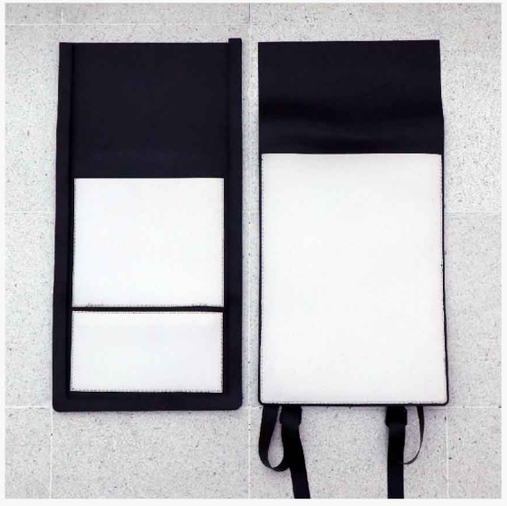
▼ Prototype 5: gray satin skin, thickness 0.05mm, Shore 60A black. (Silex Silicones)







▲ Prototype making and user testing with Beatrice Maione and Stephanie Akro, Textile Design students at London Metropolitan University.



▲ Prototype 6: black matte skin, thickness 0.1mm. (TST)

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▲ User testing with information experience designer Makiko Takashima and graphic designer Kokoro Ishii.

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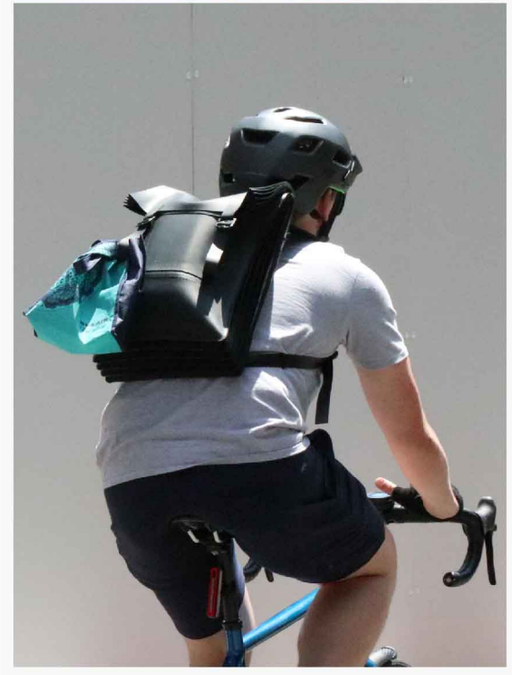
▼ Comparison of convenience between U/L and other foldable backpacks with zipper and side strips.



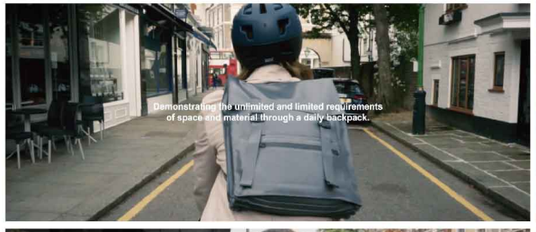
“ It’s quite light and very comfortable.
When I realise to roll down the opening, it’s very easy to load.
I like the two pockets inside.
I was very impressed by the small profile to get a large Amazon box.
Definitely the structure can get better mobility easily than other two backpacks. ”

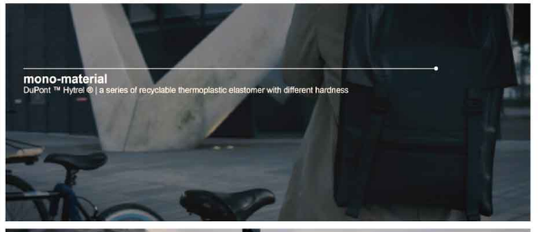
Jake Frost, Designer & Photographer at Design Laboratory in Kings Cross, U/L User testing and interview, 3 June 2018

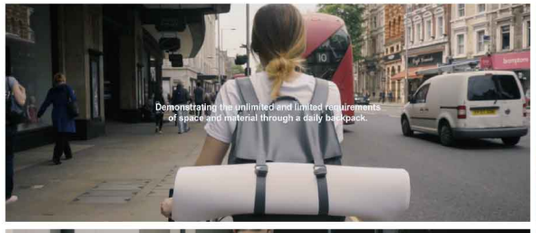
Film Stills

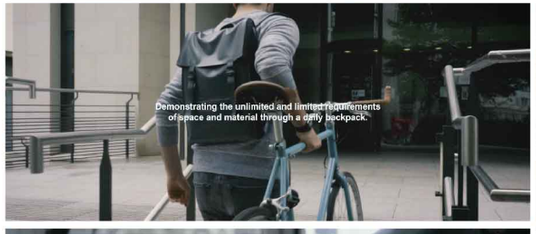
| UN/LIMITED |

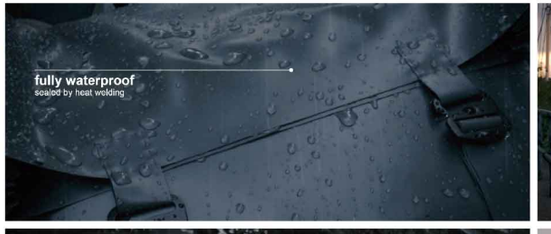
▲ Full film.

