LIAM CLOETE





INDUSTRIAL DESIGN 300 · FINAL PORTFOLIO
PORTFOLIO 2026 · STUDENT 242018 · OPEN WINDOW, STELLENBOSCH

LIAM CLOETE

ABOUT ME

Third-year industrial designer at Open Window, Stellenbosch.

I like to make the things I design, and to make them work: laser-cut steel, oiled blackwood, fumed copper, and a little code and electronics. This year that meant a stove stand made and sold, a pavilion for a forest slope, an heirloom clock and a toy that teaches colour.

TOOLS

- SolidWorks
- KeyShot
- Revit
- 3D printing
- Laser cutting
- CNC routing
- ESP32 and code

ONLINE

liamcloete.com



01

COLOUR CREATURE

EDUCATIONAL PROPERTIES OF PRODUCT DESIGN
STEM TOY, BUILT
PRESENTED



02

Tornica

SPATIAL DESIGN
SENSORY PAVILION, SPECULATIVE
PRESENTED



03

Where Tomorrow

SUSTAINABLE DESIGN
HEIRLOOM WALL CLOCK, BUILT
PRESENTED



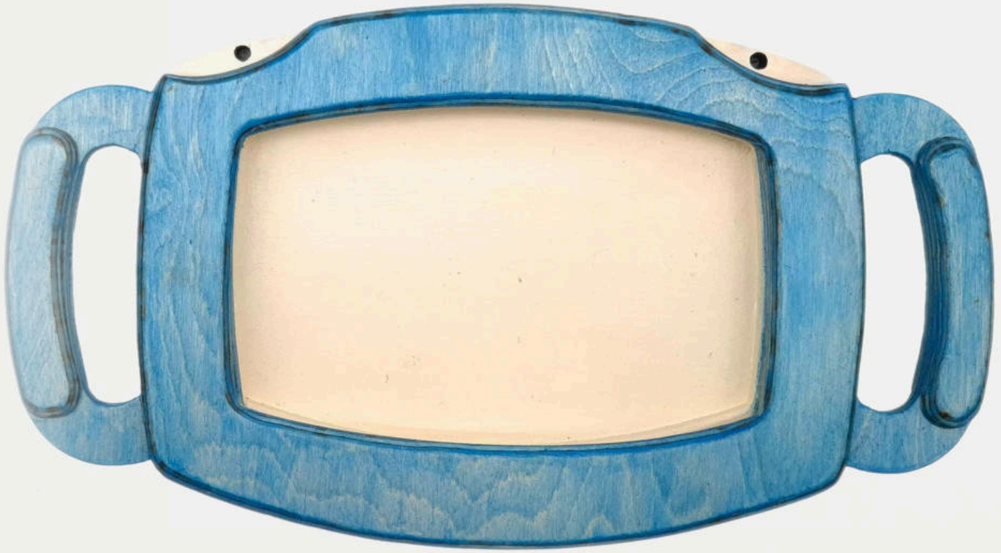
04

ARGO MULTISTAND

ENTREPRENEURIAL PRODUCT SOLUTIONS
FOLDING STOVE STAND, MADE AND LAUNCHED
DOCUMENT ONLY



COLOUR CREATURE





A screen-free STEM toy that teaches subtractive colour through play.

SOLUTION	Optical toy, ages 3–6
MATERIALS	Baltic birch, RGB cast acrylic
UNIT COST	R535.40, brief limit R750
YEAR	2026 · Semester 1 · STEM Project

PHOTO FRAME AND THREE PADDLES

FROM TECH AS MAGIC TO TECHNICAL TRANSPARENCY

6 OF 54

store STEM toys suit children under 6

14 OF 54

touch physics concepts at all

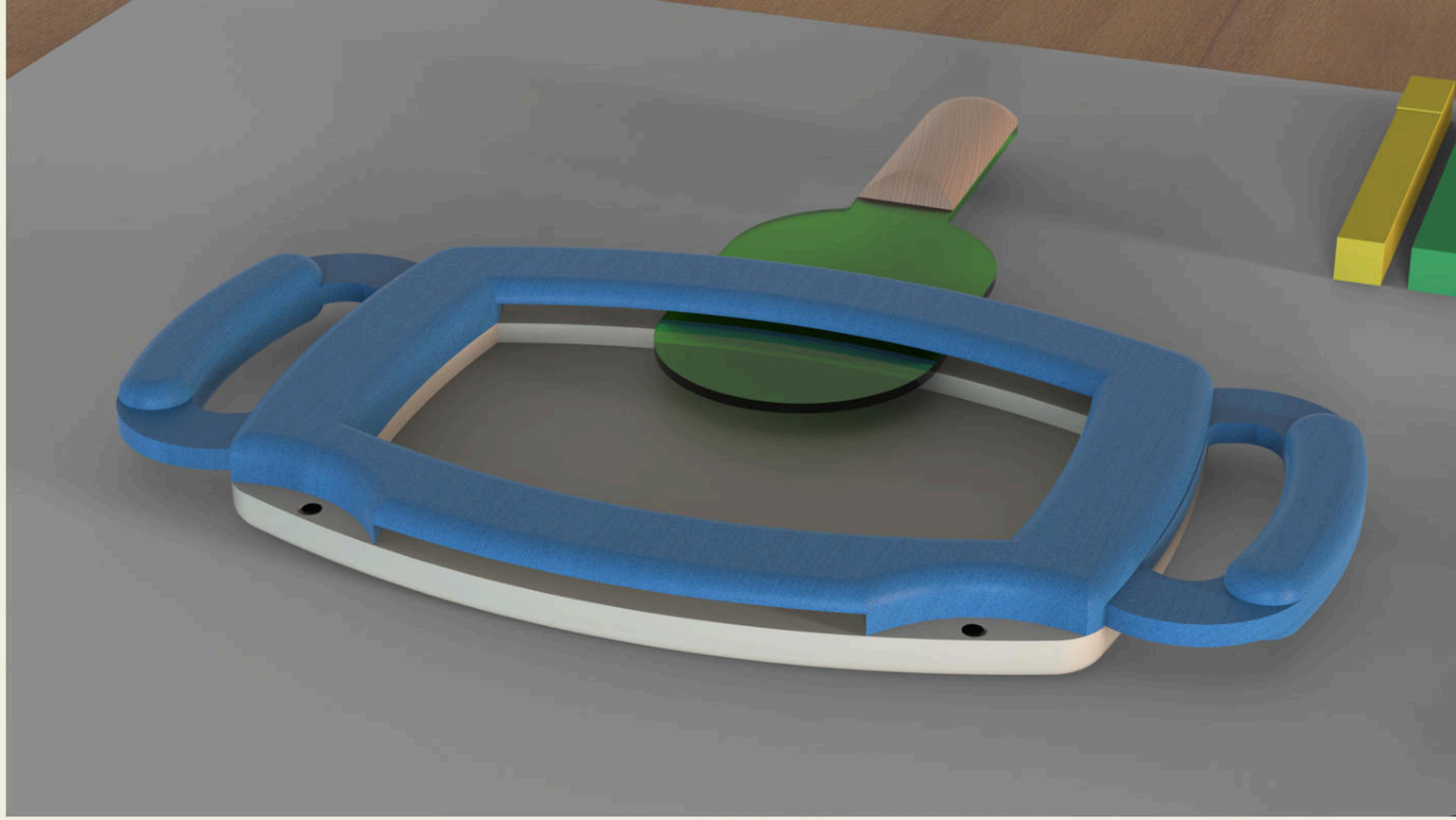
13 OF 16

respondents very interested in a screen-free physics toy

56 %

would pay R300–600

Store survey: Toy Kingdom and Toys R Us, Cape Town, May 2026, 54 products. Questionnaire: 16 parents and educators.



RENDER COLOUR CREATURE IN USE

THE CARNOVSKY EFFECT

A filter subtracts colour: one image appears, the others hide.



REFERENCE CARNOVSKY: LAYERED CMY ARTWORK

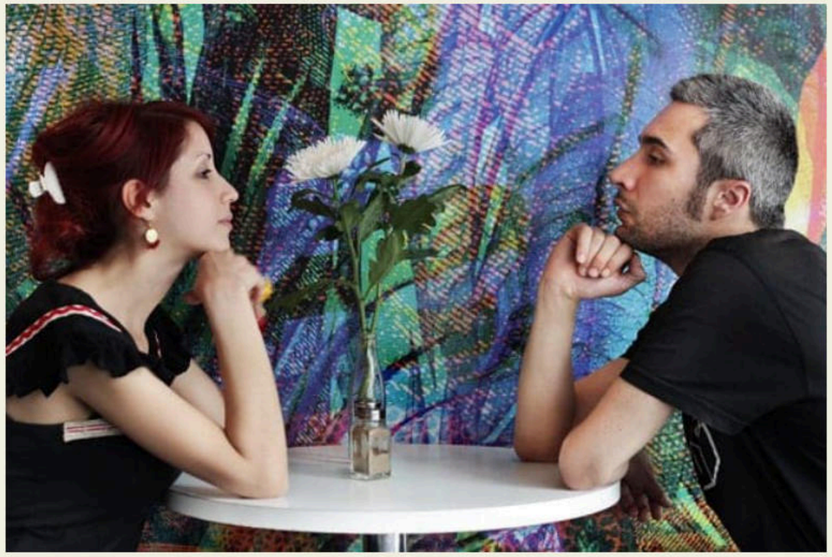
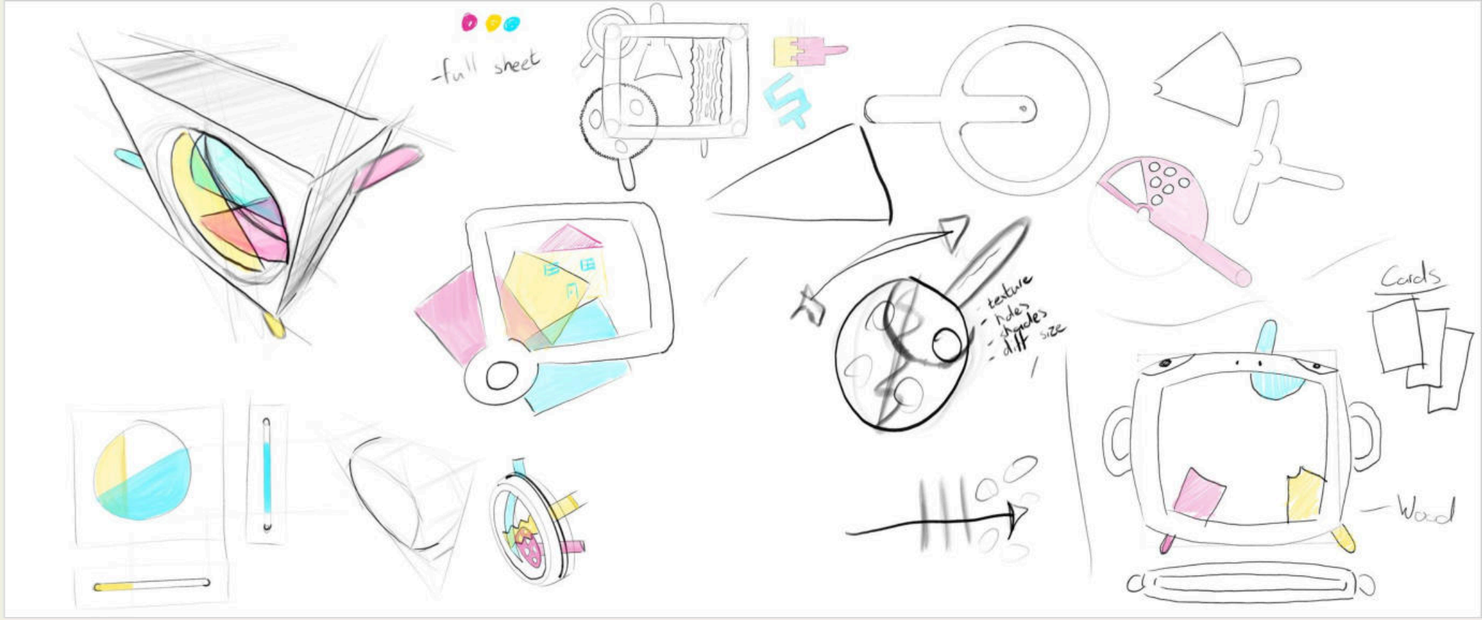


PHOTO CARNOVSKY: SILVIA QUINTANILLA AND FRANCESCO RUGI (IDEAMENSCH.COM)

