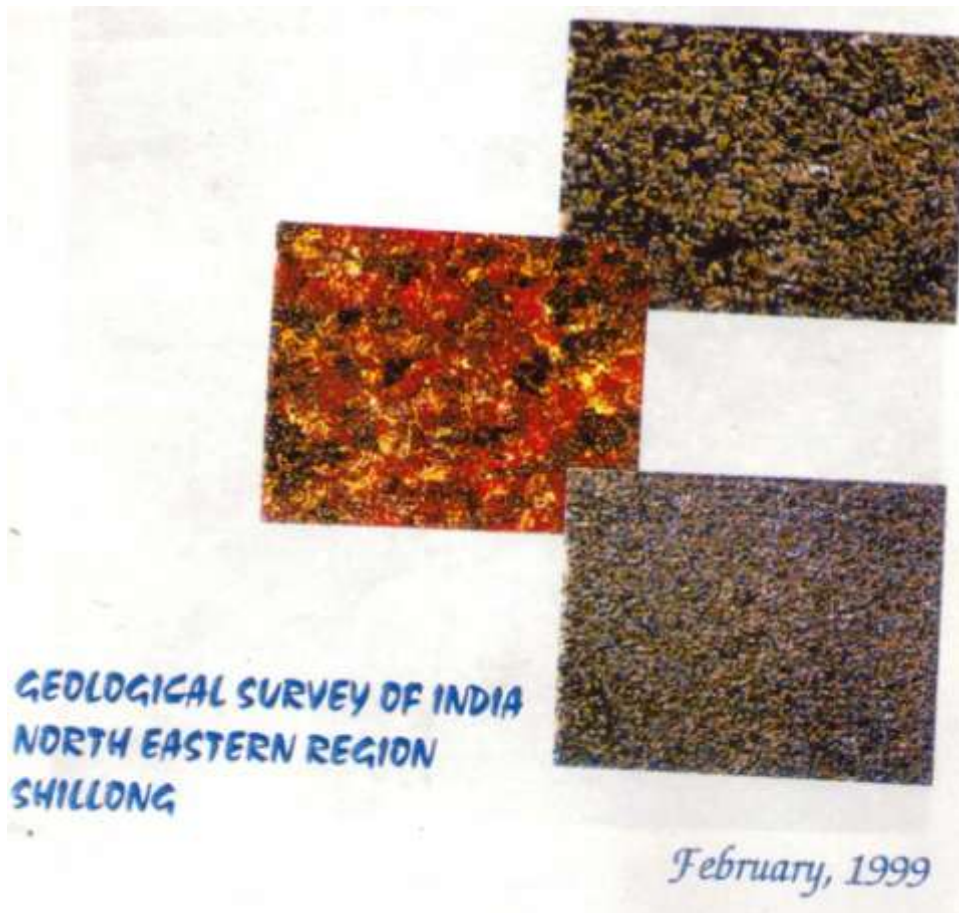
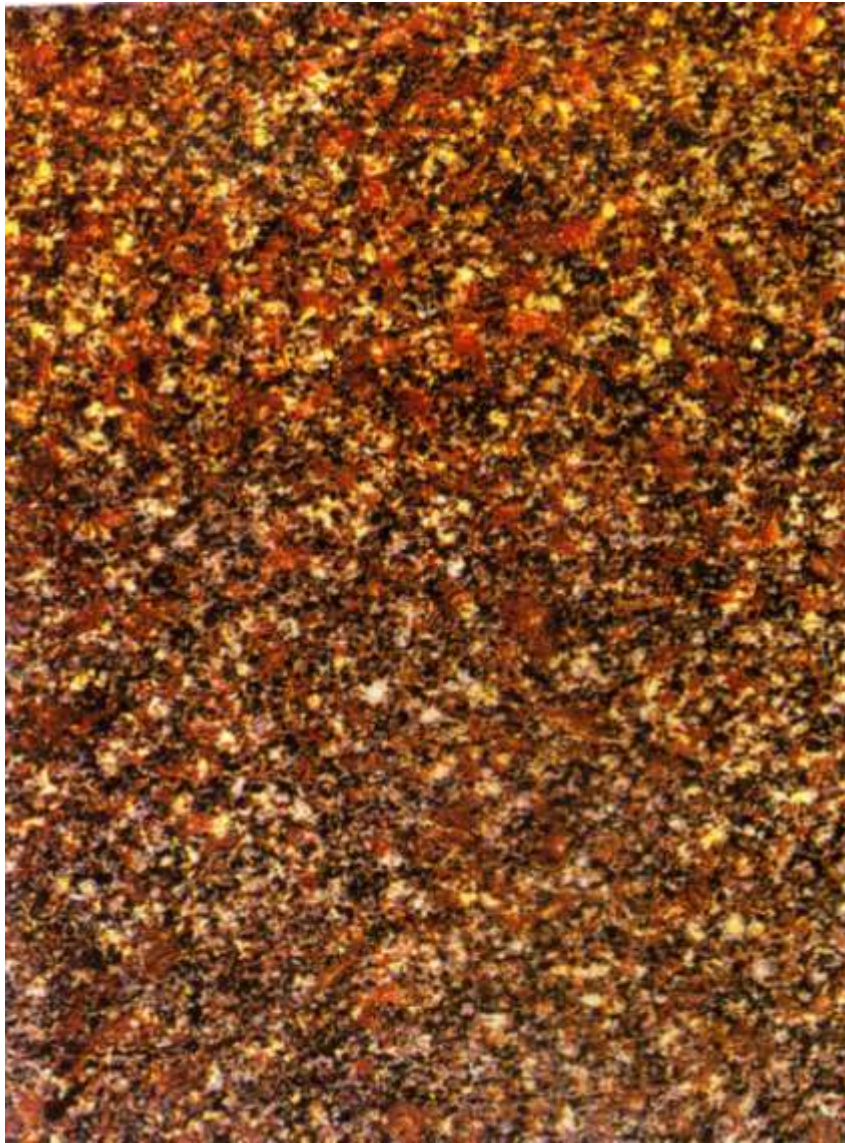




