

## THE STONE AND MINERAL INDUSTRIES OF VERMONT

(These descriptions come from the Vermont Mines exhibit, removed from display at the Perkins Museum of Geology during the museum renovation project in 1993. Eghlements from the former display have been incorporated into the new ones. It is probable that these accounts are originally published in another document.)

### ***Asbestos***

Asbestos, formed by the metamorphism of peridotite and dunite, occurs at several locations within the ultramafic belt of Vermont. This belt extends from Massachusetts to Canada east of the Green Mountains. The mineral crysotile (flexible asbestos fiber) was discovered in the Eden-Lowell area by woodsmen in 1892. Judge M.E. Tucker prospected the deposit further in 1899 by following the ultramafic zone north to the Canadian border. In 1900 B.B. Blake found asbestos on the southeast slope of Belvidere Mountain in Eden and several small companies were formed to extract the ore. In 1901 the New England Co. erected a mill in Eden and began mining crysotile asbestos fiber in 1902, only to fail soon after due to poor management. It was not until the mid-1920's that the deposit on Belvidere Mountain was developed in earnest by the newly formed Vermont Asbestos Co.

In 1936 the Rubberoid Co. acquired Vermont Asbestos, opening the new quarry and mill just to the east in Lowell. In 1967 Rubberoid merged with General Analine and Film Corp. (GAF) and continued to produce fiber until 1975 when the Environmental Protection Agency (EPA) regulations threatened the economics of the operation. Not wanting to lose a major industry, the workers bought the company and formed the Vermont Asbestos Group (VAG), which would become the largest employee owned company in the nation.

The Belvidere Mountain deposit is the only occurrence in the state to be successfully exploited. However, other prospects were opened north of Lowell in the early 1900's and another in Plymouth Township was briefly prospected.

### ***Granite***

Granitic rocks of the Devonian New Hampshire Plutonic Series are irregularly distributed over the length of Vermont east of the Green Mountains. The granite bodies formed when molten rock forced its way upward through the overlying rock, cooling near the earth's surface. Subsequent erosion has created the outcrops seen today.

The first granite to be exploited for business purposes was in the Barre area. In 1834 the firm of Hewitt and Parker advertised "cutting" granite and in 1837 a contract for the Vermont State House was filled with stone from Millstone and Cobble Hills. Business was slow in the

early days due to the laborious task of transporting the granite blocks. A typical haul from Barre to Montpelier took sixteen hours by horse and sled. Transportation problems decreased significantly with the construction of a rail system through Montpelier in 1849 and later, a spur connecting the Barre quarries to the main line in the 1870's. These improvements brought brisk business to the industry in the late 1800's and into the early 1900's. The Vermont State Geologist's Report for the biennium 1903-1904 lists 35 firms operating 100 quarries statewide and 160 companies milling granite with employment for combined milling and quarry operations exceeding 10,000 men.

Today Barre is considered the "Granite Center of the World". In the past major production also occurred in Dummerston, Windsor, Bethel, Ryegate, Groton, Woodbury, Hardwick, Kirby, Barton and Derby, Vermont. The four companies quarrying granite in Vermont now are Rock of Ages with five quarries in the Barre/Williamstown area and one in Bethel; Wells-Lamson, which operates several quarries in Barre; Swenson Granite Co. which is working one quarry in Woodbury; and the Vermont Quarry Co. which operates one quarry in Ryegate Township. Many other companies are still milling granite but they acquire all their rough stone from these companies.

Aside from railroads, other major developments which influenced the granite industry over the years are the use of steam drills and granite saws in the 1920's, detachable bits in the 1930's and the jet piercing method of cutting granite in 1957.

## ***Kaolin***

The occurrence of kaolinite in Vermont is limited to a narrow zone approximately 100 miles long, extending from East Monkton south to Pownal Township. It is intimately associated with faulting along the Green Mountain front and occurs within lower Paleozoic metamorphic rocks; primarily the Cambrian Cheshire Quartzite. Towns in Vermont where kaolinite may be found include Brandon, Rutland, North Clarendon, South Wallingford, Tinmouth, Dorset, Shaftsbury and Bennington.

