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ROOFING FOR HISTORIC BUILDINGS

Slate

Slate is a fine grained crystalline rock metamorphosed from bedded deposits of clay and silt. It can be worked into shingles readily because it has two lines of breakability: cleavage and grain. These occur generally at right angles to each other and are independent of the original bedding planes. The structure of

the bedding remains in some slate deposits as visible bands running across the cleavage. Known as ribbons, these bands may be either weaker or harder than the surrounding slate. Slate's durability as roofing is due to its high strength, low porosity and low absorption rate. Specific mineral components are responsible for the various colors: carbon (black), hematite (red and purple), chlorite and ferrous iron oxide (green). Other minerals, considered impurities (calcite and iron sulfides), are slowly transformed by weathering into gypsum, which expands and causes the slate to delaminate.



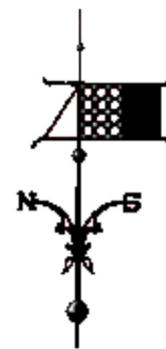
Front elevation of a dwelling published in **Supplement to Bicknell's Village Builder**. A specification for one of the designs included this direction for the French roof: "Slate the sides of the roof with slate 5 x 12 inches, cornered as shown on elevation, nailed with galvanized nails; all hips and valleys to be flashed with tin in the best manner." (Courtesy of The Athenaeum of Philadelphia)

Slate has been used as a roofing material in Europe for hundreds of years, with surviving examples dating to the 8th century. From the 17th to the 19th centuries, most of the roofing slate used in America was imported from North Wales, where slate quarrying was a major industry. Although the first commercial slate quarry in the United States was opened in Peach

Bottom, Pennsylvania, the industry was limited and local until the second half of the 19th century. At that time the industry grew and matured in response to a growing population, advancements in quarrying technology, an expanding rail system, and the immigration of Welsh slate workers to America.

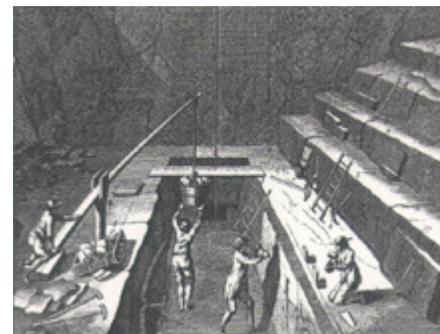
The United States became a slate exporter after the Civil War, as quarries opened in Vermont, New York, Virginia, and Pennsylvania.

Architectural styles of this period emphasized prominent roof lines and decorative patterns, details that were well suited to the varied colors and shapes available in slate.



Quarrying

Until the 1870s the quarrying of slate changed little from what is illustrated by Diderot in the **Pictorial Encyclopedia of Science Art and Technology** of 1762. Blocks were separated from the floor of the quarry using picks, wedges, prybars and gunpowder, taking maximum advantage of the natural seams in the rock. Windlasses and simple cranes employed man or horse power to lift blocks of slate from the pit. With the Industrial Revolution came mechanical drills and steam-powered stone channeling machines and hoists. Waste associated with blasting was reduced and efficiency increased. Subsequent advances were marked by the introduction of the wire saw in 1926 and the diamond belt saw in 1988.



Mineralogie, Ardoises D'Anjou. Travail de la Carrière Ouverte et Outils. **Revuel de Planches, sue Les Sciences, Les Arts Liberaux, et Les Arts Mechaniques, Avec Explication**, Diderot-D'Alembert. (Courtesy of NewsBank, Inc.) [click image for larger view]



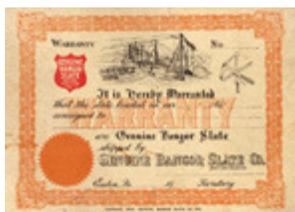
The Vendor Slate Co. had ten quarries in Pennsylvania, Vermont and New York in 1929. (**Sweet's Architectural Catalogue**, 1929. Courtesy of The Sweet's Group, The McGraw-Hill Companies, Inc.) [click image for larger view]

Properties such as nonflammability, durability, minimal maintenance costs, and aesthetic value made slate all the more desirable. Its

primary drawback was its weight, making shipping costly and requiring substantial roof framing.

Between 1897 and 1914 production peaked. Later use of slate often employed different thicknesses and colors, and unevenly cut or aligned butts to produce picturesque effects suitable for English revival styles popular in the early 20th century. After 1915 widespread use of slate roofing declined in the United States, due in part to a lack of skilled labor, but more importantly, due to the development of modern, mass produced materials such as asphalt shingles, which seemed the more economical alternative.

A slate is typically attached to wooden sheathing with two nails driven through prepunched holes, though as with tile, it may be wired or screwed to steel angles on a steel framed roof. At the end of the 19th century asphalt saturated felt laid over the wood sheathing became a standard part of most slate roof installations. Slate is installed with an overlap that depends on the slope of the roof and requires a minimum pitch (generally 4 inches of rise per 12 inches of run) to effectively shed water. Particularly in coastal areas slate can be found laid in mortar, providing extra protection against wind driven rain.



"Not all that glitters is gold. Not all that looks like slate is good slate." claims the Bangor Slate Co. of Easton, Pennsylvania. They issued this certificate in 1906 emphasizing the source of slate as an indication of quality. [click image for larger view]

Today slate continues to be quarried domestically as well as being imported from Europe, China and South America.



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