EXPERIMENTEEL BETON

2023-2024

Experimental Concrete

Installation by FEBELCEM / FEBELARCH

CONTENTS

INTRO

INSTALLATION by FEBELARCH / FEBELCEM

Designers, architects, and concrete experts collaborated to explore innovative applications with precast concrete. Their focus extended beyond typical concrete projects, allowing them to think freely and without constraints. What are the dreams of designers? What experiments do architects and concrete experts wish to undertake together? How can we elevate concrete to new heights?

Discover prototypes centred around the following themes: Bioreceptive, Bursting and Conductive Concrete, Eau de Crete, Self-Cloning Concrete, Coupling Cupola, Concrete Curtain

DESIGNERS: Lie Bormans (DMOA), Xaveer Claerhout (Claerhout – Van Biervliet), Benjamin Denef (DMOA), Kasper Habtie (Bureau Bouwtechniek), Siebe Jansegers (studiobont), Anas Kereknaoui, Dominiek Larsen (DNA-Architecten)

CONCRETE EXPERTS: Jochem Ahmad (DECOMO), Maarten Durnez (ENJOYCONCRETE), Seppe Weiss (ENJOYCONCRETE)

COACHES: Siebe Bakker (bureau bakker), Guy Mouton (Mouton), Jef Marinus (FEBELARCH), Arnaud Tandt (FEBELCEM)

EXPERIMENTEEL BETON (EXPERIMENTAL CONCRETE) is an initiative of FEBELARCH and FEBELCEM, based on a concept by Hans Köhne and Siebe Bakker.

BIO-RECEPTIVE concrete

We examined three concepts:

- Growing concrete
- Snail trail concrete
- Succulent concrete

The first question that sparked our curiosity: How can we create concrete that allows for the existence of living things either inside or on top of it? To create the Growing Concrete, we alternated layers of porous rammed concrete with layers of organic substrate. The porosity of the concrete together with the plant-filled substrate and additional water crystals make sure that enough water is retained for the plants to survive.

For the Snail Trail Concrete, we examined how nature may truly sculpt or change the concrete form or surface. Snail trails were used in a first experiment to create a visible, entirely random pattern on the concrete surface of the formwork. The pattern was based on the snail's journey.

In the third experiment which created the Succulent Concrete, concrete was poured over succulents that had been placed inside the formwork. Nature is the best architect; after the succulents were removed from the formwork, the ensuing negative shape resembled the interior of a complex mosque dome.

succulent concrete

growing concrete

succulent concrete

EAU DE CRETE

The smell of concrete is not one of the many qualities that makes it so admirable. It intrigued us to investigate ways to either enhance the perfume of concrete or turn concrete into a container for a pleasant fragrance.

In the first experiments, potpourri was added to the mixture. Unfortunately, those results weren't particularly promising, as the smell quickly evaporated, and the aesthetic features weren't a feast for the eye either. In a second experiment, tiny tubes were embedded in the concrete to hold scented oil, ready to release a pleasant aroma whenever needed. Sort of like an air freshener, but not quite.

eau de crete

SELF - CLONING concrete

Apart from 3D-printed concrete, formwork is always required when creating a concrete element. Suppose we could create a concrete element that serves both as result ànd formwork. This way the element that is created will in its turn also serve as formwork to create the next element in line. The element becomes a self-generating concrete object that will exponentially grow in numbers.

The task at hand involved creating a shape that could function as a concrete beam and, when combined with additional elements, as concrete formwork. The resulting pieces and the formwork interlock like an Esher-like sculpture. After the first elements are created, they can serve as the framework for the next; no additional formwork is required. The concrete replicates itself, allowing for exponential increases in production speed.

self - cloning concrete

COUPLING CUPOLA

How may a self-supporting structure be designed? Drawing inspiration from Richard Buckminster Fuller, we created a concrete geodesic dome design. This dome forms a modular system, consisting of different triangles, making it possible to adapt each dome to the needs of the specific architectural context.

