

Winds of Change *(continued from page 2)*

referred to as the most recent standard. At the time of this writing, the current approved and useable standards related to roofing slate are C406-00, C120-00, C121-90 (Reapproved 1999), C217-94 (Reapproved 1999), C99-87 (Reapproved 2000) and C119-04a. Note: There is a new C406-05 approved but it is waiting for an approved revision to C120 before it can be referenced in the field. ASTM C120 Flexure Testing of Slate has been under heavy scrutiny from within, and without, ASTM for some time. Of the three ASTM tests for roofing slate, C120 is the one that most often brings confusion, misunderstanding, incompetence and frustration to our tables. Recognizing the need for change in this test method, ASTM Committee C18 has recently reviewed, and is in the approval process, of making significant changes to the test as it relates to roofing slate that will require roofing slates of 3/16"-1/4" thickness to achieve a minimum breaking load of 575 pounds force rather than the current 9000 psi modulus of rupture (MOR). The 575 breaking load requirement is derived from the mathematical formula used to yield a modulus of rupture of exactly 9000 psi and a specimen thickness of 7/32", a thickness exactly midway between the minimum 3/16" and maximum 1/4" thickness allowable in modulus of rupture testing. Other variables of the MOR equation are predetermined by the required physical dimensions of the test specimens and the setup of the test stand.

The motivation behind this change recognizes that the mathematical formula used to calculate MOR for roofing slate appears to penalize, rather than favor, thicker slates over thinner slates. This aberration would indicate that it would be better to put a 3/16" thick slate on a roof rather than a 3/8" thick slate from the same source. The MOR test also yielded results that were not repeatable and even exhibited wide variations in results from duplicate tests on the same specimen. The intent of the original test was to ensure that standard roofing slates carry a specific minimum physical strength to resist breaking under light foot traffic, accidental impact and wind uplift. It also, by the test requirements themselves, intentionally precluded the passing of slates of less than 3/16" thickness, effectively keeping them out of the market. In this regard, we are unchanged from the 1930s and still not ready to see 1/8" thick slates on

our roofs. The pending revision will ensure physical strength, while eliminating some of the mystical mathematical aspects of the former test. Wording of the pending C120 change also takes into consideration that a significant number of quarriers no longer produce their roofing slate "on grain," meaning with the grain running the long dimension of the slate. "On grain" slate would normally yield the material's highest breaking strength across the short dimension of the slate shingle. Due to changes in quarry and fabrication practices it has become more efficient and economical to produce roofing slates of random grain orientation than on grain. There would be an automatic penalty to be paid by these producers, in order to meet the breaking-load requirements of ASTM, if they choose to produce random-grain slates. This penalty would typically take the form of requiring thicker material to meet the breaking-load requirement. Note: There will be those that could make a case against the practice of producing random-grain roofing slate, but that issue will be left to another time.

Additionally, the pending changes to C120 include an increase of the sample size from a minimum of six specimens to a minimum of ten specimens, to average results over a broader sample range. It is worth noting that C120 does not allow for test results to be adjusted for a sample where a specimen exhibits a dramatic variance from the average of the other specimens in the sample. This is a common occurrence and frequently related to isolated fracture damage, flaws or condition of one specimen not representative of the original material. In practice, these slates would be culled at the time of installation by the riving process. Test methods for all types of dimension stone, with the exception of slate, allow for adjustments for these "outliers" and in fact, as recently as 1985, C120 allowed for the exclusion of a specimen with a result 25% below the remaining samples' average, if after examination, it was determined that the failure was due to a physical flaw in the specimen.

continued on page 4