

# 66 Quartz & Other Silica Minerals

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The term 'quartz' is often referred to as a synonym for silica. Silica ( $\text{SiO}_2$ ) is one of the ubiquitous materials in the earth's crust. Quartz, quartz crystals, quartzite, silica sand, sand (others) and moulding sand are all coined together in one generic name 'silica minerals'. This is because all these commodities are essentially crystalline silicon dioxide ( $\text{SiO}_2$ ) with variations mostly related to their crystalline structure and presence of minor or trace impurities. Silica occurs in several forms giving rise to different varieties.

## Crystalline Varieties

The important varieties of crystalline quartz are vein quartz (massive crystalline quartz); milky quartz (white, translucent to opaque); ferruginous quartz (containing brown limonite and red haematite and almost opaque); aventurine quartz (containing glistening flakes of mica or haematite); cat's eye (opalescent greenish quartz with fibrous structure); rock crystal (clear, colourless, well-crystallised transparent quartz); amethyst (clear-purple or violet-blue), transparent quartz; rose quartz; smoky quartz; etc. Occurrences of massive crystalline quartz in veins or pegmatites have been recorded in almost all the states.

## Clastic or Granular Varieties

These varieties include sand consisting largely of unconsolidated quartzose grains (0.06 mm to 2 mm diameter), gravel consisting of largely unconsolidated coarse quartzose grains or pebbles (2 mm to 8 mm in diameter), sandstone and quartzite. The occurrences are reported from Andhra Pradesh, Bihar, Delhi, Haryana, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Tamil Nadu, Uttar Pradesh, etc. The silica sand from Naini area in Allahabad district, Uttar Pradesh is of a very high quality.

## Cryptocrystalline Varieties

This group includes chalcedony, agate, jasper, onyx, flint and chert. These varieties appear noncrystalline (amorphous) in hand specimens, but under microscope show double refraction which reveals their concealed crystalline nature. These varieties are reported from Gujarat, Uttar Pradesh, Tamil Nadu, Andhra Pradesh, Maharashtra, Madhya Pradesh, Karnataka and Punjab. The most important occurrences of agate are in Ratnapur, Rajpipla area and

further west between Tapi and Narmada rivers in Bharuch district, Gujarat, where it is found as pebbles in varying sizes associated with clay washed down with the river flow. Other occurrences of economic importance are reported from Amravati, Aurangabad, Buldhana, Chandrapur, Nashik and Pune districts in Maharashtra; beds of Krishna and Godavari rivers in Andhra Pradesh; Dumka district in Jharkhand; Dhar, Mandasaur, Sihore and Shahdol districts in Madhya Pradesh; and Kachchh district in Gujarat.

## RESOURCES

As per the UNFC system as on 1.4.2005, the total resources of quartz and silica sand in the country are estimated at 3,238 million tonnes out of which 24% i.e. 771 million tonnes are placed under reserves category while 76% i.e. 2,467 million tonnes are placed under remaining resources category. Resources of foundry and moulding grades are 20%, glass grade 10%, ceramic & pottery grade 10% and ferro-silicon grade 6%. About 53% resources are of unclassified, others and not known grades. Haryana alone accounts for about 56% resources, followed by Rajasthan (8%), Jharkhand (5%), Maharashtra (5%), Tamil Nadu (5%), Andhra Pradesh (5%), Kerala (4%), Gujarat (3%), Uttar Pradesh (3%), Karnataka (2%) and Orissa (2%) (Table - 1).

The total resources of quartzite in the country as per the UNFC system as on 1.4.2005 are estimated as 1,145 million tonnes of which reserves are about 99 million tonnes (about 9%) and remaining resources are 1,046 million tonnes (about 91%). Bulk resources of about 54% are located in Haryana followed by Bihar (24%), Punjab (7%), Orissa (5%) and Jharkhand (3%). Resources of refractory grade are 26%, ceramic & pottery grade 19% and BF grade 6%. Remaining 49% resources are of low, unclassified, others and not known grades (Table - 2).

## EXPLORATION & DEVELOPMENT

Exploration for quartz and silica minerals was conducted by DMG, Rajasthan, Haryana, Jharkhand, DGM, Maharashtra, DMM, West Bengal, CGM, Gujarat and DG, Orissa. Details of exploration carried out for quartz and other silica minerals during 2006-07 and 2007-08 are given in Table - 3(A) and Table - 3 (B), respectively.

QUARTZ & OTHER SILICA MINERALS

**Table – 1 : Reserves/Resources of Quartz and Silica Sand as on 1.4.2005**  
(By Grades/States)

(In '000 tonnes)

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						
<b>All India : Total</b>	<b>271614</b>	<b>190580</b>	<b>309314</b>	<b>771508</b>	<b>2618</b>	<b>134965</b>	<b>152072</b>	<b>55566</b>	<b>251843</b>	<b>1869517</b>	<b>123</b>	<b>2466703</b>	<b>3238211</b>
<b>By Grades</b>													
Glass	65516	17065	52808	135390	183	10142	12007	2340	1682	164197	100	190651	326041
Ferrosilicon	33704	4434	23751	61889	-	8845	2924	28	65589	44553	-	121940	183829
Sodium silicate	2357	533	7225	10115	-	1186	20	-	146	31810	-	33162	43277
Ceramic and pottery	74084	2018	68995	145097	-	17850	26636	6334	9958	122660	-	183439	328536
Foundry and moulding	77282	27314	43536	148132	1728	26778	107155	15161	32080	305281	-	488184	636315
Abrasive	2454	112	427	2993	-	-	-	-	-	815	-	815	3807
Others	926	992	56720	58638	399	61494	274	-	1860	865694	-	929722	988360
Unclassified	11924	137285	37052	186261	-	4714	1113	31704	46221	188443	17	272213	458474
Not known	3369	826	18800	22994	307	3955	1941	-	94307	146063	6	246579	269573
<b>By States</b>													
Andhra Pradesh	43626	7717	33112	84455	22	959	5114	5924	1502	55840	100	69461	153916
Assam	-	-	-	-	-	-	-	-	-	1790	-	1790	1790
Bihar	-	-	-	-	-	-	-	-	-	23378	-	23378	23378
Chhattisgarh	424	-	304	727	-	-	457	-	-	282	-	739	1466
Goa	-	-	-	-	-	20	1736	-	-	18248	-	20004	20004
Gujarat	26367	3111	21964	51442	-	2442	7708	2144	2999	30017	-	45311	96753
Haryana	196	138259	129444	267900	307	114776	96071	27839	46300	1257938	-	1543231	1811131
Himachal Pradesh	-	-	-	-	-	-	-	428	-	2500	-	2928	2928
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	3110	-	3110	3110
Jharkhand	7213	980	6222	14414	1615	941	1223	64	758	135745	6	140352	154766
Karnataka	15276	3464	13582	32321	305	1504	1829	80	80	44397	17	48211	80532
Kerala	864	765	749	2379	-	1626	1753	14611	31419	76350	-	125759	128138
Madhya Pradesh	106	11	35	152	-	-	75	47	316	2195	-	2634	2786
Maharashtra	32650	5037	27937	65624	-	524	29079	-	355	52624	-	82581	148205
Meghalaya	-	-	-	-	-	-	-	-	177	6906	-	7083	7083
Orissa	907	502	990	2399	167	96	-	-	63077	4022	-	67362	69761
Punjab	-	-	-	-	-	-	-	-	2550	1377	-	3927	3927
Rajasthan	103741	11668	65736	181145	161	5351	3964	66	167	69181	-	78890	260035
Tamil Nadu	33910	433	6054	40398	-	4476	73	3387	95837	26828	-	130601	170998
Tripura	-	-	-	-	-	-	-	326	-	164	-	490	490
Uttar Pradesh	6095	18621	2275	26991	40	2248	2992	652	6307	51421	-	63659	90650
West Bengal	239	11	912	1162	-	-	-	-	-	5203	-	5203	6365

Figures rounded off.

QUARTZ & OTHER SILICA MINERALS

**Table – 2 : Reserves/Resources of Quartzite as on 1.4.2005  
(By Grades/States)**

(In '000 tonnes)

Grade/State	Reserves				Remaining resources						Total resources (A+B)	
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333		Total (B)
		STD121	STD122			STD221	STD222					
<b>All India</b>	<b>26419</b>	<b>26051</b>	<b>46074</b>	<b>98544</b>	<b>801</b>	<b>90774</b>	<b>96281</b>	<b>91089</b>	<b>111326</b>	<b>656142</b>	<b>1046413</b>	<b>1144957</b>
<b>By Grades</b>												
Refractory	3480	5845	10711	20036	-	926	97	3888	24922	247678	277511	297547
Ceramic/pottery	18949	4478	28670	52098	48	35206	39799	-	-	91003	166057	218155
Low	1000	3730	1007	5737	-	34	13	-	-	8458	8505	14242
Ferro silicon	-	1728	376	2104	-	-	-	-	-	-	-	2104
BF	-	834	2067	2901	-	18	-	197	275	63117	63606	66507
Others	701	396	1186	2283	153	316	145	53	-	75232	75899	78181
Unclassified	2289	7750	2057	12096	600	48034	54147	66016	54999	126151	349947	362043
Not known	-	1290	-	1290	-	6240	2080	20935	31130	44503	104888	106178
<b>By States</b>												
Andhra Pradesh	3300	3496	7187	13982	-	-	2	-	-	4586	4588	18570
Arunachal Pradesh	-	-	-	-	-	-	-	-	-	5270	5270	5270
Bihar	16	6114	12084	18213	-	-	-	3118	22306	227568	252992	271205
Chhattisgarh	3402	4142	4121	11664	-	-	-	-	-	14688	14688	26353
Haryana	15702	-	16200	31902	-	89742	96165	86951	85333	231887	590078	621980
Himachal Pradesh	95	-	39	134	48	-	-	-	-	-	48	182
Jammu & Kashmir	-	1112	-	1112	-	-	-	-	-	-	-	1112
Jharkhand	409	-	416	825	-	-	-	197	275	38934	39405	40230
Karnataka	43	-	680	724	-	-	-	-	-	393	393	1116
Madhya Pradesh	-	-	-	-	-	-	-	-	-	832	832	832
Maharashtra	4	28	43	75	-	-	-	-	-	17	17	92
Orissa	3263	11160	4075	18498	753	1014	114	823	234	36534	39473	57971
Punjab	-	-	-	-	-	-	-	-	3178	78734	81912	81912
Rajasthan	185	-	104	289	-	18	-	-	-	706	724	1013
Sikkim	-	-	1125	1125	-	-	-	-	-	15994	15994	17119

Figures rounded off.

