hyperion robotics

LEADING THE TRANSITION TO SUSTAINABLE AUTOMATED CONSTRUCTION

Created for the builders of tomorrow, our solution will save, upcycle and optimise today

XAMK MIKSEI MIKKELI

Helsinki, Finland - April 2023


KUKA
hyperion

OUR NETWORK

We are working with clients and partners, who lead global industries

Metso:Outotec

redeia

IBERDROLA

peikko

TARMAC
A CRH COMPANY

We have partnered with some of the best investors in Europe

LIFE LINE VENTURES

Katapult

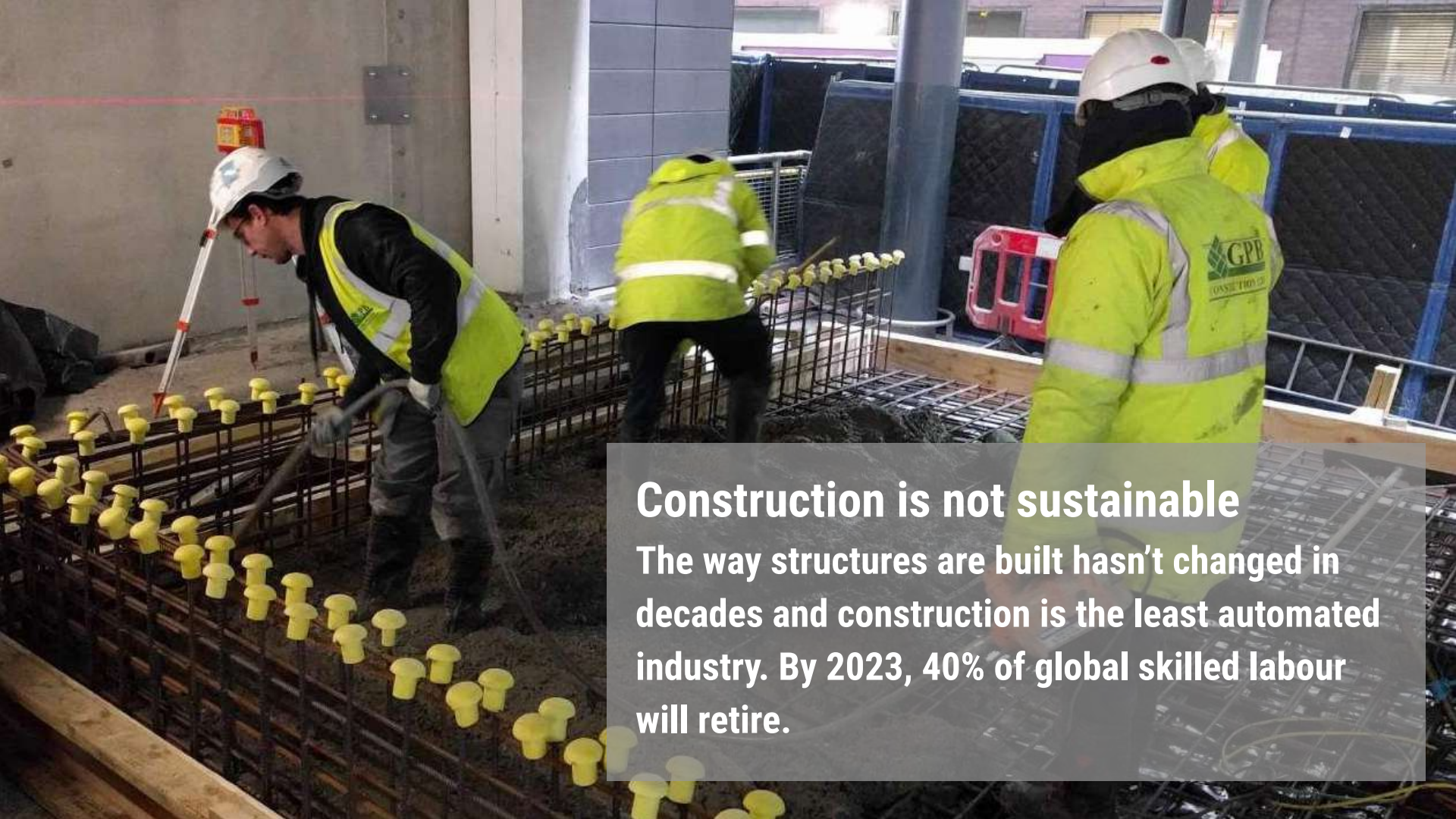
ÜBERMORGEN

GOLDACRE

PC RETTIG & CO

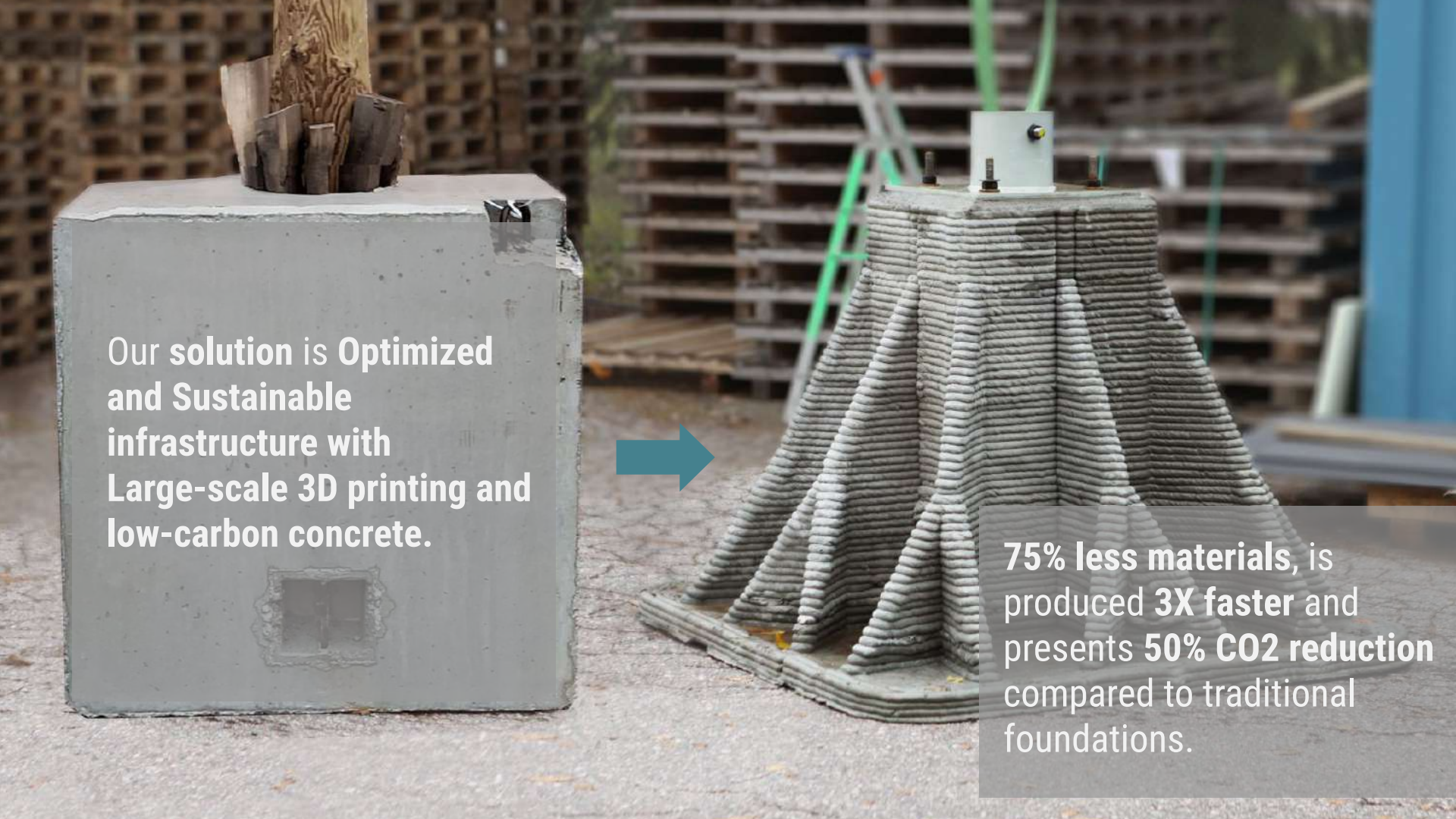
Concrete: massive source of eCO2

The most widely used man-made material on earth generates 8% of global CO2 emissions every year, an equivalent of 2.8 billion tons of CO2



