Caution urged with use of barbed fasteners

Five years ago I patented a fastener that revolutionized fastening to structural cement fiber decks and lightweight concrete decks. The stress plate and body of this plastic fastener is one piece. Inside the preassembled fastener's body are wire barbs that are driven out of the fastener and into the deck after the fastener is in place. The barbs prevent the fastener from backing out and increase its holding power.

These fasteners are now being marketed by N.T.B. Fastening Systems, Inc. Since N.T.B. introduced this product to the roofing industry many other manufacturers have jumped into the market. This is fine, but, as the original designer of these fasteners, I feel a responsibility to inform contractors of some of the potential problems involved with the use of these products. I believe there is a need to explain the concepts involved and make sure all manufacturers, architects, consultants, suppliers, building owners and contractors approach this type of fastening with caution.

Anyone considering manufacturing, marketing or using these products should remember that this type of non-penetrating, non-thermal bridging fastener was *not* designed as a roofing attachment cure-all. And it was never meant to be marketed as a commodity. It was intended to be installed in the proper place to eliminate some of the problems that occur when toggle bolts are used to mechanically attach roofing to a structural cement fiber or lightweight concrete deck.

Technically correct

A high degree of technical knowledge is needed to properly design, specify and use a fastener such as the one I have developed. Even field personnel must understand the concept behind these products so the workers can adjust their installation procedures as they work. To correctly install these fasteners, the workers must be aware of the deck's density and other reroofing situations, and respond appropriately as these conditions change from section to section and job to job.

To accurately assess rooftop conditions, some preliminary testing and planning is necessary. Workers should *never* begin a job without test pulls having been done. These test pulls will be needed for every section of the roof that will receive fasteners. The deck type and thickness should *not* be determined by the blueprints. Adjust the fastening pattern to accommodate test pull values in each roof section.

Tests must also be conducted to guard against fastener backout, which is a major problem with these types of decks. A test to determine a one-piece fastener's backout torque will not be accurate, however, if the test results are influenced by the compression or frictional contact between the underside of the stress plate and the surface it's compressing. Compression can cause misleading results because the compressive strength can change over time due to thermal expansion and contraction. Insulation fatigue can also

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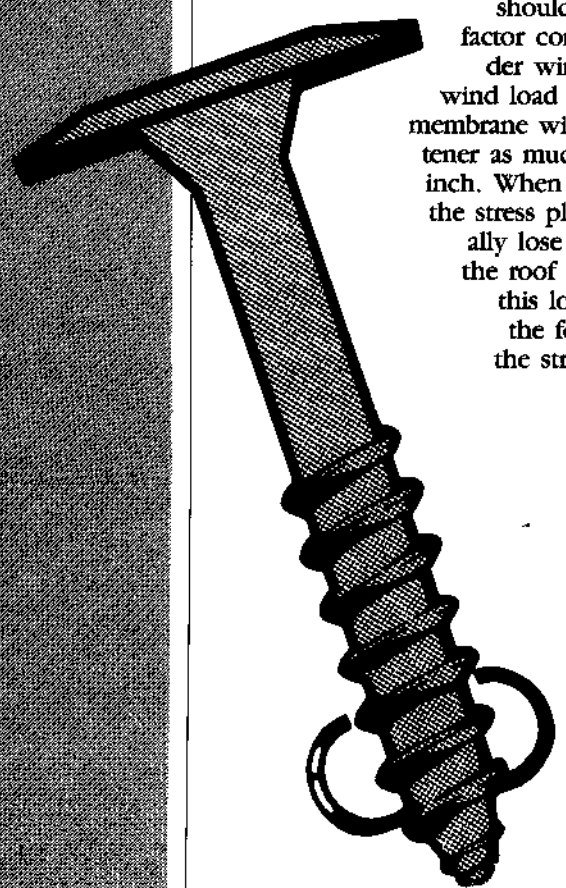
cause variations in compressive strength. As the compression changes, it will cause deviations in the fastener's backout torque, making the original measurement incorrect.

External conditions can also cause misleading variations in the frictional contact between the plate and the surface on which it rests. Much of the frictional contact that will influence a backout torque test is determined by the surface's composition. For example, the initial backout torque of a fastener installed in an insulation with a sticky asphalt surface will measure well, while a fastener installed in a glass product, which is not sticky, will show less backout torque. The same holds true for fasteners installed in membranes. Fasteners installed in EPDM will show better backout torque than fasteners in CSPE because there is more friction between a fastener and a rubbery EPDM.

To prevent a plate's friction or compression from affecting the test results, the stress plate should not touch the surface of the insulation or membrane while the backout test is being conducted. The holding power of the threads and/or locking device in the deck should be the only factor considered. Under wind cycling or wind load conditions, a membrane will lift the fastener as much as 1/16 to 1/8 inch. When this happens the stress plate will actually lose contact with the roof surface. With this loss of contact the force between the stress plate and the compressed insulation is no longer present to prevent backout.



Rooftop ground rules

Once these tests have been conducted and the results analyzed, the installation of the fasteners can begin. The actual installation should follow some basic ground rules regardless of the product chosen. For adhered systems, one fastener every 2 square feet is a good rule of thumb. If the fastener's test pull results are good and a 3-inch or larger stress plate disk is used, the fastening pattern can be opened up to one fastener every 3 square feet in the field of the roof.

More care must be taken with mechanically attached systems because these systems put a great deal of added stress on the fasteners. Sheet flutter and the back-and-forth movement of the membranes on the fastener can cause some cement fiber and lightweight concrete decks to crumble, leading to earlier fastener failure. Because of these problems, *never* fasten membranes more than 12 inches on center, no matter how good the test pulls are. Naturally the pattern should be tighter at the perimeter where half sheets are used. Larger stress plates should be used on the insulation fasteners to comply with the insulation manufacturers' requirements.

Finally, no matter what type of installation it is, a knowledgeable person should supervise the job. A mechanic who did one or two jobs successfully isn't necessarily prepared to handle all situations. There are hundreds of situations he could run into, and without proper supervision he could make a costly mistake.

The actions and considerations I have mentioned in this article should help contractors successfully install non-thermal bridging fasteners into cement fiber or lightweight concrete decks. Even more help might come from industry-wide action. I would like to invite the Single Ply Roofing Institute, NRCA and manufacturers to band together to set up a basic specification mutually beneficial to all.