QUARTZ & OTHER SILICA MINERALS

Table – 3(A) : Details of Exploration Activities for Quartz, Quartzite and Silica Sand, 2006-07

Mineral/ Agency/ State/District	Location	Mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Boreholes	Meterage		
<b>AGATE</b>							
<b>DGM, Maharashtra</b>							
Jalna	Nandi village	1:50,000 1:5,000	35 5	-	-	-	Occurrences of agate located near Math Jalgaon, Bhivandi, Bodka villages.
<b>QUARTZ/SILICA SAND</b>							
<b>DMM, West Bengal</b>							
Purulia	Kaliasota Mahisnadi, P.S. Neturis	1:50,000	4	-	-	5	Reconnoitry Survey of approx. 4 sq km.
-do-	Kultanr Jambad, Maramu, Khatanga, etc.	-	-	-	-	-	Pegmatite bodies of quartz and feldspar located.
<b>DMG, Rajasthan</b>							
Bhilwara	N/V Jitiya, Bhawanipura, Chidhriyas. Kalandia Teh. Kotri	-	-	-	-	-	Quartz width of 5 m to 30 m was exposed over a dissected strike length of about 900 m.
Bharatpur	Gadhaner, Kharwar, etc in Pahari Tehsil.	1:50,000 1:10,000 1:2,000	150 15 1	-	-	24	Estimated 2.58 million tonnes sand resources near village Gadhaner and 2.88 million tonnes near village Karwar.
Dausa	Near villages Bhanwata, Kundal, Guwara, Chobriwala	1:50,000 1:10,000 1:2,000	150 10 1	-	-	30	Tentative resources of silica sand, near village Bhanwata 75 thousand tonnes; N/V Kundal 158 thousand tonnes and Chobriwala village 126 thousand tonnes.
Dungarpur	Near village Sugwara, Bhitura Toposheet No 46 I/2	1:50,000 1:10,000 1:2000	110 6 8.2	-	-	18	Estimated 0.43 million tonnes quartzite and 0.31 million tonnes sand.
Jaisalmer	Near village Lathi, Bhadriya, etc.	1:50,000 1:10,000	150 10	-	-	20	Near village Lathi deposits of silica sand demarcated.
Karuli	Near village Khirkhira, Bariya, Richhoti, Gopalgarh	1:50,000 1:10,000 1:2000	100 10 1	-	-	28	Estimated about 12.5 million tonnes inferred resources of sand out of which about 2.5 million tonnes N/V Khirkhira, 2.5 million tonnes N/V Bariya Richhoti & 7.5 million tonnes N/V Gopalgarh to Dhoreri.
Rajsamand	Near Vill. Swadri, Haliakhed, etc. Bhim & Devgarh Tehsil	1:50,000 1:1000 1:4000	75 5 1.1	-	-	30	Pegmatite bearing area of 1760 m length x 20 m width x 15 m depth was demarcated for quartz and felspar resources. Estimated 0.60 million tonnes quartz & 0.8 million tonnes of felspar.
<b>QUARTZITE</b>							
<b>DMG, Rajasthan</b>							
Alwar	N/V Narka Dhauli, Santhali, etc.	1:50,000 1:10,000	100 10	-	-	30	Estimated 0.76 million tonnes of ferruginous quartzite and one million tonnes of chert resources.
Chhittorgarh	South of village Minana in Manji Ka Gura & Uthail area of	1:50,000 1:10,000 1:2000	100 8 0.5	-	-	-	Quartzite not suitable for refractory grade and hence resources were not estimated.

QUARTZ & OTHER SILICA MINERALS

**Table – 3 (B) : Details of Exploration Activities for Quartz, Quartzite and Silica Sand, 2007-08**

Mineral/ Agency/ State/District	Location	Mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Boreholes	Meterage		
<b>JASPER</b>							
<b>DMG, Rajasthan</b>							
Jalore	N/V Bandi	1:50,000	100	-	-	13	Two jasper veins located.
		1:10,000	10				
		1:2,000	0.5				
<b>QUARTZ/SILICA SAND</b>							
<b>Commissioner of Geology &amp; Mining, Gujarat</b>							
Sabarkantha	Golulpara, Ubhran, Bhuta, Magdo, etc. Malpur & Bayad Taluka	-	-	-	-	-	An area of 54 sq km covered by ground survey. The length of quartz veins extend up to 30 m. Estimated quartz resources of the order of 11.47 million tonnes.
Sabarkantha & Nadiad	Rambhoda, Khata, Dantala, Katkua, Boradia, Maipur & Virpur Taluk	-	-	-	-	-	An area of 50 sq.km covered by ground survey Quartz resources estimated at 11,47 million tonnes.
<b>Directorate of Geology, Jharkhand</b>							
Hazaribagh	Charhi, Amrit Nagar, Silwar Khurd, North of Jatra	1:50,000 1:2000	100 0.35	-	-	6	Estimated 1.684 million tonnes resources of quartz.
Jamtara	Gariyanala, Bodma, Satsal, Bhogikatha, Fatta, etc.	1:50,000 1:2000	42 0.38	-	-	20	-
<b>Directorate of Geology Orissa</b>							
Keonjhar & Mayurbhanj	Kesna, Sialgothani, Nuagaon, Adipur, Neundi	1:50,000	108	-	-	83	Seven quartz bodies were identified.
<b>DMG, Rajasthan</b>							
Alwar	Langarbas, Jestika, Deola, Dothana, etc. Tehsil - Kishangarh Bas.	1:50,000 1:10,000 1:2000	100 10 1	-	-	24	Estimated about 0.82 million tonnes sand resources N/V Jeslika and 3.75 million tonnes N/V Dothana.
Bharatpur	Near village Piruka, Teski, Thekri, Budli & Laban, Tehsil Pahari & Nagar.	1:50,000 1:10,000 1:2000	150 15 1	-	-	33	Estimated about 517 thousand tonnes of silica sand.
Jaisalmer	Near village Khuhra Teh. Pokhran.	1:50,000 1:10,000 1:2000	300 10 2	-	-	20	-

(Contd.)

**QUARTZ & OTHER SILICA MINERALS**

Table - 3 (B) (Concl'd.)

Mineral/ Agency/ State/District	Location	Mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Boreholes	Meterage		
Karauli	N/V Saimarda	1:50,000	200	-	-	51	A total of about 30.3 million tonnes of silica sand resources estimated of which 21.9 million tonnes was estimated in 2007-08
	Garain	1:10,000	20				
	Khirkhira	1:2000	2				
Sirohi	N/V Bhimana	1:50,000	100	-	-	-	Estimated 5 lakh tonnes inferred category quartz resources.
	Sarupganj, etc.	1:10,000	20				
	Pindwara Tehsil	1:2000	1				
Udaipur	Near Village Gurli	1:50,000	200	-	-	-	There are number of pegmatite bodies exposed in the area. Quartz milky in colour & bouldery to fragmented in nature.
	Bombara-Ponundi,	1:10,000	20				
	Tehsil Girwa & Vallabhagar	1:2000	1.5				
<b>DMM, West Bengal</b>							
Purulia	Janipur Mouza (Manbazar)	1:3960	0.08			4	Quartz resources estimated at 1.46 lakh tonnes (upto depth of 20 m).
- do -	Hirapur Mouza	-	-	-	-	12	-
- do -	Kaliasota, Mahisnadi, P.S. Neturis	1:12,500	1	-	-	9	Thin bands of glass sand sandwiched between sandstone layer identified.
<b>QUARTZITE</b>							
<b>DMG, Haryana</b>							
Bhivani	Kalayana, Kheri, Butter					2	Band of ferruginous quartzite demarcated.

## PRODUCTION, STOCKS & PRICES

### Quartz

The production of quartz at 265 thousand tonnes in 2007-08 decreased by 10% as compared to that of preceding year due to non-availability of labour, development work and less demand in the market. There were 51 reporting mines in 2007-08 as against 70 in preceding year. Besides, the production of quartz was also reported from 23 mines as an associated mineral. The share of public sector mines, in the total output was about 2% as against 1% in the previous year. The share of 9 principal producers was about 60% of the total output.

Andhra Pradesh continued to be the major producing State of quartz during the year accounting for 33% of the total production followed by Gujarat 26%, Rajasthan 22%, Jharkhand 9%, Maharashtra 5% and Tamil Nadu 2 percent. These Six states reported 98% of the total production during the year under review (Tables - 4 to 7).

The mine-head stocks of quartz at the end of the year were 110 thousand tonnes as against 94 thousand tonnes in the beginning of the year (Table - 8).

The average daily labour employed in quartz mines in 2007-08 was 595 as against 802 in the previous year. Domestic prices of quartz are furnished in (Table - 9).

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**Table – 4 : Principal Producers of Quartz, 2007-08**

Name & address of producer	Location of mine	
	State	District
Sri Ram Minerals Industries, Post & Village - Kabara, Tonk, Rajasthan.	Rajasthan	Tonk
Suresh kumar Fakirchand Parmar, 38, Vaibhav Society, Godhra, Panchmahal, Gujarat.	Gujarat	Panchmahal
B. Narshimlu, C/O Dolphine Mines, H. No.B3-14, Huda Colony, Chanda Nagar, Hyderabad, Andhra Pradesh.	Andhra Pradesh	Hyderabad
Sheetal Mineral, Main Road, Chandwa, Post- Chandwa-829 203, Dist. Latehar, Jharkhand.	Jharkhand	Latehar
Shri Vijaya Gimpex Mining Pvt. Ltd, Gimpex House, 181 L.C. Street, Chennai-600 001, Tamil Nadu.	Andhra Pradesh	Mahabubnagar
P. V. Ramana Reddy, Pattikonda, Kurnool, Andhra Pradesh.	Andhra Pradesh	Kurnool
D. P. Solanki, C/o D.R.Pandya, Patthar Talawadi, Near Hanuman Mandir, Godhra-389 001.	Gujarat	Panchmahal
Garha Minerals, Habib Nagar, Dr. Ambedkar Marg, Post-Teka-440 017, Dist. Nagpur, Maharashtra.	Maharashtra	Nagpur
Smt. Kusumben Sureshbhai Parmar, 38, Vaibhav Society, Godhra-389 001, Gujarat.	Gujarat	Panchmahal

**Table – 5 : Production of Quartz, 2005-06 to 2007-08  
(By States)**

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>302259</b>	<b>44036</b>	<b>293660</b>	<b>45134</b>	<b>264664</b>	<b>38963</b>
Andhra Pradesh	111981	16719	101504	14440	88180	11749
Bihar	910	86	-	-	-	-
Gujarat	53142	4479	72490	6869	69255	6361
Jharkhand	26610	3447	33103	3588	24487	1852
Haryana	237	24	-	-	-	-
Karnataka	23628	3032	13004	1063	2500	153
Madhya Pradesh	10	++	90	6	1562	94
Maharashtra	8338	997	15076	3388	13442	1648
Orissa	-	-	1600	400	1000	250
Rajasthan	63819	7386	50153	8153	58410	10352
Tamil Nadu	13584	7866	6640	7227	5828	6504

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**Table – 6 : Production of Quartz, 2006-07 and 2007-08  
(By Sectors/States/Districts)**

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

State	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>70(30)</b>	<b>293660</b>	<b>45134</b>	<b>51(23)</b>	<b>264664</b>	<b>38963</b>
Public sector	1	4350	5612	1	4147	5350
Private sector	69(30)	289310	39522	50(23)	260517	33613
<b>Andhra Pradesh</b>	<b>18(7)</b>	<b>101504</b>	<b>14440</b>	<b>16(7)</b>	<b>88180</b>	<b>11749</b>
Khammam	-	-	-	1	-	-
Krishna	2	820	153	2	652	86
Kurnool	1	4460	335	1	14005	1050
Mahaboobnagar	1(4)	23164	3544	(3)	33793	5052
Medak	5	30293	3418	5	13314	1539
Nalgonda	2	9960	1667	1	6120	1102
Nellore	2(3)	4022	1223	3(4)	3174	836
Ranga Reddy	2	5624	668	-	280	35
Visakhapatnam	1	10581	2116	1	9505	1229
Vizianagaram	2	12580	1316	2	7337	820
<b>Gujarat</b>	<b>9</b>	<b>72490</b>	<b>6869</b>	<b>7</b>	<b>69255</b>	<b>6361</b>
Dahod	1	201	26	-	-	-
Panchmahal	8	72289	6843	7	69255	6361
<b>Jharkhand</b>	<b>7(3)</b>	<b>33103</b>	<b>3588</b>	<b>6(3)</b>	<b>24487</b>	<b>1852</b>
Dumka	1	806	97	1	1108	136
Hazaribagh	(1)	2022	247	(1)	604	71
Jamtara	(1)	2114	254	(1)	960	114
Latehar	4(1)	23736	27	4(1)	18605	1056
Ranchi	1	109	2101	-	-	-
Saraikala-Kharsawan	1	4316	863	1	3210	475
<b>Karnataka</b>	<b>4</b>	<b>13004</b>	<b>1063</b>	<b>1</b>	<b>2500</b>	<b>153</b>
Bellary	1	253	25	-	-	-
Tumkur	3	12751	1038	1	2500	153
<b>Madhya Pradesh</b>	<b>1(1)</b>	<b>90</b>	<b>6</b>	<b>2</b>	<b>1562</b>	<b>94</b>
Balaghat	1	80	5	1	1562	94
Chhatarpur	-	-	-	1	-	-
Katni	(1)	10	1	-	-	-
<b>Maharashtra</b>	<b>4</b>	<b>15076</b>	<b>3388</b>	<b>2</b>	<b>13442</b>	<b>1648</b>
Bhandara	3	14599	3318	1	10847	1414
Chandrapur	1	477	69	-	-	-
Nagpur	-	-	-	1	2595	234

(Contd.)

