



CORKSI

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Camel in the City Design Studio

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INTRODUCTION



Corksi is a **modular furniture system** for preschool classrooms. It allows for the creation of a more **natural and welcoming learning environment** through the **warmth and soft feel of cork**. Children can easily **rearrange** the **lightweight** design to suit the classroom activity.

Point of Entry

Current furnishing standards tend to neglect the comfort level of students. I recognized the opportunity to enhance the early education setting through improving how comfortable students are when using the products, as well as how the furniture pieces affect the classroom environment.

Goal:

I will be designing a modular seating object for children. This design will change the way users interact with their space by allowing for the opportunity to create an appropriate seating arrangement.

Preliminary Design Criteria

Hygiene

Ability to be stored away

Must be able to withstand the weight of a child

Strong

Durable

Ability to be moved easily

Lightweight

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Education

Education Models

Through comparing various education models, as well as conducting interviews, the general consensus was that schools believe their students should be active learners and that they thrive when completing hands-on activities.

These schools foster a well-organized, supporting, natural environment, that encourage the children to explore their surroundings.

Bank Street Model

Views child as an **active learner** and **gains knowledge about the world through experience.** Students set the learning pace, and the teacher serves as a guide.

Comparable to play-based learning, the approach teaches lessons through **hands-on activities.**

HighScope Model

Children learn actively by having **hands-on experiences with their surroundings,** and learning is supported through **consistent daily routines and well-organized classrooms.**

Montessori Model

Emphasizes nature, creativity, and **hands-on** learning with gentle guidance provided by the teachers.

The goal of the method is to develop a child's senses, character, practical life skills, and academic ability.

Parent Co-Ops Model

Parents are actively involved with their child's education on a daily basis and work closely with the classroom teachers.

Hands-on approach allows parents and children to learn together in a **nurturing environment**. Focus is on teaching preschoolers **how to cooperate** and resolve conflicts.

Reggio Emilia Model

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Open-ended and child-led education model that **encourages exploration** and focuses on the importance of community and self-expression.

Kids learn through art, projects, and other **hands-on activities** that reflect their ideas and interests.

Waldorf Model

Strives to nurture a child's spirit, soul, and body and to focus on the child's interests.

Involves creative, **hands-on group learning** with a focus on rhythmic repetition in a **supportive environment**.

This approach strives to generate a strong inner enthusiasm for learning and develop children's innate abilities and talents.

Expert Interview Anita Bushell



Anita Bushell is an early childhood educator who has been on the faculty of Plymouth Church School since 2005. She is also a writer and has been published in the Ford Foundation Report, Plymouth Press, and Uncensored.

What are your feelings on current or past classroom furniture?

- Too cluttered
- Way too heavy
- Kids should be able to lift their own chair

How often is the layout of the class changed?

- Sometimes before the class starts
- Although, modular system could be an activity carried out with kids later on in the year after they start trusting teacher
- Doesn't want the room to be static

Do you follow an education model?

- Getting away from closed curriculum
- Focused on gross motor work
- Curiosity valued

What kind of activities are carried out?

- Playing with blocks
- Eating
- Cooking
- Painting
- Drawing
- Drama play
- Reading
- Singing

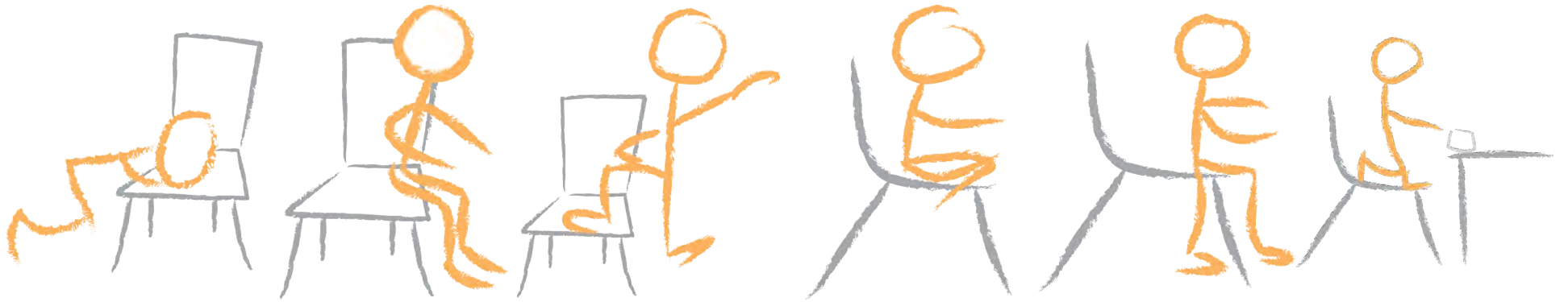
Viewpoint on color in classroom

- After visit of a Waldorf school: getting rid of all plastic and colored items because it's too overwhelming for the kids
- Neutral tones are preferred
- Color comes from artwork
- Mimic nature

Any needs or consideration?

- Weight
- Kids love small spaces
- They crawl under things
- Don't sit still for too long
- Some form of movement
- Need kids chair that rocks
- Kids don't have boundaries
- Often shift seating position
- Adults use the furniture too
- Kids may explore pieces further than expected
- Both group work and individual work are carried out

Observation



User Profile

Corksi is targeted towards schools that follow education models such as Montessori, Reggio Emilia, and Bank Street.

This iteration of Corksi is designed for preschool students aged three to five years old.

**Market
Research**

3

Existing Furniture Observation

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-**“Natural”** furniture does not have to have a rigid design.

-Current classroom furniture that fall into the **“fun”** category do so because of their use of color and not how the pieces interact with the user.



-**Modular** classroom furniture typically achieve their modularity through the design of their table. The modularity in these tables refer to how the pieces can fit together, rather than having different functionality.

Existing Furniture Type



Stack Chairs

-Easily stack one on top of the other.

Making it easy to store them.

-Stack on top of desks.

Allowing easy cleaning of classroom floors.

-Come in a variety of materials including polypropylene, steel, and solid hardwood .

-Feature glides that prevent scratches on school floors.



Ladder Back Chairs

-Commonly found in libraries.

-Typically constructed of solid hardwood.

-Generally do not stack.

-Too heavy at an average of 20 pounds.



Rocking Chairs

-Provide a great place to read a book or relax between lessons.

-Made of solid hardwood as well as polypropylene and steel.

-Come with and without arms.

-Typically used in the reading area of classroom.

Existing Furniture Material



Hardwood

- Heavy
- Durable chairs
- Long life
- Can support a lot of weight

Plastic

- Most preschool stack chairs have an easy-to-clean plastic seat
- Polypropylene, polyethylene or plastic resin.
- Lightweight
- Durable
- Long life
- Polypropylene flexes as students move in their seats, improving comfort. Plastic resin flexes less, but its rigidity provides increased durability.
- Most plastic seats feature tubular steel legs.
 - Steel legs provide durable structure and long-lasting support.
 - Most steel legs also feature coatings for enhanced durability and rust prevention.



Ergonomics Average Chair Dimensions

Width (Inches)	Depth (Inches)
10.25	10
12	10.5
13	11
13.5	12
3.125	13.125
13.75	13

School Chair Seat Height by Grade Level

75 % of preschool (3-5 yrs) 9" - 11.5"

25 % of preschool (3-5 yrs) 12"- 13"

Ergonomics Average Table Dimensions

Width (Inches)	Depth (Inches)	Height (Inches)
24	24	18
24	48	15-23
24	36	18
24	48	18
28	28	12
30	48	18
30	60	12-24
36	60	18
36	72	18

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Materiality

“Forging connections with nature to improve health and wellbeing in the built environment” Terrapin Bright Green

Biophilic Design

Edward O. Wilson hypothesized that **humans possess an innate tendency to seek connections with nature and other forms of life.** The biophilia hypothesis suggests we need nature in a deep and fundamental fashion. But, when looking at designed our spaces we see designs that both degrade the environment and alienate us from nature.

Biophilic design provides an advantage over conventional design practices by recognizing the scientific evidence **connecting human biology and high performance design.**

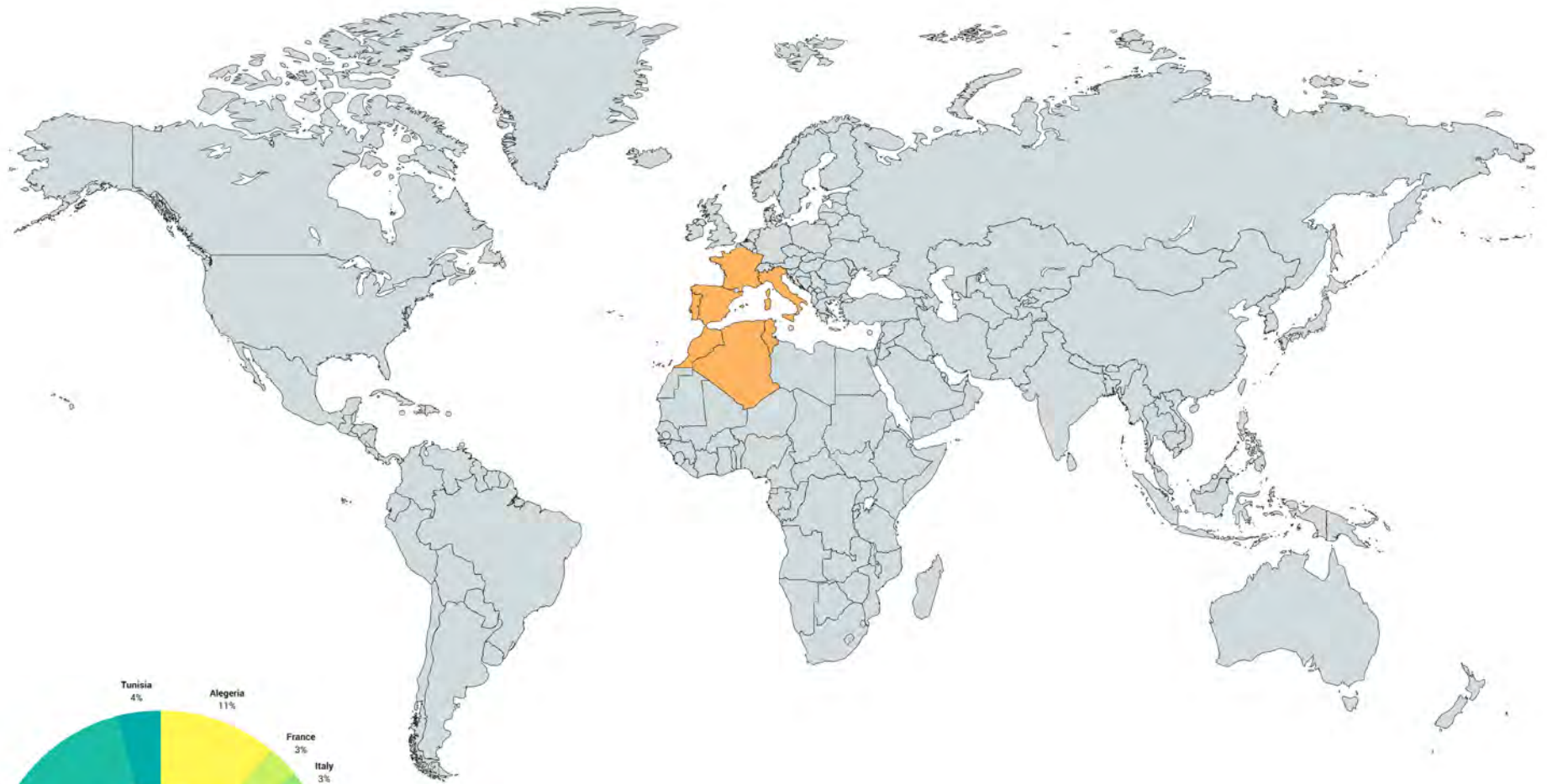
Biophilic design has quantifiable health and wellbeing benefits. Designs that speak to our relationship with nature have lead to **improved student test scores**, faster patient recovery rates, and **higher worker productivity.**

Suitability

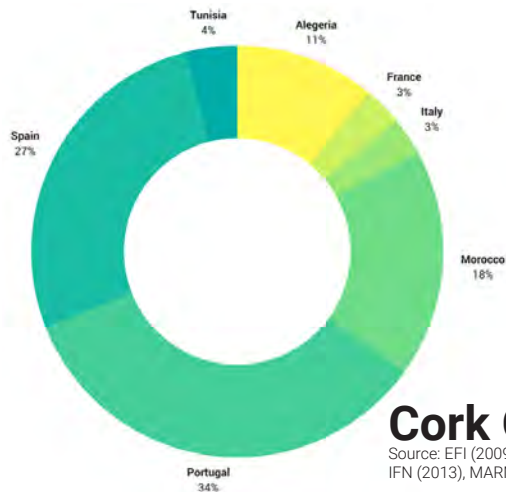
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- 100% natural
- Flexible
- High abrasion resistant
- Hypoallergenic
- Water repellent
- Lightweight
- Moisture proof
- Resilient
- Shock absorbent
- Soft touch
- Thermal effective
- Warm feeling

Cork Production



Created with mapchart.net



Cork Oak Forest Area

Source: EFI (2009), IM Liege(2005), FAO (2005), HCEF Marroc (2011), IFN (2013), MARM (2007), Ben Jamaa (2011)

Mediterranean Basin

Cork oak trees are found in the Mediterranean Basin (Algeria, France, Italy, Morocco, Portugal, Spain, & Tunisia). After its harvest and preparation, the cork is shipped throughout the world.

