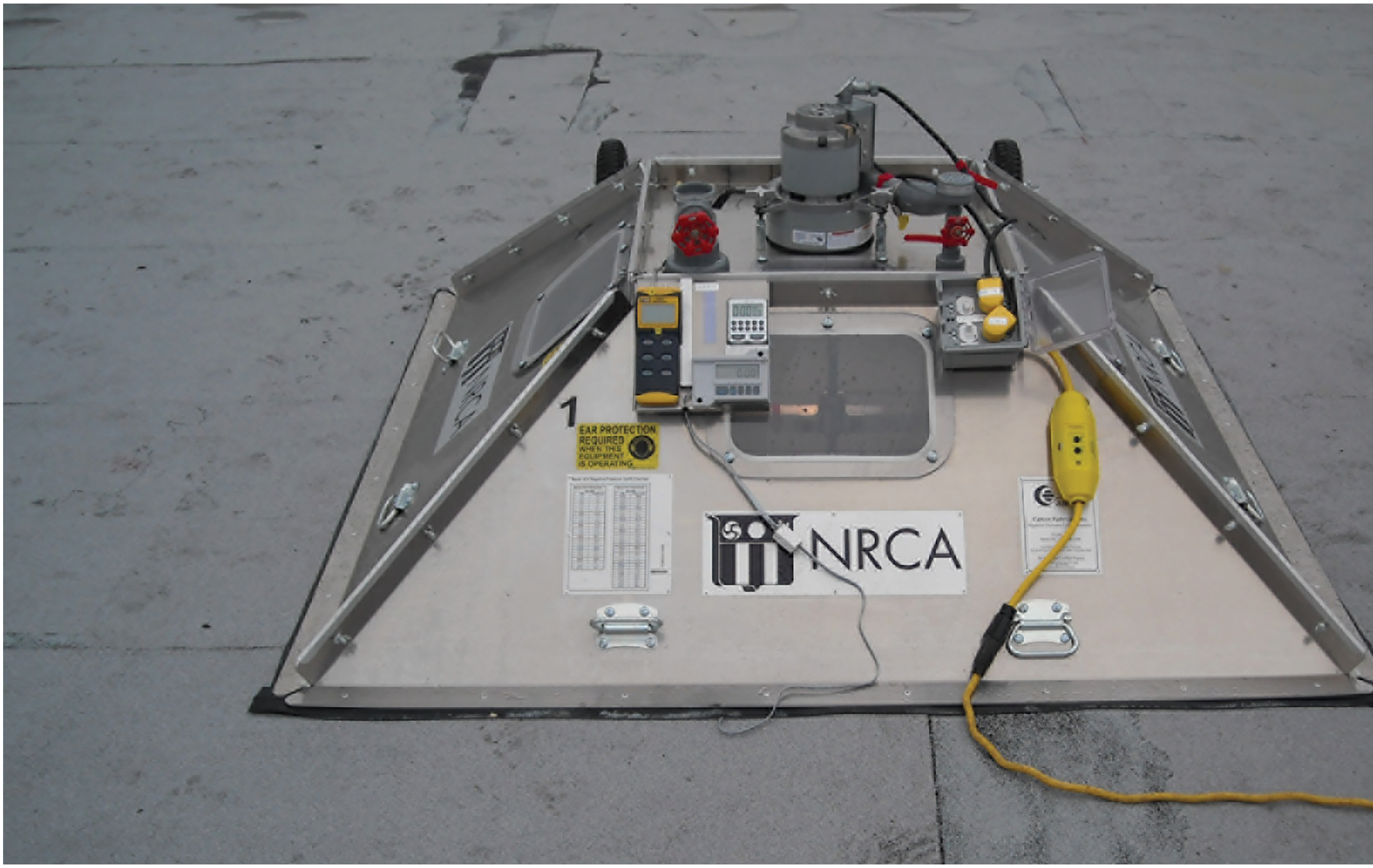


Being more tolerant

Testing shows acceptable insulation fastener placement tolerances

by Mark S. Graham

To date, little has been published addressing acceptable tolerances and variations for insulation board fastener placement. For this reason, NRCA has conducted and recently completed small-scale laboratory testing of insulation board fastener placement. This research provides useful information about fastener placement tolerances and yields interesting information regarding insulation deflection in uplift testing.

Test apparatus

For this testing, NRCA used field negative pressure uplift test apparatus and ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Loss Prevention Data Sheet 1-52, "Field Verification of Roof Wind Uplift Resistance," test procedures.

Both test methods are similar and provide for affixing a 5- by 5-foot dome-like chamber to the roof surface's topside and applying a defined negative (uplift) pressure inside the chamber to the test specimen's exterior-side surface using a vacuum pump. During the test, test specimen deflection inside the chamber is visually monitored and measured to determine whether the specimen passes or is "suspect."

