

QUARTZ & OTHER SILICA MINERALS



# Indian Minerals Yearbook 2014

(Part- III : MINERAL REVIEWS)

53<sup>rd</sup> Edition

**QUARTZ & OTHER SILICA MINERALS**

(ADVANCE RELEASE)

**GOVERNMENT OF INDIA  
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INDIAN BUREAU OF MINES**

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# 42 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 largely of unconsolidated coarse quartzose grains or pebbles (2 mm to 8 mm in diameter), sandstone and quartzite. Quartzite is a granulose metamorphic rock consisting essentially of quartz and sandstone cemented by silica which has grown in optical continuity around each grain. 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 non-crystalline (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 by 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 1.4.2010, the total resources of quartz and silica sand in the country are estimated at 3,499 million tonnes out of which 12% i.e. 429 million tonnes are placed under reserves category while 88% i.e. 3,070 million tonnes are placed under remaining resources category. Resources by grades reflect foundry & moulding grade as 19%, glass grade 14%, ceramic & pottery grade 11% and ferro-silicon grade as 5%. The unclassified, others, sodium silicate and not-known grades account for about 51% of the total resources. Haryana alone accounts for about 52% resources, followed by Rajasthan (9.5%), Tamil Nadu (6.5%), Andhra Pradesh (6%), Maharashtra (5%), Jharkhand (4.5%) and Karnataka & Gujarat (3% each) (Table - 1).

The total resources of quartzite in the country as per the UNFC system as on 1.4.2010 are estimated as 1,251 million tonnes of which reserves are about 87 million tonnes and remaining resources are 1,165 million tonnes. Bulk resources of about 50% are located in Haryana followed by Bihar (22%), Maharashtra (7%), Punjab (6.5%), Odisha (5%) and Jharkhand (3%). Resources of refractory grade are 37%, ceramic & pottery grade 18% and BF grade 5%. The remaining 40% 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, Commissionerate of Geology & Mining, Gujarat and Directorate of Geology & Mineral Resources, Mizoram. Details of exploration carried out for quartz and other silica minerals during 2013-14 are given in Table - 3.