Development of the kaolinite deposits occurred primarily at three localities. The most northern site, Monkton, was discovered by Stephen Barnum in 1792 and was developed by the Monkton Agril Co. in the early 1800's. The product was sold in New York State for crockery manufacture. The property changed hands several times and the last owner, the Vermont Kaolin Corp., finally closed in the late 1960's allegedly due to graphite in the clay which affected its "whiteness". To the south, the Brandon deposit (at Forestdale), was discovered in 1810 by Wait Broughton. Again, this deposit was worked by several enterprises to a limited extent until 1902 when the Horn-Crocket Kaolin Co. was formed. They established a viable enterprise, which was in operation until 1922 when their mine filled with water and was never reopened. The most southern deposit, which was opened at several locations in Pownal, Bennington and Shaftsbury, was first used by the Norton Pottery Co. in the late 1700's. Several other companies used the clay into the mid-1800's but they found it was more economical to import clay from out-of-state. Kaolinite was prospected in North Clarendon in the late 1800's and in Rutland. The Rutland Fire Clay Co. used impure kaolinite from 1883 until 1960 for a variety of fireproof products. The Rutland clay was never refined for use as a white clay.

## ***Marble***

### What is marble?

True marble is formed when limestone is subjected to heat and pressure sufficient to cause recrystallization of the carbonate minerals calcite and dolomite. During this process the impurities which give limestone its dark color, are either eliminated or segregated into bands and veins producing a variety of textures and patterns. All white marbles of western Vermont are true marbles. Other dimension stones quarried in Vermont are called "marble" when in fact their geologic histories are quite different. These stones can be highly polished and are suitable for building stone, thus they are sold as marble. They include the Isle La Motte Black, Champlain Red and Verd Antique "marbles". The stone quarried at Isle La Motte is a unmetamorphosed, fossiliferous limestone which, because of its density and fine texture, takes a high polish. The Champlain Red is a silicious dolomite and Verd Antique is an untramafic rock (peridotite and dunite), which has been altered to serpentinite by metamorphism. These rocks are the hardest "marbles" and hold their polish well.

The marble horizons of the early Ordovician Shelburne Formation have long been sought for the snow-white stone. Crudely wrought grave markers, mantels and lintels were among the earliest uses of marble in Vermont. One Bennington cemetery has a marble headstone dated 1768, which is believed to have come from the Dorset area. In 1785 the first commercial attempts at quarrying and milling marble were made and quarries were opened in Dorset, West Rutland and Pitsford. A discussion of which town was actually first will usually raise an argument, but present Vermont Marble Co. records indicate the Bloomer quarry on Route 30 in South Dorset was the first commercial opening.

Quarrying in the early days was done entirely with hand tools and workers relied heavily on the natural layering of the stone to acquire uniform slabs. The cutting or channeling process in the quarry was slow and a good man could produce a chisel-width channel one foot deep and four to eight feet long in a day. It was not until the 1840's that marble was sawn to a desired thickness at the mills and the 1860's before the Wardwell Channeler mechanized the cutting of stone in the quarry.

The marble business was brisk in the mid-1800's and there were as many as 50 companies quarrying and milling stone in the area in the 1870's. Soon after this time, however, the cost of quarrying stone became prohibitive for many small companies resulting in many business failures. Activity became centered in the Rutland area since the stone was softer and easier to work than the stone quarried in Dorset. Two firms, the Rutland and Sutherland Falls Marble Companies, survived the hard times. Managed by Colonel Redfield Proctor, these companies formed the heart of what was to become the Vermont Marble Co. By the 1910's the then established Vermont Marble Co. had acquired the major marble properties in Vermont and has been the major producer of marble ever since. The Green Mountain Marble Co. also produced stone in the 1900's but was small in comparison and was out of business by the mid-1900's.

Another major use of the white marbles of western Vermont was as a ground filler and pigment. In the 1940's, Vermont Marble and Thompson-Wyman formed the White Pigment Corp. and began grinding marble from a quarry in Florence. Needing a better source of stone, White Pigment reopened the Adair quarries in South Wallingford in the late 1940's and has been

shipping this stone to their Florence plant ever since. In 1960 the Vermont Kaolin Corp. plant in Monkton was dismantled, moved to New Haven and converted to Marble grinding. The Foote Street quarry in Middlebury was opened at this time to supply the new plant in New Haven. In the late 1970's OMYA and Cyprus Mining bought White Pigment, and OMYA constructed another grinding facility in Florence as a separate venture. In 1981 the Smokerise quarry in Brandon was opened to supply OMYA's Florence plant.

