Lifetyle Footwear

Zerowaste 3d printed shoe

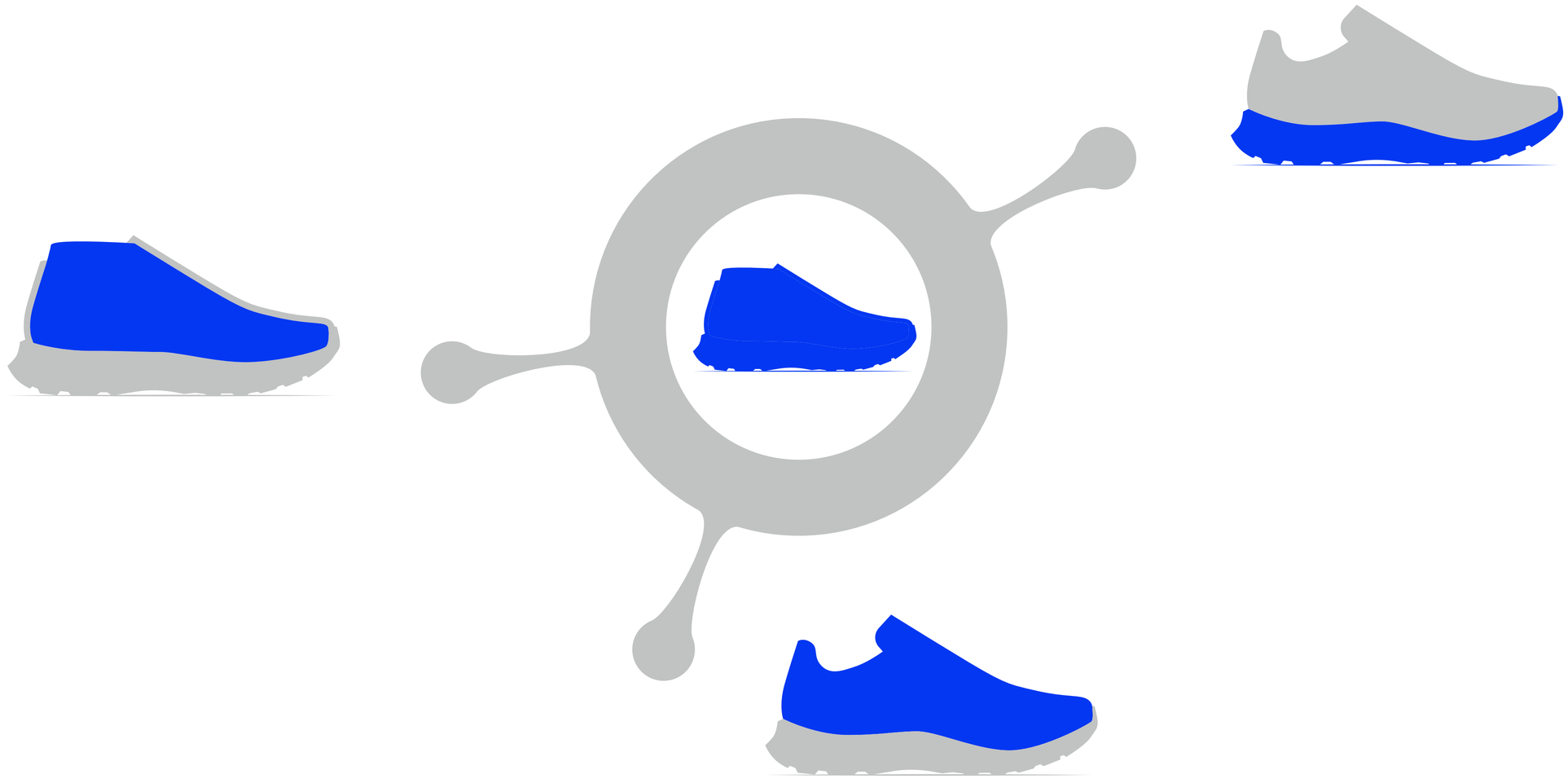
1SOURCE

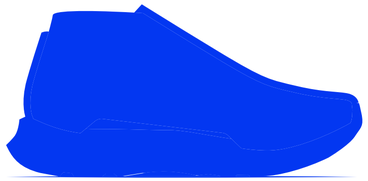
Studio Zgutka

Lead Designer Sebastian Zgutka

Year 2022/23

DESIGN MARKERS



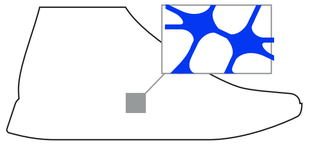


01

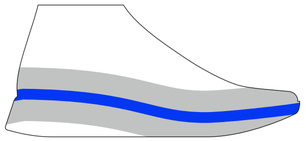
Overall

The main idea of the project was to use as little material as possible.
3D printing allows you to achieve this. To make it rational, each customer
can receive a personalized shoe based on his foot pressure scan.

ergonomic shoe last



using lattice structure

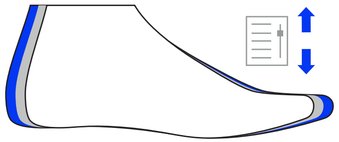


fluent pattern

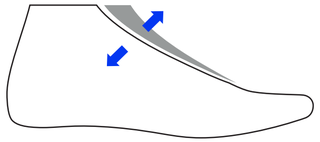
02

Shoe last

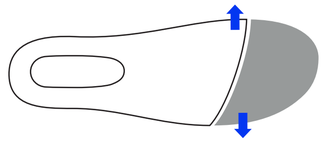
A good shoe last requires many hours of carving a model in wood,
scanning to a 3D file and then multi-stage milling on a 5-axis CNC.
What if the last will be created digitally only?



grasshopper last grading



wide cone for easy-on

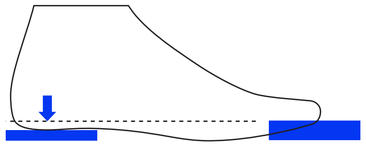


wide toebox

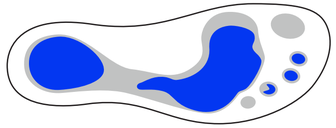
03

Sole

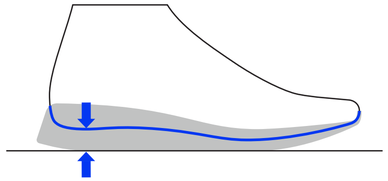
The production of the sole requires 3 different components: sole (rubber), midsole (foam), insole (EVA). The project aspires to use only one material, which under the influence of various density structure and thickness change is:
- stiff where it is supposed to protect and
- flexible where it needs to move.



low drop



foot pressure scan



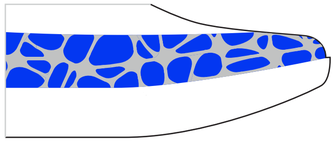
midsole low to gorund

04

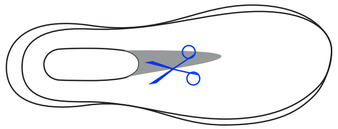
Upper

A typical upper requires many hours of work: from creating semi-finished products to finished fabrics or materials that are dyed and then joined together. Typically, each of these steps takes place in a different location, which logistically increases its carbon footprint. In addition, in order to sew everything well, the elements are glued together earlier, which makes recycling difficult. The use of 3D printing allows you to avoid these complications.