QUARTZ & OTHER SILICA MINERALS

Table – 6 (Concl.d.)

State	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>Orissa</b>	<b>(1)</b>	<b>1600</b>	<b>400</b>	<b>(1)</b>	<b>1000</b>	<b>250</b>
Sundergarh	(1)	1600	400	(1)	1000	250
<b>Rajasthan</b>	<b>16(18)</b>	<b>50153</b>	<b>8153</b>	<b>7(12)</b>	<b>58410</b>	<b>10352</b>
Ajmer	8(8)	22266	3823	2(6)	11983	1955
Alwar	1	1006	201	1	125	25
Bhilwara	1(8)	3842	400	1(5)	996	119
Bundi	-	-	-	(1)	-	-
Rajsamand	(2)	1471	114	-	-	-
Udaipur	2	15	1	-	-	-
Tonk	4	21553	3614	3	45306	8253
<b>Tamil Nadu</b>	<b>11</b>	<b>6640</b>	<b>7227</b>	<b>10</b>	<b>5828</b>	<b>6504</b>
Coimbatore	-	-	-	1	90	27
Dindugul	1	587	499	1	1038	882
Erode	3	896	691	4	242	127
Karur	3	87	74	1	52	22
Madurai	1	372	56	1	177	27
Nammakal	2	4698	5907	2	4229	5419
Salem	1	-	-	-	-	-

\* Figures in parentheses indicate the number of associated mines with kyanite and sillimanite.

**Table – 7 : Production of Quartz, 2006-07 & 2007-08(P)  
(By Frequency Group)**

Production group	(Qty. in tonnes)							
	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
<b>All Groups</b>	<b>70(30)</b>	<b>51(23)</b>	<b>293660</b>	<b>264664</b>	<b>100.00</b>	<b>100.00</b>	-	-
Up to 500	31(12)	23(11)	7550	4688	2.60	1.77	2.60	1.77
501-1000	7(6)	2(6)	9322	5992	3.17	2.26	5.77	4.03
1001-5000	13(10)	13(4)	59397	47686	20.23	18.01	26.00	22.04
5001-10000	11(1)	6	87467	46651	29.76	17.63	55.76	39.67
10001 & above	8(1)	7(2)	129924	159647	44.24	60.33	100.00	100.00

Figures in parentheses indicate the number of associated mines.

QUARTZ & OTHER SILICA MINERALS

**Table – 8 : Mine-head Stocks of Quartz, 2007-08 (p)**  
(By States)

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>93628</b>	<b>109919</b>
Andhra Pradesh	48594	68054
Gujarat	4166	5191
Jharkhand	3107	2363
Karnataka	6053	4607
Madhya Pradesh	250	345
Maharashtra	4737	2024
Orissa	237	1005
Rajasthan	24025	20545
Tamil Nadu	2459	5785

**Table – 9 : Prices of Quartz, 2005-06 to 2007-08**  
(Domestic Markets)

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08(p)
Grade A	Ex-mine L. N. Patti (Tamil Nadu)	825	825	825
Grade B	Ex-mine L. N. Patti (Tamil Nadu)	200	200	200
Grade A	Ex-mine Sungakaranpatti (Tamil Nadu)	1300	1300	1300
Grade B	Ex-mine Sungakaranpatti (Tamil Nadu)	190	190	190
Grade B	Ex-mine Agraharakunnathur (Tamil Nadu)	210	210	210
Grade A	Ex-mine Gudacharry (Tamil Nadu)	1450	1450	1450
Grade B	Ex-mine Gudacharry (Tamil Nadu)	235	235	235
Grade A	Ex-mine Pugambadi (Tamil Nadu)	150	150	150
Grade B	Ex-mine Pugambadi (Tamil Nadu)	130	130	130
90% SiO <sub>2</sub>	Ex-mine basis (Karnataka)	47.70	47.70	47.70
Lump	Ex-mine Godhra (Gujarat)	80	NQ	NQ
I Grade	Ex-mine Ajmer (Rajasthan)	400-450	400	400
II Grade	Ex-mine Ajmer (Rajasthan)	200-250	300	300
III Grade	Ex-mine Ajmer (Rajasthan)	100-125	125	125
Waste	Ex-mine Ajmer (Rajasthan)	70-90	100	100
98.5% SiO <sub>2</sub>	Ex-mine Visakhapatnam (Andhra Pradesh)	85	85	85
80-90% SiO <sub>2</sub>	Ex-mine Basavanagudi (Karnataka)	47.70	47.70	47.70
Snow-white	Ex-mine Rambas (Rajasthan)	315	315	315
Semi-snow-white	Ex-mine Rambas (Rajasthan)	295	295	295
Conglomerated (sub-grade), spotted	Ex-mine Rambas (Rajasthan)	75	75	75
96-98.5% SiO <sub>2</sub> , 6 mm	f.o.r. Visakhapatnam (Andhra Pradesh)	264	264	299
96-98% SiO <sub>2</sub> , 3 mm (Powder)	f.o.r. Visakhapatnam (Andhra Pradesh)	370	370	370
Grade A	Ex-mine MML (Karnataka)	-	500	500
Grade B	Ex-mine MML (Karnataka)	150	150	150
Medium Grade	Ex-mine Jamkanali (Jharkhand)	170	190	190

QUARTZ & OTHER SILICA MINERALS

**Silica Sand**

The production of silica sand at 3,931 thousand tonnes in 2007-08 increased by about 48% over the previous year due to market trend and more demand. Andhra Pradesh the major producing State reported an increase of about 136% in comparison with the previous year due to more production and demand.

During 2007-08, there were 117 reporting mines as against 139 in the preceding year. Besides, the production of silica sand was also reported as an associated mineral by three mines during the year. Ten principal producers accounted for about 70% of the total production. The share of public sector in the total production was 2% in 2007-08, the same as in the preceding year.

Andhra Pradesh, the leading producing state accounted for 55% of the total production during the year followed by Rajasthan(12%), Maharashtra (11%), Gujarat (10%), Jharkhand (3%) and Karnataka 2 percent. The remaining seven percent of production was the contribution of Kerala, Orissa and Tamil Nadu.

About 80% of the total production of silica sand was contributed by 22 mines (including 2 associated mines), each mine producing more than 50 thousand tonnes annually and about 17% by 39 mines, (including one associated mine) each producing five thousand to fifty thousand tonnes. The remaining 3% of the output was contributed by 59 mines, each producing less than 5000 tonnes annually (Tables-10 to 13).

Mine-head stocks of silica sand at the end of 2007-08 were 2625 thousand tonnes as against of 850 thousand tonnes in the beginning of the year (Table-14).

The average daily employment of labour in 2007-08 was 2,325 as against 2,167 in the previous year. Domestic prices of silica sand are furnished in (Table-15).

**Table – 10 : Principal Producers of Silica Sand, 2007-08**

Name and address of producer	Location of mine	
	State	District
Kumaraswamy Silica Mine, Momidi P. O., Chillakur - Mandal, Dist. Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore
Ramesh Kumar, Kutti Mohalla, P. O. Kaman-393 135, Dist. Bharuch, Gujarat.	Gujarat	Bharuch
New India Mineral Industries, 16, Vyapar Bhawan, Himmat Nagar-383 001, Gujarat.	Gujarat	Bharuch
Asha Yadav Nagla Mukrab Teh:Kaman, P.O. Bilong Distt; Bharatpur, Rajasthan.	Rajasthan	Bharatpur
Nishita Mines & Minerals, 6/160, East Street, Gudur, Post - Gudur-524 101.	Andhra Pradesh	Nellore
ESMO Minechem Industry, 255 A-1, Highway Park Aptt., Near Mahalaxmi Hall, Post - Kolhapur-416 003, Dist. Kolhapur, Maharashtra.	Maharashtra	Sindhudurg
Southern Silica Mine C/O P.Shivakumar Reddy 7/105, M.P.Street, P.O. Gudur-524 101, Dist. Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore
Bhavani Minerals P.O. Bhilod-393 135 Dist. Bharuch Gujarat.	Gujarat	Bharuch
Kasarda Co-operative Mining Society, At- Kasarda Taq. - Kankarali, P. O. Kasarda Dist. Sindhudurg, Maharashtra.	Maharashtra	Sindhudurg
Mohamad Sher Khan Pathan Post Sawa-312 613 Taluka- Chittorgarh, Dist. Chittorgarh, Rajasthan.	Rajasthan	Chittorgarh
Maharashtra State Mining Corp. Ltd. C/o Chirag Sanditext Pvt. Ltd. At - Ponda Ghat, CTQ Kankavali, P.O. Ponda Ghat-416 601, Dist. Sindhudurg, Maharashtra.	Maharashtra	Sindhudurg

QUARTZ & OTHER SILICA MINERALS

**Table – 11 : Production of Silica Sand, 2006-07 to 2007-08  
(By States)**

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>2369977</b>	<b>287542</b>	<b>2663289</b>	<b>377887</b>	<b>3931351</b>	<b>414979</b>
Andhra Pradesh	751093	41780	922686	63753	2181564	111315
Gujarat	532933	65345	607261	81186	383349	39876
Jharkhand	56507	19645	119909	34901	111143	32045
Karnataka	123955	12023	147021	19887	89713	8792
Kerala	36449	3414	35928	9221	38552	18298
Madhya Pradesh	850	96	-	-	90	11
Maharashtra	303513	51014	316955	64103	443259	96313
Orissa	20100	4523	17444	3803	8106	2027
Rajasthan	314773	43473	295170	51965	464575	67578
Tamil Nadu	36332	13206	22679	9013	27206	10264
Uttar Pradesh	193472	33023	178236	40055	183794	28460

**Table – 12 : Production of Silica Sand, 2006-07 and 2007-08  
(By Sector/States/Districts)**

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

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>139 (3)</b>	<b>2663289</b>	<b>377887</b>	<b>117 (3)</b>	<b>3931351</b>	<b>414979</b>
Public sector	4	45990	13614	4	74579	18434
Private sector	135 (3)	2616299	3642273	113 (3)	3856772	396545
<b>Andhra Pradesh</b>	<b>38</b>	<b>922686</b>	<b>63753</b>	<b>27</b>	<b>2181564</b>	<b>111315</b>
Kurnool	6	3635	340	4	2487	240
Nellore	32	919051	63413	23	2179077	111075
<b>Gujarat</b>	<b>15 (1)</b>	<b>607261</b>	<b>81186</b>	<b>12 (1)</b>	<b>383349</b>	<b>39876</b>
Bharuch	12 (1)	606811	81119	9 (1)	348920	39003
Kachchh	-	-	-	1	2045	59
Sabarkantha	1	317	51	-	-	-
Surat	1	50	6	1	55	6
Surendranagar	1	83	10	1	32329	808
<b>Jharkhand</b>	<b>1 (1)</b>	<b>119909</b>	<b>34901</b>	<b>1 (1)</b>	<b>111143</b>	<b>32045</b>
Sahibganj	1 (1)	119909	34901	1 (1)	111143	32045

(Contd.)