DIMENSION STONE GRANITE
IN NORTH EAST INDIA





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GEOLOGICAL SURVEY OF INDIA NORTH EASTERN REGION
SHILLONGFRONT INNER COVER: PHOTOGRAPH OF BURAPAHAR
PORPHYRITIC GRANITE BACK INNER COVER: PHOTOGRAPH OF
HATIGAON PORPHYRITIC GRANITE



The State of Assam has huge deposits of granites which comprise mostly pink and grey coloured varieties and similar looking metamorphic rocks of acidic composition. Apart from these, the State also has some known occurrences of black granites (a term loosely applied to dark coloured basic, ultrabasic and metamorphic rocks).

Granites are used for various purposes viz. construction of hydraulic installations, monuments, surface plates, machine tool industry and nuclear radiation shield plates. These are also used as road metal, ballast etc.

In case of slabs there are no standard specified dimensions. Various types of dimensional blocks, polished slabs and tiles are made from these rocks.

The development of granite industry in Assam, particularly the mining aspect, depends upon the accessibility, reserves and quality of the deposits. It is also dependent on the quality of the rocks being mined out. Available information suggest that most of the deposits are in a highly fractured and weathered condition.

About nine deposits have so far been identified (strictly in consideration of their nearness to highways / railway stations, etc.) which may provide raw granite blocks suitable for medium sized slabs and all standard sizes of tiles. Reserves are enormous.

The prospective deposits of granite identified are Agia in Goalpara district, Burapahar, Borjuri North and Borjuri South in Nagaon district and Centre Bazar in Karbi Anglong district. However, the total reserve figure is only an estimated one.

The characteristics of the prospective deposits are as follows: Agia (Goailara district)

This granite of average hardness is black in colour with blight rolowed dots, and takes excellent mirror finish when polished. Hair cracks are prominent. The estimated reserve is of the ord^r of 0.1 mil m³.

Borjuri North (Nagaon district)

The deposit is similar to that of Agia, being black in colour with reddish brown spots. The estimated reseive is around 10 mil m³.

The deposit is black in colour and marked with spots. It takes normal polish. The reserve is estimated to be around 5 mil m³.