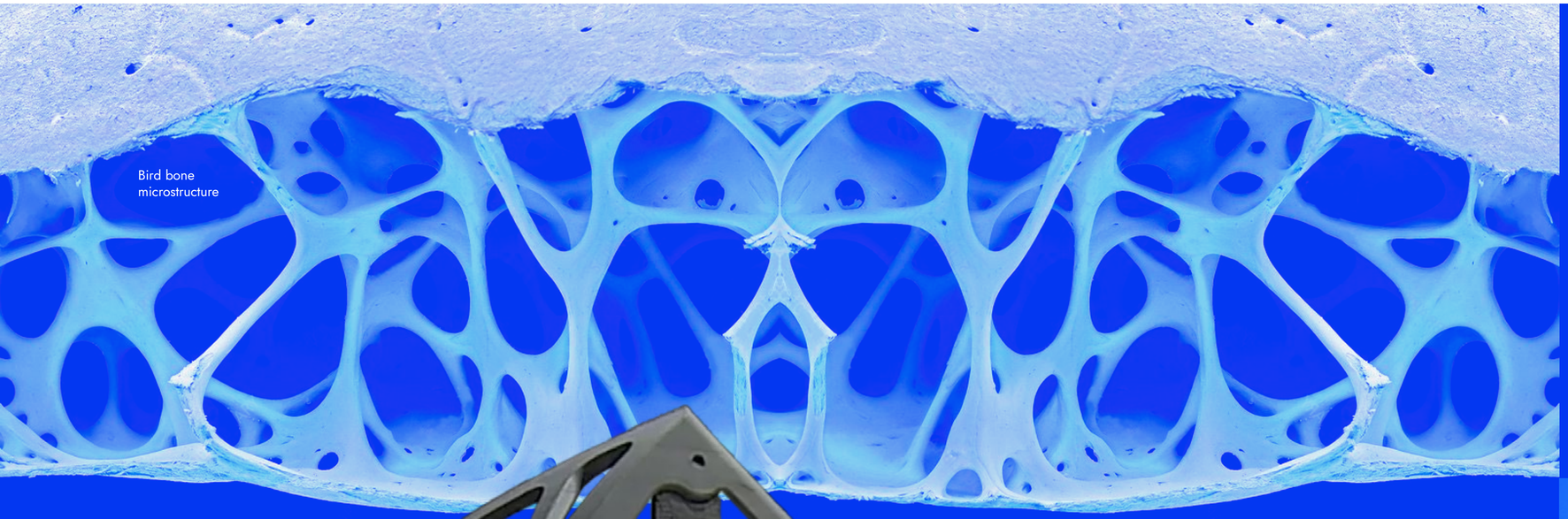
decent thickness



no reinforcements, just full infill

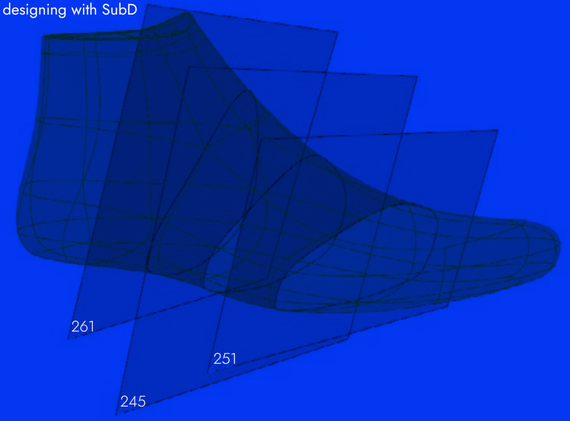


V-cut for easy-on

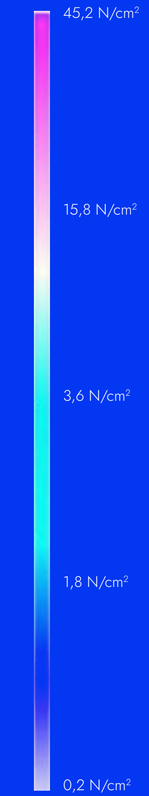


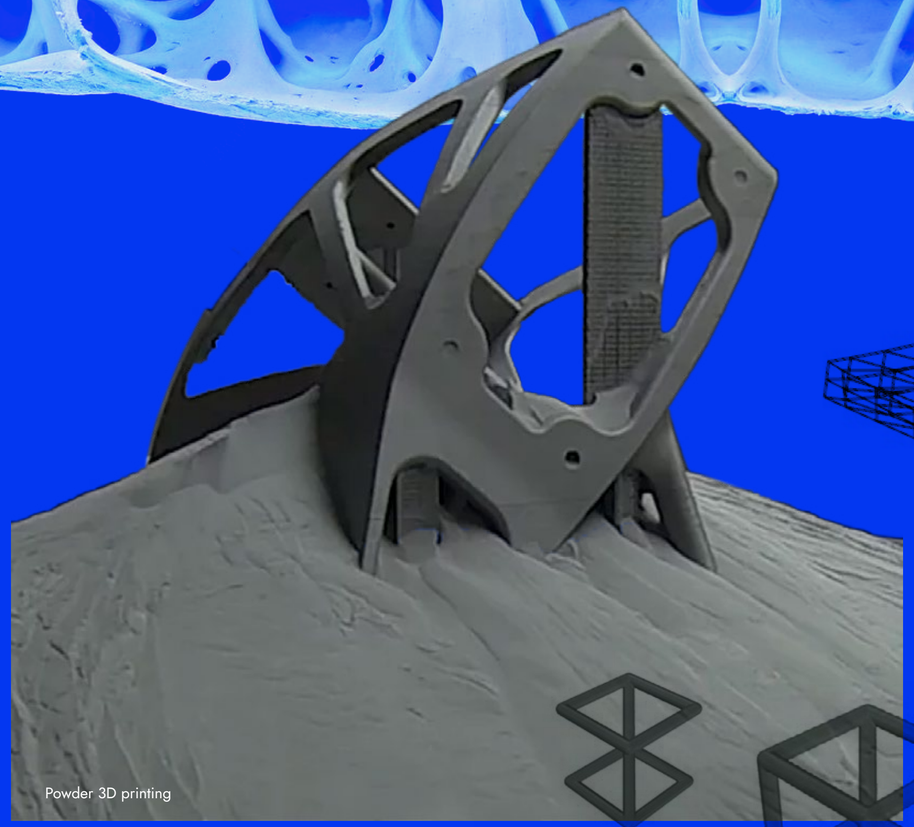
Bird bone
microstructure

Shoe last
designing with SubD

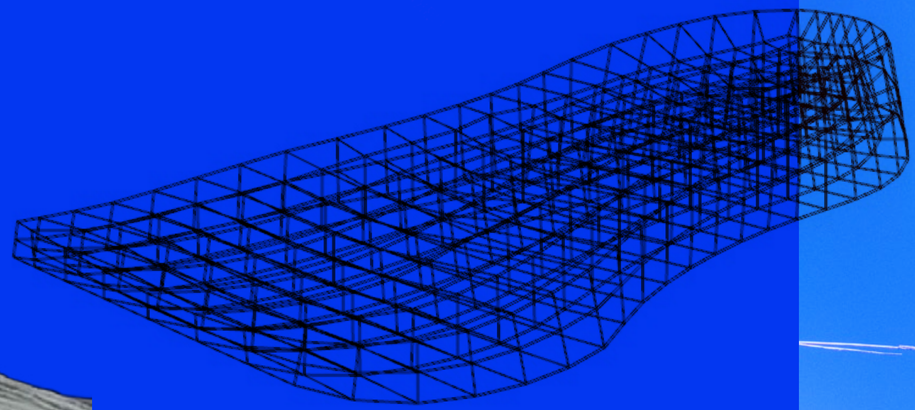


Midsole based on foot pressure

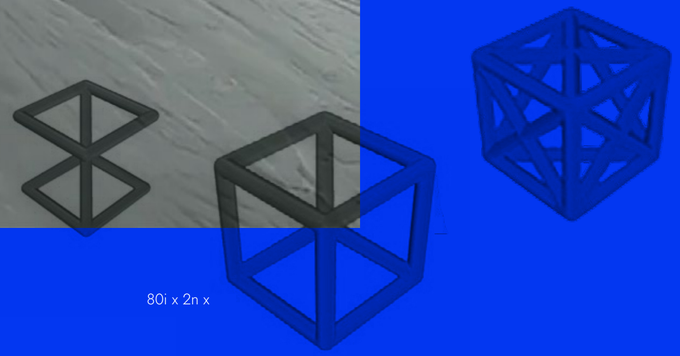




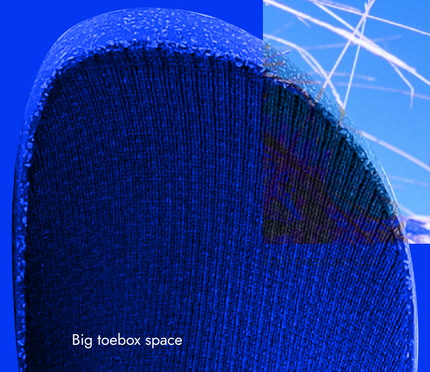
Powder 3D printing



Voxel midsole building



80i x 2n x



Big toebox space

Adidas

FUTURECRAFT 4D

A shoe with a Primeknit upper glued to a lattice sole. 3D printed midsole in DLS technology. Designed dedicated to running sports.

250 $

New Balance

ZANTE GENERATE

