Indian Minerals Yearbook 2014

(Part- III : Mineral Reviews)

53rd Edition

GRANITE

(FINAL RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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July, 2016

24 Granite

Granite technically refers to a light-coloured granulose plutonic rock composed of felspars, plagioclase, quartz (35% approx.) and minor amounts (45% approx.) of mafic minerals, such as, biotite, hornblende, pyroxene, iron oxides, etc. But, in commercial parlance, the term granite has become synonymous with all those crystalline rocks which have pleasing colours, strength to bear the processes of quarrying and cutting & polishing and which are used commonly for decorative purposes. Being more resistant to wear and tear as well as weathering, granite is most sought-after stone to be used as building as well as decorative stone. The fascination for granite is due to its amenability for taking mirror-like polish, high compressive strength, longevity and aesthetics. India possesses enormous deposits of all types of dimension stones. It is one of the largest producers of dimension stones in the world. The Dimension Stone Industry employs a workforce of over one million at its various sectors. This Industry plays a vital role in the economy of the states like Tamil Nadu, Andhra Pradesh, Karnataka and Rajasthan. Rural economy of many developing States like Madhya Pradesh, Uttar Pradesh, Odisha and North-Eastern States is dependent on this Industry.

Within the country, granite used for decorative purposes is considered costly when compared with other materials, hence, its utilisation and trade in the domestic front has been relatively low when compared to its export potential.

RESOURCES

India is endowed with abundant resources of a wide variety of granite comprising over 200 shades. As on 1.4.2010, resources of granite dimension stone of all types are estimated at 46,230 million cubic metres. Of these resources, 264 million cubic metres (less than 1%) fall under reserves category, while the remaining 45,966 million cubic metres or about 99% fall under resources category.

Of the total granite reserves, about 36 million cubic metres of all grades fall under proved category while 228 million cubic metres fall under probable category.

About ninety-four percent reserves relate to coloured granite and the balance 6% fall under black granite. About 98% reserves are located in Rajasthan, Odisha and Karnataka with a share of 42%, 30% and 26%, respectively.

Statewise breakup of total resources reveals that Karnataka & Rajasthan share about 20% each of the resources which are followed by Jharkhand (19%), Gujarat (18%), Andhra Pradesh (5%) and Madhya Pradesh (4%). These states together account for 86% of the total resources. Gradewise classification reveals that about 7% of the total resources fall under black granite while 92% under coloured granite. About 1% resources are of unclassified grade.

The details of reserves/resources as on 1.4.2010 are given in Table-1.

PRIME VARIETIES OF INDIAN GRANITE

In the world market, there are nearly 300 varieties of granite of which India supplies about 200 varieties. Out of these, prime varieties represent a wide spectrum of colour, texture and structure. These prime varieties have substantial resource base. Commercial names of granite are derived from area, colour, patterns, etc.

Karnataka specialises in the production of Ruby red, chilly red, cera grey, Kanakpura multicolour, Himalayan blue and Sira grey varieties of granite. Andhra Pradesh is famous for Black Galaxy, Srikakulam blue and black varieties of granite while Tamil Nadu is abundant in Jet-black & Tipu-white, Kashmir-white and Paradiso sea green varieties of granite. Odisha specialises in pink granite, silver grey, sea weed green, chilka blue, grey wave varieties of granite. Availability of varieties of granite in various States is furnished in Table- 2.

EXPLORATION & DEVELOPMENT

The increase in demand both in domestic and international markets for new varieties of granite has prompted DMG, Government of Rajasthan to get significantly engaged in exploration activities. The details of work carried out by the GSI & State Directorates of Chhattisgarh, Jammu & Kashmir and Rajasthan in 2013-14 are summarised in Table- 3.

