

72 Slate, Sandstone & Other Dimension Stones

The principal rock types used as dimension stones other than granite and marble are slate, sandstone, limestone and quartzite. India is endowed with abundant resources of these types of dimension stones which are increasingly used domestically. These stones are also important export commodities. India is one of the largest producers of dimensional stones in the world.

1. Slate

Slate is a low-cost decorative stone used for exterior and interior decoration of buildings. It is one of the important materials used for roofing. Slate is a fine-grained, very low-to-low metamorphic rock possessing a well developed fissility (splitting attitude) parallel to the planes of slaty cleavage. It has been formed by the metamorphism of pre-existing clay rocks such as claystone, shale or siltstone. The most remarkable feature of this rock is that it has very marked cleavage planes which enable it to be split manually or mechanically into relatively thin slabs. Slate is used as school slate and also as building dimension stone. Slate has the aesthetic value like other dimension stones, granite and marble. Slate has emerged as a low cost alternative to granite and marble which are comparatively costly. The exports of slate have increased over the years resulting in a boost to slate mining industry in the country. Micaceous and chlorite slates are generally preferred.

OCCURRENCES

The Aravalli Mountain ranges in Rajasthan and Haryana; rock assemblages under Cuddapah System in Andhra Pradesh and Tamil Nadu; and

Himalayan region in Northern India have undergone metamorphism and given rise to the slate deposits along with other metamorphosed products. The availability of slates has been reported from Madhya Pradesh, Haryana, Himachal Pradesh, Jharkhand, Andhra Pradesh, Rajasthan, Uttarakhand, Bihar and Gujarat.

No proper estimation of reserves of slate has been attempted so far. Owing to the increased trade of slate, need for proper reserve estimation for slate is being felt now. However, the Centre for Development of Stones (CDOS), Jaipur, has placed the total all-India reserves of slate at around 500 million tonnes. It is reported that slate for commercial exploitation is located in Kumaon and Garhwal region of Uttarakhand; Mandi, Kangra and Chamba Hills of Himachal Pradesh; Kurnool, Nellore, Guntur and Prakasam districts of Andhra Pradesh; Rewari, Gurgaon and Mohindergarh districts in Haryana; Alwar, Bharatpur, Bhilwara, Bundi, Dausa and Tonk districts of Rajasthan.

PRODUCTION STOCKS & PRICES

Production of slate was nil in 2007-08 as compared to 4 tonnes in the previous year due to lack of demand and closure of mines. There was no reporting mine in 2007-08. The mine-head stocks of slate at the end of the year 2007-08 were 4 tonnes as against 165 tonnes at the beginning of the year. The average daily employment of labour in 2007-08 was nil as against 8 in the preceding year.

Value of production of slate (as dimension stones) increased to Rs.367.6 lakh in 2006-07 from Rs. 262.5 lakh in the previous year (Table-1).

Table -1 : Production of Slate-Dimension Stone, 2004-05 to 2006-07 (By States)

State	2004-05		2005-06		2006-07	
	Quantity	Value	Quantity	Value	Quantity	Value
Andhra Pradesh	100193	24247	68400	18208	83556	24467
Himachal Pradesh	5638	7400	5638	7400	8230	11522
Jammu & Kashmir	-	-	880	83	100	9
Rajasthan	96252	1499	2110	556	3216	757

Qty in tonnes; value in Rs.'000)

MINING AND PROCESSING

Mining of slate is done by opencast method. The slate bands are exposed by removing the overburden by means of drilling and controlled blasting. The mining in many places is carried out by manual means but in some mines, semi-mechanised method of mining is also adopted. After removing a thick slab of slate, preferably of larger size, the slab is split using hammers and specially-made chisels and cutting knives. The saleable tile or slab of slate is obtained in 6 to 10 mm thickness for cladding and 20 to 35 mm thickness for flooring or for panels. The edges are cut manually by using machines to have a smooth and regular edge. The slate as building stone is marketed under the commercial names, such as Golden Copper, Green, Black, Panther, Mica, Speckled, Deoli, Mahi, Silver Grey and Peacock. Peacock is the only premier variety produced in Kund area, Haryana.

