

Prefab houses that are glued, not nailed, together

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The WKI has come up with a way of bonding components of prefabricated houses together with adhesive. This allows greater flexibility in component design. Credit: Fraunhofer WKI

With prefabricated houses, the dream of having one's own home can quickly become a reality. Until now, nails have been used to hold the individual components together. Now an adhesive tape has been developed to perform this task.

A finished house stands on what just a few days ago was an empty green field. Such a feat is possible thanks to components that are industrially prefabricated in a [manufacturing plant](#) for finished parts and then simply need to be assembled on the building site – "prefabricated houses" in other words. The individual wall, ceiling, and roof components are usually made of wood. First, the manufacturers make a frame structure out of squared timber in the plant, onto which they then fit boards made of timber derived materials. Nails and [staples](#) hold the structure securely together. However, several considerations must be factored in: the squared timber must not be too narrow, else the nails and staples can break out; also, wherever boards meet, there has to be a rib to which the manufacturer can attach the boards.

If it were possible to stick these boards and the other timber parts together using adhesive, it would give the building planners a lot more [flexibility](#) in component design. Although there are some companies currently using liquid adhesives in construction, this manufacturing technique has not yet become widespread. This is because the process has some drawbacks: for the liquid adhesive to set, you either have to heat the entire board including squared timber or else wait several hours – a time-consuming business that does not fit easily into industrial production processes.

Quick-setting adhesive tape

Researchers from the Fraunhofer Institute for Wood Research, Wilhelm-Klauditz-Institut, WKI in Braunschweig have come up with an alternative together with their colleagues from the Institute of Joining and Welding at the Technische Universität Braunschweig. "We've developed an [adhesive tape](#) that sets in under a minute to reliably and durably bond together the individual components," says Dr. Andreas Zillessen, a scientist at the WKI. "The adhesive sets at the push of a button, so to speak. This means that when we apply the adhesive tape

when assembling components, we can wait as long as we like without the adhesive drying out, as other kinds of adhesive would."

The secret is inside the material itself: unlike ordinary adhesive tape, it does not consist merely of a backing material and adhesive – it also has its own "heating system". This is a metal strip that is coated with adhesive on both sides. If you want to stick together two strips of wood, you place the adhesive tape in the right position, put the strips of wood in place, and then let an electrical current flow through the metal strip. The metal heats up, and the adhesive melts and binds to the wood. First the adhesive is turned liquid by the heat so that it gets into the pores in the wood; then it sets very quickly once it cools. "At present, the gluing and setting combined take around a minute, but over the long term we want to make these processes significantly shorter," explains Zillessen.

The challenge for the researchers lies not only in finding the ideal adhesive and the most suitable metal strip, but above all in optimizing the interaction of the three components. After all, the adhesive has to stick to the wood as well as to the metal. "As the adhesive tape is designed to be used primarily for load-bearing bonding in buildings, it has to possess structural strength and durable adhesive qualities," says Zillessen.

In order to attain these properties, the researchers are testing different adhesives and metal strips. They have already discovered the optimum adhesive. As for the metal, the scientists still have some work to do. Brass has shown a lot of promise. Next the experts are going to put stainless steel and aluminum through their paces. "We've already been able to demonstrate that the technology works in principle," summarizes Zillessen. In around six months' time, the scientists plan to test the adhesive tape in practical applications with the German company Schwörer.

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