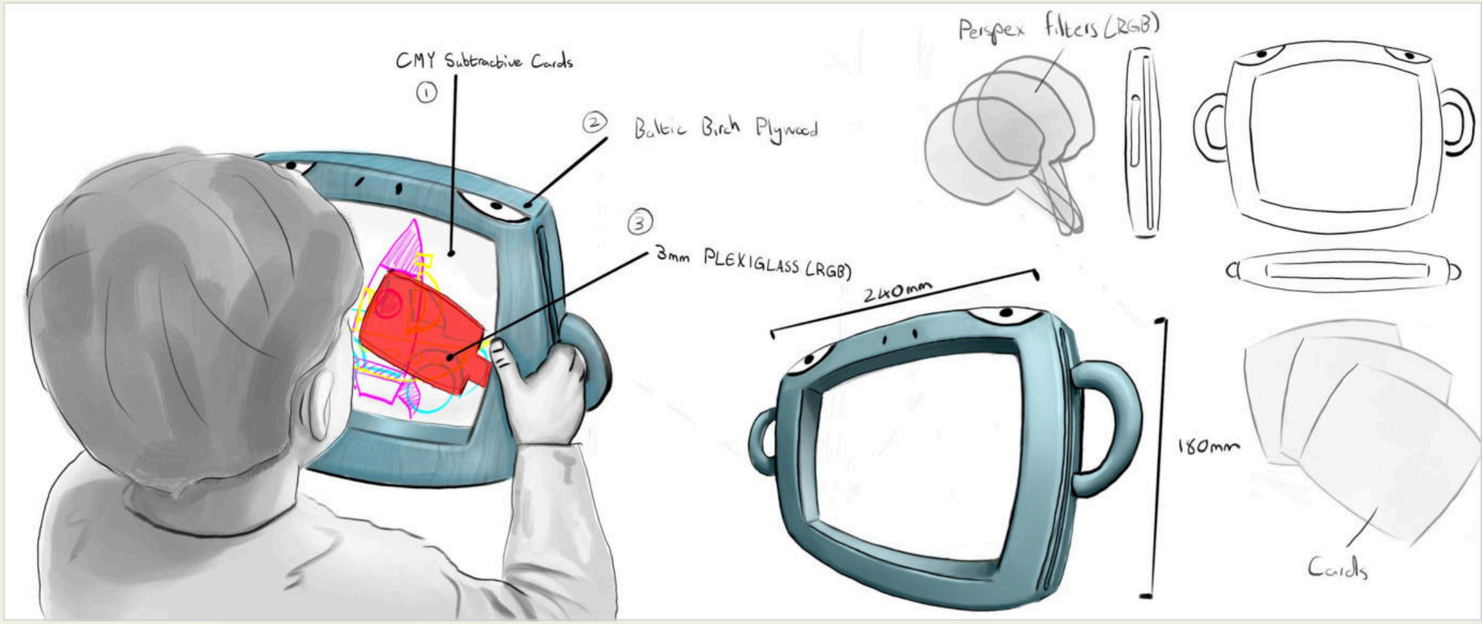


TEST PRINT CHANNEL SEPARATIONS TESTED BEFORE PRINTING

FROM COLOUR WHEELS TO A CREATURE



SKETCH A FILTER BOX BECOMES HAND-HELD FILTERS



SKETCH A MONSTER FRAME: EARS ARE HANDLES, EYES FOLLOW

1:1 CARDBOARD MOCK-UP

Slide-and-slot reads instantly

Grip and scale confirmed

Flush filters jammed: a double-layer gap fixed it

Sized for children aged 3–6



MOCK-UP DOUBLE-WALL CARDBOARD

SAFETY DESIGNED IN

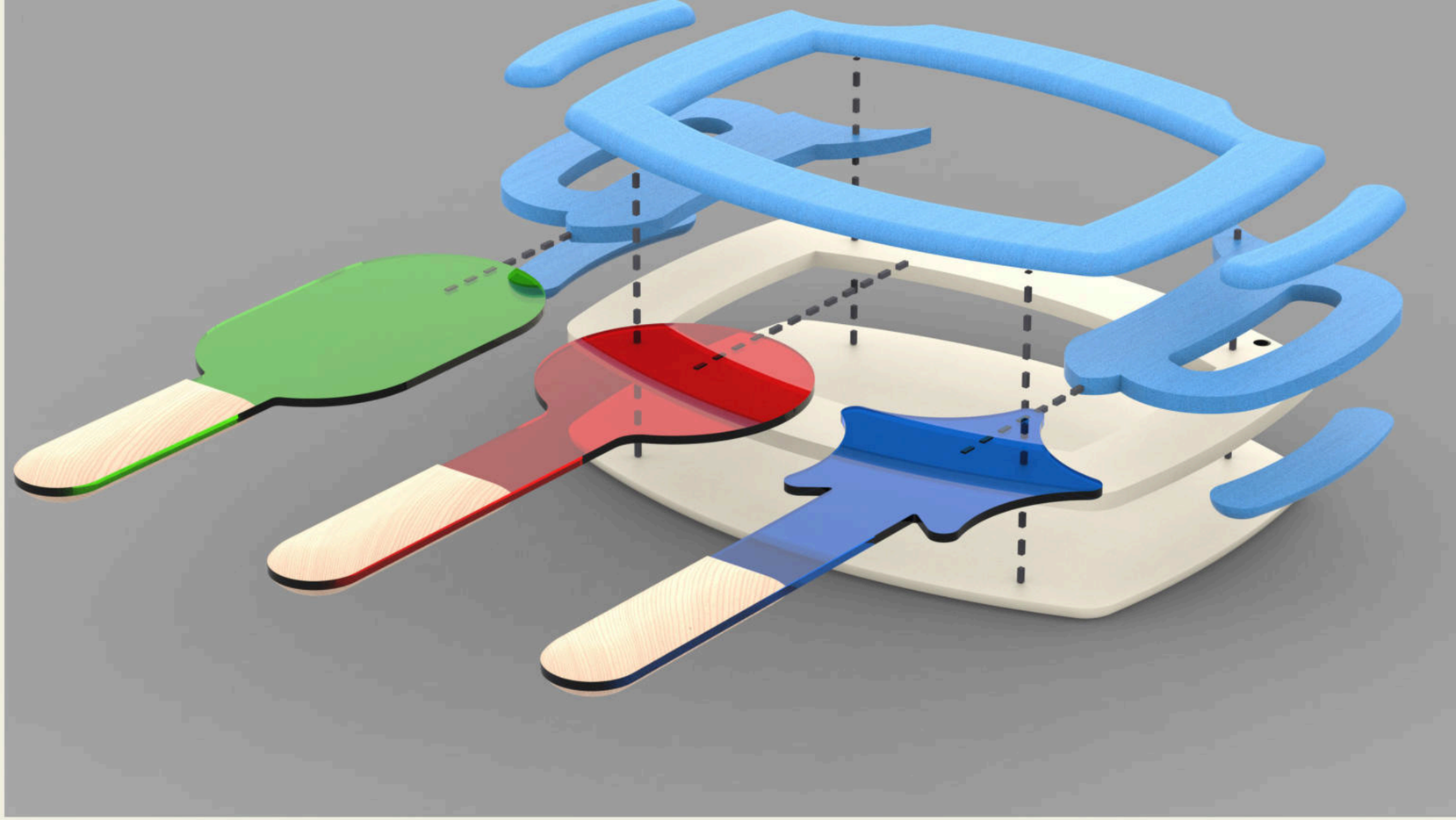
Four layers of 6 mm birch

4 mm channels for 3 mm paddles, to keep fingers out

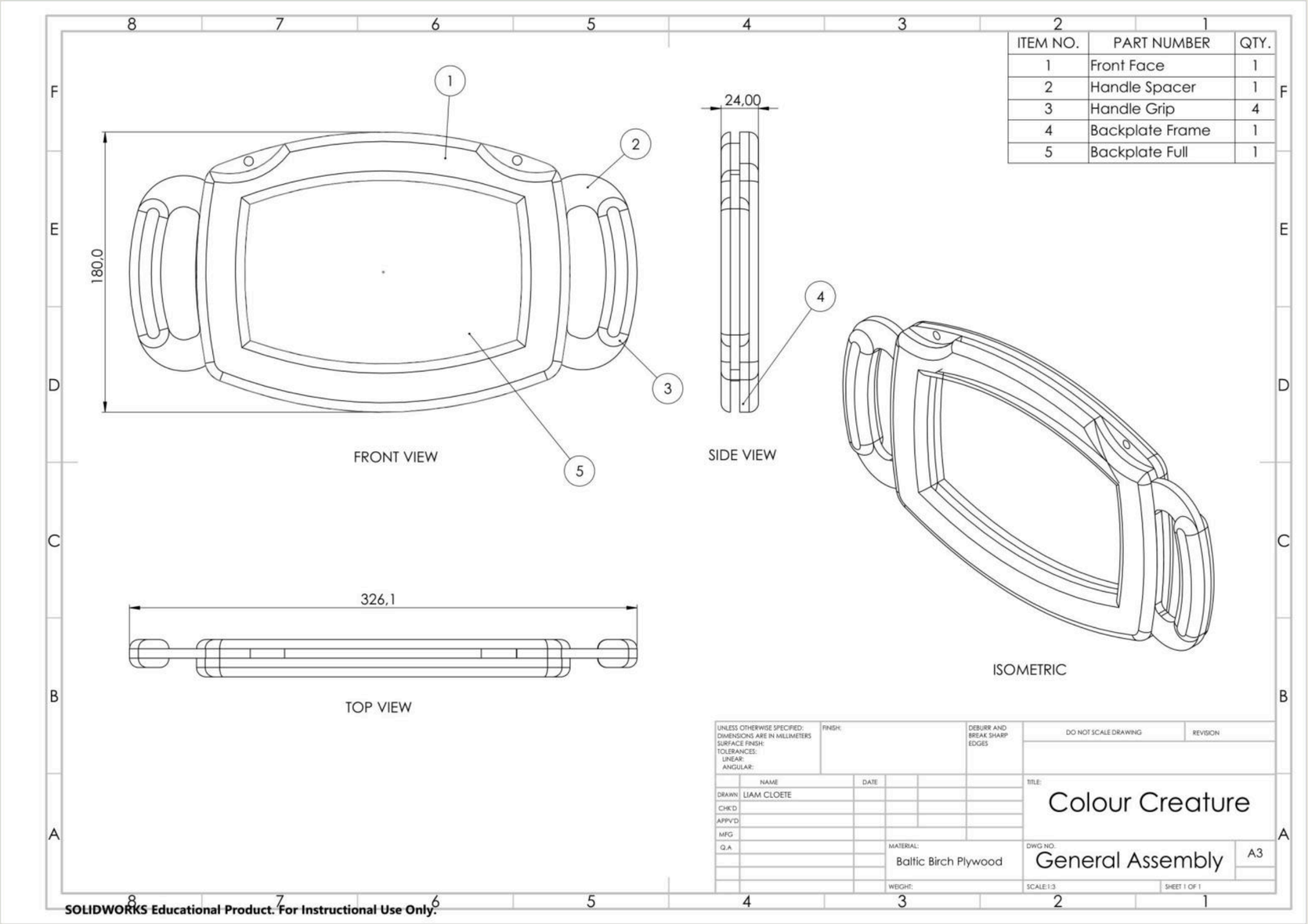
5 mm fillets on every face

Whiteboard insert for own drawings

Designed to satisfy ISO 8124-1 toy safety standards



RENDER BIRCH LAYERS AND ACRYLIC PADDLES



DRAWING GENERAL ASSEMBLY

R535.40 A UNIT

BIRCH	R51.04
ACRYLIC	R164.36
FINISHES	R20.00
CNC ROUTING	R300.00
WASTE	14.8 %, limit 20 %

THE FINISHED KIT

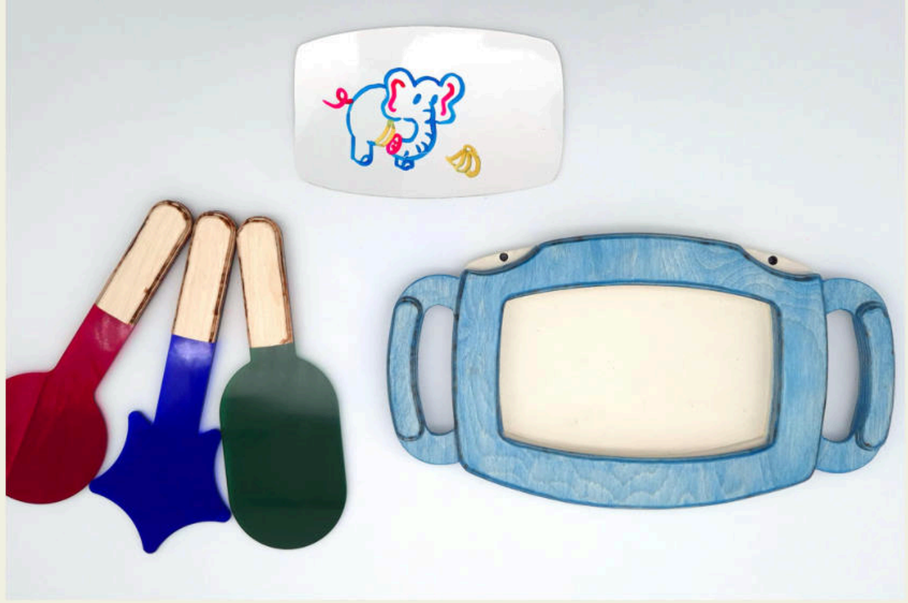
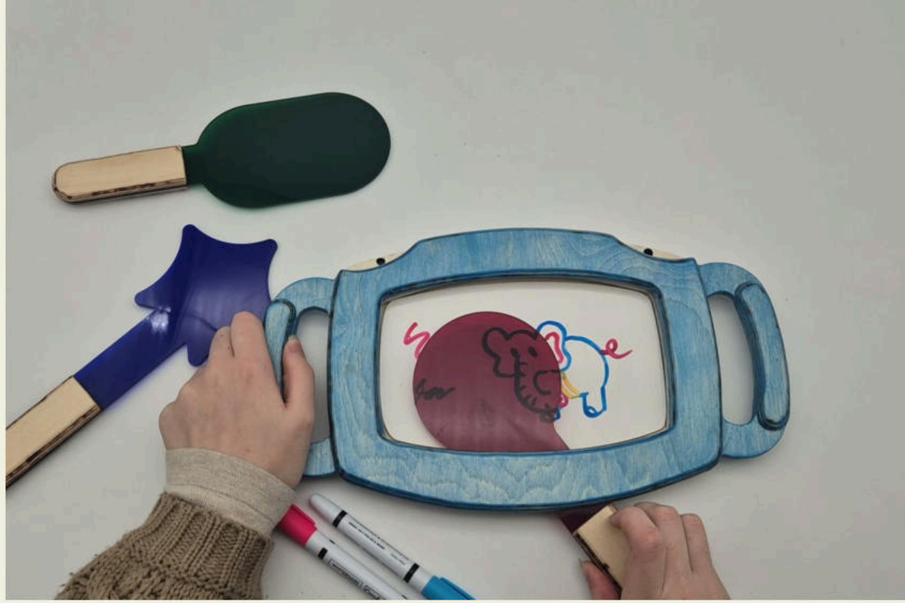