Beilughat (Karbi Anglong district)

The light pink coloured granites, when polished, takes an excellent mirror finish. The deposit is extensive with a reserve of 2 mil m³.

Centre Bazar (Karbi Anglong district)

The extensive deposit of Centre Bazar is deep pink in colour with an estimated reserve of 13 mil m³ and is similar to the one at Borjuri North.

Extensive deposits of black granite have been identified at Dormal -Saplengkata and Kakira m Coalpara districts having reserves of 400 mil m³ and 300 mil m³ respectively. The Kakira deposit is greenish black in colour. The quality of the deposits in terms of textural and colour variations, the pattern and intensity of joints and fractures is yet to be ascertained.

Other significant deposits of black granite have been identified at Thoiganga and Thanajuri (both in Nagaon district) each having a reserve of about 5 mil m³. Dandpal Hill in Coalpara district has a reserve of 10 mil m³.

Extensive pink granite deposits are located at Mahamaya (reserve 30 mil m³) in Karbi Anglong district. A light grey to pink coloured granite deposit has been located at Agaithuri, Karbi Anglong district with an estimated reserve of 120 mil m³. A popular variety of granite "Paradiso" has been found in Agchia Hill having a reserve of 4 mil m³.

Grey and pink granites with an estimated reserve of 62.5 mil m³, have also been identified at Phoponge in Goalpara district.

Burapahar (Nagaon and Karbi Anglong district)

Porphyritic granites of Hatigaon having an estimated reserve of about 81,00,000 tonnes show bright greyish colour with uniform pink spots of feldspar phenocrysts. Greyish porphyritic granites of Seconee having a reserve of about 9,11,250 tonnes take excellent aesthetic polish. Since the State of Assam has enormous reserves of potentially marketable granite, there is a scope for developing granite industry in the State.

It is expected that there would be a ready market for black and pink coloured granites in the State; polished granite tiles of standard size of 12"x6" are believed to have a reasonably good demand.

In case of slabs, depending on the colour, prices vary from Rs. 110 to Rs. 250 per sq.ft. for 18-20 mm thickness.

The expected prices of the slabs, made from selected deposits of the state and according to the colour are given in the table below:

EXPECTED PRICE OF GRANITE SLAB FROM DIFFERENT DEPOSITS

COLOUR	LOCATION	PRICE (Rs./sq.ft.)
Paradiso	Agchia Hill	210
Grey	Kamrup district	145-250

Grey	Goalpara district	145-2S0
Pink	Narakasur (Kamrup district)	124-220
Blackjet	Goalpara district	140-180
Medium	Naogaon district	110-140

1. 'BOKJIMU' {Cy%D{

Location and accessibility

Borjuri North deposit is located in Nagaon district, 175 km to the east of Guwahati. The nearest railhead is Salonah on Silghat - Sapatmukh section.

Infrastructure

Power is available at Monoi which is 4 km from the deposit. A tea estate also exists at Monoi.

Description of mineral resources

Outcrops of metadolerite occur in an arcuate fashion for about 5 km, as intrusives into the Shillong Group comprising conglomerates, sandstone phyllite and shales. The metadolerite body is greyish black in colour with an olive tinge. There are 3 sets of joints in the metadolerite mass. Selling prices of granite tiles of different sizes and thickness viz. 12" x 6", 8 mm, 12" x 12". 8 mm, 24" x 12", 20 mm will be commensurate with industry standard and demand.

2. BaRJIURI SOUTH

Location and accessibility

The deposit is located 43 km ESE of Nagaon, and can be approached by the road connecting Nagaon to Diphu. The nearest railhead is Hojai, 25 km from the deposit. The nearest village is Daboka at a distance of 4 km from the deposit.

Description of mineral resource

The metadolerite mass, of greyish black colour with an olive tinge, has 3 sets of regular joints. There is no colour variation along the outcrop.