The recovery of slate is very low, being a fragile material among all the building/dimension stones. During mining and processing, there is huge accumulation of broken pieces in and around the slate quarry. A proper mining and processing technique by using modern equipment may improve the situation.

USES AND SPECIFICATIONS

There are two main uses or applications of slate as a natural stone in building work: 1) for roofing in the form of roofing tiles, and 2) for flooring in the form of tiles and for cladding purposes.

For roofing tiles, the slate should be exfoliated easily and it should be free from minerals like iron sulphides or carbonates which in time could cause corrosion and staining on roofing tiles. For cladding or flooring purposes, the slate should be able to bear the cutting processes in required sizes, polishing or smoothening process by machines and should not peel off during the process of fixing or laying. Bureau of Indian Standard has laid down Standard IS : 6250-1981 (First revision; reaffirmed 2003) namely, Specification for roofing slate tiles (First revision) in respect of requirement of dimensions, physical properties and workmanship of slate tiles used for sloped roof covering.

2. Sandstone

Sandstone is sedimentary rock largely made up of sand grains in size ranging from 2 mm to 120 mm of varying composition. The sand may consist of grains of quartz, felspar and other detrital minerals with interstitial cementing material. The composition of sand particles and the cementing material, by and large, define the colour of sandstone while the mode of formation decides the thickness of bed which gives rise to various types of sandstones.

The colour of sandstone may range from dark red to brown, earthy to buff, white, yellow and a number of other shades. The pattern of the sandstone depends upon the thickness of bed. Sandstone produced in the country is being marketed as Vindhyan Red, Rainbow, Teak, Modak, Bundi, Bansi Pink, Mandana, Dholpur Cream, etc. The sandstone may occur as massive, thick, non-splittable bands or thin beds or layers that can be split by applying slight pressure.

RESOURCES

The occurrences of sandstone in India are spread over Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Madhya Pradesh, Meghalaya, Mizoram, Karnataka, Orissa, Punjab, Rajasthan, Uttar Pradesh, Tamil Nadu and West Bengal.

The resource estimation has not been considered important because of its abundance and easy availability. Hence, there is no comprehensive inventory of sandstone. However, the Centre for Development of Stones (CDOS), a Government of Rajasthan undertaking, has reported an estimated reserves of sandstone at over 1,000 million tonnes in the country. Huge deposits of sandstone in Rajasthan are associated with Vindhyan and Trans-Aravalli Formations, exposed over an area of nearly 35,000 sq km covering districts of Dholpur, Bharatpur, Karauli, Sawai Madhopur, Tonk, Bundi, Jhalawar, Kota, Bhilwara and Chittorgarh. It is also found scattered in the districts of western desert plane. Splittable sandstone deposits are confined to an area of 16,000 sq km out of which 10,000 sq km lie in eastern and south-eastern Rajasthan and 6,000 sq km in western Rajasthan.

In Gujarat, fine to medium-grained sandstone of varying colours ranging from white, light-purplish,

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reddish-brown, cream to yellow are found in the district of Kachchh. A brownish-yellow sandstone occurs near Chabari and Mainapara in Bhachau tehsil. The sandstone at Rampur, Katada-Roha and Rajoda Dungar near Mangwana in Nakhtrana tehsil is cream coloured and is fairly hard. Extensive deposits are found around Songir, Naswadi, Ghautoli, Namaria and Lachharas in Vadodara district.

The Vindhyan and Satpura Mountains in Madhya Pradesh have vast resources of sandstone. The red, cream and white sandstone are being quarried extensively in Panna and Shivpuri districts and in many areas near Jabalpur.

In Uttar Pradesh, sandstones suitable for making slabs and tiles are located in Agra, Mirzapur, Lalitpur, Allahabad and Sonbhadra districts. The sandstone of Lalitpur district is yellow, light green and maroon and takes good polish. The sandstone in Lalitpur

occurs in Madanpur and Rampura (near Deogarh) areas and is traded under the commercial name Royal Gold, Beach Sand and U.P. Green. The sandstone of Agra occurring in Tatpur area is red and mottled and is used for interior as well as exterior flooring and cladding. In Mirzapur and Sonbhadra areas, good quality buff to pale and creamish sandstone is available.

