Transforming Construction: The Future of Building Technology

FIABCI - JUNE 6th, 2023


1
2

TYPES OF 3D PRINTERS

Wax Casting
(Material Jetting)

DLP
(Digital Light Processing)

SLM
(Selective Laser Melting)

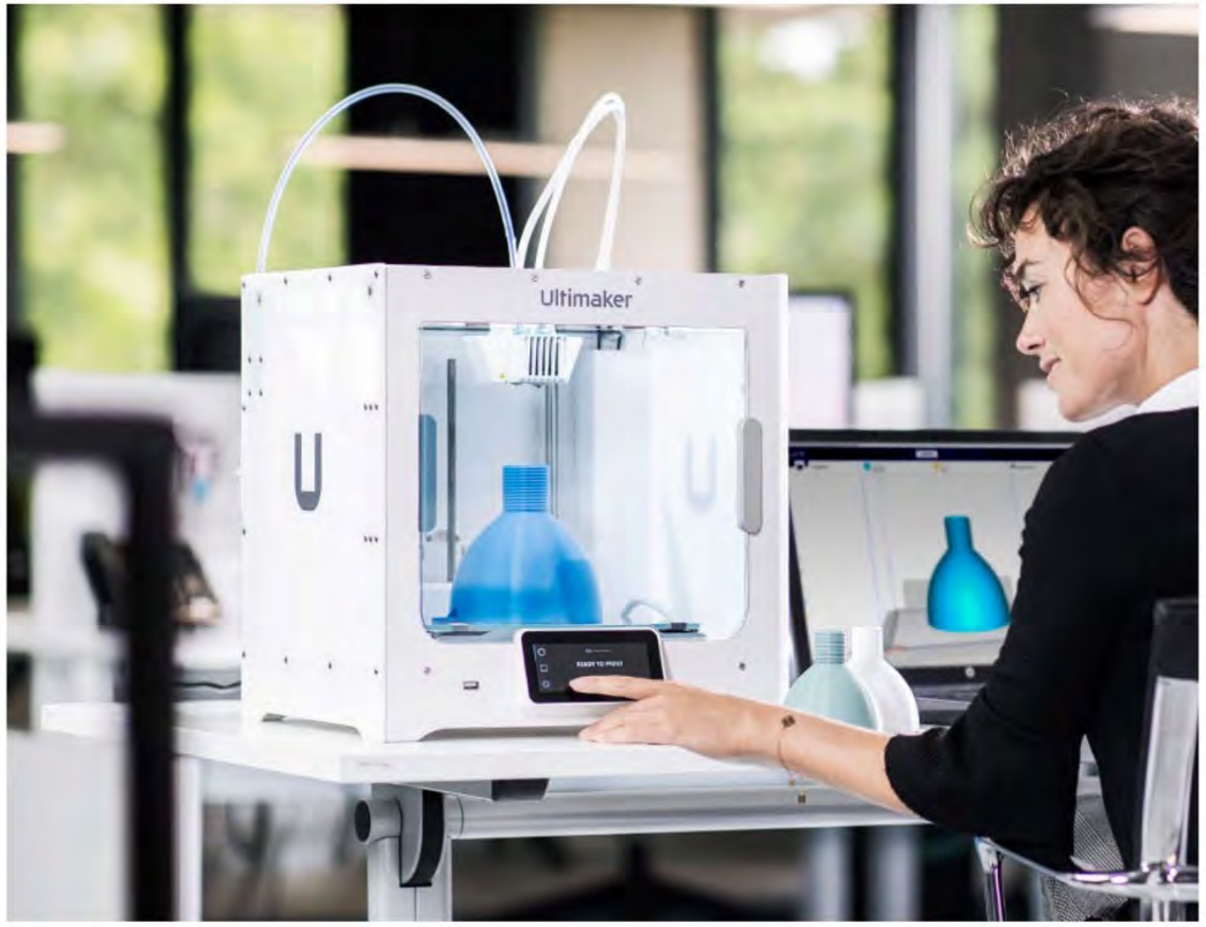
LOM
(Laminated Object Manufacturing)

SLS
(Selective Laser Sintering)

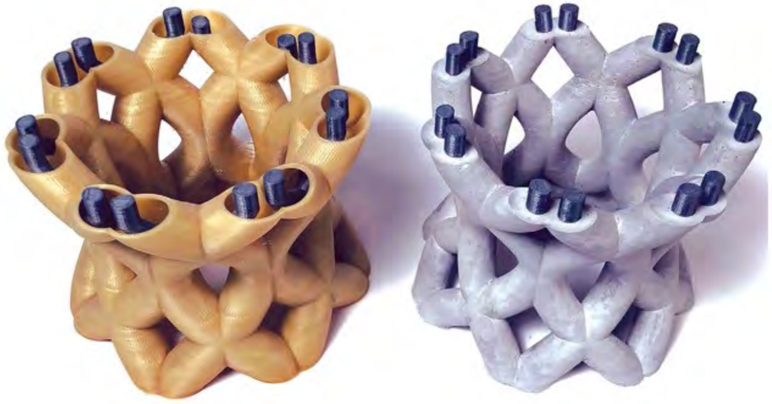
BINDER JETTING
(2D Print Head)

FDM
(Fused Deposition Modeling)

SLA
(Stereolithography)