Table – 1 : Reserves/Resources of Granite (Dimension stone) as on 1.4.2010
(By Grades/States)

(In thousand cubic metres)

Grade/State	Reserves				Remaining resources								Total resources (A+B)
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
		STD121	STD122			STD221	STD222						
All India : Total	**35741**	**201377**	**26574**	**263692**	**38462**	**51990**	**8234**	**837325**	**2063964**	**42499338**	**467296**	**45966608**	**46230300**
By Grades													
Black Granite	6936	6060	3909	16906	-	45690	1	50934	466039	2572581	23538	3158783	3175688
Coloured Granite	28805	195316	22665	246786	38462	6300	8233	786391	1276125	39843847	443518	42402875	42649661
Unclassified	-	-	-	-	-	-	-	-	321800	82911	240	404951	404951
By States													
Andhra Pradesh	-	-	-	-	-	-	-	-	-	2405890	-	2405890	2405890
Assam	-	-	-	-	-	-	-	-	800	583150	-	583950	583950
Bihar	-	-	-	-	-	-	-	-	179000	698612	-	877612	877612
Chhattisgarh	-	-	-	-	-	-	-	-	-	50057	-	50057	50057
Gujarat	-	-	-	-	-	-	-	-	-	8501947	-	8501947	8501947
Haryana	-	-	-	-	-	-	-	-	-	34000	-	34000	34000
Jharkhand	-	-	-	-	-	-	-	-	651300	8197110	26930	8875340	8875340
Karnataka	26363	19389	21836	67587	-	-	-	238	1231625	8012784	25659	9270306	9337893
Kerala	140	-	-	140	-	-	-	-	99	2570	-	2669	2808
Madhya Pradesh	-	160	-	160	-	-	-	-	-	1885924	108000	1993924	1994084
Maharashtra	-	-	-	-	-	6300	-	486925	-	665622	-	1158847	1158847
Meghalaya	-	-	-	-	-	-	-	-	-	-	286467	286467	286467
Odisha	-	80000	-	80000	-	-	-	330328	-	1432492	240	1763060	1843060
Rajasthan	5581	100380	4500	110461	38462	-	-	-	-	9021742	20000	9080204	9190665
Tamil Nadu	-	1448	238	1686	-	45690	8234	7	-	503818	-	557749	559435
Uttar Pradesh	-	-	-	-	-	-	-	-	-	494819	-	494819	494819
West Bengal	3658	-	-	3658	-	-	-	19827	1140	8802	-	29768	33426

Figures rounded off.

Table – 2 : Varieties of Granite in Various States

State	Variety
Andhra Pradesh	Black galaxy, Srikakulam blue, Steel grey, Paradiso, Anantapur grey, Silver galaxy, etc.
Bihar	Tiger skin, Mayurakshi blue, Sawan rose, English teak, Black-cheeta, etc.
Gujarat	Sonabadi grey, Balaram pink, Ajapur Galaxy, Godhra grey, Maharaja tiger-black, etc.
Haryana	Steel-grey porphyry, Purplish granite porphyry, Deep pink.
Karnataka	Ruby red, Fish Belly, Himalayan blue, Sira grey, Red multi, Tumkur porphyry, Hassan green, Magadi pink, Tiger black, etc.
Kerala	Tropical green, Paradiso, Kerala white, etc.
Maharashtra	Grey silk, Light pink, Jhansi red, etc.
Madhya Pradesh	Multicoloured, Black granite, etc.
Odisha	Berhampur blue, Silver grey, Seaweed green, Chilka blue, Red pearl, Jeypur and Keonjhar black, etc.
Rajasthan	Mokalsar green, Nagina green, Rosy pink, Blue Pearl, Chima pink, Bala flower, Platinum-white, etc.
Tamil Nadu	Kashmir white, Rawsilk, Paradiso, Pink multi, Colombo Juparana, Tiger skin, Kunnam black, Turaiyur blue, etc.
Uttar Pradesh	Ruby red, Jhansi red, Grey granite, Black granite, etc.
West Bengal	Bero pink porphyry, Streaky gneiss, Purulia black, Birbhum pink, Spotty black, etc.

