
BUILDING STONE

IN NOVA SCOTIA

BY G.B. DICKIE

Information Circular 12

Cover Photo: St. Mary's Basilica, Halifax, Nova Scotia

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Building Stone

Introduction

Building stone is a term used to describe types of stone which are used for the construction of buildings and other structures. The stone can be used in a structural capacity where it bears a load or for decorative purposes where it is used as cladding, floor pavers and other decorative panels. Virtually any stone type can be used for building stone. Some of the more common are sandstone, granite, syenite, porphyry, gneiss, felsite and marble.

Sandstone is comprised mainly of quartz grains of sand size set in a fine grained matrix of silt, clay, silica or carbonate cement. Other minor constituents include feldspar, mica and iron minerals. Sandstone occurs in a wide range of colours, grain sizes and textures.

Rocks of a *granitic* composition make up a large proportion of building stone production. Quartz, mica and orthoclase feldspar are the constituent minerals of granite, and the mica may be replaced by augite or hornblende. According to the mineral associated with the quartz and orthoclase the different varieties of granite are known as:

| Variety of Granite | Constituent Minerals |
|--------------------|------------------------------------|
| Biotite-granite | Quartz, orthoclase, biotite-mica |
| Muscovite-granite | Quartz, orthoclase, muscovite-mica |
| Augite-granite | Quartz, orthoclase, augite |
| Hornblende-granite | Quartz, orthoclase, hornblende |

The crystalline structure of granite varies from crystals of more than 3 cm in length down to grains of microscopic size.

Syenite contains the same minerals as granite: orthoclase, hornblende and augite, with the exception that quartz is not present. It also occurs in a number of varieties depending upon the type of constituent minerals present.

| Variety of Syenite | Constituent Minerals |
|--------------------|--|
| Mica-syenite | Orthoclase, mica (biotite or muscovite) |
| Hornblende-syenite | Orthoclase, hornblende |
| Augite-syenite | Orthoclase, augite |
| Nepheline-syenite | Orthoclase, nepheline |

These rocks are somewhat darker than granite and are found in various shades and colours, which, when polished, make beautiful ornamental stones.

Porphyry is a term applied to granites and syenites in which one of the minerals, quartz or feldspar, is very coarse and much larger than the other constituents. Thus there is quartz-porphyry, granite-porphyry, and syenite-porphyry.

Gneiss, which has a laminated structure, is the metamorphic representative of the granites. It is composed of the same constituent minerals which are arranged in layers rather than uniformly distributed as in granite and syenite.

Felsite is a volcanic rock, frequently very fine grained or glassy, having a similar composition to granites. It is often an attractive colour with a high degree of hardness so can be highly polished. When these properties are enhanced by a porphyritic or brecciated structure, very attractive stones result.

Marble is the term applied to materials of such varied character and origin that it is almost necessary to define the word in

each instance. The term is used here to indicate all calcareous stones of sufficient beauty to be employed for purposes of decoration. Ordinary limestones pass into marbles by the assumption of a crystalline structure, or by the possession of agreeable and variegated colours together with a fine grained texture. In Nova Scotia, both types are represented. There are crystalline limestones of Precambrian age, and variegated, fine grained, metamorphosed beds of Carboniferous age limestone.

Stone has been used for building construction in Nova Scotia since the first settlements were established in the late 17th and 18th Centuries. At that time the stone was obtained either from ship ballast or local fieldstone. Production of domestic dimension stone began in the early 1800s in the Wallace area, Cumberland County and in the Pictou area, Pictou County. Good quality sandstone was produced from both areas and used in the construction of local buildings as well as public buildings in Halifax. Province House (*Photo 1*) and the Halifax Post Office (*Photo 2*) were

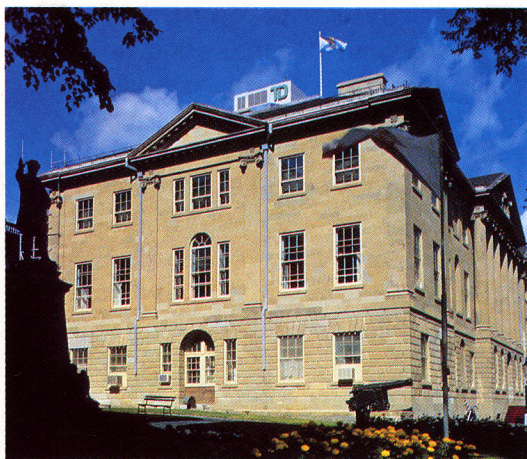


Photo 1. Province House, Halifax; Wallace sandstone.