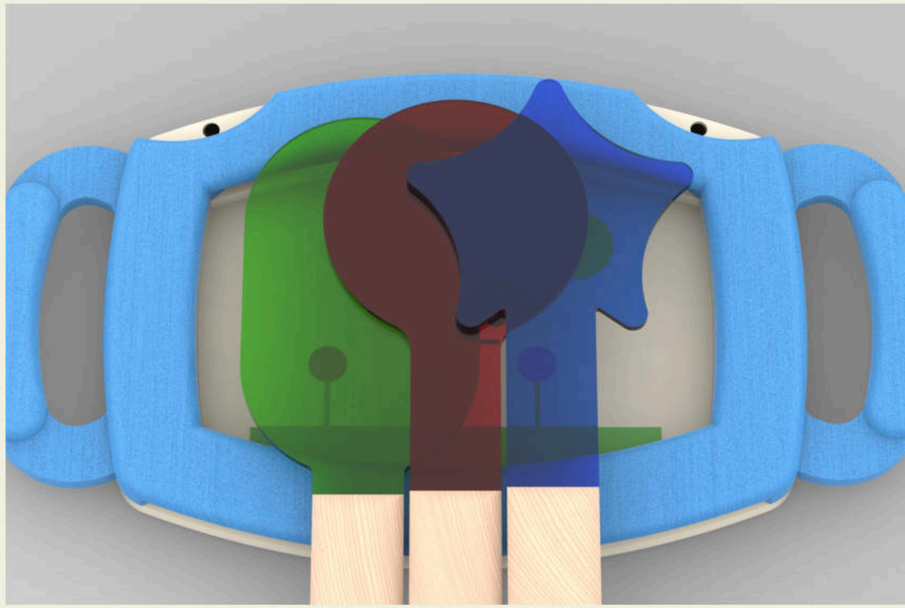
PHOTO WITH WHITEBOARD INSERT



VIDEO STILL A PADDLE HIDES PART OF THE DRAWING



VIDEO STILL DRAWING ON THE INSERT



RENDER PADDLES OVERLAPPING

PACKAGING CONCEPT

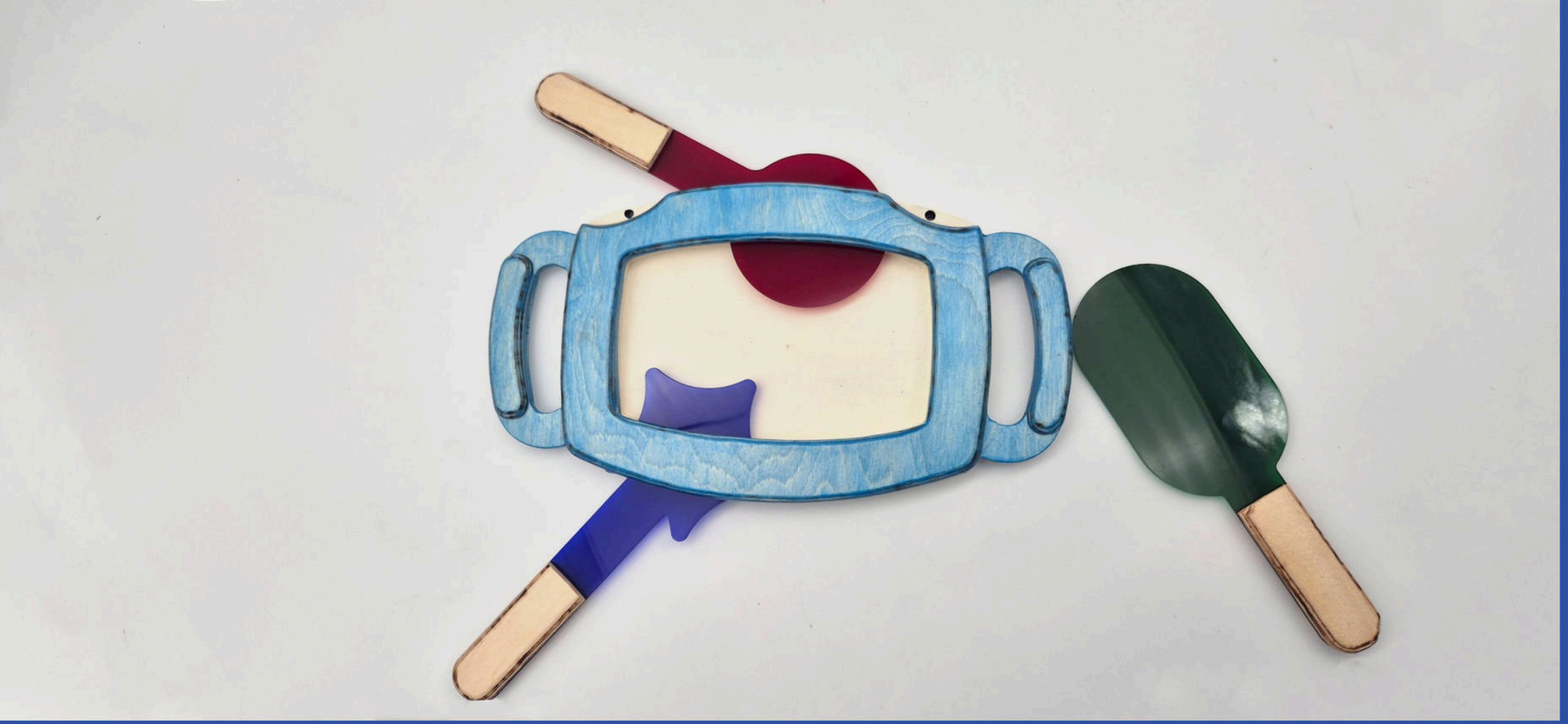
A concept for a rigid hinged box, shown as a digital mockup. Not produced.



MOCKUP CLOSED: THE LID SHOWS THE WHOLE KIT



MOCKUP OPEN: THE LINE IS THE FIRST THING YOU READ



THE MECHANISM IS THE TOY

NEXT

Packaging that explains itself on the shelf

More artwork cards

PHOTO A PADDLE IN THE WINDOW

NOTHING IS HIDDEN: SLIDE A FILTER, A COLOUR VANISHES, AND THE QUESTION OF WHY IS RIGHT THERE.

SPATIAL DESIGN

Tornica

An off-grid sensory pavilion that steps into the slope at the Afromontane forest edge, Hogsback.

SOLUTION	Speculative pavilion, unbuilt
SITE	Tor Doone, Eastern Cape
ROLE	Individual project
YEAR	2026 · Term 3



RENDER CENTRAL HUB



READ THE SITE BEFORE ANY FORM

60 × 60 M

site envelope

19.5°

slope

21.3 M

drop across the site

Brief: Pavilion Atlas 2026. Site appreciation drives the design; the senses shape every space.

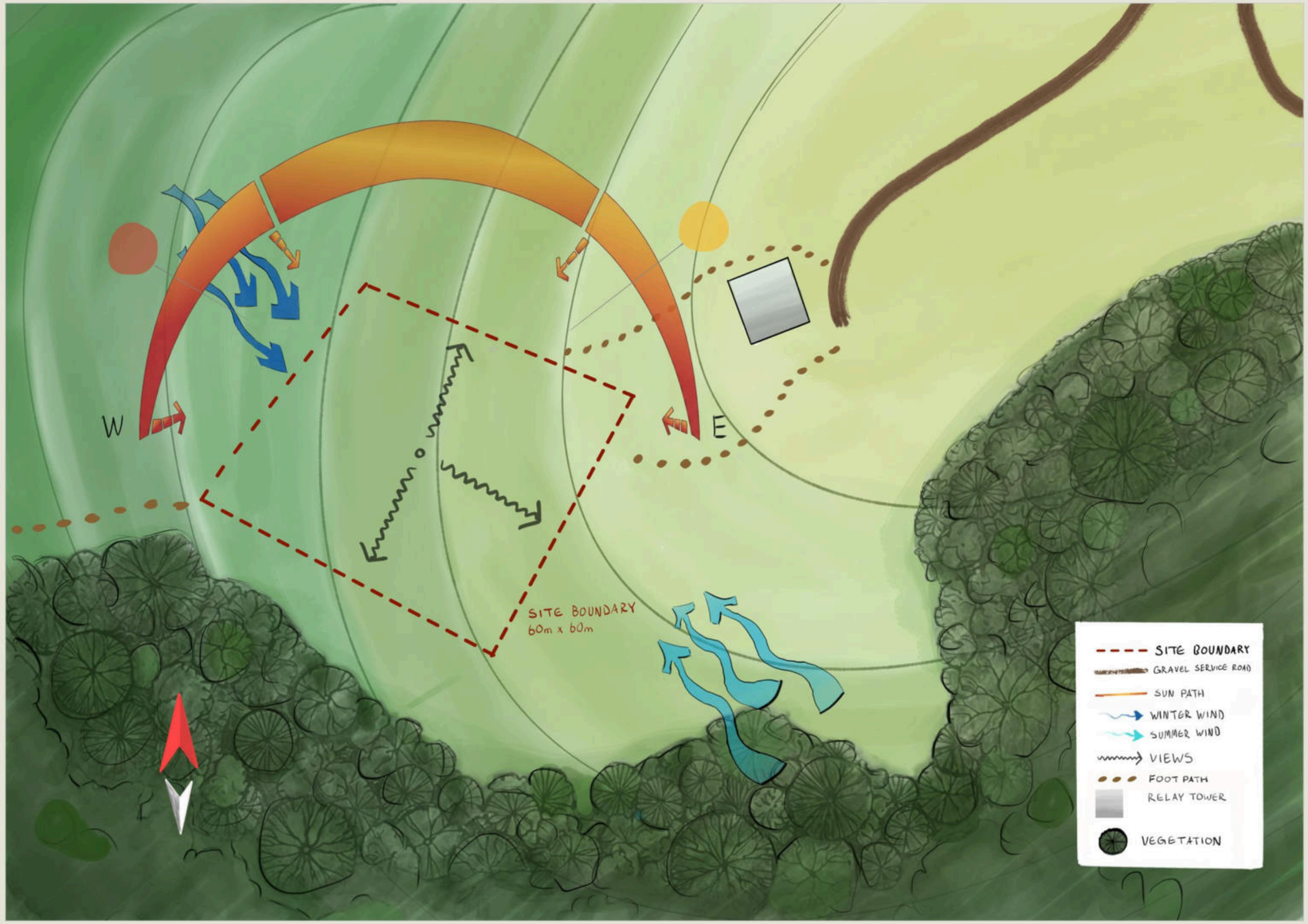


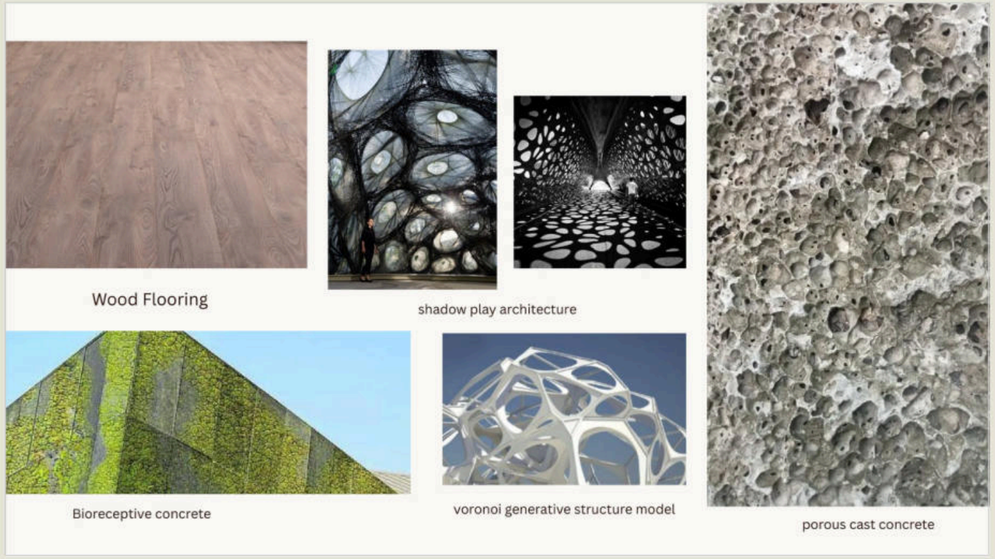
DIAGRAM BOUNDARY, WINDS, SUN PATH AND ACCESS

A PERMEABLE SKIN

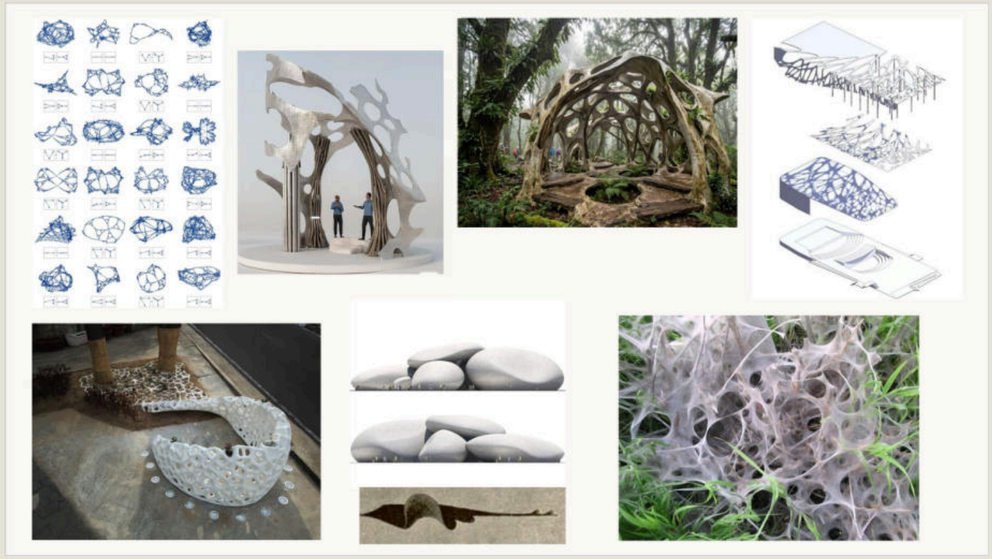
Mungo Mill showed how a skin can filter light and expose what happens inside.



PRECEDENT MUNGO MILL: A PERMEABLE TIMBER SKIN



BOARD POROUS CONCRETE, VORONOI STRUCTURE, TIMBER



BOARD FORM: CELLULAR AND ORGANIC STRUCTURES (PAVILION IMAGE: PLANTOPIA)

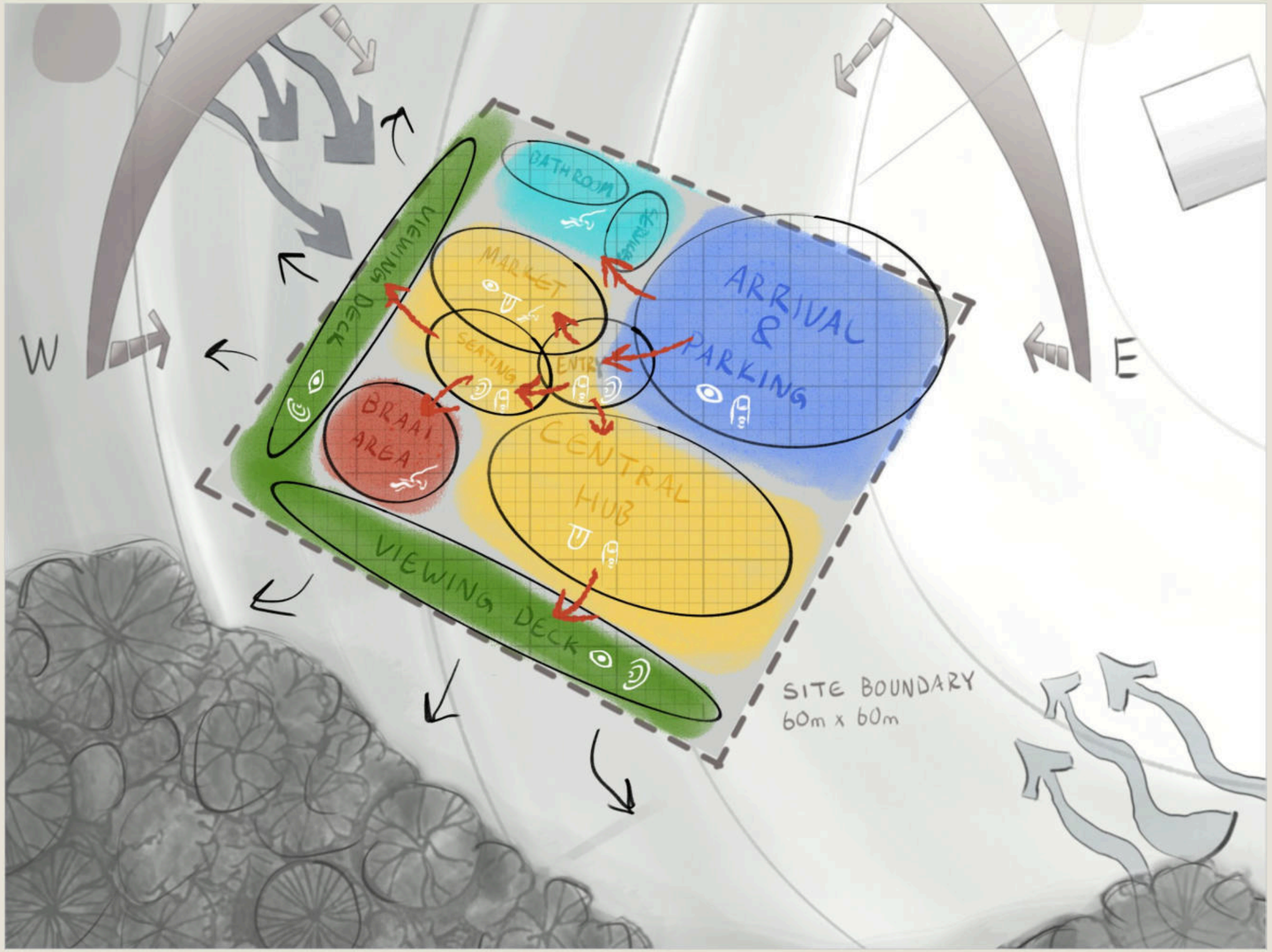
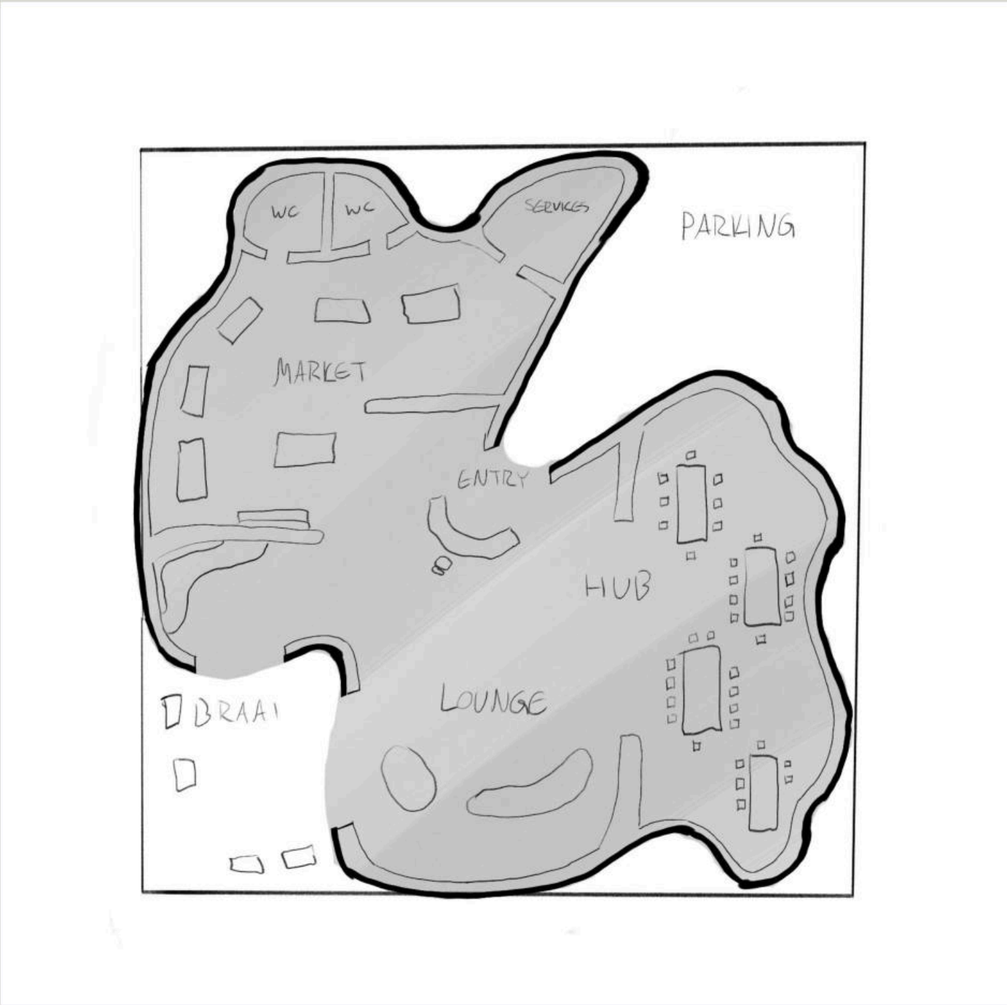


