MUSCATINE COUNTY

IGNITE VITALITY
Through Workforce Housing

ABOUT 3D HOUSE PRINTING

Building System


3D printed house by sub-contractor Alquist 3D

- The homes are printed by a robotic arm that moves on rails and prints the house layer by layer from the ground up.
- This makes it easy to create curved walls – giving 3D houses their signature look.
- Muscatine homes would be printed on site, although it is possible for 3D printers to create prefabricated walls in factories and transport them to the home site.
- 3D homes are based on a design plan that is uploaded from a digital file. The 3D printer creates a blueprint of the object's design from computer-aided design software and follows the design as it prints.
- 3D printed homes use less manual labor, increasing safety on the job site.

Building Materials

- 3D homes are printed with a concrete mix called "crete."
  - This concrete mix makes houses incredibly durable and less vulnerable to the elements than stick-build homes. For example, they have the ability to retain temperatures and withstand natural disasters better than a stick-build home.
  - The compression of a 3D home lowers utility costs.
  - Concrete is more resistant to aging issues (such as mold, mildew, insects, etc.).
  - Muscatine Communtiy College (MCC) has the only HEMP program in the state of Iowa. They will utilize this program to research the potential of creating a hempcrete mix to print houses, allowing materials to be locally sourced and creating a more environmentally friendly mixture.
    - Concrete production is responsible for 8% of global carbon dioxide emissions, according to Chatham House.
    - Hempcrete is a net carbon-negative material, which can provide major environmental benefits.
    - Hempcrete has excellent fire resistance and thermal insulating properties that can reduce heating and cooling energy demands. Utilities savings can be up to 50%.

Building Timeline

- The base of a 3D printed home is constructed in 12 days or less.
  - (Alquist 3D has done it in as quick as 28 hours).
- Finishes (i.e., roofing, plumbing, electrical, etc.) takes 6-10 weeks.


3D house rendering by sub-contractor Alquist 3D

Building Energy Efficiency

- Conventional manufacturing leads to significant amounts of waste – for every one pound used, 30 pounds of waste are created.
- Leftover crete mix can be used at the next worksite, eliminating unusable trimmed building materials.
- 3D printed homes are energy efficient, reduce utility bill costs, and minimize negative environmental impacts.

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Building Cost

- 3D printing technology costs an estimated 20% less to build a home than a traditional stick build.
- An Alquist 3D printed home in Virginia is estimated to have saved 15% per square foot in building costs.
- A 3D printed home can reduce labor costs by up to 80% – finishings still require manual labor.
- Because homes are made of concrete, the costs of storing and transporting building materials are nearly eliminated.

Why This Matters to Muscatine / Muscatine County

- Improving the housing stock is one of Muscatine's largest opportunities for improvement. A large shortage of affordable housing is burdening residents, increasing home and rental costs, and creating economic ripple effects in residents' lives. Rural areas often attract less developers, leaving Muscatine overlooked by large-scale development.
- Muscatine has a need for housing from entry level to executive.
- 62% of those employed in the City of Muscatine live elsewhere, according to 2019 U.S. Census Data.
- Total active listings in Muscatine have dropped every year for three years, while the total number of homes sold has increased in the same period.
- Muscatine's population growth was at or below 1.5% from 1980 to 2015.

Demographics for Muscatine / Muscatine County

- County income: $60,435 median household income; $30,902 per capita income
- City income: $53,768 median household income; $27,426 per capita income
- 26% of Muscatine County residents rent; 34% of City of Muscatine residents rent
- There is a high demand for ranch-style homes in Muscatine according to local realtors; they are the fastest to leave the market because they appeal to all buyers.
- 3D houses have promise for seniors because of the low-cost maintenance and accessibility.