QUARTZ & OTHER SILICA MINERALS

**Table – 1 : Reserves/Resources of Quartz & Silica Sand as on 1.04.2010**  
(By Grades/States)

Grade/State	Reserves										Remaining resources					Total resources (A+B)					
	Proved		Probable		Total		Feasibility		Pre-feasibility		Measured		Indicated		Inferred		Reconnaissance		Total		
	STD111	STD121	STD122	STD121	STD122	A	STD221	STD221	STD222	STD221	STD222	STD331	STD332	STD333	STD334		B	B	B	B	B
<b>All India: Total</b>	<b>272,972</b>	<b>35,079</b>	<b>121,173</b>	<b>429,223</b>	<b>429,223</b>	<b>185,399</b>	<b>322,454</b>	<b>321,760</b>	<b>58,683</b>	<b>259,116</b>	<b>1,907,994</b>	<b>14,402</b>	<b>3,069,808</b>	<b>3,499,031</b>							
<b>By Grades</b>																					
Glass	103,129	15,139	40,524	158,792	158,792	46,785	23,815	51,528	2,176	8,707	175,356	5,922	314,289	473,082							
Ferro-silicon	4,889	96	6,479	11,464	11,464	9,022	16,023	20,409	98	65,126	57,175	-	167,853	179,317							
Sodium silicate	1,622	38	1,594	3,254	3,254	533	1,490	5,143	-	146	31,245	11	38,568	41,822							
Ceramic and Pottery	96,746	1,554	32,111	130,411	130,411	12,935	23,781	59,764	7,328	12,826	148,729	-	265,362	395,773							
Foundry and Moulding	46,285	15,999	20,891	83,175	83,175	58,339	36,249	116,140	16,984	38,301	302,462	7,672	576,148	659,323							
Abrasive	2,405	7	13	2,425	2,425	-	249	1,861	-	10	3,508	-	5,628	8,053							
Others	10,844	116	11,398	22,358	22,358	38,280	62,210	14,649	116	25	862,023	220	977,523	999,881							
Unclassified	4,600	353	2,828	7,781	7,781	11,869	154,593	33,209	31,982	39,669	190,442	17	461,781	469,562							
Not-known	2,453	1,778	5,333	9,564	9,564	7,634	4,045	19,058	-	94,307	137,053	560	262,657	272,220							
<b>By States</b>																					
Andhra Pradesh	33,590	3,320	35,772	72,683	72,683	16,664	6,242	25,109	5,404	10,965	65,867	6,099	136,349	209,031							
Assam	-	-	-	-	-	-	-	-	-	-	1,790	-	1,790	1,790							
Bihar	-	-	2,121	2,121	2,121	-	-	-	-	-	24,652	-	24,652	26,773							
Chhattisgarh	141	-	46	187	187	385	-	620	56	-	191	7,672	8,924	9,111							
Goa	-	-	-	-	-	-	20	1,736	-	-	18,248	-	20,004	20,004							
Gujarat	16,042	684	19,256	35,982	35,982	17,133	5,110	11,774	2,144	2,999	25,629	-	64,789	100,771							
Haryana	-	46	8,317	8,363	8,363	35,553	252,759	182,478	27,837	39,767	1,264,473	-	1,802,868	1,811,231							
Himachal Pradesh	1	-	7	8	8	99	-	-	-	-	2,928	-	3,027	3,035							
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	-	3,110	-	3,110	3,110							
Jharkhand	563	4	8,671	9,238	9,238	2	989	3,299	518	1,026	141,342	107	147,283	156,521							
Karnataka	8,677	3,809	2,375	14,861	14,861	12,402	4,970	8,276	205	100	49,508	525	75,987	90,848							
Kerala	-	38	-	38	38	404	1,959	3,354	14,611	30,241	77,528	-	128,096	128,135							
Madhya Pradesh	144	11	14	169	169	51	-	86	47	316	2,191	-	2,692	2,861							
Maharashtra	12,356	2,085	10,884	25,326	25,326	29,372	15,172	48,391	-	355	58,374	-	151,663	176,989							
Meghalaya	-	-	-	-	-	-	-	-	-	177	6,906	-	7,083	7,083							
Odisha	438	69	860	1,367	1,367	1,161	1,503	2,599	90	63,385	3,836	-	72,573	73,940							
Punjab	-	-	-	-	-	-	-	-	-	-	3,927	-	3,927	3,927							
Rajasthan	132,135	10,472	27,757	170,364	170,364	40,583	13,344	23,433	3,202	7,658	73,883	-	162,104	332,468							
Tamil Nadu	60,063	9	93	60,166	60,166	29,644	4,892	7,523	3,387	95,837	27,150	-	168,432	228,598							
Tripura	-	-	-	-	-	-	-	-	225	-	264	-	490	490							
Uttar Pradesh	8,042	14,530	3,977	26,549	26,549	1,946	15,482	3,071	957	6,290	51,590	-	79,337	105,886							
West Bengal	779	-	1,022	1,801	1,801	-	11	11	-	-	4,607	-	4,629	6,430							

Figures rounded off.

QUARTZ & OTHER SILICA MINERALS

**Table – 2 : Reserves/Resources of Quartzite as on 1.4.2010  
(By Grades/States)**

(In '000 tonnes)

