

Alan Pierce

pierceaj@techtoday.us; follow on Twitter @TechToday_us

New Glue Could Replace Nails in Building Construction

I'm pretty sure that you were introduced to the strength of materials that are used in home construction at a very young age. To prove my point, I will give you a quote from the book that introduced you to construction technology when you were very, very young. "Then I'll huff, and I'll puff, and I'll blow your house in." In this fairy tale, the three little pigs learn that the strength of a structure is definitely influenced by the materials used in its construction.

Wood-framed construction is used to build residential, public, and commercial buildings. The actual construction of a building can take place on site or the building can be prefabricated in sections in a factory. Basically, both construction locations use wood elements called studs, joists, trusses, and rafters to frame the shape of the structure. Strength is created by applying plywood or other rigid sheathing to the studs, joists, and rafters.

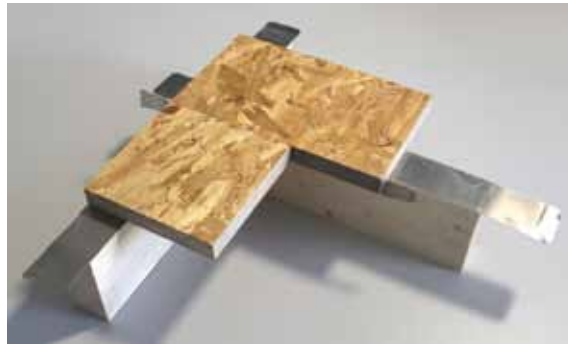
Today, the wood elements of a structure are generally held together by metal nails and staples. Gluing as a method of holding any part of the structure together is minimal because it takes too long for glues to dry and form a strong bond.

A new bonding material has recently been developed for use in the construction of prefabricated housing. It is an adhesive that, in 60 seconds, goes from a solid to a liquid and then on to form a full bond when it is activated by an electrical current.

Basically, the electrical current tells the adhesive to glue things together. By the time you read this column, testing of the adhesive will already be going on to prove its

strength and value so it can be used in the construction of prefabricated homes in Germany.

The adhesive was developed by researchers at the Fraunhofer Institute for Wood Research in Braunschweig, Germany, in collaboration with



A new adhesive has been developed to glue wood-framed structures. In 60 seconds, it goes from a solid to a liquid, then forms a full bond. It is activated by an electrical current.

colleagues from the Institute of Joining and Welding at the Technische Universität Braunschweig (Braunschweig University of Technology).

The scientists and engineers have developed a fast-setting adhesive tape that can be quickly rolled out between the contact points where the construction elements are to be joined. (See photo.) The glue on both sides of the tape will remain solid until an electrical current is sent through a metal strip that is part of the adhesive tape. When an electrical current flows through the metal strip, the metal heats up and melts the glue. The glue then goes into the pores of the wood.

It has the properties necessary to bond the metal parts that were once stapled to the wood. The second the electricity is turned off, the glue quickly turns back into a solid, permanently bonding the wood-frame elements and metal parts together.

The entire process now takes 60 seconds and the researchers are continuing to tweak the technology to make it work in less than a minute.

For this glue to change the current wood frame construction assembly paradigm, the glue will have to prove itself on many different levels. First, researchers need to prove that the bonding strength of the glue will not be adversely affected by major seasonal shifts in temperature or degrade over time. To meet fire codes, they will have to prove such a building will not self-disassemble in a major fire.

Testing will also have to show that the adhesive is at least as strong as nailing and stapling. Current nailing and stapling procedures allow for slight shifting of materials in response to the settling forces that occur over time after completion of the building. Will a glued structure have more or less settling cracks?

Gluing bearing walls together could reduce building costs if the procedure allows the use of thinner elements too narrow for nailing but dimensionally strong enough to bear the weight of the structure. For acceptance by the construction industry, the technology will need to meet fire codes and survive the rewriting of building codes. The last hurdle will be proving to the people who build wood-framed structures that there is a financial advantage to using glue instead of nails and staples.

Recalling the Facts

1. Do you think that a house that is glued together would be superior to one that is nailed and stapled together? Why?

2. Design a test experiment that can compare the relative strength of a structure that is held together by glue with one that is held together by nails and staples. ©

Alan Pierce, Ed.D., CSIT, is a technology education consultant. Visit www.technologytoday.us for past columns and teacher resources.