A shoe with an upper based on seamless materials and mesh. 3D printed midsole in SLS technology. The model came out only as a limited edition (44 pairs). The shoe is dedicated to running.

400 $

Zellerfeld

NAMI

The shoe is entirely printed from TPU filament on an FDM 3D printer. The purpose of the shoe is recreational - lifestyle type. It is an example of one of many fully printed sneakers by Zellerfeld.

250 $

ERGONOMICS

01

HEEL TEST

Drawings based on a foot scan turned out to be wrong because they were based on the unloaded foot. The heel area has been lowered so that the ankle is not irritated.

02

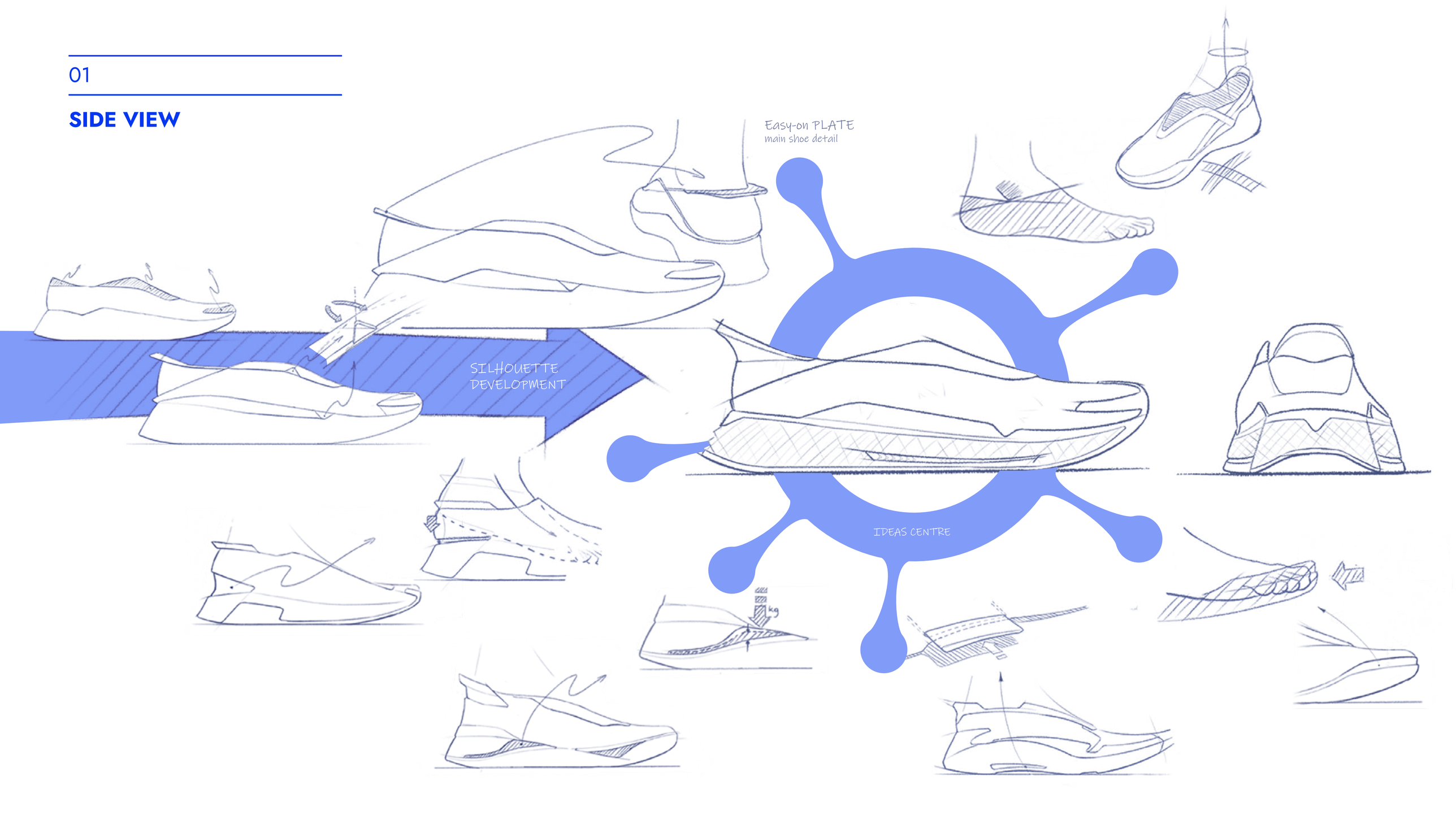
TOEBOX TEST

The drawings were true to reality toe proportions. The shape of the tip based on the shoe last has been kept almost the same.