Construction is not sustainable

The way structures are built hasn't changed in decades and construction is the least automated industry. By 2023, 40% of global skilled labour will retire.


Our **solution** is **Optimized and Sustainable infrastructure with Large-scale 3D printing and low-carbon concrete.**
75% less materials, is produced **3X faster** and presents **50% CO2 reduction** compared to traditional foundations.

KEY GENERAL BENEFITS

Sustainability

Up to
90%
improvement

- Mortar is made out of waste stream products
- Material is placed where it is needed
- Zero waste

Cost

Up to
30%
reduction

- Faster production & installation on site
- Less labour and less materials
- No formwork

Execution Time

Up to
50%
reduction

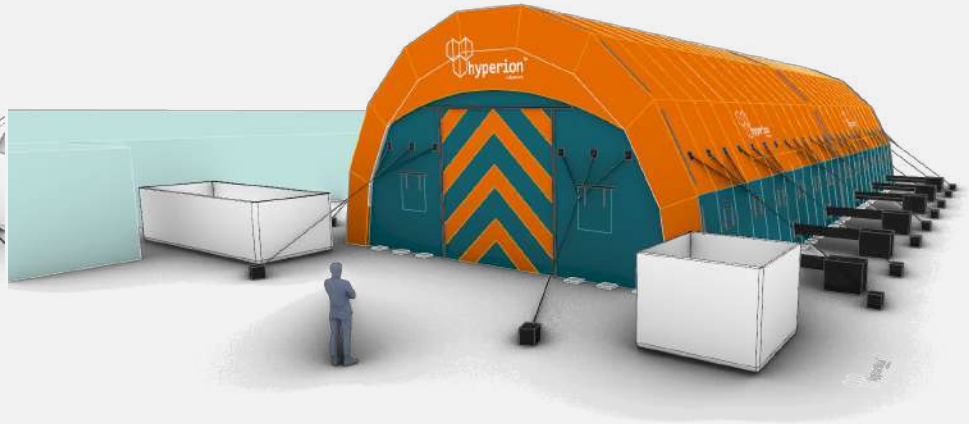
- Streamlined design & engineering phase
- Processes running in parallel

Health & Safety

Up to
50%
improvement

- Minimum labour required
- Minimum time spent on site doing hard labour

HYPERION 3D PRINTING MICRO-FACTORIES



HYPERION 3D PRINTING MICRO-FACTORIES

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HYPERION CONSTRUCTION APPLICATIONS

Water tanks

Foundations

Trenches and Nodes

Artificial reefs and Marine Infrastructure

HYPERION CONSTRUCTION APPLICATIONS

Staircases

Inspection chambers and manholes

Walls and building components

Urban furniture

3D PRINTED TEXTURES

3D printing allows a variety of textures and forms that would be almost impossible to replicate with traditional methods of construction. Above are a few explorations that Hyperion has performed in the past.