Grades/States	Reserves				Remaining resources				Total resources (A+B)				
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Total (B)					
		STD121	STD122			STD221	STD222						
<b>All India : Total</b>	<b>59004</b>	<b>1647</b>	<b>25948</b>	<b>86599</b>	<b>33217</b>	<b>105018</b>	<b>147686</b>	<b>93116</b>	<b>113611</b>	<b>669453</b>	<b>2548</b>	<b>1164649</b>	<b>1251248</b>
<b>By Grades</b>													
Refractory Grade-I	52958	268	21894	75120	4549	626	11470	829	1067	239474	1730	259745	334865
Refractory Grade-II	1520	406	485	2411	146	461	-	3183	21490	97836	-	123116	125527
Ceramic / Pottery	558	9	1015	1582	16195	35826	72771	-	3599	90702	-	219093	220675
Low	985	-	1000	1985	468	3863	18	37	-	8460	-	12846	14831
Ferro-silicon	-	-	-	-	169	692	3034	-	376	-	523	4794	4794
B.F.	242	-	1258	1500	-	606	809	197	275	62822	295	65004	66504
Others	1079	907	210	2196	9488	757	2025	588	-	3012	-	15870	18066
Unclassified	163	-	86	249	2203	55769	55479	67347	55674	133095	-	369567	369816
Not-known	1500	58	-	1558	-	6418	2080	20935	31130	34053	-	94616	96174
<b>By States</b>													
Andhra Pradesh	2114	406	2131	4651	548	1009	7481	-	4390	5209	295	18932	23583
Arunachal Pradesh	-	-	-	-	-	-	-	-	-	5270	-	5270	5270
Bihar	-	32	-	32	146	461	20054	5287	22822	227531	-	276301	276333
Chhattisgarh	1404	-	1267	2671	3086	3926	2195	-	-	14706	-	23913	26584
Haryana	-	-	-	-	15702	89742	112365	86951	85333	231887	-	621980	621980
Himachal Pradesh	25	-	16	41	16	-	-	-	-	-	-	16	57
Jammu & Kashmir	1500	58	-	1558	-	-	-	-	-	-	-	-	1558
Jharkhand	1079	-	174	1253	-	-	-	197	275	38869	-	39341	40594
Karnataka	390	-	1011	1401	-	-	190	-	-	-	1730	1920	3321
Madhya Pradesh	-	-	-	-	-	-	-	-	-	832	-	832	832
Maharashtra	48700	-	19480	68180	9516	28	1639	-	-	11353	-	22536	90716
Odisha	3629	1151	1783	6563	4204	9834	3744	681	-	34851	523	53837	60400
Punjab	-	-	-	-	-	-	-	-	116	81796	-	81912	81912
Rajasthan	163	-	86	249	-	18	18	-	-	706	-	742	991
Sikkim	-	-	-	-	-	-	-	-	675	16444	-	17119	17119

Figures rounded off.

QUARTZ & OTHER SILICA MINERALS

**Table – 3 : Details of Exploration Activities for Quartz & Silica sand, 2013-14**

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
<b>QUARTZ</b>							
DMG, Rajasthan							
Alwar	N/v Mohanbas, Pachkui, Santokpur & Rinjwas Teh-Laxmangarh	1:50,000 1:10,000 1:2,000	200 10 1	-	-	12	i) In the west of Tintput village, phyllite interbedded with quartzite exposed in the area. At the contact of phyllite & quartzite, alternate bands of quartz vein of 100 to 150 m in length and width varying from 1 to 2 m were observed. The thickness of quartz vein assumed to be 10 m and depth 12 m. ii)The quartzite found in the area mapped in 800 x 400 m n/v kho Sarangpuri.
<b>SILICA SAND</b>							
Commissionerate of Geology & Mining, Gujarat Kachchh	Bhuj, Rapar Tq.	-	-	-	-	9898	China clay & Silica sand is found to be associated with sandstone of Jurassic age formation.
Directorate of Geology & Mineral Resources, Mizoram	Topo sheet 84 A/15 NE &NW	1:25,000	180	-	-	-	-

## PRODUCTION, STOCKS & PRICES

### QUARTZ

The production of quartz at 1395 thousand tonnes in 2013-14 increased by one percent as compared to the preceding year.

There were 251 reporting mines in 2013-14 as against 308 in preceding year. Besides, the production of quartz was also reported from 138 mines as an associated mineral during the year as against 141 mines in preceding year. The share of public sector mines, in the total output was about 1% during the year. The share of 8 principal producers was about 40% of the total output.

Andhra Pradesh continued to be the major producing state of quartz in the year 2013-14 accounting for 63% of the total production followed by Rajasthan (14%), Gujarat (10%), Karnataka (5%), West Bengal (3%), Jharkhand (2%), Tamil Nadu (1%) and the remaining two percent production was

contributed by Chhattisgarh, Maharashtra, Odisha and Uttar Pradesh. About 65% of the production during the year 2013-14 was reported by 35 mines including 6 associated mines having production above ten thousand tonnes. 34 mines including 8 associated mine having annual production between five thousand to ten thousand tonnes contributed about 17% of the total production. The remaining 18% was the contribution of 320 mines including 124 associated mines having annual production below five thousand tonnes (Tables- 4 to 7).