## ***Slate***

Slate is a very fine-grained metamorphic rock with a well-developed cleavage, which allows the rock to be split into thin uniform slabs. It is formed by the metamorphism of shale or clay-rich sediments and is associated with areas of intense folding in Vermont.

Several formations have been quarried for slate in Vermont including the Hortonville formation in Benson, St. Catherine formation from Rupert to Castleton, Northfield formation in Northfield and Montpelier, Gile Mountain formation in Waterford and Thetford and Littleton formation in Brattleboro and Guilford. The St. Catherine is the only formation currently worked and supplies all of the colored slate except red. Red slate is only quarried in New York, as no known outcrops of red are found in Vermont. All of the other formations mentioned were quarried for black or grey slate.

The quarrying of slate in Vermont began in the early 1800's to supply local demand for building materials, writing slates for schools, fence posts and other items which could be fashioned from the smooth easily split rock. As the railroads became more widespread in the mid-1800's, businesses expanded and Vermont slate became a common site in many parts of the country. The colored slate industry of western Vermont was the only one to survive the 1910's and it flourished in the 1920's. At this time there were more than sixty quarries actively being worked from Lake Bomoseen south to Rupert. Forty companies employed a thousand men and four million dollars worth of slate was shipped in 1924. The black slate industry failed in the 1910's due to the availability of less expensive, high quality Pennsylvania black slate. The prosperity of the colored slate industry has had low points as well. In the 1930's inexpensive asphalt shingles became available which put all but the largest and most economical roofing operations out of business. Today, a slate roof is two to four times as expensive as asphalt but is still one of the most handsome and durable roofs available. In the 1950's the invention of synthetic tile and bakelite seriously depressed the production of floor tile and switchplates.

In recent years architectural trends are returning to natural materials for their enduring quality and beauty. The effect has been a much more stable slate industry. The largest operations such as Vermont Structural Slate Co., Rising and Nelson Slate Co., Hilltop Slate Co., Sheldon Slate and Tatko Bros. Slate Co. provide a variety of products from structural slate to roofing while the smaller family operations such as Hadeka Slate, Fair Haven Slate (Taran Slate) and Slate tile Inc. specialize in one product such as floor tile or roofing.

## ***Talc***

The commercial talc deposits of Vermont are found within the ultramafic zone, which forms a narrow, north-south trending belt along the eastern flank of the Green Mountains. Talc is formed by the progressive alteration of ferromagnesium silicates (dunite, peridotite, pyroxenite) to first serpentinite and then talc. Many talc deposits have a core of serpentinite suggesting that alteration starts on the outside of an ultramafic pod and progresses to the center. The pods are generally elongate in a north-south direction with the best talc occurring in the "nose" areas of the pod. Many variations of this general relationship are seen in the field.

Talc was initially used in the early 1800's in its massive form of soapstone or freestone; named for its greasy feel and ease of quarrying. The superior heat retention qualities of soapstone made it ideal for fireplace construction and even today soapstone is used for woodstoves. Other early uses of soapstone were door sills, hearths, window caps and bed warmers.

As a commercial enterprise, soapstone was first worked in the early 1800's in Marlboro, Townshend and the Athens/Grafton area. By the mid 1800's many other talc deposits were opened for soapstone from Windham and Newfane in southern Vermont to Waterville in the north. It was not until the turn of the century that talc was ground and used in powder form as a filler and whitener. Initially, grinding operations were centered near mines in Rochester, Reading and Chester but by the 1910's mines had been opened in Johnson, Waterville, Moretown, Waitsfield, Branville and Windham. Several of the deposits initially used for soapstone were now used for ground talc as it was a more profitable product. By 1920 most of the talc was produced by five companies operating quarries in six townships. Today, Vermont is second in U.S. talc production and all talc is mined by either the Vermont Talc co. in Windham or Windsor Minerals in Reading and Ludlow. The sole quarrier of soapstone is the Vermont Soapstone co. which operates a quarry in Chester.

*(Other economic minerals mined in the past in Vermont include: gold, silver, chalcopyrite, bornite, pyrrhotite, molybdenite and hematite. Minor garnet, Pb-Zn minerals. Sand and gravel is quarried in many locations in Vermont.)*