Table – 3 : Details of Exploration for Granite during 2013-14

Agency/ State/ District	Location/ Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Jammu & Kashmir							
Laddakh	Laddakh	PGRS	300	-	-	153	Three different types of granitic phases have been observed. Resources were not calculated.
	Granitoid complex	1:12,500	50	-	-	-	
DMG,							
Chhattisgarh							
Dantewara	Chingavaram-Bhusaras area	1:50,000	23	-	-	02	Resources were not estimated.
Kanker	Mudpar-Bundeli,	1:50,000	270	-	-	23	Area is mostly covered by granite/ gneisses of Bengal group. Black granite (dolerite) has been marked at various localities. Resources were estimated at 8000 cu.m in Mudpar-Bundeli area and 85.5 lakh cu.m in Bhanbhera area.
	Bhanbhera area	1:50,000	180	-	-	09	
Jammu & Kashmir							
Leh	Khaltsi	1:1,000	0.1	-	-	20	-
-do-	Hemishukpachan	1:12,500	20	-	-	10	-
Rajasthan							
Bhilwara	N/v. Nareli,	1:50,000	110	-	-	-	Granodiorite resembles with granite with all granitic features except mineralogical difference. Granite of this area is pink, red to grey coarse grained,which is suitable for cutting and polishing.
	Duwala, etc.	1:10,000	10	-	-	-	
	Mandal	1:4,000	5	-	-	-	
Jalore	N/v Dhawla	1:4,000	02	-	-	-	Detailed geological mapping has been carried out to locate the blockable granite. Granite plots of 3.0 ha each have been delineated.
Jhunjhunu							
Jaipur	Kesharpura,	1:10,000	11	-	-	-	The area is covered with granite
Sikar	Ratanshar	1:4,000	5.27	-	-	-	and gneiss rocks suitable for,decorative and masonary stone. Resources were not calculated.

PRODUCTION

Granite is declared as a "Minor Mineral," under the MMDR Act, 1957 and therefore falls under the purview of the State Governments. The data on production of granite, therefore, lacks precision as acquisition-delays makes it difficult to draw a conclusion. The production of granite compiled from the data received from various states for 2010-11 to 2012-13 is, however, detailed in Table-4.

Major production of granite in raw as well as processed form is generally from Andhra Pradesh, Rajasthan, Karnataka, Tamil Nadu and Gujarat.

The important granite producing centres in Tamil Nadu are located at Dharmapuri, Erode, Madurai, Salem, Virudhunagar and Villupuram districts.

In Rajasthan, production centres are mainly spread in the districts of Jalore, Pali, Sirohi, Barmer, Ajmer, Jaisalmer, Jhunjhunu and Jodhpur. Karnataka is another important producer of granite varieties with production centres predominantly located at the districts of Bengaluru, Mysore, Gulbarga, Hassan, Raichur and Kolar. The occurrences of granite have been reported from three districts of Uttar Pradesh, namely Lalitpur, Mahoba and Banda. Almost the entire production was reported from Lalitpur district. In Andhra Pradesh, important mining areas are located in the districts of Chittoor, Anantapur, Kurnool, Prakasam, Srikakulam, Warangal, Karimnagar and Khammam.

The granite resources of Gujarat are located in the districts of Mehasana, Banaskantha, Sabarkantha, Panchmahal, Dahod, Vadodara, Amreli, Bhavnagar and Kachchh. Bihar, Kerala, Odisha and West Bengal also produce granite.

Details regarding production of processed granite are not available. However, it could be contrived from the data on processed material exported from which production level in the country with addition of 5 to 15% for internal use could be estimated. From all available data, it could be concluded that India is in a comfortable position to produce the required quantity of granite to meet the demand of both domestic as well as export markets.

MINING

Production of blocks of considerable size and weight is a special feature of granite mining. The process and equipment used for granite mining differ considerably from those used for mining other minerals. The mining of granite involves two important stages of operation the first actual block splitting either from sheet rock or boulder and the second operation involve many items of works, such as removal of weathered zone or overburden, opening of faces, lifting of cut blocks, transportation and many other ancillary work before and after block splitting.

Table – 4 : Production of Granite, 2010-11 to 2012-13(P)
(By States)

(Value in ₹'000)

State	Unit	2010-11		2011-12		2012-13 (P)	
		Quantity	Value	Quantity	Value	Quantity	Value
India	**-**	**-**	**26531579**	**-**	**54198761**	**-**	**66764237**
Andhra Pradesh	cu m	919000	21435632	1255683	32381485	1787880	47674423
Chhattisgarh	cu m	477	568	-	136	948	1896
Gujarat	tonne	78732	32649	-	-	242496	113473
Jammu & Kashmir	tonne	92	22	138147	14706	265393	17955
Karnataka	cu m	268438	2914183	358490	11187507	304015	9681453
Kerala	cu m	1068	32044	13101469	7860881	15227651	3806913
Madhya Pradesh	tonne	56043	148603	27968	153059	28256	34417
Rajasthan	tonne	757620	1294141	1077000	1581250	2850000	4373700
Tamil Nadu	cu m	234192	473737	266889	757230	273958	748469
Uttar Pradesh	cu m	26667	200000	23334	262507	23077	311538