3. CENTRE-BAZAR.

location and accessibility

The Centre Bazar deposit is located in Karbi Anglong district, 210 km ESE of Guwahati, the can be approached by Nagaon - Diphu road. Hojai is the nearest railway station. 45 km from the deposit, on the meter gauge. The deposit is bounded by the coordinates:

Latitude: 26°07'15"N & Longitude: 93°09'30" E

26° 08'00" N 93°10'04"E

Infrastructure

The nearest town Centre Bazar is electrified. Description of mineral resources

Granites of this area form a part of the basement gneisses, occurring in association with biotite gneiss and migmatites. Intensity of fractures and joints is low resulting in the formation of big boulders.

4. TOKOPARA-

Location and accessibility

The Tokopara deposit is located in Kamrup district at a distance of 61 km west of Guwahati. It can be approached by NH 37. The nearest town is Boko, 5 km from the deposit. The nearest railhead is Guwahati.

Description of mineral resources

The deposit covers an area of 2 sq km and it is in the form of a ridge striking NE-SW. Granites within this area have pink and grey shades.

present at certain intervals. The deposit tends to be porphyritic towards west along the hillock.

The natural surface shows the presence of cracks at spacings of 0.6 m to 1.0 m.

Location and accessibility

This deposit is located in Goalpara district.

Tokora village, 14 km from the deposit and approachable by NH 37 is located 73 km west of Guwahati.

Description of mineral resources

A ridge of porphyritic granite runs E-W along the road for 1.5 km. The deposit here is greyish green in colour and displays augen structure. Cream coloured feldspar phenocrysts are present in a grey mass composed of hornblende / mica.

6. AGIA

Location and accessibility

The Agia deposit is located in Goalpara district at a distance of 141 km west of Guwahati and can be approached from NH 37. Guwahati is the nearest rail head. A dirt track of 7 km from the NH leads to the deposit from the village Agia.

Infrastructure

Agia is electrified. A broad gauge line from Guwahati is proposed to be constructed. Thus the nearest railhead will be Agia.

Description of mineral resources

Boulders of black dolerite with light coloured spots are present in a nala section. In situ outcrops are also present in the area having very closely spaced fractures, the spacing being 8" - 10" apart in some places.

7. BELUGHAT

Location and accessibility

This deposit is located in Karbi Anglong district and is in an ESE direction from Guwahati at a distance of 205 km. It is approachable by a 15 km dirt track from Dokmoka, located on the Nagaon - Diphu road. The nearest railway station is Hojai at a distance of 45 km from the deposit. The coordinates of the area are as follows:

Latitude: 26°35'00"N & Longitude: 93°45'00"E

26°35'10"N 93°45'01"E

Infrastructure

A power line passes very close to the deposit on its route from a hydel power station located 4.5 km from the deposit.

8. BURAPAHAR

Location and accessibility

The Burapahar, Seconee, Hatigaon and other deposits are located in Nagaon district situated at a distance of 195 km ENE of Guwahati by the side of the road from Guwahati to Dibrugarh. The nearest town Jakhalabanda, 15 km from the deposit, is also the nearest railhead on the Saparmukh - Silghat section.

Description of mineral resources

The potentialities of dimension granites have been evaluated for the granite, gneiss, porphyritic granite and granite from the Kukrakata hill, Seconee, Hatigaon and Buraparbat area respectively in Nagaon district. Granite and granite gneiss of Karkik and Mahamaya hills of Karbi Anglong district have also been evaluated and could be suitable for a wide range of use. The details of the deposits are given in the Tables - 1 & 2.



ESTIMATED TOTAL.

DISTRICT	SUITE OF ROCKS	OCCURRENCES (NUMBER INDICATED IN EARLIER TABLE)	RESERVE	
			UPTO GROUND SURFACE	UPTO 10M FORM SURFACE
NAGAON	Equigranular granite gneiss	1	23 mil. tonnes	24 mil. tonnes
	Porphyritic biotite granite and Coarse granite gneiss (pink)	2	10 lakhs tonnes	12 lakhs tonnes
	Porphyritic granite	3	27 mil. tonnes	28 mil. tonnes
	Porphyritic granite	6	380 mil. tonnes	388 mil. tonnes
KARBI ANGLONG	Grey porphyritic granite and grey gneiss	4	12 lakhs tonnes granite 6 lakhs tonnes gneiss	18 lakhs tonnes granite 6.5 lakhs tonnes gneiss
	Pink equigranular granite gneiss	5	4 mil. tonnes	4.8 mil. tonnes



To tap the granite resources of Meghalaya, so far unexploited, GSI has initiated a programme for the "resource survey for dimension stones in Meghalaya". The objective of this investigation is to identify the potential granite deposits of the State and prepare a database of the available resources to provide the required information and technical support to the granite industries of this region.

