

# 3D Printed Concrete Applications

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# What can we do with 3D printing in construction?

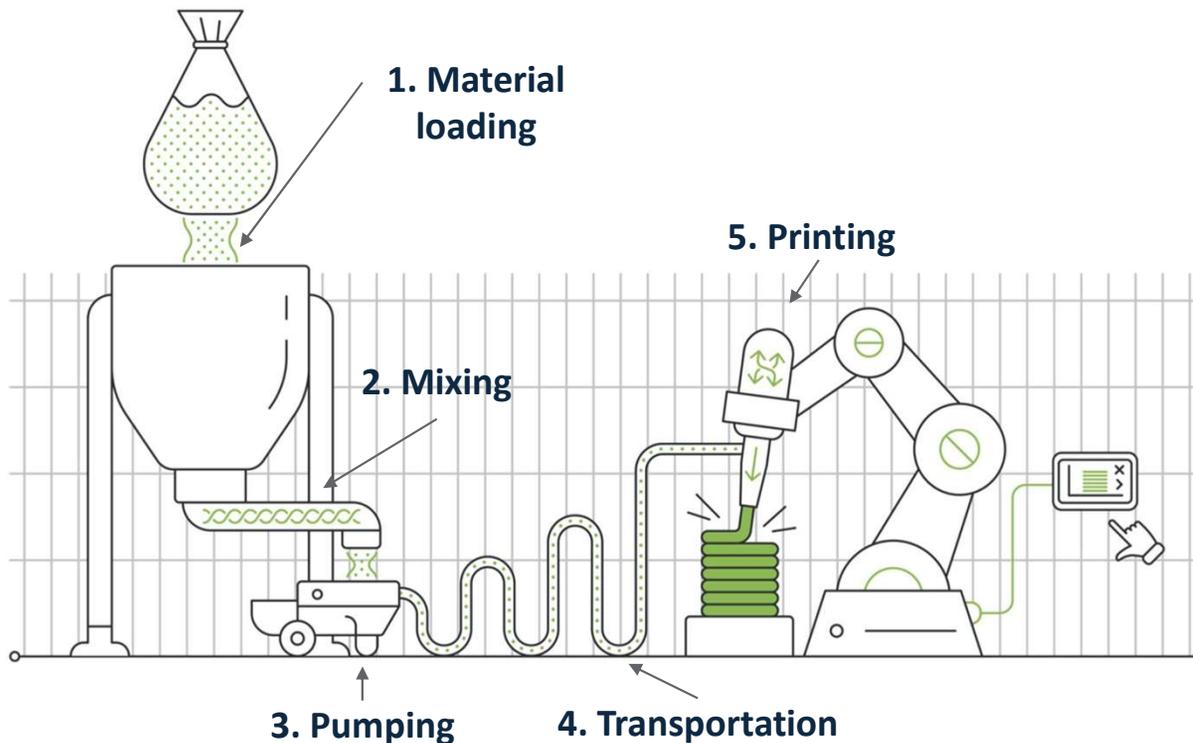
In construction, the 3D printing technology is mainly used to build:

- ***Single-floor & multi-floor buildings;***
- ***Structural components*** (foundation pads, sewage connections, walls, etc.) or other pre-fabricated elements with structural function (e.g. toilets, utility service cabins, etc.)
- ***Urban furniture or other decorative objects*** (e.g. benches, vases, decorative panels, etc.)



# A typical printing process

3D printing is a methodology that requires the sequential layering of material, starting from a digital model, in order to create tridimensional shapes. The specific advantage is that it allows the direct transfer from a 3D digital model to the final building without intermediate steps of 2D drawings/plans (Design to Print – DTP).



## 1. Material Loading

Material is loaded in the silo.

## 2. Mixing

- Material is mixed with water, in the horizontal chamber, for 6-8 seconds (similar system to plaster mixer);
- Manufacturers recommended water content (typically 12-18% of dry powder). Temperatures, weather conditions, equipment (i.e. hose length) must be considered.

## 3. Pumping

- A progressing cavity pump typically pushes the material in the hose;

## 4. Transportation

- A hose, typically 5-100 ft long (diameter 1-3" ), transports the material to the printing head;

## 5. Printing

- The structure is printed following a pre-defined printing path;
- The printer can also be controlled remotely (usually with an iPad);

# Why 3DPC ?

- Global Housing Shortage
- Aging Skilled Labor
- Labor Shortage
- Time saving
- Sustainability/Resiliency
- Cost Savings(?)



# Why 3DPC?

3D printing in construction is a relatively new way of building that through robotic automation allows the reduction of material usage, the reduction of waste, the increase of process efficiency and safety, while ensuring enhanced design freedom.

3D printing is part of a sustainability strategy to create innovative products and processes to reduce and reuse materials and build a more sustainable future.

3D printing contributes to a circular economy by reducing waste and pollution and the materials are fully recyclable.



# Where 3DPC ?

- Residential
- Commercial
- Reef Replenishment
- Energy Sector
- Government/ Military
- Mars



# Who 3DPC ?

**ICON**  
**Black Buffalo**  
**RIC technologies**  
Printed Farms  
**COBOD**  
PERI 3D  
**APIS Cor**  
SQ4D  
Printerra  
**CyBe**  
**X-Hab**  
**Contour Crafting**  
**Tvasta**  
**3D Potter**  
**Ice**  
Nidus3D  
Alquist 3D  
**MudBots**



# Printer Types

Gantry - Offers a complete print path for the project. Higher initial cost, longer setup time.

Robotic Arm – Stationary, mounted on wheels/tracks. Rapid deployable. Lower initial cost, limited reach necessitates multiple moves on the project.

Boom – High cost, rapid deployable. Phoenix – Icon's latest printer.