The felspathic sandstone occurring with the coal seams as overburden is also used as building stone. The Kamthi Sandstone occurring in and around tehsil Saoner, district Nagpur in Maharashtra, is being quarried in huge quantities and is used as building stone.

EXPLORATION & DEVELOPMENT

The DMG, Rajasthan, has carried out exploration for sandstone. The details of exploration are given in Table -2.

Table - 2 : Details of Exploration Activities conducted by DMG, Rajasthan for Sandstone, 2006-07 and 2007-08

District	Location/ Area	Mapping		Drilling		Sampling (No.)	Remarks/ Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage (m)		
2006-07							
Dholpur	Kankrai, Totpura, Ubasar, Khidarpur of Tehsil Bari	1:50,000 1:10,000 1:3,600	15 2.5	-	-	30	About 39.6 million tonnes of sandstone resources estimated.
Jodhpur	Tambriya kalan, Bandra, etc.	1:10,000 1:2,000	20 1	-	-	34	Isolated sandstone outcrops identified.
2007-08							
Jodhpur	Gopalsar, Utambar Ini Nadi	1:50,000 1:10,000 1:2,000	200 10 2	-	-	24	Reserve not estimated
Dholpur	N/v Dhanera Barauli, , Bhatikra, etc.	1:50,000 1:10,000 1:3,600	15° 15 2.05	-	-	25	About 26 million tonnes of sandstone resources estimated
Barmer	Trisulia Nausar, etc.	1:50,000 1:10,000 1:2,000	350 30 5	-	-	15	Up to 30 m thick sandstone bed demarcated in Trisulia exposed over 0.4 sq km area.
Jhalawar	N/v Borkheri, Talah-bhalti, Garra, etc.	1:50,000 1:10,000 1:2,000	200 10 2	-	-	24	About 9,625 million tonnes resources of sandstone estimated.
Baran	N/v Benta and Rajpur of tehsil Shahbad	1:50,000 1:10,000 1:4,000	150 10 0.5	-	-	2	About 3 million tonnes of sandstone resources estimated.

PRODUCTION

Data on production of sandstone are not available. However, Rajasthan may be producing about 90% of sandstone in the country used for building purposes and as road metal along with quartzite. Production value of quartzite and sandstone as available is given in Table-3.

Table - 3 : Production Value of Quartzite & Sandstone* 2004-05 to 2006-07 (By States)

State	(In Rs.'000)		
	2004-05	2005-06	2006-07(p)
India	6481887	5403806	5212994
Rajasthan	5390014	4708625	4397667
Chhattisgarh	394605	231517	277083
Madhya Pradesh	201042	154413	224894
Jharkhand	179761	179761	179761
Bihar	114326	114326	114326
Andaman & Nicobar	7538	10969	13295
Himachal Pradesh	500	500	3235
Nagaland	1193	1193	1193
Mizoram	740	740	740
Maharashtra	158980	1462	500
Orissa	230	230	230
Arunachal Pradesh	70	70	70
Sikkim	4279	-	-
Jammu & Kashmir	28609	-	-

Source: State Governments

* Used for purposes of building or for making road metal and household utensils.

The intensive quarrying activities in Rajasthan are in the districts of Bharatpur, Sawai Madhopur, Karauli, Tonk, Bundi, Jhalawar, Kota, Bhilwara, Chittorgarh, Jodhpur, Nagaur and Bikaner. The red and blue Lower Bhander Sandstones which are exposed over a large area of about 5,000 sq km in south-eastern Rajasthan, covering Kota, Bundi, Bhilwara, Chittorgarh districts is quarried at a number of places, important ones being Bijolia, Barisal, Navanagar, Banio-ka-Talab in Bhilwara district and Dabi, Budhpura, Umarthan in Bundi district. The splittable sandstone areas are Bhanpura, Rajpura, Kasara, Chobe-ki-Guwari, Mokanpura, Berda and Bhakri in Karauli district. Other important areas of sandstone quarrying in Dholpur, Bharatpur and Sawai Madhopur districts are Sar Mathura, Bari Baseri, Hindon, Sapatra, Masalpur, Roopwas and Band-Barolla. In other districts, important places are Fidusar, Sursagar, Mandor and Balesar (Jodhpur district) and Chhoti and Badi Khatau (Nagaur district).