“Cork is an ecological and sustainable material 100% natural,
renewable, recyclable, and reusable”

Amorim, Leading Cork Manufacturer

Cork Oak & the Environment

- Prevents soil degradation
- Increases soil productivity
- Regulates the water cycle
- Fights desertification
- Provides retention and storage of carbon for very long period of time
- Combats climate change
- Generates high rates of biodiversity
- Cork Oak is protected: Measure of production leads to no over harvesting risk

Cork Oak & Humans

- Creates employment and wealth in the Western Mediterranean Basin
- No negative health impact on harvesters

“Nothing is lost, everything is transformed”

Amorim, Leading Cork Manufacturer

Green Cork Project

A recycling program created in 2008 through a partnership between cork manufacturer Amorim, and the Portuguese environmental association, Quercus. They're goal was to promote recycling cork stoppers in Portugal, as a result of the success of the program other countries such as France, USA, and Italy, have implemented similar programs.

The cork stoppers are grounded down and the resulting granules are used in new applications ranging from insulation to various consumer goods; essentially raising public awareness towards “the environmental advantages of cork products in supporting an ecosystem with unique characteristics”.

Through this project they were able to extend the CO₂ retention period that is typically associated with cork stoppers as well as planting trees that are native to Portuguese woodlands ; enhancing the biodiversity of the country's rich ecosystem.

Cork & Energy

Amorim uses biomass (cork dust) to meet over 60% of it's energy needs with some of their industrial units drawing 93% of from this form of energy.

Composite Cork

Off cuts from virgin cork production, that can't be used for cork stopper production, along with off cuts from other production lines are ground up and processed with any additional granules to form composite cork that can be used in multiple fields such as fashion, furniture, and transportation.

Durability



Durability



Cork is extremely durable and has a high friction coefficient, so will survive repeated impact or rubbing extremely well.

I left a small table with a cork top in a preschool classroom for two weeks to see just how durable the material is when being used by children completing multiple activities.

Design

Development

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Updated Design Criteria

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Limited use of color

Ability to be stored away

Hygiene

Monomaterial

Must be able to withstand the weight of a child and adult

Durable

No Plastic

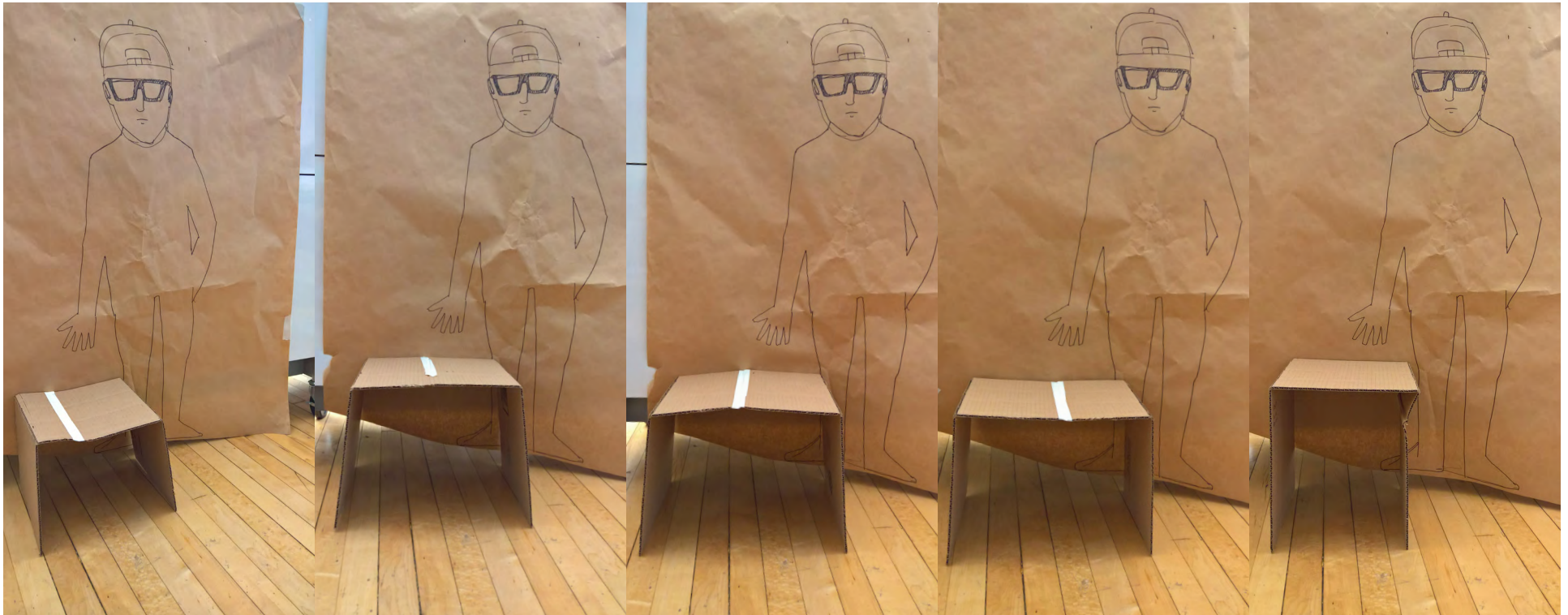
Strong

Ability to be moved easily
By both adult and children

Lightweight

Natural material

Exploration Scale



Depth 9"
Height 10"
Width 10"

Depth 12"
Height 10.5"
Width 12"

Depth 12"
Height 10"
Width 13"

Depth 10"
Height 10"
Width 13"

Depth 10"
Height 11.5"
Width 10"

Exploration Scale



Depth 11"
Height 11"
Width 13"

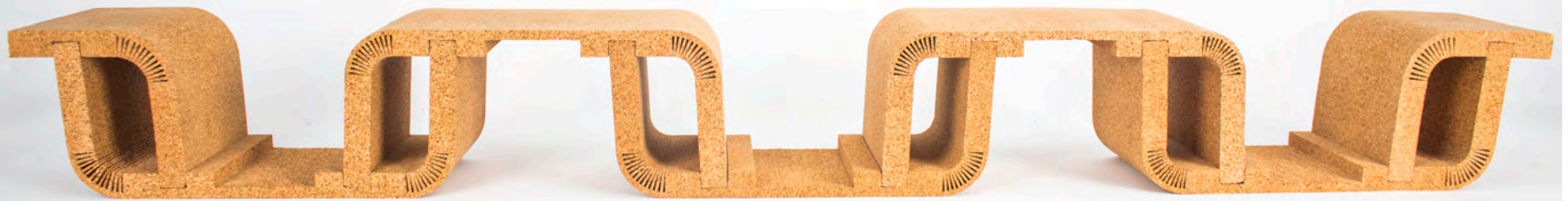
Depth 12"
Height 10.5"
Width 13.25"

Depth 10"
Height 10"
Width 12"

Depth 12"
Height 12"
Width 12"

Depth 15.25"
Height 11.75"
Width 14.5"

Exploration of scale in relation with the average dimensions of a preschooler, drawn from The Measure of Man and Woman.



Inspiration

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Kerf is a modular tabletop shelving system that utilizes the natural flexibility of cork and the kerf-cutting process to achieve its form. The system comprises of two units that allows the user to build it out both horizontally and vertically to suit their particular needs.

Materials: Cork

Dimensions: 6.0"W x 1.0"H X 24.0"L
(6.0"W x 5.50"H x 14.0"L)

6.0"W x 1.0"H X 10.5"L
(6.0"W x 5.50"H x 4.75"L)



Exploration Form



Exploration Kerfing

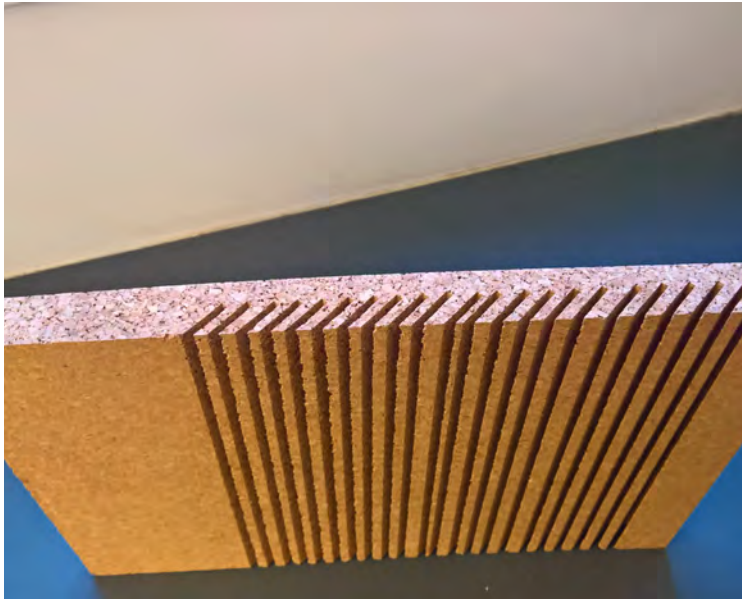
I saw an opportunity to adapt the design of my previous product (Kerf) for this project.

The main issue, however, that rose with the original project was the eventual cracking of the cork in the area where the kerf cuts were made.

A large portion of my exploration was focused on trying to solve this problem.

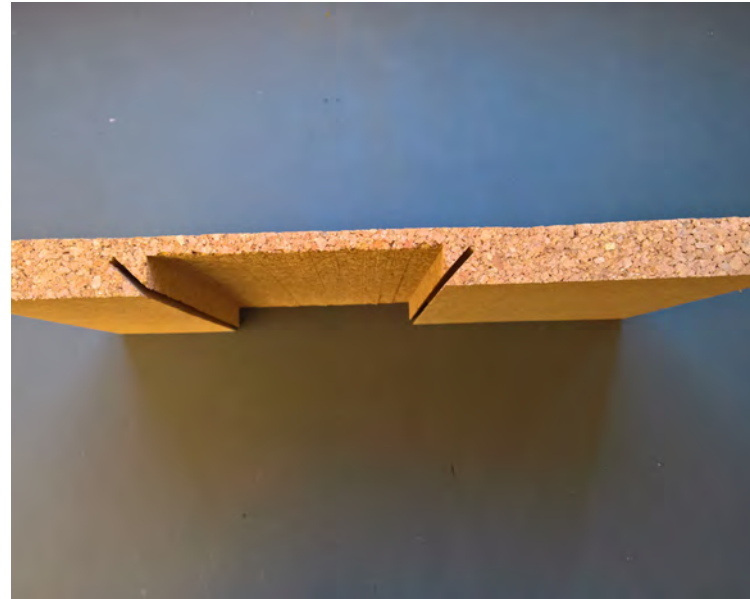
I experimented with both the type of kerf cuts as well as adding a secondary material.

Exploration Kerfing



Angled Kerf Cuts

Bends nicely, but number of cuts required to achieve the desired angle would require too many cuts.



Spaced

This piece was able to bend to the correct angle, however, it felt too fragile.



Exploration Materiality



Bending Ply
Too stiff, begins to crack. Cannot achieve correct degree of bend.



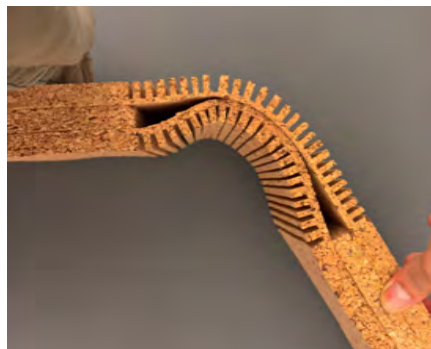
Ecofelt
Best result, however, still does not achieve ideal degree.



Muslin
Although the piece was stiff, it could still bend without breaking.



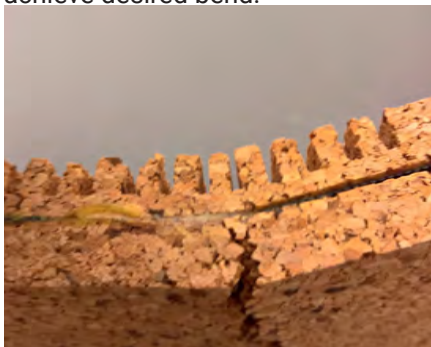
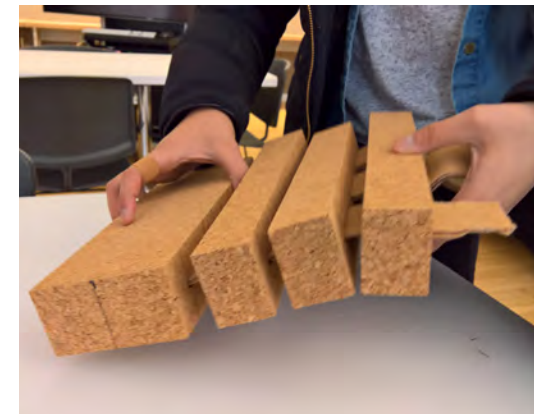
Shade Cloth
Tough to bend – Less stiff than Bending ply. However, cannot achieve desired bend.