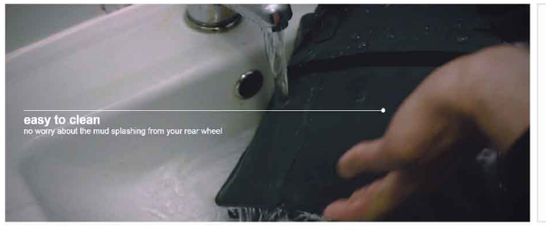






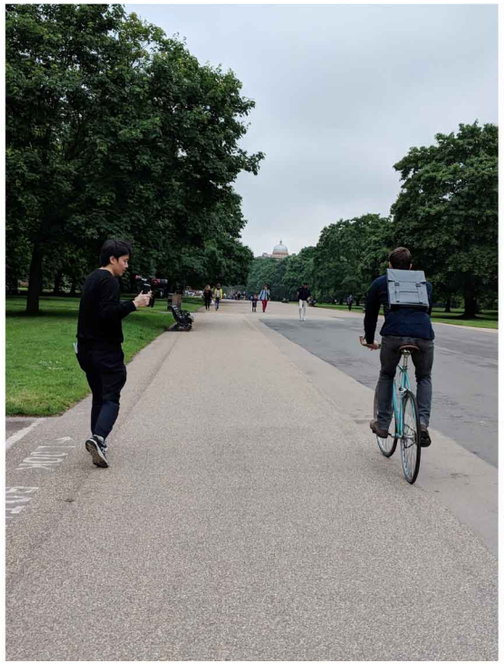


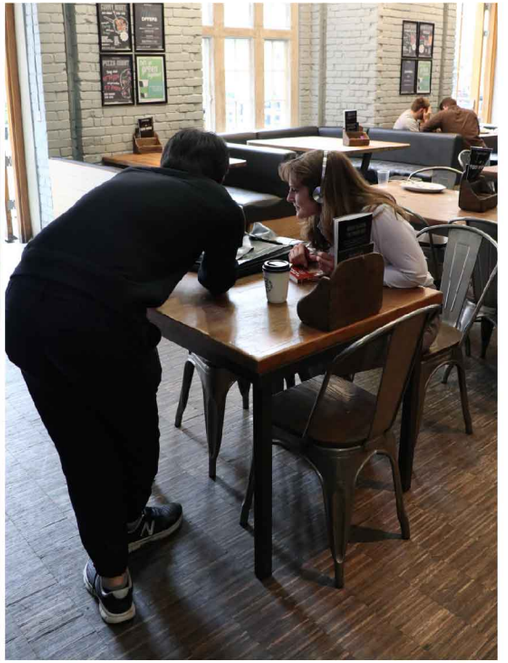


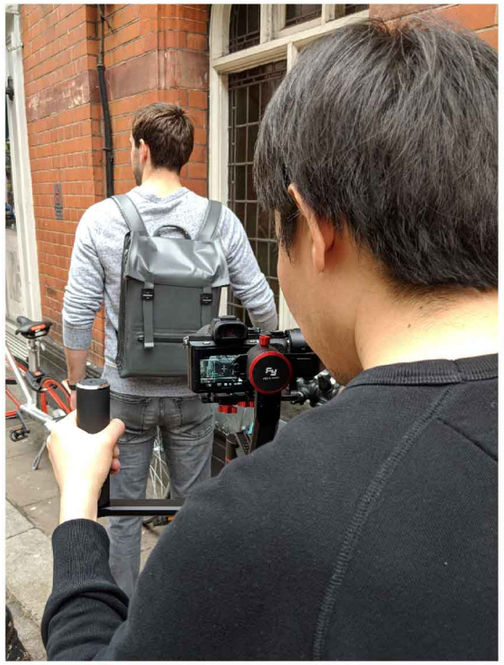


| U/L |

Behind the Scenes







" It's a very very nice bag.
It's very light, ergonomic. Simple design.
It's very easy to use, very easy to open.
Lots of space inside and compartments and this beautiful concertina side.
You can fill out lots of stuff.
...

