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**BRITISH COLUMBIA  
DIMENSION STONE MARKET STUDY**

By Jay W. Page of Beaty Geological Ltd.

This report was prepared as part of the on-going program of dimension stone investigations under the Canada/British Columbia Mineral Development Agreement. It consists of 44 pages of text that examines dimension stone markets in British Columbia, Alberta, the Pacific Northwest, California and Japan. Interviews with a total of 71 architects, suppliers, memorial companies, fabricators and international trading companies were carried out to gain information on the stone industry, market tastes and trends, prices and sales volumes.

The report summarizes international trade in dimension stone, dicusses physical standards and stone characteristics, and examines market potential for several types of stone, particularly granites, in each of the market areas.

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*Consulting Geological Services*

900-625 Howe Street  
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**prepared for the  
Province of British Columbia  
under the  
Canada-British Columbia Mineral Development Agreement**

**by**

**Jay W. Page, B.A., B.Sc., F.G.A.C.**

**March 1989**

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## 1. EXECUTIVE SUMMARY

Demand for and consumption of dimension stone has increased significantly in recent years, yet in British Columbia, despite a wide variety of natural stone resources, there has only been minor local production and most dimension stone is imported.

A thriving dimension stone industry existed in British Columbia during the late 19th and early 20th centuries and provided building stone for the construction of many courthouses and other heritage buildings. The development of these quarries reflected the architectural tastes and transportation patterns at the turn of the century. These quarries closed because of the development of concrete and steel frame construction methods which eliminated a demand for stone building blocks.

A market study was contracted to Beaty Geological Ltd. in February, 1989 to identify the market opportunities that exist for British Columbia dimension stone. The study focussed on the marketability of several British Columbia stones, particularly grey granite, within a potential market area of British Columbia, Alberta, Washington, Oregon, California and Hawaii. Potential export opportunities to Japanese markets were also considered.

In the international market, Italy is one of the most significant producers in terms of value, volume and technological developments, and is the largest exporter of fabricated granite in the world. The North American industry is primarily focussed on granite production. Canada has seen a large growth in all sectors of the dimension stone industry, that is, production, imports and exports. The American industry has seen a very large growth in imports but a relatively small growth in domestic production.

The recent popularity of dimension stone is primarily for thin slabs and veneers, which are used for interior and exterior wall facing and flooring. In these applications granite is mainly used for exterior cladding while marble remains the primary stone for interior use. Recent technological developments and automated fabrication facilities have allowed stone slabs to be produced at prices competitive with many other materials. In addition to a large demand for face finished slabs, a rapidly growing market has developed in the use of stone tiles.

Dimension stone must satisfy a variety of physical requirements. Stone used for external cladding must normally meet the standards set by the American Society of Testing and Materials. In addition the dimension stone industry requires that a stone must normally take a good polish, contain little biotite or sulphides, and have a low porosity to prevent staining and water absorption. The market requires that granites be uniform in colour, texture and pattern. Natural features such as mafic knots, veining, schlieren structures and inclusions are usually unacceptable.

A significant constraint on the development of a British Columbia quarry industry is the very limited market for selling rough blocks produced by quarries. In Western North America there are only two fabricators who buy rough blocks, although some export opportunities also exist to Japan. These markets may be too small for a quarry to achieve the necessary economies of scale for a sustained profitable operation. Potential quarries producing low value dimension stone, such as grey granite, should consider construction of a dedicated fabrication plant to achieve higher levels of production and to enter the fabricated dimension stone market.

Fabricated grey granites, especially peach-grey coloured varieties, have good market potential in the market study area. The grey granites are the cheapest and most economical of granite dimension stones and they enjoy steady moderate volume sales. A number of imported greys, particularly from Italy, presently fill this sector of the market. To effectively compete in this market a British Columbia grey granite must be quarried in large volumes, fabricated efficiently, and have local geographic advantages exploited to produce a grey granite cheaper than any import. Fabricated grey granite should be competitive if it can be marketed for about \$43.00 per square metre (\$4.00 per square foot).

The market for moderately priced dimension stone, such as pink or red coloured granite, is strong and has been steady for several years. Prices are generally higher than for the greys but this market sector is a very competitive and many varieties of pink and red granite are now available in the market place.

Significant market potential exists for premium quality granites such as fine grained black granites, and medium grained mahogany, dark red, gold, green and blue coloured granites. These stones command premium prices and enjoy large international markets. However the higher prices often reflect higher production costs and waste factors which do not translate into higher profit margins unless a quarry site with ideal conditions is developed. This is especially true of the fine grained black granites. The premium quality coloured granites have a higher profit margin on lower volumes than common granites, and are better able to survive high waste factors, quarry development costs, unfavourable currency fluctuations and higher transportation costs. Premium quality coloured granites may provide the best opportunities to develop a dimension stone industry in British Columbia.

The most important factor in developing a British Columbia dimension stone industry is that the industry must be competitive. Market opportunities exist for a variety of high quality grey, and coloured granites. To compete in this market, British Columbia stone must be efficiently quarried, fabricated and supplied to the market at competitive prices.

## 2. INTRODUCTION

The market for dimension stone in British Columbia has increased significantly in recent years with many architects, builders and consumers demanding high quality marbles and granites for both interior and exterior applications. However, with only a few minor exceptions almost all of the stone used today in British Columbia is imported. This is in contrast with the late 19th century when a thriving building stone industry supplied dimension stone to the many court houses and other heritage buildings in British Columbia.

British Columbia has a wide variety of different types of stone, including the largest mass of granitic rocks in the world - the Coast Crystalline Complex. Within the province are found alkalic rocks, marbles, high grade metamorphic rocks, volcanic rocks, quartzites and so forth - a great diversity of rock types all of which are quarried elsewhere in the world. Moreover, glaciation has removed the weathered cover leaving the rocks relatively fresh and unaltered by surface weathering. Yet today with the natural stone industry experiencing a renaissance, it is ironic and unfortunate that all major British Columbia projects involving dimension stone must import this material.

British Columbia has the natural resources required by the dimension stone industry. Work carried out by the Geological Survey Branch of the British Columbia Ministry of Energy Mines and Petroleum Resources has documented the possible reserves and characteristics of stone available in the old quarries. These sites represent only a fraction of what is available, and considerable potential exists for identifying and developing stone quarries elsewhere in the province.

A market study was proposed to stimulate interest and investment in this natural resource where it was thought that import replacement and export opportunities exist. The development of a dimension stone industry would provide broader benefits by contributing to the expansion of the province's resource industry base, and in the long term by encouraging industrial development through exploiting value added manufacturing opportunities. In February, 1989 Beaty Geological Ltd. was contracted to carry out a market study of British Columbia Dimension Stone by the British Columbia Ministry of Energy Mines and Petroleum Resources, and funded under the Canada - British Columbia Mineral Development Agreement.

Beaty Geological Ltd. is a Vancouver based consulting geological company whose professional staff has recently carried out privately contracted market studies on a number of mineral commodities, notably platinum, lithium, gallium, germanium, mica and sulphur. As a result, the firm has developed an in-house data bank on a number of metallic and non-metallic commodities and expertise in mineral market research. The company has also undertaken previous work on dimension stone through contracts with a large private dimension stone user in British Columbia and with the province of British Columbia on a review of a quarry plan for dimension stone in northcentral British Columbia.



### 3. ACKNOWLEDGEMENTS

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#### 4. DIMENSION STONE MARKET STUDY

##### 4.1 Objective

The objective of this market study is to compile, analyze and present relevant information in a report on the market potential for dimension stone produced in British Columbia. It is hoped that the opportunities and options identified in this analysis will stimulate interest and promote investment in the dimension stone resources of British Columbia. This will provide broader benefits by contributing to the diversification and expansion of the province's natural resource industry base. It may also encourage industrial development and employment by exploiting value added manufacturing opportunities where import replacement and export opportunities are believed to exist.

##### 4.2 Scope of the Study

The study focussed on supply requirements of the dimension stone industry within the primary market area of British Columbia, Alberta, Washington, Oregon, and California. Secondary markets in Hawaii, Korea, and Japan were also considered. It should be noted that there is a danger in restricting a market study of a world wide industry to a local area, because only a limited perspective of the industry may be gained. It is hoped that a balanced view has been obtained through a careful review of available literature and statistical data. The market study will probably be of interest to a wider audience than those presently involved in the industry, and so some introductory material on dimension stone has been included in the report.

The primary emphasis in the study was placed upon identifying the market for granites, especially grey granites with little attention paid to marbles. In addition the study was not limited to just the market potential of rough blocks, which are the main products of quarries, but rather it assumed that British Columbian dimension stone would be available in any form that was marketable. A limited examination of the memorial stone industry was carried out, but industrial applications such as paper mill rollers, acid bath containers and precision tables were not investigated because they are thought to represent only a small portion of the stone industry. The furniture market has been considered within the context of interior decoration, which includes interior walls, floors, counters and fireplaces. They are all grouped together since they require stone in the same form of slabs or tiles. Other forms of dimensioned stone such as rough dressed stone for building construction and landscaping, stone for restoration work, cobblestones and curbstones have not been considered in detail. The flagstone market has not been examined, nor the aggregate industry even though terrazzo tiles made from aggregate are one of the biggest competitors with stone tiles.

Market forecasting was not a primary objective of the study, although all architects and suppliers were asked for their outlook on the industry and on market trends. Statistical information collected from secondary sources is presented in section 6 in its original form. Canadian figures are reported in

Canadian dollars and metric tonnes; while American figures are reported in American dollars and short tons. No attempt has been made to compensate for inflation when considering percentage increases, or changing currency exchange rates when considering imports.

#### **4.3 Methodology**

The market research involved a search for secondary source information as well as primary data collection through interviews with dimension stone users and suppliers. Secondary source information was collected through a review of available literature and an examination of statistical data from various government sources. Architects were interviewed to identify the most marketable characteristics and new trends in architecture. Suppliers were interviewed to identify the types of stone in demand today and competitive prices in the market place.

Resource materials were supplied by the Geological Survey Branch of the Ministry of Energy Mines and Petroleum Resources and consisted of a suite of polished slabs from old quarry sites in British Columbia, copies of Information Circular 1988-6 BRITISH COLUMBIA DIMENSION STONE by G.V. White and Z.D. Hora, and negatives of the photographs illustrating the above publication. The negatives were necessary to produce photograph sets because an insufficient quantity of the Information Circular was available for the survey.