Ultimaker

Manchester Metropolitan University - Concrete 3D Printing



Dissolvable Formwork: Erin Hunt + Shelby Doyle

Digital Building Technologies Group - Smart Slab

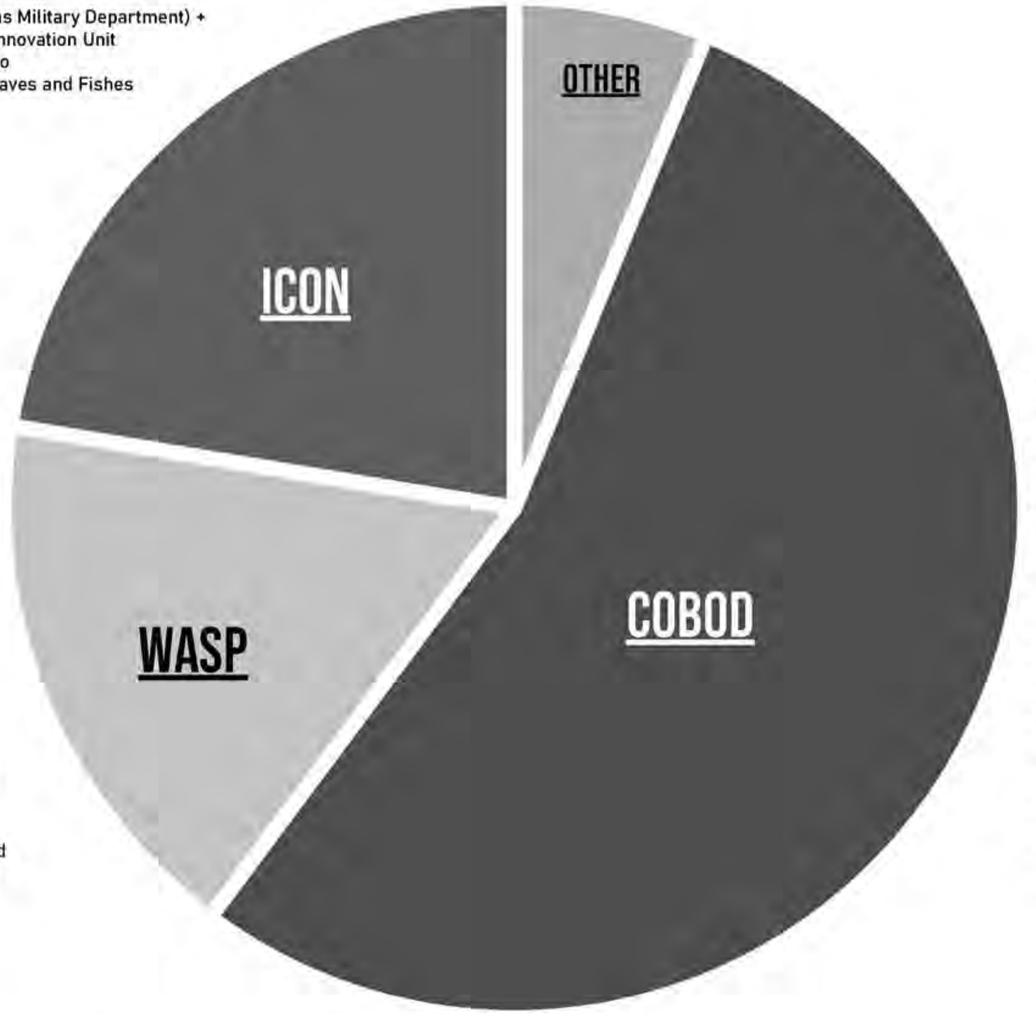
WHAT IS THE STATE OF CONCRETE 3D PRINTING TODAY?

Top House 3D Printers

HOUSE 3D PRINTER	CATEGORY*	TYPE**	BUILD SIZE (M)	COUNTRY
BetAbram P1	Available	Gantry system	16 x 8.2 x 2.5	Slovenia
COBOD BOD2	Available	Gantry system	14.62 x 50.52 x 8.14	Denmark
MAXI PRINTER	Available	Robotic arm	12.25 x 12.25 x 7	France
CyBe Construction CyBe RC 3Dp	Available	Robotic arm	2.75 x 2.75 x 2.75	Netherlands
ICON Vulcan II	Available	Gantry system	2.6 x 8.5 x ∞	United States
MudBots 3D Concrete Printer	Available	Gantry system	1.83 x 1.83 x 1.22	United States
Total Kustom StroyBot 6.2	Available	Gantry system	10 x 15 x 6	United States
WASP Crane WASP	Available	Delta system	Ø 6.3 x 3	Italy
Apis Cor	Project	Robotic arm	8.5 x 1.6 x 1.5	Russia
Batiprint3D 3D printer	Project	Robotic arm	Up to 7m high	France
SQ4D – ARCS	Service	Gantry system	9.1 x 4.4 x ∞	United States
Contour Crafting	Service	Gantry system	–	United States
XtreeE	Service	Robotic arm	–	France

ICON Partners

Lennar + BIG
New Story (Echale)
NASA
TMD (Texas Military Department) + Defense Innovation Unit
Lake+Flato
Mobile Loaves and Fishes



COBOD Partners

Peri Group
General Electric (USA)
14Trees
Cementos Progreso
Fortex
Harcourt Technologies
Cemex
Kites Construction
Siam Cement Group
Power2Build
KampC
Gutech
Dar Al Arkan
Printed Farms
Roser GMBH
DTU (Technical University of Denmark)
3DCP Group
1PRINT
Emergent 3D Printing

WASP Partners

Honda
Mario Cucinella Architects
Tinybe
Dior
IAAC (Institute for Advanced Architecture of Catalonia)
RiceHouse
University of Naples

COBOD

BOD2

Mission:
At COBOD, our mission is to disrupt the global construction industry through world-class 3D robotics and automation. Faster. Better. Cheaper. We work tirelessly to improve printing speed, efficiency, labor need, and material cost to challenge conventional construction.

Vision:
3D printed and robotics constructed buildings in every city around the world. With our future printer systems, the printers can hardly be called just printers anymore - they will be multifunctional construction robots. Right now, we are working with the first movers. We are ahead of tomorow's norms and the big volume market. However, we will democratize 3D construction, making it accessible to all. Maturing technology and lowering risk - selling 3D robotics & automation solutions beyond firt-movers and entrepreneurs.

PRINT VOLUME	14620 × 50520 × 8140 mm
LAYER HEIGHT	5-40 mm
MAX PRINT SPEED - X AXIS	250 mm/s
MAX PRINT SPEED - Y AXIS	250 mm/s
MAX PRINT SPEED - Z AXIS	50 mm/s
OPERATING TEMPERATURE	5-35º C
WEIGHT	5390 kg