I like the front small pocket, easy to grab keys and changes.
The back is also very comfortable.
Highly recommended. "

Victoria Lynn-Hamilton, Actress, U/L User testing and interview, 30 May 2018

▲ User's feedback.

Validation

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Reconfirmed the latest production with Mark Hazel, Design Specialist at DuPont.

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Degree Show

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South Kensington Campus, Royal College of Art, London | June 2018.

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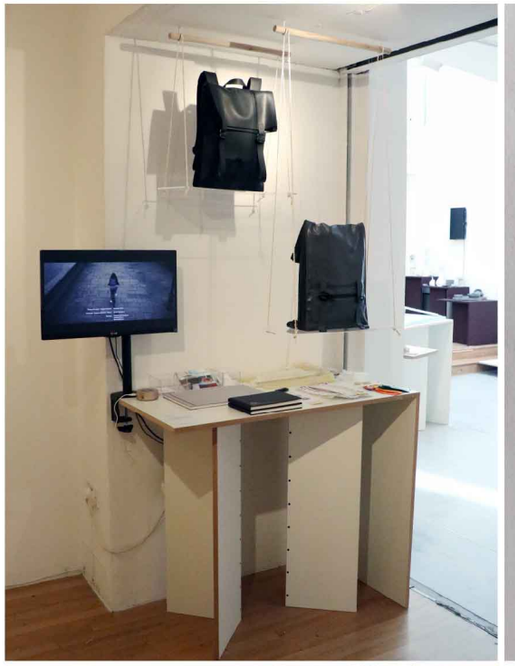

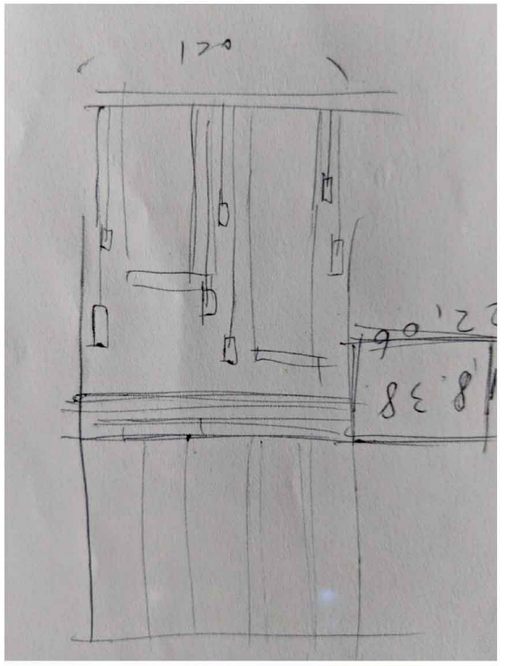

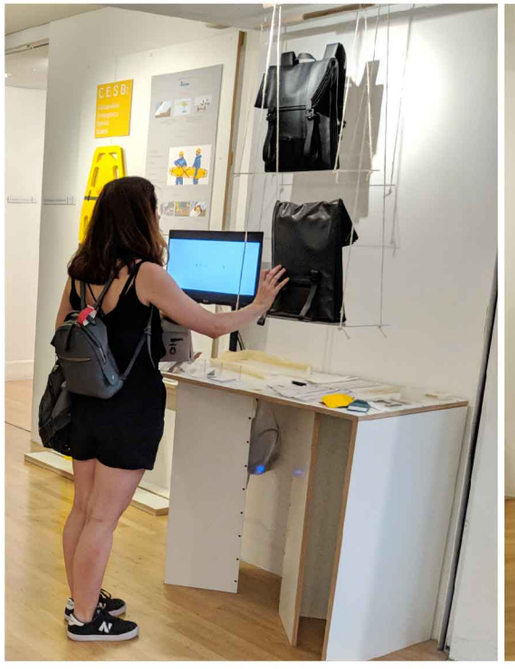

Gallery

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Rendering in different colours.

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Gallery

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Rendering in different colours.