DIAGRAM ARRIVAL, HUB, MARKET, BRAAI, VIEWING DECKS

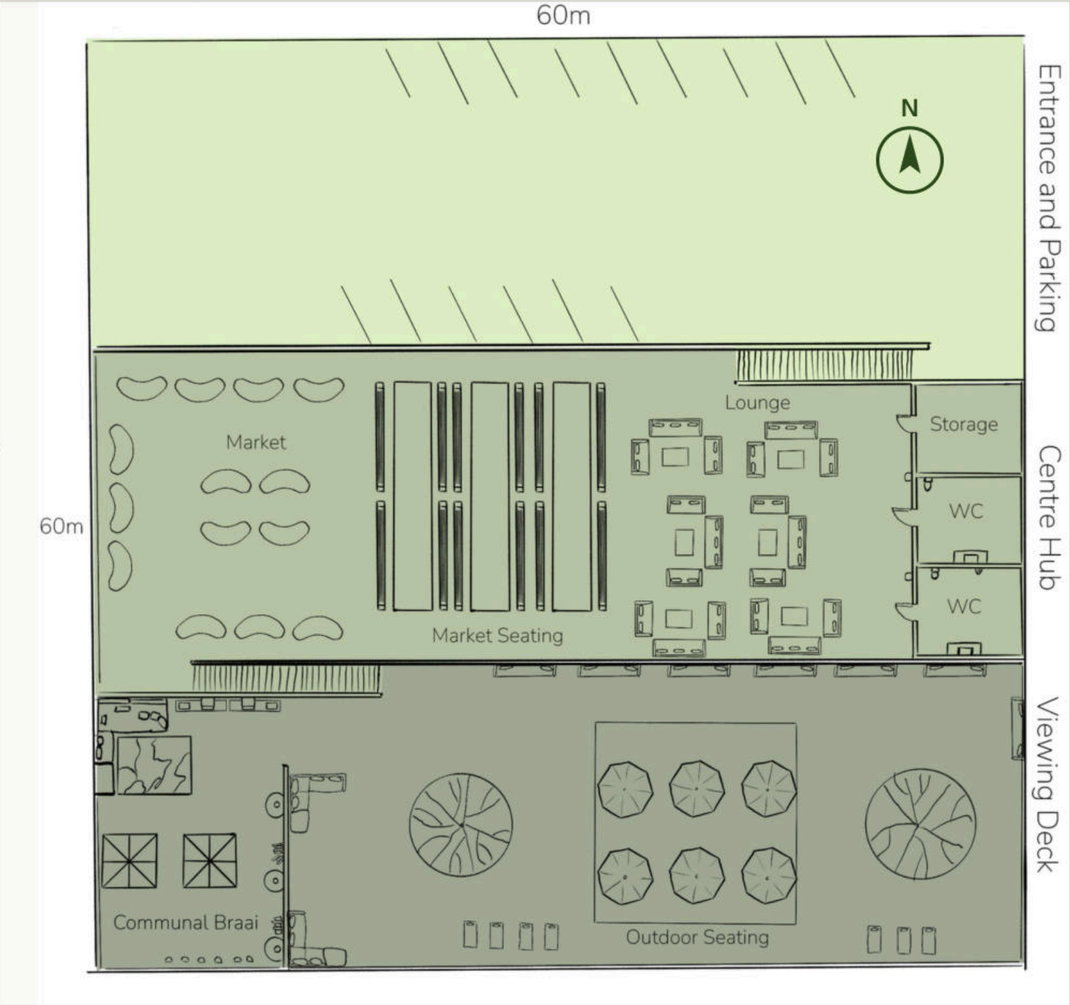
ONE CONTINUOUS SENSORY JOURNEY

SOUND	Rocks underfoot
TOUCH	Aerated concrete
SMELL	Pine and fireplaces
TASTE	Market and braai
SIGHT	Valley views

FROM ORGANIC SKETCH TO FLOOR PLAN

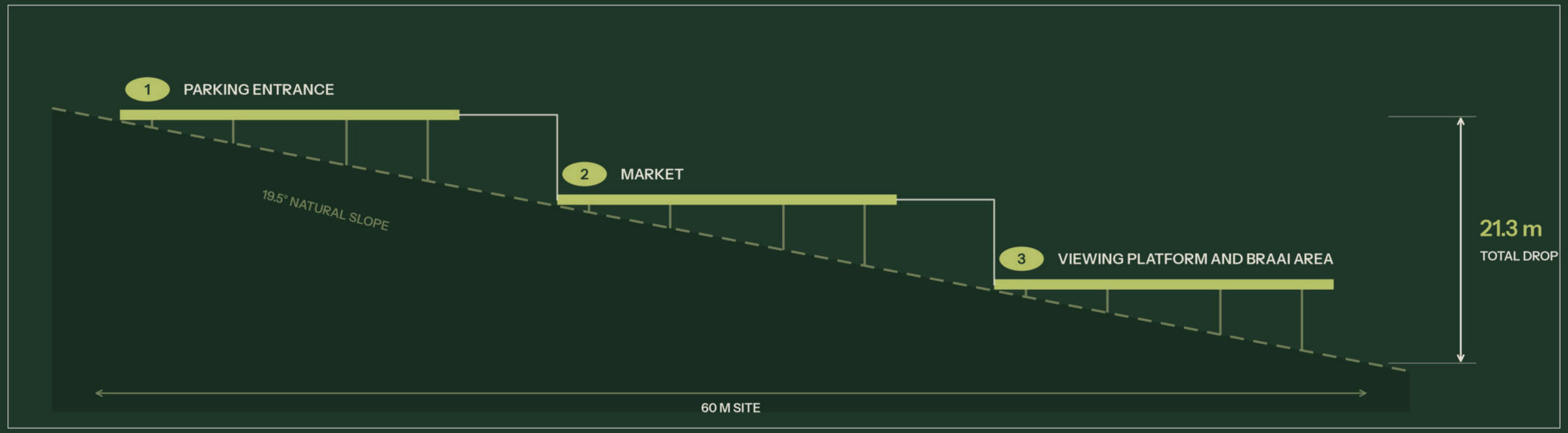


SKETCH CONCEPT PLAN



PLAN FLOOR PLAN, 60 × 60 M SITE

STEPPING DOWN A 21 M FALL



SECTION DIAGRAMMATIC SECTION ALONG THE FALL LINE, NOT TO SCALE

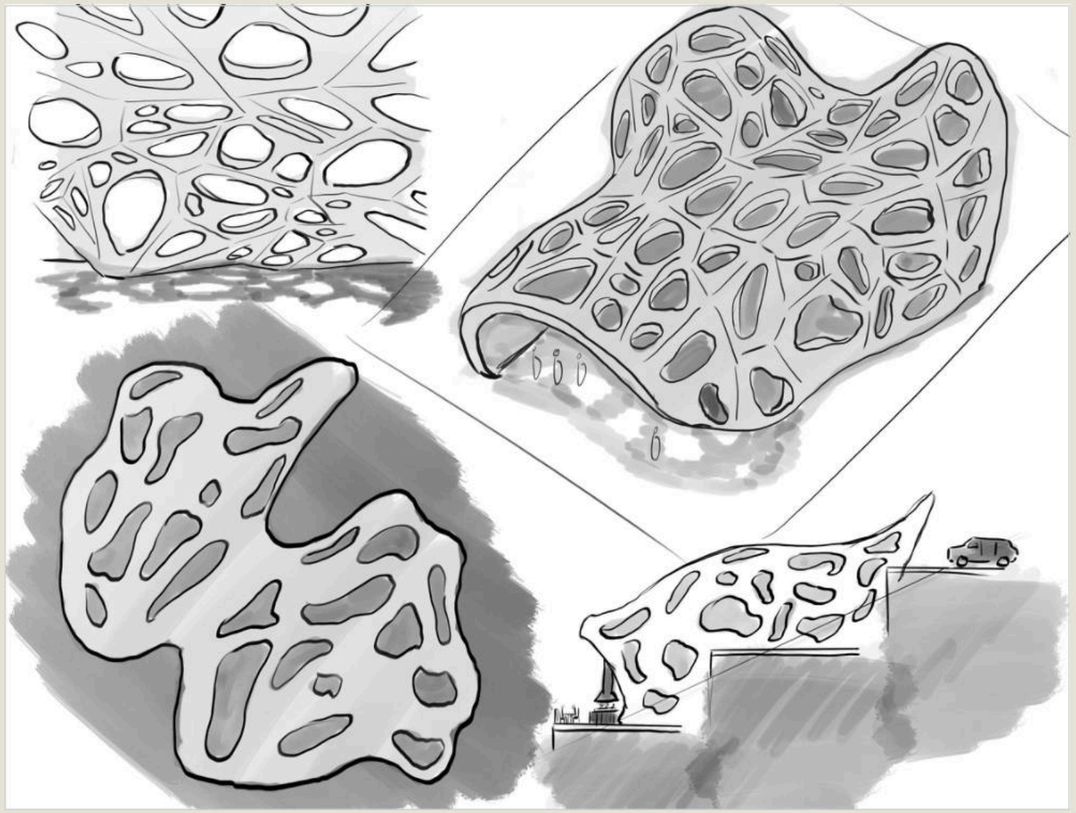
STRUCTURE Terraced platforms on raised piers, not one cut-and-fill slab

WATER Roof gutters, first-flush diverters, cisterns terraced below the hub

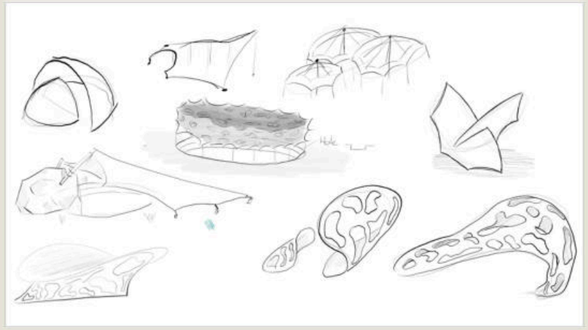
WASTE, POWER Package treatment and reed-bed greywater; north-pitch solar to a battery bank. A strategy, not yet sized.

A VORONOI SHELL, GROWN, NOT BUILT

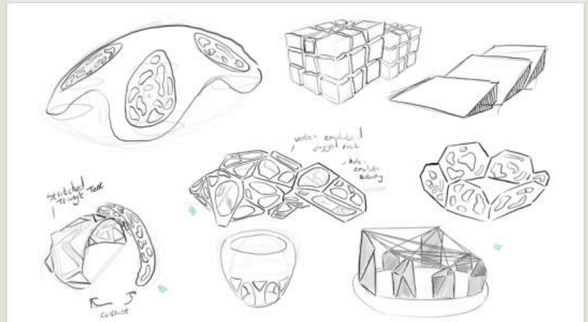
Porous shell filters wind and light. Modelled in Revit with Dynamo, rendered in D5.



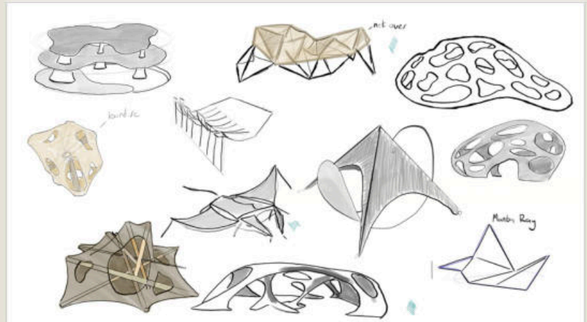
SKETCH VORONOI BIORECEPTIVE CONCRETE CANOPY IN PLAN AND PERSPECTIVE



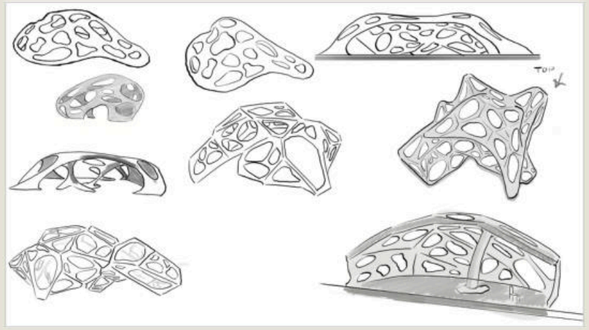
SKETCH IDEATION SHEET 1



SKETCH IDEATION SHEET 2



SKETCH IDEATION SHEET 3



SKETCH EXPLORATION SHEET

FROM THE CAR PARK TO THE VALLEY VIEW

Renders in D5.