COBOD Global partners

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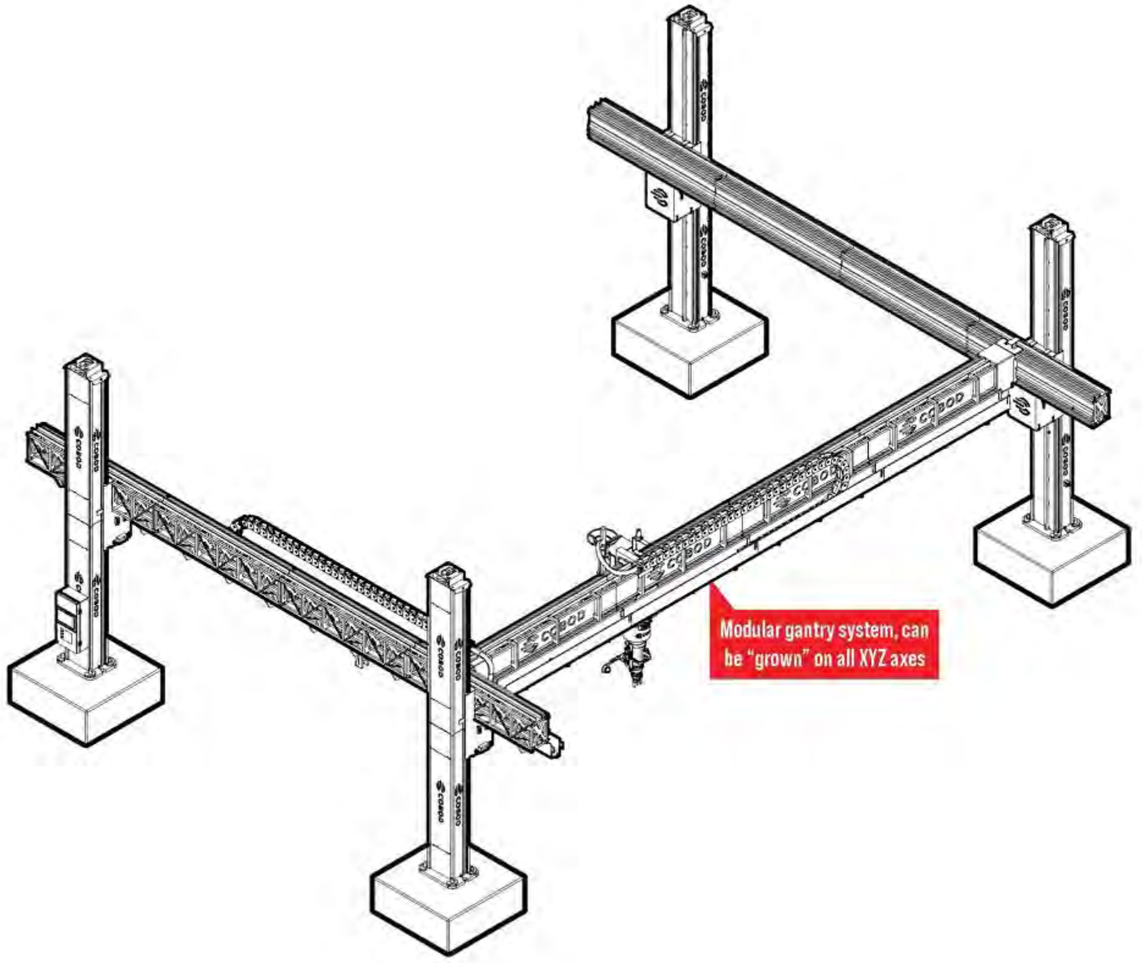
SCHOOL OF ARCHITECTURE
FABRICATION LAB



COBOD + PERI

2 STORY HOUSE, GERMANY

This project was
Germany's first 3D printed home
and let to many new homes
being printed in
Germany by PERI.

LOCATION:
GERMANY

SIZE:
2,800 SQ FT

PHOTO:
VIA PERI GROUP

UNIVERSITY OF MIAMI
SCHOOL OF ARCHITECTURE
FABRICATION LAB

TWO STORY HOME PRINTED IN GERMANY

COBOD + KAMP C

2 STORY HOME, BELGIUM

This house is a prototype by KAMP C in Germany and rapidly decreased the 3D print time through multiple iterations.

LOCATION:
BEGLIUM

SIZE:
1,000 SQ FT

PHOTO:
KAMP C & JASMIEN SMETS

COBOD + PERI

3 STORY HOUSE IN GERMANY

This house was the world's first 3 story 3D printed home by Peri Group in Germany.

LOCATION:
GERMANY

SIZE:
2,800 SQ FT

PHOTO:
VIA PERI GROUP

THREE STORY HOME PRINTED IN GERMANY

WASP

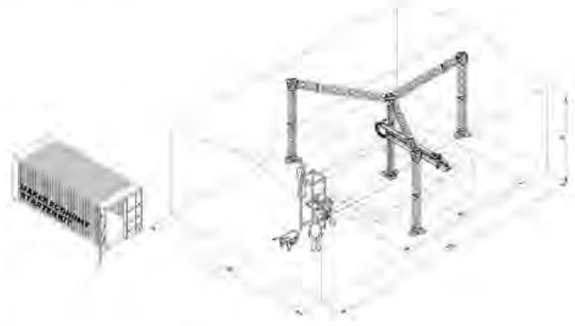
CraneWASP

Vision:
3D printing is WASP's heart since a small and fast printer that materialises objects made of bio-plastic, clay, silicone and biocompatible materials, which mills wood and aluminium, makes it easy to start mini-productions and to create what you need by yourself.

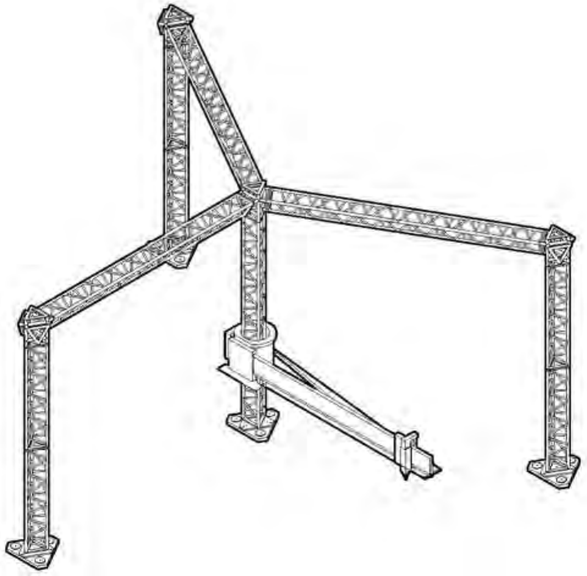
The revenue from the sale of solid printers is invested in the research and development of integrated projects aiming at a production revolution that could result in widespread prosperity. Research that advances hand in hand with eco-friendly, sustainable and functional materials and innovative systems. The projects so far realised by the group are 100% self-financed.

The aim of WASP is to build 'zero-mile' homes, using materials found on the surrounding area. A similar project requires that the machine be portable and features low energy consumption, since in large areas of the planet, there is no electricity at all. It must therefore be able to use renewable energies such as sun, wind and water.

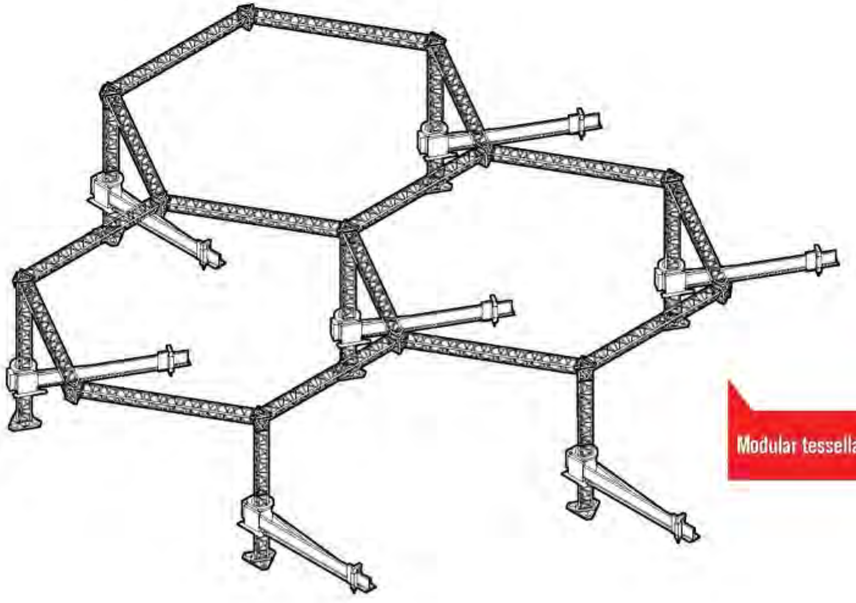
PRINT VOLUME	Ø6300 mm x h3000 mm
MIN LAYER HEIGHT	9 mm
MAX PRINT SPEED	300 mm/s
OPERATING TEMPERATURE	10-40º C
WEIGHT	150 kg



Single Module



Multiple Modules



WASP
TECLA, ITALY

The TECLA house was 3d printed using locally sourced clay in Italy.