De design consists of three elements:

- The equilateral triangles (triangles with 3 equal sides)
- The isosceles triangles (triangles with 2 equal sides)
- The connections in between the triangles

The most significant design obstacle was figuring out how to keep the many components cohesive, while maintaining the modular concept.

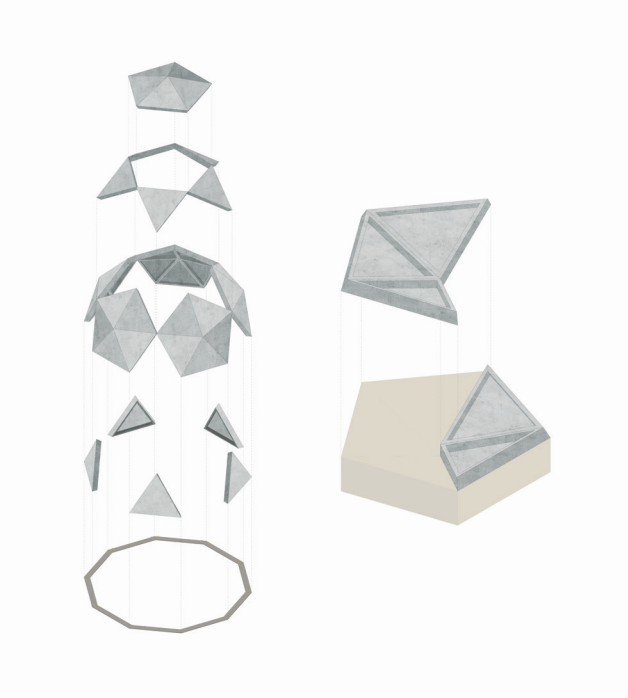
Essentially, there are two distinct triangle components: the equilateral and the isosceles triangles. The isosceles triangles are used to create the 3D-curved pentagonal shape, while the equilateral triangles are necessary to assemble these pentagonal shapes together. The pentagonal shapes are composed on site, using a mould to make sure the triangles are positioned with the proper inclination. After that, the assembled shape is placed in position and connected to the other components.

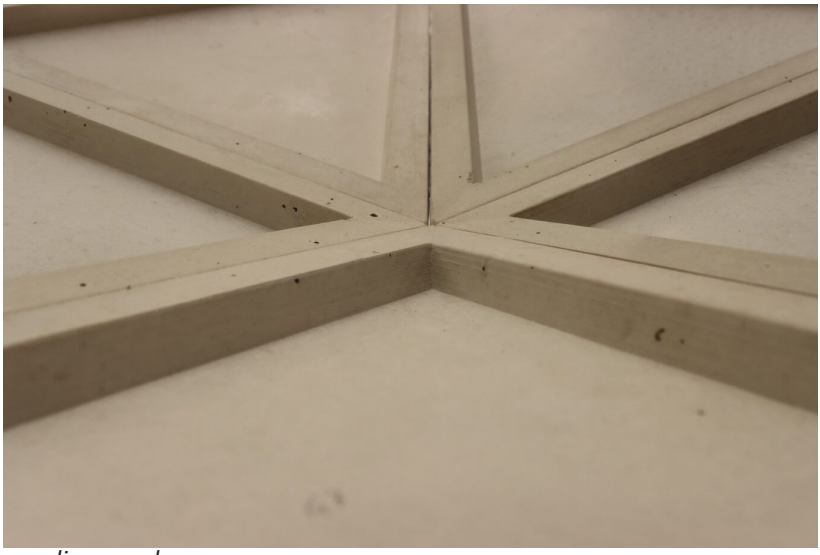
To fixate each panel to the other, different connections are possible. We consider penon and hole, bolt or tongue and groove connections. More romantic connections are also envisioned, such as a possible weaving technique to keep the structure intact, but those belong to future investigation.