MINING & PROCESSING

Mining of sandstone is generally done manually by using hammers and chisels of various shapes. At the first stage, the overburden is removed which is in the form of soil, rubble or non-splittable sandstone. The hard non-splittable sandstone is drilled and blasted to expose the underlying splittable sandstone. But, with the advent of sandstone cutting and polishing machines, this operation is also executed carefully to obtain Khandas and blocks for further processing in the form of slabs.

In conventional mining, advantage of the natural vertical joints present in the range from 0.6 m to 60 m, is taken. The initial quarrying starts from these joints. After making the initial cut, blocks having 1.2 m width, 3 to 4 m length and thickness up to the nearest cleavage plane are removed.

In absence of joints, a 'jhiri' is opened in a line by drilling closely spaced (about 15 cm apart) oblong or eye-shaped holes (duggis) of about 8 to 10 cm depth and the eye-shaped steel wedges (Gullas) are hammered in these holes by expert miners. The continuous hammering develops a crack along the holes. The mining starts from these blocks. The required length and width of the slab to be obtained is marked and cut accordingly using the same technique of wedging. The splitting of individual slab is carried out using natural bedding plane by inserting sharp wedges or by hammering alone.

The majority of quarry owners produce hand-dressed slabs and tiles in different thicknesses. But, in the present export market, machine-cut tiles are in demand. Presently, the simple edge cutting machines with single or double cutters are used for getting machine-cut tiles. The further requirement of tiles in 10 to 12 mm thickness with one side natural and other calibrated has resulted in establishing cutting and polishing units of sandstone. In Rajasthan, there are four units engaged in the production of polished sandstone tiles measuring 30 x 30 x 1 cm and 40 x 40 x 1.2 cm. The sandstone is also exported with natural, honed and polish-finishes. BIS has prescribed IS:3622-1977 (First Revision, reaffirmed 2003) as the specifications for sandstone slabs and tiles.

3. Dimensional Limestone

The limestone which is used as a dimension stone differs from the limestone used for cement making or for any other industrial purpose in two ways: firstly chemical composition and secondly the mode of occurrence. In both the types, the major constituent is calcium carbonate but very high silica content gives limestone sufficient hardness to be utilised as dimension or building stone. The industrial limestone occurs as massive formation with less intercalations while in case of dimensional limestone, thin-bedded deposits are preferred. Limestone which is compact and amorphous in texture is known as flaggy or splittable limestone and is quarried in the form of thin slabs ranging in thickness from 12 mm to 50 mm in ready-to-use form.

Limestone has been used since ancient times for construction of houses, flooring and for various other building purposes. In recent times, the use of limestone has increased manifold mainly in interior flooring, cobble stones and for decorative purposes in combination with other stones because of its various colours and shades. Depending upon the place of origin of limestone and its colour, various types of nomenclatures have been used in the trade for limestone, such as, Cuddapah Stone, Shahabad Stone, Kota Stone with different shades and colours (Kota Blue, Kota Brown, etc.), Kutch Stone, Milliolic Limestone, etc.

OCCURRENCES

The occurrences of dimensional limestone have been reported from various states, such as, Shahabad Stone of Bijapur, Gulbarga and Belgaum districts in Karnataka; and 'Cuddapah Stone' of Kurnool, Anantpur and Guntur districts and 'Tandur Stone' of Cuddapah district, Andhra Pradesh, etc. Other coloured well-known limestones are from Betamacherla, Tadipatri, Macherla, Nereducherla and Muddimanikyam. 'Milliolic Limestone' from Saurashtra region, 'Yellow Limestone' of Kachchh district of Gujarat, 'Kota Limestone' of Kota district and 'Yellow

Limestone' of Jaisalmer district, Rajasthan are the other prime localities of limestone occurrences in India.