LOCATION:
ITALY

SIZE:
700 SQ FT

PHOTO:
VIA WASP

WASP

DIOR, DUBAI

The Dior Pop Up Store in Dubai was a material exploration in using local sand as the primary material in 3d printing. While also exploring textures.

LOCATION:
DUBAI

SIZE:
700 SQ FT

PHOTO:
VIA WASP

WASP + IACC

EARTH WALL

Earth Wall is a material exploration into how 3D printed walls could connect to and receive other building members.

LOCATION:
BARCELONA

SIZE:
N/A

PHOTO:
VIA WASP

ICON

Vulcan II

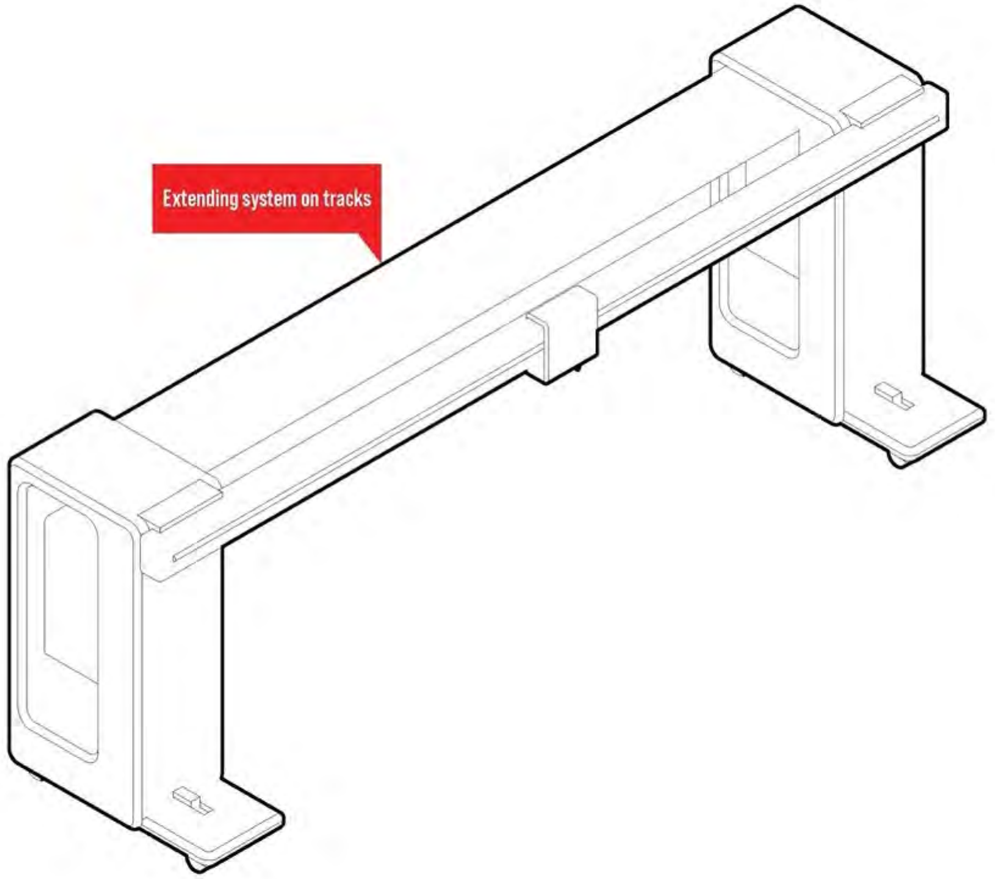
What is ICON?
"Develops advanced construction technologies that advance humanity. Using proprietary 3D printing robotics, software, and advanced materials.

Mission:
"re-imagine the approach to homebuilding and construction to make affordable, dignified housing available to everyone throughout the world"

Problem:
Housing Crisis - demand and population increase but home building can not keep up.

1. Affordability
2. Sustainability
3. Availability

PRINT VOLUME	2600 x 8500 x 2600 mm
MIN LAYER HEIGHT	9 mm
MAX PRINT SPEED	5' 10"/sec
OPERATING TEMPERATURE	Not Provided
WEIGHT	4309 kg



ICON

CHICON HOUSE, AUSTIN, TX

Chicon House, first permited 3D printed home in the US, done with the nonprofit New Story.

LOCATION:
AUSTIN

SIZE:
700 SQ FT

PHOTO:
Via ICON

ICON

A PLACE TO CALL HOME, MEXICO

3D printed affordable housing community in Tabasco, Mexico. Each house is 500 sq ft, done with the nonprofit New Story.

LOCATION:
MEXICO

SIZE:
700 SQ FT

PHOTO:
VIA ICON

ICON + LAKE FLATO

HOUSE ZERO

House Zero is a net zero house primarily 3d printed in Austin Texas by Lake Flato Architects.

LOCATION:
AUSTIN

SIZE:
N/A SQ FT

PHOTO:
VIA LAKE FLATO ARCHITECTS

ICON + BIG

TEXAS SUBDIVISION, AUSTIN, TX

This is a subdivision filled with 3D printed houses designed by BIG Architects with ICON.