1. HALLIDAYGANJ

The following observations make the dyke body of Hallidayganj area, exposed between Hallidayganj and Bangetagiri, to be considered most suitable for dimension stones. The details are given in Table - 3.

(i) The rock possesses physical characteristics like fine to medium grain size, texture uniformity, compact, massive nature and dearth of any major defect. Though some plagioclase grains show alteration to chlorite under microscope, the effect of alteration is very little. Moreover, with the above physical characteristics, a deep black to bluish black colour imparts to the rock a better market value and demand.

(ii) From the geotechnical point of view, the rock, with better strength values and other characteristics could be suitable for a wide range of use.

(iii) The dolerites, having very little or no quartz, have a good sawability. Besides having a fine to medium grain size, compactness and an uniform texture, the rock takes a good polish and shows high reflectivity.

(iv) Extension of the dyke body for a considerable strike length (4 km), an average width of 30 m and availability of bigger size boulders on the surface makes for encouraging sign for its commercial exploitation. Below a depth of 5 to 7 m, where spacing between horizontal joints increases, bigger size blocks can be extracted.

(v) In Goramaragiri block, a reserve of 67,500 cu.m of black granite upto a depth of 15m from the surface, has been estimated. An additional reserve of 2,02,5000 cu.m of the dyke rocks upto a depth of 15 m can be inferred for the other two dyke segments of Singmari and Bangetagiri blocks.

DATA FOR DIMENSION STONE GRANITE (HALLIDAYGANJ)

1	LOCATION	HALLIDAYGANJ (LAT. 25°44' N, LONG. 89°54'E) WEST GARO HILLS DISTRICT, MEGHALAYA, TOPOSHEET NO: 78G/14	
2	ROCK TYPE	a; DOLERITE b) GRANITE	
3	TOPOGRAPHY	HILLS / RIDGE ELEVATION FROM GROUND LEVEL : 60-80 m SLOPE ANGLE: 15° -25°	
4	VEGETATION	SPARSELY VEGETATED/ SHRUBS	
	DEGREE OF WEATHERING /WEATHERED ZONE OVERBURDEN	MODERATE TO HIGH (1-2 cm) CAPPING ON THE BOULDERS MORE THAN 2 ffl	
6	MODE OF OCCURRENCE	DOLERITE GRANITE	DYKE PRODUCT OF METAMATISATION
7	NATURE OF OUTCROP	DOLERITE GRANITE	DETACHED BOUIDERS (SIZE: 40x50x60 cm ³ TO 80x100x150 cm ³) BOULDER (SIZE: 2x2.5x3m ³ TO 5x6x8 m ³)
8	MINERALOGICAL COMPOSITION	DOLERITE GRANITE	PYROXENE, PLAGIOCLASE, QUARTZ QUARTZ. PLAGIOCLASE, MICROCLINE, BIOTTTE
9	COLOUR	DOLERITE GRANITE	BLUISH BLACK PINK, GREYISH PINK
10	GRAIN SIZE AND	DOLERITE	FINE TO MEDIUM GRAINED,

