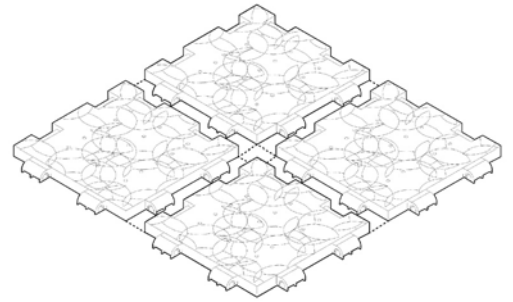


Accessibility Tile

*designing a modular tile
for wheelchair and cane users*



a research project by Studio Kathryn Larsen
for Distributed Design Platform



maker

CXF

**We would like to thank the
Distributed Design Platform for
including our work in their
project.**

**Studio Kathryn Larsen &
Collaborators**

*Alexa Kaczor, Kathryn Larsen, Sean Barrett,
Cath Borch Jensen, Lyndsay Jensen, Mate
Madcher*

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Introduction

What is the accessibility tile?

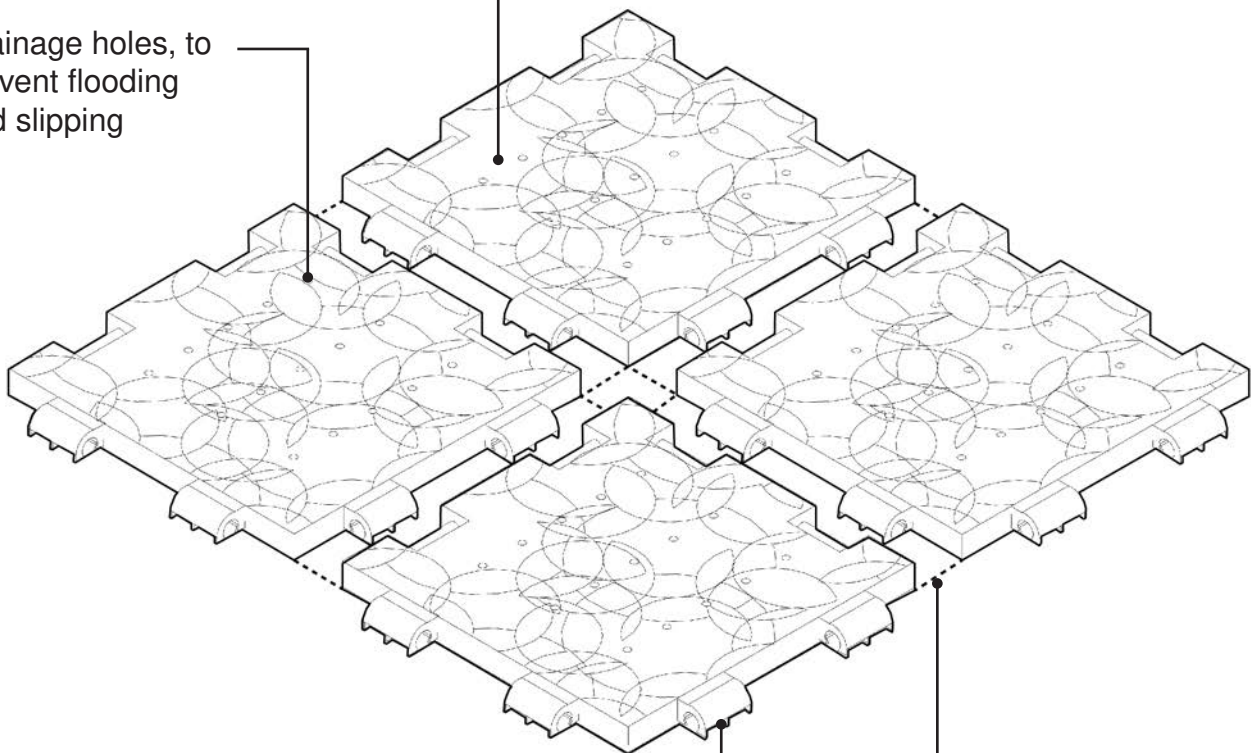
Old cities in Europe, like Copenhagen, are filled with cobblestones in front of museums, events and festivals. The accessibility tile can be used to create a temporary, even surface to improve mobility for everyone.

What's wrong with cobblestones?

Cobblestones create uneven edges. A wheel or a cane can catch that edge - leading to unstable footing, or jarring sensations to shoot up the body. Have you ever tried to ride a bike over cobblestones? Now imagine you have to experience that feeling every time you want to access your favorite coffee shop.