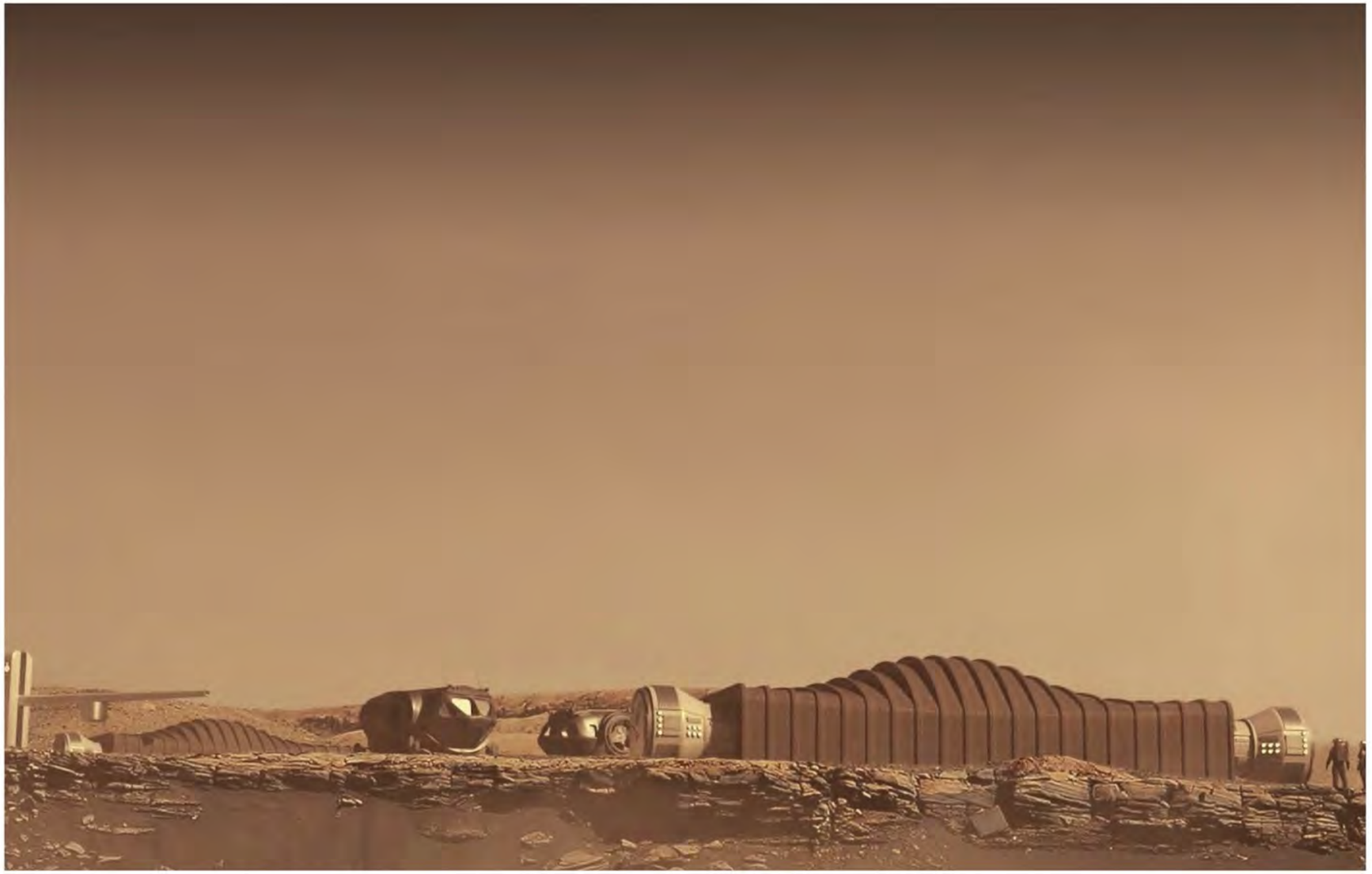
LOCATION:
AUSTIN

SIZE:
MULTIPLE UNITS

PHOTO:
VIA ICON

ICON + BIG

MARS DUNE HABITAT



This is a rendering of a potential 3d printed structure located on Mars.

LOCATION:
MARS

SIZE:
N/A

PHOTO:
VIA BIG

ACADEMIC PROJECTS

DIGITAL BUILDING TECHNOLOGIES

CONCRETE CHOREOGRPAHY

BLOCK RESEARCH GROUP + ZAHA HADID ARCHITECTS

STRIATUS

HANNAH OFFICE

ASHEN CABIN

3D PRINTING IN FLORIDA

PRINTED FARMS AND COBOD

EQUESTRIAN BARN, LOXAHATCHEE, FL

PRINTED FARMS SITE IN LOXAHATCHEE

PRINTED FARMS AND COBOD

EQUESTRIAN BARN, LOXAHATCHEE, FL

PRINTED FARMS AND COBOD

TALLAHASSEE

Location:
Tallahassee

3D PRINTING AT UM

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FABRICATION LAB

RENDERING OF POTENTIAL 3D PRINTER SITE ON CAMPUS

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06.06.2023

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SCHOOL OF ARCHITECTURE
FABRICATION LAB

VIEW FROM STUDENT WORK STATIONS

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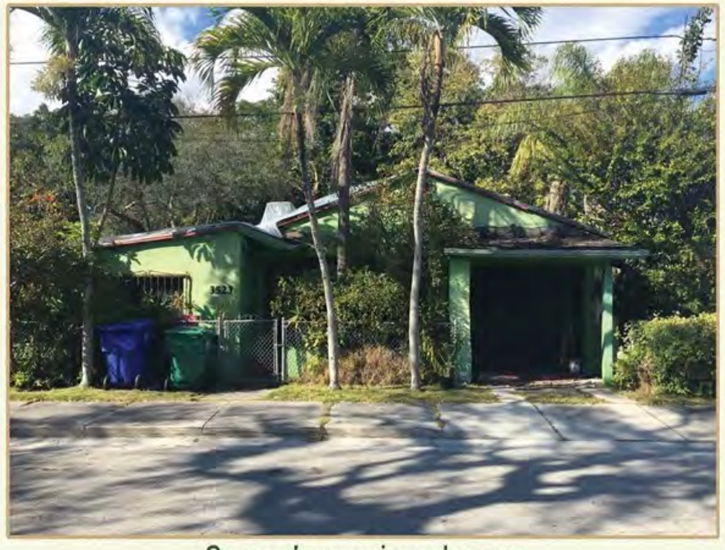
06.06.2023

Charles Ave 3DP

The People

Born July 25, 1953, Linda was raised in Coconut Grove, Florida by her single mom Bessie Thompson Haithman. A creative and compassionate outlook on life was instilled in her at an early age which shaped her into becoming a representative of her community. Linda attended and graduated from Coral Gables Senior High School in 1971. She then went on to start her career as a secretary for Pancoast Architects. Five years, and several jobs later, she opened a business of secretarial/clerical services provided to the general public. She completed her working career with Macedonia Missionary Baptist Church. After her mother's passing in 2006, Linda became committed to working to improve her community by being a part of the Coconut Grove Village West Homeowners and Tenants Association (HOATA). She is a part of several associations like the Community Advisory Committee, Coconut Grove Negro Women's Club, the Historical Cemetery Association, and the Coconut Grove Village Council. Alfred Williams was born on April 7, 1943 and raised by a single mom, Lucille Hannah, Alfred along with his younger brother, Eddie Lee Peters, lived in Attapulgus, Georgia. They eventually moved south to Miami, Florida in 1951 where he graduated from George Washington Carver Sr High School. After graduation, following his curiosity, he attended the National School of Meat Cutting in Toledo, Ohio. Upon returning home, he attained various jobs throughout the years like the Griffin Roofing Company, Maintenance Department at the University of Miami, and later retired from Winn Dixie Stores in 2005 after 31 years of service.. Alfred and Linda met in 1971, and after a long courtship they married in 1983 and had a son, Alfred Jr. Alfred and Linda both enjoy many activities but some of their favorites include sewing, cooking, and barbecuing with friends and family.