Spaced
Can achieve the correct degree. But, this iteration feels too fragile and flimsy to be used for furniture.



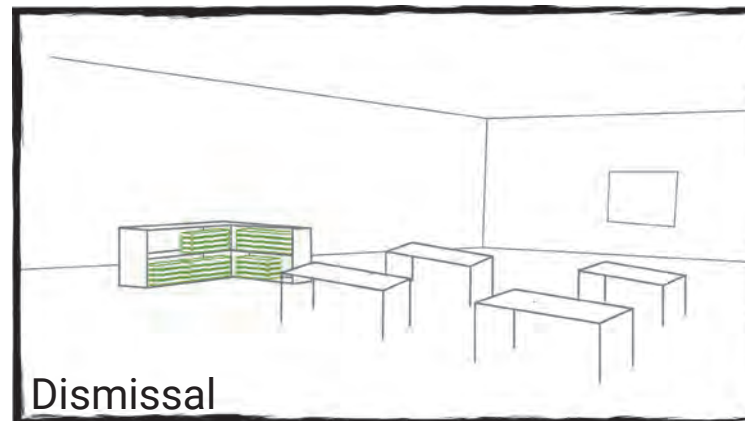
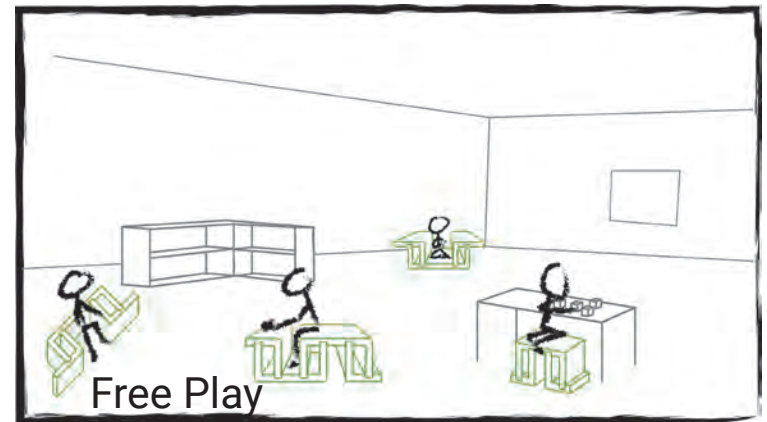
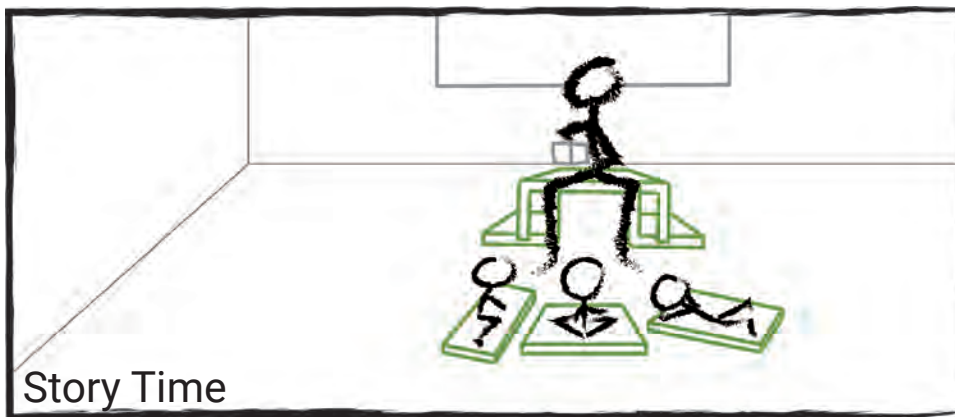
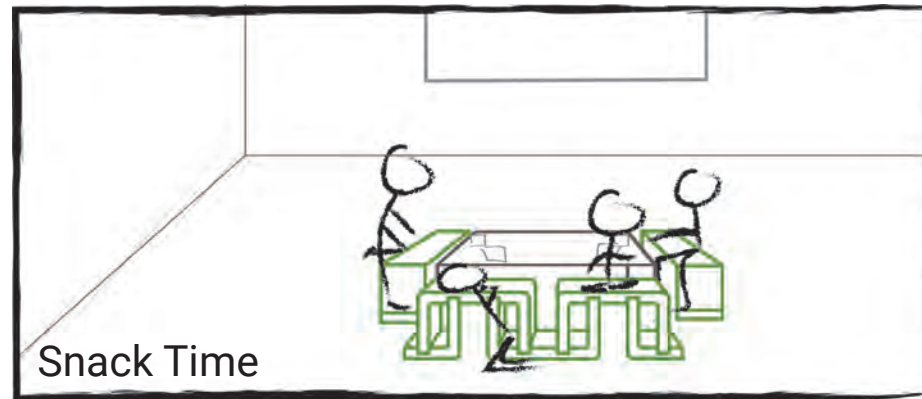
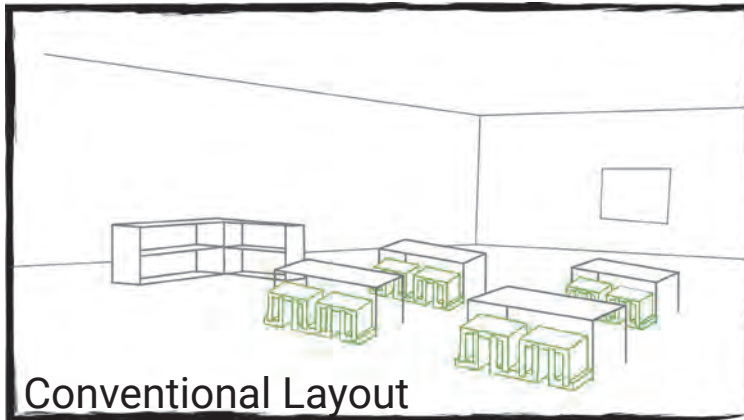
Vellum
Does bend, but is too stiff and begins to crack.



Living Hinge
Threaded felt through blocks of cork in an attempt to create a living hinge. Although this method did work it presented its own concerns: the pieces became too clunky and would at times pull the felt out of place.



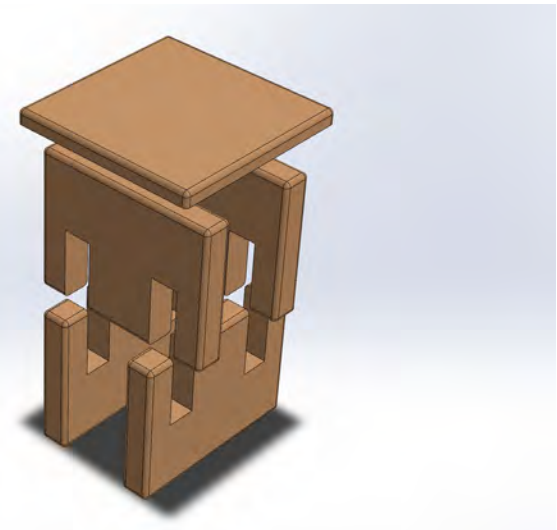
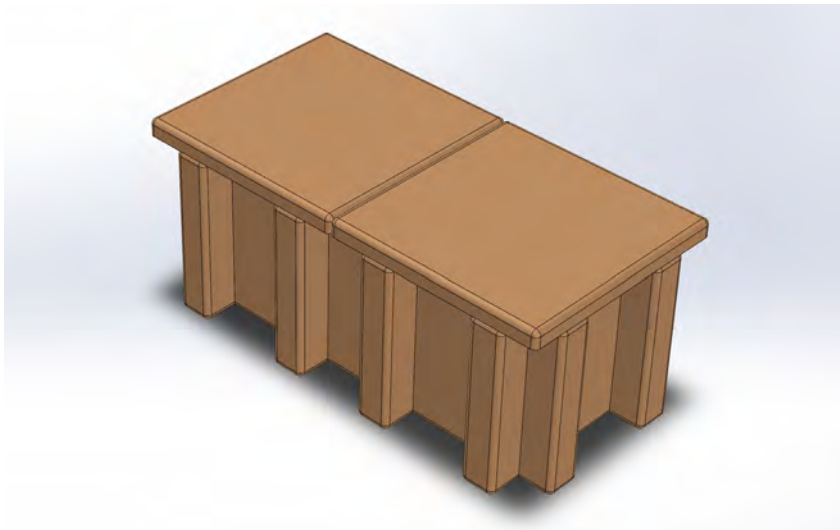
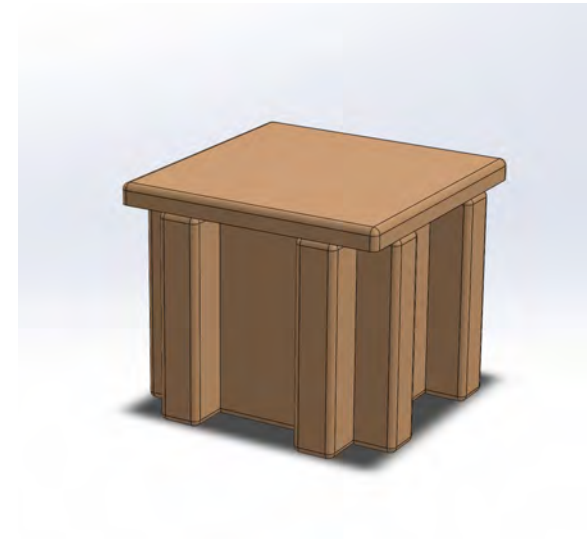
User Scenarios



Form Change

The exploration of kerfing and adding a secondary material reached its limit as it would not work for this type of application.

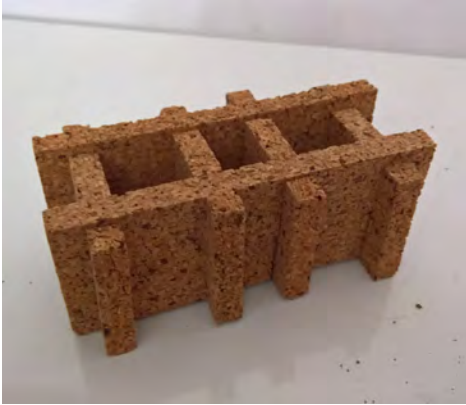
I proceeded with changing the form of the design and how the pieces fit together; drawing inspiration from building blocks.



Form Change User Observation



Form Change Configurations

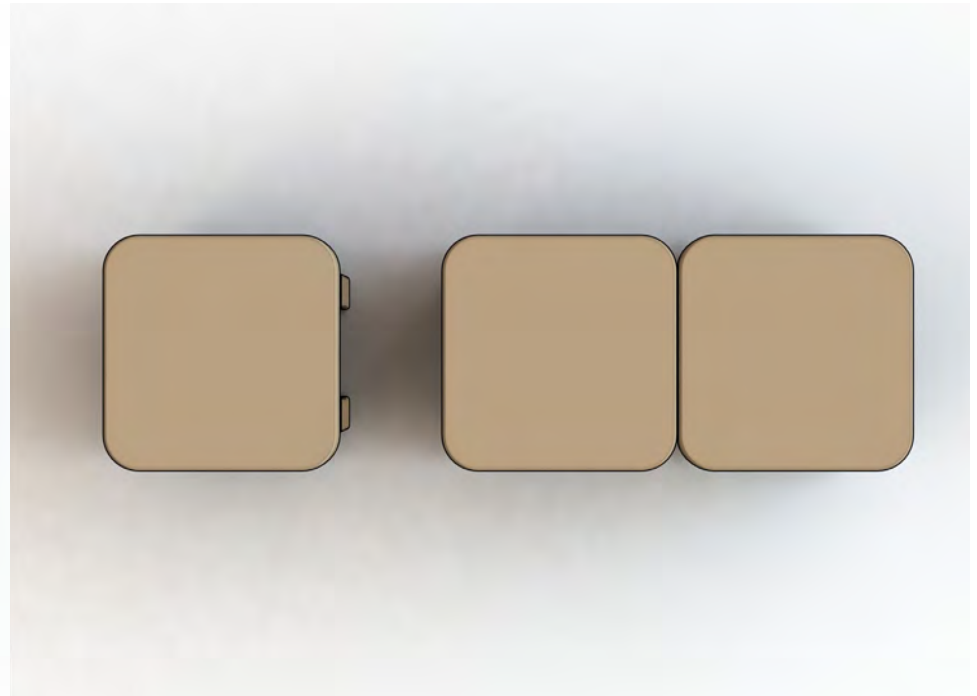
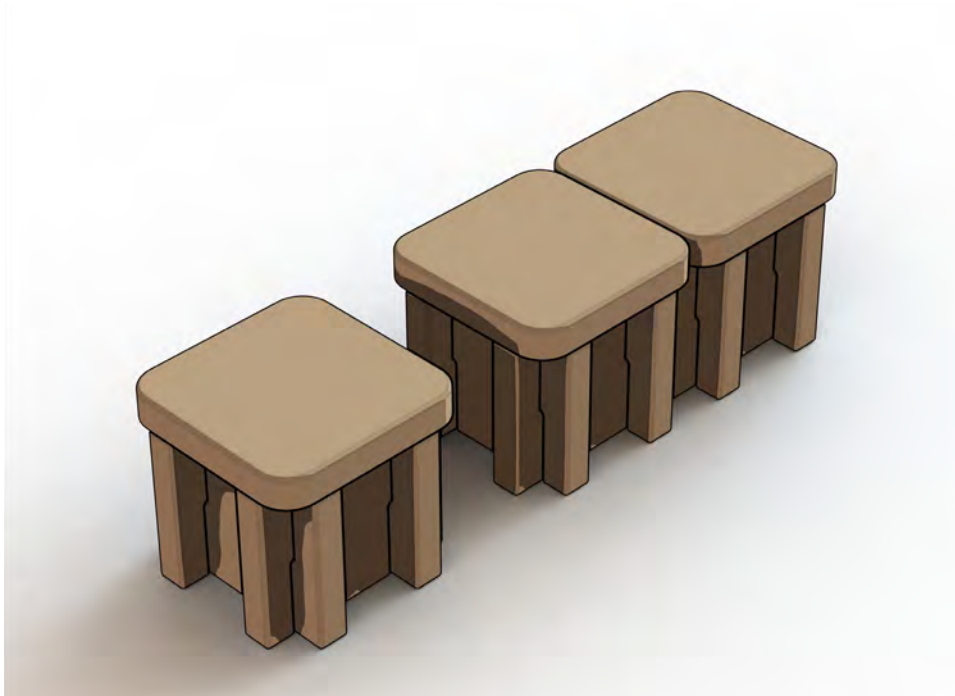