Raised customizable design surface, to create grip for feet.

Drainage holes, to prevent flooding and slipping



Smooth connection to create a level surface

Snap-fit joints to create flexibility and tolerance between uneven cobblestones

Why does this matter?

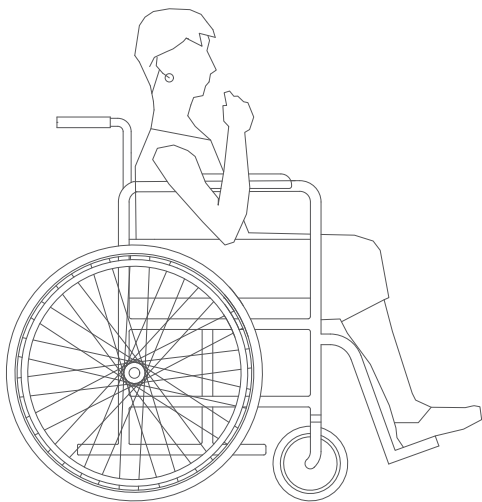
A lack of accessibility is also a health challenge for many wheelchair and cane users. It causes stress about navigation, can lead to bone fractures, and sometimes means that people who are disabled stay at home.

A modular tile, kept by venues can be a quick and easy solution to improve accessibility, without damaging expensive cobblestones.

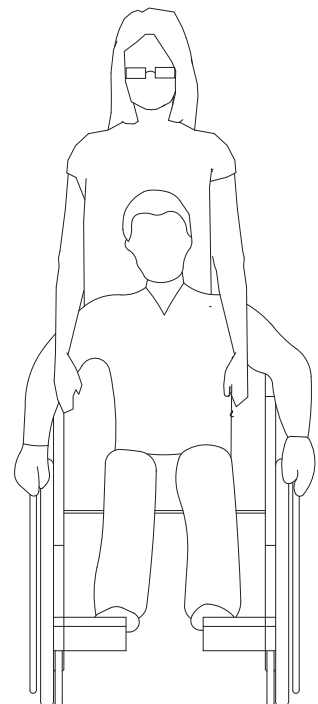
“We need things to become more accessible to people who cannot just jump over a cobblestone with a nostalgic smile.”

“Something like this can help me, and people like me. I think it’s easy to roll on to, and a great idea.”

“Bjørn has broken his leg twice due to bad ‘moving’ practices that is worsened due to osteoporosis. So, when myself or the staff go for walks with him in Køge the cobblestones are a nightmare.”



Cath, activist, dancer, and taboo-buster



Lyndsay, author and editor
Bjørn, always smiling₅

Background



Most people don't think about it.

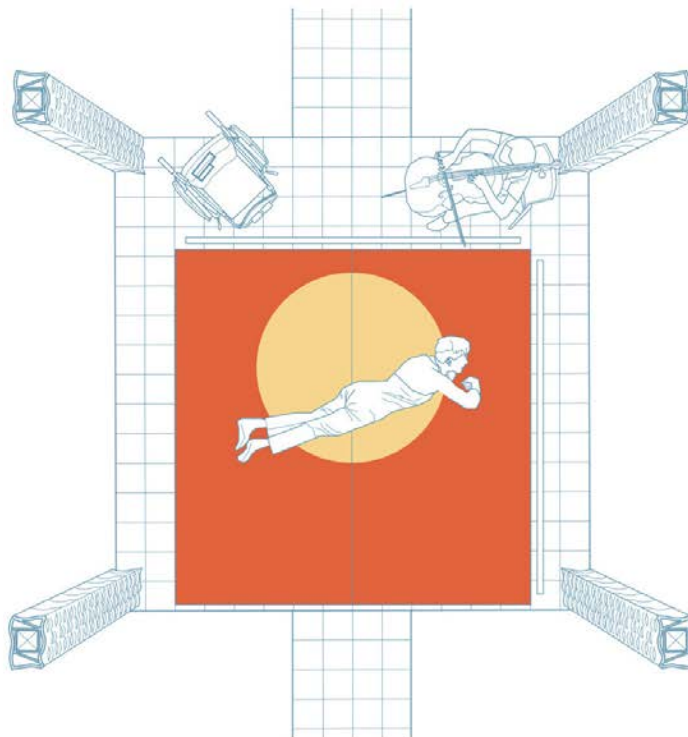
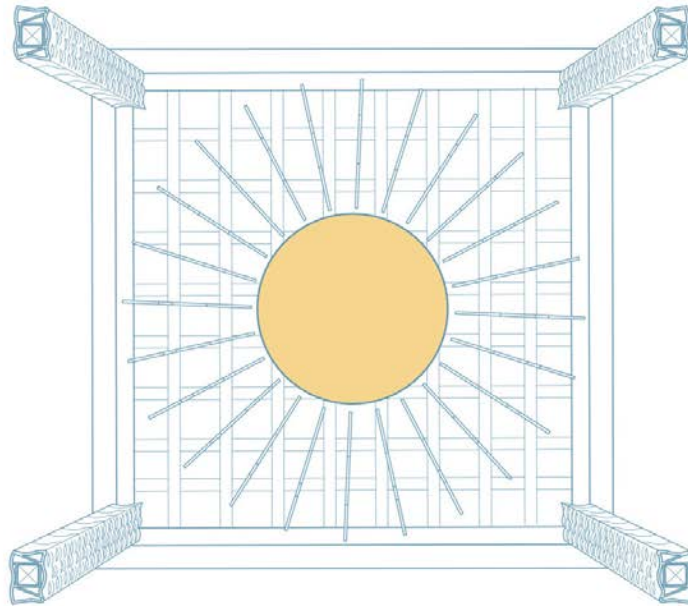
All surfaces seem the same.