Photo 2. Halifax Post Office; Wallace sandstone.

constructed using Wallace stone in 1811 and 1935 respectively. During the mid to late 1800s as many as 75 quarries produced sandstone in Nova Scotia (*Fig. 1*). Many of these quarries produced only enough stone for the basement course of local buildings. However, the Wallace quarries produced stone for domestic consumption and a flourishing export trade to Central Canada and the Eastern Seaboard of the United States. A small quantity of Wallace stone found its way as far west as California. Wallace stone has been used in conjunction with Sackville, New Brunswick red sandstone in the recent past in the construction of the Ralph Pickard Bell Library (*Photo 3*)

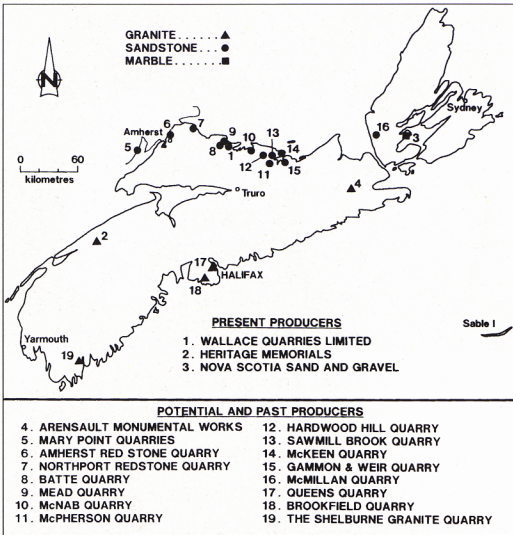


Figure 1. Major present and past producing Nova Scotia building stone quarries.

and other buildings at Mount Allison University in Sackville, New Brunswick. The restoration of the Nova Scotia Legislature in 1987 used Wallace sandstone to replace defective stone. Additional restoration projects in Nova Scotia and other areas will consume significant amounts of Nova Scotia sandstone. A mason apprentice program initiated for the Province House restoration program has provided a workforce capable of carrying out stone restoration internationally (*Photo 4*).



Photo 3. Ralph Pickard Bell Library, Sackville, New Brunswick; Sackville and Wallace sandstones.



Photo 4. Mason and apprentice working Wallace sandstone.

Nova Scotia granite has been quarried and used for foundation courses, monuments, and dimension stone. As early as the middle 1700s the old Queens Quarry on the Northwest Arm, Halifax and quarries at Terence Bay, Halifax County provided much of the granite used in the Halifax area. The front elevation of Saint Mary's Basilica (*Photo 5*) and the Merrill Lynch Building (*Photo 6*) were constructed of local granite. Granite quarries operated in Shelburne, Shelburne County, Nictaux, Annapolis County, and West Erinville, Guysborough County produced dimension and monument stone.

In the period 1873 to 1973 a total of 1 000 000 t of stone production was recorded with the Nova Scotia Department of Mines (*Fig. 2*). Of the total production 90.1 per cent was sandstone, 4.9 per cent granite, 3.1 per cent grindstone and 1.9 per cent quartzite. By far the largest single stone producer was the Wallace Quarry (*Fig. 3*). It has produced a total of 841 000 t of stone in the last 100 years. Approximately 50 per cent of that was dimension stone for building construction.

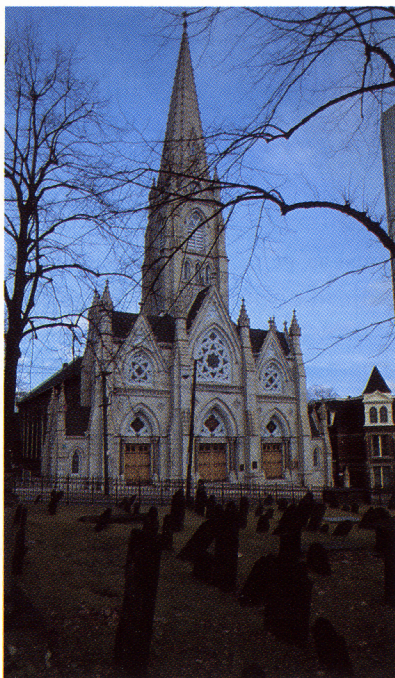


Photo 5. St. Mary's Basilica, Halifax; Purcells Cove granite and ironstone.



Photo 6. Merrill Lynch Building, Halifax; Terence Bay granite.