hyperion™ robotics

PAD FOUNDATION USE-CASE

IBERDROLA

OPTIMIZED PAD FOUNDATION

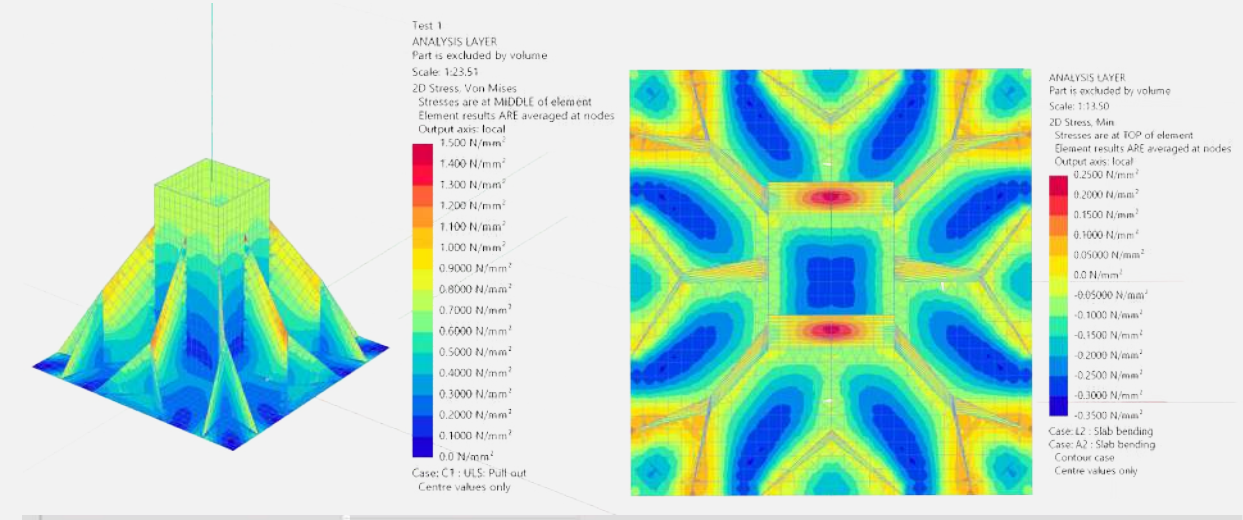
By **placing material were it is most needed**, Hyperion can create robust and efficient structures in collaboration with our client's engineering team.

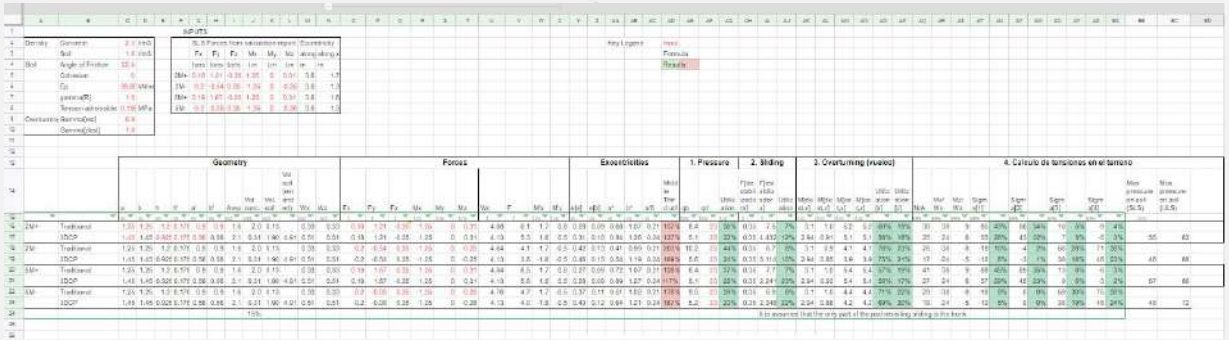
In this application, the result is a thin slab stiffened by a series of ribs branching out from the main trunk of the foundation.

Compared to traditional mass concrete foundations, this foundation has 2 main material benefits:

- It **utilises only 25%** of the typical amount of material
- It **saves up to 80%** of excavated material removal from site

ENGINEERING DESIGN





The structural design was based on the client's load requirements.