But for someone like me- it's a big deal.

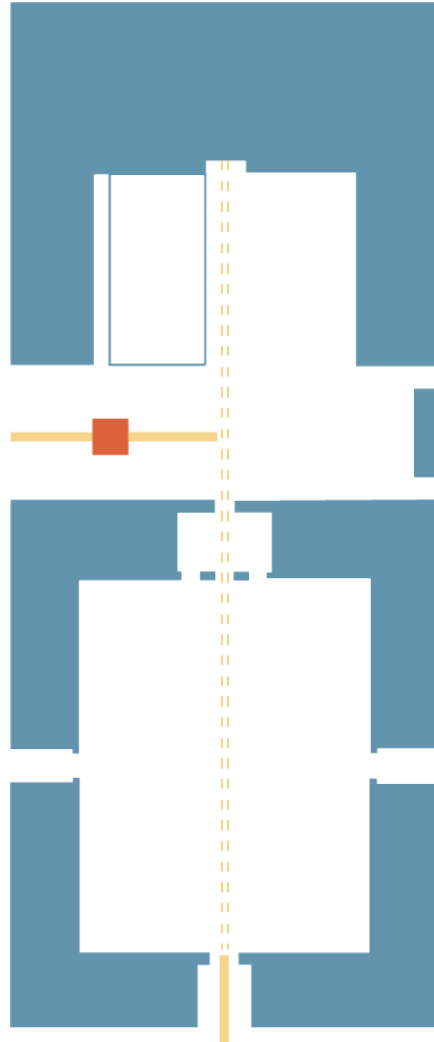
How can I participate in CHART when I can't even access it?

Cobblestones make access for wheelchair users and cane users difficult. This is a true story from an artist, who felt excluded from CHART due to the lack of accessibility. It's time to change this.

Our idea for working with the accessibility tile was actually born out of our competition entry for 2023 CHART Art Fair. The theme was universal design and New European Bauhaus. Knowing our blind spots as able-bodied designers, we decided to work directly with people in the disability community.



“The New Wave” Proposal - 2023
Studio Kathryn Larsen
Alexa Kaczor, Kathryn Larsen, Sean Barrett,
Cath Borch Jensen



Charlottenborg Courtyard

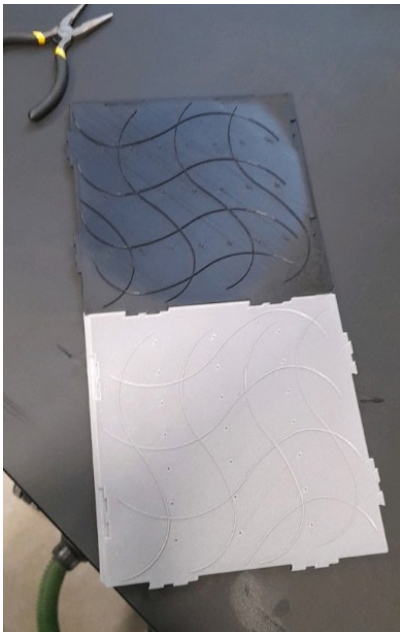
Legend

- - Existing accessibility path
- Temporary accessibility path (26m²)
- Pavilion structure (16m²)
- Existing structure

Cath Borch Jensen, our collaborator, shared a story with us of how she couldn't physically access Charlottenborg's courtyard because of the cobblestones. We decided to propose a solution that could connect the courtyard with temporary tiles, making the entire event accessible for people like Cath and her family.