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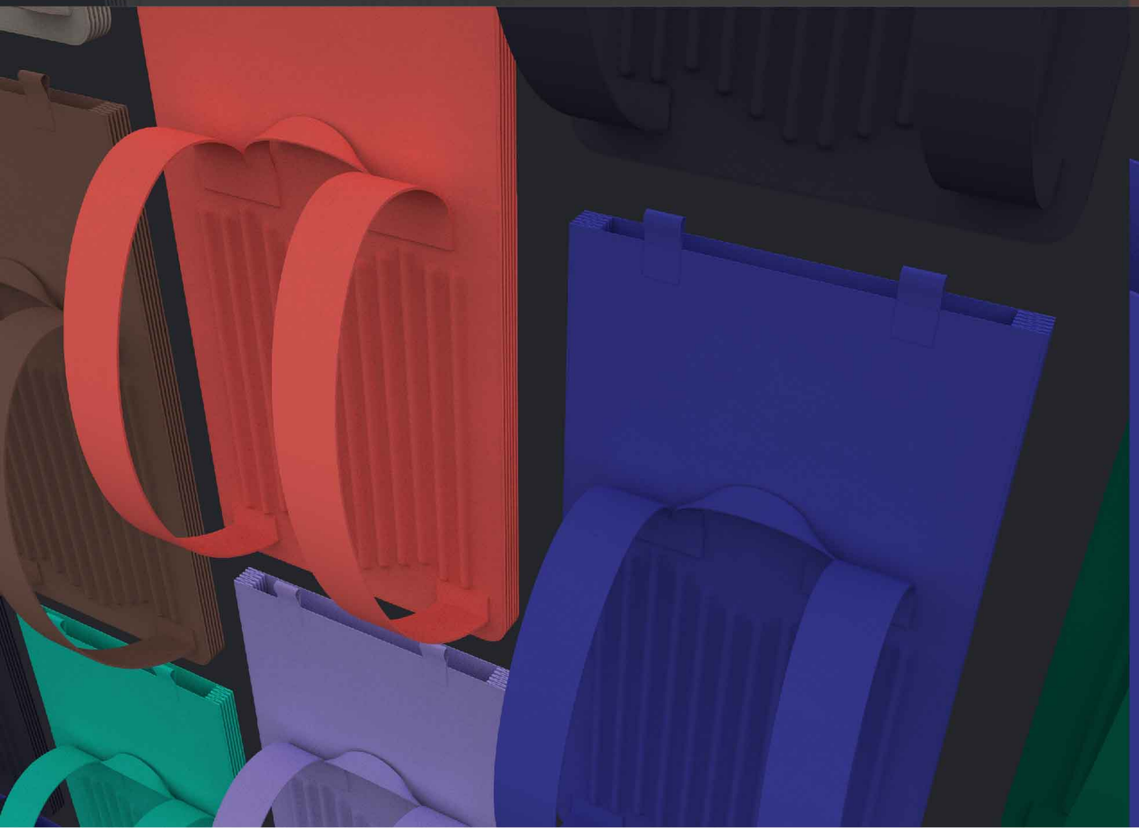