Ideation Seat Form

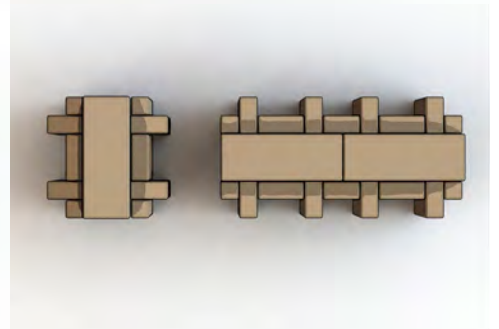
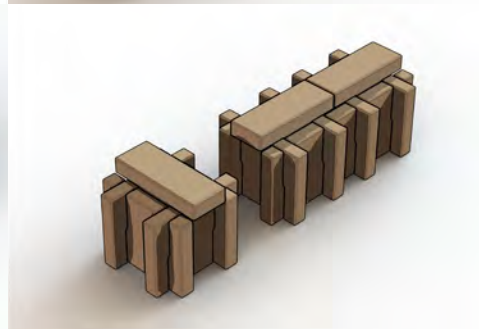
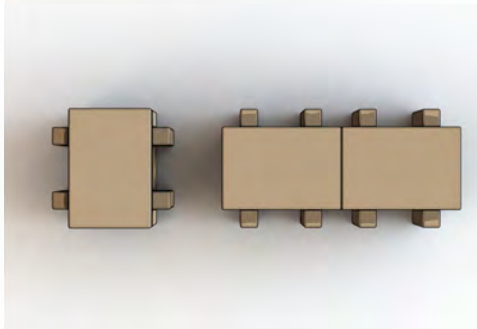
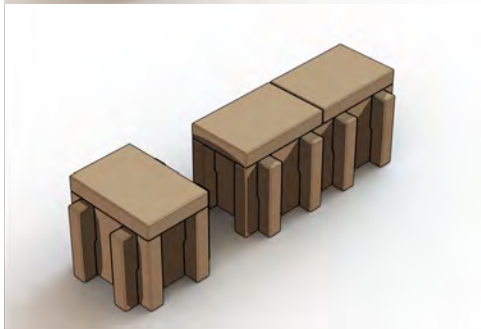
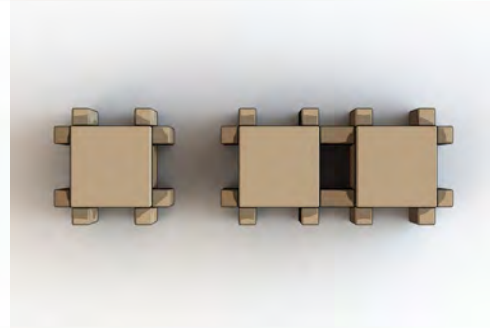
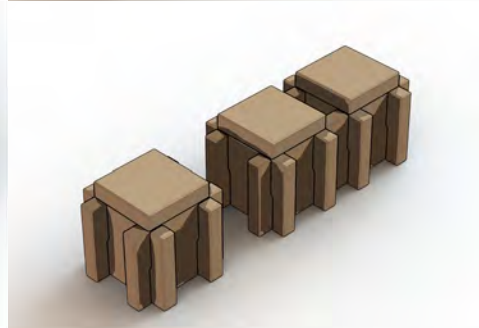
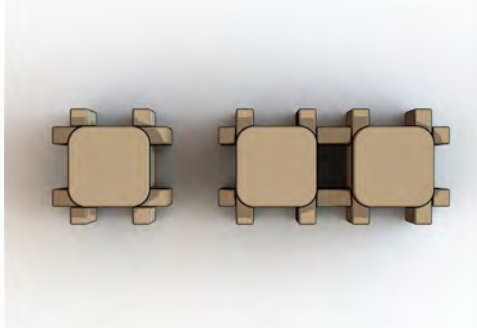
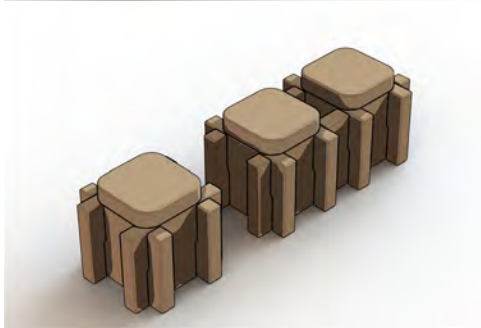
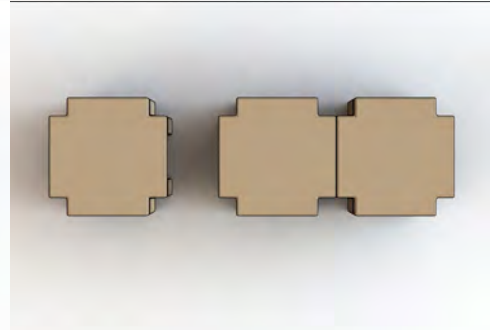
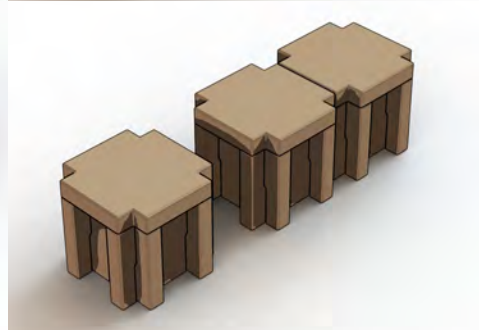
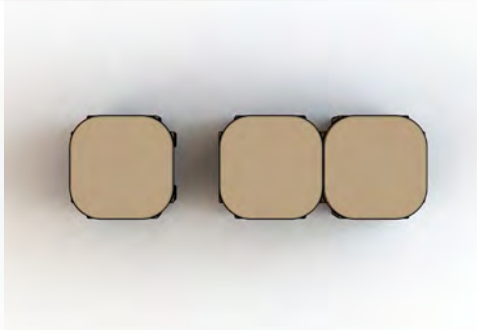
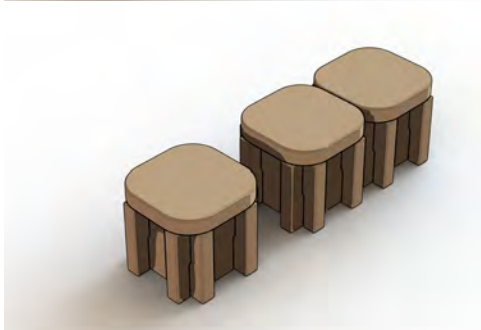
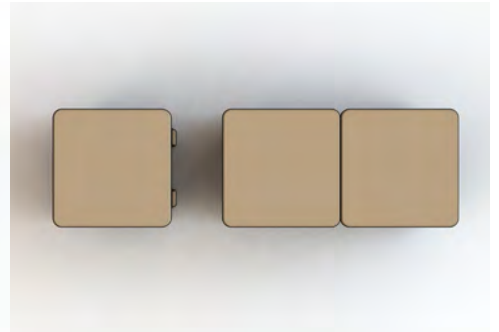
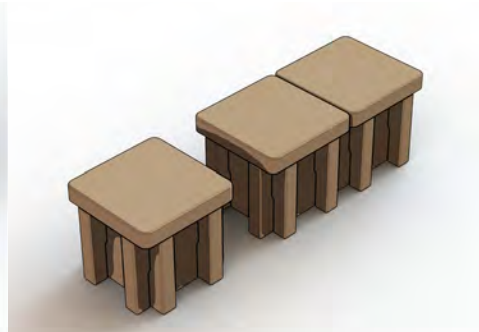
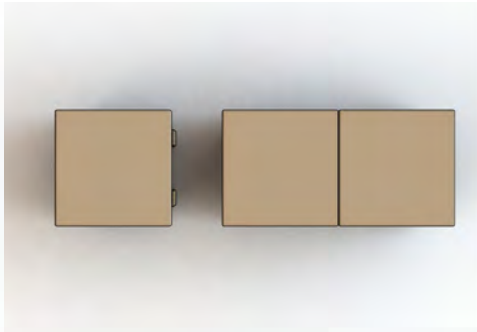
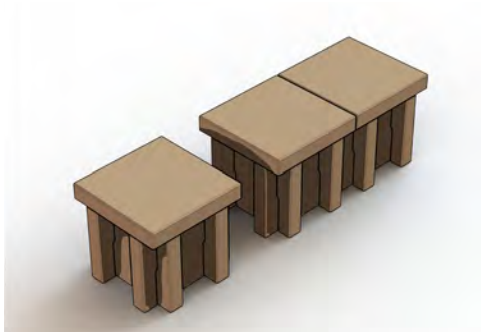
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I explored different forms for the seat top to see how they would fit with the rest of the system.

The version I proceeded with had the same coverage as the original iteration but had softer corners; making it ideal for children's furniture.



Ideation Seat Form

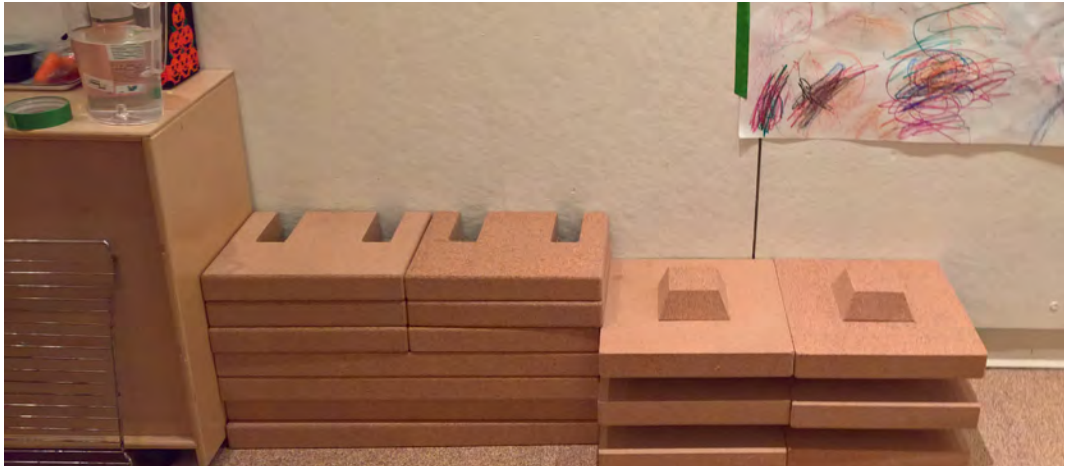


“Can we keep them [Corksi] in the class room?”
Maddie, Preschooler.

User Testing Setting Up



User Testing Configurations



User Testing Sitting



User Testing Assistance



User Testing Durability



User Testing Findings

Effectiveness

-How well does it work as a chair?

Single unit holds up to 2 people, Double can hold up to four.

Supports various seating positions.

-How well does it work as a table?

Enough of a height difference to use as a table, both with the chair and sitting on the floor.

-Can kids handle pieces?

Yes, they can carry the pieces by themselves as well as being able to put them together.

-How many variations can the user come up with?

At the start they kept putting the pieces together in a “standard” way (Single chair, or bench) but then expanded to a larger table as well as using the pieces as building blocks stacking them vertically.

Efficiency

-Rearranging

Rearranging the pieces didn't take up too much time.