CONCEPTS

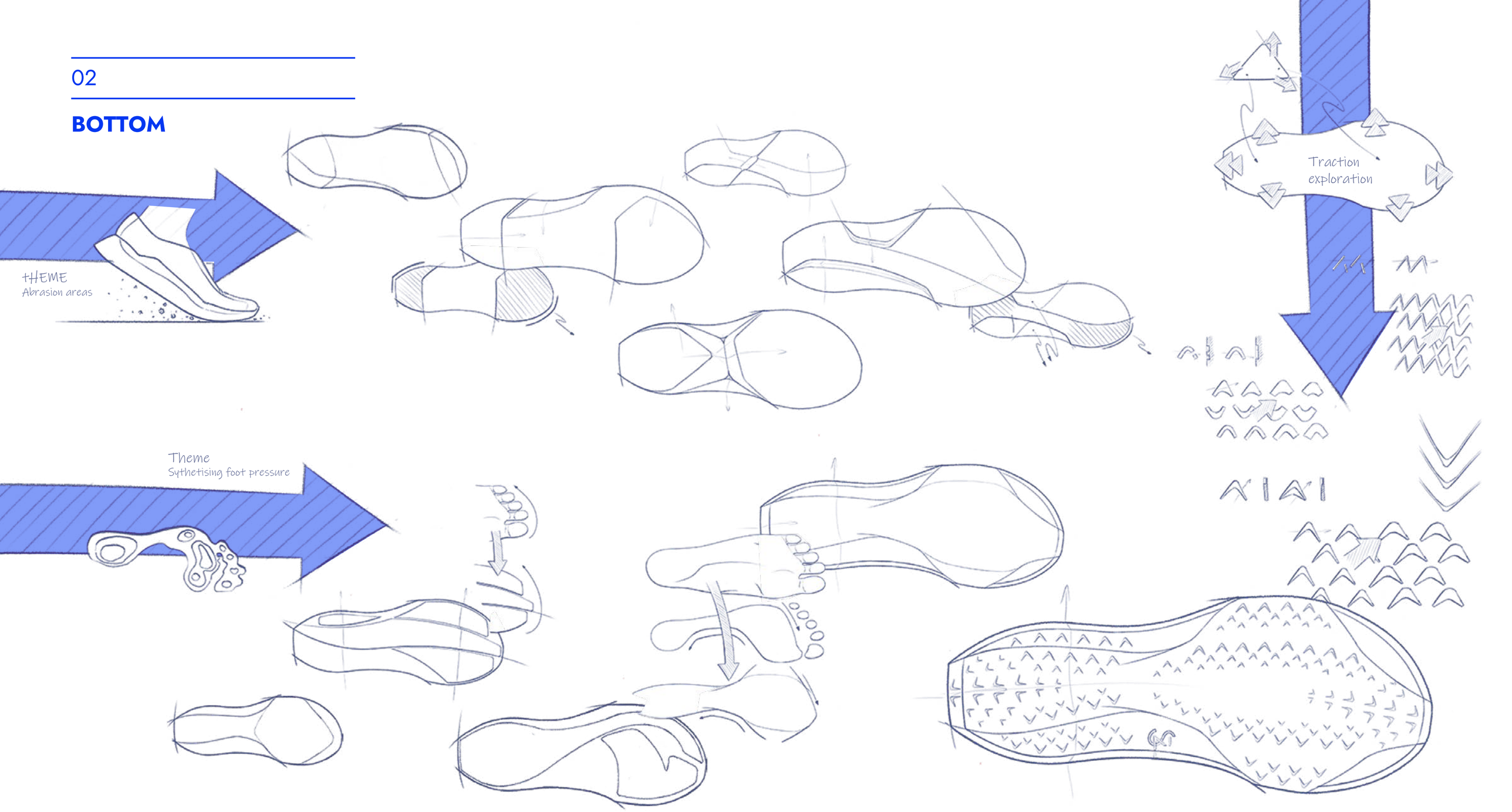
01

SIDE VIEW


Easy-on PLATE
main shoe detail
SILHOUETTE
DEVELOPMENT
IDEAS CENTRE
kg

02

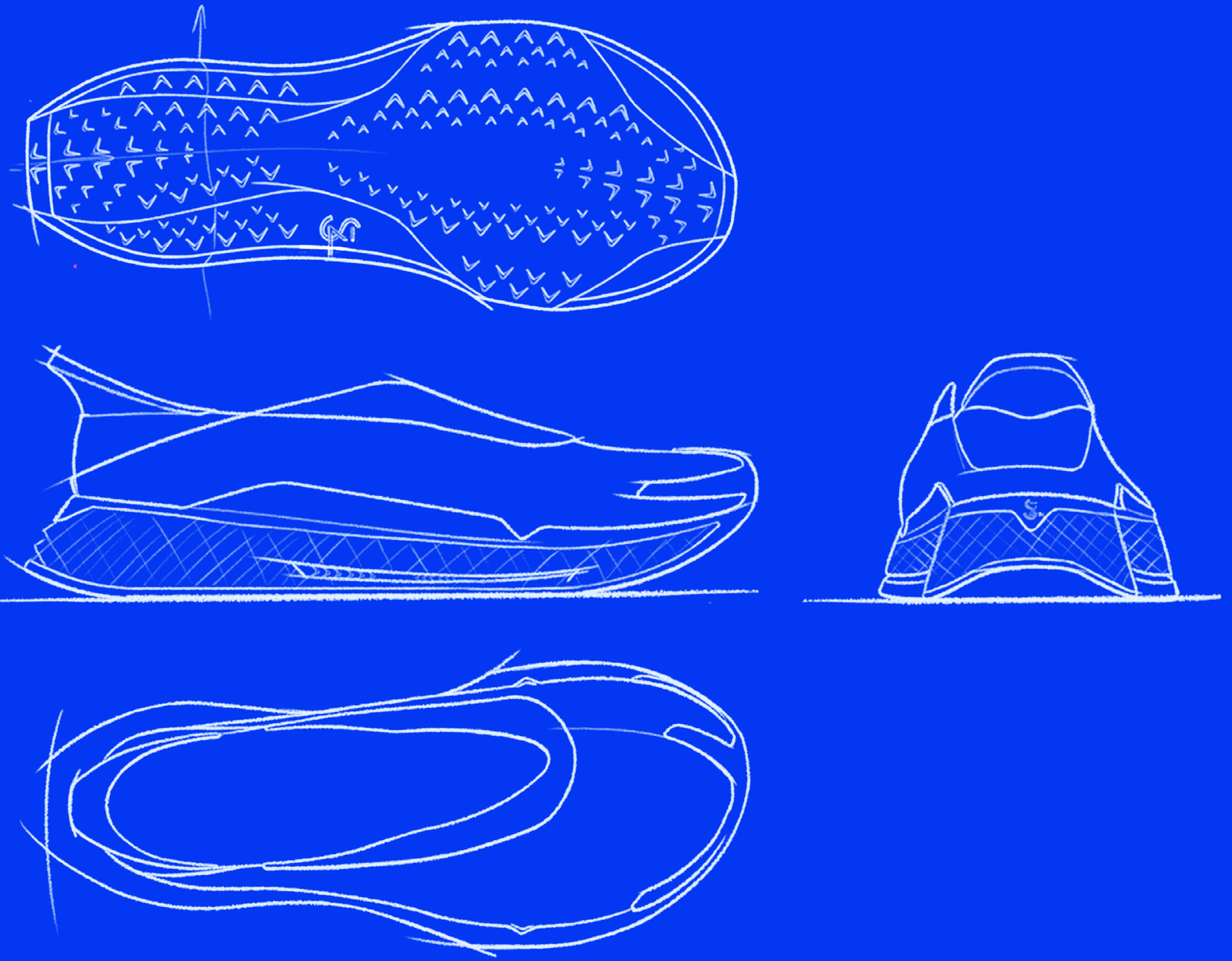
BOTTOM


THEME
Abrasion areas
Traction
exploration
Theme
Sythetising foot pressure

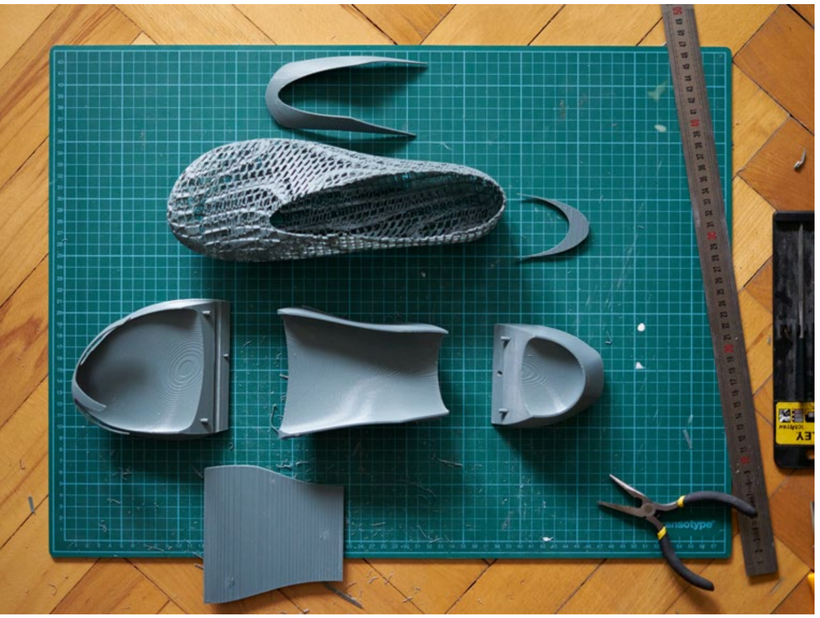
03

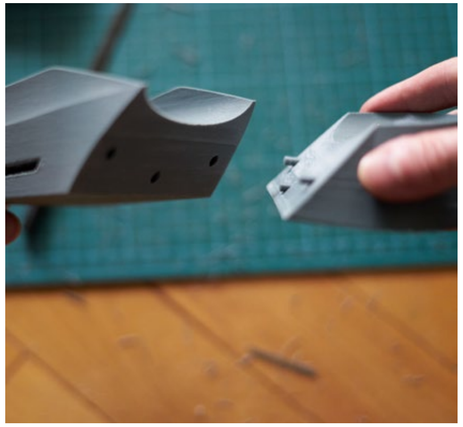
FINAL CONCEPT

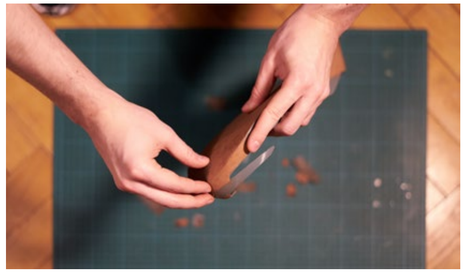
The concept phase was based on the main idea. In the center was the overall silhouette: easy-on and dynamic. Around it were various side concepts that after initial testing have been incorporated into the main draft.



PROCESS







01

MOCK-UP