Rajasthan is endowed richly with the occurrence of greenish-grey 'Kota' limestone. The Kota stone has gained tremendous popularity and is widely used for flooring and cladding purposes. The important deposits of limestone are in Kota, Jhalawar, Chittorgarh and Jaisalmer districts, Rajasthan. Kota, Jhalawar, and Chittorgarh are the major producing districts of the dimensional limestone in the State. Extensive limestone deposits are found in the Upper Stage of the Lower Vindhyan, represented by limestone which has a good potential as cement-grade limestone as well as flooring stone. Certain portions of the limestone having splittable form are used extensively as flooring stones. The limestone occurs in a north-south belt from Dalla-ka-Khera to Nimbahera and extends into Madhya Pradesh, covering a distance of about 70 km. It is fine-grained, thinly bedded and has a total thickness of about 150 m. At a few places, the major portion of the limestone deposit is suitable for cement making but there are pockets containing splittable forms that can be used for building and flooring purposes directly.

Yellow limestone deposits of Jaisalmer: The yellow limestone of Jaisalmer is of Jurassic age and is found at Jaisalmer, Bada Bag, Mool Sagar and Kanod villages. It contains 42 to 51% calcium oxide and has thickness of about 3 m. It is quarried in the form of blocks and can be sawed into slabs and tiles. It is also termed as yellow marble as it takes reasonably good polish.

Flaggy limestone deposits of Jhalawar and Ramganjmandi, Kota area: It belongs to Lower Vindhyan Group and is available in plenty at Sarola Kotri Chitawa and Khokhriya-Khurd. Extensive deposits are available near Ramganjmandi, Aroliya and Parolia areas. Ramganjmandi and Jhalawar Road are the main railway stations from where the splittable limestone produced is dispatched to various parts of the country. In the last few years, export market of this limestone which is popularly known as 'Kota Stone' has also been developed.

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This stone has a bright future and its demand can be increased manifold by adopting proper mining, processing and marketing techniques.

EXPLORATION & DEVELOPMENT

Details of exploration activities conducted for dimensional limestone during 2006-07 and 2007-08 are furnished in Table-4.

Table - 4 : Details of Exploration Activities for Dimensional Limestone, 2006-07 and 2007-08

Agency/ State/ District	Location/ Area	Mapping		Drilling		Sampling (No.)	Remarks/ Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage (m)		
2006-07							
DMG, Rajasthan							
Jaisalmer	N/v Pithla	1:10,000 1:2,000	15 3	-	-	-	Deposits of limestone suitable for flooring identified.
MECL Limestone							
Kolasib	Saipum block	1:1,000	0.12	-	-	-	Shell limetone occurring in the the area is found suitable for manufacturing of polished slabs/ tiles. A total of about 0.21 million tonnes resources were estimated.
2007-08							
DMG, Rajasthan							
Bundi	N/v Murjadpura Narayanpura	1:50,000 1:10,000	150 10	-	-	12	Estimated 2.6 million tonnes resources of limestone suitable for flooring and 1.04 million tonnes of cement grade. Besides about 22.5 million tonnes resources of sandstone were also estimated.
Jaisalmer	N/v Hansu-ki- Dhani, Soro-ki- Dhani, etc.	1:10,000 1:2,000	15 3	-	-	-	Limetone deosits suitable for its use as building stone were identified.

MINING AND PROCESSING

The mining methods as well as the processing of limestone have changed in the last 15 to 20 years but there is still scope for improvement in mining techniques. Simultaneously, the handling of waste and utilisation of waste rock is equally essential.

The mining of Kota Stone is carried out by opencast manual methods. Semi-mechanised method is also adopted. The Kota Stone strata are found in the form of natural thickness ranging from 12 to 150 mm or even more. The mined out slabs are cut to size by using hammer and chisel. Diamond saws are used to cut the tiles in required thicknesses and measurements. Tiles of Kota Stone are available in various sizes and thicknesses to suit the requirement of various building projects. Data on production of limestone is furnished in Table-5.