-Taking apart

10 sec

-Set-up

40 sec-1 minute 20 seconds

-1 student vs 2 students setting up

1 student is able to assemble the pieces alone.

Although it is easier when 2 students work on it together.

Opportunity to teach them cooperation.

Took turns putting the pieces in place.

User Testing Findings

Learnable

-Can kids figure out the set up on their own?

-Without guidance

The 3s had a bit of a hard time aligning the slots.

The 5s were able to figure it out on their own with a little time.

-With guidance (teacher led)

With a little bit of help they were able to assemble the pieces faster.

-Can adult figure out how to set up the pieces with no instructions?

Yes, easily.

Other

-What else is it used as

Building blocks

Dramatic play

-What it reminds them of, any connections

Castle

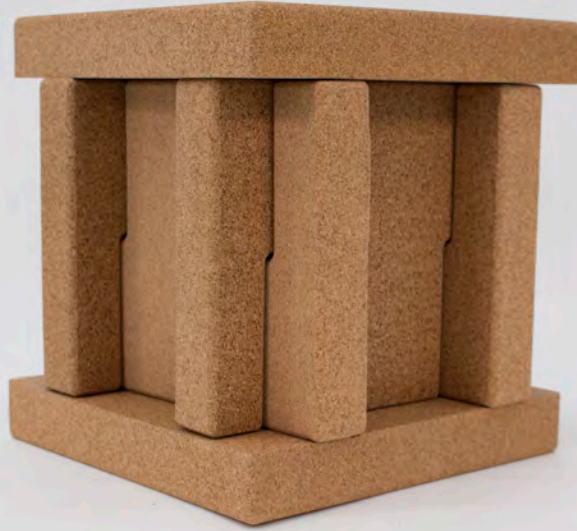
Monster

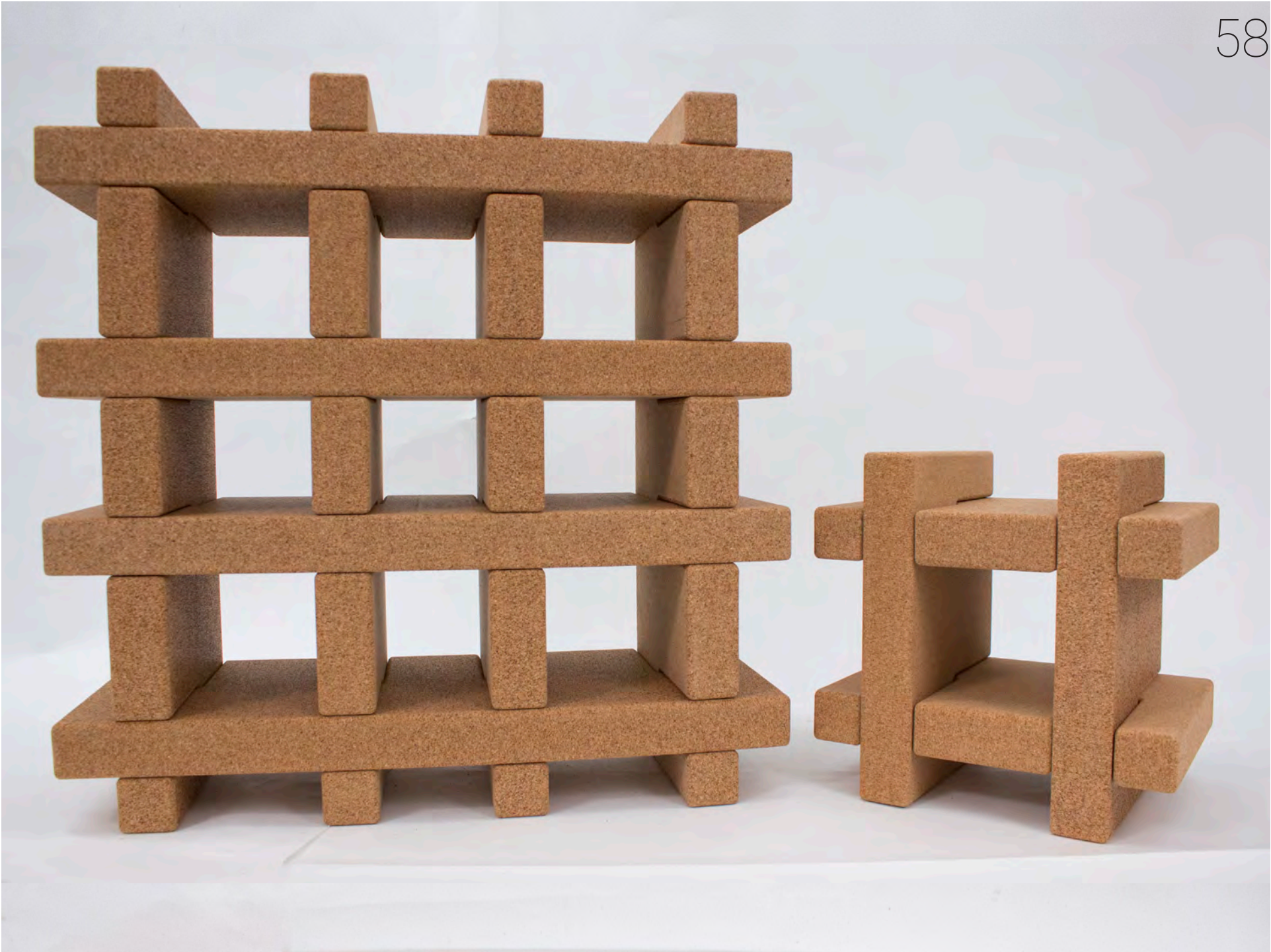
-Full sense, beyond visual

Feels nice

6

Corksi









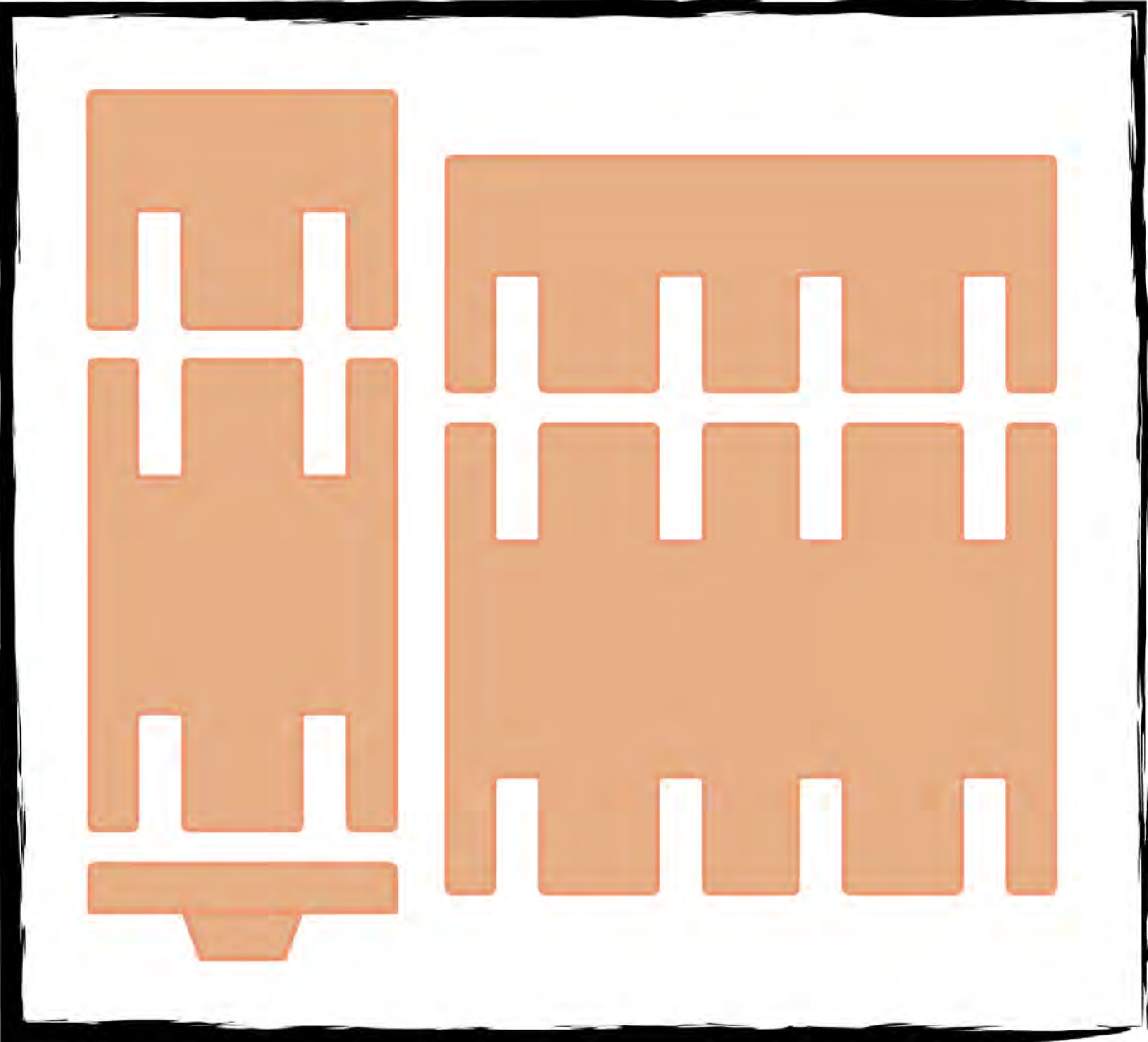




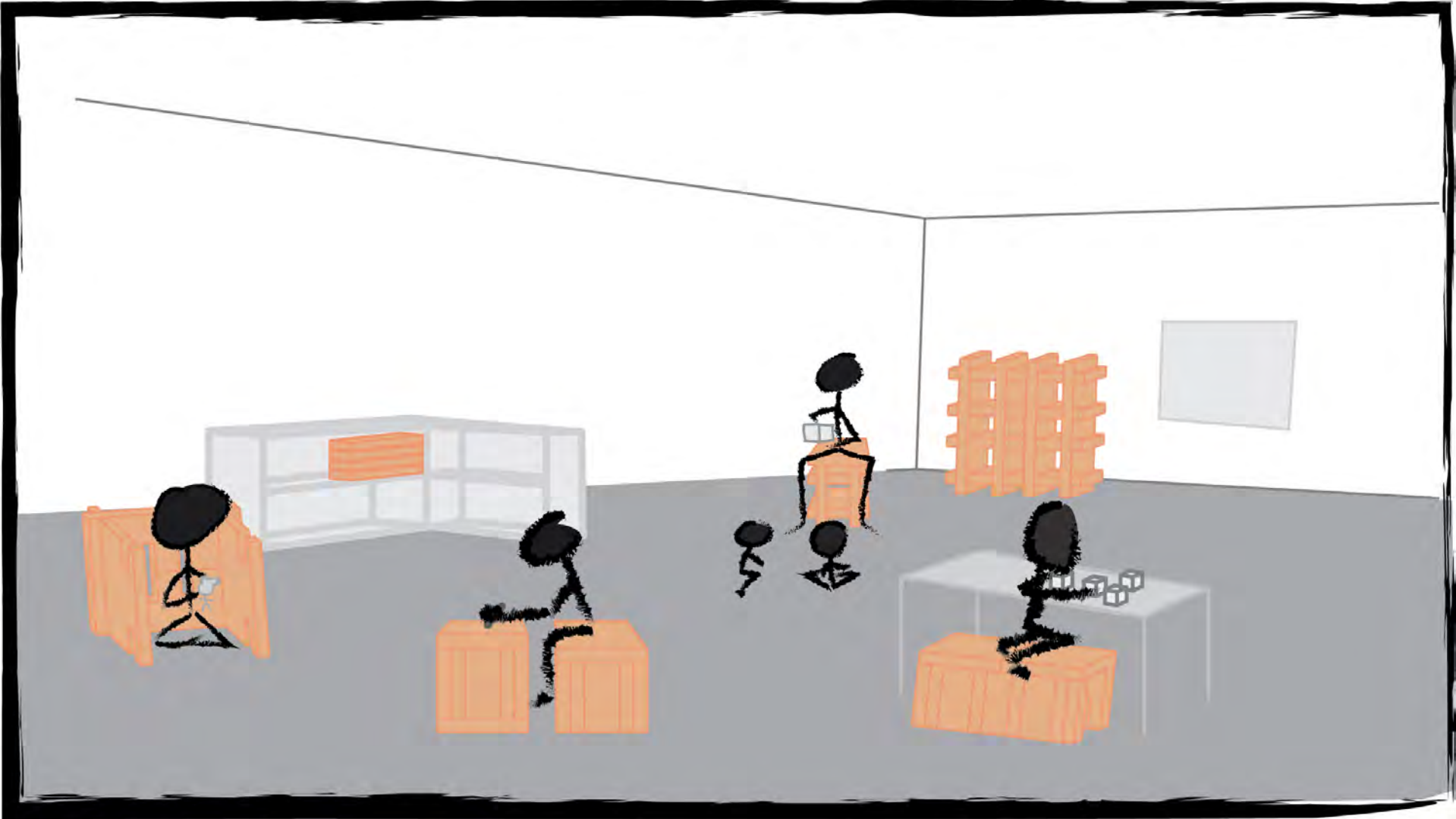




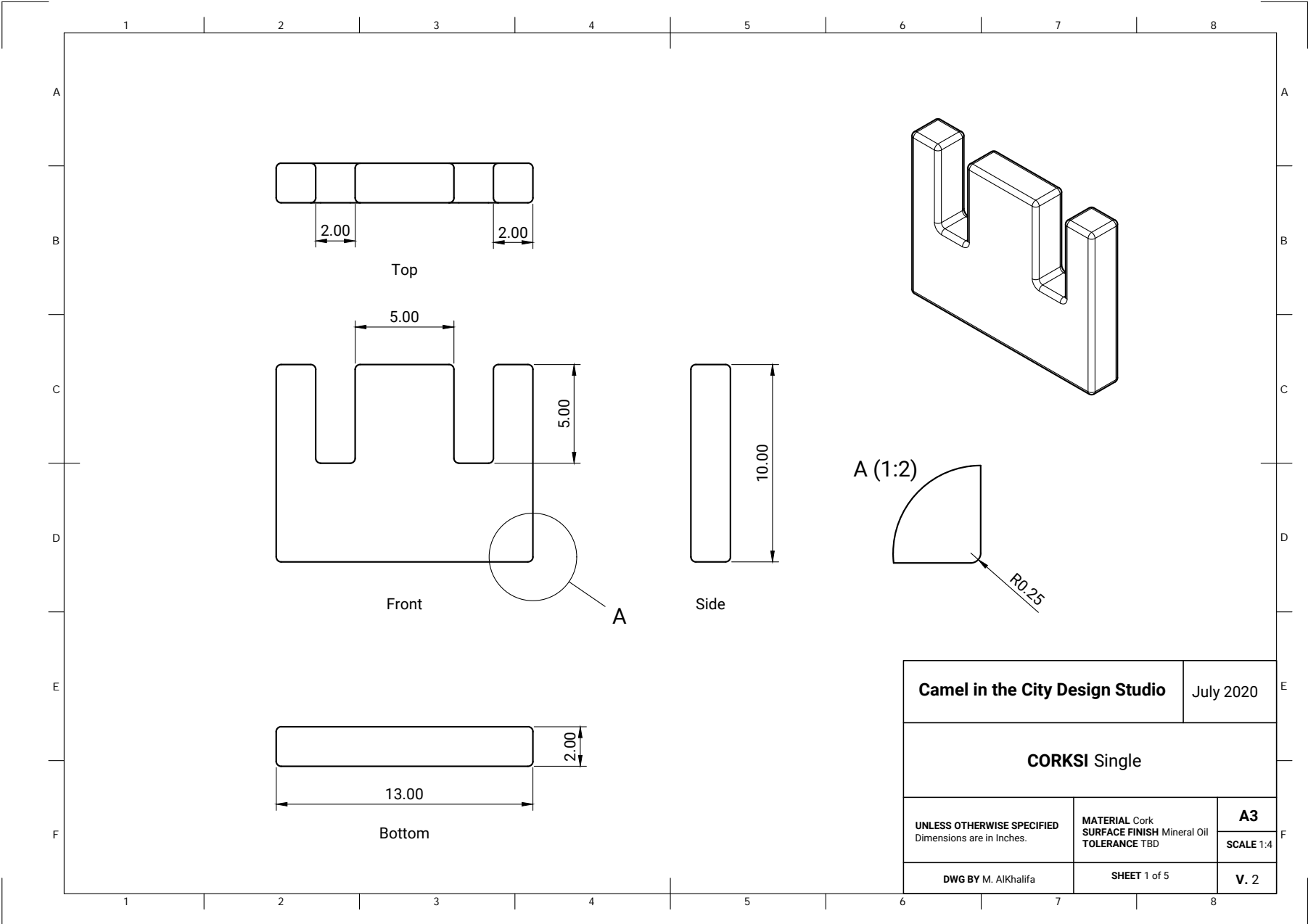
Corksi Modules



Transformation Potential

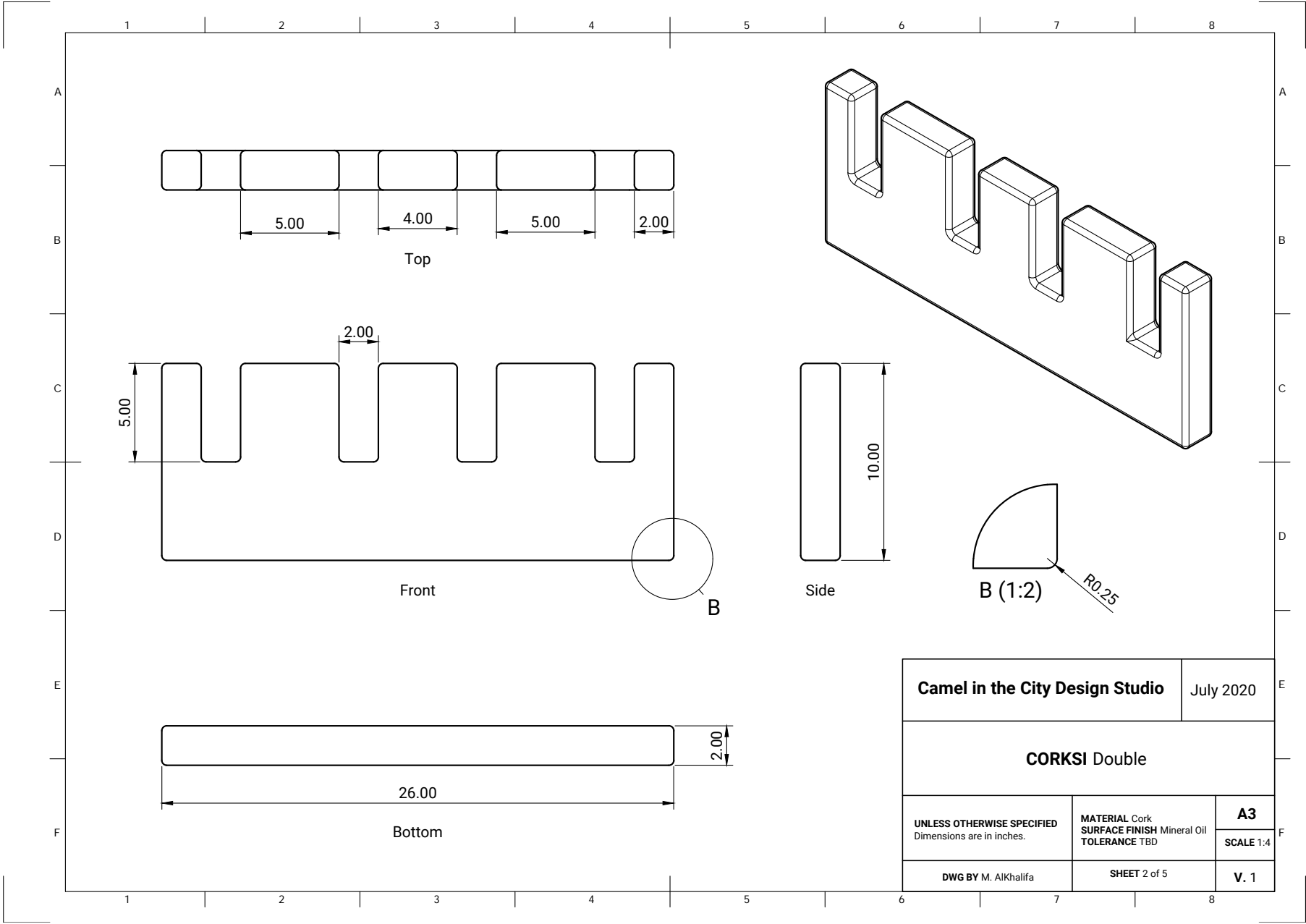


Technical Drawings



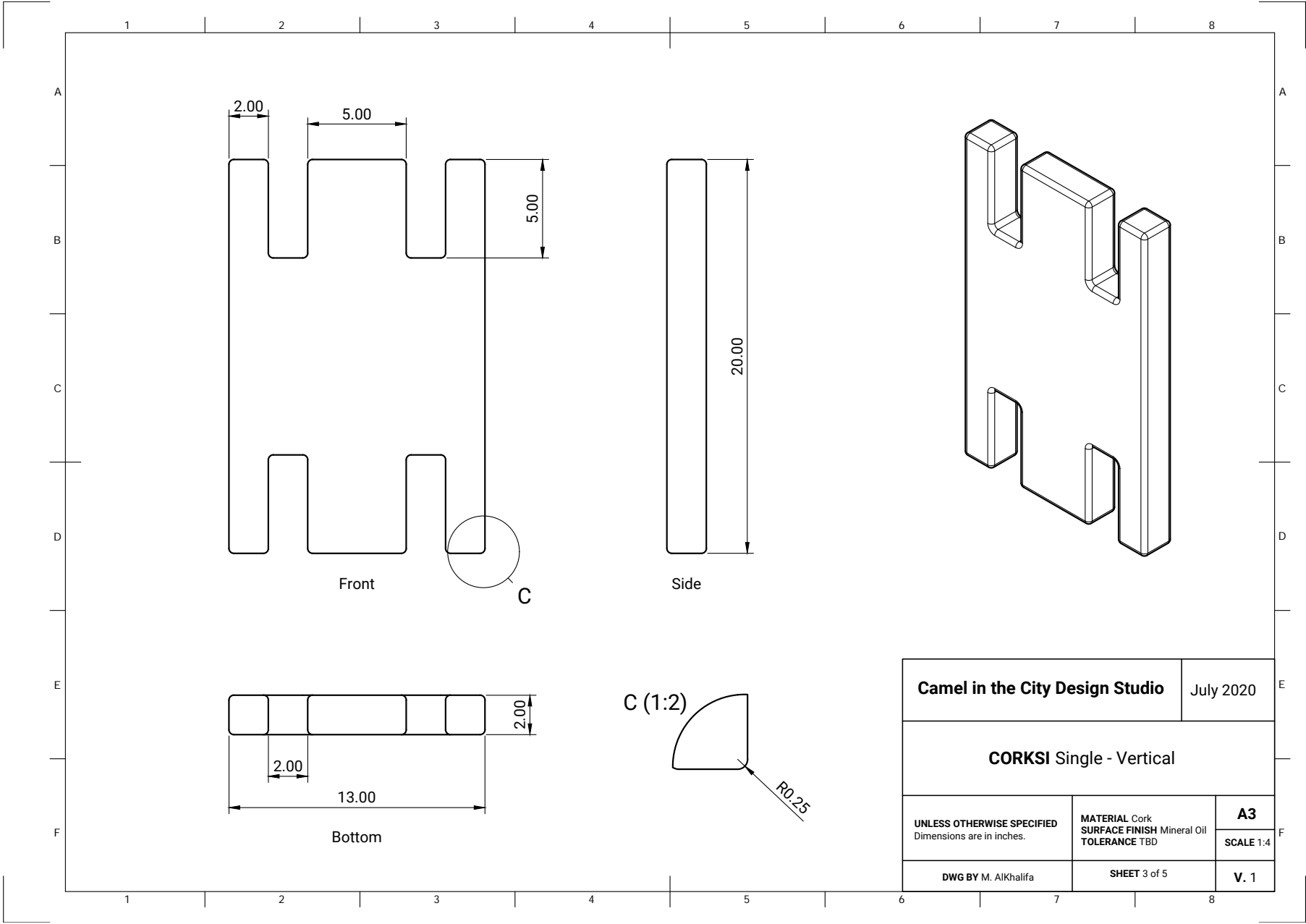
Camel in the City Design Studio		July 2020
CORKSI Single		
UNLESS OTHERWISE SPECIFIED Dimensions are in Inches.	MATERIAL Cork SURFACE FINISH Mineral Oil TOLERANCE TBD	A3
		SCALE 1:4
DWG BY M. AlKhalifa	SHEET 1 of 5	V. 2