QUARTZ & OTHER SILICA MINERALS

Table – 12 (Concl.)

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>Karnataka</b>	<b>30</b>	<b>147021</b>	<b>19887</b>	<b>24</b>	<b>89713</b>	<b>8792</b>
Belgaum	3	375	45	2	900	108
Davangere	1	600	45	1	660	50
Gulbarga	6	8210	1301	2	2093	139
Haveri	6	34585	3079	3	23430	880
Udupi	10	77956	13271	11	37470	5460
Uttar Kannad	4	25295	2146	5	25160	2155
<b>Kerala</b>	<b>8</b>	<b>35928</b>	<b>9221</b>	<b>7</b>	<b>38552</b>	<b>18298</b>
Alappuzha	8	35928	9221	7	38552	18298
<b>Madhya Pradesh</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>90</b>	<b>11</b>
Khargone	-	-	-	1	90	11
<b>Maharashtra</b>	<b>16</b>	<b>316955</b>	<b>64103</b>	<b>15</b>	<b>443259</b>	<b>96313</b>
Ratnagiri	5	17562	3803	6	55811	11914
Sindhudurg	11	299393	60300	9	387448	84399
<b>Orissa</b>	<b>1</b>	<b>17444</b>	<b>3803</b>	<b>1</b>	<b>8106</b>	<b>2027</b>
Sundergarh	1	17444	3803	1	8106	2027
<b>Rajasthan</b>	<b>7(1)</b>	<b>295170</b>	<b>51965</b>	<b>10(1)</b>	<b>464575</b>	<b>67578</b>
Alwar	1	6729	908	1	6010	661
Bharatpur	4	201775	26496	6	297636	34957
Bundi	1	58898	17964	1	53712	18799
Chittorgarh	(1)	1650	198	(1)	70662	8325
Dausa	1	26118	6399	1	14640	3587
Karauli	-	-	-	1	21915	1249
<b>Tamil Nadu</b>	<b>7</b>	<b>22679</b>	<b>9013</b>	<b>6</b>	<b>27206</b>	<b>10264</b>
Kanchipuram	4	15630	5483	3	17335	8588
Villupuram	3	7049	3530	2	2117	901
Cuddalore	-	-	-	1	7754	775
<b>Uttar Pradesh</b>	<b>16</b>	<b>178236</b>	<b>40055</b>	<b>13</b>	<b>183794</b>	<b>28460</b>
Allahabad	15	174646	39703	12	180119	28100
Chitrakoot	1	3590	352	1	3675	360

Figures in parentheses indicate the number of associated mines with agate, ballclay, kaolin and steatite.

QUARTZ & OTHER SILICA MINERALS

**Table – 13 : Production of Silica Sand, 2006-07 and 2007-08 (p)**  
(By Frequency Groups)

(Qty. in tonnes)

Production group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
<b>All Groups</b>	<b>139(3)</b>	<b>117(3)</b>	<b>2663289</b>	<b>3931351</b>	<b>100.00</b>	<b>100.00</b>	-	-
Up to 500	25	13	4350	3757	0.16	0.10	0.16	0.10
501 to 1000	9	13	7053	8754	0.26	0.22	0.42	0.32
1001 to 3000	22 (1)	18	49493	38051	1.87	0.97	2.29	1.29
3001 to 5000	11	15	44099	57808	1.66	1.47	3.95	2.76
5001 to 10000	26	15	188889	108240	7.09	2.75	11.04	5.51
10001 to 15000	8	3	100953	43421	3.79	1.10	14.83	6.61
15001 to 25000	11 (1)	14 (1)	243555	299344	9.14	7.61	23.97	14.22
25001 to 50000	11	6	367718	224073	13.81	5.70	37.78	19.93
50001 and Above	16 (1)	20 (2)	1657179	3147903	62.22	80.07	100.00	100.00

**Table – 14 : Mine-head Stocks of Silica Sand, 2007-08 (p)**  
(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>850340</b>	<b>2625317</b>
Andhra Pradesh	159590	1749247
Gujarat	346677	458370
Jharkhand	7561	1521
Karnataka	91526	86229
Kerala	7708	5926
Maharashtra	116032	192873
Orissa	1595	1004
Rajasthan	76860	89934
Tamil Nadu	23	29
Uttar Pradesh	42768	40184

**Table – 15 : Prices of Silica Sand, 2005-06 to 2007-08**  
(Domestic Markets)

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08(p)
Non-glass Grade	Ex-mine Rajpardi (Gujarat)	61.60	61.60	61.60
Glass Grade	Ex-mine Rajpardi (Gujarat)	106.40	106.40	106.40
Glass Grade/	Ex-mine Sindhudurg (Maharashtra)	140	140	140
Foundry Grade	Ex-mine Sambalpur (Orissa)	230	230	230

QUARTZ & OTHER SILICA MINERALS

**Quartzite**

Production of quartzite at 84 thousand tonnes in 2007-08 decreased by 18% as compared to that in the previous year due to shortage of labour, lack of demand and heavy rains.

There were 14 reporting mines during 2007-08 as against 15 mines in the previous year. During the year under review, five principal producers accounted for about 76% of the total production. Entire output of quartzite was reported from mines operated in the private sector. Orissa was the leading producing state during the year under review contributing above 46% of total production which was followed by Bihar 27%, Jharkhand 16%, Rajasthan 6%, Chhattisgarh 4% and Karnataka contributed 1% of the total production (Tables - 16 to 18).

Mine-head stocks of quartzite at the end of the year 2007-08 were 24 thousand tonnes as against 29 thousand tonnes in the beginning of the year (Table - 19).

The average daily employment of labour during the year under review was 349 as against 403 in 2006-07. Domestic prices of quartzite are furnished in Table - 20.

**Table – 16 : Principal Producers of Quartzite 2007-08**

Name and address of producer	Location of mine	
	State	District
Tata Refractories Ltd. At & P.O. Belpahar, Orissa.	Orissa	Jharsuguda
Khalsa Stone Works, Albert Road, Jamalpur, Munger, Bihar.	Bihar	Munger
Bharat Mining Company, Post- Sundernagar, Dist. Singhbhum, Jharkhand.	Jharkhand	Singhbhum(E)
Banwari Lal Newatia, P. B. No. 5, Circuit house Road, Chaibasa-833 201, Singhbhum (West), Jharkhand.	Jharkhand	Singhbhum(E)
Banwari Lal Goel C/O Ashok Minerals Post- Bonli, Sawai Madhopur, Rajasthan.	Rajasthan	Sawai Madhopur

**Table – 17 : Production of Quartzite, 2005-06 to 2007-08 (By States)**

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>109210</b>	<b>54590</b>	<b>102711</b>	<b>95191</b>	<b>84312</b>	<b>24940</b>
Andhra Pradesh	-	-	156	8	260	13
Bihar	17061	5476	30870	10409	22440	7414
Chhattisgarh	23130	31327	23704	72562	3278	3640
Jharkhand	9375	938	10997	990	13152	1315
Karnataka	-	-	568	48	100	14
Maharashtra	41	14	-	-	-	-
Orissa	50793	15513	30786	10611	39289	11965
Rajasthan	8810	1322	5630	563	5793	579

QUARTZ & OTHER SILICA MINERALS

**Table – 18 : Production of Quartzite, 2006-07 and 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
<b>India</b>	<b>15(1)</b>	<b>102711</b>	<b>95191</b>	<b>14(3)</b>	<b>84312</b>	<b>24940</b>
Private sector	15(1)	102711	95191	14(3)	84312	24940
<b>Andhra Pradesh</b>	<b>(1)</b>	<b>156</b>	<b>8</b>	<b>(1)</b>	<b>260</b>	<b>13</b>
Kurnool	(1)	156	8	(1)	260	13
<b>Bihar</b>	<b>2</b>	<b>30870</b>	<b>10409</b>	<b>2</b>	<b>22440</b>	<b>7414</b>
Munger	2	30870	10409	2	22440	7414
<b>Chhattisgarh</b>	<b>3</b>	<b>23704</b>	<b>72562</b>	<b>3</b>	<b>3278</b>	<b>3640</b>
Raigarh	2	23604	72552	2	3228	3635
Rajnandgaon	1	100	10	1	50	5
<b>Jharkhand</b>	<b>1</b>	<b>10997</b>	<b>990</b>	<b>1</b>	<b>13152</b>	<b>1315</b>
Singhbhum (East)	1	10997	990	1	13152	1315
<b>Karnataka</b>	<b>1</b>	<b>568</b>	<b>48</b>	<b>1</b>	<b>100</b>	<b>14</b>
Belgaum	1	568	48	1	100	14
<b>Orissa</b>	<b>7</b>	<b>30786</b>	<b>10611</b>	<b>6(2)</b>	<b>39289</b>	<b>11965</b>
Boudh	2	8090	1205	1	229	23
Jharsuguda	1	12830	8224	1	18875	9482
Keonjhar	-	-	-	(2)	10225	1462
Mayurbhanj	3	3485	390	3	6039	511
Sonepur	1	6381	792	1	3921	487
<b>Rajasthan</b>	<b>1</b>	<b>5630</b>	<b>563</b>	<b>1</b>	<b>5793</b>	<b>579</b>
Sawai Madhopur	1	5630	563	1	5793	579

**Table – 19 : Mine-head Stocks of Quartzite, 2007-08 (p)  
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>29439</b>	<b>23721</b>
Andhra Pradesh	156	-
Bihar	1458	1916
Chattisgarh	2831	1472
Jharkhand	54	317
Karnataka	142	60
Maharashtra	7	-
Orissa	18390	15375
Rajasthan	6401	4581

QUARTZ & OTHER SILICA MINERALS

**Table – 20 : Prices of Quartzite, 2005-06 to 2007-08  
(Domestic Markets)**

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08(p)
Refractory Grade (100 mm to 350 mm)	Ex-mine Mirzapur Baradah (Bihar)	425	520	520
Refractory Grade (50 mm to 150 mm)	f.o.r. Jamalpur (Munger) (Bihar)	700	700	700
Refractory Grade (50 mm to 100 mm)	Ex-stock yard Naya Ramnagar (Uttar Pradesh)	750	750	750
+96% SiO <sub>2</sub>	Ex-mine Rairangpur (Orissa)	110	110	110
+98% SiO <sub>2</sub>	Ex-mine Rairangpur (Orissa)	170	170	170

**Sand (Others)**

The production of sand (others) at 1424 thousand tonnes in 2007-08 decreased by about 20% as compared to that in the previous year due to lack of demand in Andhra Pradesh.

There were nine reporting mines in 2007-08 as against eleven in the preceding year. The Singareni Collieries Co. Ltd, having seven mines in Andhra Pradesh contributed about 63 % of the total production of sand (others). The remaining 37% was from two mines of Western Coal Fields Ltd located in Chandrapur district of Maharashtra. The entire production was reported by public sector in both the years (Tables - 21 to 23).

