Corian® Solid Surface Reversible Joints

Purpose

We are tasked with working with DuPont's Corian® Solid Surface (CSS), which is a versatile building material. Trends in the market are creating the need for reversible joints/fasteners. For example, modular designs benefit from industrial mass production economics; including reversible joints in the design enables inexpensive component replacement & upgrading. Another trend is disassembling articles so the component materials can be recycled. Reversible joints reduce the labor, and therefore the cost, of recovering materials. **DuPont would like our team to develop new, reversible joining and fastening methods** that satisfy the needs of architects & designers who are pioneering these trends.

Figure 1: Example of a Corian® Solid Surface kitchen

Design

Throughout the semester, we plan to test a minimum of four main designs: a fastener, a friction mat, a joining technique, and a dowel method.

- The dowel will involve drilling holes into the CSS and then putting dowels in the holes to prevent movement. As part of the dowel, we will be experimenting with machining dowels out of CSS to see if they are capable of working.
- The friction mat has two main parts: the CSS and a mat that it lies on top of. The idea behind this is that the weight of the CSS and the high coefficient of friction of the mat will create a high threshold to overcome the static friction, keeping the CSS immobile.
- The joining technique is inspired by various traditional techniques of creating a strong joint between wood. The approach is to machine a design into the CSS that allows the material to come together smoothly in a certain direction, but makes it very difficult to separate in any other direction
- The fastener will involve a dog bone fastener and a hole machined into the CSS. This will keep the sheets of CSS bonded together.

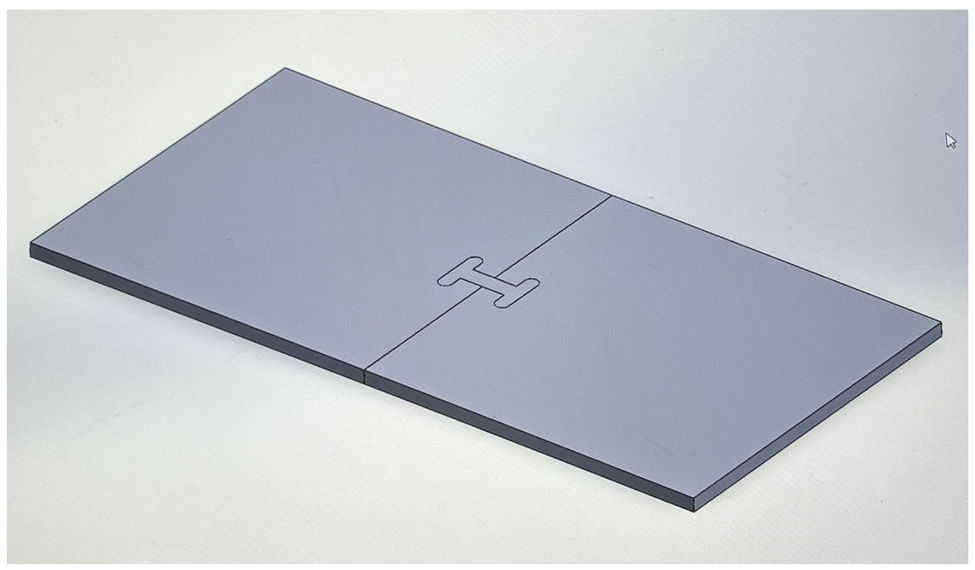


Figure 2: CAD mockup of a dog bone fastener joint

Existing Process

Many articles fabricated from CSS require joining two CSS pieces and/or fastening CSS to a substrate. Traditionally, either approach employs a permanent adhesive. The chemical bonding process effectively fuses separate pieces into a single, inseparable unit. As a result, Corian® surfaces cannot be easily dismantled at the end of their service life, which makes the material difficult to recycle or repurpose. Instead of being reprocessed into new sheets, most discarded Corian® installations are treated as construction waste. This reliance on adhesives has therefore raised sustainability concerns, particularly as the building industry places growing emphasis on circular design and material recovery.

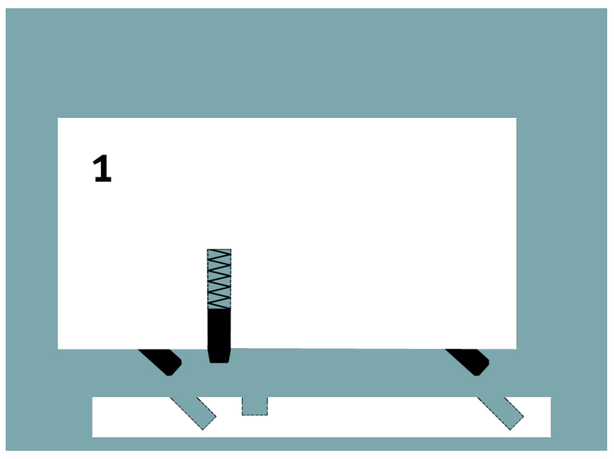


Figure 3: Drawing of a Valinge flooring dowel joint

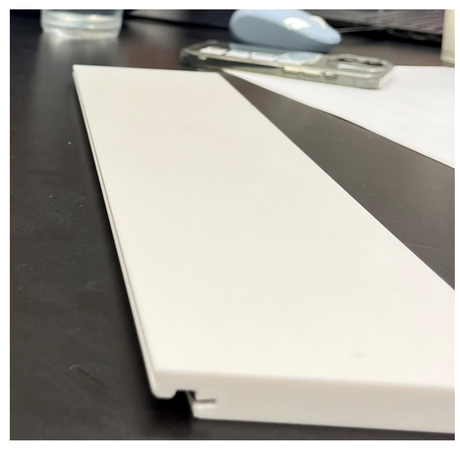


Figure 4: Prototype of joining technique

Timeline

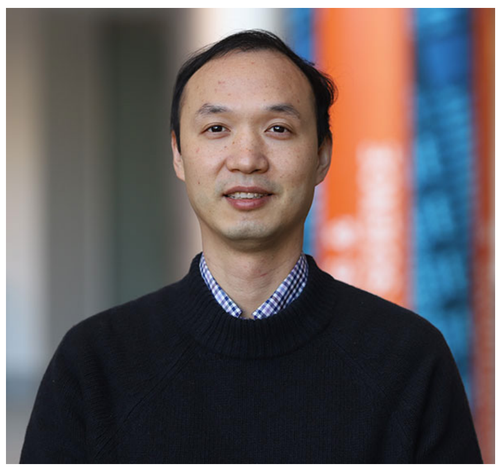
At this point in the semester, we have several prototypes in the design stage and in the production phase. We have also ordered sample mats to experiment with the friction mat idea.

Testing

To test our designs, we will put them through a variety of trials, including a stress simulation, a cleanliness test, and a table test. The stress simulation will consist of both real and simulated components to determine the maximum stress each joining method can withstand, ensuring that the joint can be safely used in various applications. The cleanliness test will consist of leaving various materials on the joint for a set period of time and seeing how easy they are to clean up afterwards. This is important for applications in restaurants where spills are likely to happen, and the countertop needs to be a clean, sterile surface in order to safely prepare food. The final test, the table test, is about making sure that the CSS will not move when jostled. This will be performed by experimentation and measuring the associated forces.

Semester Deliverables:

During this semester we plan on delivering a tabulation of various CSS joining/fastener methods that will be used by interior designers and architects to determine which method is bet for their application while also allowing improved recyclability and reusability of CSS products.



Faculty Mentor: Dr. Zhang

Jared Murtha

Ashton Webb

Owen Weisenburger