The triangle components are precast at the workshop, to ensure good quality and precise measurements and the necessary elements to make the connections are already put into place.

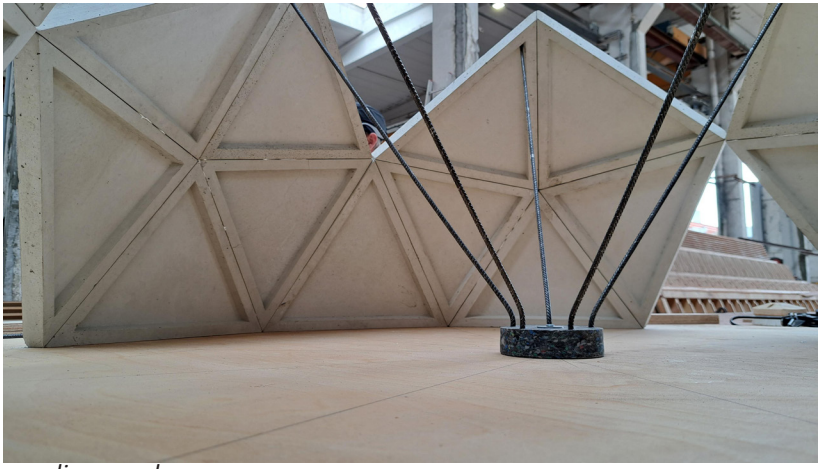
The design is flexible to meet the specific requirements of the architectural context. Triangles can be left off to create passages or to allow natural light to enter the structure. Alternatively, if a more subtle incidence of light or a more open structure is desired, the triangles can also be perforated.

Different compositions of triangles and the connection technique determine how the cupola looks. But the core concept of the design remains intact: creating a modular system that is easy to assemble / dissemble, with a structure that is strong and self-supporting.





coupling cupola



coupling cupola

BURSTING concrete

It is well known that concrete and steel are two perfect partners, due to their equal thermal expansion and their complementary behaviour to take on strain and stress.

However, what could happen if we combine another material with concrete that has a completely different thermal expansion? What could be the effect if that material is heated, causing the concrete to expand and fracture in the sun's heat? To achieve this, the concrete is manipulated in such way that cracks could easily develop. In the region we wish to crack, the material is exceptionally thin. To maximize heat absorption, black concrete was selected.

This way the arising tension in the concrete causes a crack to naturally occur, defining the concrete panels' beauty.

concrete CURTAIN

Is it possible to modify the shape of concrete without having to create a unique formwork for each variation? How can pliable shapes be created?

The hypothesis behind the research was that textiles may be employed both as a formwork, as reinforcement. We discovered that by elevating steel rods beneath jute that had been lathered in concrete, we could give the jute a fixated shape. The concrete would solidify, and a flowing shape would be defined, depending on how the steel bars were positioned.

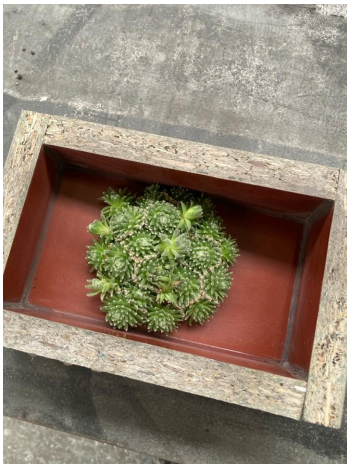
There was one big hurdle that needed solving. How can you connect multiple of these organic shapes together in a vertical structure like a wall? We developed a system that ensured that the supporting rods are fixed in predefined positions. As the jute cloths are bended around these rods, their curves will match the curves of the next panel because of their predefined rods.

This allows for some variations while also ensuring that the various elements can be connected to form one concrete curtain.

concrete curtain

concrete curtain

PROCESS



FEBELARCH

FEBELCEM