The mock-up was made using an FDM printer. Clay was then applied for correction of 3D print shapes. Finally, the whole thing was painted to visualize the appearance of the shoe.

02

MOCK-UP TEST

After assembling the 1:1 scale mock-up it was tested. This phase made it possible to consider the ease of putting on, the presence of loose areas (fitting) and the proportions between the parts of the shoe.

1SOURCE

1MOVE

01

EASY-ON

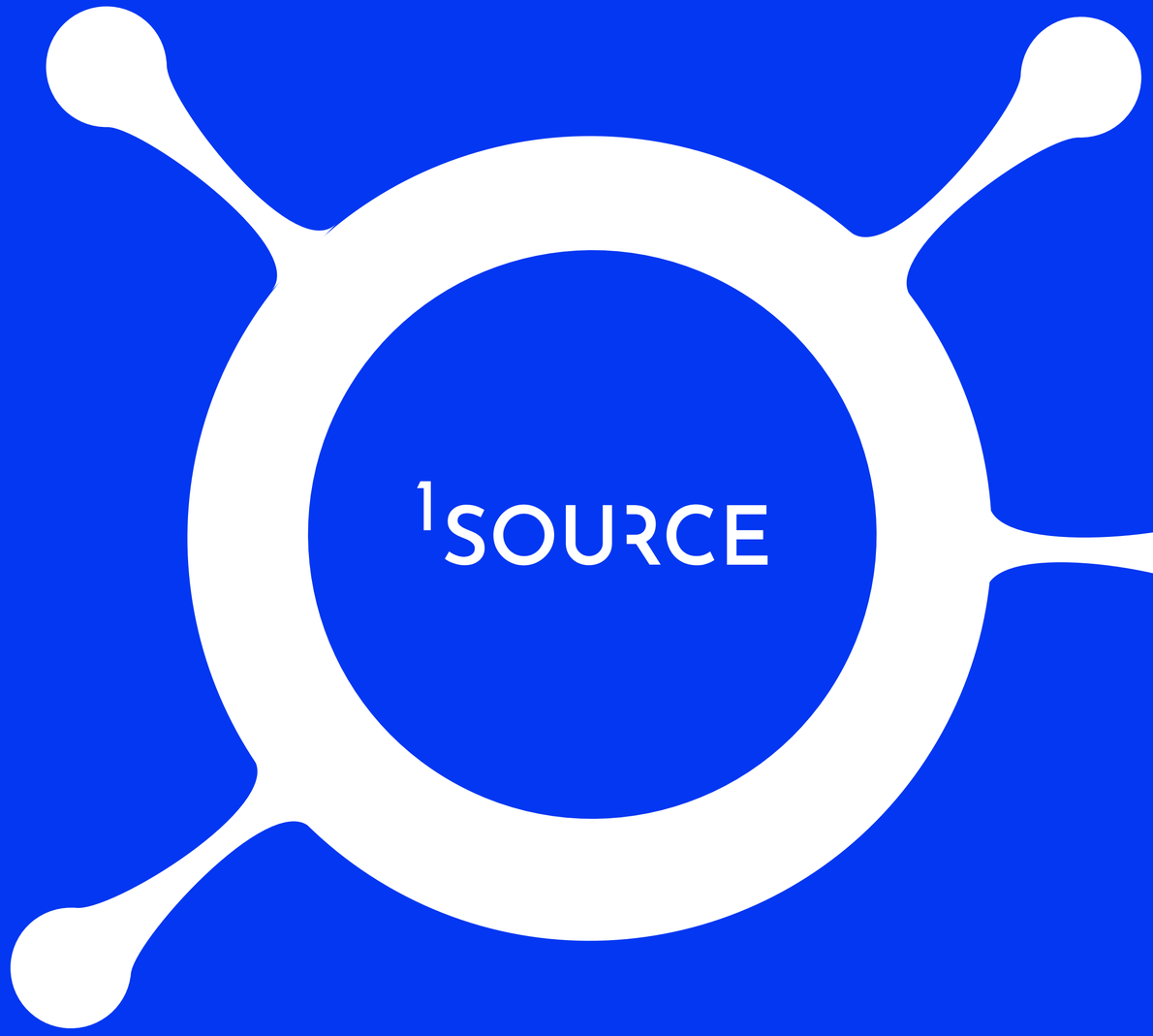
The shoe is put on hands-free.
Pressing the heel from above with your foot makes shoe to compresses so we can slide the foot forward.

1TECH

02

3D PRINT - MJF

This technology eliminates the need of extensive machine park.
MJF 3D printing also allows printing without supports (zero-waste).