**Table - 5 : Production Value of Limestone*
2004-05 to 2006-07
(By States)**

State	(Value in Rs' 000)		
	2004-05	2005-06	2006-07(p)
India	623709	3226719	3395253
Rajasthan	298236	2791789	2828289
Chhattisgarh	157954	180681	308590
Gujarat	90310	153492	146665
Jammu & Kashmir	31369	41714	58425
Meghalaya	4808	26784	26784
Andhra Pradesh	16893	24219	20250
Karnataka	9486	4500	4500
Madhya Pradesh	14653	3540	1750

Source: State Governments

* Used in kilns for manufacture of lime to be used as building material.

USES & SPECIFICATIONS

Application of Kota Stone ranges from interior flooring, wall cladding to exterior use for paving and facades for building of all kinds and types.

Massive, dense and fine-grained varieties are generally durable as these are not porous. These are tough and have a crushing strength of 17.8 kg/mm² and a high compressive strength of over 2189 kg/cm². Abrasion value of Kota Stone is 18.12 to 18.32 and has a high resistance to delamination and failure under freezing and thawing conditions. The Kota Stone has a natural split non-slip surface. Bureau of Indian Standards has adopted Specification for Limestone (Slab & Tiles) (First revision) as IS : 1128 - 1974 (First Revision, reaffirmed 2003).

4. Other Dimensional Stones

In addition to the dimension stones already described, other dimension stones are being quarried and used for the construction of houses and other building purposes.

In Orissa, Karnataka, Goa and in parts of coastal states, laterite is quarried in huge quantities. It is utilised as bricks in the construction of houses and pavements.

Huge deposits of basalt in Maharashtra, Karnataka and Gujarat are used as building stones since ancient times.

Quartzite bands occurring along with phyllite schists are also utilised for building purposes.

In addition, stone aggregates, such as broken and sized pieces of limestone, dolomite, quartzite and sandstone are mixed either with cement for building and road-making purposes or with asphalt for mending road. To utilise the huge waste generated

during mining and processing, a new variety of man-made stone "Terrazo" has been developed, which is composed of stone chips set in cement, epoxy or polyacrylate and then polished. The Terrazo is an economical alternative to solid marble slabs or tiles.

5. Felsite

Felsite is a fine, evenly grained acid or intermediate igneous rock, usually occurring as dykes and veins in country rocks and in the parent plutonic mass. BIS has prescribed the specification IS:10874-1983 (reaffirmed 2000) for felsite grinding media and liner stones.

The production of felsite decreased to 200 tonnes in 2007-08 as compared to 642 tonnes in the previous year due to shortage of labour. There were 3 reporting mines during the year under review as against 5 in the previous year. Two producers operating 3 mines accounted for the entire production of felsite during the year. All the three reporting mines are located in Mysore district of Karnataka (Tables - 6 to 8).

The mine-head stock of felsite at the end of the year 2007-08 was 1,938 tonnes as against 2,116 tonnes at the beginning of the year (Table-9).

The average daily employment of labour was 16 in 2007-08 as against 35 in the previous year.

Table - 6 : Producers of Felsite, 2007-08

Name and address of producer	Location of mine	
	State	District
B.C. Muddumadappa, New Mysore Industries, 196, 3 rd Cross, 6 th Block, Jayanagar, Bangalore, Karnataka.	Karnataka	Mysore

**Table - 7 : Production of Felsite, 2005-06 to 2007-08
(By State)**

(Qty. in tonnes; value in Rs. '000)

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	981	838	642	790	200	400
Karnataka	981	838	642	790	200	400

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**Table - 8 : Production of Felsite, 2006-07 & 2007-08
(By Sector/States/Districts)**

(Qty in tonnes; value in Rs.'000)