Owner's previous house

Rebuilding Together®

Miami-Dade

Interior damage from Hurricane

Charles Ave 3DP

The Project

The Coconut Grove 3D Printing Initiative at the University of Miami School of Architecture started through a collaboration through the University and Rebuilding Together Miami-Dade to help rebuild a house for a family in Coconut Grove whose house was damaged during a hurricane. The initiative began in September of 2021 and has continued to move through a research and design phase. The initiative aims to push utilize digital fabrication, in particular concrete 3D printing to rebuild the shell of the house and traditional construction to build the interior of the house. The team for this project consists of a range of students from the M. Arch, B. Arch, Construction Management, and Master's of Real Estate Development programs to think through the project on a wide range of issues. Students have met with the owners of the lot to discuss aesthetics, culture, constructibility, and economics related to the project. At the same time the students have been investigating the opportunities and limitations provided by using a large format 3d printer to print at full scale. The project aim to complete the design phase by April 1st and move into permitting and construction over the Summer of 2022. The project depends on fundraising to put together the funds needed to construct the house, with the management of the project being led by Rebuilding Together.

Meet our Team


Michaela Urteaga


Catalina Cabral-Framiñan


Giuliano D'Arrigo

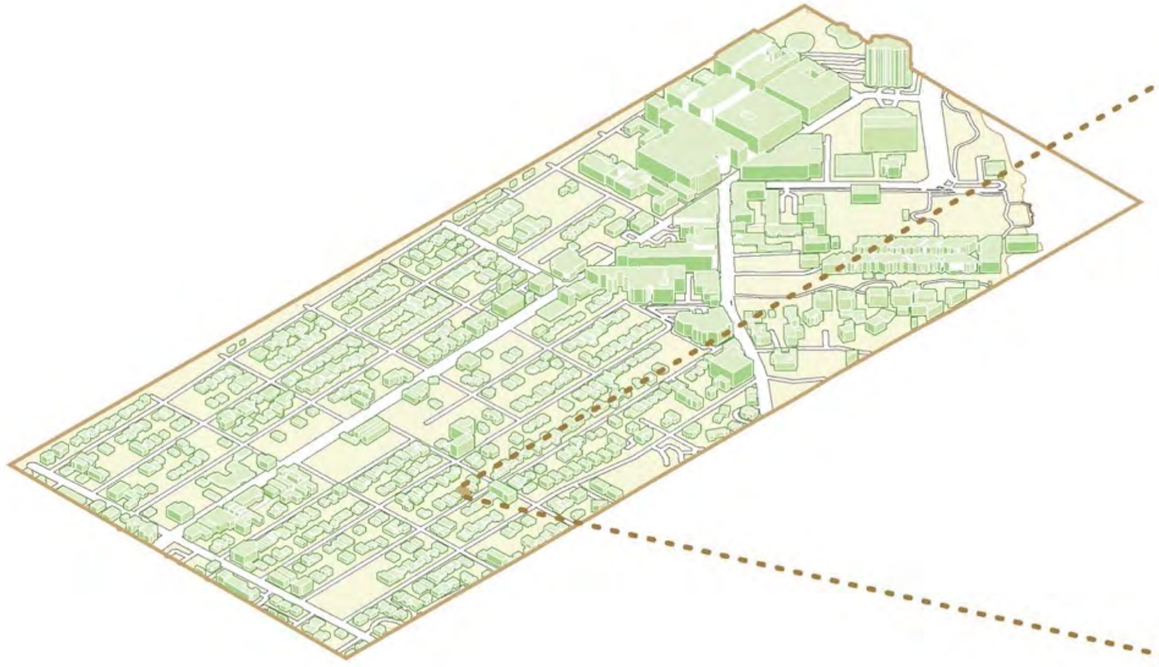

Robert Sims Dubon


Stephen Matthews


Amber Kountz


COBOD 3D Printer


Concrete Extrusion



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SITE IN COCONUT GROVE

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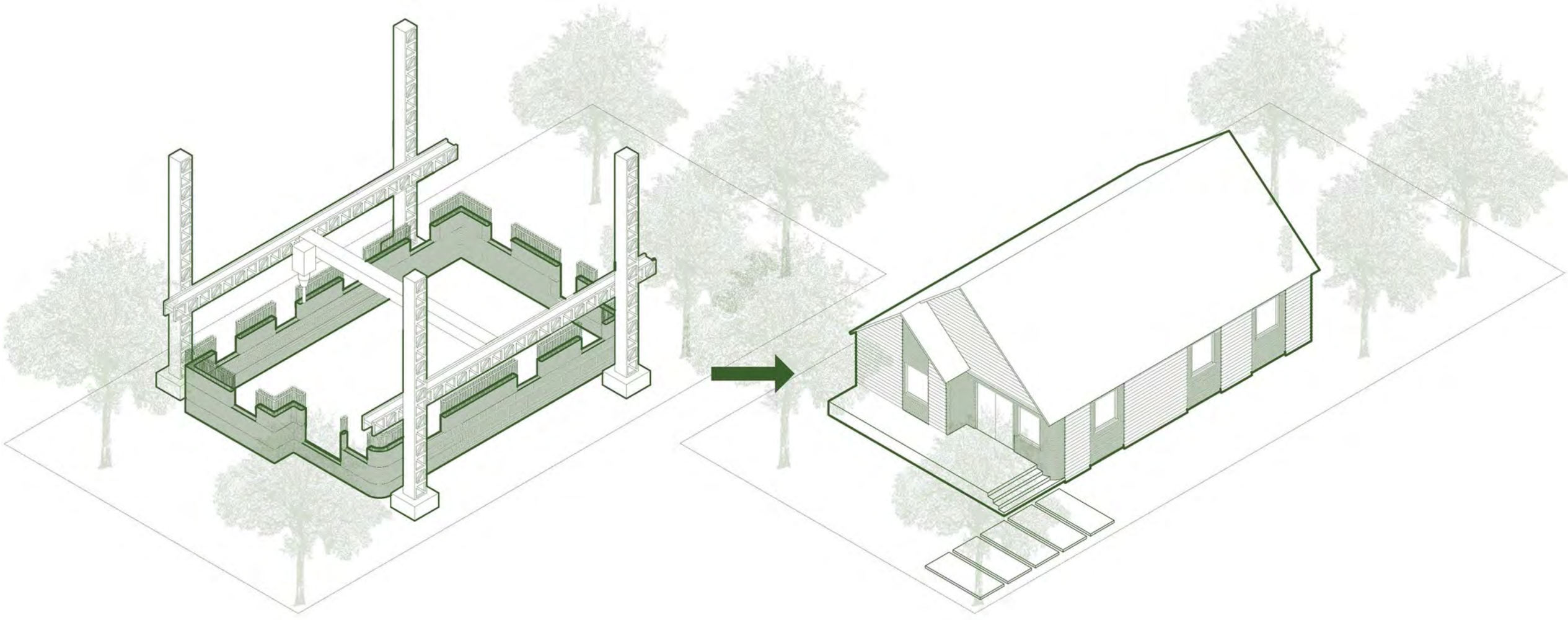