According to ASTM E907, a specimen is suspect if the deflection measured during the test is 1 inch or more. FM 1-52 states a specimen is suspect if the measured deflection is between 1⁄4 of an inch and 15⁄16 of an inch depending on the maximum test pressure; 1 inch if a thin topping board (cover board) is used; or 2 inches if a thin cover board or flexible, mechanically attached insulation is used.

Test setup

Test specimens consisted of single polyisocyanurate boards measuring 4 feet by 4 feet by 2 inches thick installed over an air retarder layer over a steel roof deck. Four fasteners per board were installed in each of the test specimens in a symmetrical pattern 6, 12 and 18 inches from board edges.

Because the test chamber is wider than a single insulation board, infill insulation was placed around the boards.

The test chamber was placed centered over the specimen with the test's deflection gauge positioned at a board's center. The test chamber was placed directly on the insulation boards without a roof membrane in between to eliminate the known variability roof membrane adhesion would have on the test.

Figure 1 shows the test setup.

Results and analysis

Three tests on separate specimens were conducted for each of the fastener placement locations. Testing was conducted to failure. Failure modes varied, including the insulation board pulling over fastener plates, the insulation board breaking along a knit line and the insulation board breaking at its center. Figure 2 shows the test results.

Manufacturers typically recommend fastener placement be about 12 inches from board edges; however, because of field conditions, fastener placement into immediately adjacent metal deck flanges sometimes is necessary and typically considered acceptable. The 6- and 18-inch locations from the boards' edges in these tests are intended to represent typical adjacent flute fastener placement locations.

The tests show fastener placement 6 inches from board edges results in an 8.3 to 30% reduction in failure loads compared with 12 inches from board edges. Similarly, fastener placement 18 inches from board edges results in a 16.7 to 40% reduction compared with 12 inches from board edges. These tested values all occur comfortably within the safety factor of 2.0 associated with low-slope membrane roof system wind design.

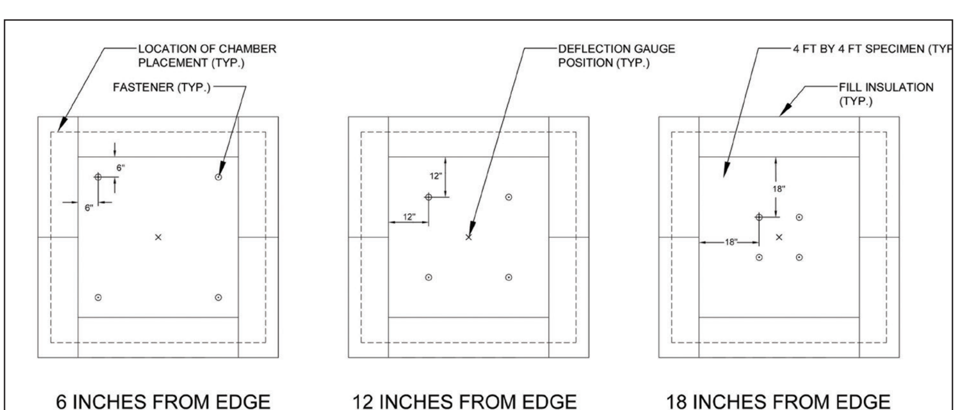


Figure 1: Illustration of test specimens

Condition	Fastener placement		
	6 inches from edge	12 inches from edge	18 inches from edge
Load at test failure	52.5 to 55 psf	60 to 75 psf	45 to 50 psf
Deflection at test failure	3¼ to 4 inches	2 to 5 inches	½ to 1 inch

Figure 2: Test results

Particularly noteworthy is the measured deflection values at failure for 6 and 12 inches from board edges are well in excess of the maximum allowable values provided in ASTM E907 and FM 1-52. This indicates these maximum allowable test values have been arbitrarily established and have little technical basis. Also, the variability in the tested values indicates known variability in the test method and normally anticipated material variability.

NRCA acknowledges testing without a membrane adhered to the insulation board's top surface may affect test results. Thick and heavily reinforced adhered membranes may somewhat restrict an insulation board's ability to deflect between fasteners during uplift testing. Also, heavily reinforced adhered membranes will result in horizontal (peel) forces being applied to the insulation-to-membrane interface as the insulation board deflects during uplift testing. These peel forces would exhibit themselves as membrane peel or insulation facer sheet delamination failures in uplift testing.

To read "Field-uplift testing," an NRCA Industry Issue Update, go to professionalroofing.net.