Source: *State Governments.*

The block splitting from the sheet rocks or boulders is mainly done manually or in some cases by semi-mechanised methods, whereas the other operations, such as, removal of overburden, lifting & transportation of cut blocks, etc. are carried out by mechanised methods. There are a few mines which have adopted the modern method of block splitting by using flame-jet burner and diamond wire saw for cutting. Heavy-duty derrick cranes of capacity to handle 50-tonne blocks from a depth of more than 60 m has brought revolution in granite quarrying by way of augmenting output with less cost. The percentage recovery of granite on the whole is quite low and it varies from 5 to 15% because of the prevalent unscientific mining method.

One of the modern and scientific mining methods adopted recently to enhance the recovery of dimensional blocks is that 'Water Jet Cutting', technique. In this technique, water with tremendous pressure is passed through an orifice to form a jet. This jet is used to cut into the primary blocks as well as secondary blocks. The cutting loss in this process is minimum and there is no damage to adjacent block as in case of blasting.

PROCESSING INDUSTRY

The processing of granite in India is an age-old phenomenon and started in a small way in 1930s when some trimmed blocks as kerbstones were exported to UK. Since then, semi-hand-worked or hand-polished granite tombstones found their acceptability in the UK. Granite processing basically involves sawing or cutting of raw blocks into the tiles/slabs of required size & thickness and polishing of sawn-off surfaces. Other ancillary functions involve edge cutting, milling, boring and contouring for enhancing the quality and price of production. In India, the Processing Industry is in three sectors, namely, small-scale units, medium-scale units and 100% export-oriented units (EOU). The Processing Industry of granite in the country has developed over the years, and the share in exports of processed material has increased manifolds.

Centre for Development of Stones (CDOS), registered as a Non-profit Making Society, is the common Facilities Centre for the entire Stone Industry, including granite, established under the National Programme for Development of Stone Industry in India (NPDSI), which is a joint effort of Govt. of India and United Nations Industrial Development Organisation (UNIDO). CDOS was set up as an autonomous organisation by Govt. of Rajasthan and Rajasthan State Industrial Development & Investment Corpn. Ltd (RIICO) at Jaipur, with an objective to develop, promote and support the Dimensional Stone Sector and related industries in India. It also has testing centre for stones that conforms to international standards.

USES & SPECIFICATIONS

Uses

Granite is the most sought-after among all building stones. In ancient times, granite pillars and beams were preferred material to support the huge structures of temples and palaces and for making protective walls around them. With the invention of modern tools of greater hardness and polishing ability, the use of granite has rather increased on account of its aesthetic value. The modern motorised tools of tungsten carbide and brazed diamond have enabled the user to cut & polish granite as per the specifications of the Building Sector. Presently, cut and polished granite slabs of 20 mm thickness are preferred for flooring, while tiles of 10 or 12 mm thickness are used for cladding. In addition, gravestones and monuments of various shapes and sizes are also in vogue. The flexibility of the cutting tools have engendered creation of many artifacts of granite for decorative purposes.

Granite also finds its application in making garden furniture, such as, benches, fountains and many other articles which are used for landscaping and/or decorative purposes. The cut-to-size small blocks are used as cobblestone, kerbstone, road sidings and for many other innovative purposes.

Crude granites are utilised for structural purpose after little dressing & sizing, whereas processed granites are used mostly in the construction of buildings and monuments and for interiors and exterior facing. Granites, because of its superior wear resistance and non-denting quality, are used as parts in various meteorological and engineering instruments, such as, surface plates, straight edges, parallels, cubes, V' blocks and work-mounting tables of co-ordinate measuring machines.

The surface plates are used as flat datum surface whenever precise measurements of dimensions and geometrical relationships are to be carried out. For this purpose, harder variety of granite is required so that it can bear the high-degree of grinding, polishing and calibration for achieving flat surface. For its use as surface plates, granites should have properties such as, close grain size, homogeneity, high density and hardness, uniform colour, low moisture absorption and should be free from flaws.