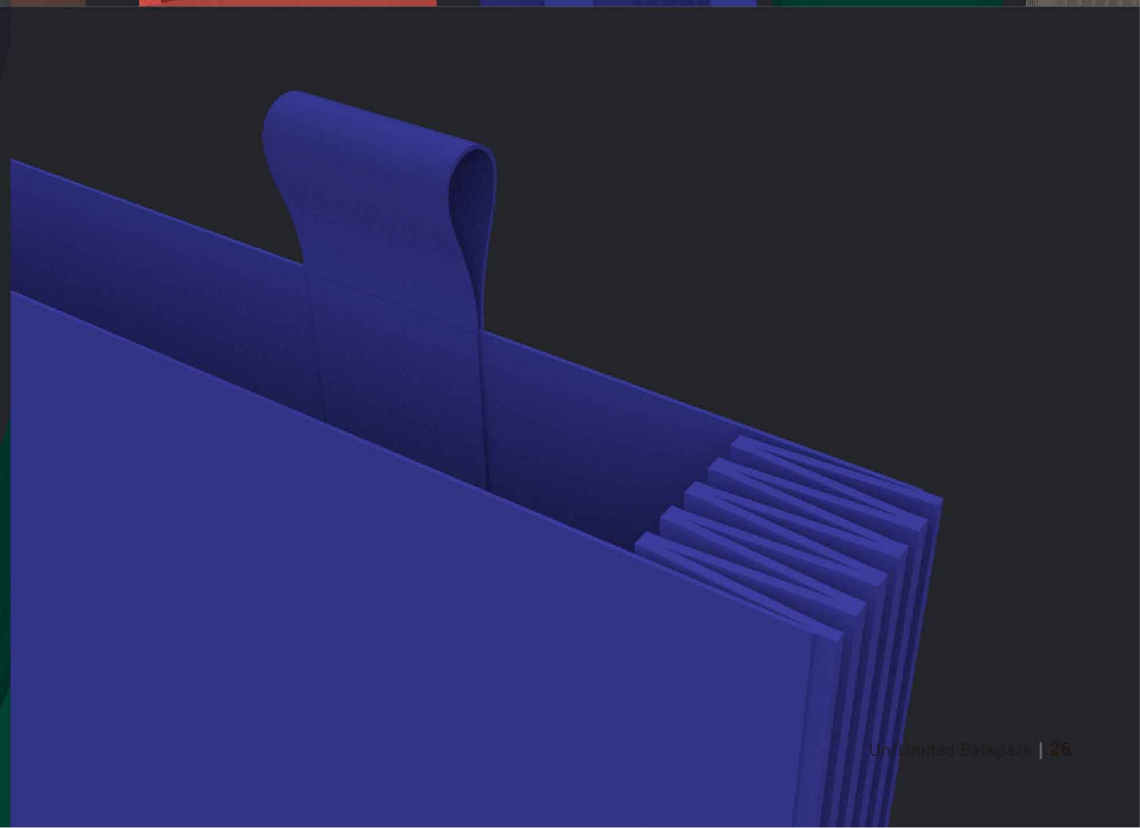

Gallery

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Speckled texture.

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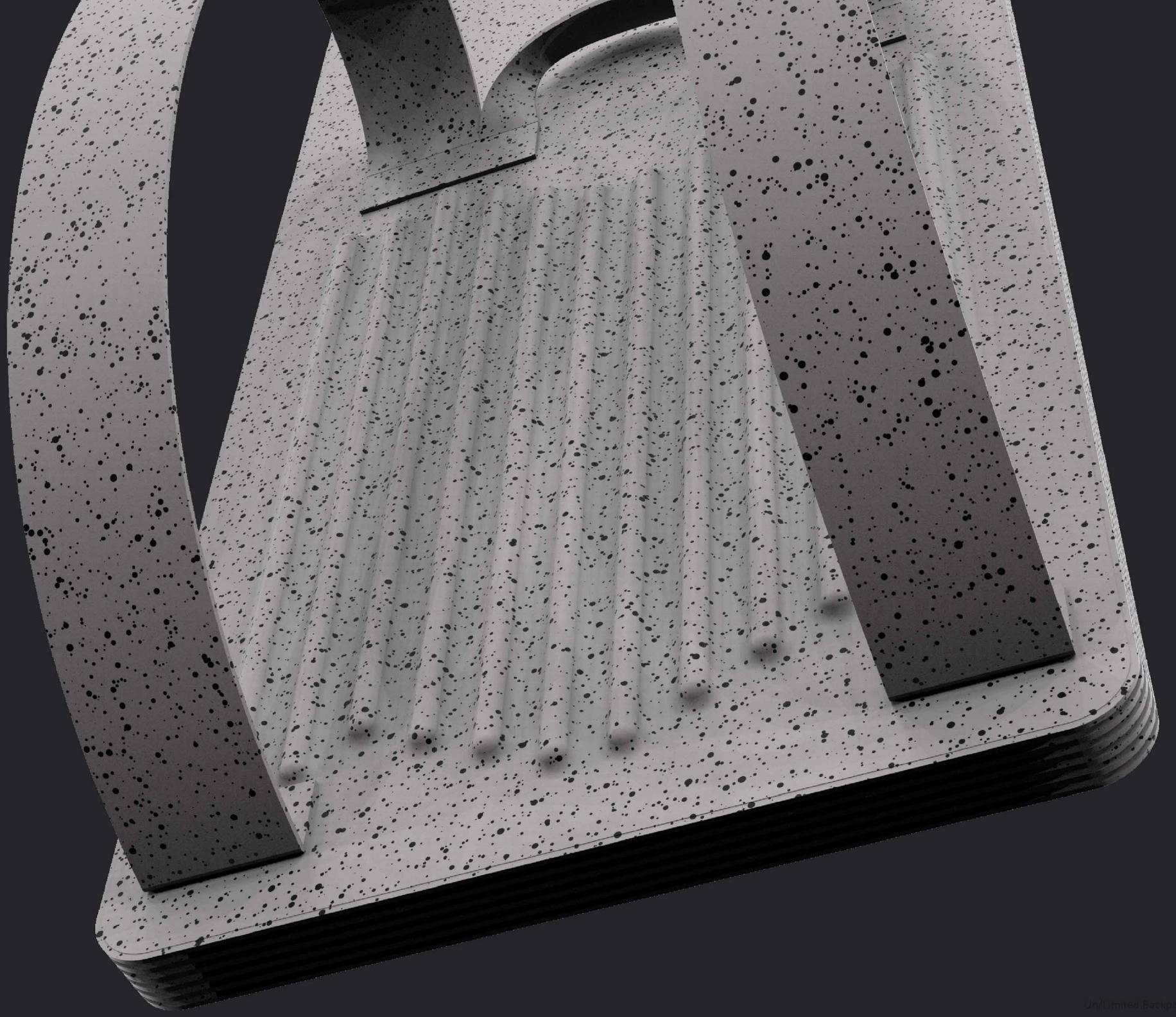

Gallery

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Translucent body with white compartments.

