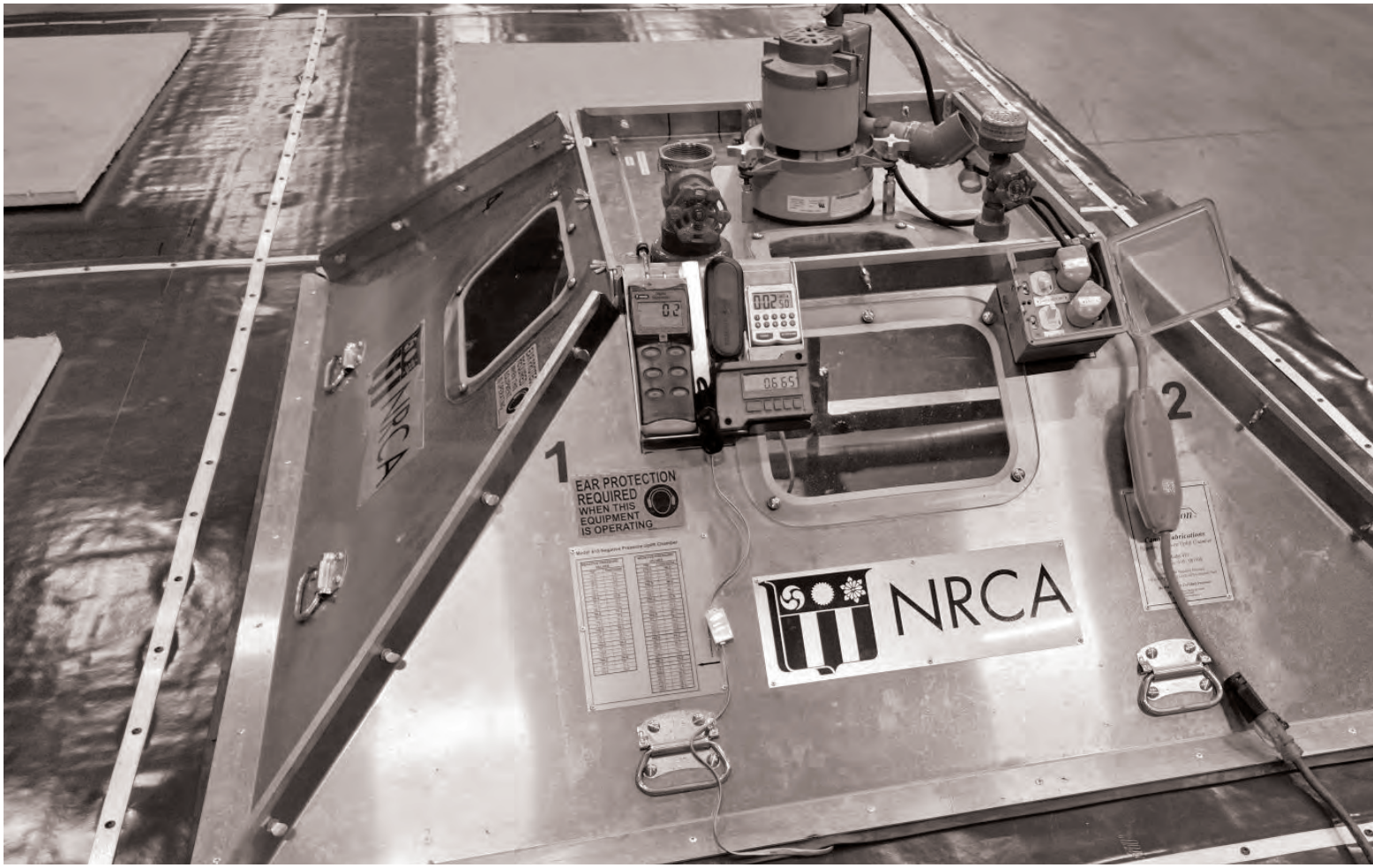

Putting the test to the test

Substantial variability has been found in field-uplift testing

by Mark S. Graham

NRCA participated in an ASTM International interlaboratory study to evaluate the accuracy and precision of the field-uplift test method. The study provides some useful data and information for evaluating the appropriateness and effectiveness of field-uplift testing.

Field-uplift testing

There are two recognized field test methods for determining adhered membrane roof systems' uplift resistances: ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Loss Prevention Data Sheet 1-52 (FM 1-52), "Field Verification of Roof Wind Uplift Resistance." In each of these test methods, a vacuum is created inside a test chamber mounted on a roof surface and membrane deflections resulting from the induced negative (uplift) pressures inside the chamber are measured.