Specifications

The properties of granite which are normally valued for exploitation are compressive strength, tensile strength, density, p-wave velocity, etc. For marketability, other requirements like colour, texture, granularity, size, water absorption, porosity, hardness, moisture content, etc. are also essential. Raw blocks should be free from normal defects like fractures, joints, shears, hairline cracks, segregation, veins, etc. (Table-5)

A snippet of BIS specifications for granite are highlighted below:

IS: 3316 - 1974 (First Revision; Reaffirmed 2008) Specifications for Structural Granite

This Standard covers section, grading and strength requirements of structural granite for various constructional uses. The general requirements as per the specifications are that granite shall be free from flaws, injurious veins, cavities and similar imperfections that would impair its structural integrity and would affect adversely its strength and appearance. The strength requirements as per IS: 3316-1974 are as follows:

i) The compressive strength when tested according to IS: 1121 (Part 1) - 1974 (Reaffirmed 2008) shall not be less than 1,000 kg/cm^2.

ii) The true specific gravity when tested according to IS:1122-1974 (Reaffirmed 2008) shall not be less than 2.6.

iii) The water absorption when tested according to IS: 1124-1974 (Reaffirmed 2008) shall not be more than 0.50%.

The shape of slabs shall be rectangular or square and of specified dimensions with tolerance in length and breadth as 12 mm and thickness 1 mm. The dimensions of blocks for masonry shall be as specified. The tolerance allowed for facing blocks is 15 mm.

IS:14223 (Part 1) - 1995; (Reaffirmed 2012) Specifications for Polished Building Stones: Part I Granite

This Standard covers physical properties and finish requirements of polished granites used for various purposes. The general requirements as per the specifications are that the granite should be free from all imperfections and deleterious minerals that may interfere with the appearance, strength, structural integrity and its amenability to take good polish. Imperfections are mostly imparted by the textural variations which is a function of degree of uniformity and the distribution of the constituent minerals. Hairline cracks/joints, flower, moles, knots, white and dark lines due to segregation of light-coloured minerals in multicoloured granite and ferromagnesium minerals in light-coloured granites are considered to be imperfections. Granite should be free from deleterious minerals, such as, pyrite, marcasite, biotite, chlorite and ilmenite which interfere with the colour and appearance on weathering and also affect polishing characteristics.

The shapes of the slabs shall be rectangular or square and of specified dimensions with a tolerance in length and breadth as +2 mm and thickness +1 mm. The bottom face may be rough but the top surface shall be fine-polished and joint faces shall be dressed with the top surface without hollowness and spalling off.

The physical properties of granite shall conform to the requirements given in Table-5. Surface of the polished granite shall be mirror-finish without any hairline crack. The polish on the surface shall be checked with glassometer and shall not be less than 95%.

On the international scene, with the formulation of European Economy, the CEN Norm has come into force. As per CEN TC 246, various standards of stones have been formulated. The objectives of these standards are to necessitate the companies to have the tests conducted for the different stones that are commercialised so as to profit the users the choice of the stone with desired physical characteristics according to the purpose intended. It has become mandatory for every company doing business with European Union to mark their products with 'CE' marking from March 2004 onwards.

Table – 5 : Physical Properties of Granite as per IS : 14223 (Part 1) -1995 (Reaffirmed 2012)

Sl. No.	Characteristic	Requirements	
		Pink granite	Multicoloured & grey granites
1	Moisture content (%) (max)	0.15	0.15
2	Dry density (m/v)	2.58 to 2.63	2.60 to 2.68
3	Apparent specific gravity (min)	2.75	2.75
4	Water absorption (%) (max)	0.50	0.50
5	Porosity (%)	1.02 to 2.50	1 to 2
6	Compressive strength (kg/cm^2)	1000-1500	1300-2200
7	Tensile strength (kg/cm^2) (min)	90	90
8	Shear strength (kg/cm^2)	280-425	300-540
9	Hardness (Mohs' scale)	6 to 7	6 to 7
10	Hardness (Schmidt No.)	80-100	85-110
11	Hardness (Shore No.)	50-60	46 to 61
12	Ultrasonic pulse velocity	5000	5000
13	Resistance to wear	Not greater than 2 mm, on an average and 2.5 mm for any individual specimen	Not greater than 2 mm, on an average and 2.5 mm for any individual specimen

POLICY

Granite is a 'Minor Mineral' under the MMDR Act, 1957. The grant of various mineral concessions for granite is therefore administered under the Minor Mineral Concession Rules of the respective State Governments. However, the Granite Conservation and Development Rules, 1999 aims at uniform rules for conservation, systematic development and scientific exploitation of granite resources. GCDR, 1999 inter alia, provides for:

Prospecting Licences (PL) prior to granting mining lease; Period of PL; Minimum and maximum period of mining lease and for renewals; Minimum and maximum area of lease; Preparation of scheme of prospecting; Mining Plan to be prepared for grant of mining lease; etc.