A spreadsheet calculator was created to determine the overall dimensions of the pad foundation and a series of FEM (Finite Element Modeling) models was created for local stress checks

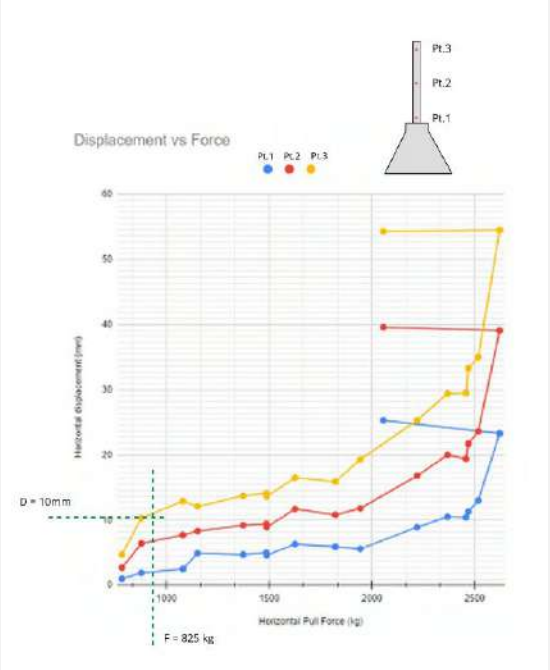
3D PRINTING PRODUCTION

The printing was achieved in 1h15 min for the 1.5 ton optimized foundation. Steel inserts provided by Peikko were embedded within the printed concrete and steel rods were then grouted in the pockets created by the printer. It requires **2 people to operate our machinery**. One holding the robot controller, the other one checking material feeding.

DELIVERY TO SITE AND INSTALLATION

The foundation was transported in a truck and lifted into the hole excavated beforehand.
A digger and hand-held compactor were used to backfill the excavation with the original soil material similar to what is traditionally done on site.

CODE COMPLIANCE AND REGULATIONS



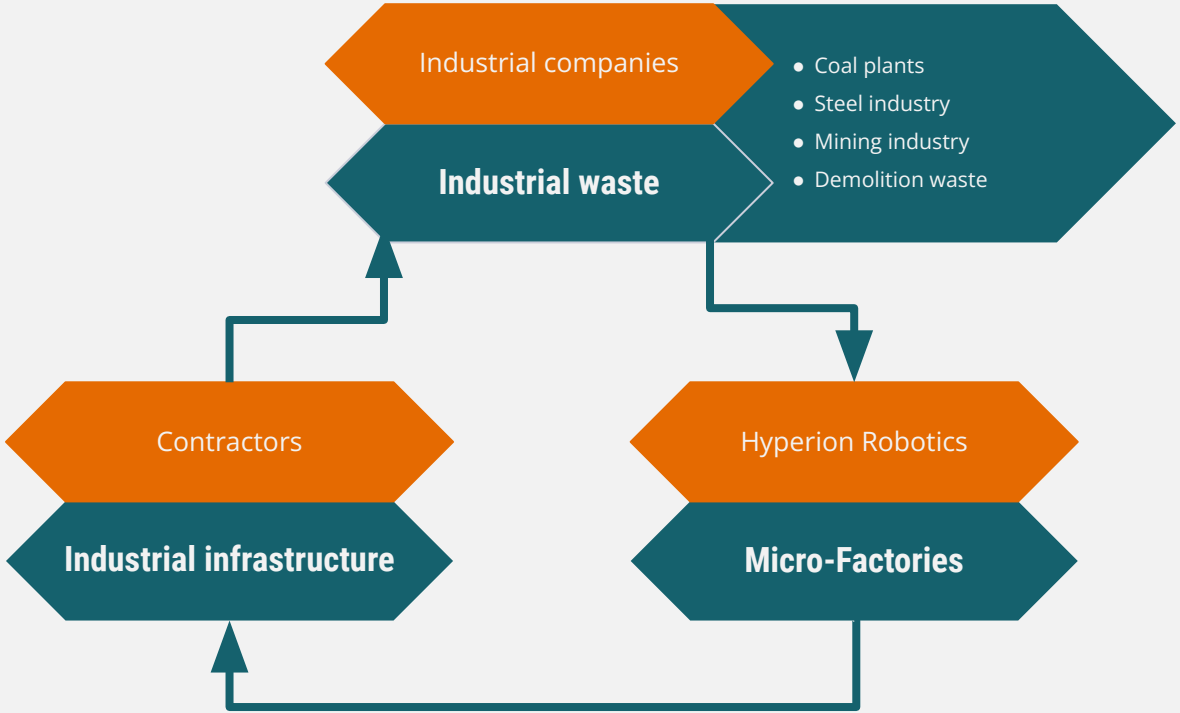
2 tests were performed to assess the resistance of the foundation. The first, horizontal pull, was to test the overturning resistance of the foundation. The second, was a direct uplift.