RENDER ARRIVAL AND MARKET


RENDER MARKET LEVEL


RENDER COMMUNAL BRAAI AND LOUNGE


RENDER LOUNGE UNDER THE SHELL



POSTER TORNICA: THE PAVILION ON THE TOR DOONE SLOPE

TOUCHING THE EARTH LIGHTLY

ONE ROUTE, ONE POROUS SHELL

THE BIORECEPTIVE CLAIM IS STILL A MATERIAL ASSIGNMENT, NOT YET A PERFORMANCE-DRIVEN FORM.

NEXT

Tune cell sizes for moisture and spores

Study vernacular Eastern Cape lattice building

Dimension the circulation plan; size cisterns and solar



RENDER THE CANOPY OVER THE TERRACES

SUSTAINABLE DESIGN

Where Tomorrow

An heirloom wall clock. Its one hand is a steel ball, pulled round a fumed-copper face by a magnet nobody sees.

SOLUTION	Heirloom wall clock
MATERIALS	Copper, blackwood, glass, steel
SIZE	About Ø490 × 125 mm
YEAR	2026 · Term 4 · Individual project



PHOTO FINISHED CLOCK, STUDIO

BUILT TO BE REPLACED

Most clocks are sealed boxes, thrown away when they fail. Nothing on them records the family that lived with them.

HOW MIGHT A CLOCK RECORD A FAMILY'S TIME, NOT JUST COUNT IT?

Ubi cras? Where is tomorrow? The Cloete family motto, on seals since at least 1826.



PHOTO DETAIL: THE BALL IN THE CLEAR WEDGE

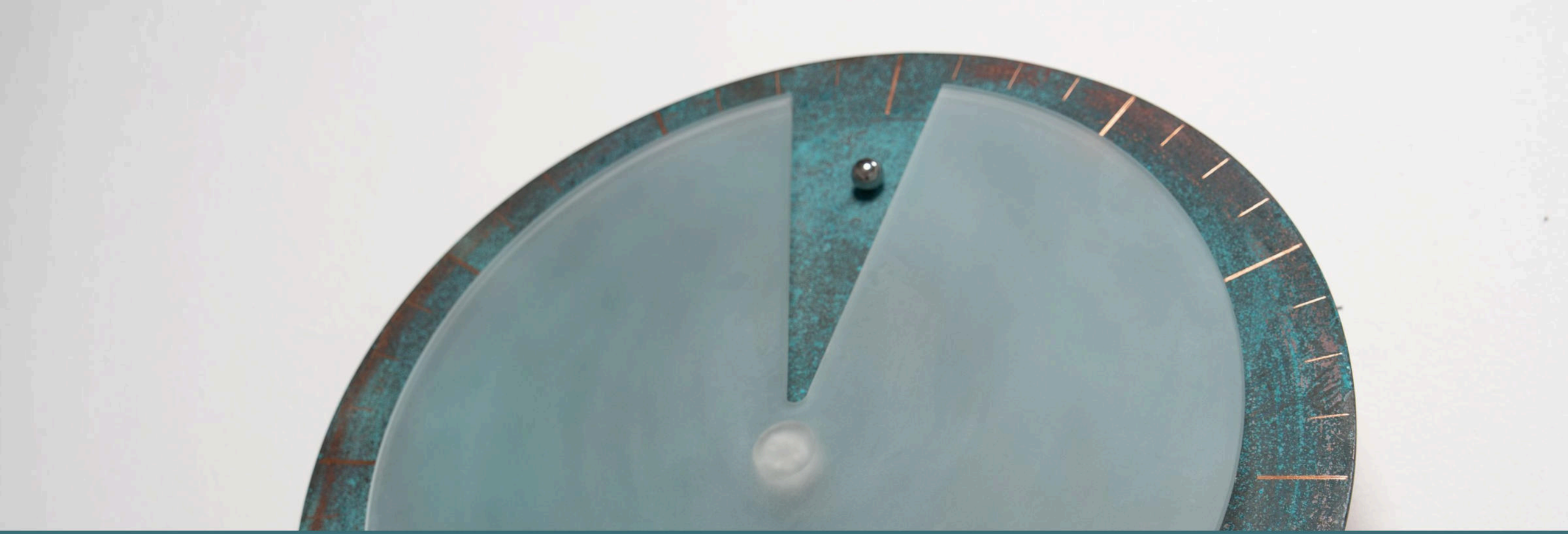


PHOTO VERDIGRIS RIM, SCRIBED TICKS, FROSTED VEIL

PATINA IS A RECORD, NOT DAMAGE

68 % keep objects because they tell a story

63 % keep things that belonged to someone they loved

53 % chose copper with dark wood

84 % would repair rather than replace

Survey, 12 Oct, n = 19. Theory: Bakker, *Products That Last*.

THE TRICK ALREADY WORKS

Hawkins' clock and the Bradley watch show that the mechanism already works. What this clock adds is the record and the ritual of handing it on.

The ball runs on copper instead of wood, so its path becomes a polished record.

A glass veil softens the face and shows the ball through a clear wedge.

There is only one hand.

It is built to be handed on, with a ritual for re-fuming the face.



PRECEDENT TROY HAWKINS, MAGNETIC WALL CLOCK (ARDUINO TEAM, 2020)



PRECEDENT EONE, BRADLEY TIMEPIECE (2013)

A HAND YOU CAN'T SEE MOVES A HAND YOU CAN

In front: ball and veil. Only the present is sharp.

Through: 1.6 mm copper, not magnetic.

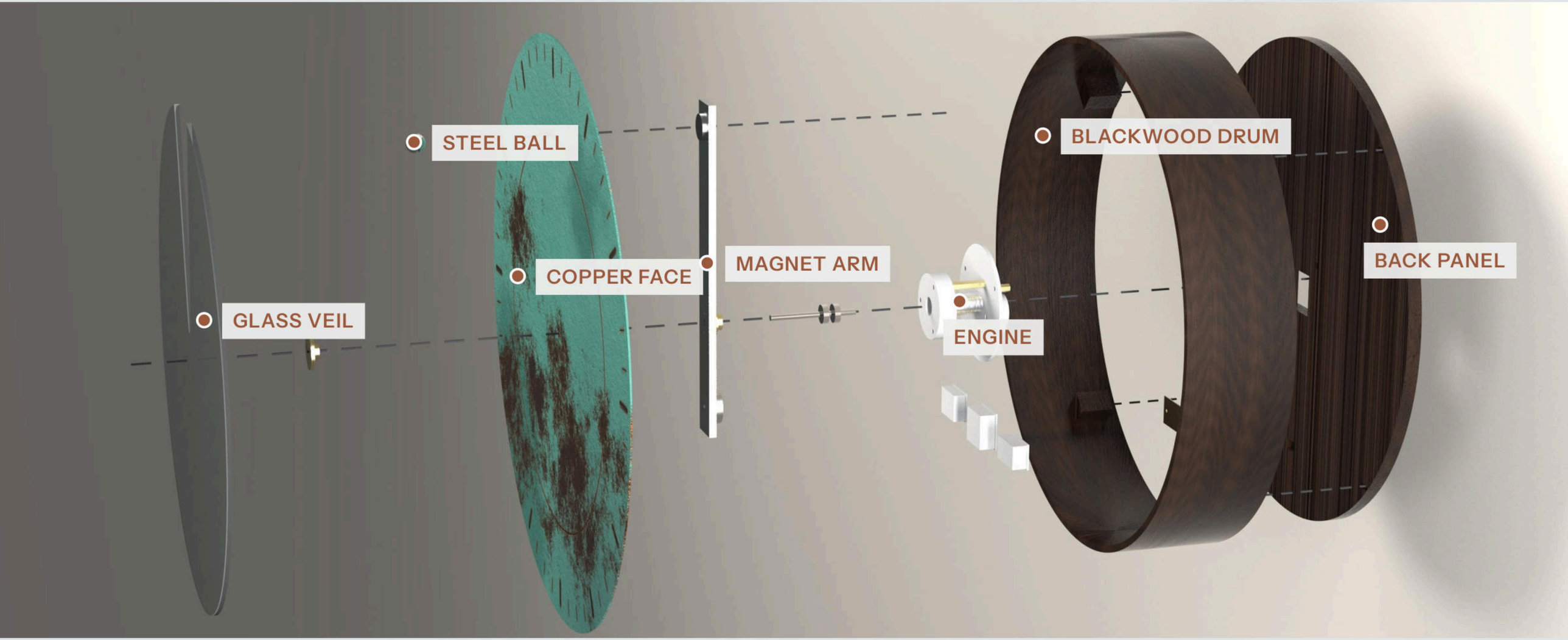
Behind: magnet on a stepper-driven arm, once round in 12 h.



PHOTO THE FACE

EXPLODED VIEW

RENDER EXPLODED VIEW OF THE DESIGN MODEL



WHERE THE IDEA CAME FROM

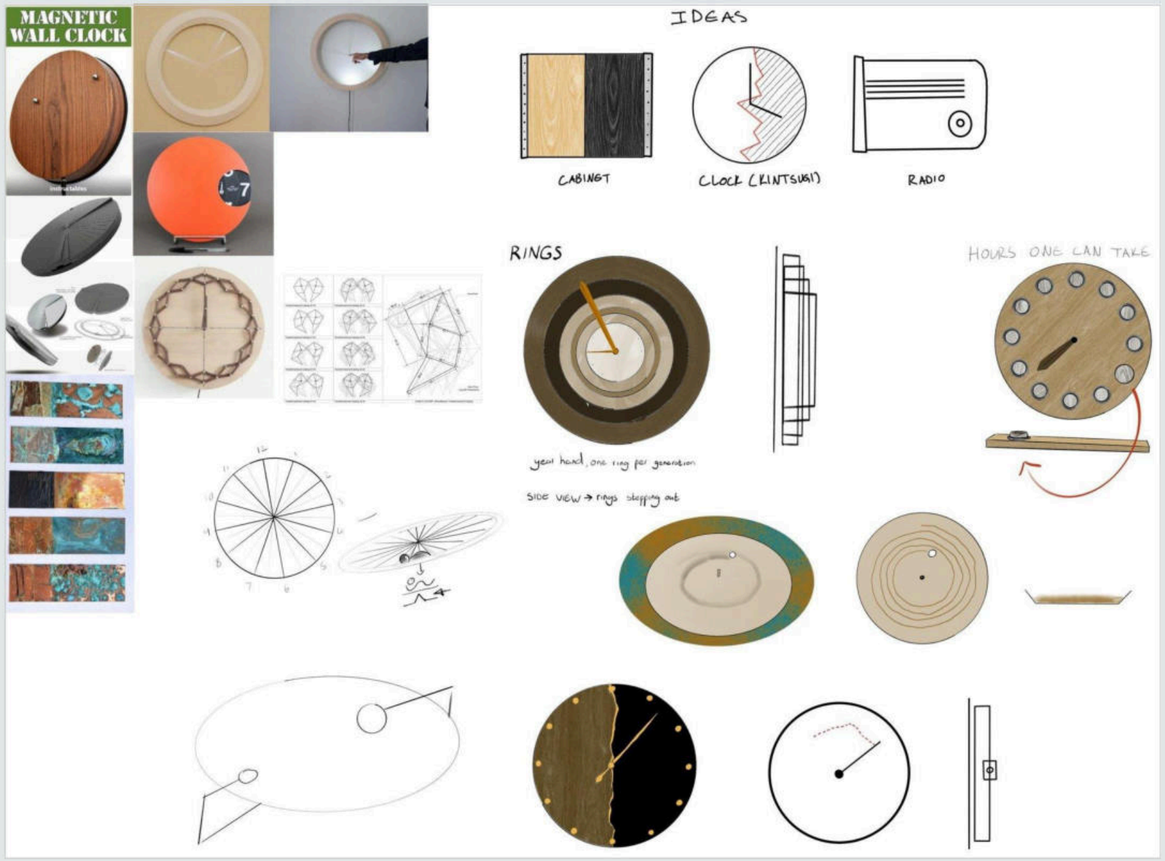
Ubi cras, and the old word *kloot*, which also means a ball. Copper with a patina and a ball bearing is where the idea first started.

The magnetic ball: time that takes some effort to read

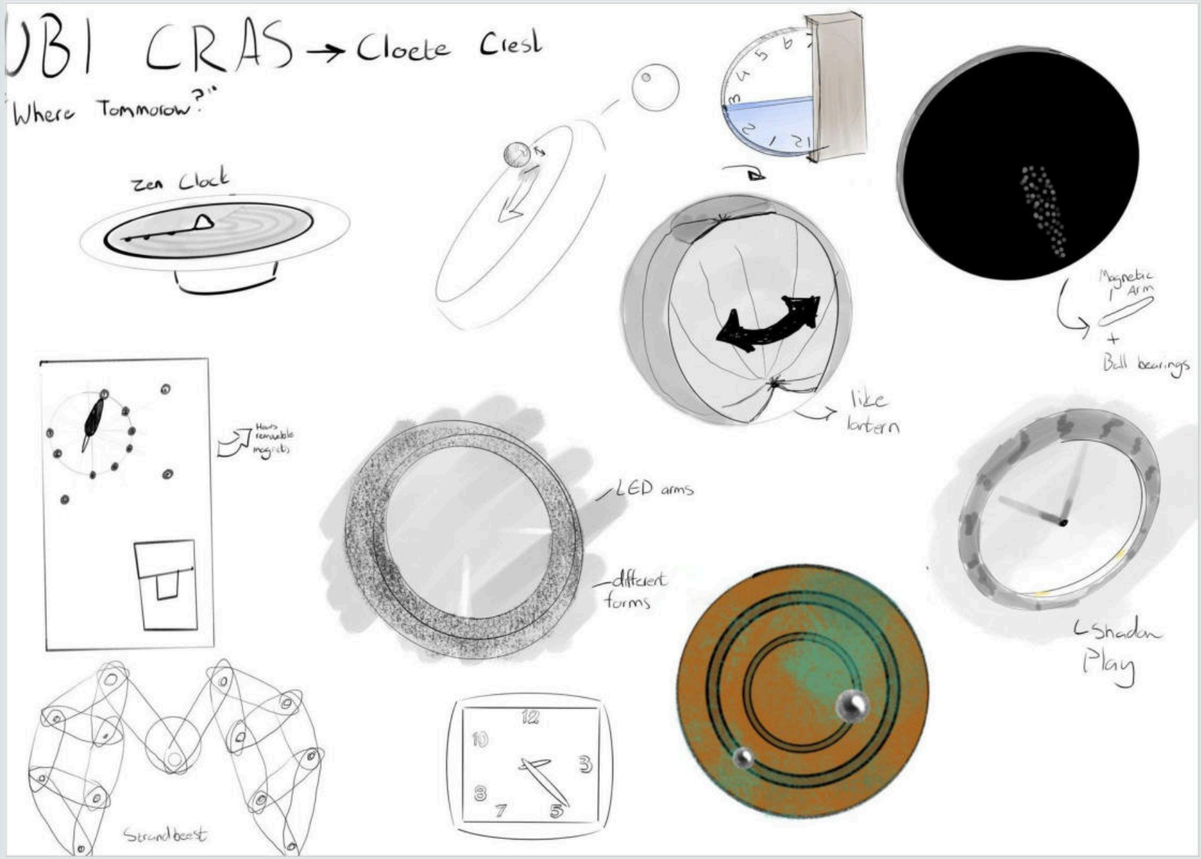
Hidden time, and the interaction of working it out