All mines were captive in nature and contract labour were employed by the producers. Mine-head stocks at the end of 2007-08 were 342 thousand tonnes as against 568 thousand tonnes in the beginning of the year (Table 24).

**Table – 21 : Producers of Sand (Others)  
2007-08**

Name and address of producer	Location of mine	
	State	District
Singareni Collieries Co. Ltd P.O. Kothagudam Collieries, Bhadrachalam Road, Station S. C. Railway, Dist. Khammam, Andhra Pradesh.	Andhra Pradesh	Karim-Nagar
Western Coal Fields Ltd Sasti Colliery, P .O. Sasti, Dist. Chandrapur.	Maharashtra	Chandrapur

**Table – 22 : Production of Sand (Others), 2005-06 to 2007-08  
(By States)**

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

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>2277632</b>	<b>77523</b>	<b>1770235</b>	<b>67080</b>	<b>1424103</b>	<b>58859</b>
Andhra Pradesh	1875872	55908	1206032	37406	901161	32346
Maharashtra	401760	21615	564203	29674	522942	26513

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**Table – 23 : Production of Sand (Others), 2006-07 and 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
<b>India</b>	<b>11</b>	<b>1770235</b>	<b>67080</b>	<b>9</b>	<b>1424103</b>	<b>58859</b>
Public sector	11	1770235	67080	9	1424103	58859
<b>Andhra Pradesh</b>	<b>9</b>	<b>1206032</b>	<b>37406</b>	<b>7</b>	<b>901161</b>	<b>32346</b>
Karimnagar	8	1183926	36698	7	901161	32346
Vizianagaram	1	22106	708	-	-	-
<b>Maharashtra</b>	<b>2</b>	<b>564203</b>	<b>29674</b>	<b>2</b>	<b>522942</b>	<b>26513</b>
Chandrapur	2	564203	29674	2	522942	26513

**Table – 24 : Mine-head Stocks of Sand (Others), 2007-08 (p)  
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>568106</b>	<b>341608</b>
Andhra Pradesh	435745	236231
Maharashtra	132361	105377

### Agate

The production of agate at 15 tonnes in 2007-08 decreased by more than two times as compared to the preceding year due to less demand. There was a single private sector mine reporting production in both the years (Tables - 25 to 27).

Mine-head stocks of agate at the end of the year 2007-08 were nil as against 40 tonnes at the beginning of the year. The average daily employment of labour was 3 in 2007-08 as against 4 in the previous year.

### Jasper

No production of jasper was reported during 2006-07 and 2007-08. All the four mines were closed due to lack of demand. In 2005-06 about 536 tonnes of jasper valued at Rs. 1.96 lakh was produced in Jodhpur district of Rajasthan. The mine-head stocks of jasper at the beginning of 2007-08 were 1,091 tonnes and at the end of the year were 85 tonnes.

**Table – 25 : Producer of Agate 2007-08**

Name & address of producer	Location of mine	
	State	District
Almiya I. Saiyad,16, Vyapar Bhawa, Himmatnagar, Gujarat.	Gujarat	Bharuch

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**Table – 26 : Production of Agate, 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
<b>India/Gujarat</b>	9	5	38	23	15	9

**Table – 27 : Production of Agate, 2006-07 and 2007-08  
(By Sector/State/District)**

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

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No .of mines	Quantity	Value
<b>India/Private sector</b>	<b>1</b>	<b>38</b>	<b>23</b>	<b>1</b>	<b>15</b>	<b>9</b>
<b>Gujarat/Bharuch</b>	<b>1</b>	<b>38</b>	<b>23</b>	<b>1</b>	<b>15</b>	<b>9</b>

## MINING

Mining for silica minerals is carried out by manual opencast method. Quartz produced in the form of lump along with other associated minerals is invariably hammered to pieces and manually sorted before it is despatched to the consuming industries. It is sometimes crushed and marketed. Glass sand is generally screened and washed to remove all the deleterious constituents for its use in glass industry.

APMDC owns two crushing plants in Mahaboobnagar district in Andhra Pradesh having a crushing capacity of 45 tonnes and 1,000 tonnes a month, respectively. Besides, Maharashtra Minerals Corp. Ltd has a 50,000-tonne per year beneficiation plant at Phondaghat in Sindhurg district. The plant has advanced technology in washing both by water and chemicals and further grading it in required fractions.

## HEALTH HAZARDS

The regulation of respirable silica continued to cause main concern to miners and consumers since many minerals contain crystalline silica, especially in industrial sand and gravel. There is a potential threat of "silicosis" to the workers in quartz, silica sand and gravel mines. In the USA, the Occupational Safety and Health Administration (OSHA) listed "crystalline silica" as one of their top five priorities for making formal rule. The OSHA, on the basis of significant information in International Agency for Research on Evaluation of Cancer, has declared that any material containing more than 0.1% crystalline silica should indicate its carcinogenic hazard.

## USES

Quartz, quartzite and silica sand are used in various industries like glass, refractory, foundry, ceramic, cosmetic, electrical, abrasives, paints, etc.

The primary use of silica is in the manufacture of virtually all types of glasswares, ceramics and ceramic glazes. Other major uses are in metallurgy, (where silica is used as a refractory, foundry mould, fluxes and as a source of silicon for the production of silicon metal and ferro-silicon and other ferro-alloys), silicon carbide manufacture, chemical and construction sectors, and as a natural abrasive. Because of its piezoelectric properties, high quality quartz crystal is used in electronic devices, multiple telephone lines, depth-sounding devices, range finders, chronometers, etc.

Sand is also used as a fireproofing material, for sandstowing in mines, soundproofing material and as a filler. Silica sand is also used to maintain or increase the permeability of oil and gas-bearing formations; as a filler in acid proof cements, putty, paints, epoxy and polyester, resins, in horticulture, as a filtration medium, and for ornamental purposes. Silica flour is used as a filler in plastic and rubber products.

Flint and chert are used in abrasives and tube-mill lining. Besides, chert is used in crushed form as aggregate for concrete and road surfacing. Rounded pebbles of chalcedony are used as balls in ball mill for finer crushing and grinding felspar, calcite and barytes. The different cryptocrystalline varieties of transparent and translucent chalcedony are valued as semiprecious stones and are carved out into a variety of ornaments and used for making different ornamental wares or articles of decoration. Agate pieces after cutting and polishing are sold as semiprecious stones. Big pieces are used in making mortars and pestles for laboratory use. Agate cut into requisite shapes are also used as fulcra of scientific balances and in making edges, planes and bearings of precision instruments.

## INDUSTRY & SPECIFICATIONS

In India, quartz, quartzite and silica sand are used mainly in glass, foundry, ferro-alloys and refractory industries and also as building materials. According to its suitability for different purposes, it may be named as building sand, paving sand, moulding or foundry sand, refractory sand or furnace sand, engine sand, filter sand, glass sand and grinding and polishing sand.

## Glass

Main use of silica minerals is in the manufacture of different types of glasses; i.e. glass containers, bottles, amber glass containers, clear flint glass, vacuum bottles and other glasswares. The production during 2006-07 and 2007-08 (up to Dec. 2007) of bottle glassware was 803,526 tonnes and 674,750 tonnes, respectively. The status of glass industry is also discussed in the Review on 'Mineral- Based Industries'.

The natural silica sand is the preferred material in glass industry, but in some cases where the glass plants are located far away from silica deposits, crushed quartz is also used. For use in glass industry, the silica sand must be uniform in chemical composition, size and shape of grains. Uniform grain size promotes even melting in the glass tank. The sand should not be coarser than 20 or 30 mesh and finer than 100 to 120 mesh. As a general rule, the grains should be angular rather than rounded, because angular grains melt more readily than the rounded ones.

For glass manufacturing, the silica sand should be fairly free from contaminations of clay materials, pebbles, etc. Silica sand usually contains iron oxide, calcium oxide, potassium oxide and sodium oxide in small amounts. Iron is the most objectionable impurity because it imparts colouration to the glass. The common permissible limits of iron oxide in silica sand for use in the manufacture of different types of glass are as follows:

Glass type	Fe <sub>2</sub> O <sub>3</sub> %
Optical glass	0.005-0.008
Flint or soda-lime glass	0.02-0.05
Plate glass	0.1-0.2
White bottles or window glass	0.2-0.5
Dark bottle glass	0.5-0.7

Chromium compounds, alumina, lime and magnesia are the other deleterious impurities. Chromium compounds are undesirable because these compounds impart more colouration to the glass than iron. Alumina tends

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to decrease transparency and makes the batch more difficult to melt. The maximum quantity of alumina permissible in sand is 1.5 percent. The maximum permissible limit for lime and magnesia is about 0.05% and for alkalies it is 0.01% or less.

### Ceramic

The ceramic industry in India is around 100 years old and ranks 7<sup>th</sup> in the world in terms of production of ceramic tiles. Ceramic industry comprises ceramic tiles, sanitaryware and

crockeryware items. These products are manufactured both in the large and small scale sector. In organised sector, there were 16 units for ceramic tiles with an installed capacity of 2.1 million tonnes per year, 16 units for potteryware with 43,000 MT per annum and 7 units for sanitaryware with 1,43,500 MT per annum capacity in the country. The estimated production during 2007-08 of ceramic tiles was 290 million sq m, potteryware 58,781 tonnes and sanitaryware 365,695 tonnes (Table - 28).

**Table – 28 : Ceramic Industry**

Industry	Unit	2006-07		2007-08	
		Units (No.)	Production	Units (No.)	Production (Estimated)
Ceramic Tiles	million sq m	16 + 200 SSI Units	220	16 + 200 SSI Units	290
Potteryware	tonnes	16 + 1200 SSI Units	39187	16 + 1200 SSI Units	58781
Sanitaryware	tonnes	7 + 200 SSI Units	251625	7 + 200 SSI Units	365695

*Source : Ministry of Commerce & Industry, Department of Industrial Policy & Promotion, Annual Report, 2007-08.*

In small scale sector, there were over 200 units of sanitaryware with capacity of 53,000 MT per annum, 1200 plants of potteryware with a capacity of 3 lakh MT per annum.

Ceramic whiteware contains about 40% silica, besides other constituents except for bone china in which it is not used at all. The silica serves to provide whiteness, renders the ceramic body to dry easily and provides compatibility between the body and the glass to prevent crazing or peeling. Main source of silica for this application is silica sand. In addition, silica flour is used in formulation of ceramic body for enamels and frits. Silica flour produced by fine grinding of quartzite, sandstone or lump quartz are used in enamels. The silica flour should contain more than 97.5% SiO<sub>2</sub>, less than 0.55% Al<sub>2</sub>O<sub>3</sub> and less than 0.2% Fe<sub>2</sub>O<sub>3</sub>. Purity and small particle size (BS mesh-200) are fundamentally important for silica in manufacture of ceramics.

### Foundry

The Indian foundry industry is the fifth largest in the world. This industry is well established in the country and is spread across a wide spectrum consisting of large, medium, small and tiny sector. A special feature of domestic foundry industry is its geographical clustering i.e. Coimbatore cluster is famous for pump sets castings, Kolhapur and Belgaum cluster for automotive castings, Rajkot cluster for diesel engine castings and Batala and Jalandhar cluster for machinery parts and agriculture implements.

A large number of foundries in both ferrous and non-ferrous sectors are functioning in the organised sector in the country. Most of the foundry units use moulding sand having 40 to 65 A.F.S. (American Foundrymen's Society) numbers.

Silica sand is used in both foundry cores and moulds because of its resistance to thermal shock. Silica content of 85% is used in iron casting. In steel foundries, silica content should be at least 95 percent.

