

# Fastener corrosion to be judged by new standard

**I**t's been three years since the Factory Mutual System (FM) first recommended the use of mechanical fasteners as the sole means to secure the first layer of insulation to a steel deck. Since then, the industry has almost unanimously adopted this procedure. Architects and engineers specify mechanical fastening during the building design stage and experienced roofers employ the technique during the construction stage.

Today, mechanical attachment is used in all types of roofing. Fasteners have gained wide acceptance for use with single-ply roof covers as well as conventional BUR construction. When mechanical fasteners are used to attach a single-ply system to the deck, the wind performance of the entire system rests on the fastening systems' shoulders. The fastener itself must hold tight in the deck while the fastening system's bars or plates hold the insulation or cover in place and resist tearing.

It's not hard to understand why mechanical fastening is so widely accepted. It is the consensus of opinion among roofing professionals that, when properly installed, mechanical fasteners work. The industry has come to rely on the mechanical attachment of the insulation assembly as a way to prevent wind blow-offs and maintain the integrity of the roof cover against splitting.

The importance of proper fastener use and installation can't be stressed enough, however. Selecting the right fastening system and placing the correct number of fasteners (with discs or washers) in the proper configuration is vital to overall performance. Before specifying a roof fastening system, FM's approval guide for fire-, wind-, and explosion-tested products should be consulted. In the guide's references to roof components it lists which materials are compatible and explains how they can be combined to form a roofing system.

## Test method should allow consistent evaluations

by George A. Smith Jr.

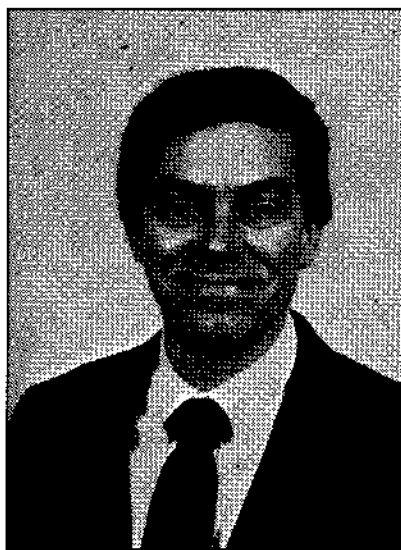
### Kesternich test proves valid

Although the use of mechanical fasteners has helped reduce the number of roofing losses, the practice is not without its problems. The tendency to corrode is a frequently mentioned fault of these components. Many have found that the roof environment can quickly degrade a fastening system that is not properly protected from corrosion.

It has been difficult to assess the seriousness of the problem until recently, however, because the industry lacked the performance criteria it needed to judge the corrosion of metal parts. In the past, corrosion was investigated mostly by individual roofing component suppliers who used the salt spray (fog) test as well as the Kesternich test (acid spray). Today, most acknowledge that the Kesternich test produces more valid results.

FM has brought some consistency to the situation with its Standard 4470, which includes a test procedure that evaluates the relative resistance to corrosion of all metal parts used within a single-ply roof system.

The Kesternich test that the Standard prescribes subjects the samples to an acidic environment at an elevated temperature in the presence of excess moisture. The 24-hour Kesternich cycle consists of eight



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**FM-approved fasteners have less than 15 percent surface-area corrosion.**

FM's new Standard 4470 covers the corrosion resistance of single-ply fasteners.

hours in an environment produced by the concentration of two liters of sulphur dioxide in a 100 percent relative humidity atmosphere at a temperature of 40C (104F). The remaining 16 hours of testing are at ambient conditions. Between cycles, the samples are gently washed in distilled water and then placed back in the cabinet.

For fasteners that will be used with steel decks, the samples must be installed in a section of steel deck with a minimum 22-gauge thickness. For fasteners to be used with other deck substrates, the procedure requires that the samples be installed and then removed prior to testing.

A fastener can have no more than 15 percent of its surface area corroded after 15 test cycles to be considered a candidate for FM approval. Effective date for compliance with this portion of the Standard is Dec. 1, 1988. All stress distribution plates and batten bars are also required to meet the same test criteria and effective date to receive FM approval. Roof cover fasteners that are currently approved by FM must successfully complete the new test procedure before the Dec. 1 date for FM approval to continue. All products currently in the approval process will be subjected to the corrosion resistance test before FM finally grants approval.

## More standard revisions to come

Standard 4470 is only the beginning. The same corrosion resistance requirements will be included in FM's Standard 4450 (Approval Standard for Class I Insulated Steel Deck Roofs), which covers metal parts used to secure insulation. A preliminary review of Standard 4450 is scheduled for completion by March 1987, with a final acceptance of all new approval requirements to follow. Once FM has completed work on Standard 4450, it will review Standard 4451 (Approval Standard for Nominal 1½-inch Deep Steel Deck). This document will also include the new corrosion resistance evaluation.

Most roof fasteners have evolved through sound engineering design and judgment. Proper design of the complete roof assembly must now follow. As construction methods and materials change and improve, so should the design concepts and evaluation techniques used for roofing systems.