1PART

03

“MONOLITH” SHOE

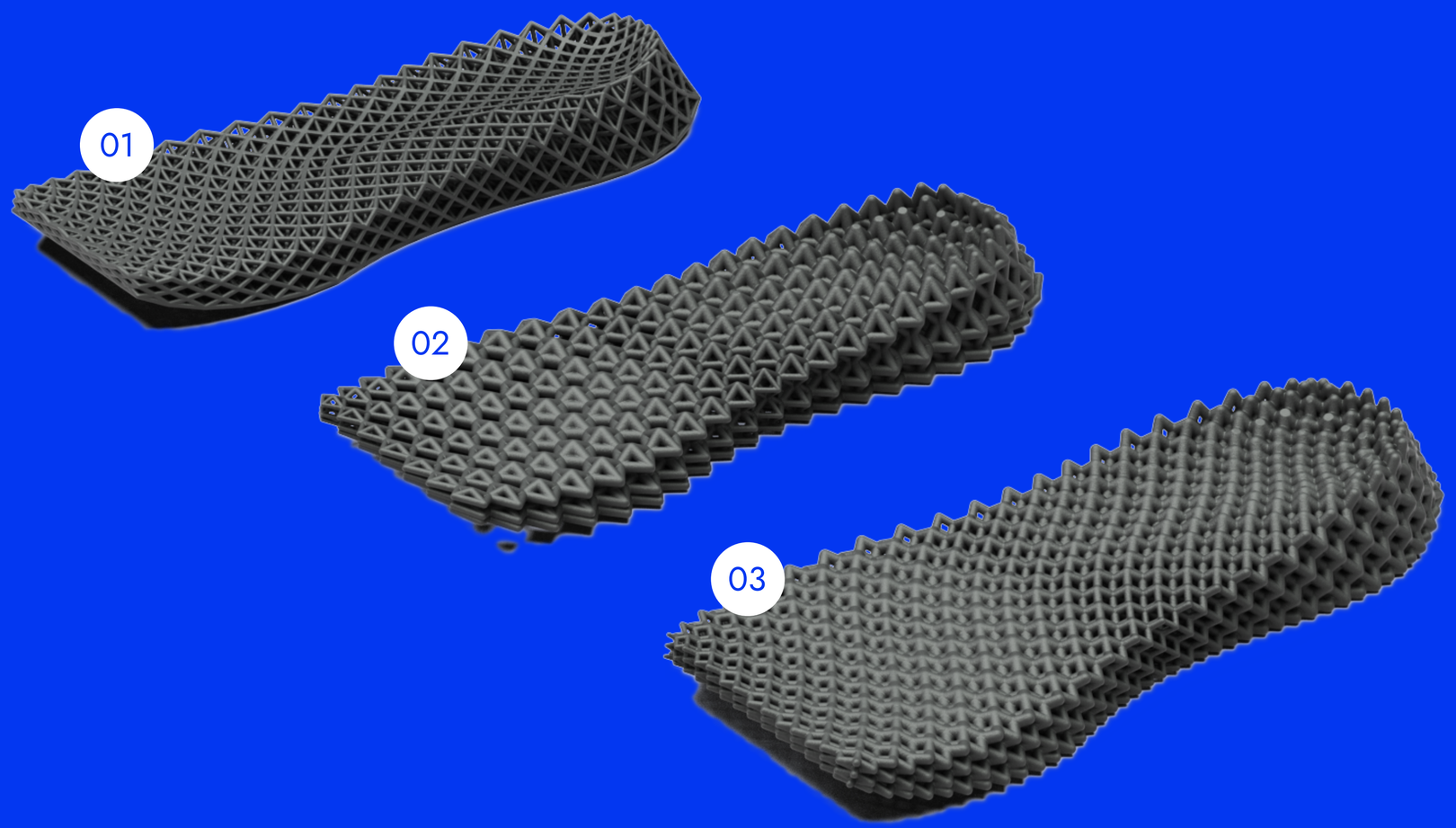
The shoe has no component parts, so it forms a monolith. This ensures durability by preventing from coming apart when the shoe is weakened.

1MATERIAL

04

TPU POWDER (BASF)

Bonded TPU powder is durable.
Applying it in the original color without additives makes it easier to recycle when shoe will be used off.



01

TETRAHEDRON

Better for rigid structures. With a mul-ti-layer construction rubber material starts being weak to shear forces.

02

STAR TETRAHEDRON

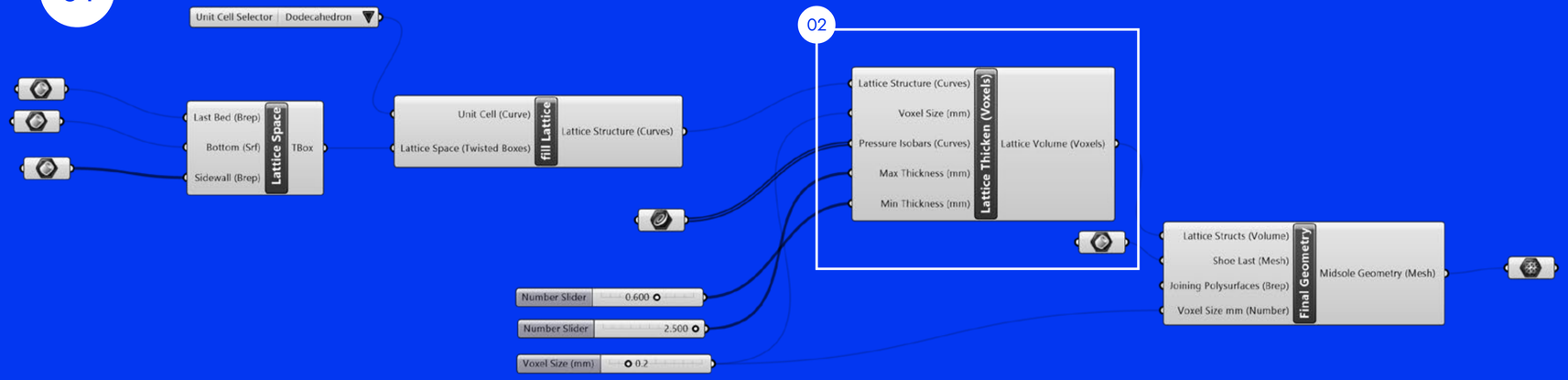
Lattice resistant to multi-directional forces. Difficult to arrange in a small midsole voulemen.