As per the Export-Import policy for 2009-14 and the Foreign Trade Policy thereunder, the imports of granite monumental and building stone that fall under Heading No. 2516 (whether or not roughly trimmed or cut, by sawing or otherwise, into blocks or slabs of a rectangular shape) are restricted. On the other hand, worked granite blocks/tiles under Sub-heading 680223 can be imported freely. There are no restrictions on exports of granite and items under Chapter 25 and Chapter 68.

ENVIRONMENT

The mining of granite, started initially in the bouldery zone, had little damage to the environment. As more and more blocks in huge sizes were required to meet the demand, the sheet rock was approached by making cut in the ground and by removing top soil or overburden, which resulted in general degradation of environment.

Environmental problems are similar to any opencast mining operations. The blasting and movement of heavy vehicles generate dust and aggravate air pollution in addition to noise pollution.

The processing of granite requires huge quantities of water for cutting and polishing. In some cases, kerosene and lime water are used as coolants for cutting purpose. Although most of the kerosene and lime is recycled, there are always chances that these coolants get mixed with natural water courses.

Sludge generated during cutting needs proper disposal to avoid increased silting and pollution of the natural waterways.

For abating environmental pollution, guidelines have been spelt out in GCDR,1999. The technology for making artificial stone called Terrazzo will prove to be a boon for the utilisation of waste generated during mining and processing.

WORLD REVIEW

World dimension stone production including granite was estimated to be around 125 million tonnes in 2012. The top five principal producing countries in 2012 in descending order by tonnage were China, Turkey, India, Iran and Italy and these countries accounted for about 72% of the global production.

The United States apparent consumption of dimension stone increased by 17% in 2013.

China

China is the main producer in the world and USA the main customer of granite. There are four main regions for natural stone production and handling imports and exports: the provinces of Shandong, Fujian, Sichuan and Guangdong. The key centres of Chinese stone processing have been created mainly in Shandong, Fujian and Guangdong. Their chief function is to process local and imported materials into products for decorative interior finishing. Large quantities of natural stones are also imported for processing into gravestones for the Japanese and Korean markets.

Brazil

Brazil is the largest producer of natural stone in the world and well-known for producing prime varieties like Juparna, Classico and Tijuca black, from quarries located at the outskirts of Rio. Major areas of production are in Minas Gerais where multicoloured granite is produced. The yellow Veneziano variety of granite is produced in Victoria State. The production of granite was estimated at 60 million cu m during 2011.

More than half the Brazilian production is being exported, mostly to the North American market. In terms of weight, around half the Brazilian natural stone exports include rough blocks of granite.

Italy

Italy has a broad, in-depth know-how of stone quarrying and processing based on centuries of experience, but in the mass production segment, it has been overtaken by China, India, Iran and Brazil. Production of granite was estimated 1.6 million tonnes in 2011.

USA

In USA, dimension granite was produced by 35 companies operating 55 quarries in 15 States. Production was 498,000 tonnes valued at $132 million in 2013. Granite production tonnage decreased slightly and the value increased by 12% compared with those of 2012. The top producing States were, in descending order by tonnage, Massachusetts and Georgia, and they accounted for 55% of the tonnage and 40% of the value of granite production.

FOREIGN TRADE

Exports

Granite is an important commodity amongst ores and minerals that have tremendous export potential. It is mainly traded in the form of crude or roughly trimmed blocks, as cut blocks & slabs; and as polished blocks & tiles. The export value of granite (total) increased to ₹9,869 crore in 2013-14 from ₹7,942 crore in 2012-13. The share of granite (others) was 53% at ₹5,268 crore while that of crude or roughly trimmed blocks was about 35% at ₹3,471crores. Similarly, the share of granite (polished blocks/ tiles) was 7% at ₹646 crore, while granite (cut blocks/slabs) was 5% at ₹484 crore. China was the most important buyer for granite and its share in the total value of exports of granite was 33%, followed by USA (16%) and Turkey & Germany (4% each) (Tables- 6 to 10).