Natural moulding sand contains variable amount of clay which acts as a bond between the sand grains. These sands, therefore, possess strength, plasticity and refractoriness to varying extent depending upon the clay minerals present. When it contains more clay, it is blended with river sand, which is relatively clay-free so as to get the optimum properties desired in the sand mixture.

Washed grains shall be mostly sub-angular to rounded shape. As far as possible, the sand shall be free from gravel. As per IS:3343-1965, natural moulding sand for use in foundries shall be of three main grades; namely, A, B and C with respect to clay content.

Grade	Clay (%)
A	5 to 10
B	10 to 15
C	15 to 20

Refractoriness of the natural moulding sand based on sintering temperature range should be as follows:

Grade A - 1350 to 1450°C

Grade B - 1200 to 1350°C

Grade C - 1100 to 1200°C

Washed sand grains are required to be sub-angular to rounded shape.

Silica flour is particularly used in the steel foundry in dressing for moulds and cores and also for adding to moulding sand mixtures. It is also used to obtain elevated temperature strength, high density and resistance to metal penetration in cores. Silica flour shall be produced by crushing, washing and grading high grade quartz/quartzite rocks or white silica sand or other deposits sufficiently pure to get the desired material.

### Refractory

Quartz and quartzite are used in the manufacture of refractory silica bricks. However, recently these bricks are being replaced by basic linings of magnesite, dolomite or natural types such as bauxite, etc. in L.D., basic oxygen and electric furnaces. Silica reacts readily with basic slag and is therefore unsuitable in the basic steel making process. Nevertheless, silica bricks continue to be used in coke ovens, ceramic kilns, glass tank crowns and as blast furnace chequers in some steel mills. Silica bricks have excellent load resistance capacity at high temperature. For the manufacture of refractory bricks, silica mineral should be free from aluminosilicates (felspar, mica, etc.) as aluminosilicates adversely affect refractoriness of the bricks. Silica rock (raw material) should be hard, having high bulk density and low porosity.

### Fluxes

Massive quartz, quartzite, sandstone and unconsolidated sands are the main sources of silica to be used as flux in smelting base metal ores where iron and basic oxides are slagged as silicates. Silica is also used to balance the lime and silica ratio of the blast furnace mix. The silica content should be as high as 90% with minor amounts of impurities like iron and alumina up to 1.5% maximum.

### Ferro-silicon and Other Alloys

Ferro-silicon contains about 75-90% silicon and minor amounts of iron, carbon, etc. It is estimated that for the manufacture of one tonne ferro-silicon of 70-75% grade, about 1.78 tonnes quartz is required besides other raw materials like coke, iron scrap, etc. Quartz is the major source of silica in the manufacture of ferro-silicon. Occasionally, quartzite is also used. However, use of quartzite is restricted as it contains higher alumina and iron and more likely that it would break down in the furnace. Lump silica in the size range from 3/4 to 5 inches are generally preferred. Ferro-silicon is produced by smelting a mixture of quartz, metallic iron (steel scrap and turnings) and a reducing agent like coke, charcoal or wood chips.

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Quartz suitable for ferro-silicon production should have more than 98% SiO<sub>2</sub>, less than 0.4% Al<sub>2</sub>O<sub>3</sub> and not more than 0.2% each of Fe<sub>2</sub>O<sub>3</sub>, CaO and MgO. Phosphorus or arsenic should not be present in quartz. If Al<sub>2</sub>O<sub>3</sub> is more than the prescribed limit, it affects reduction in the electric furnace. Alkali has a tendency to promote a sticky slag which contaminates the products. If higher iron (more than 0.3%) is present in quartz, the fusion in the furnace takes place at lower temperature and affects reduction process. Another important factor is that quartz should have good thermal stability at 1200°C or more.

As per Indian Ferro Alloys Producers' Association, 35 units having a capacity of 205,750 tpy were established for the production of ferro-silicon. However, presently only 20 units are in operation with a total capacity of 145 thousand tpy. The production of ferro-silicon was estimated at around 83,700 tonnes in 2007-08. List of principal producers of ferro-silicon is furnished in Table-29.

Silico-manganese, a combination of 60-70% manganese, 10-20% silicon and 20% carbon, substitutes low carbon ferro-manganese in steel industry. The production of silico-manganese including medium and low carbon silico manganese was estimated at 911,402 tonnes in 2007-08. The details of silicon ferro-alloys are also discussed in the 'Ferro-Alloys' review.

**Silicon Metal**

A high purity quartz containing about 99.80% SiO<sub>2</sub>, without any other contaminant, is used in the production of silicon metal. The production of silicon metal is similar to that for ferro-silicon except that no iron is added. The alumina and iron contents are specified to be below 0.1% each with calcium and phosphorus contents each restricted to 0.005 percent. For production of one tonne of silicon metal, about 2.6 tonnes silica is consumed. Specifications of silica minerals to be used in different industries are given in Tables - 30 to 32.

**Table – 29 : Principal Producers of Ferro-silicon**

Name of the plant	Installed capacity (tpy)
Ferro Alloys Corp. Ltd, (Ferro Alloys Division), Vijayanagaram, Andhra Pradesh.	8000
Navbharat Ferro-alloys Ltd, Paloncha, Dist. Khammam, Andhra Pradesh.	9300
VBC Ferro Alloys Ltd, Medak, Andhra Pradesh.	19000
GMR Technologies & Ind. Ltd, Ravivalasa, Dist. Srikakulam, Andhra Pradesh.	25000
Akshay Ispat & Ferro Alloys Ltd, Distt. Namchi, Sikkim	6000
Hindustan Malleables & Forgings Ltd, Dhanbad, Jharkhand.	1800
Anjaney Ferro-alloys Ltd, Mihijam, Dist. Dumka, Jharkhand.	NA
Sandur Manganese & Iron Ore Ltd, Vyasankere, Bellary, Karnataka	24000
Shri Laxmi Electroselters Pvt. Ltd, Erumathala Aluva, Kerala.	NA
Indsil Electrosmelts Ltd, Pallabhari, Dist. Pallakad, Kerala.	NA
Indian Metals & Ferro Alloys Ltd, Therubali, Dist. Cuttack, Orissa.	53000
The Silical Metallurgic Ltd, Pudducherry.	10560
Snam Alloys Ltd, Village Kariamanickam, Pudducherry.	4000
V.S.K. Ferro-alloys Ltd, Thuthipet, Pudducherry.	3000

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**Table – 30 : BIS Specifications of Silica Minerals for Various Industries**

Industry	Mineral consumed	BIS No.	Physical specifications	Grade	Chemical Specifications						Remarks	
					SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	Fe <sub>2</sub> O <sub>3</sub> (%)	CaO (%)	MgO (%)	TiO <sub>2</sub> (%)		P (%)
Glass	Silica sand	IS: 488 1980 (Second Revision; Reaffirmed 1998)	-	Special Gr.	99	0.020 (min)	-	-	-	0.10	-	For manufacturing high-grade colourless glass; viz, crystal glass, tableware and decoratedware.
				Gr. I	98.0 (min)	0.04 (max)	-	-	-	0.10 (max)	-	For manufacturing decolourised glassware; viz, containerware, lampware, etc.
				Gr. II	97.5 (min)	0.07 (max)	-	-	-	0.10 (max)	-	For manufacturing glassware where slight tint is permissible.
				Gr. III	97% (max)	0.2 (max)	-	-	-	-	-	For manufacturing of decolourised and some coloured glasses.
Foundry	Silica flour	IS:3339 1975 (First Revision; Reaffirmed 2003)	-	-	98.0 (min)	-	-	-	-	-	100% silica flour should pass through 150-micron I.S. sieve and atleast 95% through 75-micron sieve. The fusion temperature should be >1700°C.	
Ceramic	Quartz	IS:11464 1985 (Reaffirmed 2001)	-	Gr. I	98.0 (min)	1.0 (max)	0.25 (max)	0.5 (max)	-	0.10 (max)	-	Suitable for white opaque, transparent glaze & whiteware body.
				Gr. II	96.0 (min)	2.0 (max)	1.0 (max)	1.0 (max)	-	1.0 (max)	-	
Iron (BF)	Quartzite	IS:13676 1993 (Reaffirmed 2003)	Lumpy, Hard, Non-friable of size -150 to +10 mm	-	96-98	2-4	-	-	-	-	-	After prescribed thermal stability test on -25+19 mm material, +19 mm fraction should be more than 55% and -5 mm fraction should be less than 5%.
	Banded Hematite Quartzite	-do-	-do-	-	48-50	1.0 max	50 52 (Fe)	-	-	-	-	After prescribed tumbling test on +5 mm material, +5 mm fraction should be more than 90%.

*Note : In addition, BIS has prescribed following specifications : - silica for paint industry (IS : 67 - 1998; Second Revision; Reaffirmed 2002), High-silica sand for use in foundries (IS : 1987-2002; Second Revision), Quartz quartzite for production of ferro-alloys (IS : 13054-1991; Reaffirmed 2003).*

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**Table – 31 : General Industrial Specifications of Silica (International)**

End-use	Minimum SiO <sub>2</sub> (%)	Maximum Al <sub>2</sub> O <sub>3</sub> (%)	Maximum Fe <sub>2</sub> O <sub>3</sub> (%)	Minimum CaO/MgO(%)	Grain size	Remarks
Glass sand optical	99.5	Variable	0.008	-	0.1-0.5 mm	Must be less than 6 ppm chromium, 2 ppm cobalt and 0.01-0.05% TiO <sub>2</sub> . Grain size and purity constant.
Colourless domestic	99.5	0.1-0.5	0.013	-	-	-
container/flat	98.5		0.030			
Foundry sand	88-99	Extremely variable	-	-	20-200 mesh	Chemical composition variable, 98-99% SiO <sub>2</sub> is preferred. Sub-angular to rounded grains.
Silicon carbide	99.5	0.06-0.25	0.1	Absent	100 mesh	No phosphorus is allowed. Maximum 0.25% Al <sub>2</sub> O <sub>3</sub> .
Silica flour	97-98	0.5	0.2	-	Micron	-
Silicon	98.0	0.4	-	0.2 each	25 mm diameter	No arsenic/ phosphorus allowed.
Ferro-silicon	96.0	0.4	0.2	-	25 mm diameter	0.1% P maximum.
Silica brick (refractory)	96-98	0.1	Low	-	8 mesh	-
Sodium silicate	99	0.25	0.02	0.05	20-100 mesh	Same as glass grade.
Silica flux	90	1.5	1.5	0.2	5-6 mm	

*Source: Industrial Minerals*

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Table – 32 : Specifications of Silica Minerals by User Industries

Mineral consumed	Industry	Physical property	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	Fe <sub>2</sub> O <sub>3</sub> (%)	Combined CaO/MgO (%)	Remarks
Silica sand or powder	Sodium & potassium silicate	20 to 100 mesh	99	Less than 0.25	0.03	0.05	Combined CaO/MgO content of 0.85% with sodium carbonate at 1200-1400°C. The ratio of Na <sub>2</sub> CO <sub>3</sub> to SiO <sub>2</sub> can be varied to obtain a wide range of products. Potassium silicate can be manufactured with silica minerals by using potassium carbonate in place of sodium carbonate.
Quartz	Ferrosilicon	-	98	Less than 0.4	0.2	0.4	No phosphorus/arsenic should be present in quartz. Al <sub>2</sub> O <sub>3</sub> should not be more than prescribed limits. Quartz should have good thermal stability at 1200°C or more.
Quartzite	Refractory (Product: acid silica bricks)	Medium, fine-grained, compact crypto-crystalline, granular texture homogeneous	Gr. I +98 Gr. II +96	Less than 0.75 Less than 1	Less than 0.75 Less than 1	-	High silica is essential with least possible Al <sub>2</sub> O <sub>3</sub> free from iron bands and pyrite spots.
Quartzite	Iron & steel	Chips 10 to 80 mm	94 (min)	1 (max)	-	-	The quartzite is added to the blast furnace charge to correct silica to alumina ratio. Some steel plants use banded haematite quartzite in place of quartzite.
Silica sand/sand/crushed sandstone	Cement	-	65-98	3.58 to 10	0.5 to 0.6	1-1.5	In cement industry, silica sand or crushed sandstone is used as additive to make for the silica deficiency in the raw mill. Indian Standard Specification for Standard sand for testing cement is IS : 650-1966.
Silica sand	Fertilizer	18 to 100 mesh	80 (min) 1% moisture (max)	-	-	-	Silica sand is used in fertilizer industry as a filler to balance the fertilizer grades. There is no rigid specifications in this industry. In some cases, river sand is used.