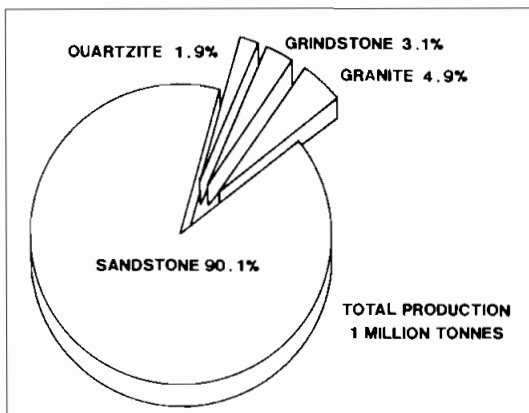


Figure 2. Nova Scotia building stone production, 1873 to 1973.

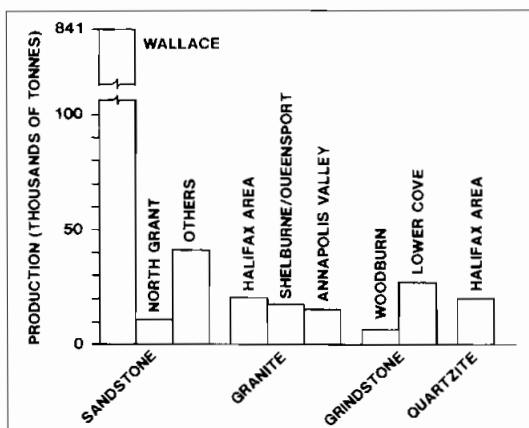


Figure 3. Nova Scotia building stone production by district, 1873 to 1973.

Physical Properties

Sandstone and granite are employed for many purposes. They must be tested in a variety of ways to determine their suitability for the particular purpose for which they are to be used.

Granite and sandstone are commonly tested for specific weight, absorption, compressive strength, transverse strength, and resistance to abrasion. These characteristics determine the durability of

a stone or its capacity to resist weathering agents such as acid rain and pollution, freeze thaw cycles, human and vehicular traffic, chemicals and vandalism.

Sandstone

Geology

Over 75 quarries periodically produced sandstone in northern Nova Scotia over the last 150 years. They may be divided into two broad categories and ages (Fig. 4). The red sandstone from River John, Pictou County, Amherst, Cumberland County, and Northport, Cumberland County are from the Late Carboniferous lower to middle, redbeds of the Pictou Group. The olive, buff and grey sandstones of Wallace, Cumberland County, Eight Mile Brook, Pictou County, Sawmill Brook, Pictou County, McKeens Quarry, Pictou County, and Hardwood Hill, Pictou County are from the Late Carboniferous Boss Point Formation of the Cumberland Group. The Boss Point Formation is predominantly sand deposited in moderate to low sinuosity meandering, sand-dominated streams. The Pictou grey beds exhibit fining upward sequences of conglomerate to sandstone attributed to

| AGE | | GROUP | QUARRY | |
|---------------|---------------|---------|------------|-----------|
| CARBONIFEROUS | LOWER PERMIAN | PICTOU | ③ ④ | |
| | STEPHANIAN | | ② | |
| | WESTPHALIAN | D | CUMBERLAND | ① ⑤ ⑥ ⑦ ⑧ |
| | | C | | |
| | | B | | |
| | | A | | |
| | NAMURIAN | MABOU | | |
| | VISEAN | WINDSOR | | |

① WALLACE
 ② RIVER JOHN
 ③ AMHERST
 ④ NORTHPORT
 ⑤ EIGHT MILE BROOK
 ⑥ SAWMILL BROOK
 ⑦ McKEENS QUARRY
 ⑧ HARDWOOD HILL

Figure 4. Approximate position of Nova Scotia sandstone quarries in the Carboniferous stratigraphic succession.

deposition in low sinuosity streams. The conglomerates constitute channel lags and the sandstones (arkoses), channel fill due to the migration of dunes, which resulted in trough cross-stratification.

Granite

Granites are the most universally used monumental and building stones and are widely used as cladding panels, pavings, thresholds, steps and risers, and for monument blanks and press rollers. At present Heritage Memorials Ltd., Windsor, Hants County is the only granite producer which operates a granite quarry. Heritage produces a small amount of blue-grey granite from the Nictaux Quarry for use as monument blanks and bases. Nova Scotia is at present importing significant amounts of red, black and various shades of green granites from Africa, India, Quebec and Ontario. Due to high quarrying costs and the small volumes of stone required annually by Nova Scotia monument fabricators, most are finding it less expensive to purchase imported stone. If a superior quality black or red granite can be found in sufficient quantity locally it may be possible to enter the lucrative export market (*Table 1*).