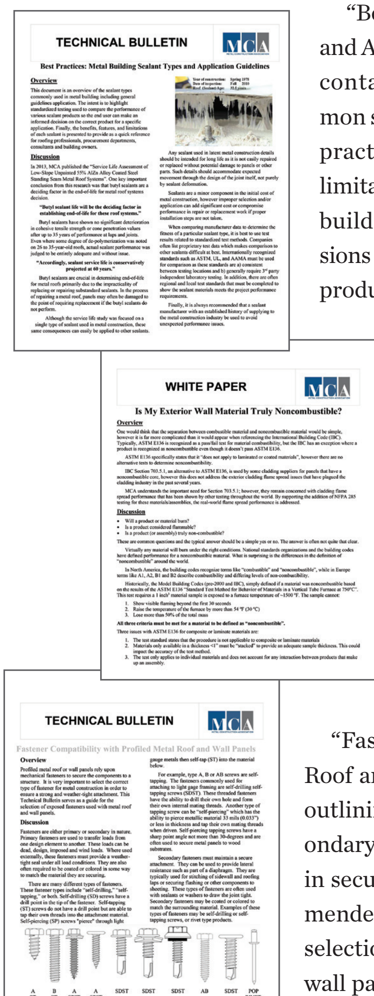
Additional information about tolerances applicable to membrane roof systems is provided in *Quality Control and Quality-assurance Guidelines for the Application of Membrane Roof Systems*, which is available at shop.nrca .net.

MARK S. GRAHAM is NRCA's vice president of technical services.

@MarkGrahamNRCA

MCA releases three white papers

The Metal Construction Association has published three white papers on its website, metalconstruction.org. The white papers address important design and safety aspects of metal construction, including metal roofing, metal walls and metal fasteners.


TECHNICAL BULLETIN

Best Practices: Metal Building Sealant Types and Application Guidelines

WHITE PAPER

Is My Exterior Wall Material Truly Noncombustible?

TECHNICAL BULLETIN

Fastener Compatibility with Profiled Metal Roof and Wall Panels

"Best Practices: Metal Building Sealant Types and Application Guidelines" is a new white paper containing information about the most common sealant types used in metal roofing and best practice guidelines for each. The benefits and limitations of the sealants are discussed, enabling building professionals to make informed decisions and recommendations regarding the correct product for a specific application.

"Is My Exterior Wall Material Truly Noncombustible?" clarifies safety standards in the International Building Code® regarding metal walls and ASTM E136, "Behavior of Materials in a Vertical Tube Furnace at 750°C," the test for material combustibility. The new white paper explains which products or materials will burn, what criteria causes a product or its assembly to be deemed noncombustible, and cladding flame spread performance.

"Fastener Compatibility with Profiled Metal Roof and Wall Panels" is an updated white paper outlining the differences among primary and secondary fasteners and the importance of fasteners in securing components to a structure. A Recommended Fastener Guide is included to clarify the selection of fasteners used with metal roofing and wall panels, and fastener durability, compatibility and load resistance also are explored.

The white papers can be downloaded for free at metalconstruction.org/tech-resources.

GCP Applied Technologies launches online design tool

GCP Applied Technologies, Cambridge, Mass., has made available its MONOKOTE® UL Fireproofing Design Selector to streamline the selection of optimal UL fireproofing designs for MONOKOTE Fireproofing products used in specific construction project conditions. MONOKOTE fireproofing material is used for commercial buildings, as well as tunnels and oil and gas facilities.

MONOKOTE UL Fireproofing Design Selector is an online tool intended to help contractors, architects, specifiers and structural engineers accurately and efficiently determine the best GCP Applied Technologies fire-resistant UL designs—those with the lowest thickness that meet a project's needs. The tool is intended for use in the U.S. and other countries that use the International Building Code.®

The tool guides users through a series of questions to determine the proper UL designs. Users can receive fireproofing information for a specific section of a structure or a complete project, including floors, columns and the roof system.

The MONOKOTE Fireproofing UL Design Selector is available at gcpat.com/en/solutions/products/monokote-fireproofing.

Solar panel construction declines amid COVID-19 crisis

A recently published article by international market research source researchandmarkets.com reports the COVID-19 crisis has resulted in the construction of fewer new solar panels, wind farms and other facilities to produce renewable energy, according to solarindustrymag.com.

The decline is caused by a slowdown in construction activity, supply chain disruptions and lockdown measures. Growth, resulting from completion of postponed projects and continued government support, is expected to resume in 2021. Despite the disruption to planned projects, the researchandmarkets.com article predicts 167 gigawatts of renewable power capacity will be added globally in 2020.

To view a list of related market reports compiled by researchandmarkets.com, go to professionalroofing.net.

Analysts predict a partial recovery in 2021 as renewable energy installations are forecast to rebound to 2019 levels. However, combined growth for 2020 and 2021 is expected to be 10% lower than was forecast before the COVID-19 outbreak. The sharp decline in oil and gas prices also could affect the demand for renewable energy heating. Consumers experiencing the economic effects of COVID-19 may take advantage of reduced prices and delay switching from fossil fuel heating to renewable alternatives.