Within the Vancouver area personal interviews were carried out with most of the larger architectural firms and a variety of smaller firms, all of which had recently used dimension stone. Personal interviews involved an informal discussion of market trends, projections, recently selected stones and an evaluation of the British Columbia quarry samples. In addition interviews were carried out with suppliers, fabricators, memorial companies and international trading companies; some in person and others by telephone. Outside the Vancouver area the Information Circular was mailed to 26 architectural firms and 50 sets of pictures were mailed to suppliers in Calgary, Edmonton, Seattle, Spokane, Portland, San Francisco, Los Angeles and Honolulu. All groups were later contacted by telephone and interviews attempted.

**TABLE I**  
**Market Survey Responses**

Location	Architects	Suppliers	Memorial Companies	International Trading Co.	Fabricators	Trade Organizations
British Columbia	19	7	2	-	1	-
Alberta	1	9	-	-	-	-
Pacific Northwest	2	9	1	-	-	-
California	-	7	2	3	-	1
Hawaii	-	1	-	-	-	-
Eastern Canada	-	-	-	-	3	-
Eastern USA	-	-	-	-	2	1
<b>Total</b>	<b>22</b>	<b>33</b>	<b>5</b>	<b>3</b>	<b>6</b>	<b>2</b>

A total of 71 interviews were carried out with architects, suppliers, memorial dealers, fabricators and international trading companies. Table I shows the distribution of interviews. In general personal interviews were far more useful than telephone interviews. Interviews with suppliers provided the most information about the stone industry, while interviews with architects gave a better insight in to market tastes and trends. Obtaining wholesale prices was difficult as most suppliers refused to divulge this information, and none would provide information on sales volumes. Only a few architects participated in telephone interviews; most declined saying that they were too busy. Time constraints prevented the collection of much information about markets in Hawaii and Korea, and they are only referred to in a very general way.

## 5. BACKGROUND TO THE BRITISH COLUMBIA DIMENSION STONE INDUSTRY

The dimension stone industry in British Columbia has a history that dates back to the late 19th century when a large number of quarries were actively producing stone for the many prominent buildings of that era. The stone industry was largely introduced to western Canada by the Canadian Pacific Railway, which brought over large numbers of Scottish stone masons to work on the railway and its associated bridges, buildings, and other structures. After the railway was completed many of the stone masons settled in western Canada and applied their talents to the construction of the many courthouses, and commercial buildings which are now a prized part of our heritage.

The distribution of stone quarries that developed during this period was controlled by the transportation patterns of the 19th century. The quarries were found in locations which were either close to the construction sites, or were accessible by railway or barge - being the only economical means of transporting heavy blocks of stone. Quarries supplying construction sites for interior cities tended to be located along the Canadian Pacific Railway, except in the Nelson area where water access on Kootenay Lake was also available. Stone quarried for construction sites in Vancouver, Victoria and Nanaimo came primarily from quarries located along the Coast.

Quarry sites were chosen where the jointing patterns and fracture spacing promoted the extraction of blocks of a useful size. The quarries primarily produced blocks for the construction of buildings in which the stone walls provided the main structural support. A limitation on the size of blocks was provided by the amount of weight which could be lifted by 19th century equipment. It was a desirable feature that blocks could be quarried in a variety of sizes that could be easily handled and then transported to the construction site.

The stone quarried was primarily grey granite, buff sandstone and light grey marble, all of which reflected the architectural tastes of the late 19th century. Sandstone was popular at this time because of the ease with which it could be worked, however the British Columbia varieties were of poor quality for building construction. Haddington Island andesite was later used as a substitute for sandstone and saw extensive use through to the 1930's. Limited quarrying of dimensioned sandstone also continued through the early part of the 20th century, mainly for the production of grist wheels for the pulp and paper industry. Grey granite was primarily produced from the Nelson Island area on the Coast, while a range of colored granites were taken from the interior quarries. Marble was quarried in the Kootenays, and from several locations on the Coast.

After the late 19th century construction boom, quarry production declined and construction activity did not pick up until after the First World War. By this time the development of cement and cheaper construction techniques, coupled with a lack of skilled stone masons limited the use of stone to only the most prestigious buildings in the growing coastal cities of Vancouver and Victoria. The coastal quarries producing grey granite and andesite saw the most production during this period. This was, however, short lived for all the

quarries were eventually closed during the depression of the 1930's. Following the Second World War, building construction began on an unprecedented scale that has continued through to the present. The development of steel frame high rise construction methods, and an emphasis upon concrete, glass and steel materials has precluded the use of much natural stone until recently.

The post war period has seen a gradual growth in the use of stone facing for interior walls and floors and more recently for exterior applications. This is due in part to the high immigration from Europe which has included many skilled stone masons, particularly from Italy. They brought with them an appreciation of natural stone, a tradition of stone use and the techniques for working with stone in slab form. The immigrants established local "marble shops" and maintained commercial contacts with previous employers, suppliers and quarries in Europe. All their equipment and most of their stone was imported from Europe. As the market for dimension stone grew, their efforts were best rewarded by increased marketing of their imported products, rather than by attempting to become a primary producer. The difficulty in entering the market with a locally sourced stone was exacerbated by the lack of fabricating facilities and possibly a lack of capitalization in an industry composed largely of small independent businesses. Any rough stone produced could only have been exported, unless the business was prepared to invest in fabricating facilities. In addition there was a perception that British Columbia had little to offer in the way of quarry potential, particularly when the market until recently was primarily for marble. The post war development of a dimension stone industry in British Columbia has focussed on the marketing of European values, techniques and stone to consumers, not the production of rough stone for export.

The resurgence in the use of natural stone in the last decade has developed because of a growing appreciation of the aesthetic beauty of natural stone and because of competitive pricing. Technological advances in cutting and polishing equipment have allowed stone to be fabricated into very thin slabs. Automated processing has reduced costs and has made a country like Italy a standard of efficiency, and a dominant supplier in the world market. New techniques of using thin stone veneers have been developed, including prefabricated panel systems which have significantly reduced labour costs and installation time on major projects. Stone is now cost competitive with other materials especially when its long life, low maintenance and high aesthetic qualities are considered.

In the last decade there have been a number of attempts to open quarries in British Columbia, and there has been some limited production. Flagstone which is used as a rough facing stone has been produced for over 20 years from a mica schist quarry near Revelstoke, and from several quartzite quarries in the Salmo area. Minor amounts of Nelson Island granite from an old stockpile have existed in the market place up until recently. Slabs of Haddington Island andesite are still to be found in suppliers yards and there has been limited quarrying of andesite for restoration work. There has also been minor amounts of both a light grey and a black granite collected in the Squamish area and small amounts of jade and other semi-precious stones have been produced from

various parts of the province. The latter have usually been sold as rough stone for carving, although attempts have been made to market jade tiles.

Major investments in the last decade include an attempt to develop the Babette Quartzite deposit north of Prince George which included the construction of a modern fabrication plant (Canroc Industries Ltd.) in Delta. This project floundered, however, without any significant production. In 1985 a quarry on Knight Inlet was opened by Kellard Marble Inc. and has seen limited production of a dark bluish granite marketed under the name of Katherine Blue. The most successful recent quarry has been the Beaverdell quarry which is operated by Quadra Stone Company Ltd. The light pink granite is cut and polished by Ladha Industries Ltd. (using the former Canroc Industries Ltd. plant) and is marketed as Cascade Coral. It has achieved limited sales as far away as Los Angeles and was used in precast concrete panels on the Royal Bank in Victoria.

## 6. PRODUCTION AND TRADE

### 6.1 International Producers

Dimension stone is quarried and fabricated in many countries; world production in 1985 was estimated at approximately 12 million tonnes (Taylor, 1986). The trade patterns for granite and marble differ somewhat but in both cases Italy is the largest exporter of fabricated dimension stone. Italy is also the leader in terms of total production, and the development of fabrication technology. In 1985 Italy produced 6.0 million tonnes of dimension stone of which 30% was granite, 40% marble, 10% travertine, and 20% other (Taylor, 1986).

Major world producers of rough block granite are the United States, Spain, France, Portugal, Brazil, Japan, India and South Africa; while major fabricators are the United States, Italy, France and Japan. Within this group Italy is the largest fabricator that is dependent on imported stone and on export markets, the others are net importers and their production is largely for domestic consumption.

### 6.2 Canadian Production and Trade

Canadian production of dimension stone has steadily increased during recent years with total dimension stone produced in 1986 valued at 22 million dollars. This total is composed of approximately 71% granite, 11% limestone, 6% marble, 11% sandstone and 1% slate. The most important sector, dimension granite production, has shown positive growth in production and value since 1984 as shown in Table III. Quebec is the largest producer of dimension stone, both in terms of the amounts quarried and fabricated. Approximately 23 companies in Quebec are involved in granite production, which is primarily focussed on pink and grey varieties.



**TABLE II**  
**Total Dimension Stone Production in Canada**  
**1983-86**

	1983		1984		1985		1986	
	t	\$	t	\$	t	\$	t	\$
Rough	190	7114	225	8712	280	10581	154	11542
Monument	38	3963	53	5990	58	6527	74	8405
Other	<u>38</u>	<u>1001</u>	<u>40</u>	<u>1024</u>	<u>25</u>	<u>1337</u>	<u>28</u>	<u>2203</u>
<b>TOTAL</b>	<b>266</b>	<b>12078</b>	<b>318</b>	<b>15726</b>	<b>363</b>	<b>18445</b>	<b>256</b>	<b>22150</b>
% Change	-15%	25%	20%	30%	14%	1.5	-29%	+20%

Note: Weight in thousands of metric tonnes, value in thousands of Canadian dollars.

Source: Statistics Canada, catalogue 26-225; 1983-1986

**TABLE III**  
**Total Granite Production in Canada**  
**1983-86**

	1983		1984		1985		1986	
	t	\$	t	\$	t	\$	t	\$
Rough	41	5186	54	6521	57	6904	57	7309
Monument and Ornamental (not finished)	20	3047	33	4950	38	5399	53	7396
Other (flagstone, curbstone, paving etc.)	<u>7</u>	<u>392</u>	<u>6</u>	<u>222</u>	<u>9</u>	<u>500</u>	<u>11</u>	<u>1002</u>
<b>TOTAL</b>	<b>68</b>	<b>8625</b>	<b>93</b>	<b>11693</b>	<b>104</b>	<b>12803</b>	<b>121</b>	<b>15707</b>
% Change	+35%	-6%	37%	36%	12%	9%	16%	23%

Note: Weight in thousands of metric tonnes, value in thousands of Canadian dollars.