	TEXTURE	ITE GRANITE	OPFITIC TO suB-oPHrnc MEDIUM TO COARSE GRAINED, HYPIDIOMORPHIC
11	STRUCTURE/ TECTONIC EFFECTS	NO MAJOR TECTONIC EFFECTS OBSERVED	
12	DEFECTS	NO MAJOR DEFECTS FOUND	
13	EXTENSION	LENGTH : 4 km; WIDTH : 30-40 m; AREA : 0.25 sq.km.	
14	AREA COVERED BY DETAILED STUDY	1 km STRIKE LENGTH OF THE DOLERITE DYKE ON 1: 2000 SCALE	
15	RESERVE	BLACK GRANITE : 2,70,000 cu.m PINK GRANITE: 13,12,500 cu.m	
16	STATUS OF EXPLOITATION	EXPLOITED ONLY FOR ROAD AND BUILDING MATERIAL. NO EXPLOITATION FOR DIMENSION STONES.	
17	ACCESSIBILITY AND INFRASTRUCTURE	a) CONNECTED BY A 3-4 KM FAIR WEATHER ROAD WITH TURA-HALLIDAYGANJ STATE HIGHWAY WHICH CONNECTS WITH GUWAHATI (260 KM) BY STATE/NATIONAL HIGH WAY b) AVAILABILITY OF POWER : GOOD c) AVAILABILITY OF WATER : GOOD d) AVAILABILITY OF LABOUR : GOOD	
18	GEOTECHNICAL	^ COMPRESSED STRENGTH: AVERAGE	

	PROPERTIES	900+ kg/cm ² b) WATER ABSORPTION RATIO : AVERAGE < 0.5 %
19	PROCESSING CHARACTERISTICS	a) DOLERITE HAS GOOD SAWABILITY AND EXCELLENT POLISHING CHARACTER b) GRANITE IS HARDER BUT TAKES GOOD POLISH
20	POSSIBLE PRODUCTS	DOLERITE : TILES FOR FLOORING AND WALL CLADDING GRANITE : TILES AS WELL AS SLABS OF REGULAR SIZES FOR VARIOUS PURPOSES

(vi) Availability of infrastructural facilities and hilly terrain conditions, which improve the recovery percentage, is favourable for commercial exploitation of the rocks.

(vii) In addition to the above black granite (dolerite) deposit, pink granites having suitable physical, structural, geotechnical and processing characteristics for dimension stones are also available in Coramara giri block. This granite can also be commercially exploited along with the black granites.

2. MAWTHALIANG

The Mawthaliang granite body on the other hand, occurs as bouldery outcrops. In most part of the area, the overburden / soil cover is about 1-2 m. Due to spheroidal weathering, boulders are generally rounded to ellipsoidal. Larger boulders range from 2 m to 10 m in diameter. However, the average size of the boulders is about 5m x 3m x 2.5m. These are massive and mostly devoid of any major structural defects. They can be trimmed and brought to the required dimensions. Though these are lighter in shade, they may improve in quality depth wise, with darker shades and less defects.

The granite of Mawthaliang block is pink to greenish pink in colour. A slight variation in colour is observed which may be due to weathering and leaching of potash feldspar. Materials with uniform colour and deeper shades could be expected at deeper levels. The rock is medium to coarse grained and mostly equigranular. However, due to clustering of feldspar grains it sometimes gives an impression of a sub-porphyritic texture. Hardness of the rock ranges from 6.00 to 7.00 in Mohs scale. The rock occurs on the surface as boulders, mostly spheroidal to ellipsoidal in shape. A weathered skin of 1-2 cm thickness has developed on the surface of the boulders. Inside, however, the boulders are massive, compact and mostly devoid of any major

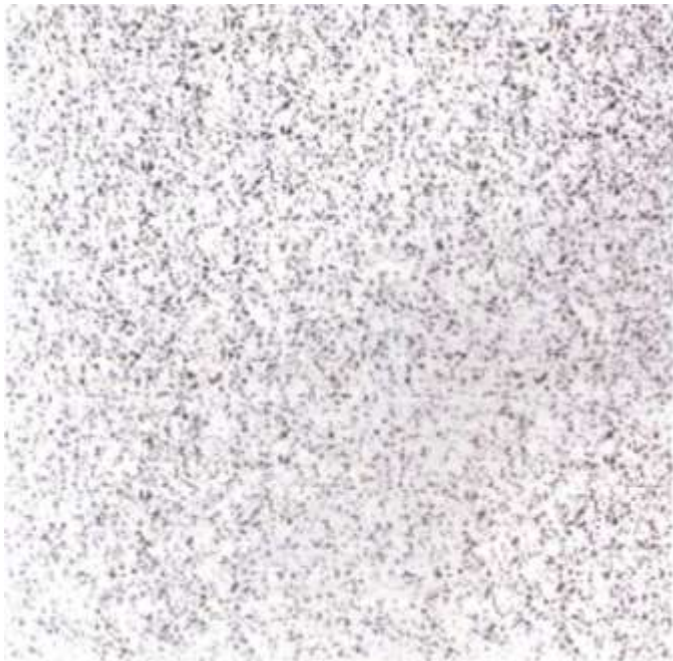
structural defects. The details of the granite are tabulated in Table - 4.