03

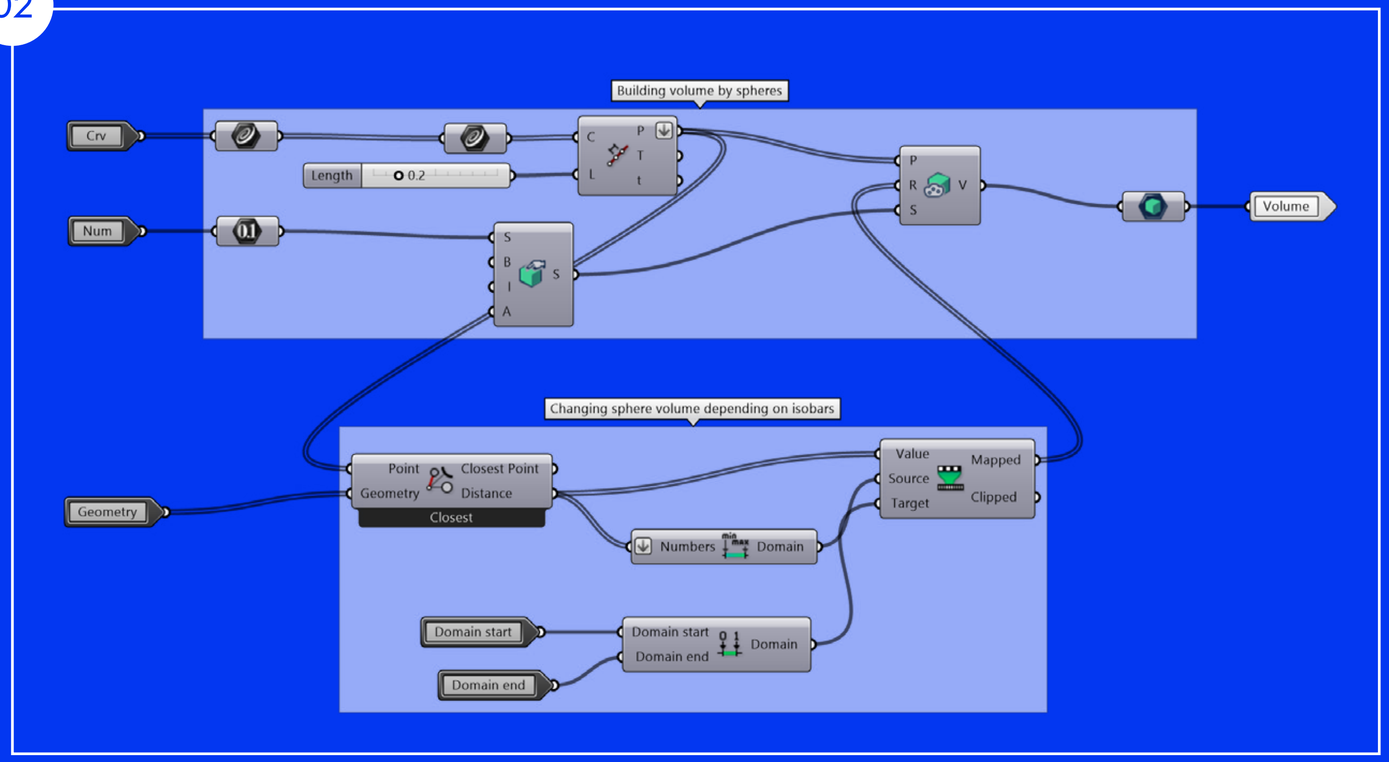
DODECAHEDRON

Lattice with great energy-return.

01



02



01

SOLE ALGORITHM

A visual representation of the algorithm created in Grasshopper.
On the outline basis of the sole, a voxel grid is created, in which the selected cell module is inscribed.

02

CLUSTER

Part of mathematical definition of an overall algorithm. In this case, it is the local lattice thickness for each individual cell based on the foot pressure load in a particular area.

01

UPPER

Mostly uniform structure with increased thickness in areas requiring greater strength while perforation provides flexibility and breathability.

02

MIDSOLE

Lattice structure based on individual body weight. Open structure provides max. performance with minimal weight. Full area (2a) is a stabilizing plate that protects knee injuries.

03

OUTSOLE & INSOLE

The structure on which the foot rests directly. “Shelltoe” protects the toes and outsole provides good traction.

01

OUTSOLE

Multi-directional traction in a minimal-istic style. The pattern was created by repeating module using a parametric design in Grasshopper environment.

02

UPPER

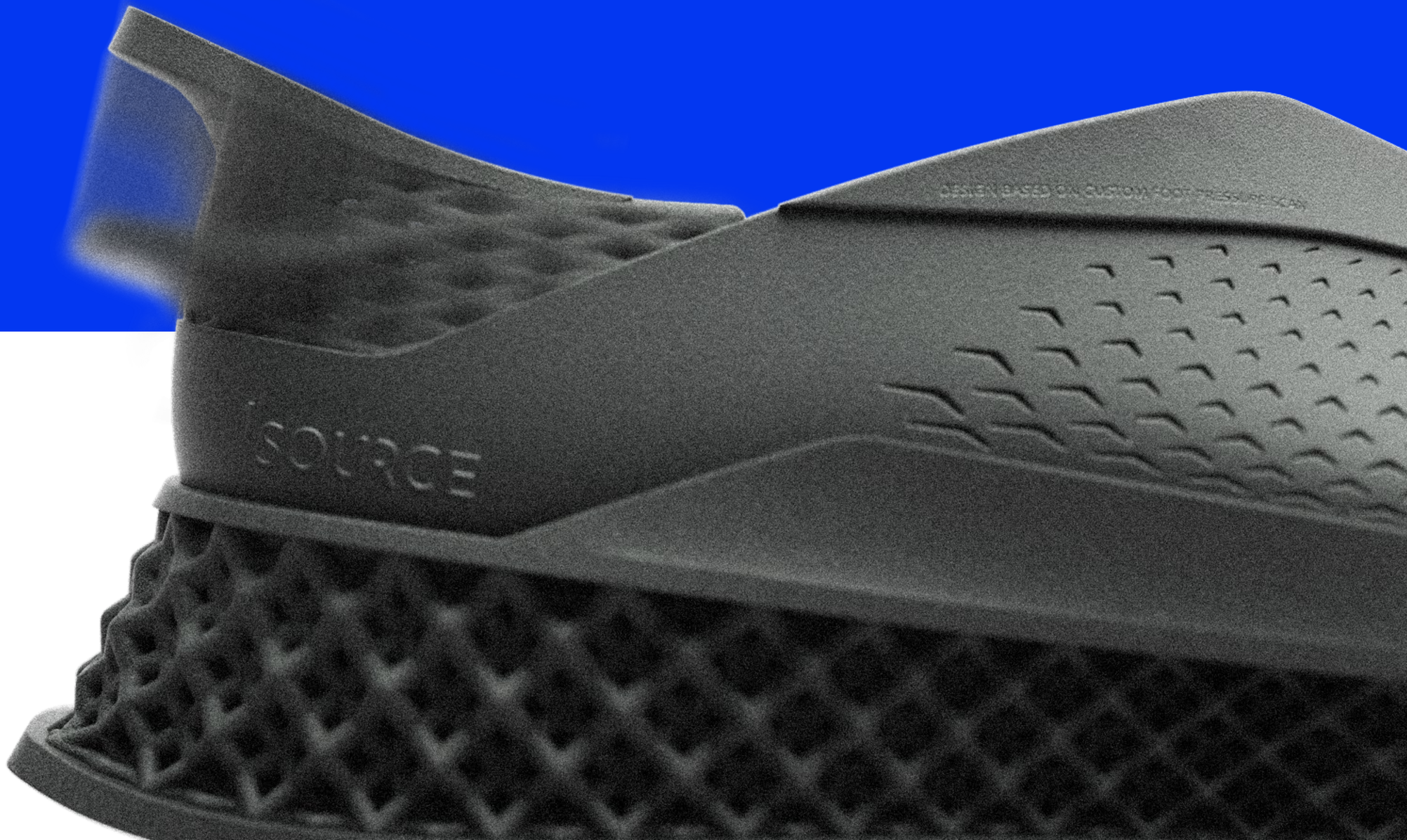
Made for breathability and flexibility. For this purpose, an openwork pattern was made while full material with thickening strengthens the parts more exposed to using-off.