(Contd.)

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Table - 32 (Concl.)

Mineral consumed	Industry	Physical property	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	Fe <sub>2</sub> O <sub>3</sub> (%)	Combined CaO/MgO (%)	Remarks
Quartz	Ceramic	-	97-99.9	0.1 to 2	0.05-1	-	Quartz is used in ceramic industry to reduce shrinkage while drying & firing and to impart rigidity to the body. Iron is the most deleterious constituent and it should be as less as possible. Mostly high silica quartz with low iron content is used in ceramic industry.
Silica sand & quartz	Silicon carbide & other abrasives	-	99%	0.1	(-) 0.1	-	It should not contain lime, magnesia and phosphorus. Quartz is also used for the manufacture of sandpaper. Flint is used with silica 99% and low iron as far as possible. For abrasives, size frequency distribution is very important.
Quartz	Chemical	-	+ 96	-	-	-	Quartz is used in the manufacture of phosphorus pentasulphide. Silica sand having 99% SiO <sub>2</sub> and free from iron is used in the manufacture of ultramarine blue.
Silica powder	Asbestos products	-	+ 97.5	-	-	1.5/0.8 (CaO) (R <sub>2</sub> O <sub>3</sub> )	Silica powder is used as one of the constituents in the manufacture of asbestos-cement sheets/pipes.
Silica sand	Insecticide	-	+95	-	-	-	Silica sand is used as a carrier in the insecticide industry. Specification is not that very rigid.
Silica sand and quartz powder	Electrode	100 - 200 mesh	97.5-99.5	-	-	5.2 (max)	Silica sand or quartz powder is used as one of the components of welding flux mixture in electrode industry. Sulphur should be 0.03% max.
Silica sand	Coal washery	30 - 100 mesh	-	-	-	-	In coal washeries, silica sand is used as one of the ingredients in the flotation process of coal. Sand having constant density of more than 2.64 is used. Clay content is limited to 0.5%.
Quartz powder	Paint	Crystalline and amorphous dry powder	-	-	-	-	Specifications (IS:67-1979) stipulate that lead content in SiO <sub>2</sub> shall not exceed 0.03% and colour particle shape shall closely match with the approved sample.

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### CONSUMPTION

The consumption of quartz and silica sand was estimated at 1.5 million tonnes in 2007-08. Major consuming industries were glass (38%), cement (20%), ferro-alloys (16%), foundry (9%) and fertilizer (7%). Other industries like iron & steel, ceramic, alloy steel, insecticide, refractory, abrasive, etc. consumed the remaining 10%.

The consumption of quartzite was estimated around 274 thousand tonnes out of which iron and steel industry consumed about 55%, followed by refractory and ferro-alloys (19% each) and cement (6.5%).

Consumption of moulding sand in 2007-08 was estimated to be unchanged at 59,900 tonnes. Major consuming industries were foundry (91%), followed by mining machinery (9%) and iron & steel (2%).

The total ferro-silicon consumed by various industries in 2007-08 was estimated at 45,600 tonnes. Major consuming industries were iron & steel (83%), alloy steel (12%) and foundry (5%) (Tables - 33 to 36).

### POLICY

Foreign Trade Policy (FTP) for 2004-2009 was notified on 31.8.2004 and made effective from 1.9.2004. The amended Export and Import Policy incorporated in the FTP and effective from 1.4.2008, freely allows the import of quartz and quartzite lumps and powder as also silica sands and quartz sands. However, the exports of silica sands and quartz sands are restricted and permitted under licence. The export of river sand to Maldives is permitted, subject to 'No Objection Certificate' by CAPEXCIL within the annual ceiling of 450,000 tonnes for 2007-08 and 585,000 tonnes for 2008-09.

### SUBSTITUTION

In order to reduce the potential threat of "silicosis," a variety of materials are used as substitutes for silica. Basic and neutral refractories (including magnesite, mag-chrome, dolomite and high alumina bricks) have replaced silica in a large number of applications. Chromite, olivine and zircon are alternatives to foundry sands. Garnet and to a lesser extent, olivine are used in sand blasting to avoid the risk of silicosis. Wollastonite is more favoured than free silicon for use in the ceramic industry, again due to the risk of silicosis. In electronic industry, replacement of natural quartz crystal by cultured quartz crystal is increasing steadily.

**Table – 33 : Reported Consumption of Quartz/Silica Sand, 2005-06 to 2007-08  
(By Industries)**

Industry	2005-06(R)	2006-07	2007-08(p)
<b>All Industries</b>	<b>1511500</b>	<b>1494300</b>	<b>1457800</b>
Alloy steel	14500 (10)	14500 (10)	14500 (10)
Cement	280700 (14)	274500 (14)	283400 (14)
Ceramic	68700 (37)	68500 (37)	68900 (37)
Ferro-alloys	244100 (28)	258800 (30)	236200 (30)
Fertilizer	158700 (4)	128300 (4)	105800 (4)
Foundry	122900 (31)	127300 (32)	127200 (32)
Glass	558400 (51)	558400 (51)	558400 (51)
Iron & steel	16000 (1)	14200 (1)	13500 (1)
Others (Abrasive, asbestos, chemical, dry cell battery, electrical, paint, pesticide, refractory and rubber)	47500 (74)	49800 (75)	49900 (75)

*Figures rounded off. Data collected on non-statutory basis.*

*Figures in parentheses denote the number of units in the organised sector reporting consumption.*

QUARTZ & OTHER SILICA MINERALS

**Table – 34 : Reported Consumption of Quartzite, 2005-06 to 2007-08  
(By Industries)**

				(In tonnes)	
Industry	2005-06 (R)		2006-07		2007-08(p)
<b>All Industries</b>	<b>229300</b>		<b>243900</b>		<b>274200</b>
Cement	8000	(2)	18800	(2)	17900 (2)
Ferro-alloys	41600	(11)	43200	(11)	52700 (11)
Foundry	800	(4)	800	(4)	800 (4)
Iron & steel	129100	(15)	133400	(15)	150300 (15)
Refractory	49800	(13)	47700	(13)	52500 (13)

*Figures rounded off. Data collected on non-statutory basis.*

*Figures in parentheses denote the number of units in the organised sector reporting consumption.*

**Table – 35 : Reported Consumption of Moulding Sand, 2005-06 to 2007-08  
(By Industries)**

				(In tonnes)	
Industry	2005-06(R)		2006-07		2007-08 (p)
<b>All Industries</b>	<b>59900</b>		<b>59900</b>		<b>59900</b>
Foundry	54300	(15)	54300	(15)	54300 (15)
Iron & steel	1400	(4)	1400	(4)	1400 (4)
Mining machinery	4100	(3)	4100	(3)	4100 (3)
Others (Sugar & Textile)	100	(7)	100	(7)	100 (7)

*Figures rounded off. Data collected on non-statutory basis.*

*Figures in parentheses denote the number of units in the organised sector reporting consumption.*

**Table– 36 : Reported Consumption of Ferro-silicon, 2005-06 to 2007-08  
(By Industries)**

				(In tonnes)	
Industry	2005-06 (R)		2006-07		2007-08 (p)
<b>All Industries</b>	<b>44500</b>		<b>44200</b>		<b>45600</b>
Alloy steel	5500	(13)	5500	(13)	5500 (13)
Electrode	++	(8)	++	(6)	++ (6)
Ferro-alloys	100	(1)	100	(1)	100 (1)
Foundry	2200	(25)	2200	(26)	2200 (26)
Iron & steel	36700	(12)	36300	(13)	37800 (13)
Sponge Iron	-		100	(1)	- (1)

*Figures rounded off. Data collected on non-statutory basis.*

*Figures in parentheses denote the number of units in the organised sector reporting consumption.*

## WORLD REVIEW

Basically, silica is abundant in the earth's crust. Sand and gravel resources of the world are sizable. Quartz-rich sand and sandstone are the main sources of industrial silica sand which occurs throughout the world. Resources of natural quartz crystal suitable for electronics or optical use in the world are limited. The world's dependence on these resources will continue to decline because of the increased acceptance of cultured quartz crystal as an alternate material. Electronic applications accounted for the most industrial uses of quartz crystal, followed by optical application.

All quartz crystals used for electronics were cultured. The world production of industrial silica sand and gravel by principal countries is given in Table - 37.

**Table – 37 : World Production of Sand and Gravel (Industrial), 2005 to 2007 (By Principal Countries)**

(In '000 tonnes)

Country	2005	2006 <sup>(e)</sup>	2007 <sup>(e)</sup>
<b>World : Total (rounded)</b>	<b>117000</b>	<b>118000</b>	<b>120000</b>
Australia	4000	3700	3700
Austria	6800	6800	6800
Belgium	1800	1800	1800
Brazil	1600	1600	1600
Canada	1600	1600	1600
France	6500	6500	6500
Gambia	1530	1390	1400
Germany	8160	7700	7700
India	1600	1600	1600
Iran	1900	1900	1900
Italy	3000	3000	3000
Japan	4750	4600	4600
Mexico	2078	2630	2600
Norway	1600	1500	1500
Poland	1500	1500	1500
Romania	1500	1500	1500
Slovakia	2000	2000	2000
Slovenia	11000	10000	10000
South Africa	2574	3216	3200
Spain	6500	5100	5100
Thailand	1300	-	-
Turkey	1200	1200	1200
UK	4500	5000	5000
USA	30600	31700	35000
Other countries (rounded)	9500	10600	11000

Source : Mineral Commodity Summaries, 2007 and 2008.

## FOREIGN TRADE

### Exports

Exports of quartz and quartzite decreased to 160,456 tonnes in 2007-08 from 185,717 tonnes in the previous year. Out of total exports, quartz comprised 72% and quartzite 28%. Exports were mainly to UAE (19%), Japan (18%), Bangladesh (15%), Italy (12%) and Israel (8%). Exports of silica sand increased to 88,701 tonnes in 2007-08 from 69,579 tonnes in 2006-07. Exports were mainly to Bangladesh (61%), Japan (12%) and Vietnam (11%). Exports of sand (excluding metal bearing) increased sharply to 413,598 tonnes in 2007-08 from 237,691 tonnes in the previous year. About 98% exports were to Maldives in 2007-08. Exports of agate (uncut) decreased sharply to 1,009 tonnes in 2007-08 from 20,699 tonnes in 2006-07. USA was the main buyer in 2007-08. Exports of agate (cut) declined to 32 thousand carats in 2007-08 from 68 thousand carats in 2006-07. Exports of flint increased to 1,193 tonnes in 2007-08 from 432 tonnes in the previous year. Exports of silicon increased to 567 tonnes in 2007-08 from 183 tonnes in the previous year. Exports were mainly to China, Singapore and UAE (Tables - 38 to 46).