Patina and verdigris: colours that contrast, yet occur naturally

Movement: the Strandbeest, a water level, a Zen rake, a ring of LEDs



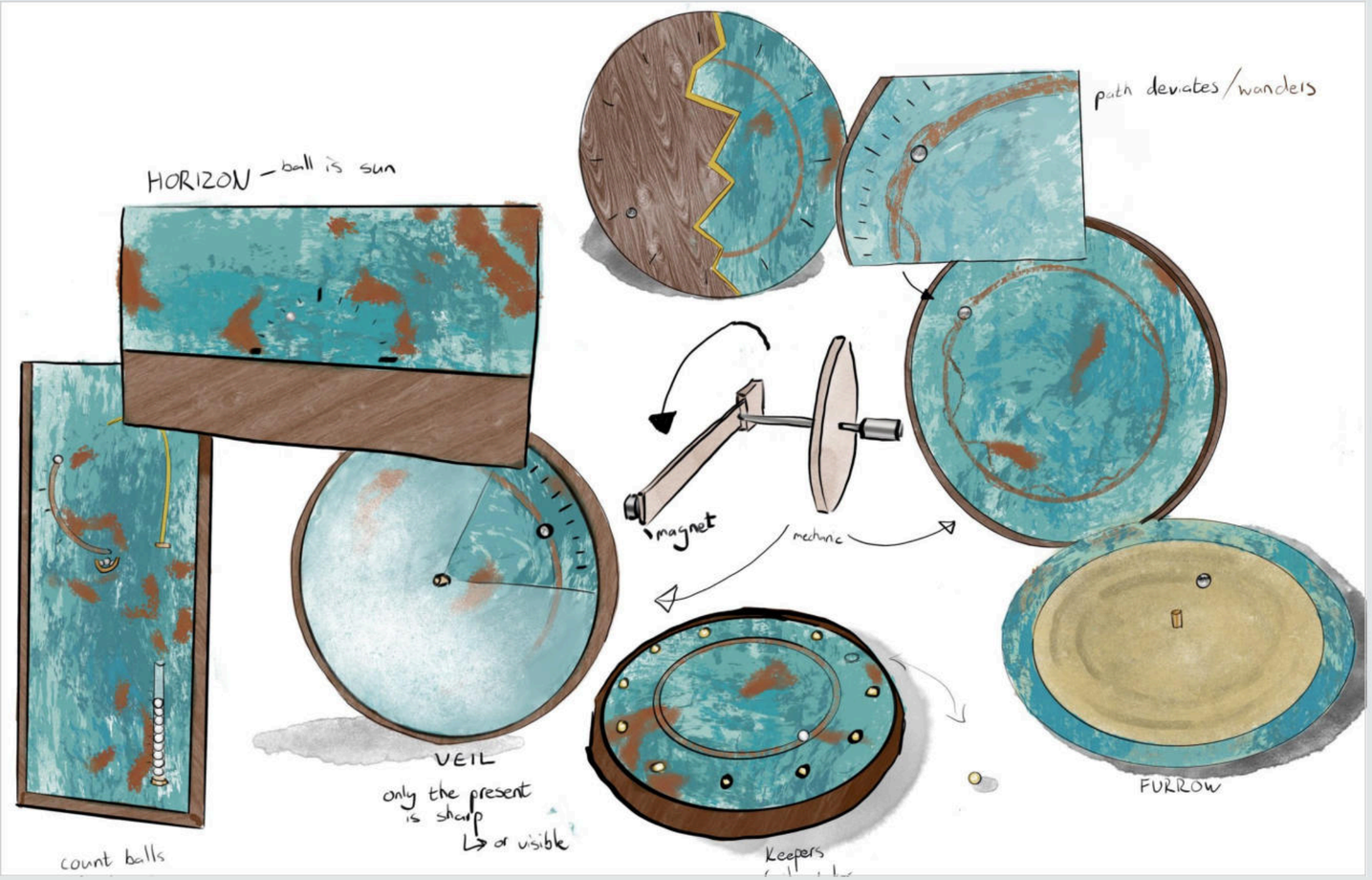
SKETCH IDEATION SHEET 1



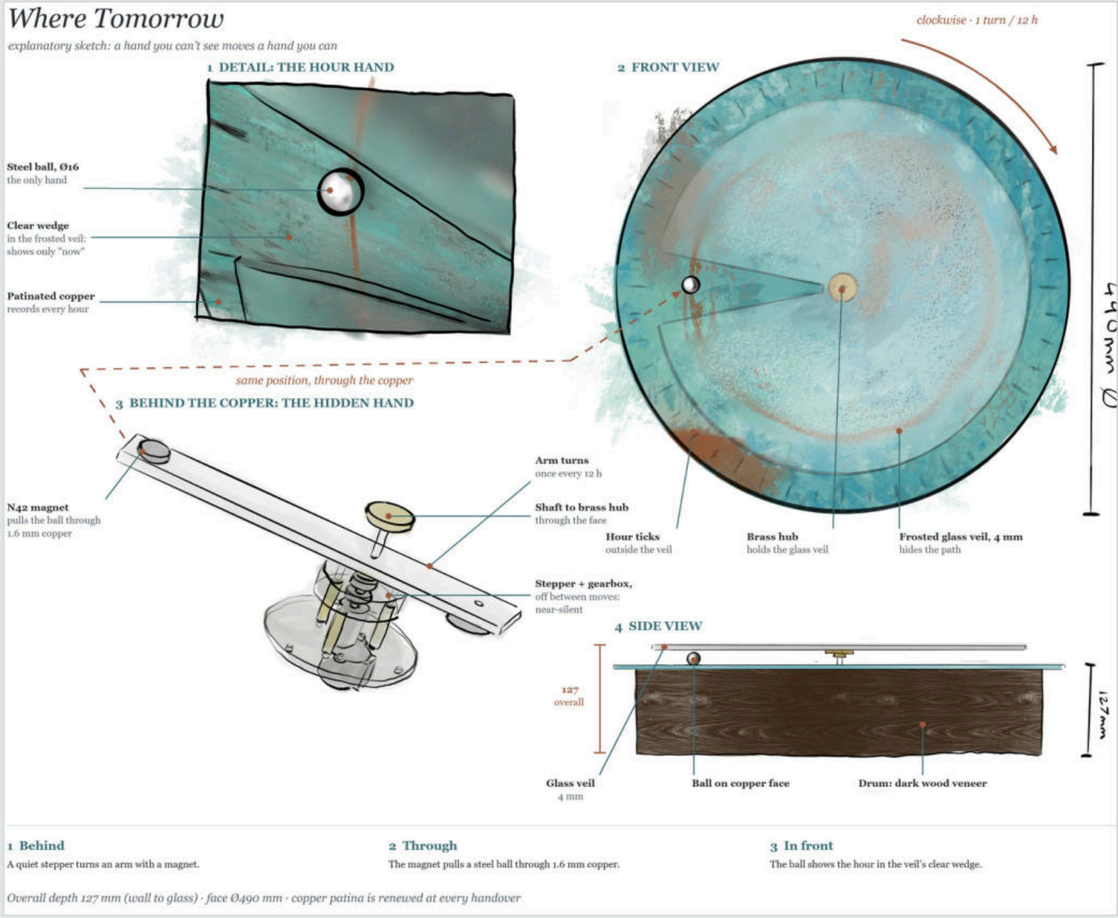
SKETCH IDEATION SHEET 2

THE VEIL WON

Horizon: the ball rises and sets like the sun. Count Balls: the hour is the number of balls collected. Keepers: family members keep a ball each. A Zen garden gave the polished path. The Veil went further: it hides the past and the future, and focuses on the present.



SKETCH BODIES AND FACES EXPLORED



SKETCH EXPLANATORY SKETCH: BALL IN THE WEDGE; ARM, MAGNET AND COUNTERWEIGHT BEHIND

TESTED, THEN CHANGED

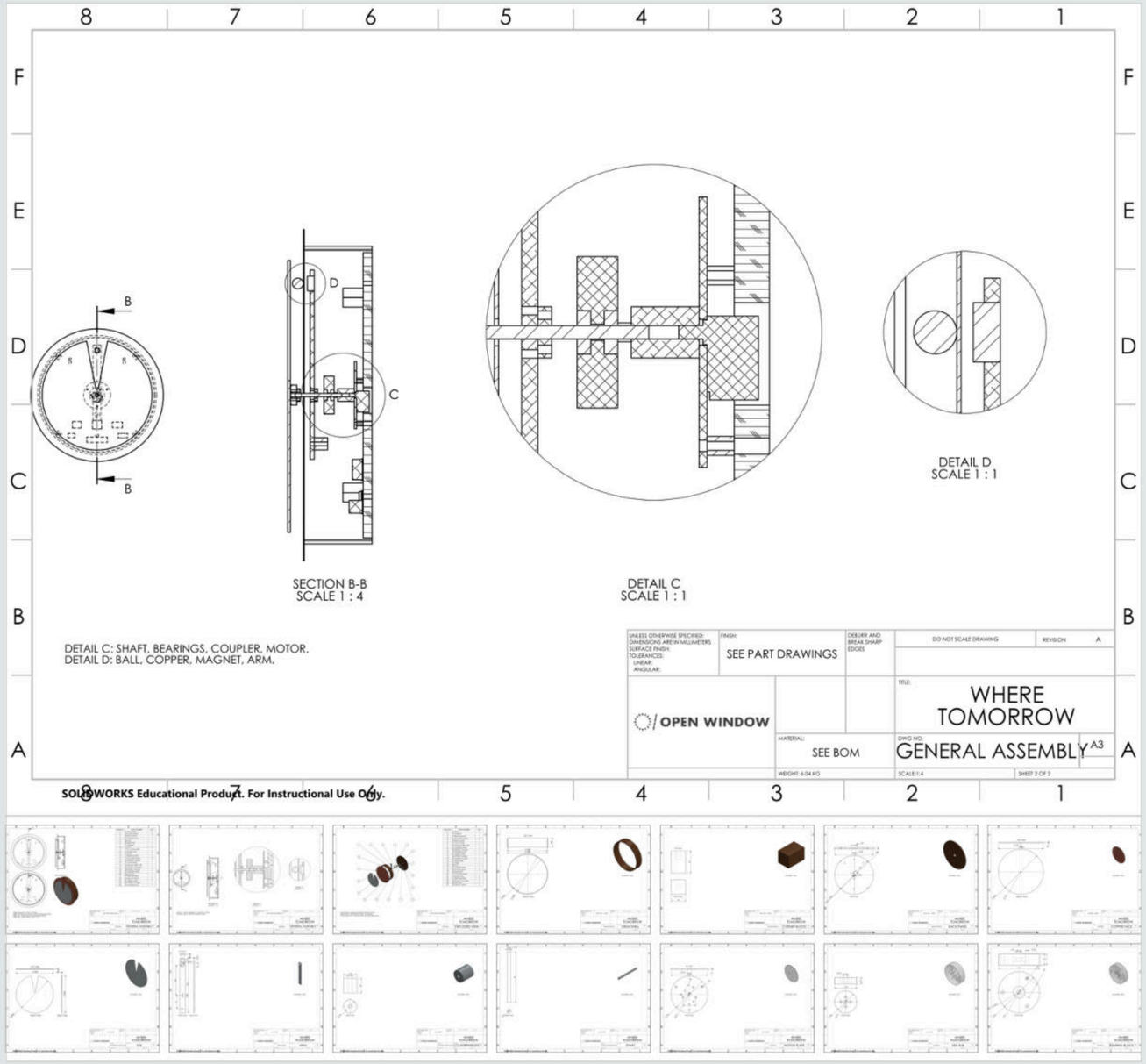
TRIED	FOUND	CHANGED TO
Quartz movement	Failed its stall test	**28BYJ-48 stepper, DS3231 clock chip**
Acrylic veil	Looked cheap for an heirloom	**4 mm extra-white glass, satin-etched**
30° wedge	Narrowed	**22° clear wedge**
Veneered drum, 4 × 1.5 mm	Dropped	**3 × 2 mm blackwood, oiled**
Third ply bent dry	Cracked	**Steamed 10 min, then glued**
Epoxy on the copper	Let go after about 1 h	**Re-glued under weight; held**



RENDER SIDE VIEW: THE COPPER FLOATS OFF THE DRUM

14 AS-BUILT SHEETS

FACE	Ø490 × 1.6 mm copper, fumed, waxed
DRUM	Ø440 × 100 mm blackwood, three plies
VEIL	Ø406 × 4 mm glass, 22° wedge
HAND	Ø16 steel ball, N42 magnet behind
DRIVE	28BYJ-48, ULN2003, DS3231, 625ZZ
POWER	18650 cell, TP4056, boost to 5 V
MASS	6.5 kg



DRAWING SECTION SHEET, WITH ALL 14 AS-BUILT A3 SHEETS BELOW

BENT, FUMED, SCRIBED, BY HAND

New method: bent lamination. Three plies, Ø428 mm former.