The mine-head stocks of quartz at the end of 2013-14 were 719 thousand tonnes as against 616 thousand tonnes at the beginning of the year (Table -8).

The average daily labour employed in quartz mines in 2013-14 was 2,464 as against 3,113 in the previous year. Domestic prices of quartz are furnished in the General Review on 'Prices'.

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**Table – 4 : Principal Producers of Quartz  
2013-14**

Name & address of producer	Location of mine	
	State	District
Veejee Mines & Minerals, 1-154, Hanaval (Post), Adoni – 518 344, Andhra Pradesh.	Andhra Pradesh	Kurnool
Adibonia Subbarayadu, 20/1/2, Kondapeta, Rajivnagar, Dhone, Kurnool-518 222, Andhra Pradesh.	Andhra Pradesh	Anantapur
Sibelco India Minerals Pvt. Ltd, (Formerly Vijaya Gimpex, Mining (P)Ltd), No.8-2-293/k/311-312, Sriman Chambers, Kamalapuri Colony, Phase-3, Hyderabad -500 073, Andhra Pradesh.	Andhra Pradesh	Anantapur, Mahabubnagar, Rangareddy
Bijendra Kumar Goyal, 35-36, Shiv Nagar, Murlipura, Jaipur – 302 013, Rajasthan.	Rajasthan	Tonk

Table - 4 (Concl.)

Name & address of producer	Location of mine	
	State	District
Asha Lata Bairwa, R-3, Raghu Vihar, Lal Kothi, Gandhi Nagar, Jaipur – 302 015, Rajasthan.	Rajasthan	Tonk
Sri Venkateshwar Mining Corporation, Prop. Ravindra Goud, Narayanguda, Hyderabad – 500 020, Andhra Pradesh.	Andhra Pradesh	Rangareddy
K. Maheswara Reddy, 5/57, Village & PO. Hussainapuram, Peapully – 518 222, Andhra Pradesh.	Andhra Pradesh	Kurnool
Allum Prashant, 11 <sup>th</sup> Ward, Gadigi Palace Car Street, Bellary – 583 101, Karnataka.	Karnataka	Bellary

(Contd.)

**Table – 5 : Production of Quartz, 2011-12 to 2013-14 (P)  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2011-12		2012-13		2013-14(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>782575</b>	<b>173890</b>	<b>1384155</b>	<b>341129</b>	<b>1395452</b>	<b>345695</b>
Andhra Pradesh	361566	73655	893670	198156	877036	198503
Bihar	-	-	8997	3914	-	-
Chhattisgarh	731	144	17009	6804	14784	5843
Gujarat	156248	27785	164462	24330	139336	24145
Jharkhand	109127	25461	42474	8566	27244	6448
Karnataka	-	-	6931	2225	63124	22774
Madhya Pradesh	-	-	340	31	-	-
Maharashtra	5315	2658	17475	14899	14974	6794
Odisha	6241	2091	7720	3529	6976	4527
Rajasthan	114632	22485	173448	40937	199801	49148
Tamil Nadu	12631	14611	21367	28368	15756	14878
Uttar Pradesh	-	-	-	-	900	90
West Bengal	16084	5000	30262	9370	35521	12545

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**Table – 6 : Production of Quartz, 2012-13 & 2013-14 (P)**  
(By Sectors/States/Districts)

(Qty in tonnes; Value in ₹'000)

