ASTM provides material standard for roofing slate

by **Mark S. Graham**

Q: *On a recent slate roofing project, I thought the quality of the new slate was not as consistent as that of slate used on previous projects, even though we had purchased the slate from the same quarry. Specifically, we observed that the thickness of some "commercial standard" slate varied considerably. We also have encountered a large number of slates with broken corners. I realize slate is a natural, quarried material and some variability is not uncommon, but are there any material standards that govern roofing slate?*

A: Although slate has been used in roofing applications in Europe for hundreds of years and in the United States since the late 1600s, the development of suitable, modern material standards has been relatively recent.



Slate roofs can be assigned to one of three general categories: standard, textural and graduated.

Standard slate roofs are those composed of commercial standard slate, which has a nominal thickness of 3/16 of an inch (4.8 mm), is of one uniform length and width, and typically has square tails or butts.

Textural slate roofs have uneven tails or butts and some variation in thickness and size; generally, the slate for textural roofs is not more than 3/8-inch (9.5-mm) thick.

In graduated slate roofs, slates ranging in thickness from 3/16 of an inch (4.8 mm) up to 1½ inches (38 mm) are used; the thickest and longest slates are placed along the eaves, and slates gradually diminishing in size and thickness are used as the courses progress up to the ridge. Thicker, heavier slate is used in some applications.

Until the 1950s, roofing slate classification primarily was based on visual grading, as is done currently with dimensional lumber. Visual grading techniques were acknowledged to vary widely between slate regions and even varied somewhat among individual quarries within a particular region.

In visual grading, roofing slate was characterized by color, surface texture, straightness, thickness and weight. Roofing slate also was divided into two classes: ribbon and clear. Ribbon slates are those containing narrow bands of carbon that typically are darker in color than the surrounding slate. These ribbons are inclusions from the original slate beds and can be softer and less durable than the surrounding slate. Clear slate is characterized as slate without ribbons.

In 1957, a national standard for roofing slate was developed by the American Society for Testing and Materials (ASTM). ASTM Standard C 406, "Standard Specification for Slate Roofing," addresses the material characteristics, physical requirements and sampling procedures appropriate for the selection of roofing slate. This material standard specifically excludes ribbon slates because of their wide variation in physical properties and composition.

The current edition of ASTM C 406 lists three grades for classifying roofing slate: Grade S_1, Grade S_2 and Grade S_3. These grades are intended as a prediction of the slate's expected service life. Grade S_1 slate has an expected service life of more than 75 years; Grade S_2, 40 to 75 years; and Grade S_3, 20 to 40 years.

The determination of slate grade is based on the physical properties of the slate, including the flexural strength (modulus of rupture), water absorption and weather resistance (depth of softening). These physical properties are determined by standardized ASTM test methods.

ASTM C 406 also indicates that no more than 1 percent of broken slates, including those having cracks that prevent the slate from ringing when sounded, are acceptable. Any broken corners on the exposed ends of slates should not be greater than 1½ inches (38 mm) in either the base or vertical directions.

Face dimensions of slates should not differ by more than ⅛ of an inch (3.2 mm) from that specified. The ASTM standard does not, however, address dimensional tolerance for thickness.

Over time, it has become generally recognized that for commercial standard slate, some tolerable variations above and below the nominal 3/16-inch (4.8-mm) thickness are acceptable. If no low tolerance is desired, either *full 3/16-inch (4.8-mm) slate* or *not less than 3/16-inch (4.8-mm) slate* should be specified to indicate a desire for hand-picked selection. For thicker slate, only high tolerances are recognized as permissible; therefore, a ¼-inch (6.4-mm) slate must be a full ¼ of an inch (6.4 mm) or thicker.

Additional information on slate roofing materials and installation is included in *The NRCA Steep Roofing Manual.*

Because the cost of roofing slate is relatively high and the amount of money saved by using Grade S_2 or Grade S_3 slates typically is minimal, the use of Grade S_1 slates is recommended for most slate roofing applications.

Editor's note: *ASTM D 406, as well as the test method standards referenced in this standard, appear in ASTM's* Annual Book of Standards, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics. *This volume, or reprints of the individual standards, is available from ASTM; telephone (215) 299-5585.* PR

Each month in this column, Mark S. Graham or Terrance R. Simmons, RRC, both NRCA deputy directors of technology and research, will answer readers' technical questions. If you have a specific question that you would like answered in this column, send it to Professional Roofing, *10255 W. Higgins Road, Suite 600, Rosemont, Ill. 60018-5607; or fax (708) 299-1183.*