ASTM E907 has been a consensus-based standard since it was originally published in 1983. ASTM International withdrew the standard in 2013 because it lacked a precision statement, which is required for all ASTM International test methods.

Unlike ASTM E907, FM 1-52 is a nonconsensus-based method for performing field-uplift testing on FM Global-insured buildings where the design wind speeds are equal to or greater than 100 mph (hurricane-prone regions) and in tropical cyclone regions. FM 1-52 also lacks any form of precision statement.

ASTM Committee D08 on Roofing and Waterproofing is revising and updating ASTM E907. At the committee's June meeting, a draft of the standard, including the results of a newly conducted interlaboratory study assessing the test method's accuracy and precision, was discussed.

The study

An ASTM International interlaboratory study is a procedure used to obtain a test method's precision statement. It involves multiple laboratories, each generating replicate test results on one or more materials. ASTM E691, "Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method," describes the techniques for planning, conducting, analyzing and treating the results of a test method's interlaboratory study. ASTM International's staff assists in planning a study and analyzing test results.

For the interlaboratory study on the field-uplift test method, eight organizations, including NRCA, volunteered to conduct field-uplift tests using similar test equipment under controlled laboratory conditions on a specific roof assembly configuration selected by the ASTM International task force. Replicate roof assembly specimens were constructed and tested at FM Approvals' West Glocester, R.I., research facility.

The roof assembly configuration selected for the study was a self-adhering, reinforced single-ply membrane over 2-inch-thick polyisocyanurate insulation mechanically fastened to a steel roof deck. Each 4- by 4-foot insulation board was fastened with four fasteners. The tested roof assembly has an FM Approvals' RoofNav number indicating a Class 90 wind-resistance rating, meaning it had been evaluated by FM Approvals to achieve 90-pounds-per-square-foot uplift resistance.

The specific roof assembly configuration and installation method and test chamber placement on the specimens were specifically selected by the ASTM International task force to limit potential variability in materials, installation and chamber placement. In the study, these variables are intended to be as constant and consistent as possible so the variability in the test method itself—and not the roof assembly—can be analyzed.

Using the then-current draft of the ASTM International field-uplift test procedure, each of the eight organizations conducted three identical tests in 15-psf increments up to the 90-psf classified uplift rating. The resulting roof assembly deflections during testing were measured and recorded at each increment of each test. Twenty-four specimens of the replicate roof assembly were tested at six pressure increments.

The results

The test results show notable variations among testing entities and variations among individual specimens' results from several of the entities.

ASTM International staff identified some individual results as statistical outliers at the initial 15-psf test increment and continuing at the 30-, 45-, 60- and 90-psf test increments. Some individual results at 30, 45 and 90 psf were considered statistical outliers to the extent these results were excluded from the analysis by ASTM International staff.

Also, 16 of the 24 specimens exhibited failure before completing the 90-psf test increment.

Using FM 1-52's acceptance criteria, which provides for a maximum allowable deflection of half of an inch for this particular assembly configuration, five of the tests' results at the 45-psf increment and all the tests' results at 60, 75 and 90 psf exceeded FM 1-52's maximum allowable deflection.

My thoughts

I applaud ASTM International and the other participants for conducting the study, as well as FM Approvals for making its facility and staff available. This volunteer effort is no small task and is commendable.

The study's findings provide useful data and information for evaluating the appropriateness and effectiveness of the field-uplift test method whether that be the withdrawn version of ASTM E907; its newly developed, revised and updated draft version; or FM 1-52.

The variability in deflection values derived under controlled laboratory conditions is of concern. Also, because the study intentionally did not consider other known variables, such as test chamber placement relative to fastener placement, insulation board joint locations and deck supports, and operator and other witness movement, the measured variability shown in the data is only a portion of what is likely in field testing.

Having 16 of the 24 specimens fail without completing the 90-psf test increment necessary to achieve FM Approvals' Class 90 wind-resistance rating is of notable concern. Clearly, there is no correlation between the field-uplift test method's results—even under controlled laboratory conditions—and FM Approvals' laboratory-derived evaluation uplift-resistance classifications.

Also, having all the specimens fail to withstand FM 1-52's maximum allowable deflection criteria is a significant, further

indication of the lack of correlation between FM 1-52's results and FM Approvals' uplift-resistance classification.

The ASTM International interlaboratory study clearly illustrates NRCA's long-standing position that field-uplift testing should not be relied upon as an indicator of an adhered roof assembly's in situ uplift resistance or as a quality-assurance measure of roof assembly installation. Continuing to use it as such is irresponsible.

Since the study results were released, NRCA's Technical Operations Committee has asked FM Global to immediately discontinue use of FM 1-52's field-uplift test as a quality-assurance measure for roof assembly installation.