Imports

In 2013-14, imports of granite (total) increased marginally to 71,378 tonnes from 64,739 tonnes in the previous year. Out of the total imports, 40,563 tonnes were of crude or roughly trimmed granite, 7,849 tonnes of cut blocks/ slabs, 4,060 tonnes of polished blocks/tiles and 18,906 tonnes of other granite. Granite was mostly imported from Norway (29%) and China (18%) (Tables- 11 to 15).

Table – 6 : Exports of Granite : Total (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**6061302**	**79415582**	**6802309**	**98685772**
China	3982986	26805646	4484850	32660873
USA	384598	12061935	481000	16132951
Turkey	126147	3463517	135744	3920445
Germany	83089	3120022	74530	3485290
UK	59924	2623943	62029	3037862
Italy	137022	2437778	142949	2805264
Libya	40616	1248120	95775	2765467
UAE	105545	2300555	115246	2714147
Belgium	77374	2156840	67707	2104150
Poland	57321	1522488	71807	2047242
Other countries	1006680	21674738	1070672	27012081

Table – 7: Exports of Granite (Crude or Roughly Trimmed) (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**4191897**	**29290552**	**4622452**	**34705710**
China	3608506	23546325	4061786	28262862
Chinese Taipei/ Taiwan	139523	1484652	150008	1773800
Italy	93827	979977	100008	1280867
Hong Kong	119039	1032856	91763	862659
Vietnam	45648	449710	46589	606103
Belgium	41030	423983	30975	389700
Poland	19395	176399	23376	271164
Spain	14435	159466	16156	248623
Thailand	19269	227072	15112	212835
Croatia	16534	188456	14892	176530
Other countries	74691	621656	71787	620567

Table – 8 : Exports of Granite (Cut Blocks/Slabs) (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**512455**	**3526575**	**787137**	**4843967**
China	318594	2277184	353767	3241610
USA	96127	323878	137883	514346
Hong Kong	76261	685815	33298	404504
Chinese Taipei/ Taiwan	3329	41604	9404	141547
Vietnam	744	5230	6664	88541
Thailand	832	9381	5944	72023
Belgium	154	3100	5109	66835
Sri Lanka	3527	44958	2706	56301
Italy	1018	17113	2833	22102
Poland	-	-	1564	17786
Other countries	11869	118312	27965	218372

Table – 9 : Exports of Granite (Others) (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**1106773**	**38838065**	**1368930**	**52680472**
USA	241236	9910400	308699	14357101
Turkey	118263	3249256	131303	3810445
Germany	62002	2492852	61219	2953868
UK	46259	2216050	53290	2810304
Libya	34135	997281	87496	2664222
UAE	94592	2099871	102204	2458463
Poland	32055	1151116	42340	1603797
Canada	24944	1216555	25970	1497484
Netherlands	23183	1107549	25162	1413604
Belgium	28939	1372289	26504	1387389
Other countries	401165	13024846	504743	17723795

Table – 10 : Exports of Granite (Polished Blocks/Tiles) (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**250177**	**7760390**	**223790**	**6455623**
USA	42809	1757431	24396	1156931
China	48895	833867	63724	1065677
Germany	15015	589515	11225	509652
Saudi Arabia	12662	241487	22202	430436
Nigeria	11168	278911	11662	323544
Belgium	7251	357468	5119	260226
Netherlands	7489	347302	4721	239204
UAE	8966	177613	10683	223868
UK	9256	371067	4594	196204
Italy	8231	248729	6106	183361
Other countries	78435	2557000	59358	1866520

Table – 11: Imports of Granite: Total (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**64739**	**1860578**	**71378**	**2402008**
Norway	17285	448997	20421	659004
China	20140	600413	12863	445850
Brazil	5675	224693	9338	390160
Italy	2826	118217	2876	141681
Sri Lanka	308	15237	2932	117447
Ukraine	3268	85292	3601	114430
South Africa	2963	68446	3419	112745
Finland	4167	73797	4441	81503
Angola	1351	31211	2086	77775
Namibia	2790	47607	3237	70565
Other countries	3966	146668	6164	190848