Although we weren't selected as finalists, we were told by Cath and other wheelchair users how much something like this could change people's lives, increase mobility, and improve their quality of life.

First Prototype



We started printing and prototyping the design we made for the pavilion.

These were printed with 0mm tolerance in the joints, and although it seemed like it could work, we knew we needed to test it to learn if it worked or not.





On relatively even cobblestones, it worked. But with uneven cobblestones, it was a different story.

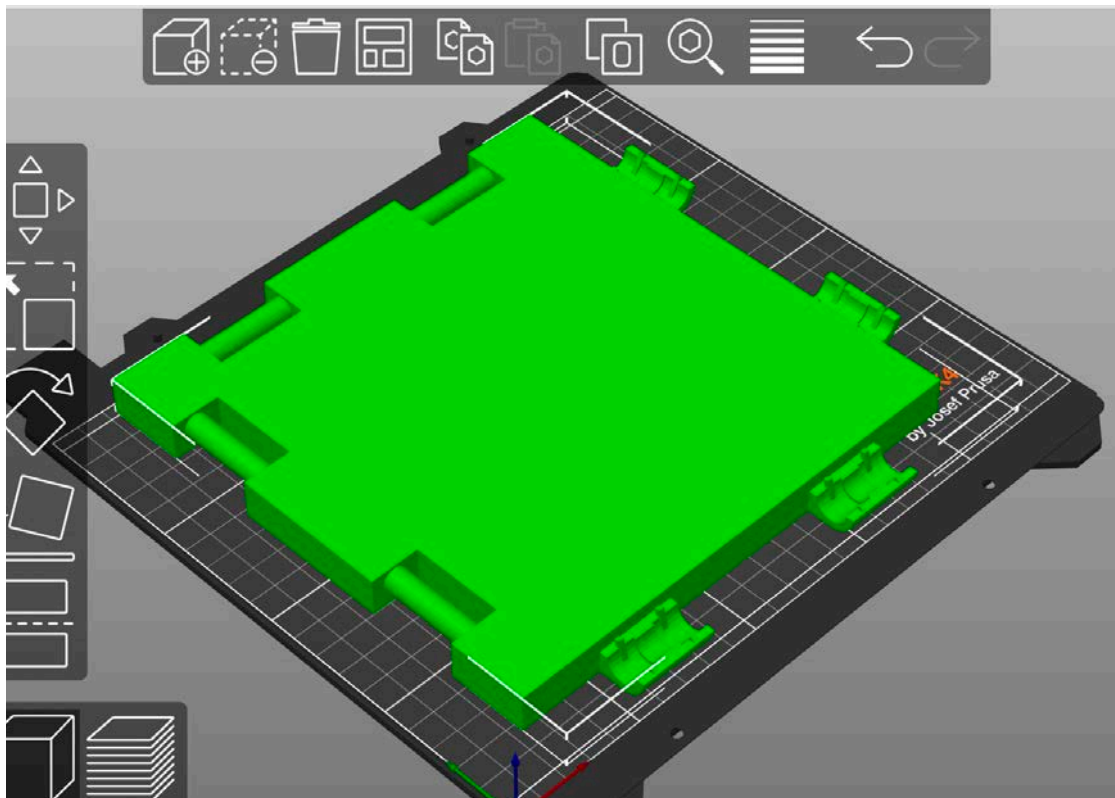


Down in Køge, we tested the tiles on the gigantic cobblestones, with Bjørn and his mother Lyndsay. Bjørn's wheelchair is heavier than Cath's and requires pushing from an aid.