Source: Statistics Canada, catalogue 26-225; 1983-1986

Imports of stone to Canada during 1986-87 have shown large increases, averaging 44%. In 1987 shaped or dressed marble (face finished slabs) showed a 71% increase, followed by shaped or dressed granite at 49%. In 1987 imports of shaped or dressed marble were primarily from Italy with a value of \$11,745,000. Imports of shaped or dressed granite were also largely from Italy (\$11,690,000) followed by the United States (\$2,521,000), Spain (\$1,168,000) and others (\$672,000) (Statistics Canada Catalogue 65-207, 1987).

Exports of Canadian stone steadily rose during the period 1985-87 to \$42,000,000 with very large increases in exports of rough stone. In 1986 there was a 118% increase by value on a 93% increase in volume, and in 1987 a 78% increase by value on a 124% increase in volume for rough stone. In 1987 the largest export of dimension stone was to the United States (\$3,892,000), followed by Japan (\$1,581,000) Italy (\$401,000) and several others (\$116,000). (Statistics Canada, Catalogue 65-202, 1984).

TABLE IV

**Stone Imports and Exports in Canada  
1984-86**

	1984		1985		1986		1987	
	t	\$	t	\$	t	\$	t	\$
<b>Imports:</b>								
Building Stone	7	1203	9	1379	11	1853	18	2383
Stone Crude N.C.S.	6	468	4	357	6	463	8	645
Granite rough	31	5101	34	6154	34	6646	46	7866
Marble rough	9	3902	6	2716	6	2725	6	2771
Shaped or dressed granite		7796		6278		11224		16051
Shaped or dressed marble		4007		5311		8792		15056
Natural stone, basic products		<u>7017</u>		<u>9996</u>		<u>15357</u>		<u>22042</u>
<b>TOTAL</b>		<b>29494</b>		<b>32191</b>		<b>47060</b>		<b>66814</b>
% Change		28%		9%		46%		42%
<b>Exports:</b>								
Building Stone rough	11	1785	12	1657	18	2674	37	5990
Stone crude N.C.S.	208	1432	171	1386	330	3016	739	5383
Natural stone, basic products		<u>28977</u>		<u>24381</u>		<u>29186</u>		<u>30966</u>
<b>TOTAL</b>		<b>32194</b>		<b>27424</b>		<b>34876</b>		<b>42339</b>
% Change		26%		-15%		27%		21%

Note: Weight in thousands of metric tonnes, value in thousands of Canadian dollars.

Source: Statistics Canada, catalogue 65-207 (1984-1987), 65-202 (1984-1987)

### 6.3 United States Production and Trade

Domestic production in the United States is centered in the states of Georgia, Indiana and Vermont, which account for 40% of output. The type of dimension stone produced in 1988 is estimated as 52% granite, 28% limestone, 10% sandstone, 3% slate, 2% marble and 5% others (Taylor, 1988). Domestic production by volume increased during the 5 year period 1984-1988 by 14% but the value of that production decreased by 1%. During the same period imports rose by 130%, exports rose by 35% for an overall increase in consumption of 78%. In granite only, domestic production increased by 8%, imports increased by 38%, while exports declined by 5%, resulting in an increased apparent consumption of 23%.

TABLE V

USA  
Total Dimension Stone Production and Trade  
1984-88

	1984	1985	1986	1987	1988
Production:					
Tonnage	1141	1104	1163	1184	1300
Value	162	172	173	190	161
Imports for consumption:					
Value	223	291	380	439	513
Exports:					
Value	23	14	15	20	31
Consumption:					
apparent Value	362	449	538	609	643
Percent Change	13%	24%	20%	13%	6%

Note: Weight in thousands short tons, Value in millions of US dollars

Source: Taylor (1989)

**TABLE VI**  
**USA**  
**Dimension Granite Production and Trade**  
**1984-88**

	1984	1985	1986	1987	1988
Production	622	606	625	629	670
Imports for consumption	490	620	698	758	674
Exports	92	46	57	58	87
Consumption apparent	1020	1180	1266	1329	1257
Percent Change	57%	16%	7%	5%	-5%

Note: Weight in thousands short tons

Source: Taylor (1989)

The United States has seen significant increases in imports and consumption with only modest gains in production in recent years. In 1988, the United States imported about 75% by value of its total consumption of dimension stone. Imports contributed slightly less than half of the granite consumed in 1988 (Taylor, 1988). The sources of imported dimension stone were by value: 66% Italy, 8% Spain, 6% Canada, 4% Taiwan and 16% others. However, for granite only the source of imports was 65% Italy, 15% Canada, 7% Spain and 13% others. The changes in production, imports, exports and consumption for total dimension stone is summarized in Table V and for granite only in Table VI.

#### **6.4 Market Study Area Production and Consumption**

Production the market study area has been stable but at relatively low levels. Total production of rough dimension stone in 1986 is estimated at 128,000 metric tonnes. In the American section of the study area, California is by far the largest producer of dimension stone which in 1986 amounted to US \$2,582,000 for 23,000 tons (Taylor, 1986). A red granite shipped to Cold Spring Granite Co. in Minnesota, contributed part of this production, while the balance is flagstone and rough building stone. Washington also produces limited quantities of flagstone and rough building stone. Oregon and Hawaii have no recent recorded production.

**TABLE VII**  
**Dimension Stone Production in the USA**  
**1983-86**

	1983		1984		1985		1986	
	T	\$	T	\$	T	\$	T	\$
California	20	2839	23	1658	23	2449	23	2582
Oregon	-	-	-	-	-	-	-	-
Washington	1	37	0.8	53	0.8	53	1.2	69
Hawaii	<.5	3	-	-	-	-	-	-

Note: Weight in short tons, value in US dollars.

Source: U.S. Bureau of Mines 1984, 1986.

In the Canadian section of the study area there has been limited production of flagstone and building stone in both British Columbia and Alberta. An examination of British Columbia records by mining district indicates that the production figures are merely estimates and do not include recent production from the Beaverdell quarry, nor flagstone produced by the Kootenay Stone Center in Salmo.

**TABLE VIII**  
**Dimension Stone Production in Canada**  
**1983-87**

	1983		1984		1985		1986		1987	
	t	\$	t	\$	t	\$	t	\$	t	\$
British Columbia	-	15	-	23	-	20	-	49	-	52
Alberta	1	57	1	69	1	64	1	57	NA	NA

Note: Weight in metric tonnes, value in Canadian dollars.

Source: Statistics Canada Catalogue 26-225; 1983-1986

TABLE IX

**Dimension Stone Production in British Columbia  
by Mining District  
1985-87**

	1985	1986	1987	Comments
Kamloops	\$ 6,600	\$ 8,200	\$ 7,000	Flagstone
Revelstoke	3,300	15,000	19,000	Flagstone & fireplace stone
Vancouver	<u>10,000</u>	<u>26,000</u>	<u>26,000</u>	Knight Inlet Quarry and building stone
<b>TOTAL</b>	<b>\$ 20,000</b>	<b>\$ 49,000</b>	<b>\$ 52,000</b>	

Source: McKee (1989).

Production of fabricated stone from the former Canroc Industries Ltd. plant in the past few years is unknown, but it has certainly only been a fraction of its rated annual capacity of 46,000 square metres (500,000 square feet). Much of its past production has been contact fabrication of external cladding for commercial buildings from rough blocks quarried at Beaverdell or imported from locations such as South Dakota. The plant is now owned by Ladha Industries Ltd. and is becoming a major supplier in the market study area, with plans to double capacity in the near future.

Trade or consumption statistics within the market area do not exist, but despite minor local production it is an area of high demand. The area contains about 15% of the population of Canada and the United States and as a percentage of apparent consumption for both countries, it is estimated that annual consumption of dimension stone in the market area is in excess of US \$100,000,000.

## 7. THE DIMENSION STONE INDUSTRY

### 7.1. Dimension Stone

Dimension stone is a term used to describe any natural stone that is quarried, shaped and finished to specifications. This is a broad definition that includes a variety of stone products that are classified according to the type of stone and its purpose. Many different types are quarried, including granite, limestone, marble, sandstone, shale and slate; however stone that is used for chemical processing, or that is crushed, or pulverized is not dimension stone. Only stone that is cut or accurately sized to certain specifications is a dimensioned stone.

Two types of dimension stone, granite and marble, are more significant in terms of gross value and volume of international trade than other types. Granite is considered to be any feldspathic crystalline rock of predominantly interlocking texture with mineral grains visible to the naked eye. This includes everything from syenites to gabbros, schists and gneisses. Marble is any crystalline calcareous rock, which includes serpentine, travertine and onyx.

The production of dimension stone is a process that is carried out in several different stages. First the stone must be quarried, which is to take it from its natural geological setting, usually from open pits. Historically stone was quarried in small blocks for building construction, however today the quarry blocks are large, often measuring 3 m x 1.6 m x 1.4 m (9.8' x 5.3' x 4.6') and weighing about 18 metric tonnes. Blocks for tile production can be smaller, about 2.5 m x 1.4 m x 1.4 m (8' x 4.6' x 4.6') and weighing about 13 metric tonnes. In general, smaller blocks have lower unit values because of decreased machining efficiency during fabrication. Rough blocks are sold by volume, with prices quoted in terms of cubic metres or cubic feet. The rough blocks are trimmed into rectangular shapes and transported to a fabricating plant which may be located near the quarry site in some countries, while in others the blocks may be exported.

The fabrication process first involves cutting the rough blocks into slabs. The equipment used for this purpose, such as saws, are often very specific to certain types of stone, as granite or marble. In the fabricating plant the block is sawn by multi-bladed gang saws into slabs which can measure as little as 1 cm (3/8") thick. Slabs are most commonly cut to 2 cm (3/4") thick, but 3.2 cm (1 1/4") is also common in the United States. Tiles maybe cut from 1 cm thick slabs, but are more often cut from blocks by special tile cutters. The tiles usually measure 30 cm (12") square but can be sized up to 60 cm (24") square. Slabs for memorials are usually cut 7.5-12.5 cm (3"-5") thick. Stone that is intended for use as building stone, curbstones or cobblestones will not be finished beyond the initial cutting.

The slabs are further processed by grinding and or polishing the surface to achieve the required finish. There are a wide variety of finishes but the most common finish is a high luster polish. Other frequently required finishes are a honed flat finish, and a flamed rough finish. Only one side of the slab is

finished. The face finished slabs are sold to wholesalers and installers or "marble shops" who carry out the final operation of cutting the slab to specifications and may install it. Face finished slab is sold by area, with prices quoted in terms of square metre or square feet.