PHOTO BLACKWOOD PLY BENT ROUND A LASER-CUT FORMER

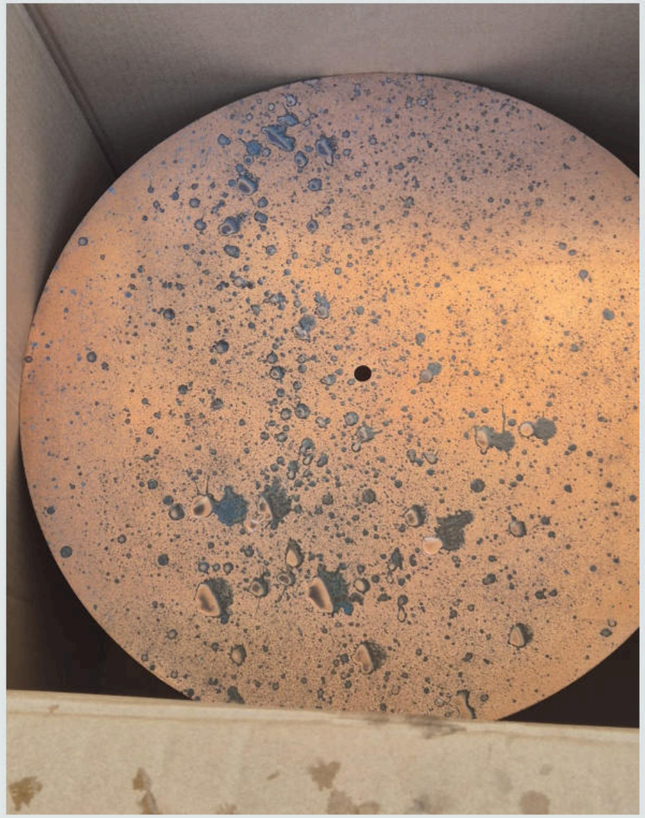


PHOTO COPPER AFTER AMMONIA FUMING



PHOTO TICK TEMPLATE ON THE FACE



PHOTO COPPER BONDED TO THE DRUM

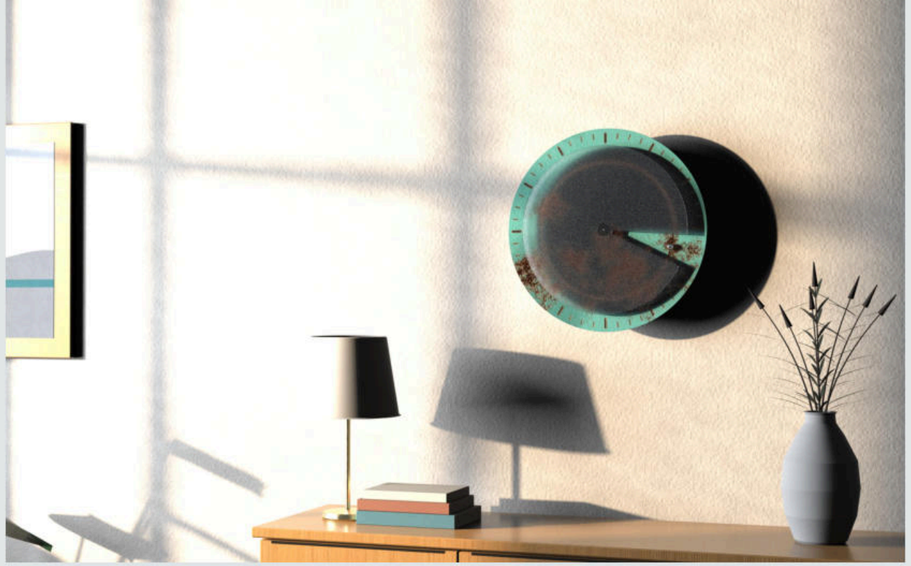
ONLY THE PRESENT IS SHARP



PHOTO THE BALL IN THE CLEAR WEDGE, FINISHED CLOCK

ONE CLOCK, ONE DAY

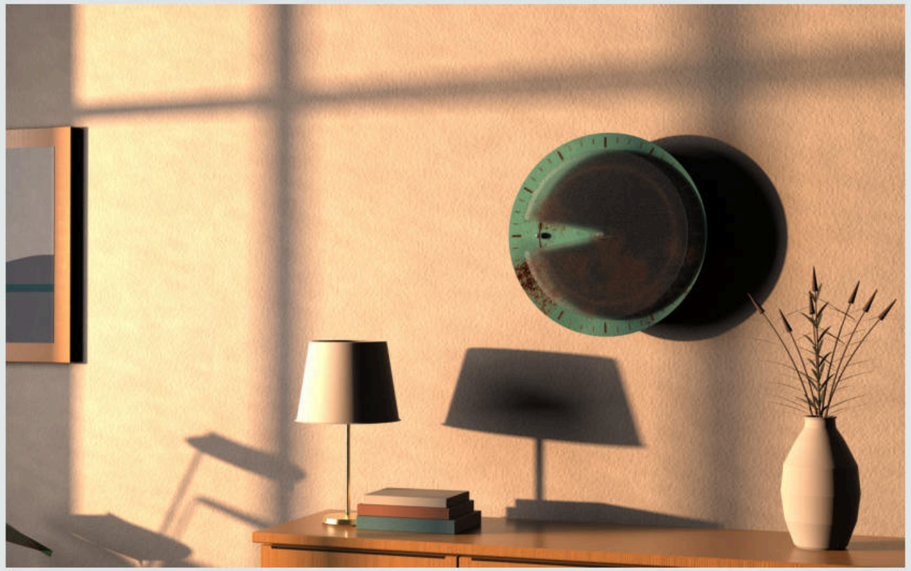
Same wall, same camera. The ball moves; the light moves. Part of the promo film. Renders of the design model; the built clock is in the photographs.



RENDER 07:20



RENDER 13:40

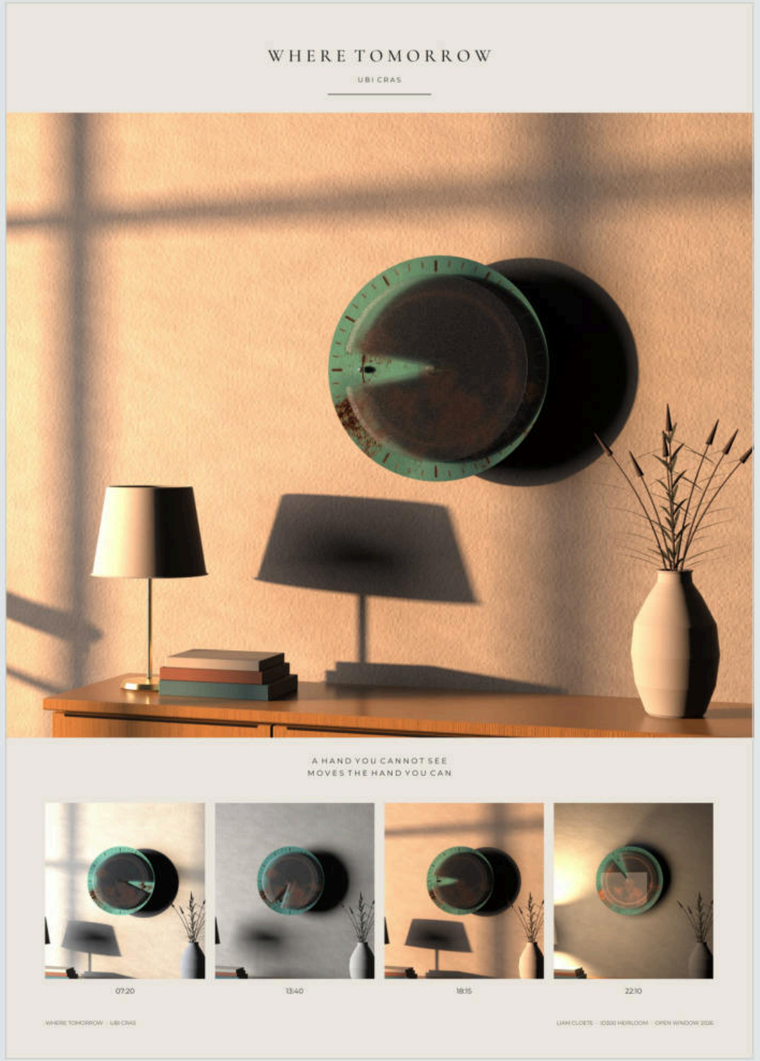


RENDER 18:15

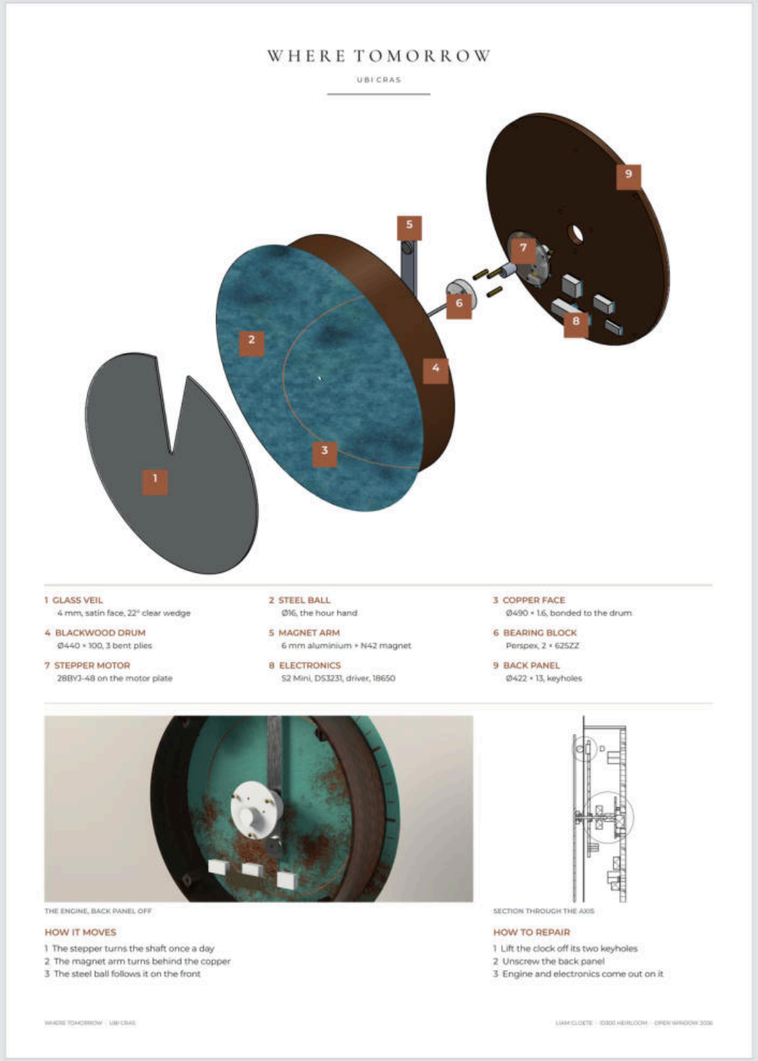


RENDER 22:10

DESIGNED TO LOOK OLDER EVERY YEAR



POSTER THE PASSAGE OF TIME



POSTER THE HIDDEN MECHANISM



POSTER WHERE TOMORROW

A CLOCK THAT RECORDS

WEAR IS THE POINT.

CRITICAL

Test the riskiest part first

A drawn size is not a cut size

Keep calculated and measured apart

NEXT

Reading test with 3 to 5 people at 3 m

Homing sensor, so a stall corrects itself

Handover kit: tick template, fuming notes, keeper's record

Parts in the clock R4,256.77 · total spent R6,335.11, including the failed quartz movement, spares and tests



Year 1

A faint thread.



Year 10

A polished path.



Year 25

A burnished ring.

ENTREPRENEURIAL PRODUCT SOLUTIONS

An ultralight stainless-steel platform for gas-canister stoves, by the student brand Dead Reckon. Group project, document only, not presented.

SOLUTION	Folding stove stand
MATERIAL	304 stainless steel, 3 mm
ROLE	Concept developer in a team of five: concepts, moodboards, colouring, logo design, and some photography with Josh Brand
YEAR	2026 · Term 1 · 5K Project

ARGO MULTISTAND



PHOTO LEGS SPREAD

NAVIGATE WITHOUT CERTAINTY

Flimsy plastic stands fail on rugged Cape terrain.

8

hikers interviewed by the team

4–100

units the brief allows in the run

R5,000

minimum group profit

3 + 3

materials and processes, maximum

Frame: a buy-once alternative to plastic stands and heavy alloy.

PHOTO UNDER A CANISTER



THE GEOMETRY DOES THE WORK

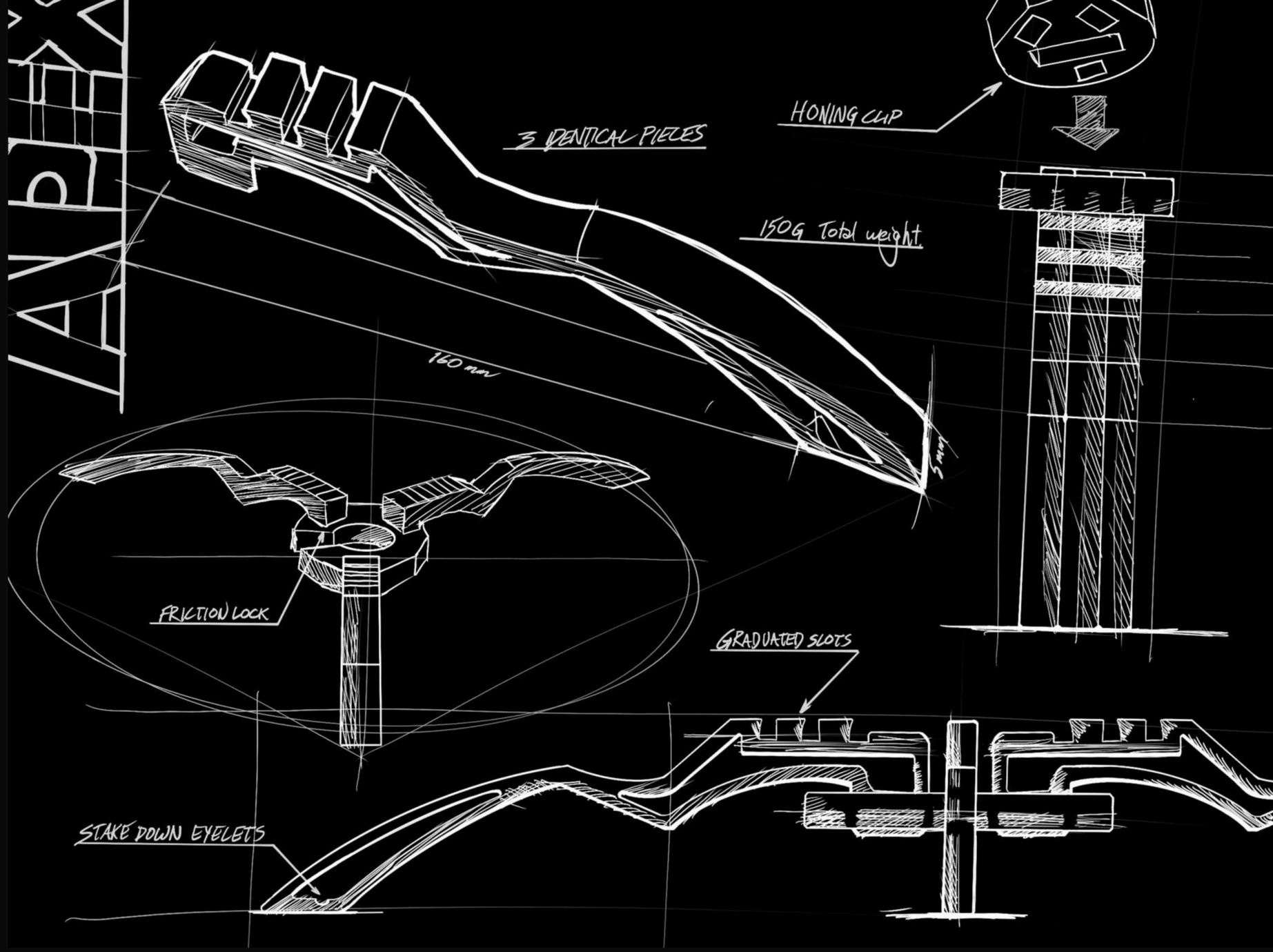
Graduated slots sized for MSR, Snow Peak and Jetboil threads