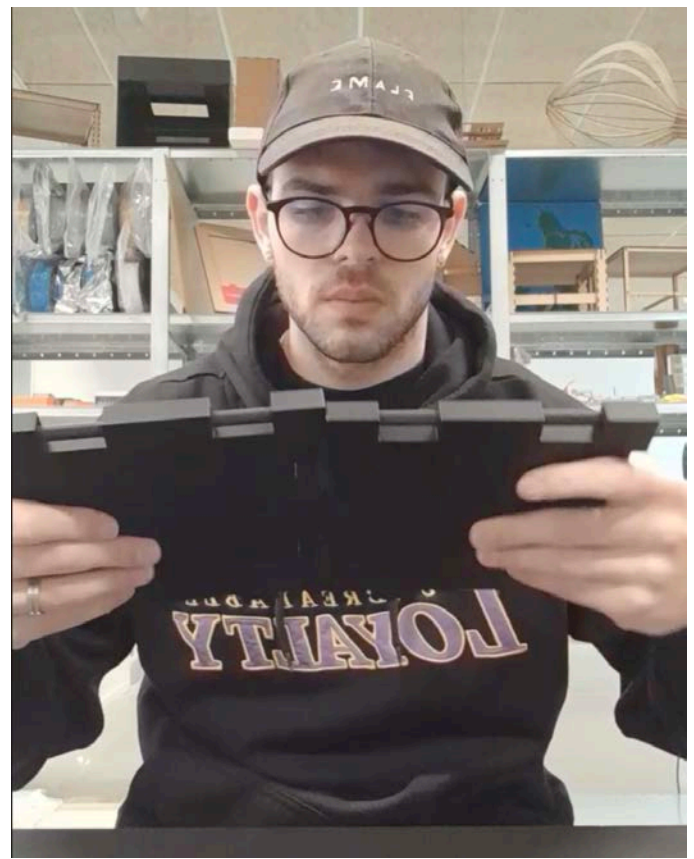
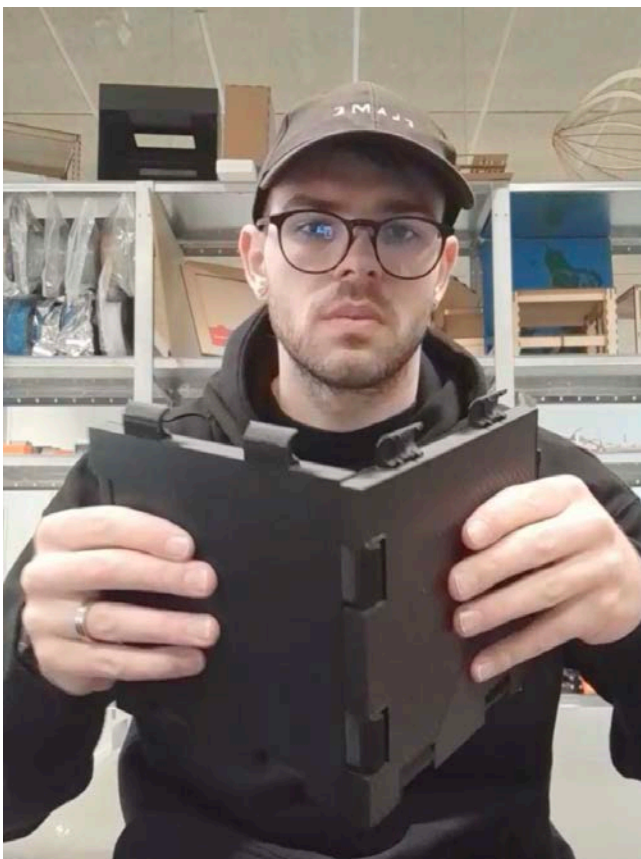
The test showed conclusively that the tile joints needed flexibility, and more tolerance.

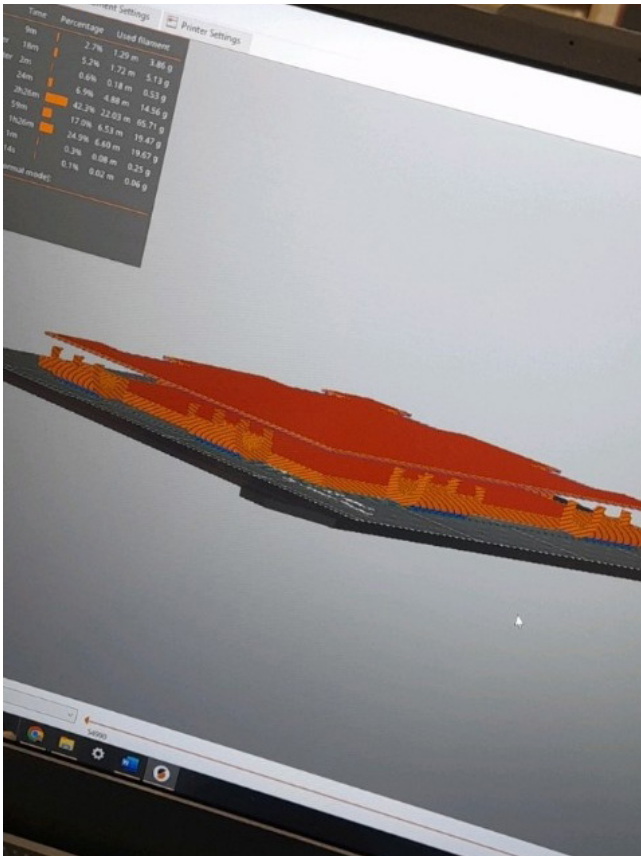
**Time to go back
to the drawing
board.**