Karlos / Putzmeister – RMC, higher volume potential than most (40 yds/day).





## Some of the Completed Projects

- Wolf Ranch , TX – Icon 3D, 100 Homes
- 2 Story Home,TX – Peri3D, 4,000sf
- Marfa, TX – Hive 3D, 10 Homes
- Walmart,TN – Alquist 3D, 7,100sf, 20 ft
- Habitat for Humanity Homes, US – 15+

## Upcoming Projects

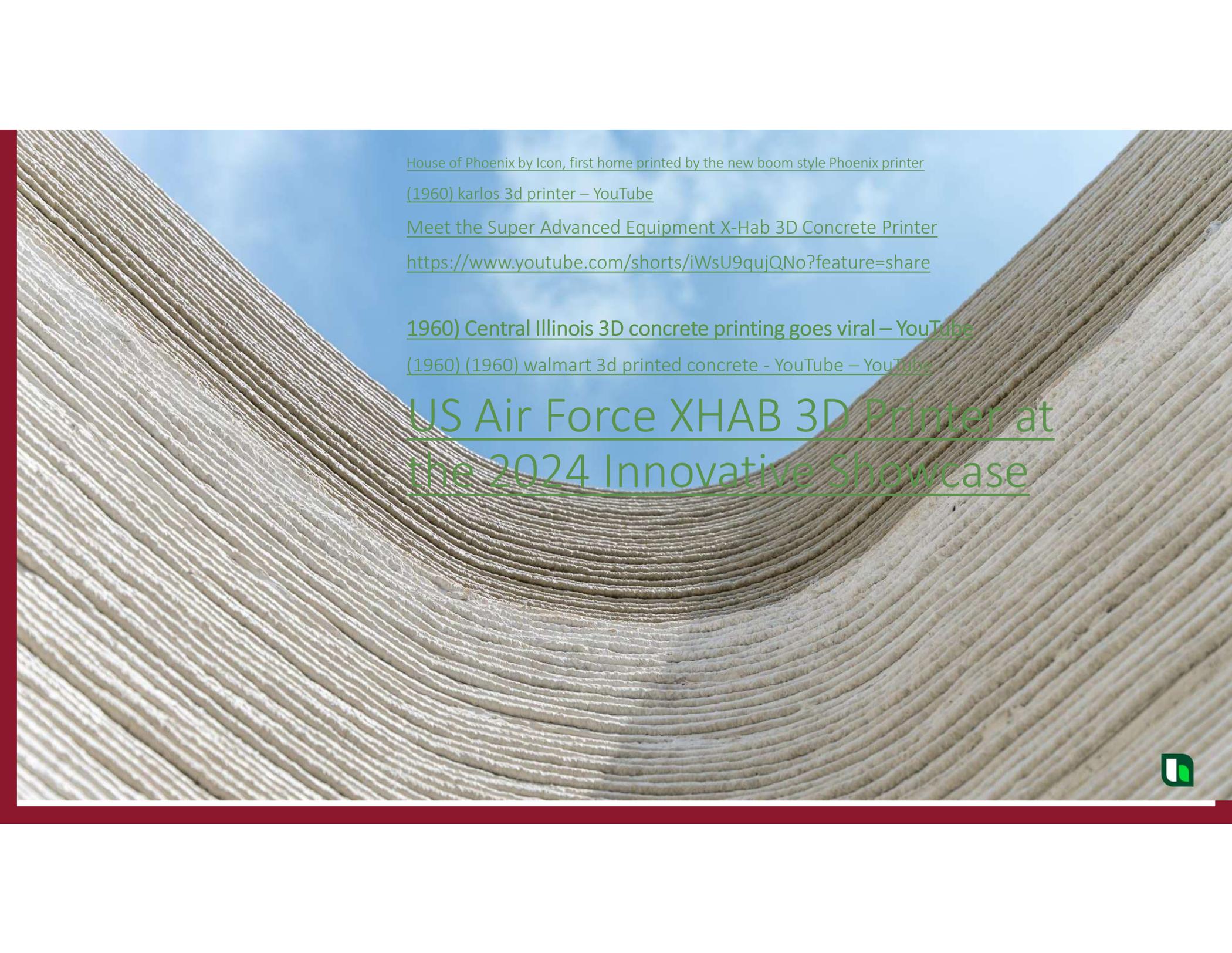
- Littleton, NC – 154 Homes
- Stuart, FL – 20 Homes
- Montcello, IL – 15 Homes
- Austin, TX – 20 Homes
- Wichita, KS – 75 Homes

# What's next for 3DPC ?

- Housing – quality, resilient, energy efficient, less waste, low cost
- Infrastructure – On-site/near-site fabrication of very large pieces.
- Continued improvements thru automation (more processes onsite, AI)
- Equipment – will become more integrated from end to end. Each manufacturer continues to advance their technology in meaningful ways. A weeding out is likely to happen in the future.
- Materials – The need for material will scale (\$ sacks, rmc, onsite). The equipment type and application will dictate what is needed (concrete/mortar).
- Challenges
  - Skilled personnel
  - Permitting – current path forward in the IBC has been to mimic a masonry wall design (excess material resulting in more time /cost)



# Thank You!



[House of Phoenix by Icon, first home printed by the new boom style Phoenix printer](#)

[\(1960\) karlos 3d printer – YouTube](#)

[Meet the Super Advanced Equipment X-Hab 3D Concrete Printer](#)

<https://www.youtube.com/shorts/iWsU9qujQNo?feature=share>

[1960\) Central Illinois 3D concrete printing goes viral – YouTube](#)

[\(1960\) \(1960\) walmart 3d printed concrete - YouTube – YouTube](#)

## [US Air Force XHAB 3D Printer at the 2024 Innovative Showcase](#)



# YouTube Posts

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