Inexpensive new instruments test building sealants under real-world conditions

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Sealants, like weather stripping, are what separates the inside from the outside of a building, byproviding a barrier that prevents water from seeping in, for example, or heat from leaking out. The challenge, says research chemist Christopher White of the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland, is predicting when they will fail.

Current methods test sealants statically, by placing them outdoors for long periods of time, to measure their resistance to the elements. The problem, says White, is that under normal conditions, sealants are also affected by constant movement: the temperature-induced expansion and contraction of the different kinds ofmaterials they seal together—such as glass, in a window, and steel, in the window and building frame. "When you put sealant on a building, it is because the glass window and steel frame expand and contract at different rates with changes in temperature," he explains. "The sealant needs to be able to seal this gap, as it changes." This creates fatigue in the sealant, eventually causing it to crack and fail.

Using simple materials that can largely be purchased from a hardware store—including PVC pipe, wood, steel supporting frames, and toilet flanges—White and his colleagues have developed the first instruments to test sealants under real-world conditions, while monitoring their displacement and load with sensors and tracking environmental conditions with a weather station. "This new device—which is very inexpensive—induces movement that is very similar to what a sealant

would see in the actual application, in a building," he says.

The designs of the two devices—one that puts sealants in tension and one that puts them in compression when cold—have been passed along to an industrial consortium of sealant manufacturers working with NIST. "Two companies have actually built and are using them for sealant testing," says White.

More information: The paper, "Design, Fabrication and Implementation of Thermally Driven Devices for Building Joint Sealants," by Christopher White, Kar Tean Tan, Emmet O'Brien, Don Huntson, and Joannie Chin, appears in the *Review of Scientific Instruments.*

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