Stone is used for a wide variety of purposes. Thin slabs in the 2 cm (3/4") to 3.2 cm (1 1/4") range are used for a whole variety of purposes including exterior cladding of buildings, interior walls, floors, counters, fireplaces and tables. In 1988, the Bureau of Mines (Taylor, 1989) estimated that domestic production and use of dimension stone in the United States totalled 1.3 million tons, which was used for building construction (45%), monuments (26%), rubble (13%), curbing (11%), flagging (4%) and other uses (4%).

## **7.2 Market Structure**

The dimension stone industry within the market area is made up of a large number of small "marble shops" with a few larger stone companies in each city. Most of these firms have been in existence for several decades and are family owned, often with more than one generation involved in their operation. The only fabrication plant in the market area is the Ladha Industries Ltd. (formerly Canroc Industries Ltd.) plant in Delta, but to date it has had little impact in the market. Likewise, there are a number of dimension stone quarries in British Columbia, Alberta, Washington and California but their production and influence on market supply has been minimal.

Most firms in the dimension stone industry buy or import their stone from a limited number of wholesalers and fabrication plants. These are usually groups with which the firm has had a long standing commercial relationship. Most North American quarries and fabricators have their own sales people or are well enough known not to need them. Offshore fabricators usually are represented by a local agent who sells stone to suppliers, arranges for its transportation to North America, and bids on large fabrication contracts.

The variety of stone carried by most firms is surprisingly wide, although some degree of specialization may occur in smaller firms. For example, only Italian marbles may be carried. The most common offshore sources of dimension stone are Italy, Spain, Portugal, Brazil, Argentina, Norway, India, China and Taiwan. In addition, stone from eastern Canada is common in Alberta and stone from the eastern United States is common on the U.S. west Coast. Most of the stone consumed in the market study area is purchased by the suppliers in the fabricated state (cut and polished slabs or tiles), with minor exceptions in the memorial industry.

A degree of specialization exists in the installation business. Small firms generally do not undertake large commercial installations and there is often a market division among the small firms, with some groups specializing in marble floors, others in countertops or furniture and some in tile installations. Most marble shops and stone companies maintain an inventory of stone in slab form and can handle small jobs from this supply. For medium sized projects, the stone must be ordered by the successful bidder and installed upon arrival. On



large projects the project architect and general contractor often work closely with the fabricator through a local agent. The fabricator will supply stone cut to specifications to a subcontractor, who may integrate it into prefabricated or precast panels, which in turn may be installed by another subcontractor on the construction site.

### **7.3 Stone Selection Process**

The selection process for dimension stone on large commercial projects begins at an early stage of the project when the initial design of the building is being developed. The developer or architect will have decided that stone will provide certain benefits or project a certain image if used in the project. This may be based on previous experiences, exposure to other projects, or perceived cost-benefits of its use. Specifications for the stone will be developed by a design and engineering team, depending upon the stone's intended use and the installation technique. Consultation with stone fabricators, engineering consultants, and subcontractors is often necessary to determine the specifications required for certain techniques such as pre-cast panel systems.

Suppliers and agents for fabricators will be contacted to provide samples and preliminary estimates. Based on these samples several stones will be selected in consultation with the client. The suppliers and agents will then be asked to submit bids based on pre-approved stones.

The final stone selection actually depends on a number of factors. The stone will be custom fabricated, so the ability and reputation of the fabricators will be an important consideration. The ability of the respective quarries to produce sufficient volumes of high quality stone on schedule is also very important. The final selection is price sensitive, but the stone quality, the fabricator's reputation and ability to deliver on schedule, sales promotion and customer support more important than simply which bid is lowest. The United States International Trade Commission (Brunsdale, et al, 1988) found that only once in 38 cases investigated was an imported granite selected in preference to a domestic granite solely on the basis of price. The chosen stone must, however, be reasonably priced relative to competing stones and within the approved budget.

## 8. MARKETABLE CHARACTERISTICS OF DIMENSION STONE

### 8.1 Physical Standards

Dimension stone must meet a variety of physical standards to be suitable as a construction material. Generally, most exterior applications, such as cladding, require that a stone meet the physical requirements as established by the American Society for Testing and Materials (ASTM). A wide range of specifications are required depending upon the type of stone and use, however the most common are: minimum density, maximum absorption by weight, minimum compressive strength and minimum traverse strength. Testing of samples is done under a variety of conditions and can normally be carried out by any well equipped geotechnical laboratory. The basic physical requirements are as shown in Table X.

TABLE X

Physical Requirements - Building Stones

Stone	Minimum Density		Maximum Absorption by weight (per cent)	Minimum Compressive Strength		Traverse Strength	
	lb/ft <sup>3</sup>	kg/m <sup>3</sup>		PSI	MPa(x 10 <sup>6</sup> )	PSI	MPa (x 10 <sup>6</sup> )
Granite	160	2560	0.40%	19,000	131	1500	10.34
Marble	162	2595	0.75%	75,00	52	1000	7.00

(from American Society for Testing and Materials, 1984)

The strength of a stone depends on its mineralogy; its textures, including grain size and foliations; the types of natural cements, and the presence of hidden fractures. In granites, fine grained varieties are generally stronger than coarse grained ones, mainly because feldspar crystals in granites split easily along certain crystal orientations and if they are large this becomes a significant feature in the failure of the stone under stress. If a stone, which is considered for an external application, cannot meet the ASTM standards then it must be incorporated into a structure such as a precast panel which compensates for the stone's weakness and which overall has acceptable physical properties. A stone that does not meet the physical requirements must be discounted to allow for the cost of structural reinforcing, if it is considered at all. Some fabricators such as Cold Spring Granite Co. in Minnesota will not even consider a stone unless it passes the ASTM tests. Stone used for ground level interior applications will generally not need to meet the ASTM standards. Tiles or slabs of structurally weak stone are often cut thicker than normal, or reinforced with fiberglass or steel rods. In general the physical properties of a stone do not contribute to its value, but if it is physically deficient they certainly detract from its value.

The porosity of a stone is a very important physical consideration especially in climates with a large number of freeze thaw cycles. Absorbed water when frozen can cause fracturing and promote physical deterioration of the rock. Porosity is also an indication of susceptibility to staining. This is generally not a problem with granites unless they have been subject to chemical weathering or alteration. However, porosity can be a serious problem with marbles and quartzites, particularly coarse grained marbles, and the potential staining of floors, counters and furniture is a very real concern. Another consideration for exterior cladding is the ability of a stone to withstand pollution and acid rain. While there is generally very little problem with granites in this regard, the susceptibility of marble to weathering can result in a loss of surface finishes and a deterioration of anchor systems.

In addition to the ASTM standards the dimension stone industry has a set of less objective standards to evaluate the quality of stone. The stone must take a polish well, and it should contain a minimum of biotite, which tends to flake off and create pits in the polish. Likewise, soft or altered minerals will tend to wear away faster than the rest of the rock during polishing, creating dead spots or hollows. Variolitic cavities are also unacceptable, and the rock must be free from sulphides which in exterior applications will cause rusty stains. Iron rich silicates such as olivine, pyroxene, and epidote are also subject to chemical weathering. A high percentage of quartz in a rock can give it a high abrasiveness resulting in increased fabrication time and costs. Vershuren, et al (1989) report that stones containing in excess of thirty percent quartz should be avoided.

## **8.2 Desirable Natural Characteristics**

### **8.2.1 Rock Type**

The natural characteristics of stone demanded by the dimension stone industry are largely a function of the type of rock, and it is these characteristics that make one type of stone more suitable for certain types of applications than others. Marbles are more widely used for interior applications in both residential and commercial settings, while granite is more commonly used for exterior cladding of commercial buildings with a smaller but growing use in interior design. Granite gives an impression of stability and permanence, while marbles create an appearance that is both luxurious and expensive. Marble is available in a vast array of colours and patterns which lend themselves to a wide variety of interior design schemes. In contrast granite is available in a narrower range of colours and patterns, and it is the abstract colour modulation of granites and variety of finishes that allows them to be used with good effect at any scale, from counter tops to exterior cladding of entire buildings. In recent years there has been a market shift favoring coloured granites at the expense of white marbles.

### **8.2.2 Colour**

Colour is one of the most important factors establishing the value of a dimension stone. Architectural tastes in colours are trendy and regularly change, following to some extent the lead established by the fashion industry. Colour selection also varies according to use. Residential use favours warm tones while commercial office applications tend to be more conservative and use colder colours such as greys. Commercial retail outlets use a wider range of colours, especially unusual colours and wild patterns. There are also regional variations in colour preferences perhaps reflecting the natural palette of colours found in different areas. The colour preferences varied with the different areas of the market study and will be covered separately under Section 9.3, Market Areas.

### **8.2.3 Texture**

The texture is also a very important consideration in determining the value of stone, especially granites. In general, the finer grained stones are worth more than coarse grained varieties. This is especially true of solid colours such as blacks which must be fine grained to command high prices. The fine grained stones are more commonly used where people can see the stone at close quarters, such as for interiors, rather than applications where the stone will be seen from a distance and may not be recognized as stone. In contrast, the medium to coarse varieties when viewed from a distance project a sense of richness and character, and are well suited for large areas such as building exteriors. Variations in the grain sizes or random large crystals look unbalanced and are undesirable. Suppliers report that, in general, medium grained granites are the best sellers in terms of volume.

In contrast to the granites, marbles are always best if they are fine grained because they are stronger, allowing them to be worked more easily. Also fine grained varieties are generally less porous and hence have fewer staining and absorption problems.

### **8.2.4 Uniformity**

The colour, texture and pattern of a stone must be uniform. This is especially true for large commercial applications where granite is often chosen because it can offer more uniform qualities over large areas. Foliated granites and patterned gneisses also have some market acceptance, as long as the fabric is consistent and the stone can be installed in a complimentary fashion. However, many natural features such as veining, mafic knots, inclusions and schlieren structures are normally unacceptable in granites. In contrast, patterns are common and desirable in marbles, and even features such as veining and breccia structures can be used to good effect in interior designs where the amount of stone is limited, and the area can be uniformly covered.

## 9.0 MARKET POTENTIAL

### 9.1 Market Potential by Product

#### 9.1.1 Rough Blocks

Quarries primarily produce rough blocks of stone, and while there is a very large market for fabricated dimension stone, there is a very limited market for rough blocks. Within the market study area there is only one fabricator, Ladha Industries Ltd. in Delta, which can process rough blocks to produce face finished slabs for the dimension stone industry. The plant is small by world standards, with a potential annual capacity of about 46,000 square metres (500,000 square feet) of face finished slabs, although plans exist to double capacity by installing a second gang saw. The present capacity is approximately equivalent to processing 200 rough blocks per year, each 6 cubic metres (210 cubic feet) in size.

