A 'PLUG-IN HOUSE'

DESIGNED, MANUFACTURED, TRANSPORTED AND ASSEMBLED: FLEXIBILITY IS THE KEY TO BUILDING AN AFFORDABLE URBAN HOME.

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IN FEBRUARY 2020, the Huoshenshan Hospital, a prefabricated hospital that could hold 1,000 patients, was built in nine days in Wuhan, meeting unprecedented demand on the front lines of rapid-response health care. Without prefabrication, this would not have been possible. The hospital serves as an example of rapid building options in times of uncertainty. Yet the same construction approach can also be applied to building affordable houses. These are "plug-in houses" that can easily be assembled from prefabricated parts and used anywhere, from China's Hutong neighborhoods to American backyards.

1. CONTEXT

Mrs. Fan is a young lady who grew up in a hutong neighborhood. A hutong is a type of narrow alleyway found in cities in northern China, such as Beijing. These neighborhoods are very old and tend to have lower standards for housing. People have increasingly left them for the comforts of modern, high-rise apartments. Though Mrs. Fan moved away from her hutong when she was a teenager to a suburban apartment building, she didn't really like it there. The sense of community was gone. It was also inconvenient. She was not close to public services and had to travel long distances to get around. Being recently married and expecting a child, she asked herself what kind of house and neighborhood she really wanted to raise children in. A hutong community was the answer for her. However, her old house was in disrepair and nobody was living there, so she looked for a way to replace it.

2. DESIGN

Unfortunately, a traditional renovation would have been unaffordable for her family. It would also have been difficult because the house sits along a narrow alley, located in a courtyard shared with many neighbors. The neighbors likely wouldn't agree to a long construction period. A prefabricated "plug-in house" presented a solution. The concept was to design a new house inside the old courtyard, using a modular system that incorporates everything needed: structure, insulation and wiring, as well as the interior and exterior finishes fashioned into prefabricated panels. The house is created using 3-D computer modeling, making it easy for future residents to participate in the design process as it's being developed. Using the core concept, the architects worked together with Mrs. Fan, figuring out a spatial shape that would suit her family's needs and be considerate to neighbors and the community.

3. MANUFACTURING

The factory machines produced the panels based on the digital 3-D model file of the building design. The machines adjust the size and shape for each customized panel. The panels are made of sheet metal on both sides, with a core of foam insulation made from an adjustable mold. Similar to the way that cars are built, prefabricated buildings use industrial manufacturing to mass produce modular parts in factories, allowing the cost of the house to remain low.

4. TRANSPORTATION

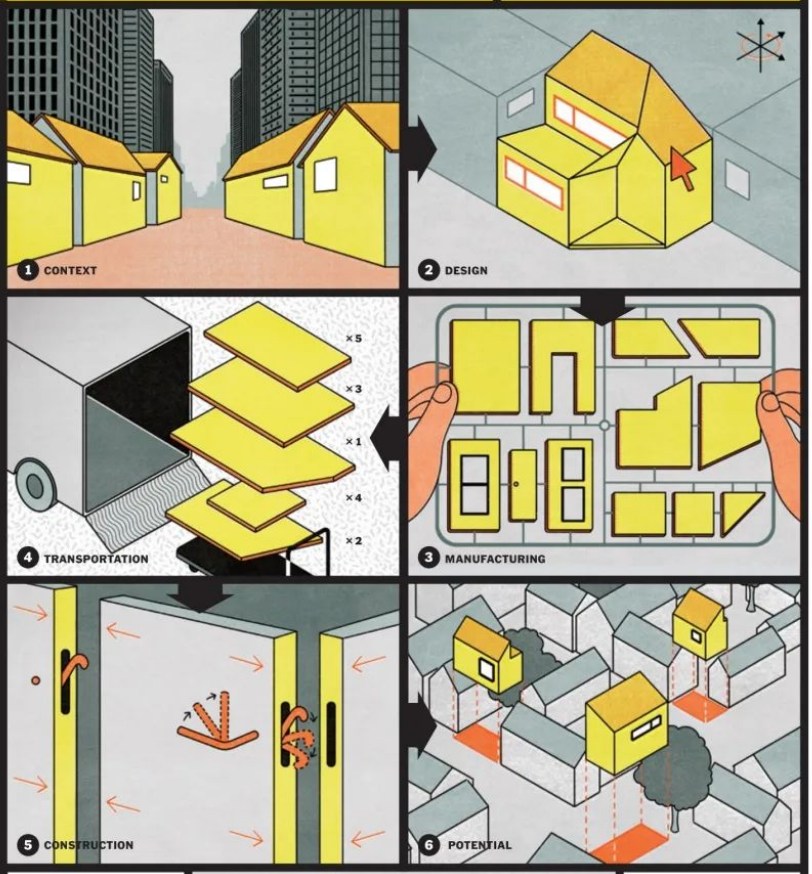
Mrs. Fan's house used around 40 panels. Most of them were different in shape and size, much like a big puzzle. The panels are very easy to transport, since they can be stacked on each other, just like flat-packed IKEA furniture. In this way, a lot of space on a truck or in a container is saved.