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3DP DIAGRAM

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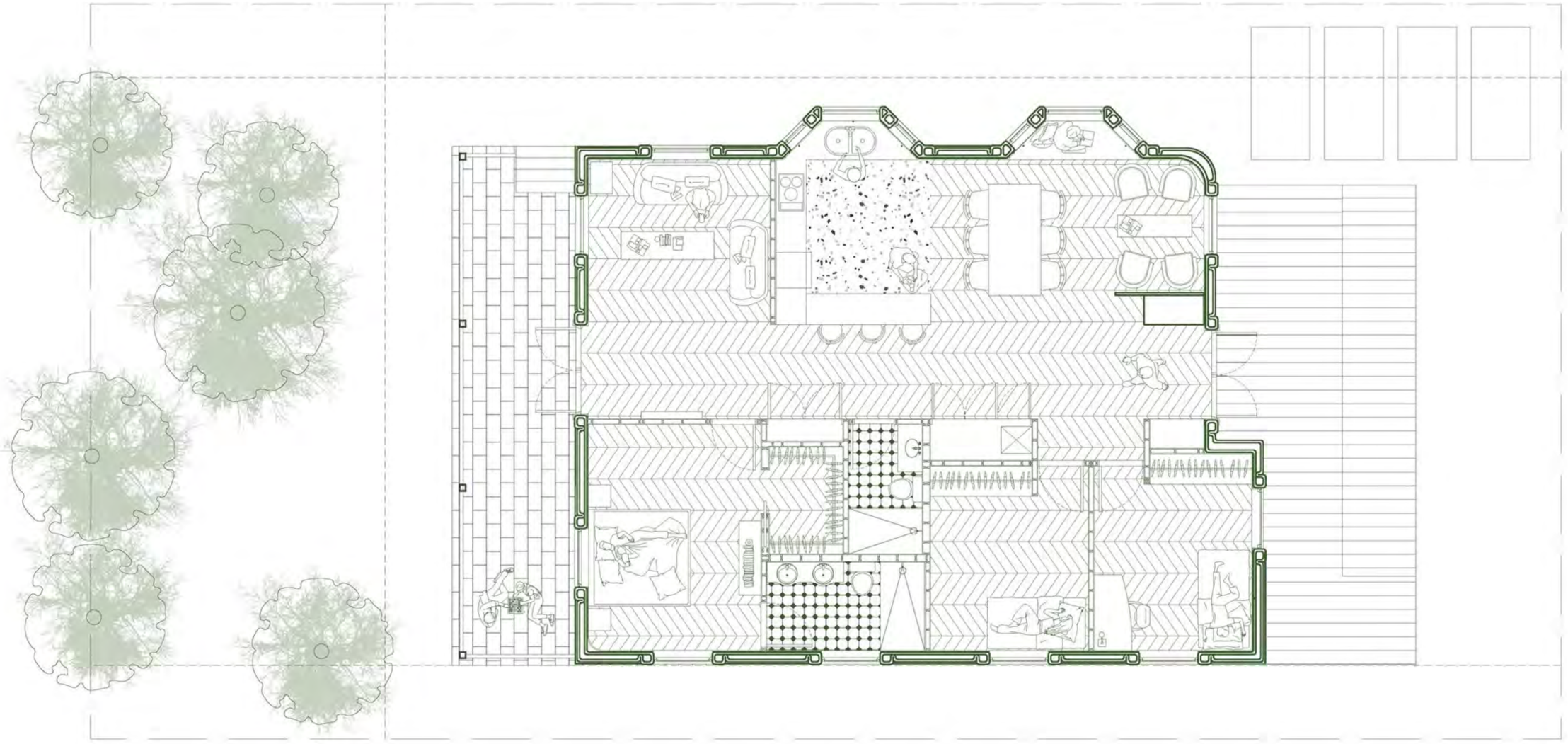

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PROPOSED FLOOR PLAN

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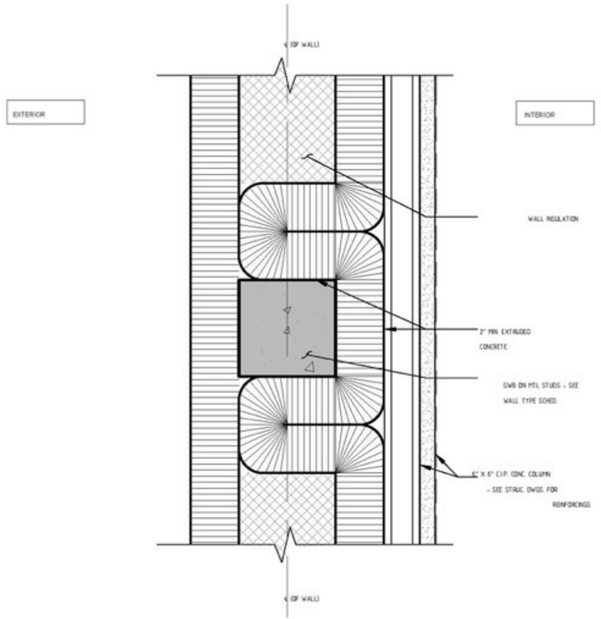
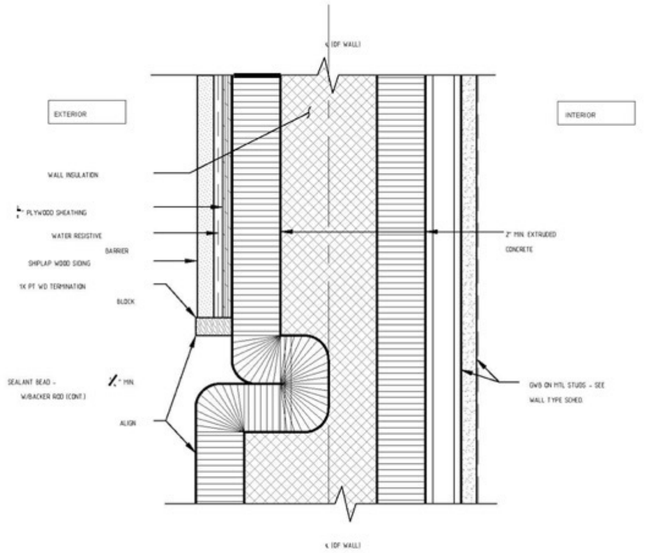
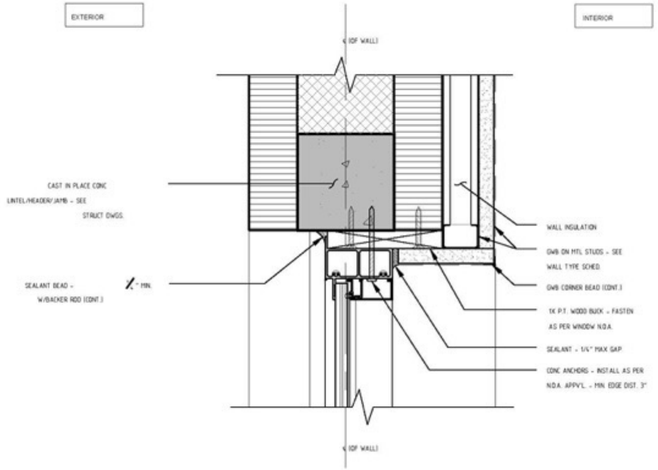