Both tests resulted in a **factor of safety of 3x** which correlated with the calculations

CODE COMPLIANCE AND REGULATIONS

We follow a rigorous testing regime and a process called “**DESIGN BY TESTING**”

CIRCULAR VALUE CHAIN



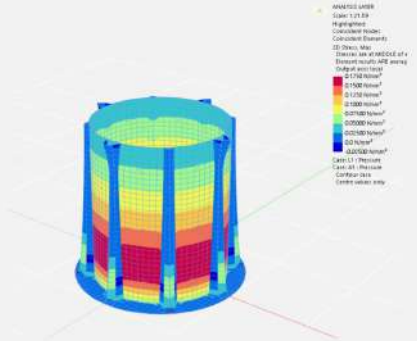
RANGE OF MATERIALS

- Up to 80 MPa
- Cement based and fully recycled materials
- Ingredients **upcycled from industrial waste** streams
- The **lowest CO2** 3D-printable materials on the market

CASE STUDY: CEMENT FREE WATER TANK

Key Benefits:

- Eco-friendly approach to reuse directly available material from the mining process.
- Speed of execution with automated approach
- Large scale elements with all features built directly into the object



97% RECYCLED

ZERO CEMENT

90% LESS CO2

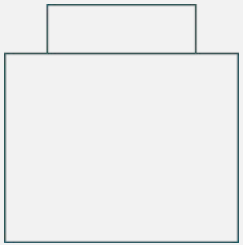
Hyperion Carbon Project <> MIKSEI MIKKELI

LOW-CARBON 3D PRINTING CONCRETE WITH BIOCHAR

Hyperion Carbon Project <> MIKSEI MIKKELI

The following carbon savings calculator shows the impact of combining Hyperion's optimized foundations.

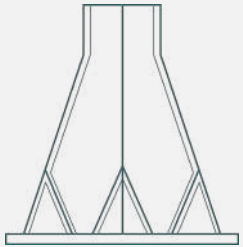
Traditional Concrete Foundation



W: 1 ton

CO2: 100kg

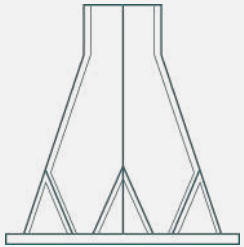
3D-printed optimized foundation with Hype-Cement mix (70% material savings)



W: 300kg

CO2: 34 kg

3D-printed in Hype-Carbon mix



W: 300kg

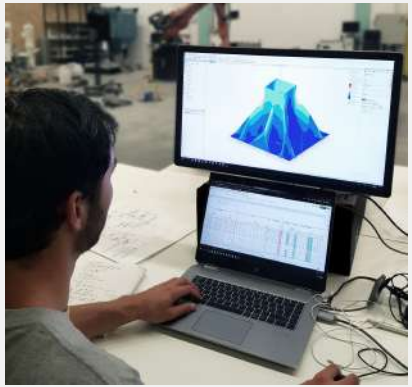
CO2: 16 kg

WITH FURTHER DEVELOPMENT, WE CAN ACHIEVE CARBON NEGATIVE STRUCTURES!!

CUSTOM PRODUCTS & REQUIREMENTS: PROCESS

If you haven't found what you are looking for in our catalogue, please contact us to describe your needs and specifications. Our team of engineers will design for you any solution for your custom elements.

1. Scope definition and planning



2. Design and engineering

3. Onsite and offsite production

4. Delivery

Contact us

MICRO-FACTORY VIDEO

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LET'S 3D PRINT A BETTER FUTURE TOGETHER

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