5. CONSTRUCTION

Like Lego pieces, the panels are easily assembled and locked together on site. Requiring only one simple tool, the construction of Mrs. Fan's house took about a day or two. The construction starts from the bottom up, with the floor, then the walls and finally the ceilings. Then the windows and doors are done at the end. A typical construction process lasts several months, so poor weather can be a problem and materials may be damaged. But this is not a major obstacle for a prefabricated house, due to the speed of construction.

6. POTENTIAL

A "plug-in house" is a creative way to add new housing to communities in locations that are highly valued, but difficult to build in. The goal is to improve the residents' living conditions and preserve the existing buildings and communities. It can be built in an empty backyard, on top of a structure like a garage, or even inside an old house, as a way of renewing dilapidated buildings. Also, the house is designed for dense urban locations where people share more resources and live more efficiently. Today, renewed interest in prefabricated housing allows for more affordable options in places where people want to live, but otherwise could not afford.

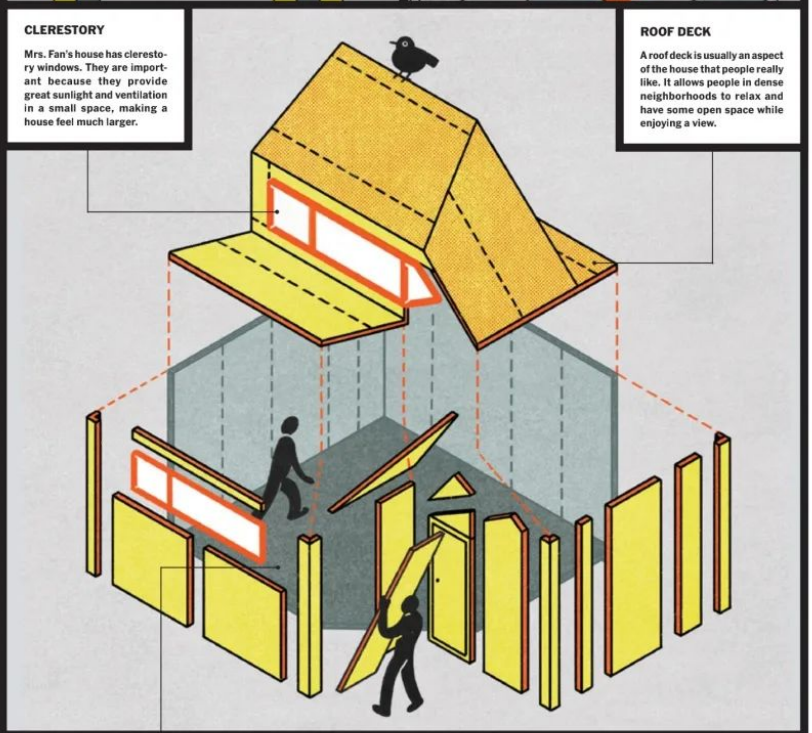


CLERESTORY

Mrs. Fan's house has clerestory windows. They are important because they provide great sunlight and ventilation in a small space, making a house feel much larger.

ROOF DECK

A roof deck is usually an aspect of the house that people really like. It allows people in dense neighborhoods to relax and have some open space while enjoying a view.



LOAD-BEARING AND FOUNDATION

The house is sturdy. It can stand on its own and doesn't require anything outside of its own structure. An important aspect is the foundation to which the structure is anchored. ◆

James Shen, the founding partner and principal of People's Architecture Office. Source photo: People's Architecture Office