Test cuts are not quality assurance

by **Mark S. Graham**

NRCA recently has received a number of inquiries regarding the use of post-application roof sampling and analysis, commonly referred to as "test cuts," as a way to assess a built-up roof (BUR) system application's quality. Although test cuts once were considered by some as measures of application quality, the method's shortcomings long have been recognized by roofing professionals.



This article will explain the current, industry-recognized standards for taking and analyzing test cuts; review these methods' shortcomings; and provide industry-recognized recommendations for assuring application quality.

ASTM standards

There are two standard methods for taking and analyzing test cuts recognized by the American Society for Testing and Materials (ASTM): ASTM D 3617, "Standard Practice for Sampling and Analysis of New Built-Up Membranes," and ASTM D 2829, "Standard Practice for Sampling and Analysis of Built-Up Roofs."

ASTM D 3617 applies to BUR systems under construction, and ASTM D 2829 applies to completed BUR systems.

The primary difference between these two methods is ASTM D 3617 allows for field analysis of a membrane; results can be obtained immediately after taking the test cut. ASTM D 2829 implies the need for laboratory analysis of the test cut; therefore, there is some time lag between roof membrane sampling and obtaining results. This delay in obtaining results is not conducive to effective quality assurance of a roof system application.

Shortcomings

A test cut generally is not considered to be a reliable measure of quality control or assurance because the findings of one or several small test cuts may not represent the entire roof area accurately. For example, some variances in BUR systems are common, so a small random sample from a roof system, such as a test cut, may not adequately account for these variances. Roofing professionals acknowledge that limited application variances do not adversely affect a BUR system's overall quality and performance.

In addition, test cuts are destructive. A test cut requires a roofing professional to disassemble completed roofing components and repair a new, otherwise continuous membrane system with membrane patches.

Project Perfect Square

A test cut's limitations as an effective quality-assurance method are illustrated in a research project conducted by William Cullen, former NRCA research associate, in 1986. This project was called Project Perfect Square.

In Project Perfect Square, a BUR system was applied meticulously to a 5- by 13-foot (1.5- by 4-m) test roof deck during ideal weather conditions. Eight test cuts were taken from the roof; six 12- by 12-inch (305- by 305-mm) test cuts were analyzed in accordance with ASTM D 2829, and two 4- by 40-inch (102-mm by 1-m) test cuts were analyzed in accordance with ASTM D 3617.

The number of test cuts taken from the test roof represented a small sample-to-roof-area ratio of 1-to-10. This is compared with the ratio of 1-to-10,000 (i.e., 1 per 100 squares) in the ASTM standards. The data in Project Perfect Square far more accurately revealed the recognized variances in application quantities, which are not necessarily recognized in the conventional test cut analysis.

Test cut results analyzed in a laboratory revealed a range in interply mopping weight from 17.5 to 23.6 pounds per square (0.85 to 1.15 kg/m²). The percent embedded aggregate surfacing from the samples ranged from 55.1 to 72.9 percent. Interestingly, the high and low samples for interply mopping weight and percent embedded aggregate were taken less than 6 feet (1.8 m) from each other, respectively, on the test roof.

Had this test roof been analyzed with only a single test cut, as is described in the ASTM standards, the variances in interply mopping weight and percent embedded aggregate, as well as the high or low values in the ranges, would go undetected. Although this is not necessarily problematic if, for example, only a single test cut had been taken in the exact location of the test cut revealing a 17.5 pounds per square (0.85 kg/m²) interply mopping weight, the entire test roof would be characterized as having relatively low interply mopping weights.

Taking the number of test cuts to accurately characterize a roof system's application quantities is not feasible in conventional, nonresearch-intended situations.

Quality control/assurance

NRCA maintains that the most effective way to evaluate the quality of a roof system's application is by thorough, continuous visual examination and evaluation at the time of application. These should be conducted by a person who is knowledgeable about roofing technology, the specific type of roof system being applied and good work practices.

Specific guidelines for quality control and assurance for BUR systems are contained in NRCA's *Quality Control Guidelines for the Application of Built-Up Roofing.* PR

Editor's note: *Additional information about Project Perfect Square is contained in an NRCA Fax on Demand document. Those interested should call (888) 455-NRCA and request Document No. 1315.*

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