Testing at maker

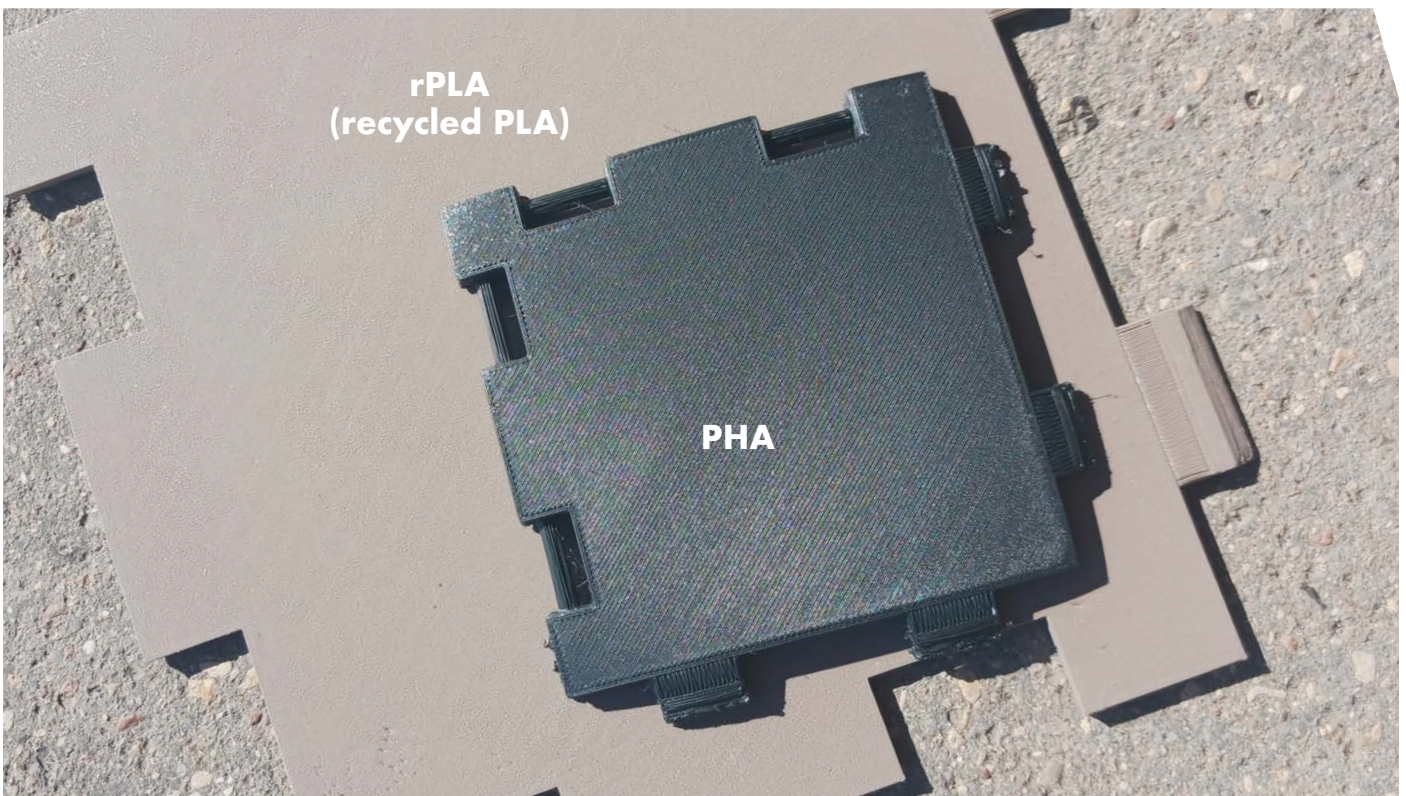


We decided to attempt snap-fit joints, which threw us into a trial-and-error process. The perfect snap-fit would lock the joint, but also keep it flexible enough to adjust for uneven surfaces. These joints were too loose to snap together, with a 1mm tolerance.