01

EASY-ON HEEL

Heel made of rhombic mesh compresses under the weight of the foot. Without using your hands, you can slide your foot in, after which the heel will bounce back up.

1MOVE

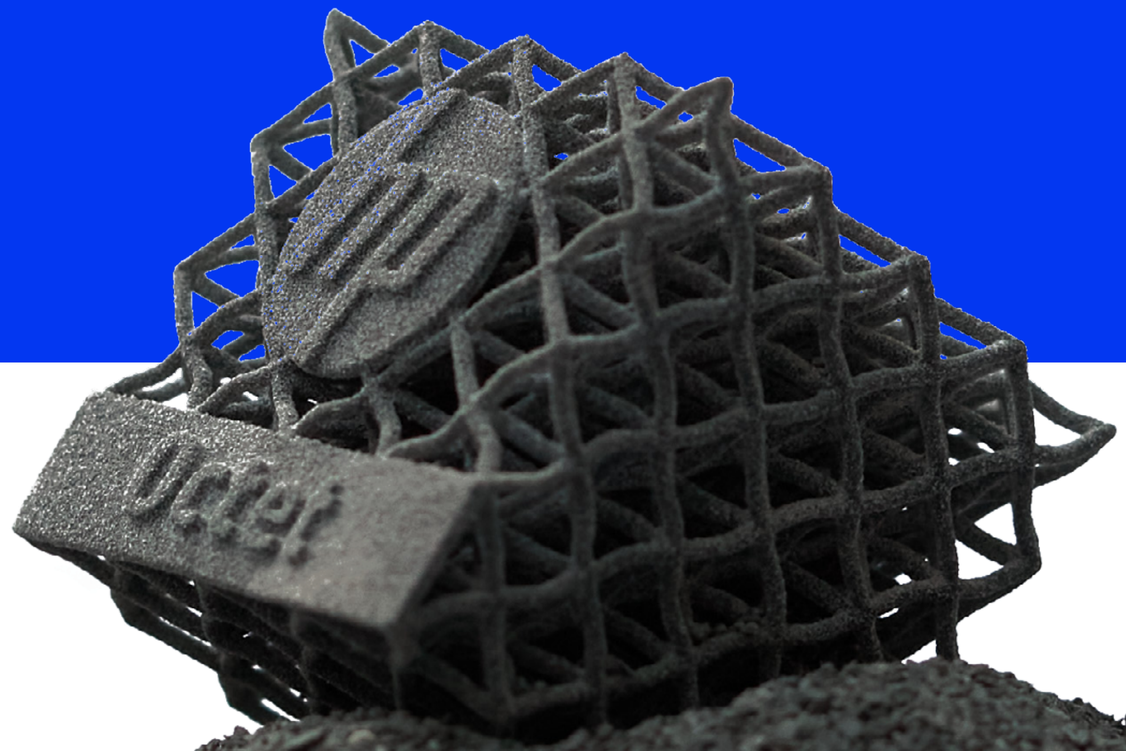


1TECH

02

3D PRINT - MJF

Using one type of machine allows you to print at the local manufacturer closest to the consumer. This reduces the carbon footprint in transporting the product to the customer as the supply chain becomes 1-step.



03

TPU POWDER

BASF's TPU powder is more durable than the flexible filaments of FDM printers. This ncreases overall resistance of the shoe. It is also abrasion resistant which is perfect for outsole usage conditions.

1MATERIAL

04

“MONOLITH”

Sneaker can be directly recycled after use. This is possible due to the lack of footwear disassembly and segregation for further processing into other products.

1PART

05

PROTOTYPE

After analyzing the model and selecting the thickness parameters in the midsole the first prototype was printed. Its resistance turned out to be greater than was assumed.

06

VISUAL IDENTIFICATION

Simple graphics have been added to the design that create a feeling of finished product and explains well features and benefits of 1Source shoe

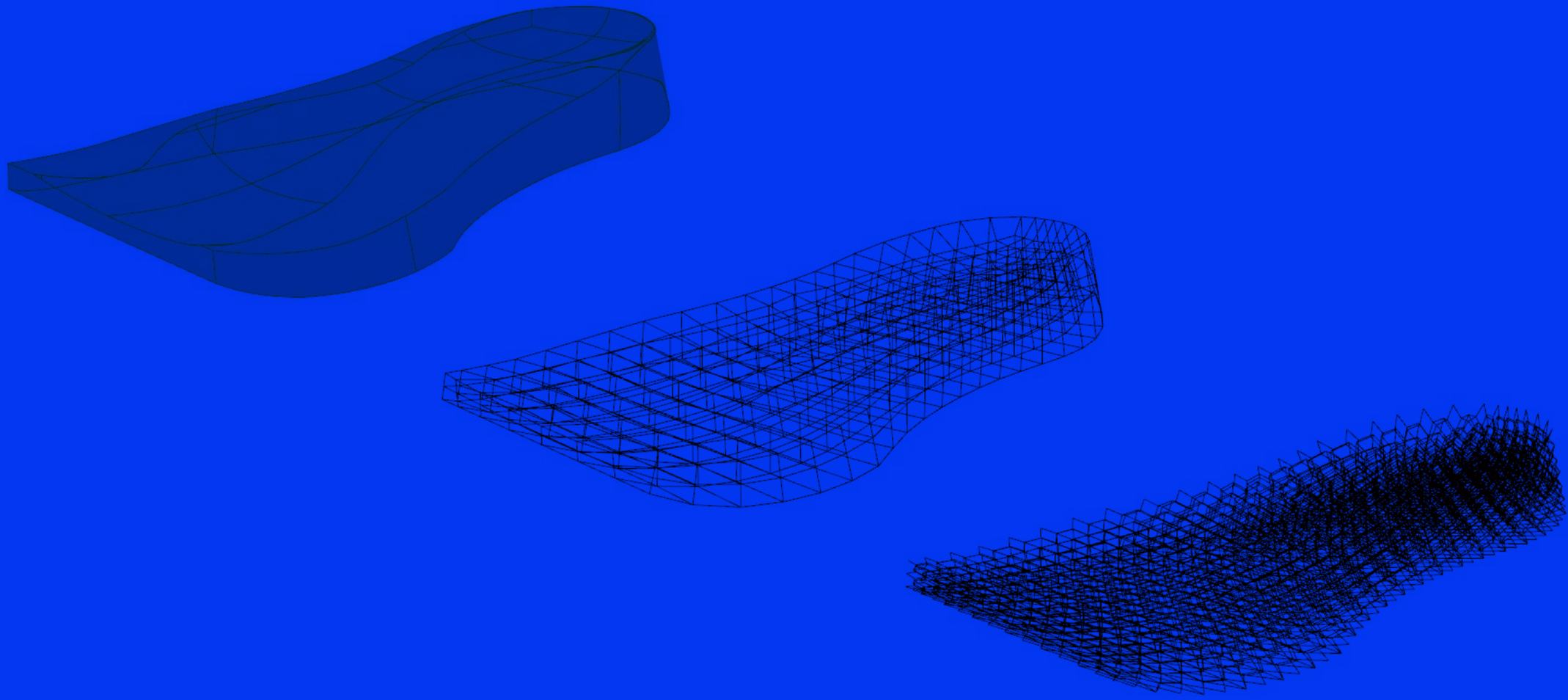
01 Project name

1SOURCE

02 1Move Pictogram

03 Studio logo

1SOURCE



THANK YOU