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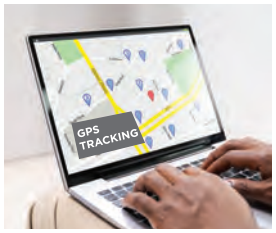
Tracking company vehicles can help protect your company



When you have company vehicles on the road, using technology to track your fleet and interpret data can help streamline your business operations and protect your company and employees.

Rather than relying on individuals manually logging relevant data, some businesses use a fleet management service that can track vehicle fleets and employee behavior through a comprehensive system. When considering a fleet management service, look for the following features: hardware and installation, such as plug-and-play hardware, which does not require a professional's help to install; driver safety and performance to hold drivers accountable for their actions; vehicle maintenance tracking to identify when maintenance is needed; GPS tracking for location and mileage; and alerts and reports to better understand how and when your employees operate company vehicles.

Learn more about the benefits of vehicle tracking at professionalroofing.net.

Tracking the right data is key to improving efficiency, increasing tax savings and identifying areas of overspending to ensure employees use company resources wisely. The U.S. Chamber of Commerce shares ways to track your company's vehicle use.

Data to track includes:

- **Trip dates:** Log and organize trip data under the specific date to hold employees accountable and reduce costs.
- **Mileage:** A record of how many miles a car was driven can identify instances of personal use with the vehicle.
- **Working hours:** This will ensure employees are only using the vehicle during business hours.
- **Driving behaviors:** Many systems track bad driving behaviors that contribute to a vehicle's wear and tear, such as harsh braking, excessive idling and speeding.
- **Current location and destination:** This can help protect your assets in case of theft and allow you to better provide customers with updates regarding an employee's arrival time.

What types of technology can benefit contracting companies?

Technology can help contracting companies automate workflows, reduce errors, improve security and boost efficiency.

The U.S. Chamber of Commerce offers the following technology tools to help contractors thrive.

1. **Project management tools.** These tools provide task management, scheduling, collaboration and tracking features. They help companies manage multiple projects and remote teams and can be used to communicate, assign tasks and track progress.
2. **Accounting software.** This software offers streamlined invoicing and billing processes, efficient time and expense tracking, and comprehensive financial reporting, among other benefits. It also can provide valuable insights and prevent missed deadlines.
3. **Cybersecurity.** Data breaches can result in lost customers, damage to a company's reputation and financial losses. Cybersecurity tools protect sensitive company and customer data.
4. **Customer relationship management software.** This software helps manage customer relationships and lead conversion, store contact information, track sales and support customer service.
5. **Email marketing tools.** These tools offer email templates, list management, automation and analytics so businesses can efficiently manage their marketing campaigns and improve the campaigns' effectiveness.
6. **Invoicing and billing software.** This technology is key to helping businesses track projects and invoices and ensure timely payments. Cloud-based accounting software can offer automated invoice reminders, faster online payments and better expense tracking.
7. **Contract management software.** This software streamlines the contract life cycle with features such as custom fields, automated approval processes, alerts, redlining, e-signatures and audit trails to help increase efficiency and visibility.

Unit-price procurement analysis addresses cooperative purchasing agreement challenges

The RCI-IIBEC Foundation has released a new study, An Analysis of Unit-Price Procurement, regarding unit-price procurement of design and construction services.

The study found the unit-price approach, especially within cooperative purchasing arrangements, introduces opportunities for abuse in the prequalification, design and construction building phases.

Based on interviews with vendors, cooperative purchasing list owners, regional cooperative purchasing agents, public owner facility managers and public procurement staff, the study also includes a review of relevant literature by study authors Paul S. Chinowsky, professor emeritus in the Civil, Environmental and Architectural Engineering Department at the University of Colorado, Boulder, and Gordon Kingsley, an associate professor in the School of Public Policy at Georgia Institute of Technology, Atlanta.

In the study, the authors provide an overview of unit-price procurement and its challenges and suggest areas where adjustments are needed to help avoid inappropriate actions.

"This study makes clear the limitations of unit-price procurement, which is being adopted broadly by school districts, municipalities and university systems," says RCI-IIBEC Foundation Chair Mike Blanchette, F-IIBEC, RRC, RRO. "Our report makes it clear there's a better way to ensure excellence through all phases of the building enclosure design and construction process."

"This report shows the challenge for policymakers and procurement officials who need to protect the public's investment in infrastructure," says IIBEC Executive Vice President and CEO Brian Pallasch. "We've developed a series of policy fixes to ensure the separation of the design, construction and materials supply parts to help ensure taxpayers receive the best value for their investment in these critical infrastructure improvements."

The report is available to download at rci-iibecfoundation.org/home.aspx.

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