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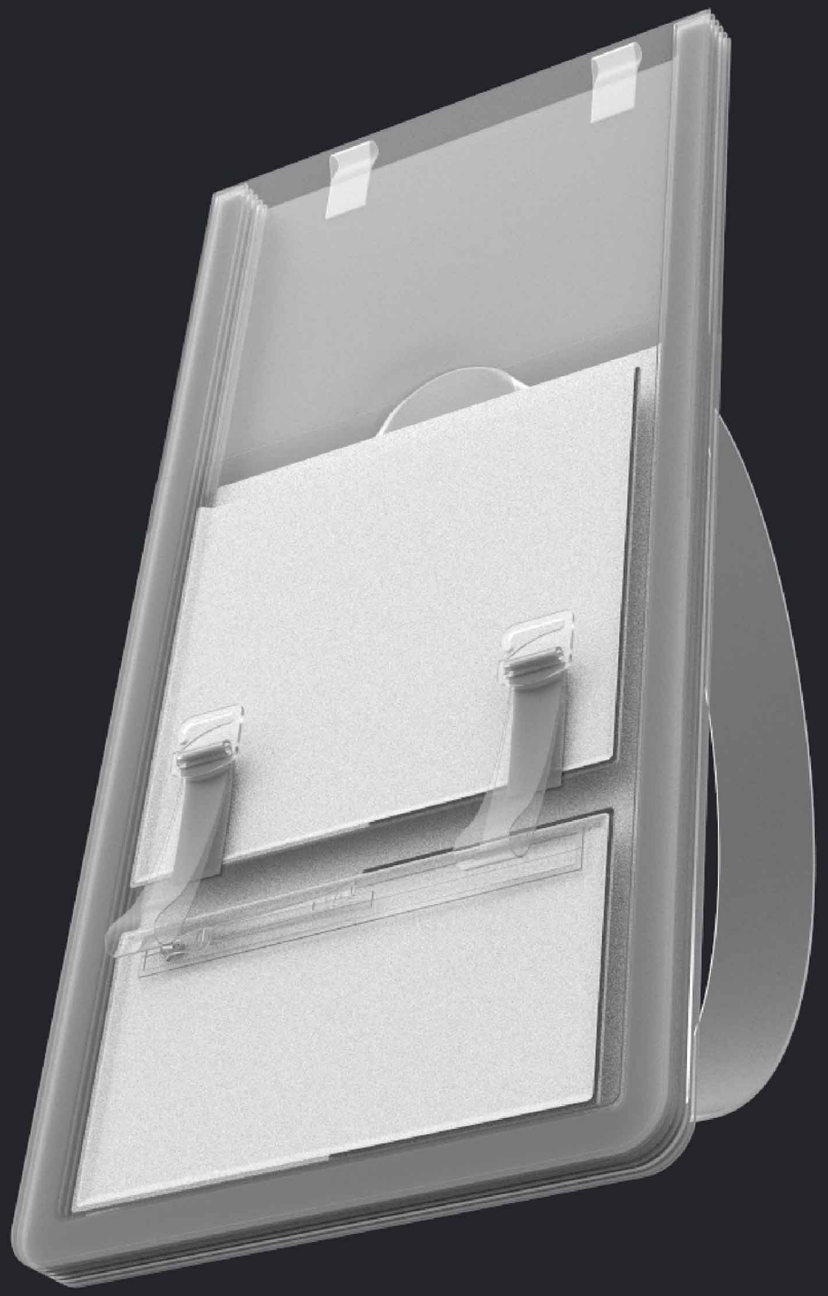