A significant constraint on the development of a British Columbia quarry industry is that potential quarries are faced with limited opportunities to market their stone. Vershuren, et al (1989) indicate that mainstay quarries producing moderate value stone usually have an annual production of 2,200 to 5,600 cubic metres (80,000 to 200,000 cubic feet) or approximately 325 to 830 rough blocks each 6.75 cubic metres (238 cubic feet) in size. The single fabrication plant would be adequate during initial start up stages, but its entire capacity would be too small for a quarry to achieve the necessary economies of scale for a sustained profitable operation. In addition, an industry with a single potential customer is unlikely to attract investment.

It is readily apparent that under the present circumstances, and in the absence of increased local fabricating capacity, rough blocks must be sold outside the market study area. Initial possibilities in North America include fabricators such as Cantile Granite Co. in Winnipeg, Cold Spring Granite Co. in Minnesota, and Granite and Marble World Trade Co. in Chicago, all of which operate modern fabrication plants and purchase rough blocks. In addition there are many other fabricating plants in Quebec and the eastern United States.

Most fabricators operate a number of quarries and produce a variety of different types of dimension stone. There is no guarantee that eastern fabricators would buy British Columbia rough blocks even if the blocks were competitively priced because they may already own, or have an interest in, a quarry producing a similar and competitive stone. Also the ability of established competing quarries to discount their stone to maintain market share should not be overlooked. In any case, it is unlikely that fabricators will purchase rough blocks until there is a demonstrated market for the stone and the fabricator has received orders for it.

A significant export possibility for rough blocks exists to Japan, which imports large amounts of granite and marble for domestic use. A substantial portion of Japanese imports are in the form of rough blocks and this combined

with favourable shipping charges from Vancouver certainly identifies Japan as a prime market for rough blocks. Italy is another possibility since it is the largest fabricator of imported rough blocks in the world. Transportation rates, however, are much less favourable than they are to Japan. All exports of rough blocks outside the market study area involve significant transportation charges. A factor when considering export markets is that the exported stone will be competing in markets which may be quite different from the one studied in this market study, for it is unlikely that any of the stone exported as rough blocks will return to this market area as fabricated dimension stone.

The cost of transportation to other market areas and intense international competition favours the export of premium quality stones over common varieties. The higher unit value of premium quality stones exists because of a favourable demand and supply situation in which there is less competition. The market for premium quality stone is less price sensitive, and is better able to absorb the costs of transportation to foreign or eastern markets.\*

#### **9.1.2 Face Finished Slabs**

Face finished slab is the most common product produced in the fabrication process. A U.S. International Trade Commission (Brunsdale, et al, 1988) estimated that approximately 90% by value of all granite purchases are of face finished granite. The survey of architects indicated that exterior cladding, and interior applications using face finished slab, were the most widely contemplated uses for dimension stone. The survey of suppliers identified 2 cm (3/4") as the most common dimension stone material installed and is in many cases the only product carried. Slabs 3.2 cm (1 1/4") thick are also commonly used for external cladding but are usually custom cut for large projects. Potential fabricators in the market study area should produce face finished slabs in 2 cm (3/4") thickness as their primary product.

#### **9.1.3 Tiles**

Tiles have made a big impression in the market place in the last decade and represent a fast growing segment of the stone industry. This is particularly true of granite tiles which allow the use of granite in a variety of lower budget applications which could not support the cost of custom slab installation. The majority of suppliers carry stone in tile sizes and most reported that they felt the use of tiles had grown faster than stone usage overall. In addition many small suppliers carry a larger quantity of tile in stock than they would slabs, and ceramic tile and masonry businesses, who are peripheral to the stone industry, now often carry large quantities of stone tile.

There are no tile fabrication facilities in the market study area; the nearest fabricator being Canitile Granite Co. in Winnipeg. Other manufacturers of tile in North America are Granite St-Gerard (1985) Inc. in Quebec, Cold Spring Granite Co. of Cold Spring Minnesota, and Granite Tile Manufacturing Corp of America in Massachusetts. All of the tile fabricators produce granite tiles; there is no marble tile production in North America. Imports contribute a

significant quantity of tile to the North American market. A 1987 survey (Brunsdale, et al, 1988) indicated that 37.7% of granite imports from Italy and Spain were tile, while US producers contributed only 5.1% of their production. It was also noted that domestic tile producers were operating at full capacity in 1986 and were unable to keep pace with increasing demand. Burbridge (1989) reports that granite's share of the California market is increasing because of strong demand for commercial and residential tile, and that this segment of the industry has good opportunities for Canadian producers. Tile production from a fabrication facility in British Columbia would open up a wide market for a local quarried stone and is an option that should be considered.

#### **9.1.4 Monuments**

The monument industry represents a significant part of the dimension stone business. In 1986 the monument and ornamental stone category of dimension granite production in Canada was 47% of total granite production, and 38% of total stone production by value. During the period 1983-86 the industry showed an average rate of growth of 36% (Statistics Canada 1986). Most of this stone production was in Quebec. In the United States the monument industry was estimated to represent 23% of the total stone production by value in 1988 (Taylor, 1989). The largest producer of monument stone in the United States is Rock of Ages of Vermont, and it was reported that this company set an all time company production record of 225,000 cubic feet of granite block from its quarries in September 1986, reflecting strong markets (Taylor, 1986). However, discussions with five monument dealers in Vancouver, Seattle and San Francisco indicate that business has been static for the past couple of years. Most felt that the out look for the business was poor, and one respondent was even getting out of the memorial stone business. Reasons given for the lack luster future were the high percentage (50%) of people who chose cremation over burial, and a trend against upright headstones in memorial gardens. Declining business was also attributed to the use of smaller headstones and the use of bronze markers. In fact, all of the respondents felt that business would be even worse if not for the demand created by population growth, and cheap imported memorial tablets which more people can afford to buy. The inconsistency between the optimistic government statistics and the pessimistic memorial company interviews maybe because the statistics are based on production from quarries that traditionally produced stone for the memorial business, and are now supplying stone for other purposes.

Black granite is the stone in highest demand by the memorial business. This is followed by lesser amounts of red and grey granite, although grey granite is more popular than black in California. In all areas grey granite is also used for monument bases. Both of the California companies interviewed buy their grey granite from Cold Spring Granite Co. in Minnesota. Most black granite used in the market study area is imported from India, which has replaced the traditional sources from Quebec, South Africa and Sweden. All of the respondents felt that it would be impossible for a local quarry to compete with the imported black granite from India. Some noted that even the large memorial suppliers in the United States such as Royal Milrose are now importing stone from Asian sources.

The memorial business appears to be facing a declining market and very competitive pricing for stone tablets. There may be opportunities for British Columbia quarries to supply grey granite to the market study area, but it will probably not represent a significant part of the quarry sales.

### **9.1.5 Rough Dressed Stone**

A market does exist for rough dressed stone blocks, including curbstones and cobblestones for landscaping and restoration purposes. Several architects in the Vancouver area inquired as to the supply of rough dressed stone, and it could potentially represent a secondary market for undersize blocks and quarry waste. The low value of these materials would limit the market to a fairly local area.

## **9.2 Market by Stone**

### **9.2.1 Grey Granite**

A significant market for grey granite exists in the market study area. Grey granite is sold as a "low cost leader" providing stone at economical price, and in direct competition with other materials such as ceramic, terrazzo, and marble tiles, glass, textured concrete, and enameled steel. The grey granites have a steady market and are not as affected by architectural trends in colour as other granites, although the coloured granites certainly enjoy significantly higher sales when they are popular. Grey granite is estimated to occupy about 10-20% of the market by volume. A surprisingly wide variety of grey granites exists, both in grain size, and in the amount of grey or other colour tones such as pink or amber.

There are a large number of grey granites in the market place. One fabricator, Cold Spring Granite Co., indicated that over 50 quarries in the eastern United States produce grey granite. A 1987 study found that 20.5% of United States granite production was grey granite, and 10.4% of granite imports from Italy and Spain were also grey granites (Brunsdale, et al, 1988). Two popular Italian grey granites in the local market place are Luna Pearl, a medium cool grey, and Sardinia grey, a peach-grey. They are available, landed in California, for about US \$43.00-\$48.50 square metre (\$4.00-\$4.50 square foot). In British Columbia they are imported for about Cdn \$64.50-\$70.00 square metre (\$6.00-\$6.50 square foot). There is also a large production of grey granite in Quebec from companies such as Les Carrières St. Marc (1983) Ltée., Dumas & Voyer Ltée., Granicor Inc., Granit Busnière Inc., and Rock of Ages du Canada Ltée.

A primary objective of the market study was to determine the market potential for British Columbia grey granites. Several grey granites are illustrated in Information Circular 1988-6, and photographs of the Nelson Island and Fox Island granites were mailed out to suppliers during the survey. In addition polished samples of the above granites were taken to interviews with architects.



Several trends emerged from the study. Grey granites are more popular in the northern part of the study area than in California. In Vancouver there was a strong preference for Nelson Island granite with its amber or peach tones as opposed to Fox Island which is a medium grey with no colour tones. This contrast was especially noticeable between architects, many of whom stated that they would never consider using the Fox Island granite but would use the Nelson Island granite if it was available. Several architects also stated that they preferred the lighter toned "warm" coloured greys, especially for interior work. Some indicated that they thought peach-grey was becoming a popular colour. Suppliers in Alberta also felt that the Nelson Island granite and peach-greys in general had better sales potential than Fox Island "cold" grey. Preferences for one grey over another were not evident in Seattle or Portland. In California, the greys attracted little attention but there was some interest in the peach-greys. The Japanese market, which is largely for funeral memorials, preferred the cold greys and there is some export potential for granites, like Fox Island grey, to Japan.

The market study did not identify any strong textural preferences. Some people preferred fine grained grey granite for floor tiles because of its uniform abstract appearance, others stated that they could achieve the same effect with ceramic tile at a fraction of the price. A number of architects indicated, that in general, they preferred coarse grained granites for exterior uses. However, approximately one third of the architects stated that they would never use grey granite for exterior cladding because from a distance it looks like concrete, and if a client is willing to pay for stone cladding, then they want something distinctive. Medium grained greys would seem to have the widest appeal for both interior and exterior applications.