Technical Drawings



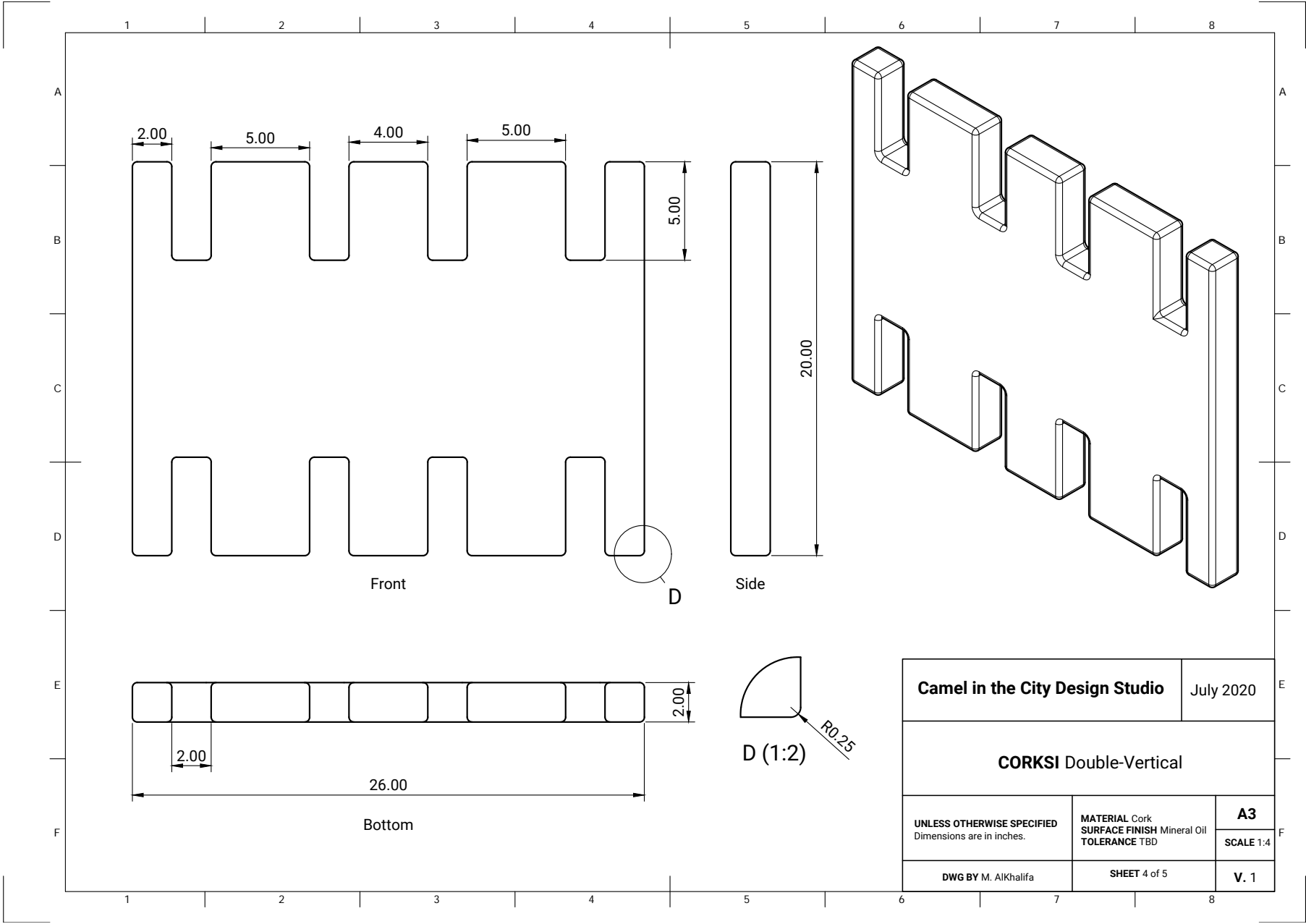
Camel in the City Design Studio		July 2020
CORKSI Double		
UNLESS OTHERWISE SPECIFIED Dimensions are in inches.	MATERIAL Cork SURFACE FINISH Mineral Oil TOLERANCE TBD	A3
		SCALE 1:4
DWG BY M. AlKhalifa	SHEET 2 of 5	V. 1

Technical Drawings



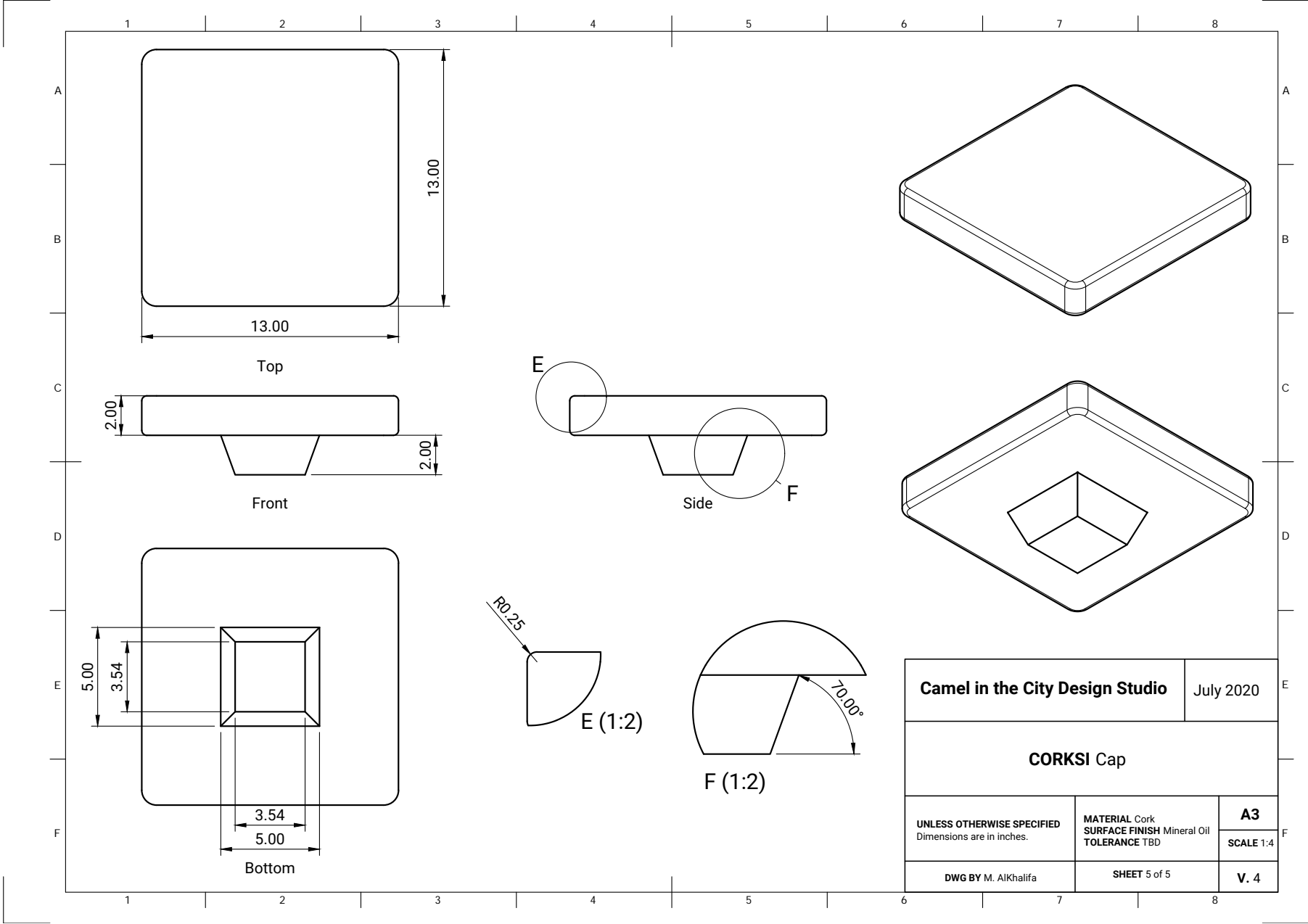
Camel in the City Design Studio		July 2020
CORKSI Single - Vertical		
UNLESS OTHERWISE SPECIFIED Dimensions are in inches.	MATERIAL Cork SURFACE FINISH Mineral Oil TOLERANCE TBD	A3
		SCALE 1:4
DWG BY M. AlKhalifa	SHEET 3 of 5	V. 1

Technical Drawings



Camel in the City Design Studio		July 2020
CORKSI Double-Vertical		
UNLESS OTHERWISE SPECIFIED Dimensions are in inches.	MATERIAL Cork SURFACE FINISH Mineral Oil TOLERANCE TBD	A3
		SCALE 1:4
DWG BY M. AlKhalifa	SHEET 4 of 5	V. 1

Technical Drawings

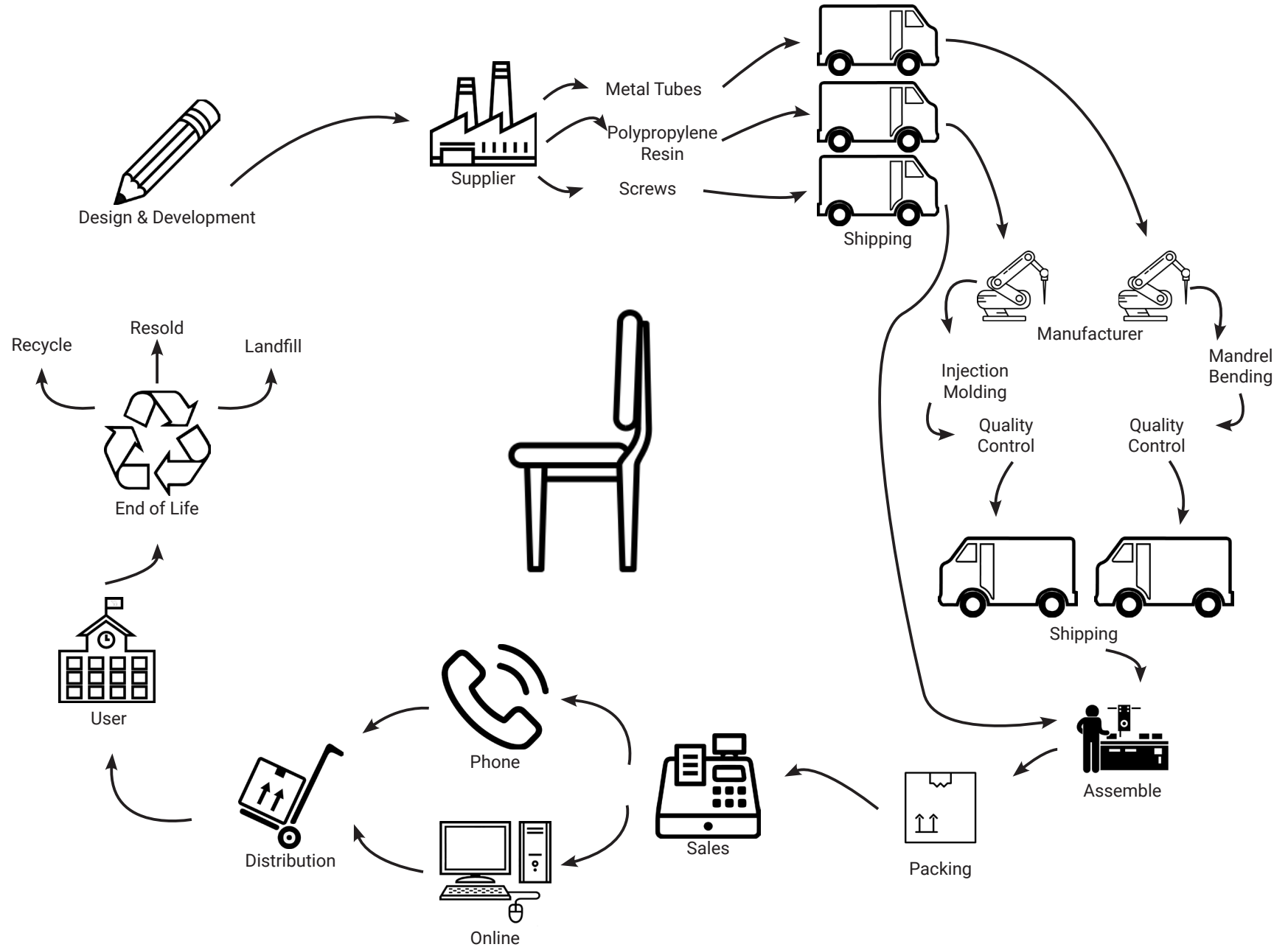


Camel in the City Design Studio		July 2020
CORKSI Cap		
UNLESS OTHERWISE SPECIFIED Dimensions are in inches.	MATERIAL Cork SURFACE FINISH Mineral Oil TOLERANCE TBD	A3
		SCALE 1:4
DWG BY M. AlKhalifa	SHEET 5 of 5	V. 4