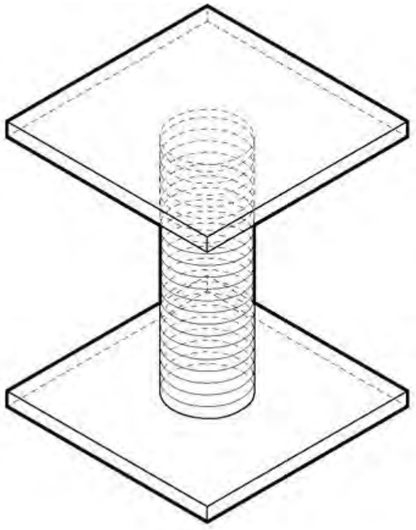
Column Plan Detail



Wall Setback Plan Detail

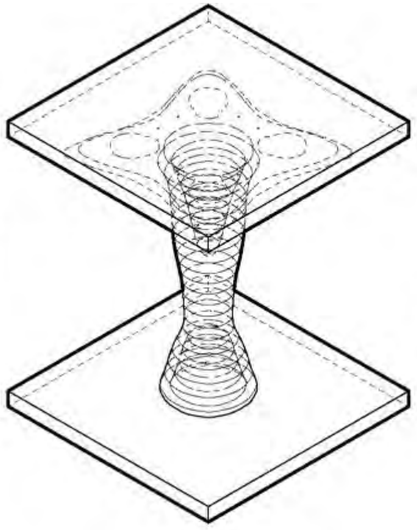


Window Section Detail



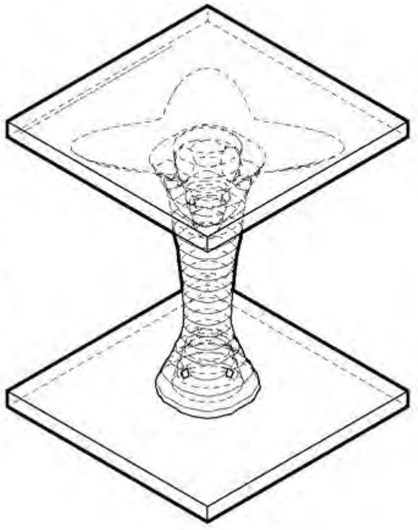
STANDARD CYLINDRICAL COLUMN

OPTIMIZATION LOOP



OPTIMIZED (10th iteration)

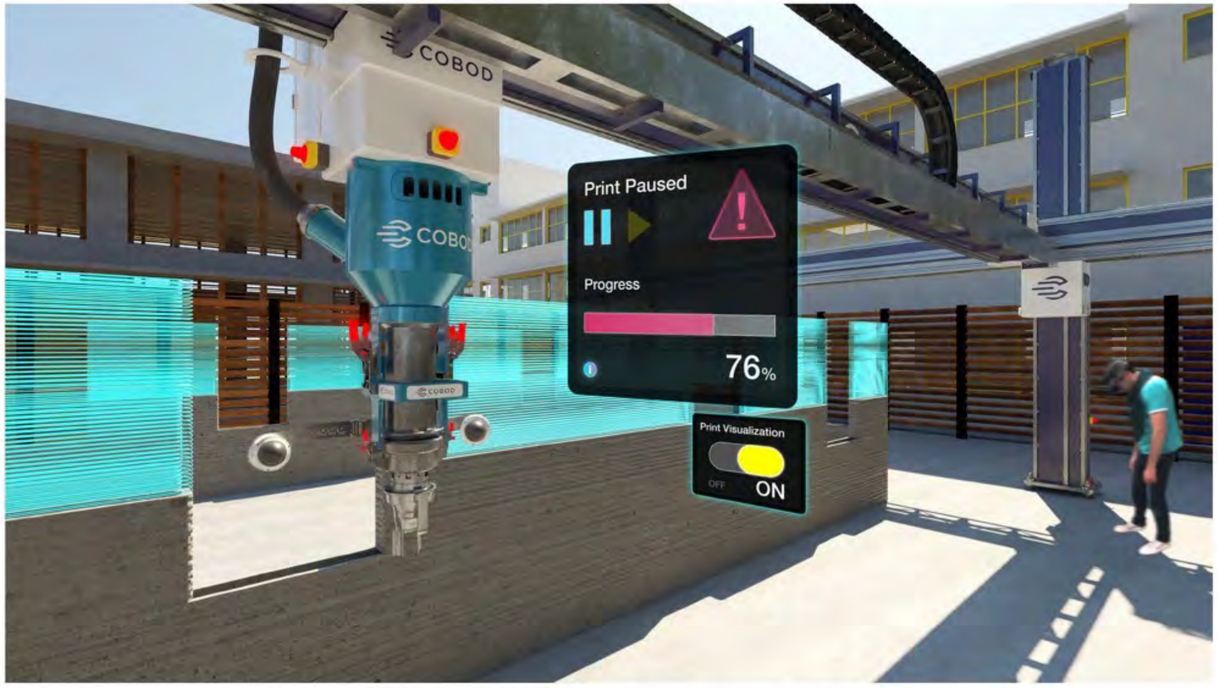
OPTIMIZATION LOOP



OPTIMIZED (100th iteration)

TEST 3D PRINT (CERAMICS)

CONTROL OF BATCH PLANT



CONTROL OF EQUIPMENT + GEOMETRIC OVERLAY

FRONT RENDERING

COURTYARD RENDERING

THANK YOU!