There is a well established market for grey granite and good potential for selling a range of grey tones in both face finished slab and tiles. The grey granites have low profit margins, and they require high volume production to be supplied to the market at competitive prices. The stone must be quarried in large volumes under ideal conditions, transported and fabricated efficiently, and geographical advantages exploited to produce a grey granite cheaper than any imported grey can be supplied to the local market. If these conditions can be met then good market potential exists for British Columbia grey granite.

### **9.2.2 Pink Granite**

Pink granite is one of the most popular granites of recent years and it is certainly one of the most important in terms of volume. A wide variety of pink granite is available in the market place. Major North American fabricators of pink granite are Canitile in Winnipeg, and Carrière Granite du Nord Enr., Les Carrières St. Marc. (1983) Inc., Dumas & Voyer Ltée., Granite Bussière Inc., and Rock of Ages Du Canada Ltée. in Quebec, and Cold Spring Granite Co. in Texas. In the United States 8.6% of granite production in 1987 was pink granite. In the same year 30.2% of granite imports from Italy and Spain were pink granites (Brunsdale, et al, 1988). Some imported pink granites such as Rosa Perina and Sardo Pink are available at very competitive prices, which are imported into California for about US \$54.00 square metre (\$5.00 square foot). The most

Point quarry sample in the market study was considered by most to be stained rather than yellow and does not appear to have much market potential.

### **9.2.7 Black Granites**

Black granite is considered to be the most marketable stone today by virtually all suppliers, fabricators, memorial companies and import-export companies. All indicated that it must be jet black, fine-grained and free from all imperfections. The black granite market has been traditionally dominated by production from South Africa with stones such as Belfast Black produced by Belfast Granite Quarries (Pty) Ltd., and Impala Black from Impala Granite SA (Pty) Ltd. However, in the past decade black granites produced by companies like Emmaboda Granit AB in Sweden, has gained a large market share. Blacks from Brazil, such as Black Tijuca produced by Granimar S.A., Marmores E. Granitos in Sao Paulo, are now more popular and are very competitively priced. In the market study area the memorial industry is dominated by black granite memorial tablets from India, although, the face finished slab market is not. This is apparently because most of the blocks quarried in India are not large enough to be cut into standard size sheets. Most of the face finished black granite slab in the world is fabricated in Italy. Several black granites are produced by companies such as Columbia Granite Inc. which, like Granicor Inc., is a member of Granigroupe Inc..

Black granite is a premium stone that commands high prices and has a large world market where it is used for a wide variety of interior and exterior applications. The high value of black granite is not necessarily reflected in a high profit margin. Irregularities in colour tones and textures are more noticeable in black granites than in other granites, and the market is very intolerant of these perceived imperfections. Hence a much larger volume of stone may have to be quarried to fill a single order of uniform quality. This combined with typically more closely spaced joint patterns in fine grained rocks can result in much higher production costs. Vershuren, et al (1989) report that black anorthosites quarried in the Peribonca River area of Quebec have a waste to production ratio of 9:1. Similarly Allison (1984) notes a 90% waste factor in the production of a Belfast Black granite from South Africa. Black granites such as Cambrian black from Quebec are available for about Cdn \$107.00-\$129.00 square metre (\$10.00-\$12.00 square foot) in the market place. If a high quality black granite could be produced in British Columbia at a reasonable cost and without excessive wastage it would do very well both internationally and in the market study area.

### **9.2.8 Salt and Pepper Granite**

Salt and pepper granite is largely composed of white feldspar with subordinate dark mafic minerals. White is the dominant colour and the market usually dictates that the rock be fine to medium grained. It is often referred to as white granite. Several architects and suppliers in Vancouver and California indicated that they felt that a demand existed for salt and pepper granites which are primarily used indoors for flooring and counter tops. No samples of salt and

pepper granites were shown to people in the interviews but one illustrated in the Information Circular is the Duffy Lake Road Granite. The market for salt and pepper granites is largely residential and not likely to develop into a large volume market.

#### **9.2.9 Blue Granite**

Blue granite was requested by several architects and suppliers who noted that a high demand and premium prices exist for several blue granites in the market. One granite which could be considered in the blue category is Labradorite, produced in Quebec and Norway. It shows a Blue iridescence on polished surfaces. This is very striking in the Norwegian varieties which are marketed under various trade names such as Blue Pearl and Norwegian Pearl by companies like A/S blue Pearl, A/S Granit, and Lundhs Labradoreksport A/S. A dark blue-black gabbro norite is produced by Marikana Granite Quarries (pty) Ltd. in South Africa and marketed as Rustenburg Imperial Dark. One of the most attractive blue granites, Blue Paulista, is produced by Granimar S.A. Marmores E Granitos in Brazil, however suppliers report that is weak and difficult to work.

In the market study area a dark grey-blue granite has been quarried from the Knight Inlet area by Kellard Marble Inc. and marketed as Katherine Blue Granite. It has seen some limited use for monument and ornamental purposes. The stone attracted some attention among Vancouver architects and Seattle suppliers who felt that it could be used for ornamentation in interior work. The stone currently does not have a very popular look, and there is not a large market for it. There was some dissatisfaction among the suppliers with the type and quality of blue granites available in the market, and any medium blue, or blue-white granite would certainly be very well received by the international market.

#### **9.2.10 Green Granites**

Green granites, in medium to dark green tones, were widely requested by architects and suppliers in Vancouver and California. The market is presently served by several green granites such as Uba Tuba (yellow-green) from Africa, Verde Fontana (dark green) from Italy and Emerald Pearl from Norway. Several green granites are also produced in Quebec by Dumas & Voyer Ltée., Lacroix & Fils Granite Ltée. and Granit St. Gerard (1983) Ltée. Most architects felt that green is becoming fashionable in interior design and if this trend includes exterior applications then green granite will be in high demand. However, for interior use only green marbles and serpentine will provide serious competition for granites. Green is a very popular colour in Asia, especially in Taiwan and Hong Kong, and good export market potential exists there. In summary, any high quality green granite that is produced will command high prices and enjoy an international market.

### **9.2.11 Patterned Granite**

Patterned granites such as gneisses, were mentioned by both architects and suppliers as suitable for interior design work. However, most indicated that they would not consider using them for large scale exterior work, such as office tower cladding, because of the generally conservative business tastes of most clients, and the difficulty of matching colours and patterns over large areas. Several gneisses are available in the market study area from Quebec, India and Brazil. The Canadian producers, Carrière Granite du Nord ENR, and Les Carrières St Marc (1983) Ltée., quarry and fabricate a pink granitic gneisses in Quebec.

The Vancouver Island porphyry was the only patterned granite in the market study and it aroused considerable comment and interest. Over half of the Vancouver architects thought that it had excellent potential for interior decorating and may replace black granite for some uses. Suppliers in Seattle and California thought it also had potential while suppliers in Alberta and Portland stated that they would not carry it. Again this is a stone that may see frequent interior use but is unlikely to be used in large volumes.

### **9.2.12 Marble**

Marble is the stone of choice for most interior decoration in residences, hotels and upscale commercial retail outlets. Marble is available in an extremely wide range of colours and patterns, creating a luxurious appearance which is unmatched by granite. Marble is also softer, and more easily quarried and fabricated than granite, resulting in higher machining efficiency and cheaper unit costs. Marble is the main competitor for granite in most interior applications, although competition for marble is provided mainly by cheaper materials, such as terrazzo or ceramic tiles or cast aggregates. Italian marble is the dominant product in the market place in terms of quality, and image, and Carara white marbles produced by Italian fabricators such as Industria Marmi Granit Imeg Sp A, are among the most popular marbles today. Other major producers in Europe are Portugal, Spain, Turkey (travertine), Yugoslavia, and Greece. A significant portion of the marble exports from these countries are in the form of rough blocks to Italy where the marble is fabricated into slabs and tiles. However, an increasing amount of competition in the international market place is being provided by Taiwan and China. The marbles in highest demand, and which command the highest prices in the international market, are very fine grained, compact, pure white marbles. Pure black marbles are also very expensive but less available. In terms of volume the most popular colours are white and pink marbles, followed by the earth tones. The blue and green colours would be more popular if they were not as limited by high prices and availability.

Several architects who viewed the local grey marbles, thought that the Marblehead dark marble had potential for interior design work because of its "character", although suppliers noted that the coarse grain size would make it weak and difficult to work, and possibly prone to staining. Generally most architects and suppliers felt that the grey, coarse grained Marblehead, Kaslo.

and Nootka Sound marbles were indistinctive and had very little market potential. The Texada Island patterned pink marble was moderately popular in all areas and most respondents felt it would sell well if competitively priced. The brown Texada Island marbles aroused very little interest except in Alberta where several suppliers have moderate sales of a similar marble.

There are significant constraints on the development of marble quarries in British Columbia, not the least of which is the extremely low price of imported fabricated marble. The other significant factor is the lack of fabrication facilities within reasonable range for all but the highest quality marbles. Both Ladha Industries Ltd. and Canitile Granite Co. have facilities which are designed for cutting granite and they have no interest in adapting their equipment to fabricate marble. Any potential marble producer will have to construct their own facilities for marble fabrication and, given the low value of the British Columbia samples, this seems unlikely.

#### **9.2.13 Building Stone**

Rough sawn or faced building stone was a peripheral part of the study although a sample of Haddington Island andesite was taken to personal interviews. It raised very little interest. An architect involved in restoration work felt that it was a poor quality stone, but upon further questioning it became evident that the Haddington Island andesite was not being distinguished from some of the poor quality sandstones used on turn-of-the-century buildings. Suppliers with some in stock noted that there was no demand for it. However, there was some interest in limestone which seems to be regaining some popularity.

#### **9.2.14 Slate**

Several architects and one supplier noted some recent interest by consumers in slate. This is primarily for floor tiles where a "rustic" look is desired. The dark green and grey-green colours appear to be more desirable than the plain grey colours. A world wide trend to increased consumption of slate is noted in the literature (Taylor, 1986) especially in Europe where there is a strong market for slate roofing. Slate is produced in North America by a number of companies such as the structural slate company of Pen Argyle of Pennsylvania, Green Mountain Slate Co. of Vermont, and Arvonick-Buckingham Slate of Virginia. No samples of slate were used in the study but a British Columbia sample is illustrated in Information Circular 88-6. There is some demand for slate but there is little indication that it will develop into a significant market.