Geology

A large portion of Nova Scotia is underlain by granitic rocks. Past granite production has exploited the South Mountain Batholith and its related satellite plutons. The Batholith is a composite intrusion consisting predominantly of grey, coarse grained granodiorite to monzogranite. The pluton borders are generally fine grained

and have hosted most of the former granite producers.

The eastern shore region of the Province boasts a number of zoned plutons of gabbroic composition. The Arsenault Monumental Works Ltd. black granite quarry at West Erinville, Guysborough County produced thin slabs of a good quality black granite until the middle 1960s.

The Cape Breton Highlands are underlain by a number of granite plutons with colours ranging from grey to red to black. Due to the overburden cover and deep weathering in some areas, prospecting for economic granite deposits is difficult. The Cobequid and Antigonish Highlands areas are also underlain by granite plutons. Although no granite production has occurred in these regions previously, the variety of colours present may warrant some exploration.

Crystalline Limestone, Limestone, Marble and Felsite

Significant quantities of marble are imported into North America for use as decorative panels, floor tiles and trim for both interior and exterior applications. The use of marble and other decorative rocks is also increasing in the manufacture of exposed aggregate panels. Stone chips are also being used in the landscaping field as is stone for walls and walks. Minor amounts of marble and alabaster are used by sculptors and other specialties of the arts.

Marble

Large deposits of white, grey and banded marble occur on Cape Breton Island at Glencoe, Inverness County, Marble

Table 1. Physical properties of Nova Scotia building stone*

| Quarry | Stone Type | Colour | Specific Weight lbs/ft ³ |
|------------------|------------|-------------|--|
| Wallace | sandstone | blue | 145.87 |
| Wallace | sandstone | olive | 144.81 |
| Amherst | sandstone | pinkish-red | 142.93 |
| Eight Mile Brook | sandstone | grey | 142.42 |
| Hardwood Hill | sandstone | tan | — |
| English Property | sandstone | olive, tan | 141.65 |
| Terence Bay | granite | white | 164.95 |
| Halifax Quarries | granite | grey | 167.76 |
| Nictaux Quarry | granite | blue | 167.63 |
| Shelburne | granite | grey | 167.02 |

** unconfined

* After Parks (1914)

| Absorption % | (Compressive Strength) lbs/in ² | Transverse Strength lbs/in ² |
|--------------|--|---|
| 5.58 | 15 633 | 1 534 |
| 5.90 | 13 681 | 1 838 |
| 6.894 | 11 122 | 551 |
| 6.66 | 16 888 | n/a |
| n/a | 8 520 ** | 962 |
| 6.85 | 10 348 | 869 |
| 0.209 | 25 893 | 2 269 |
| 0.208 | 25 959 | 2 439 |
| 0.137 | 34 058 | 3 572 |
| 0.172 | 28 440 | n/a |

Mountain, Inverness County and George River, Cape Breton County. The marbles tend to be narrow in width and structurally deformed at most locations although sections of white marble, up to several hundred metres in width, have been intersected by core drilling at the Glencoe deposit.

The Marble Mountain deposit is presently being exploited by Nova Scotia Sand and Gravel Ltd. for the production of white marble chips primarily sold in bags at garden centres. This material may also be well suited for the production of chips for exposed aggregate panels.

Felsite

Cape Breton Island hosts volcanic rocks which are frequently very fine grained, hard and of attractive colour. When these properties are enhanced by a porphyritic or brecciated structure, very beautiful stones result.

Scatarie Island, Cape Breton County hosts felsite breccias of very beautiful colour variations. Two types are present; the first is comprised of large, bright red fragments in a deep green matrix. The second type contains deep green fragments in a red matrix. The fracture and joint patterns are very closely spaced rendering the stone unsuitable for the production of large blocks. The breccias would however, make very attractive decorative chips for exposed panels, landscape chips and other products which require small fragments. The vivid colours are unsurpassed in this type of stone.

Building Stone Quarries In Operation in 1992

- Nictaux Quarry, Heritage Memorials Ltd., Annapolis County: blue-grey granite, fine grained.
- Pictou County Sandstone Quarry Limited, Hardwood Hill, Pictou County: tan to olive, fine- to medium-grained sandstone.
- Wallace Quarries Ltd., Wallace, Cumberland County: blue, dark olive, light olive sandstone.

Mineral Rights

Building stone is not defined as a mineral under the Mineral Resources Act of Nova Scotia. In order to open and operate a building stone quarry, the surface rights for the property must be held by the owner of the quarry or arrangements must be made with the landowner to develop the quarry. On land which is owned by the Crown, the Nova Scotia Department of Natural Resources is the agency responsible for their administration.

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Nova Scotia



Department of Natural Resources

Honourable Donald R. Downe
Minister

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