### Imports

Imports of quartz and quartzite (natural) decreased to 312 tonnes in 2007-08 from 433 tonnes in the previous year. Out of total imports in 2007-08, those of quartz were 246 tonnes and quartzite 66 tonnes. China, Vietnam, Spain and USA were the main suppliers. Imports of silica sand increased to 12,203 tonnes in 2007-08 from 6,948 tonnes in 2006-07. Silica sand was imported mainly from Bhutan, Italy and China. Imports of sand (excluding metal bearing) decreased to 1.77 million tonnes in 2007-08 from 1.80 million tonnes in the previous year. Imports were almost entirely from Nepal. Imports of agate (uncut) were 342 tonnes in 2007-08 compared to 328 tonnes in the previous years. Imports were mainly from China. A nominal quantity of cut agate was also imported in 2006-07 and 2007-08. Imports of flint dropped to 597 tonnes in 2007-08 from 2,541 tonnes in the previous year. Imports were mainly from UK and Turkey. Imports of silicon were 25,521 tonnes in 2007-08 compared to 25,733 tonnes in the previous year. Imports were mainly from China (Tables - 47 to 55).

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**Table – 38 : Exports of Quartz and Quartzite  
(Natural) : Total  
(By Countries)**

Country	2006-07		2007-08	
	Qty	Value	Qty	Value
	(t)	(Rs.'000)	(t)	(Rs.'000)
<b>All Countries</b>	<b>185717</b>	<b>614780</b>	<b>160456</b>	<b>638649</b>
Japan	41820	180021	28916	129808
Italy	36186	46705	19719	105626
UAE	27098	68251	31151	80325
Israel	12972	78032	12664	68713
Bangladesh	23328	38671	23338	49161
Vietnam	7616	51910	7378	42352
Iran	2447	15166	6223	28531
Germany	4458	24872	5378	27770
Malaysia	3305	14158	3186	15465
Korea, Rep.of	2763	11677	2278	10750
Other countries	23724	85317	20225	80148

**Table – 40 : Exports of Quartz (Natural)  
(By Countries)**

Country	2006-07		2007-08	
	Qty	Value	Qty	Value
	(t)	(Rs.'000)	(t)	(Rs.'000)
<b>All Countries</b>	<b>142868</b>	<b>394056</b>	<b>114832</b>	<b>402639</b>
Japan	25575	104820	18391	82528
UAE	24448	62225	28050	73702
Bangladesh	23038	37992	22344	47310
Vietnam	5349	36654	6490	36900
Italy	31029	14578	6119	24939
Iran	1679	10520	5085	21250
Israel	7282	36844	4915	20396
Germany	2364	12557	3646	17249
Malaysia	3137	13469	3032	14877
China	3138	13234	1288	5678
Other countries	15829	51163	15472	57810

**Table – 39 : Exports of Quartzite (Natural)  
(By Countries)**

Country	2006-07		2007-08	
	Qty	Value	Qty	Value
	(t)	(Rs.'000)	(t)	(Rs.'000)
<b>All Countries</b>	<b>42849</b>	<b>220724</b>	<b>45624</b>	<b>236010</b>
Italy	5157	32127	13600	80687
Israel	5690	41188	7749	48317
Japan	16245	75201	10525	47280
Germany	2094	12315	1732	10521
Iran	768	4646	1138	7281
UAE	2650	6026	3101	6623
Vietnam	2267	15256	888	5452
New Zealand	330	1932	754	4412
USA	2074	7158	847	4131
Australia	1190	8260	175	1995
Other countries	4384	16615	5115	19311

**Table – 41 : Exports of Silica Sand  
(By Countries)**

Country	2006-07		2007-08	
	Qty	Value	Qty	Value
	(t)	(Rs.'000)	(t)	(Rs.'000)
<b>All Countries</b>	<b>69579</b>	<b>409954</b>	<b>88701</b>	<b>279705</b>
Japan	14847	173275	10994	124398
Vietnam	5317	41507	9855	60792
Malaysia	3870	48104	2273	25790
Tanzania	238	1173	2992	12160
Bangladesh	23291	7656	54206	10175
Germany	476	3073	1056	7096
UAE	9192	72172	685	4867
Singapore	2050	25533	345	4148
Italy	855	6106	479	3200
Israel	768	4922	327	2025
Other countries	8675	26433	5489	25054

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**Table – 42 : Exports of Sand (Excl. Metal Bearing)  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>237691</b>	<b>235058</b>	<b>413598</b>	<b>386569</b>
Maldives	224703	174448	405040	347835
Morocco	-	-	1235	6997
China	-	-	1350	6038
Sri Lanka	444	1532	683	3374
Israel	1201	7454	275	1746
Italy	411	2505	324	1498
Kuwait	1260	4226	431	1435
Saudi Arabia	684	3536	203	782
Nepal	1831	4120	651	591
Germany	1904	8774	-	-
Other countries	5253	28463	3406	16273

**Table – 45 : Exports of Flint  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>432</b>	<b>1539</b>	<b>1193</b>	<b>3224</b>
Djibouti	90	367	481	884
Saudi Arabia	64	257	205	770
UAE	246	810	198	728
Jordan	-	-	109	382
South Africa	-	-	27	147
Sudan	-	-	55	125
Bangladesh	-	-	100	95
Japan	-	-	18	93
Cameroon	4	27	-	-
Thailand	28	78	-	-

**Table – 43 : Exports of Agate : (Uncut)  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>20699</b>	<b>10708</b>	<b>1009</b>	<b>4236</b>
USA	4841	5339	741	2063
UK	4060	1939	69	754
Chile	-	-	100	384
China	628	1287	15	357
Chinese Taipei/ Taiwan	10014	750	30	165
Japan	10	22	30	163
Germany	-	-	10	157
Hong Kong	100	341	-	-
Israel	30	256	-	-
Lebanon	1000	717	-	-
Other countries	16	57	14	193

**Table – 46 : Exports of Silicon  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>183</b>	<b>7709</b>	<b>567</b>	<b>35499</b>
China	-	-	140	15900
Singapore	34	520	127	5999
Korea, Rep. of	-	-	30	3186
UAE	26	1002	105	2975
Kenya	1	114	49	1937
Nepal	9	457	48	1311
Canada	-	-	18	729
Switzerland	42	3253	5	544
USA	-	-	4	513
Saudi Arabia	30	1121	3	80
Other countries	41	1242	38	2325

**Table – 44 : Exports of Agate: (Cut)  
(By Countries)**

Country	2006-07		2007-08	
	Qty ('000 Carat)	Value (Rs.'000)	Qty ('000 Carat)	Value (Rs.'000)
<b>All Countries</b>	<b>68</b>	<b>34358</b>	<b>32</b>	<b>17715</b>
USA	34	17208	17	10046
UK	2	1081	5	2895
Japan	1	324	2	764
Germany	3	1472	1	672
Chile	3	1251	1	612
Hong Kong	1	1637	1	134
Italy	7	6108	++	103
China	4	1184	-	-
Chinese Taipei/ Taiwan	1	1367	-	-
Israel	3	1062	-	-
Other countries	9	1664	5	2489

**Table – 47 : Imports of Quartz and Quartzite  
(Natural) : Total  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>433</b>	<b>12887</b>	<b>312</b>	<b>9777</b>
China	177	3523	93	2515
USA	5	1174	43	2283
Vietnam	86	4130	43	2278
Germany	52	2250	25	853
Italy	20	156	40	506
Russia	1	36	0	449
Spain	71	1217	51	447
Belgium	2	97	5	242
UK	10	162	6	113
Thailand	7	70	-	-
Other countries	2	72	6	91

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**Table – 48 : Imports of Quartzite (Natural)  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>184</b>	<b>6972</b>	<b>66</b>	<b>5449</b>
USA	5	1128	4	1771
China	3	131	16	840
Russia	1	36	++	449
Belgium	1	47	++	44
Germany	++	75	++	42
France	1	11	1	12
Italy	20	156	-	-
Spain	57	1096	-	-
UK	10	162	-	-
Vietnam	86	4130	43	2278
Other countries	-	-	2	13

**Table – 49 : Imports of Quartz (Natural)  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>249</b>	<b>5915</b>	<b>246</b>	<b>4328</b>
Belgium	1	50	5	198
China	174	3392	77	1675
Germany	52	2175	25	811
Italy	-	-	40	506
Spain	14	121	51	447
Sri Lanka	1	56	-	-
Switzerland	-	-	3	30
Thailand	7	70	-	-
UK	-	-	6	113
USA	++	46	39	512
Other countries	++	5	++	36

**Table – 50 : Imports of Silica Sand  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>6948</b>	<b>141112</b>	<b>12203</b>	<b>232106</b>
Bhutan	1022	9174	5507	94901
Italy	41	606	2292	34570
Spain	1	41	512	24696
Germany	623	19630	640	22637
China	324	11683	1028	12377
USA	702	42279	335	11363
UK	845	14595	720	11135
France	130	6365	186	3803
Saudi Arabia	1755	22843	312	1184
Norway	176	5382	-	-
Other countries	1329	8514	671	15440

**Table – 51 : Imports of Sand  
(Excl. Metal Bearing)  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>1802997</b>	<b>258882</b>	<b>1768513</b>	<b>262181</b>
Nepal	1802587	249507	1765756	247860
Germany	232	7035	217	6639
Belgium	75	949	270	3211
Jordan	-	-	1271	2231
USA	61	856	28	1758
Bangladesh	-	-	962	233
France	-	-	3	162
UK	1	11	4	60
Netherlands	++	66	-	-
Sweden	20	363	-	-
Other countries	21	95	2	27

**Table – 52 : Imports of Flint  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>2541</b>	<b>6554</b>	<b>597</b>	<b>5598</b>
UK	478	5486	443	3743
Turkey	21	210	145	1803
China	2000	506	8	46
France	22	257	1	6
Singapore	20	95	-	-

**Table – 53 : Imports of Agate : Uncut  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
<b>All Countries</b>	<b>328</b>	<b>535</b>	<b>342</b>	<b>204</b>
Hong Kong	-	-	12	94
USA	7	50	10	80
China	320	477	320	30
Brazil	1	8	-	-

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**Table – 54 : Imports of Agate : Cut  
(By Countries)**

Country	2006-07		2007-08	
	Qty (‘000 Carat)	Value (Rs.‘000)	Qty (‘000 Carat)	Value (Rs.‘000)
<b>All Countries</b>	++	<b>329</b>	++	<b>33</b>
Germany	-	-	++	33
Hong Kong	++	7	-	-
Thailand	++	322	-	-

**Table – 55 : Imports of Silicon  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.‘000)	Qty (t)	Value (Rs.‘000)
<b>All Countries</b>	<b>25733</b>	<b>1401899</b>	<b>25521</b>	<b>1641824</b>
China	24703	1244169	23928	1448323
France	556	45549	660	57977
Germany	52	57655	27	54621
UK	106	8945	224	16730
Kuwait	-	-	118	9867
Italy	30	8107	20	8792
Norway	12	2919	35	7452
Hong Kong	181	9838	123	7278
UAE	2	1503	71	5981
USA	35	13805	48	3893
Other countries	45	6922	267	20910

## FUTURE OUTLOOK

The demand for quartz, silica sand, moulding sand and quartzite is increasing over the years to cater to the requirement of ferro-silicon, silico-manganese, silico-chrome, silica refractories, glass and for moulding and

casting purposes. The requirements of these products are linked up directly with iron & steel industry including alloy steel production. Further, setting up foundries and enhancing their capacities are also linked with metallurgical industry.