### **9.3 Market Areas**

#### **9.3.1 British Columbia Market**

There is a strong demand for granites in the Vancouver area. A good market exists for grey granites, especially peach-greys, and black granites are always in high demand. Pink granites have been and remain very popular, although red granites are currently selling better than pink. Green, blue and mahogany coloured granites are also in high demand and command premium prices. In exterior commercial applications there is a trend toward more strongly coloured stone, especially varieties with more character such as very coarse grained granites. There is also a developing trend toward the use of a variety of different colours of stone in projects. Granite is being used more frequently indoors and a significant market is developing for granite tile. In the marble market, the white and pink varieties are doing well and there is a trend toward the use of lighter tones and softer patterns in interior design. The British Columbia market is estimated to consume in excess of 5 million dollars of finished dimension stone annually.

#### **9.3.2 Alberta Market**

The Alberta market is more conservative than the Vancouver market. Pink, grey and black granites are in demand, but red does not seem to be as popular as elsewhere despite high profile uses such as the Petro Canada building in Calgary. Within the grey category there was a preference for peach-greys. Marble remains the traditional stone for interior use and there is a market preference for traditional whites and strongly patterned marbles. The Alberta market is estimated to be worth several million dollars annually.

#### **9.3.3 Pacific Northwest Market**

The Seattle and Portland markets were found to be very similar, with one major exception - the grey granites. In Seattle there is a moderate demand for grey granite, although no strong preferences as to the type of grey was evident. Portland was more similar to California in that there was little interest in grey colours. In both Seattle and Portland pink granite is not as popular as the darker coloured granites such as dark reds and mahoganies. Blacks were considered to be good sellers by most suppliers. In the Pacific Northwest there is an emerging demand for yellow coloured granites, and some demand for blue granites such as Blue Pearl. There was no evidence of a demand for green granites. The taste in marble is fairly traditional with a demand for white and pink marbles. The Pacific Northwest market is estimated to consume in excess of 10 million US dollars of dimension stone annually.

### **9.3.4 California Market**

The California market did not show a strong interest in grey granite, although suppliers report that it has a steady market. Almost all other colours are popular. Pink is a traditional good seller, and possibly has a better market than most red granites, although the dark coloured granites such as Dakota Mahogany and burgundy red granites are more popular. Salt and pepper whites, and black granites are very popular and in high demand for interior applications. Exotic greens, blues and yellows are also in demand and command high prices. In contrast the light pastel colours do not seem to attract much interest. Among the marbles the whites are popular followed by a variety of other colours such as pink, green and the earth tones. The California market is the largest in the market study area and is estimated to be in excess of 80 million dollars annually. Information provided by the Canadian Consulate General (Burbridge, 1989) in Los Angeles indicates that the annual value of dimension stone sold in southern California is between 60 and 80 million dollars, of which granite has about 20% of the market.

### **9.3.5 Japanese Market**

The Japanese market has developed a very strong demand for granites and marbles in the last decade. Within this market, the greatest demand for imported granite is for black granite by the Japanese memorial industry. There is also a strong demand for grey granites, especially the cool greys such as Fox Island grey. Otherwise a large variety of granites are available in Japan, (over 200 different types according to a respondent) and a good demand exists for the red and mahogany coloured granites. The largest suppliers of rough granite to Japan are India, Korea, Portugal and China (Fukuda, 1989).

According to the Japanese External Trade Organization (1986) approximately 50% of Japanese granite consumption is imported, with 70% of the imported granite is used for memorials, 30% is used for building cladding and other uses. In the first eleven months of 1988 Japan imported 980,662 tonnes of rough granite, of which 41,568 tonnes came from Canada, and 193,140 tonnes of worked granite, of which only 546 tonnes originated in Canada. The total granite production in Japan in 1988 was 1,591,000 square metres (17,125,941 square feet) of slab, and 83,600 square metres (899,892 square feet) of tile (Fukuda, 1989).

In contrast approximately 99% of the marble consumed in Japan is imported. Italy is the largest supplier of marble followed by Spain, Portugal, and Greece (Fukuda, 1989). Traditionally the Japanese have favoured dark marbles but white marbles have recently become popular. During the period January to November 1988, Japan imported 69,572 tonnes of crude marble, 38,011 tonnes of marble slabs and 6,320 tonnes of polished marble. Total production of marble in 1988 was 628,000 square metres (6,759,956 square feet) of slabs and 75,200 square metres (809,472 square feet) of tiles (Fukuda, 1989).

The Japanese market is primarily for rough blocks, and only limited possibilities exist for selling face finished slabs because of the vertically

## 10. PRELIMINARY ECONOMIC ANALYSIS OF GREY GRANITE

### 10.1 Rough Blocks

To identify the potential market for rough blocks of grey granite beyond the Vancouver area, the value of rough blocks and the cost of transporting them to various fabricators was considered to determine what options were feasible. The approximate value of rough blocks shown in Table XI was obtained from discussions with fabricators who indicated that these were recent prices, or what they would pay if they had a contract to supply that type of stone. The estimated transportation costs in Table XII are based on discussions with truck and steamship lines and they can vary considerably, especially in regard to trucking charges which will depend on the type of trailer, size of blocks, overweight surcharges, back haul potential, turn around time and contract volume. Hence the quoted figures are only approximate. Two situations are considered, the first is two blocks with a combined weight of 75,000 lbs, and the second is a single block weighing 40,000 lbs. Upon examining tables XI and XII it is readily apparent that the cost of transporting grey granite to Minnesota, Chicago and Italy approaches or exceeds the value of the blocks and these areas cannot be considered markets. It may be feasible to transport the blocks to Canitile Granite Co. in Winnipeg or export the blocks to Japan if the quarry can profitably produce the rough blocks for about \$176.00 cubic metre (\$5.00 per cubic foot).

TABLE XI  
Approximate Value of Rough Blocks

	Type of Granite									
	Grey		Pink		Red		Mahogany		Black	
	Cu ft	Cu M	Cu ft	Cu M	Cu ft	Cu M	Cu ft	Cu M	Cu ft	Cu M
<u>CANADA</u> (Cdn \$)										
Vancouver	\$12.00	\$423.00	\$12.00	\$423.00						
Winnipeg			\$12.00	\$423.00	\$12.00	\$423.00				
East Canada	\$9.00	\$317.00								
<u>United States</u> (US \$)										
Minnesota	\$7.00	\$247.00								
Chicago	\$7.50	\$265.00								
South Dakota							\$8.00	\$282.00		
Texas					\$6.00	\$212.00				
<u>Italy</u> (US \$)	\$3.50	\$123.00								
<u>Japan</u> (Cdn \$)	\$11.33	\$400.00							\$22.66	\$800.00
<u>S Korea</u> (Cdn \$)	\$5.67	\$200.00								



**TABLE XII**  
**Estimated Transportation Costs**  
**Rough Blocks**

<b>From</b>	<b>To</b>	<b>Via</b>	<b>Weight lbs</b>	<b>Est. cost (Cdn \$)</b>	<b>Cost per cubic ft</b>
Vancouver	Winnipeg	truck	45,000	2,000	7.47
Vancouver	Winnipeg	truck	75,000	2,500	5.60
Vancouver	Minnesota	truck	45,000	2,500	9.33
Vancouver	Minnesota	truck	75,000	3,000	6.72
Vancouver	Chicago	truck	45,000	3,000	11.20
Vancouver	Chicago	truck	75,000	3,500	7.84 *
Vancouver	Italy	ship	40,000	3,000	12.60
Vancouver	Japan	ship	40,000	1,500	6.30

## 10.2 Fabricated Dimension Stone

To identify the potential market area for locally fabricated grey granite, the wholesale prices of imported dimension stone were obtained from suppliers, and transportation costs from local trucking companies. A wide range of dimension stone costs were received in each area perhaps reflecting the varying costs of transporting different sized shipments, currency exchange fluctuations and whether the stone was directly imported by the respondent or purchased from an import company. Only the lower range of prices are considered and are shown on Table XIII. The transportation costs shown in Table XIV are at best estimates since, as mentioned in the previous section, many factors will affect the real cost. No duty or tariffs are considered because, under the Free Trade Act, stone quarried in either Canada or the United States is duty free.

TABLE XIII

**Competitive Price Ranges  
Face Finished Granite Slab - 2 cm thick  
March 1989**

Location	Grey Granite	Pink-Red Granite	Black Granite
Vancouver	\$6.00-\$6.50	\$9.00-\$10.00	\$11.00-\$12.00
Alberta	\$8.00-\$12.00	\$8.50-\$12.00	\$10.50-\$12.50
Pacific Northwest	US \$4.00-\$5.00	US \$5.00-\$7.00	US \$10.00
California	US \$4.00-\$6.00	US \$5.00-\$7.00	US \$10.00
Hawaii	US \$6.00	-	US \$10.00-\$11.00
Italy	US \$3.50	-	-

TABLE XIV

**Estimated Transportation Costs  
Face Finished Granite Slabs**

From	To (by truck)	Weight (lbs)	Cost (Cdn)	Cost (sq ft)
Vancouver	Calgary	42,000	\$ 1,000	\$0.25
Vancouver	Edmonton	42,000	1,100	0.28
Vancouver	Seattle	42,000	450	0.11
Vancouver	Portland	42,000	700	0.18
Vancouver	San Francisco	42,000	1,400	0.35
Vancouver	Los Angeles	42,000	1,650	0.41
Vancouver	Toronto	42,000	3,400	0.85

Note: This assumes a load of 4,000 sq. ft of 3/4" slab weighing 42,000 lbs.

It is apparent from the data that transportation costs should not add a significant burden to the cost of the stone, and if face finished slabs of grey granite can be produced for about Cdn \$43.00 square metre (\$4.00 square foot) it should be marketable in all of the areas considered.

## 11. MARKET OPPORTUNITIES

A variety of opportunities exist for developing a British Columbia dimension stone industry. A good market for grey granite exists in the study area and imported grey granites enjoy steady sales. However, as a low value stone, a quarry producing grey granite will require ideal conditions of uniform colour and texture, low waste factor, and close proximity to markets and infrastructure. Potential sales of rough block grey granite exist with Ladha Industries Ltd. in Delta, Canitile Granite Co. in Winnipeg and Japanese fabricators if the costs of producing and transporting these blocks are competitive. A preliminary economic analysis suggests that rough blocks would have to be produced for about Cdn \$176.00 cubic metre (\$5.00 cubic ft) to be marketed outside the study area.

