



GENUINE STONE

MATERIAL FACT SHEET

SLATE

NATURAL STONE COUNCIL

MARKET OVERVIEW:

The United States is one of the chief producers of dimension stone in the world, having generated an estimated 1.5 million tons in 2006. Slate sales comprised the smallest portion of this market at 1% by tonnage, according to a USGS study.

Extensive and productive slate deposits exist in the eastern US, and large volumes of slate are imported into the US from China, India, Brazil, Canada, and Spain. Comparatively small quantities of slate products are exported from the United States to Canada and the UK.

Sources: Dolley, T.P. 2007. Mineral Commodity Summaries 2006. U.S. Geological Survey. US Government Printing Office. Washington, DC: 156-157. Stone World Magazine. Monthly Statistics. Accessed 21 July 2009. <<http://www.stoneworld.com/CDA/HTML/a8142955339b7010VgnVCM100000f932a8c0>>.

PRODUCTS & APPLICATIONS:

Common Dimensions

Characteristics of quarried stone are dependent upon the attributes of the deposit from which the stone was extracted; each quarry is able to offer a range of products unique in dimensions, color, and structural properties to its deposit. Therefore, it is preferable that the designer and stone supplier collaborate closely prior to and throughout the design process since planning a project around readily available stone reduces the environmental impact of raw material extraction. Slate is quarried in irregularly-shaped slabs by being split along natural cleavage. Slab dimensions often fall within the following ranges but may also be extracted in larger sizes as a deposit permits:

AREA (length x width): 1-60 ft²
THICKNESS: 4-24 inches

Common Building Applications

- Cladding (exterior/interior)
- Countertops
- Landscaping
- Roofing
- Coping
- Flooring
- Paving

Other Uses: aggregate, memorials & monuments, mulch

Available Finishes

TEXTURED	Hammer-milled	Split
	Natural/cleft	Thermal flamed
SMOOTH	Honed	Polished
	Sand rubbed	Sandblasted
	Machine gauged	

Custom finishes may also be available through your stone supplier.



Courtesy of Michael Reis, BNP Media

FORMATION & SOURCES:

Slate is a metamorphic deposit that evolves from sedimentary rock consisting of clay or volcanic ash. While typically composed of numerous minerals, the predominant constituents include quartz and muscovite or illite.

The slate quarried in North America comes mainly from the eastern regions of the United States and Canada, particularly from the slate belts of New York, Pennsylvania, and Vermont.

This factsheet was developed by the Natural Stone Council as part of a continuous effort to provide reliable and useful information regarding Genuine Stone® products. The information presented has been extensively reviewed by owners and operators of granite quarries and fabrication facilities. To access factsheets for other stone types and learn more about Genuine Stone®, including the industry's environmental initiatives, visit www.genuinestone.com.

ENVIRONMENTAL DATA:

	Quarrying	Processing
Embodied Energy (MJ/ft ³)	130	2,300
Embodied Water (gal/ft ³)	160	8,400
Global Warming Potential (kg CO ₂ equivalents)	4.0	24

Source: *Natural Stone Council. Slate Dimensional Stone Quarrying and Processing: A Life-Cycle Inventory. August 2009. Center for Clean Products. University of Tennessee. <http://isse.utk.edu/ccp/projects/naturalstone/results_pubs.htm>.*

INDOOR AIR QUALITY:

Volatile Organic Compounds (VOCs)

- None emitted from slate
- May source from adhesives and sealants applied; low-VOC options are available on the market
- Resources: refer to MSDS of chemical(s) used

PHYSICAL PROPERTIES:

A wide variety of slates exist on the market, both foreign and domestic, and these can be drastically different in density, hardness, porosity, and aesthetics. Users should verify that the slate they plan to use is applicable to the demands of the project and has a successful history in such installations. ASTM test data is the most common data available to compare the properties of any stone, including slate.

PERFORMANCE:

Durability

- Flooring: 100 years with proper maintenance
- Roofing: 20-40 years for Grade S₃, 40-75 years for Grade S₂, and over 75 years for Grade S₁ with proper maintenance
- Other exterior applications: lifetime

Source: *American Society for Testing and Materials. ASTM C-406 Standard Specification for Roofing Slate. 2006.06.01 (E 2006). National Association of Home Builders. 2007. Study of Life Expectancy of Home Components. <http://www.nahb.org/fileUpload_details.aspx?contentID=72475>.*



Reuse & Recyclability

- Ensure reclaimed slate meets ASTM specifications before using for structural purposes.
- Example applications:

Aggregate/fill	Memorials & monuments	Retaining walls
Landscaping	Re-installation on new buildings	Walkways



Courtesy of Michael Reis, BNP Media

ASTM STANDARDS:

ASTM C-406 “Standard Specification for Roofing Slate”

ASTM C-629 “Standard Specification for Slate Dimension Stone”

- Includes material characteristics, physical requirements, and sampling appropriate to the selection of slate for roofing slate and general building and structural purposes, respectively.
- The table below lists the required test values for slate; the necessary tests are prescribed by and located in the ASTM standards.

ASTM STANDARD	PROPERTY	REQUIRED TEST VALUE				
		Exterior	Interior	Grade S ₁	Grade S ₂	Grade S ₃
ASTM C-406	Breaking load, min, lb (N)	n/a	n/a	575 (2558)	575 (2558)	575 (2558)
ASTM C-406	Absorption, max, %	n/a	n/a	0.25	0.36	0.45
ASTM C-406	Depth of softening, max, in (mm)	n/a	n/a	0.002 (0.05)	0.008 (0.20)	0.014 (0.36)
ASTM C-629	Absorption by weight, max, %	0.25	0.45	n/a	n/a	n/a
ASTM C-629	Modulus of rupture, min, psi (MPa)	9,000 (62.1)	7,200 (49.6)	n/a	n/a	n/a
ASTM C-629	Abrasion resistance, min, hardness*	8.0	8.0	n/a	n/a	n/a
ASTM C-629	Acid resistance, max, in (mm)	0.015 (0.015)	0.025 (0.64)	n/a	n/a	n/a

*Pertains only to stone subject to foot traffic.

Adapted from ASTM C-406 “Standard Specification for Roofing Slate” and ASTM C-629 “Standard Specification for Slate Dimension Stone”, copyright ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM (www.astm.org).