An area of 2 sq km was demarcated near Mawthaliang village, about 10 km from Sonapahar on the Nongstom - Sonapahar road. By detailed mapping, (1:2000), 0.45 sq km area was studied and reserve estimation done upto a depth of 15 m yielding 1.63 million cu.m of good quality commercial granite. This granite is medium grained, pink in colour and takes very good polish. As it is exposed on the road side and occurs as huge boulders, it can be easily exploited with low cost and can be transported easily.

3. MYLLIEM

The granite of Myllieiv area qualify as excellent dimension stone as it contains negligible or almost no defects and impurities. The details are given in Table - 5.

To begin, mining of the big boulders which are plentiful, is advisable. The porphyritic granite can be cut into slabs for use as wall panels, ties, tabletops and exterior decorative pieces. The land of granite that occurs in MyHieni area, if made into rough, blocks, may fetch between 500 to 550 US \$ per block and may find markets in countries like Italy, Germany, Korea nd Taiwan.



GEOLOGICAL INFORMATION:
WEST KHASI HILLS DISTRICT, MEGHALAYA

SL NO	LOCALITY	LAT/ LONG	VARIETY	COLOUR	EXPECTED BLOCK SIZE	POTENTIAL AREA OF BLOCK SO KM/ HECTS	RECOVERABLE RESOURCES		QUALITY A. PRODUCTIVE. B. POTENTIAL C. DEFECTIVE.
							UPTO GROUND LEVEL	UPTO 10 m BELOW GROUND LEVEL	
1	Mawthaliang	28°40'10" N/ 91°07'80" E	Pink Granite	Pink to Greenish Pink	Tiles and slabs of regular size	0.0782+ 0.2218= 0.3 sq. km	1.63 million cu.m (upto 18 m depth)		B

REMARKS : (i) Suitable for its colour and texture

(ii) Moderate to good savrability and good polishing character Assumed recovery factor- 35 to 40

GEOTECHNICAL PROPERTIES:

LOCALITY : MAWTHALIANG, West Khasi Hills district, Meghalaya. Lat. 25°40'00" N & Long. 91°07'50" E. Water Absorption Ratio 0.29 - 1.13 Compressive Strength : 710 - 1S30 kg /cm² High compressive strength and low water absorption ratio indicates suitability for commercial use.

GEOLOGICAL INFORMATION:

REMARKS : Recovery percentage above 25% GEOTECHNICAL PROPERTIES:

LOCALITY : MYLLIEM, East Khasi Hills district, Meghalaya. Lat. 25°29'40" N & Long. 91°49'20" E.

Compressive Strength : 2200 - 3000 kg/cm²

Failure Load : 900 to 3900 kg/cm²

SL. NO	LOCALITY	LAT/ LONG	VARIETY	COLOUR	EXPECTED BLOCK SIZE	AREA OF BLOCK SO KM/ HECTS	GENERAL HEIGHT ABOVE SURFACE	RECOVERABLE RESOURCES		QUALITY A.PRODUCTIVE B. POTENTIAL C.DEFECTIVE.
								UPTO GROUND LEVEL	UPTO 10m BELOW GROUND LEVEL	
1	Mylliem	25°29'40" N/ 91°49'20" E								
	a. Nonglcyri h		Mylliem white Rose	Greyish White	Boulders 2.0m. x 1.0m	1.5 km. x width 1.0 km.		Not estimated		Potential
	b. Laitlyngot		Mylliem pink Rose	Pink	2m x 2m x 1.3m.	Length 1.4 km. x width 0.7 to 0.8 km.		Not estimated		Potential

Point load Strength Index : 2000 to 2600 kg/cm²

Samples take fairly good to very good polish.

EAST KHASI HILLS DISTRICT, MEGHALAYA