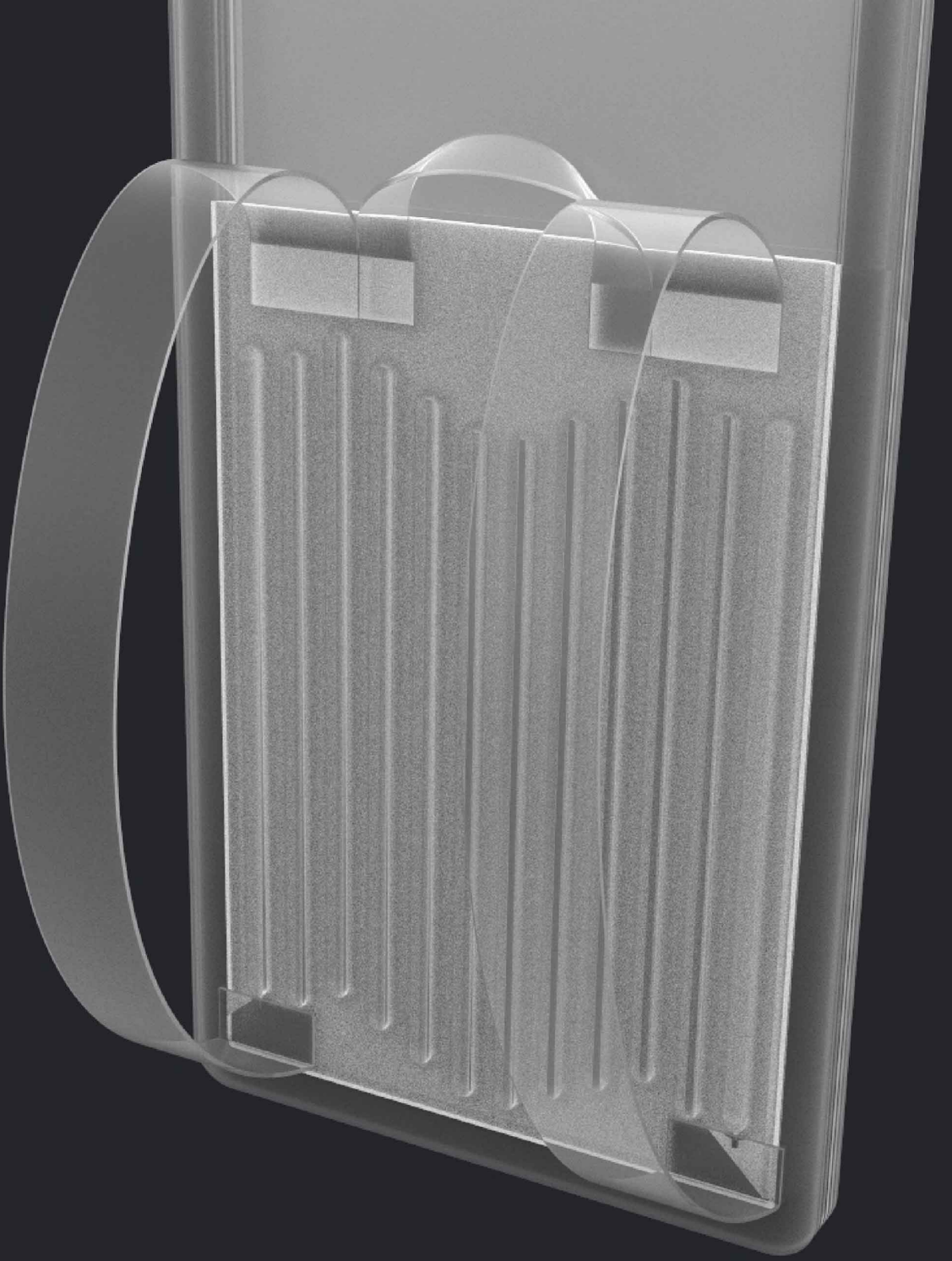

Gallery

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Translucent body with white compartments.

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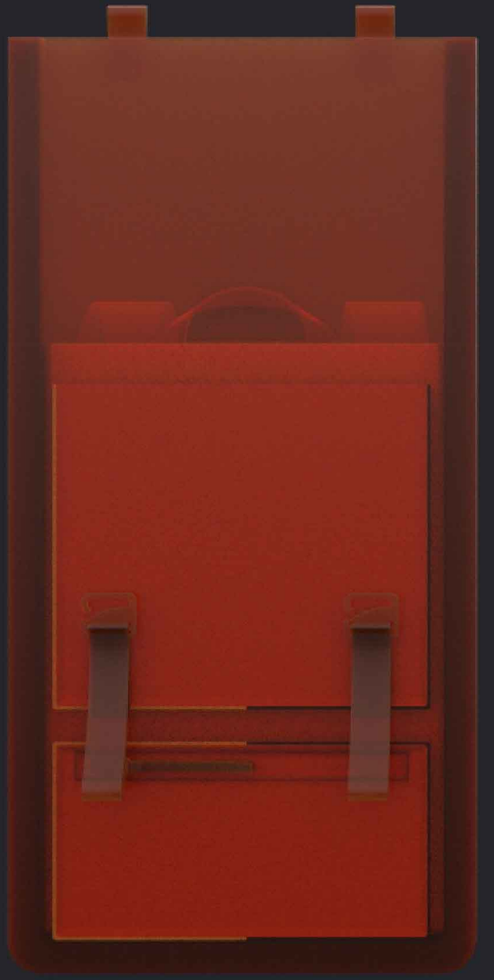