State/District	2012-13			2013-14 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>308(141)</b>	<b>1384155</b>	<b>341129</b>	<b>251(138)</b>	<b>1395452</b>	<b>345695</b>
Public Sector	4(1)	14975	16629	2	11677	7095
Private Sector	304(140)	1369180	324500	249(138)	1383775	338600
<b>Andhra Pradesh</b>	<b>126(36)</b>	<b>893670</b>	<b>198156</b>	<b>97(35)</b>	<b>877036</b>	<b>198503</b>
Adilabad	2	2620	393	-	-	-
Anantpur	8	192450	25094	7	164561	23750
Chittoor	1(1)	130	39	1	1190	476
Cuddapah	1*	-	-	-	-	-
Godavari (West)	-	-	-	1	6033	3810
Guntur	1*	-	-	1*	3062	1225
Krishna	2	3430	1676	-	-	-
Kurnool	8	258152	53776	10	264651	53694
Mahbubnagar	28(15)	247828	55069	29(17)	246038	55030
Medak	17	55635	17407	12	40669	13675
Nalgonda	8	10095	2746	4	15611	3065
Nellore	15(18)	19092	8278	7(17)	30551	13522
Nizamabad	1	4882	2563	2	1984	430
Prakasam	12	5771	2329	5	7630	3402
Rangareddi	9(2)	57257	15190	9(1)	77559	20005
Srikakulam	1	40	15	1*	-	-
Visakhapatnam	3	30371	11509	3	11195	4240
Vizianagaram	9	5917	2072	5	6302	2179
<b>Bihar</b>	<b>1</b>	<b>8997</b>	<b>3914</b>	<b>1*</b>	<b>-</b>	<b>-</b>
Nawada	1	8997	3914	1*	-	-
<b>Chhattisgarh</b>	<b>5</b>	<b>17009</b>	<b>6804</b>	<b>6</b>	<b>14784</b>	<b>5843</b>
Mahasamund	5	17009	6804	4	11960	4749
Rajnandgaon	-	-	-	2	2824	1094
<b>Gujarat</b>	<b>19</b>	<b>164462</b>	<b>24330</b>	<b>19</b>	<b>139336</b>	<b>24145</b>
Dahod	5	19535	2855	4	14180	2439
Kaira	1	36787	5518	1	10525	1631
Panchmahals	13	108140	15957	14	114631	20075
<b>Jharkhand</b>	<b>11(4)</b>	<b>42474</b>	<b>8566</b>	<b>6(2)</b>	<b>27244</b>	<b>6448</b>
Deoghar	1	1156	289	1	72	18
Dumka	1	2559	320	-	-	-
Giridih	2	5466	1716	3	13233	4336
Hazaribagh	(1)	2534	507	(1) 1451	364	-
Jamtara	(1)	11056	1327	(1)	12288	1700
Latehar	5(1)	16703	3762	-	-	-
Palamu	(1)	750	150	-	-	-
Ranchi	-	-	-	1	200	30
Saraikela-Kharaswan	1*	-	-	1*	-	-
Singbhum (East)	1	2250	495	-	-	-

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Table - 6 (Concl.d.)