State/District	2006-07			2007-08(p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	5	642	790	3	200	400
Private sector	5	642	790	3	200	400
Karnataka	5	642	790	3	200	400
Mandya	1	51	15	0	0	0
Mysore	4	591	775	3	200	400

**Table - 9 : Mine-head Stocks of Felsite, 2007-08 (p)
(By State)**

(In tonnes)

State	At the beginning of the year	At the end of the year
India	2116	1938
Karnataka	2116	1938

TRADE POLICY

As per the export-import policy announced for the period 2004-09; and the Foreign Trade Policy as amended with effect from 1st April 2008, the imports of slate blocks or slabs whether or not roughly trimmed or merely cut are restricted under heading no. 2514. On the other hand, worked slate and articles thereof or of agglomerated slate can be imported freely under heading no. 6803.

Import of crude or roughly trimmed/cut blocks or slabs of sandstone and other monumental or building stones; viz, Pakur Stone, stone boulders, and others, are restricted under heading no. 2516. However, sets of curb stones and flagstones of natural stone (except slate), under heading no. 6801 and worked monumental building stone (including slate) tiles, cubes and similar articles, under heading no. 6802 can be imported freely provided the c.i.f. value of items, under heading no. 6802 is US \$ 2700 and above per cu m.

WORLD REVIEW

Resources of slate and other dimension stones are substantial in the world. Spain was the major exporting country for dimension stones

in the world. Other important exporters of slate were China, Italy, India, Spain and Brazil. Major importers of slate were Germany, UK, USA and France.

FOREIGN TRADE

Exports

Exports of building and monumental stones (NES) decreased to 0.98 million tonnes in 2007-08 from 1.06 million tonnes in 2006-07. Quantitywise, Maldives was the leading buyer sharing 26% in the total exports, followed by Bangladesh (17%) and UK (9%). Valuedwise, USA was the leading buyer, contributing 21% to total value of exports, followed by UK (19%) and Maldives (6%) (Table - 10).

In 2007-08, the total exports of slate also decreased to 170 thousand tonnes from 196 thousand tonnes in 2006-07. Out of the total exports of slate during 2007-08, about 27,448 tonnes were of slate (worked) while the bulk of the exports i.e. 143,000 tonnes were of slate (others). The USA was the leading buyer, accounting for over 56% value of the total slate exported followed by Canada (8%) and UK (6%) (Tables - 11 to 13).

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In 2007-08, the exports of sandstone increased to 1.22 million tonnes from 1.13 million tonnes in the previous year. The UK was the leading buyer in 2007-08 with 47% of the total value of sandstone exported followed by Belgium, Italy and Ireland (5% each) (Table - 14).

Imports

During 2007-08, imports of building & monumental stones (NES) increased to 2.09 million tonnes from 1.95 million tonnes imported in the previous year. Nepal was the leading supplier contributing 59% to the total value of imports followed by Bangladesh (26%).

Imports of slate during 2007-08 were nominal at 16 tonnes as compared to 19 tonnes in 2006-07. There were no imports of sandstone in 2007-08 (Tables - 15 to 17).

Table - 10 : Exports of Building and Monumental Stones, NES (By Countries)

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	1055825	3373599	978346	4527245
USA	72634	945977	74857	963270
UK	46163	398257	89099	853762
Maldives	301004	240339	252848	250724
Belgium	25758	131649	46666	233095
Italy	8948	80509	23074	224145
UAE	8836	110314	16981	171967
Germany	10903	88555	17442	159378
Australia	7625	126059	14905	148996
Spain	7377	111437	11037	129600
Bangladesh	478744	361871	161466	71887
Other countries	87833	778632	269971	1320421

Table - 11 : Exports of Slate (By Countries)

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	195957	2350410	170448	2110100
USA	82255	1269390	78848	1173378
Canada	16008	191124	13816	176118
UK	26265	211677	14517	134262
Australia	7788	80094	7847	83483
South Africa	11057	127689	7158	77081
Netherlands	5912	38148	6955	52431
Spain	4461	47315	3419	40630
Belgium	4846	43670	3506	35889
Malaysia	5812	42294	4499	33860
Italy	1134	18177	2654	29623
Other countries	30419	280832	27229	273345