Sometimes there was more emphasis on the error part of trial-and-error.



We began testing with our biobased polymer, PHA, which was more prone to warping than PLA due to a greater elasticity in the polymer.

Print your own tiles!

Step 1:

Prepare your 3d file in Sketchup and export as an STL file. Make sure that there are no reverse-faces in your model, missing faces, or extra faces/lines in the geometry. The program "Solid Inspector" is a great way to check for 3d failures.



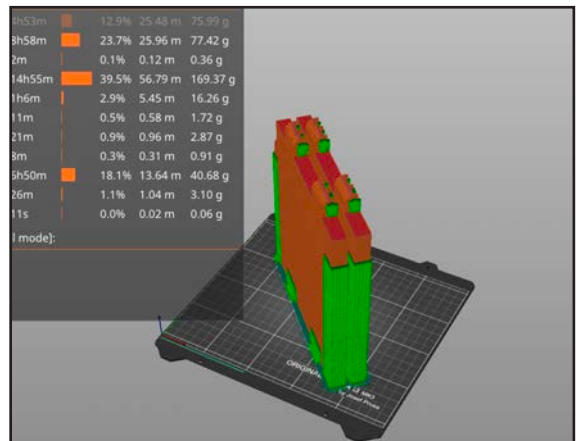
Step 2:

Import the STL file into your slicer program. Adjust your printer settings for the filament. With pha filament, you always want to print on a cold bed, and with a brim to reduce warping.



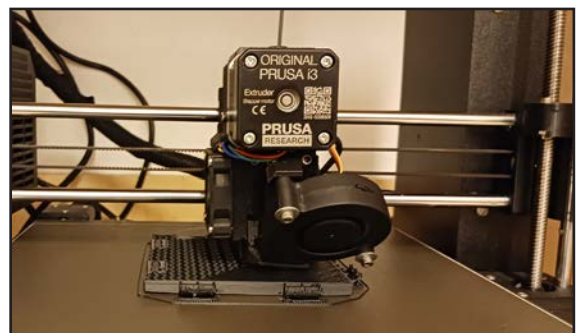
Step 3:

Check the rotation of the tile. We found that printing the tile on its side could improve printing the geometry, and print two tiles at once. Select supports everywhere.



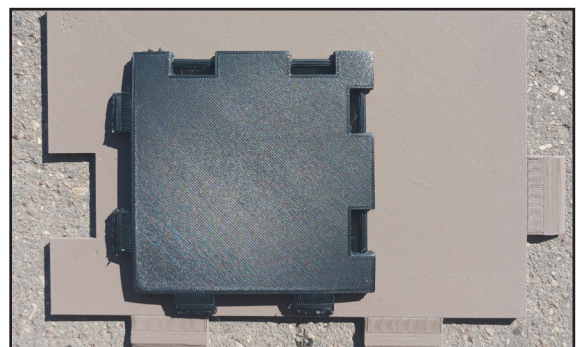
Step 4:

Export the gcode, plug it into your calibrated 3d printer, and press print!



Step 5:

Remove supports - and there you have it: a brand new accessibility tile!



Understand bioplastic

Not all polymers are created equally. For this project, we experimented with polyhydroxyalkanoate (PHA), which is reportedly fully compostable in all biotopes, including water and soil¹. If something is compostable, then it is confirmed to completely break down via soil test. If something is biodegradable, it just means that it breaks down in nature-while degradable means it only breaks down in industrial conditions, with man-made enzymes.