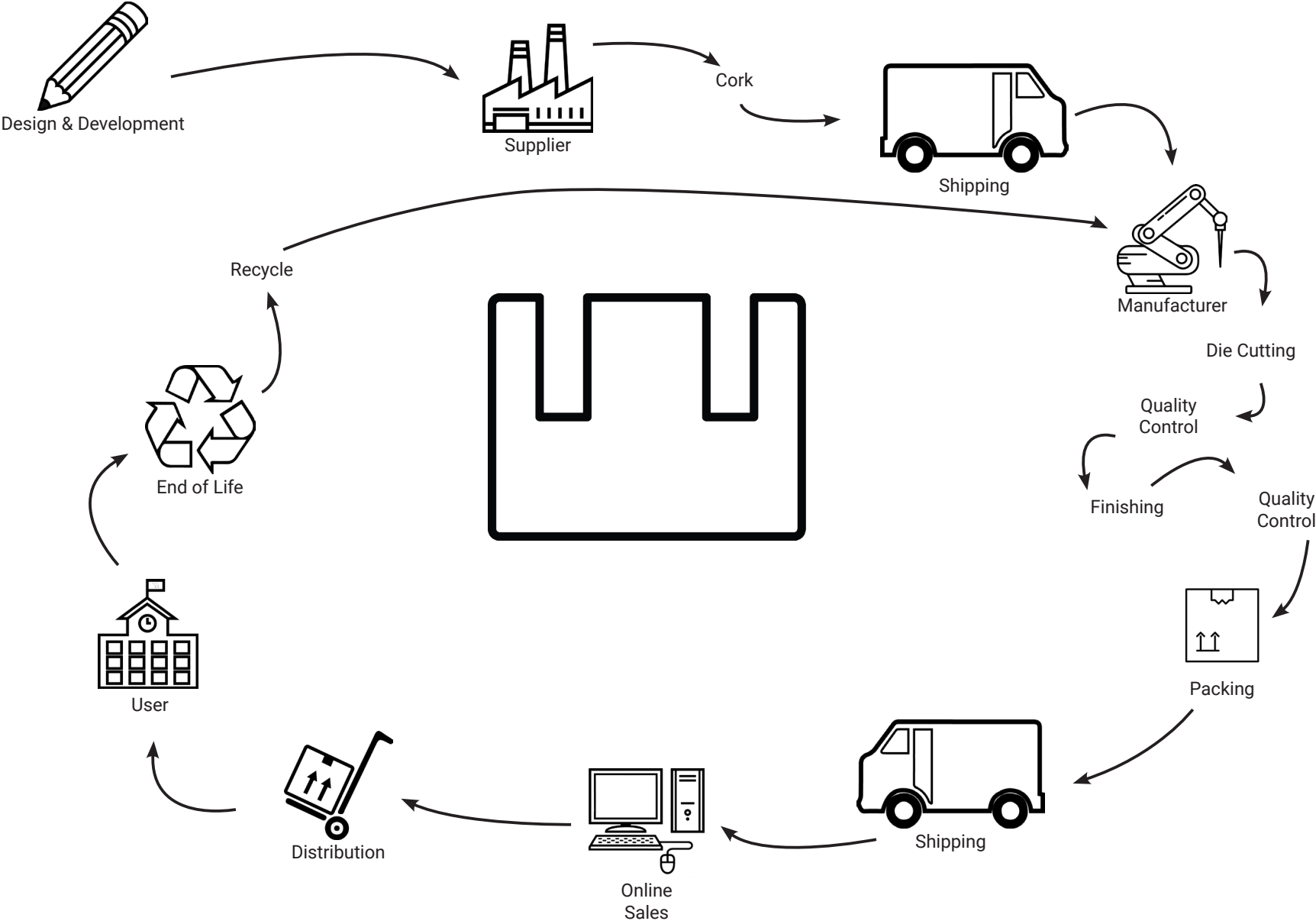
Impact

7

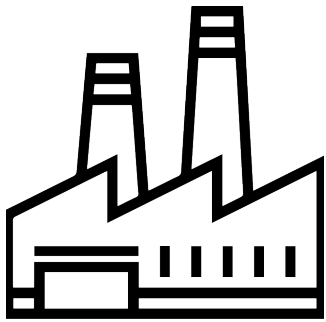
Life Cycle Existing Classroom Chair



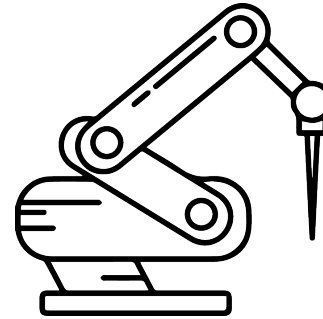
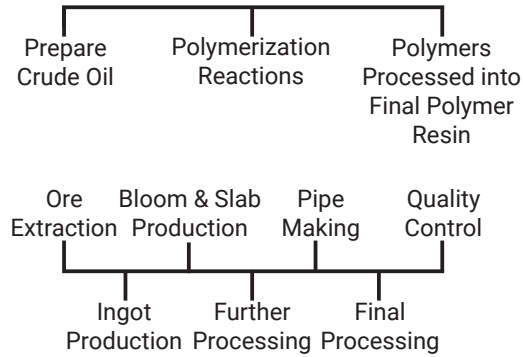
Life Cycle Corksi



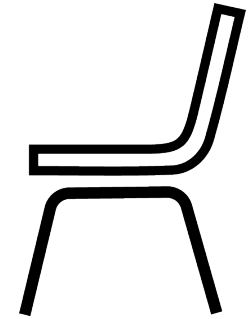
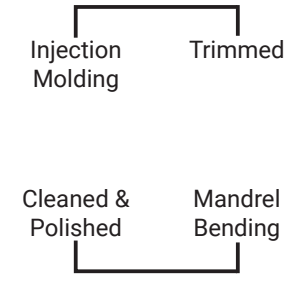
Process Tree Existing Classroom Chair



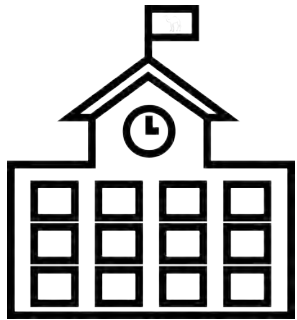
Supplier



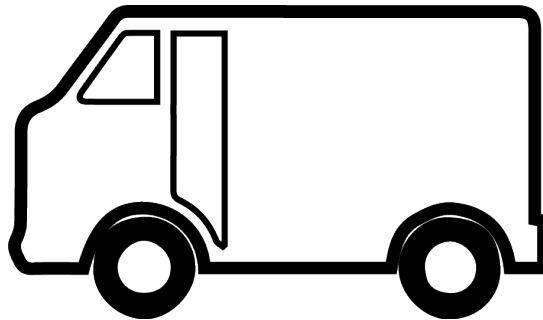
Manufacturer



Assembly



User



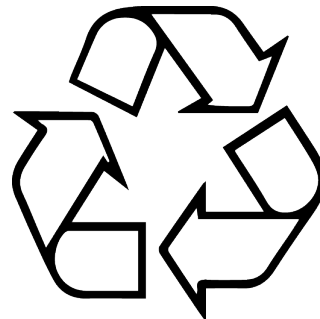
Shipping



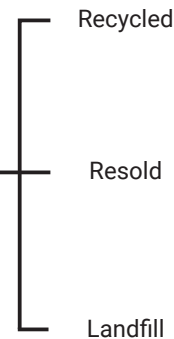
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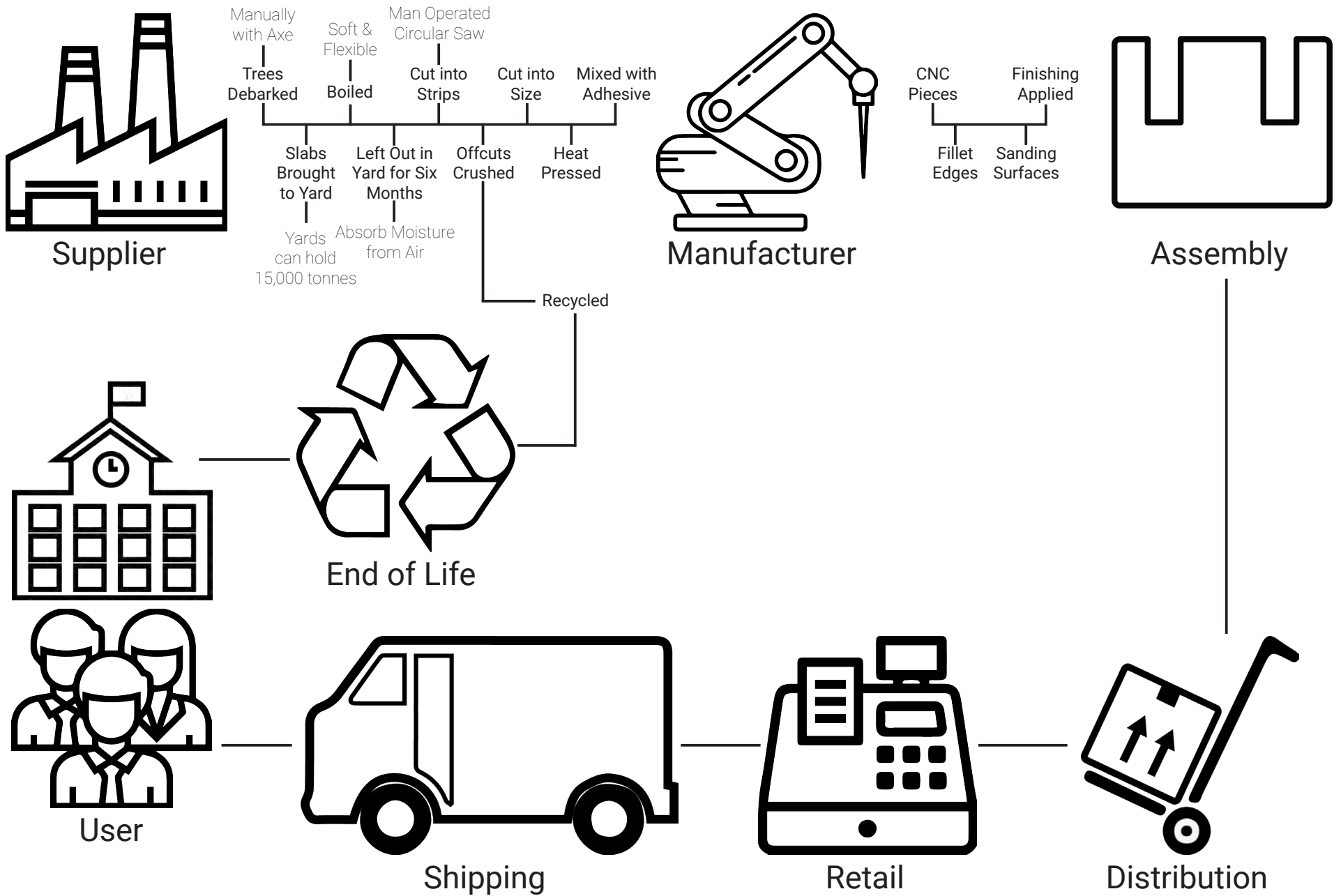
Distribution



End of Life



Process Tree Corksi



Quadruple Bottom Line

Economic

- Cost effective
- Market competitive because it is a more attractive option.
- Economic incentive to recycle the pieces.
- Only have to pay for single unit rather than having to replace an entire traditional chair or table if damaged.

Social

- Increase comfort leads to better performance.
- Activity to strengthen student-teacher relationship.

- Cork - Sustainable
- Easily recyclable
- No waste material

Ecological

- Fits needs of alternative education models.
- Teaching tool.
- Teaches kids that a variety of outcomes can be achieved with simple elements

Purpose

8

Credits

Mark Bechtel Capstone Professor
Erika Doering Capstone Professor
Matt Callahan Teaching Assistant

Anita Bushell Expert -Education
Daniel Michalik Expert - Material
Geoff Faucher Expert - Process
Pineapple Room Students Experts - Users

Adam Model
Loretta Model
Max Model
Kayla Wolfe Photographer

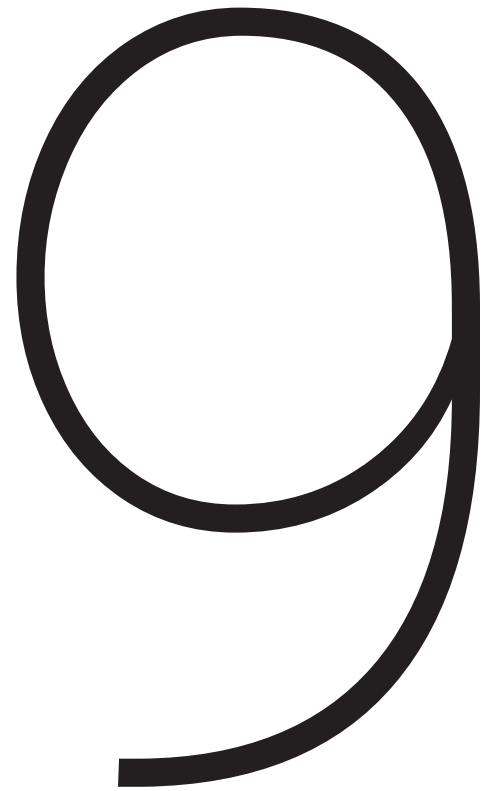
Michelle Eguia Graphics Consultant

Vanessa Palacio Spatial Consultant

Matt Leabo Prototyping Consultant
Andrew McCandlish Prototyping Consultant

Mohammed AlKhalifa Writing Consultant

Sources



The Future is our Present Amorim

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Materials for Design Chris Lefteri

Manufacturing Processes for Design Professionals Rob Thomas

The Measure of Man & Woman Alvin Tilley

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Cork Link tinyurl.com/lcghx2r

How it's Made: Cork Production tinyurl.com/n6sdyea

Preschool Chairs Guides tinyurl.com/mf5v9sh

School Outfitter tinyurl.com/ktgq6bjx

Six Types of Preschool Programs tinyurl.com/mvygexbs

Terrapin Bright Green tinyurl.com/lcghx2r

The Noun Project tinyurl.com/2g4vtqv

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