A much better alternative to exporting rough blocks is to fabricate the blocks locally and market face finished slabs and tiles. The Ladha Industries fabrication plant has the potential to provide a market during the start up stages and some demand during normal production, but a quarry of the size necessary to achieve economies of scale with a low value stone would need a larger market. Potential quarries should consider building a dedicated fabrication plant to meet that objective. If face finished grey granite slab in the 2 cm (3/4") thickness can be produced for about Cdn \$43.00 square metre (\$4.00 per square foot) it should displace existing imports and expect regular sales.

Market opportunities exist for several coloured granites. Much of the previous discussion directed at grey granites is also valid for coloured granites. If a quality stone could be produced cheaply, it would capture a share of the market, especially where it had a local geographic advantage. This certainly applies to pink and red granites which generally have a higher unit value than grey granites and a significantly larger market. However, there are many high quality pink and red granites available in what has become a very competitive market, and it has yet to be demonstrated that a high quality pink or red granite exists in British Columbia that could compete in this market.

Significant market opportunities also exist for several premium quality granites. These granites are fine grained black granites, and medium to coarse grained mahogany, dark red, gold, green and blue coloured granites. All of these stones command premium prices and enjoy an international market with few competitors. However, the higher prices often reflect higher production costs and waste factors which do not translate into higher profit margins unless or quarry site with ideal conditions is developed. This is especially true of the fine grained black granites. The premium quality coloured granites have a higher profit margin on lower volumes than common granites, and are better able to survive high waste factors, quarry development costs, unfavourable currency fluctuations, and higher transportation costs. Premium quality coloured granites may provide the best opportunities to develop a dimension stone industry in British Columbia.

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**APPENDIX I**

**List of Interviews**

APPENDIX I

List of Interviews

Architects: Vancouver

Aitken Wreglesworth Associates  
Architects Ltd.  
171 West Esplanade  
North Vancouver, B.C.  
V7M 1A1  
Telephone: 604-986-7371

Arch Design International  
Suite 345, 3665 Kingsway  
Vancouver, B.C.  
V5R 5W2  
Telephone: 604-433-9812

Arthur Erickson Architects  
2412 Laurel Street  
Vancouver, B.C.  
V5Z 3T2  
Telephone: 604-879-9221

Baker/McGarva Architecture  
1024 Mainland Street  
Vancouver, B.C.  
V6V 2T4  
Telephone: 604-683-1024

Michael Bjornson Architect  
3216 West 2nd Avenue  
Vancouver, B.C.  
V6K 1K8  
Telephone: 604-733-2613

Blewett Dodd Ching Lee Architects  
353 Water Street  
Vancouver, B.C.  
V6B 1B8  
Telephone: 604-683-1266

Charles Bentall Architect  
2373-595 Burrard Street  
Bentall Center 3  
Vancouver, B.C.  
V7X 1K8  
Telephone: 604-682-6511

Hamilton Doyle Kwan Architects  
200-1450 Creekside Drive  
Vancouver, B.C.  
V6J 5B3  
Telephone: 604-733-3100

Hotson Baker Architects  
1447 Hornby Street  
Vancouver, B.C.  
V6Z 1W8  
Telephone: 604-684-1561

IBI Group  
Suite 100  
1111 West Georgia Street  
Vancouver, B.C.  
V6E 3G7  
Telephone: 604-683-8797

Robert G. Lemon Architecture and  
preservation  
125 E. 4th Avenue  
Vancouver, B.C.  
Telephone: 604-874-7544

Morton Associates  
3594 West 17th Avenue  
Vancouver, B.C.  
V6S 1A1  
Telephone: 604-736-3788

Musson Cattell McKee partnership  
1825 Two Bentall Center  
555 Burrard Street  
Vancouver, B.C.  
V7X 1M9  
Telephone: 604-687-2990

Toby Russell Buckwell & Partners  
Architects  
1650 Alberni Street  
Vancouver, B.C.  
V6G 1B1  
Telephone: 604-682-6881



Vladimir Plavsic Group  
400 W. Georgia Street  
Vancouver, B.C.  
V6B 1Z3  
Telephone: 604-682-6101

William Rhone Architects  
165-1020 Mainland Street  
Vancouver, B.C.  
V6B 2T4  
Telephone: 604-688-2526

WZMH Group  
400 West Georgia Street  
Vancouver, B.C.  
V6B 1Z3  
Telephone: 604-688-2223

**Architects: Victoria**

Alan James Hodgson, Architect  
404 Henry Street  
Victoria, B.C.  
V9A 3J4  
Telephone: 604-383-6874

**Architects: Alberta**

Forseth Gerard L. Architect Ltd.  
1008-8 St. SW  
Calgary, Alberta  
Telephone: 403-265-0696

**Architects: Pacific Northwest**

David Kehle Architect  
Suite 302  
1932 First Avenue  
Seattle, Washington  
USA 98101  
Telephone: 206-433-8997

Adkison, Leigh, Sims, Cuppage  
Architects  
700 Old National Building  
Spokane, Washington  
USA 99201  
Telephone: 509-838-8568

**Suppliers: Vancouver**

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1275 W. 75th Avenue  
Vancouver, B.C.  
V6P 3G4  
Telephone: 604-266-5341

C&S Ceramic Tile  
2720 Ingleton  
Burnaby, B.C.  
Telephone: 604-435-4431

Bordignon Marble and Granite Ltd.  
1670 West Fifth Avenue  
Vancouver, B.C.  
Telephone: 604-733-8109

Artistic Marble and Granite Ltd.  
1614 84th Avenue  
Surrey, B.C.  
Telephone: 604-597-3646

Fraser Valley Brick and Block Supplies  
3595 East 1st Avenue  
Vancouver, B.C.  
Telephone: 604-299-0270

Marchesi Marblecraft  
3851 East Hastings Street  
N. Burnaby, B.C.  
V5C 2H7  
Telephone: 604-294-8922

Marble Art Canada Ltd.  
2127 Granville Street  
Vancouver, B.C.  
V6H 3E9  
Telephone: 604-734-0333

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Calgary, Alberta  
Telephone: 403-275-1101

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Alberta Marble and Tile Co.  
3812-7th St. S.E.  
Calgary, Alberta  
Telephone: 403-287-0944  
Porter Tile and Marble Ltd.  
5746 Burleigh Cr. S.E.  
Calgary, Alberta  
Telephone: 403-258-2258

Terra Firma Stone Company  
4007 Ogden Road S.E.  
Calgary, Alberta  
Telephone: 403-233-2622

Ceramic Tile Warehouse  
5832 Burbank Road S.E.  
Calgary, Alberta  
Telephone: 403-258-0330

Estevan Brick  
2536 7th Avenue N.E.  
Calgary, Alberta  
Telephone: 403-235-6933

Columbia-Melco Contractors Ltd.  
11244 154 Street  
Edmonton, Alberta  
Telephone: 403-452-9895

Manstar  
16920-128A Avenue  
Edmonton, Alberta  
Telephone: 403-447-1774

Ceramic Tile Warehouse  
112040 154 Street  
Edmonton, Alberta  
Telephone: 403-451-2676

**Suppliers: Pacific Northwest**

Allied Marble Inc.  
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Redmond, Washington  
Telephone: 206-867-1913

Oregon Tile and Marble  
6110 6th Avenue South  
Seattle, Washington  
Telephone: 206-762-1858

Cacalleri Marble Company  
1535 S Albro Place  
Seattle, Washington  
Telephone: 206-767-6300

Distinctive Marble Design  
2112 116th Avenue N.E.  
Bellevue, Washington  
Telephone: 206-455-3150

Oregon Tile and Marble  
2541 S.E. 9th Street  
Portland, Oregon  
Telephone: 503-231-0058

Le Port Marble & Granite  
10402 S.E. Holgate  
Portland, Oregon  
Telephone: 503-761-6155

Elite Granite and Marble  
2701 N.W. Vaughn  
Portland, Oregon  
Telephone: 503-221-4222

Great Northern Granite and Marble  
1921 S.E. Hawthorne Blvd.  
Portland, Oregon  
Telephone: 503-238-1905

Eurocraft  
2425 S.E. Division  
Portland, Oregon  
Telephone: 503-231-6060

**Suppliers: California**

Granite and Marble World Trade  
2409 17th  
San Francisco, California  
Telephone: 415-864-5188

V. Fontana & Co.  
7600 El Camino Real  
Colma, California  
USA 94014  
Telephone: 415-755-4510

Bay Marble Importing and  
Manufacturing  
39 Maxwell Ct.  
Santa Rosa, California  
Telephone: 707-578-0291  
Andrea's Natural Marble and Stone Co.  
1319 Carroll Avenue  
San Francisco, California  
Telephone: 415-522-2373

Bruner Pacific Marble and Granite  
11180 Penrose  
Sun Valley, California  
Telephone: 818-768-8930

AGI Marble Co.  
11370 Luddington  
Sun Valley, California  
Telephone: 818-767-1002

**Suppliers: Hawaii**

Stone Craft  
1718 Kahai Street  
Honolulu, Hawaii  
Telephone: 808-847-3944

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Ladha Industries Ltd.  
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Ladner, B.C.  
Telephone: 604-946-6688

Canitile Granite Co.  
Winnipeg, Manitoba  
Telephone: 204-224-2286

Ellero Marble Ltd.  
Sudbury, Ontario  
Telephone: 705-674-4704

Khoury Granite Ltd.  
Sudbury, Ontario  
Telephone: 705-560-9460

Cold Spring Granite Co.  
Cold Springs, Minnesota  
Telephone: 612-685-3621

Granite and Marble World Trade Co.  
Chicago, Illinois  
Telephone: 312-243-9007

**Memorial Companies**

Chandler W.R. Memorial Ltd.  
5498 Fraser Street  
Vancouver, B.C.  
Telephone: 604-327-1230

Newall J.B. Memorials Ltd.  
5096 Fraser  
Vancouver, B.C.  
Telephone: 604-327-1312

Quiring Monuments Inc.  
9608 Auroran  
Seattle, Washington  
Telephone: 206-522-8400

Donohoe & Carroll  
1635 Mission Hill  
Colma, California  
Telephone: 415-755-5251

M&B Import Studio  
500 Lincoln  
Santa Clara, California  
Telephone: 408-296-6015

**International Trading Companies**

Primex Inc.  
Suite 1415  
555 California Street  
San Francisco, California  
Telephone: 415-956-4097

G.B. International Trading Co. Inc.  
3476 Diablo Avenue  
Hayward, California  
Telephone: 415-887-7707

Emser International Inc.  
8431 Santa Monica Blvd.  
Los Angeles, California  
Telephone: 213-650-2010