Table – 12 : Imports of Granite (Crude or Roughly Trimmed) (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**33233**	**873669**	**40563**	**1299814**
Norway	15428	388030	15371	508900
Brazil	4330	167983	8143	315483
Ukraine	2775	71455	2944	98319
Angola	1219	28465	2002	72992
Finland	4052	68478	4106	71314
South Africa	2020	42954	2152	65738
Iran	203	5728	1406	44206
Italy	610	16764	958	33800
Namibia	588	14048	808	22718
Spain	280	6942	759	19840
Other countries	1728	62822	1914	46504

Table – 13 : Imports of Granite (Cut Blocks/Slabs) (By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**2312**	**49713**	**7849**	**200368**
Norway	628	14629	4246	116828
Namibia	-	-	1142	23845
South Africa	92	1919	415	10293
Finland	-	-	335	10189
Madagascar	-	-	476	10074
China	-	-	432	7777
Saudi Arabia	-	-	179	5685
Ukraine	210	4307	164	4017
Italy	497	7943	120	3122
Spain	-	-	75	2678
Other countries	885	20915	265	5860

Table – 14 : Imports of Granite
(Polished Blocks/Tiles)
(By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**4313**	**148805**	**4060**	**130545**
Norway	1229	46338	804	33276
Brazil	273	13561	335	24829
Sri Lanka	308	15237	1633	22420
China	932	30765	489	20365
Bahrain	7	1219	121	8994
Hong Kong	10	670	80	5259
Ukraine	-	-	183	3894
South Africa	374	10919	86	2963
Namibia	712	10847	176	2407
Madagascar	186	6323	39	2049
Other countries	282	12926	114	4089

Table – 15: Imports of Granite (Others)
(By Countries)

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**24881**	**788391**	**18906**	**771281**
China	19208	569649	11942	417709
Italy	1673	91237	1757	103139
Sri Lanka	-	-	1289	94626
Brazil	510	28294	837	48821
South Africa	477	12654	766	33751
Namibia	1490	22712	1111	21596
Saudi Arabia	331	10042	508	17734
Ukraine	283	9530	310	8200
Angola	-	-	84	4783
Japan	9	387	22	4183
Other countries	900	43886	280	16739

FUTURE OUTLOOK

India possesses one of the best granite deposits in the world having excellent varieties comprising over 200 shades. India acounts for over 20% of the world resources in granite. The total granite resources in India as on 1.4.2010 are: 46,230 million cu m. As per the Report of the Working Group for 12th Plan (2012-17), the Indian stone production during 2009-10 was 35,342 thousand tonnes, and in value terms, the estimated turnover of the Indian Dimensional Stone market in 2009-10 was of the order of ₹30,000 crore out of which the southern states accounted for ₹18,000 crore, Rajasthan ₹7000 crore, and the rest of India ₹5000 crore. Granite alone accounts for 2/3rd of the value of production.

As per the Report for 12th Plan, the Dimension stone market is said to grow at a fervent pace as the demand for granite, marble, sandstone and other dimension stones and stone products is on the rise and are anticipated to grow at around 15% CAGR. A similar rate of growth in exports can also be achieved with the help of suitable policy framework, infrastructure and other facilities which the Industry expects to consolidate for augmentation of prospects. The Working Group for 12th Plan has recommended that well-planned, concerted and dedicated efforts are essentially needed for promotion of Indian stones to galvanise their export prospects. The emphasis needs to be on popularisation of Indian stones in both the traditional markets as well as other niche markets and exploration of new avenues by strengthening the activities of the Centre for Development of Stones (C-DOS) in Rajasthan by upgrading it into a national centre of excellence could render the much-needed fillip to the industry as a whole. Alternatively, other options for exporting granite and marble in processed form to maximise export earnings are to develop and promote artifacts and special decorative and ornamental items of high value addition. There is tremendous skill in the country, which can be explored and supported with special incentives. This can certainly bring about substantial foreign exchange addition, as well as significant employment generation.

The Working Group for 12th Plan had observed that the present investment in Dimensional Stone Industry in India is at ₹20,000 crore. Further, it was observed that with the right policy support, the total turnover of the sector could rise to around ₹30,000 crore in 2009-10 and even higher to over ₹40,000 crore by 2012-13, and thereafter, double every five years considering an estimated growth rate of 15%. To sustain this level of anticipated growth, there must be a protracted growth, investment flow into this sector to the tune of ₹1,07,500 crore by 2022-23 (including foreign investment).