

Are robot-made 'printed' buildings a solution to Bay Area housing crisis?

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Credit: Mighty Buildings

In a cavernous warehouse near the Oakland Coliseum, a 3-D printer extrudes a secret blend of minerals and plastic polymer that's hardened into a heavy stone-like form under ultraviolet light.

The end result of that alchemy? A move-in-ready, robot-made modular home from technology startup Mighty Buildings.

Backed by \$30 million in venture capital, Mighty Buildings is following a classic Bay Area startup recipe: use technology to address a big problem and—it hopes—disrupt an existing industry. The company claims it will be able to make homes faster, cheaper and greener than traditional builders and help solve a persistent [housing](#) crisis in the Bay Area and beyond.

"We are revolutionizing an industry by introducing more efficient materials and more efficient technology that isn't tailored to certain designs," said chief operating officer Alexey Dubov, an engineer who co-founded the company in 2017 with physicists Slava Solonitsyn, the CEO, and chief technical officer Dmitry Starodubtsev.

But while housing experts see promise in the technology and the product, they say serious hurdles must be overcome if Mighty Buildings is to gain traction in the market and make a dent in the housing crisis. Beyond the sheer scale of the problem—state officials estimate that California needs nearly 2 million more homes by 2025—Mighty Buildings is seeking to disrupt a development process notorious for slow-moving bureaucracy and resistance to change.

For now, the outer shells of Mighty Buildings' studios and small, one- to two-bedroom homes are 30% 3-D printed—and can be milled by the firm's giant robots to resemble bricks or stonework—but the company expects larger homes that it plans to start installing this year will be 60% to 80% 3-D printed.

"We do it all with zero waste because we print exactly what we need," said chief sustainability officer Sam Ruben, adding that the process results in 99% less construction waste than standard home-[building](#).

While the startup's goal is to print any kind of building to an architect or designer's specifications, including multi-family structures and office buildings, Mighty Buildings is presently focused on small "accessory dwelling units" that can be installed as second houses and used by homeowners who may rent them out.

"For us it's a stepping stone," Dubov said.

So far, six units have been installed, including one in San Ramon, one in Hayward and one in Livermore. The startup has the capacity to make 20 homes per month but intends to boost that to about 80 by the end of this year.

Mighty Buildings isn't the first company to build houses using 3-D printing. Small homes produced by Texas-based ICON began housing homeless people last summer in the state. But Ruben said Mighty Buildings' "light stone material" is the first 3-D printed product certified for home construction by the international safety standards organization UL.

In the Bay Area, accessory dwelling units or ADUs, also known as tiny houses or in-law units, have been hailed as a partial solution to the housing crisis. Issi Romem, an economist and fellow at the Terner Center for Housing Innovation at UC Berkeley, estimated in late 2019 that if 1 in 10 Bay Area lots with a single-family residence had an ADU, the region's housing stock could grow by nearly 20% over the next two decades. The Bay Area Council is pushing to ease regulations and lower fees for development and installation of tiny homes.

Mighty Buildings focuses its marketing on a "turn-key" package that includes permits, foundation and a building, along with on-site installation or assembly. A 350-square foot one-bathroom Mighty Mod unit dropped by crane onto a property costs \$183,750 while a two- to

three-bedroom and one- to two-bathroom Mighty House ranging from 864 to 1440 square feet starts at \$287,500 and is assembled on site.

"Once the permits are in hand, we can go from a virgin backyard to completed in a month," Ruben said.

Mighty Buildings wants to address the housing crisis by adding its ADUs to a region's housing stock, but also, by 2022, through multiple-residence buildings up to five stories tall. "If we're going to tackle housing affordability that's an important aspect," Ruben said.

Stanford University professor of engineering and design Barry Katz believes that in the push to bring 3-D printing into mainstream home construction, "Lots of people will try, most of them will fail, and some of them may engineer the real breakthrough." The Bay Area's pressing housing shortage, coupled with the popularity of ADUs, may boost Mighty Buildings' fortunes, Katz said. But housing, he said, "has been one of the most resistant areas to experimental technologies."

Terner Center researcher Tyler Puller also tempers the potential promise he sees in the company's plans with some skepticism. He believes ADUs can make "a dent" in the housing shortage and that multi-story housing could do even more. But he's not sure 3-D construction is the answer. "I just don't fully understand the appeal other than it's flashy and exciting," he said.

Plus, Mighty Buildings' relatively high prices for ADUs don't appear to reflect reduced labor costs, and the plastic in the firm's printing mixture may put it out of step with the market's movement away from petroleum products, Puller said. The cost of a traditionally built small ADU, Puller said, averages about \$150,000, which is in line with a \$400-per-square-foot cost formula used by The Bay Area Council.

Puller sees Mighty Buildings, among other startups taking aim at the housing crisis, "as part of a grouping that is using venture capital to go after what is seemingly a pretty luxury market, no matter how much they claim to be addressing the housing shortage."

While Mighty Buildings' executives believe their "incremental" approach to increasing the percentage of 3-D-printed material in its homes will help gather support and approval from local development officials and modernize building codes to allow for its products, Puller said the technology is a dramatic departure even for those cities that have shown a willingness to consider new materials and techniques.

The company boasts in marketing materials that its turn-key package can dramatically accelerate the process of putting up a home, and slash building costs, with the panels for its studios, for example, requiring half the workers of traditional construction and 95% fewer hours to make. "We're not trying to replace labor," Ruben said. "We're just trying to deal with a fact that we don't have enough people to build all the housing that we need."

A 2019 McKinsey report on automation in construction, including the use of 3-D printing, projected that robotic technologies producing modular structures will "have a significant impact on the construction workforce, but the transition will take decades."

Construction workers union leader David Bini doesn't expect 3-D printing to rob tradespeople of jobs, as people will still need to lay foundations, assemble homes and put in plumbing and wiring. And construction is evolving, with some workers now spending their entire days in front of screens, said Bini, executive director of the Santa Clara and San Benito Counties Building and Construction Trades Council. He sees no "silver bullet" for the Bay Area's [housing crisis](#), but Mighty Buildings may play a role in addressing it, he said.

"At this stage, I think this is a great idea if it gets ADU units in people's backyards and helps out our housing problem," Bini said.

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