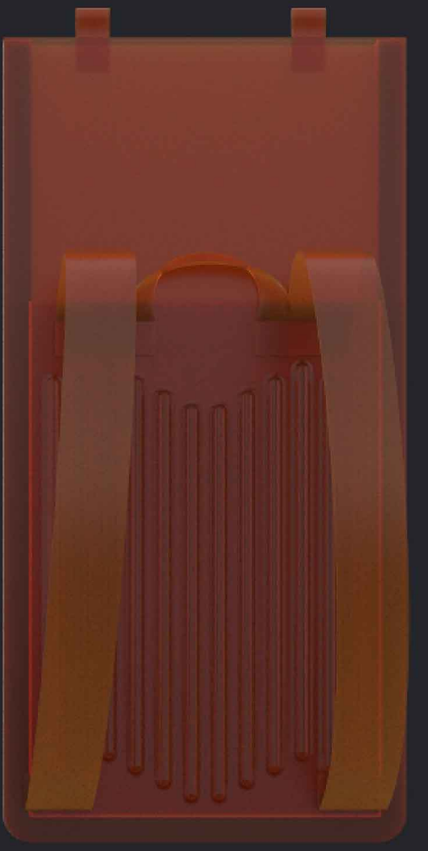

Gallery

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Model: Peijie Gu, Hiroki Yokoyama.

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Gallery

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Model: Peijie Gu, Hiroki Yokoyama

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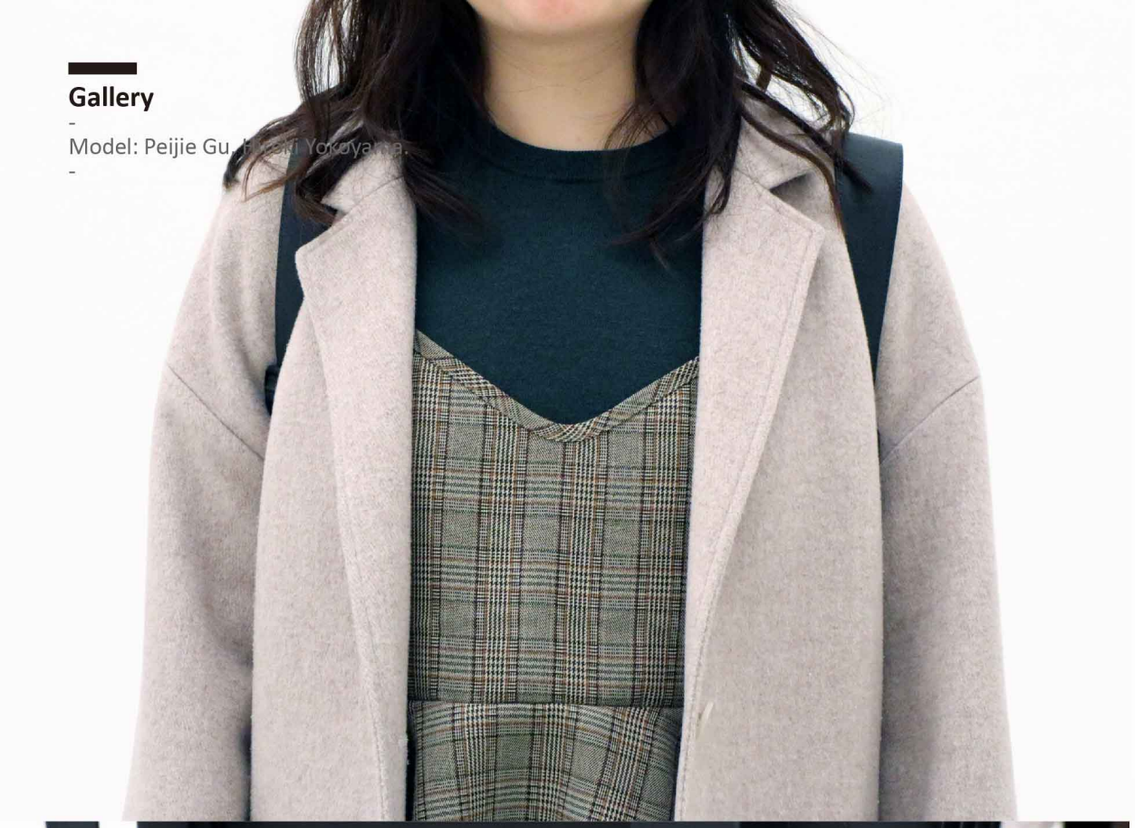

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