Stake-in eyelets for wind

Edges double as a ferro-rod striker

Legs fold flat on one pivot

Works with cold hands



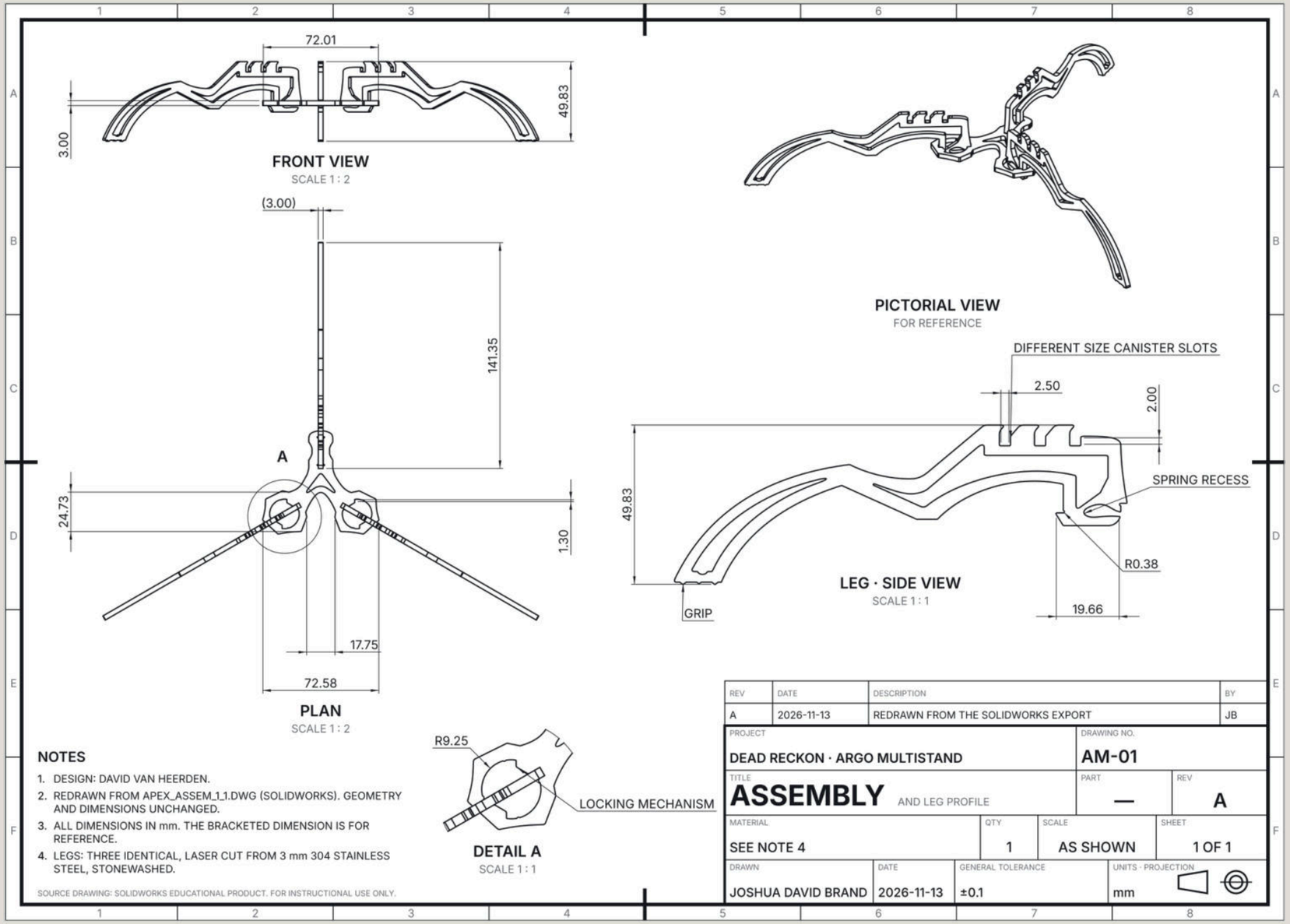
SKETCH CONCEPT SHEET (APEX, THE WORKING NAME). WEIGHTS ON THE SHEET ARE EARLY TARGETS

WHAT STEEL TAUGHT THE DESIGN

TRIED	FOUND	CHANGED TO
Stopper and dimple	Steel shears; PLA springs	**Welded M12 washers, locking pin**
5 mm steel	Far too heavy	**3 mm**
316 stainless	Cost and supply	**304 stainless**
SolidWorks DXF	Open contours rejected	**Paths closed in Illustrator**
Ferric etch	Uneven	**Home-built stonewash tumbler, ceramic media**



PROTOTYPE STAINLESS STEEL PROTOTYPE LEG IN THE FERRIC SOLUTION



DRAWING AM-01 ASSEMBLY DRAWING: DRAWN BY JOSH BRAND, DESIGN BY DAVID VAN HEERDEN

DRAWN FOR THE LASER

PARTS	Hub, three legs, M12 washers, rivets, pin
PROCESS	Fibre laser, drill press, TIG weld
FINISH	Stonewashed in ceramic media, matte
FITS	MSR, Snow Peak, Jetboil
MASS	210 g
LOAD	Tested to 40 kg

FROM SCREEN TO TOOL IN HAND

A lean run of 19 units to optimise material yield.



PHOTO TIG WELDING



PHOTO FINISHING TRIALS

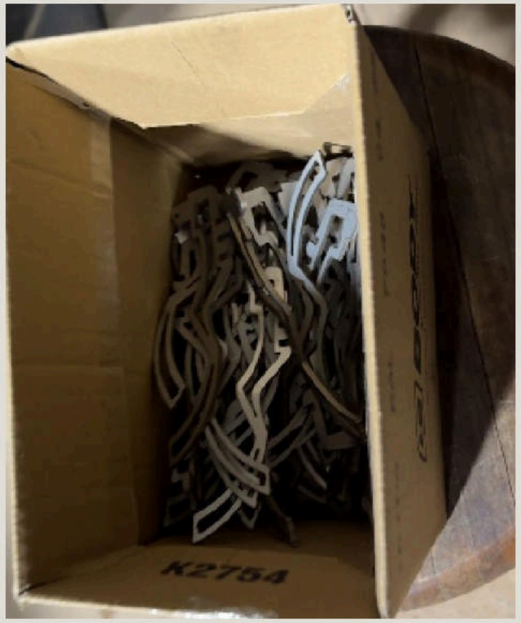


PHOTO LASER-CUT BATCH

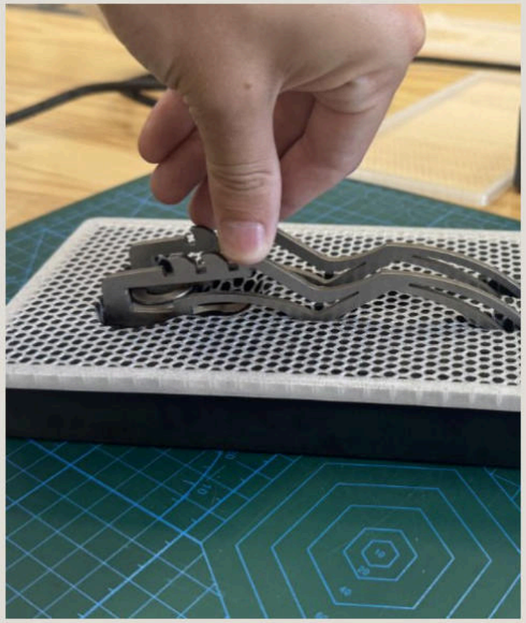


PHOTO FIT CHECK

THREE UNITS TO BREAK EVEN

R173.23

variable cost a unit:
laser and steel R84.34,
packaging R88.89

R499

retail, direct online

R325.77

contribution a unit

R941

fixed: stonewash R521,
marketing R300,
prototypes R120

19-unit run: projected net profit R5,249.63. Team costing, April 2026; labour, the tumbler build, website and ads are not itemised.



PHOTO TOP VIEW, LEGS SPREAD

IN THE CAPE WILDERNESS



PHOTO STUDIO, THREE-QUARTER

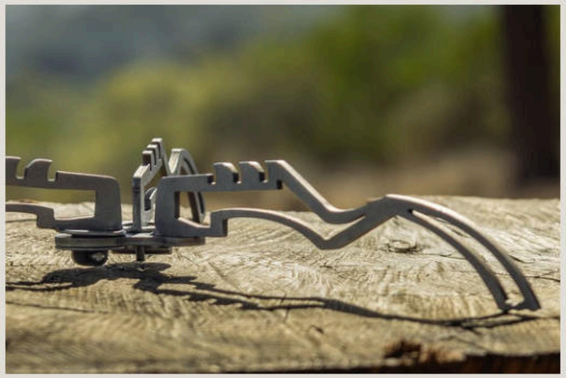


PHOTO ON A WEATHERED STUMP



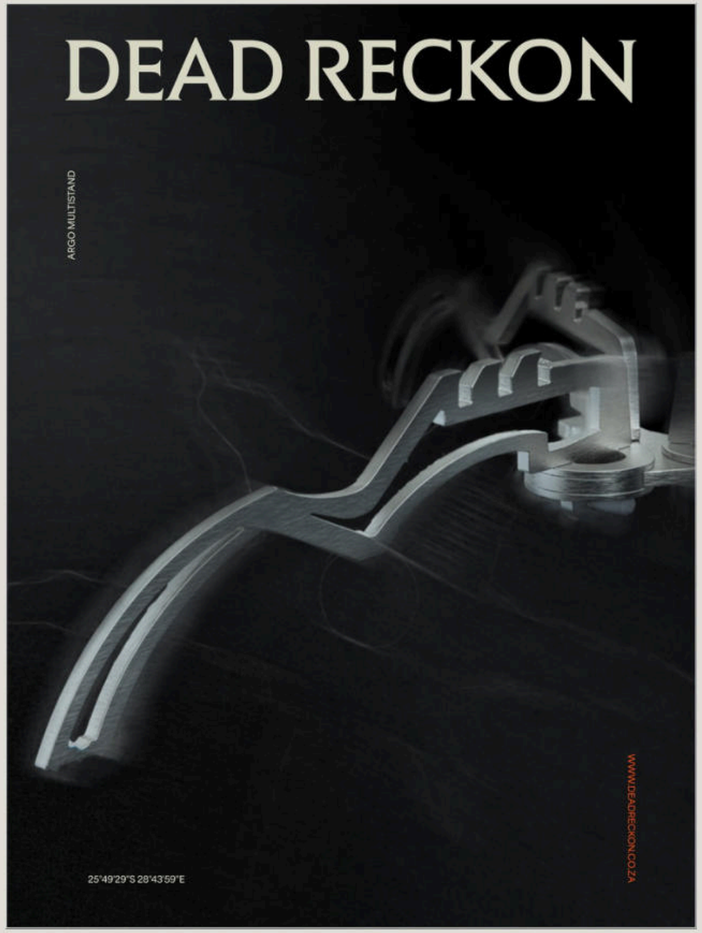
PHOTO BESIDE STOVE AND POT



PHOTO FOLDED FLAT

DEAD RECKON

Technical field gear: understated pieces for the South African backcountry.



POSTER LAUNCH POSTER

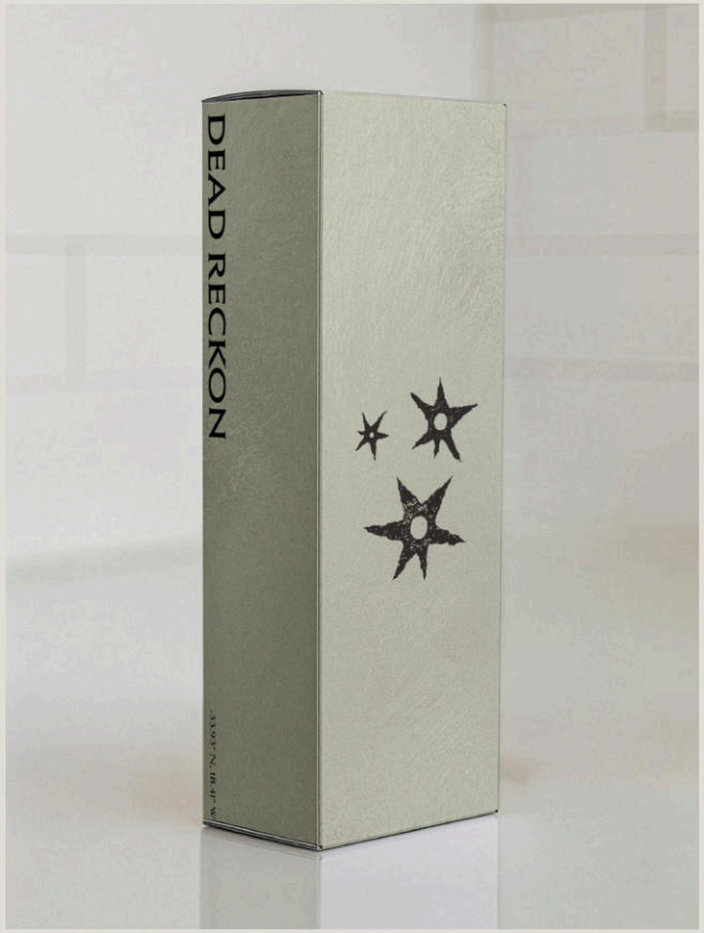
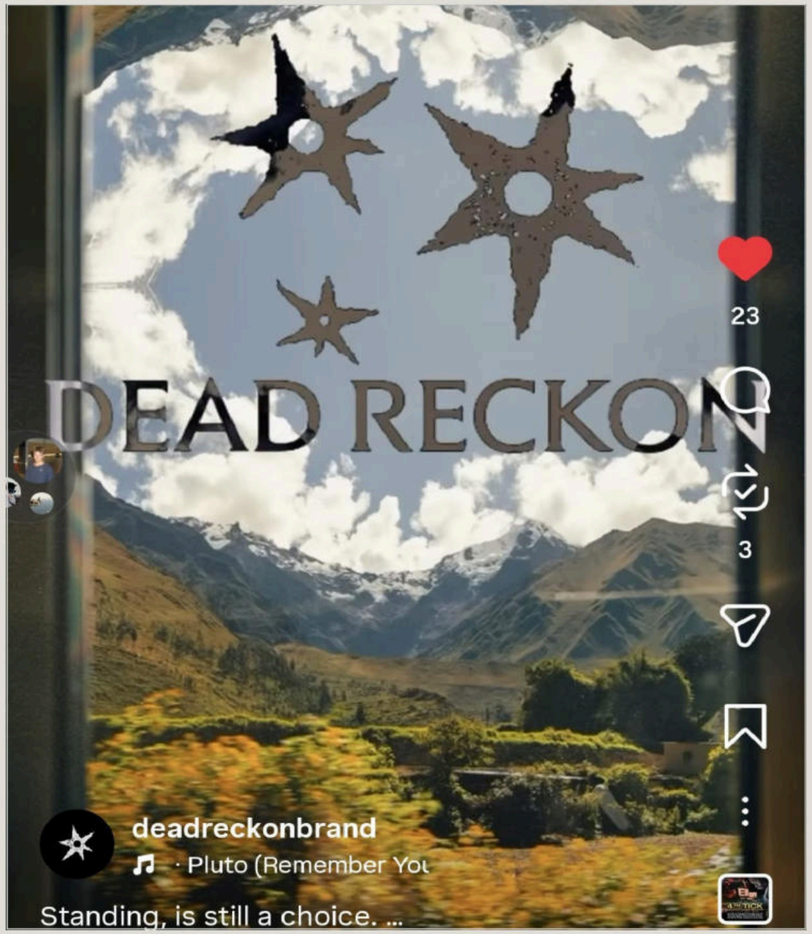


PHOTO PACKAGING



SOCIAL INSTAGRAM ROLLOUT

HONEST, FUNCTIONAL, RELIABLE

A SERIOUS PIECE OF KIT, NOT A SEASÓN'S THROWAWAY.

CRITICAL

Steel behaves nothing like PLA

Costing moved with every quote

Every checkpoint slipped

NEXT

First stands sold (fewer than ten): sell the rest of the 19-unit run

Field feedback from those owners before a second batch

PHOTO ARGO MULTISTAND, FOLDED



LIAM CLOETE



liamcloete.com

THANK YOU

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