technical bulletin

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Sampling Shingles for ASTM Testing. Understanding Why Proper Sampling Provides Credible Results.

Sampling is the process of selecting material to be tested. For example, ASTM D3462 directs the user to consult ASTM D228 for guidance on selecting samples. D228 outlines a method for selecting samples that is referred to in the field of statistics as "lot-based" sampling. ASTM E 456 defines lot as "a definite quantity of a product or material accumulated under conditions that are considered uniform for sampling purposes". Examples of a lot might include (1) all the shingles of a particular brand and style in a distributor's warehouse, (2) shingles delivered to a job site for application on a roof, or (3) all shingles of a specific type on a single truckload shipping from a roofing manufacturer.

D228 directs random selection of five bundles from lots of 1000 bundles or less. For lots larger than 1000 bundles, a formula is used to determine the minimum number of bundles to select. Random is a key term. Grabbing the first five bundles available does not satisfy the random criteria. Random selection requires that each bundle in the lot has the same chance (probability) of being selected. This includes the bundle on the bottom row of the least accessible pallet.

Proper sampling is essential. If the correct number of bundles are selected, and the criteria of randomness is satisfied, the tester can have reasonable confidence that similar results would be obtained if different bundles in the lot were tested. Results from testing properly selected sample bundles can be inferred over the entire lot of material.

Suppose five bundles of shingles are purchased at a retail outlet without being randomly selected and tested. Results from testing the bundles are applicable only to those five bundles. The tester cannot properly infer those results to the pallet or pallets from which the bundles were taken, to the remainder of stock in the warehouse, or to the specific brand and style of shingles, because the randomness requirement of the sampling methodology was not satisfied. All that can be concluded is that the five bundle sample met or failed to meet the criteria being evaluated.

As another example, assuming a purchaser and seller have agreed to testing beyond the "time of manufacture" and the tester randomly selects three bundles from four pallets at a job site and tests for D3462 compliance. What can be concluded based on the results? Suppose the shingles meet all the requirements of D3462. Can the tester conclude that all the shingles on the job site are D3462 compliant? Can he conclude that the shingles on any one of the four pallets are compliant? Neither conclusion is valid, because the sampling was not conducted in a fashion that allows the results from the three bundles to be inferred to the larger group. ASTM D228 prescribes selection of a minimum of five bundles from lots of 1000 bundles or less, and that those bundles must be selected at random. Failure to follow these aspects of D228 sampling methodology significantly limits the conclusions that can be drawn.

If the sampling procedures prescribed in D228 are not followed, conclusions drawn from results of testing are limited to the samples selected, and cannot be applied to the entire lot of material from which the samples were selected. Use of proper sampling techniques ensures confidence in conclusions drawn from testing of product samples.