Table - 12 : Exports of Slate (Others) (By Countries)

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	139678	1320652	143000	1480145
USA	45949	587438	63388	784053
Canada	11570	111215	11365	121003
UK	23108	159955	13376	105281
South Africa	9124	95775	6528	65697
Australia	6026	53479	6897	65660
Netherlands	5456	30583	6565	47609
Malaysia	5508	38059	4467	33263
Spain	3462	30416	2669	27760
Belgium	3565	19451	2517	20430
UAE	3924	25567	1624	13037
Other countries	21986	168714	23604	196352

SLATE, SAND STONE & OTHER DIMENSION STONES

**Table - 13 : Exports of Slate (Worked)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	56279	1029758	27448	629955
USA	36306	681952	15460	389325
Canada	4438	79909	2451	55115
UK	3157	51722	1141	28981
Australia	1762	26615	950	17823
Belgium	1281	24219	989	15459
Italy	689	13127	867	13456
Germany	383	9254	483	13303
Spain	999	16899	750	12870
South Africa	1933	31914	630	11384
France	756	15776	335	7858
Other countries	4575	78371	3392	64381

**Table - 14 : Exports of Sandstone
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	1132910	6006621	1217781	6867992
UK	548740	2893736	604132	3246900
Belgium	79208	302013	80132	365848
Italy	53604	331359	58268	354836
Ireland	43801	289350	54850	337786
Germany	66221	260032	44387	266380
UAE	58200	297855	31753	221698
USA	29895	200526	24284	209405
France	37485	161576	39414	199372
Spain	18724	157329	23277	167329
South Africa	20589	192654	13851	108772
Other countries	176443	920191	243433	1389666

SLATE, SAND STONE & OTHER DIMENSION STONES

**Table - 15 : Imports of Building and Monumental Stones, NES
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	1953299	577812	2089255	684053
Nepal	1815484	342420	1891833	400585
Bangladesh	134057	132860	189800	179700
Greece	-	-	242	25814
China	721	16584	1397	23468
France	68	958	579	23432
Italy	1521	31153	304	6291
Spain	11	1094	68	5119
USA	27	4449	244	2344
Oman	211	6587	-	-
Sri Lanka	150	9062	-	-
Other countries	1049	32645	4788	17300

**Table - 16 : Imports of Slate
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	19	4221	16	2966
China	++	87	11	1992
Germany	++	18	2	511
Thailand	-	-	1	196
Hong Kong	-	-	++	8
France	10	1634	-	-
Korea, Rep. of	9	2238	-	-
UAE	++	139	-	-
USA	++	105	-	-
Unspecified	-	-	2	259

SLATE, SAND STONE & OTHER DIMENSION STONES

**Table - 17 : Imports of Sandstone
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	8	89	-	-
Thailand	++	8	-	-
UK	8	81	-	-

FUTURE OUTLOOK

Slate is mostly used as roofing material, but other uses like cladding and flooring tiles are also gaining momentum. Slates occur widespread in the country but no detailed study is conducted to quantify the resources. About 80% production of slate in the country was exported whereas remaining 20% is consumed in the domestic market.

India has abundant resources, technical know-how, large quarrying base and processing capacity and can safely ensure export growth @20% per annum during the XIth plan period.

Dimension stone industry has to gear up to meet the increasing demand for exports as well as for domestic consumption in foreseeable future. India is having great export potential as well as large domestic market.

The demand for artifacts specially carved work is on the rise the world over. India with its rich tradition of craftsmanship and trained artisans can embark upon the world scene.

It is proposed in XIth plan document to set up a National Stone Technological Upgradation and Development Funds for sustainable developments of Indian dimensional stone sector by imposing access of 2% of the royalty payable by quarry owners for marble, granite, sandstone, slate, flaggy limestone/dimensional limestone and quartzite.

Improved quarrying, finishing and hauling technology, availability of greater variety of stones and the rising cost of alternative construction materials are among the factors that suggest a continuing increase in demand for dimension stones in future.