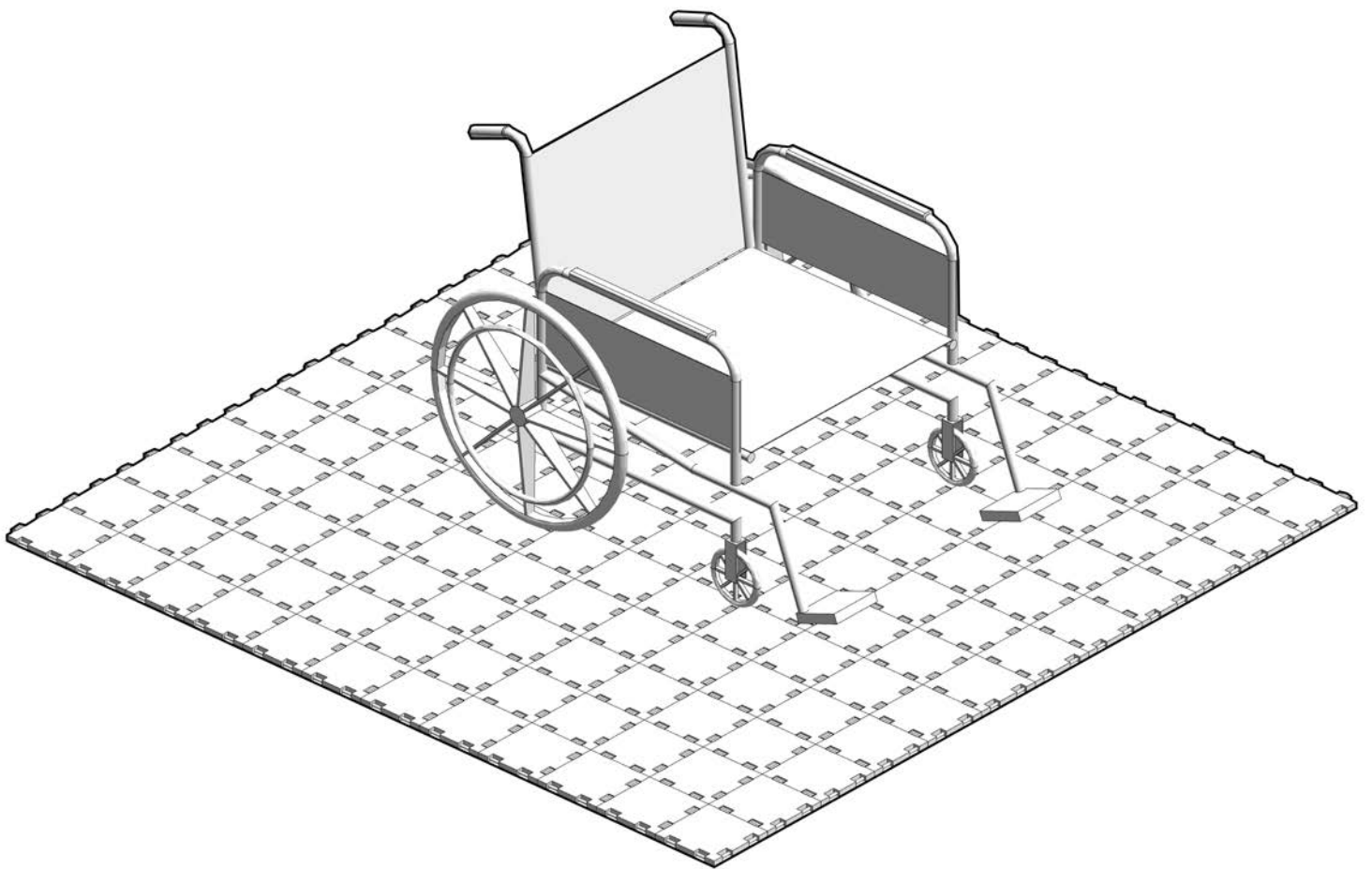
Sometimes biodegradability is overhyped in the media, so it's important to filter what you read in the news and look at the latest peer-reviewed articles to determine what's current information and what is outdated. This table is what we know in June 2023.

	Bio-degrad-able	Compostable	Micro-plastics	Recycled
rPLA	No. Degradable, only in 'industrial conditions'.	no	yes - may even break into microplastics faster than petroleum plastics. ²	yes
PLA	No. Degradable, only in 'industrial conditions'.	no	yes - may even break into microplastics faster than petroleum plastics. ²	no
PHA	yes - but it takes several years.	yes - but it takes several years.	does not reportably cause microplastics.	no

1. Acharjee SA, Bharali P, Gogoi B, Sorhie V, Walling B, Alemtoshi. PHA-Based Bioplastic: a Potential Alternative to Address Microplastic Pollution. *Water Air Soil Pollut.* 2023;234(1):21. doi: 10.1007/s11270-022-06029-2. Epub 2022 Dec 29. PMID: 36593989; PMCID: PMC9797907.

2. Ali, W., Ali, H., Gillani, S. et al. Polylactic acid synthesis, biodegradability, conversion to microplastics and toxicity: a review. *Environ Chem Lett* 21, 1761–1786 (2023). <https://doi.org/10.1007/s10311-023-01564-8>

We dream of a future where makers democratize design.



When we are satisfied with the R&D of our joints, the tile file and this booklet will be made open source on WikiFactory for others to tinker with and print for their communities.