State/District	2012-13			2013-14 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>Karnataka</b>	<b>6</b>	<b>6931</b>	<b>2225</b>	<b>7</b>	<b>63124</b>	<b>22774</b>
Bellary	-	-	-	2	29000	9425
Chitradurga	1	4300	1290	1	12100	3630
Hassan	2*	-	-	-	-	-
Koppal	1	600	154	1	15000	6810
Raichur	1	1716	686	1	4000	1600
Tumkur	1	315	95	2	3024	1309
<b>Madhya Pradesh</b>	<b>2(1)</b>	<b>340</b>	<b>31</b>	<b>1*</b>	-	-
Balaghat	1*	-	-	-	-	-
Chattarpur	1*	-	-	1*	-	-
Jabalpur	(1)	340	31	-	-	-
<b>Maharashtra</b>	<b>5</b>	<b>17475</b>	<b>14899</b>	<b>5</b>	<b>14974</b>	<b>6794</b>
Bhandara	3	15291	13012	3	2425	2183
Chandrapur	1	2076	1864	1*	-	-
Gadchiroli	-	-	-	1	12549	4611
Nagpur	1	108	23	-	-	-
<b>Odisha</b>	<b>2(1)</b>	<b>7720</b>	<b>3529</b>	<b>1</b>	<b>6976</b>	<b>4527</b>
Kalahandi	1	5	2	-	-	-
Mayurbhanj	1(1)	7715	3527	1	6976	4527
<b>Rajasthan</b>	<b>65(98)</b>	<b>173448</b>	<b>40937</b>	<b>50(100)</b>	<b>199801</b>	<b>49148</b>
Ajmer	36(53)	74075	18887	29(46)	57175	14638
Bhilwara	7(35)	24323	7086	6(42)	33236	9460
Jaipur	4	545	110	3	-	-
Rajsamand	2(8)	7509	985	(9)	6937	2965
Sikar	11(2)	13896	2459	7(2)	13262	3052
Tonk	5	53100	11410	5(1)	89191	19033
<b>Tamil Nadu</b>	<b>63(1)</b>	<b>21367</b>	<b>28368</b>	<b>55</b>	<b>15756</b>	<b>14878</b>
Coimbatore	4	1376	1229	3	551	493
Dharmapuri	-	-	-	1	981	245
Dindigul	6	609	236	5	917	439
Erode	12	970	954	13	2341	2090
Karur	18	9769	8854	13	2587	1696
Madurai	1	295	236	1	244	248
Namakkal	9	3769	11268	7	5265	7376
Salem	9	1310	383	10	511	123
Tiruchirapalli	1	701	470	1	2094	1664
Tiruppur	1	430	818	1	265	504
Thirivarul	(1)	2088	3890	-	-	-
Tuticorin	1*	-	-	-	-	-
Vellore	1	50	30	-	-	-
<b>Uttar Pradesh</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(1)</b>	<b>900</b>	<b>90</b>
Hamirpur	-	-	-	(1)	900	90
<b>West Bengal</b>	<b>3</b>	<b>30262</b>	<b>9370</b>	<b>3</b>	<b>35521</b>	<b>12545</b>
Bankura	1	8755	3085	1	11925	5366
Birbhum	1	10855	3408	1	13667	4373
Purulia	1	10652	2877	1	9929	2806

Figures in parentheses indicate no. of associated mines of quartz with asbestos, felspar, mica, laterite, pyrophyllite and quartzite.

\* Reported labour and/or production of felspar.



QUARTZ & OTHER SILICA MINERALS

**Table – 7 : Production of Quartz, 2012-13& 2013-14 (P)  
(By Frequency Groups)**

(Qty in tonnes)

Production group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2012-13	2013-14(P)	2012-13	2013-14(P)	2012-13	2013-14(P)	2012-13	2013-14(P)
<b>All Groups</b>	<b>308(141)</b>	<b>251(138)</b>	<b>1384155</b>	<b>1395452</b>	<b>100.00</b>	<b>100.00</b>	-	-
Up to 500	159(77)	114(72)	28421	19708	2.05	1.41	2.05	1.41
501-1000	27(15)	27(23)	30558	37555	2.21	2.69	4.26	4.10
1001-5000	65(41)	55(29)	241352	198114	17.44	14.20	21.70	18.30
5001-10000	33(3)	26(8)	267559	235281	19.33	16.86	41.03	35.16
10001 & above	24(5)	29(6)	816265	904794	58.97	64.84	100.00	100.00

Figures in parentheses indicate number of associated mines of quartz with asbestos, felspar, laterite, mica, pyrophyllite & quartzite.

**Table – 8 : Mine-head Stocks of Quartz  
2013-14 (P)  
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>616280</b>	<b>718998</b>
Andhra Pradesh	431915	506288
Bihar	302	-
Chhattisgarh	5866	8111
Gujarat	5608	5502
Jharkhand	4560	3444
Karnataka	17949	56506
Madhya Pradesh	21217	9500
Maharashtra	5524	1729
Odisha	7214	6771
Rajasthan	97262	111729
Tamil Nadu	17261	9050
Uttar Pradesh	1279	67
West Bengal	323	301

## SILICA SAND

The production of silica sand at 3,346 thousand tonnes in 2013-14 decreased by about 22 % over the previous year due to decrease in market demand and non-availability of labour.

During the year under review, there were 136 reporting mines as against 170 in the preceding year. Besides, the production of silica sand was also reported as an associated mineral by eight mines during the year. Ten principal producers accounted for about 50% of the total production. The share of public sector in the total production was only 1% in 2013-14 as against 3% in the preceding year.

Andhra Pradesh, the leading producing state accounted for 43% of the total production during the year followed by Gujarat (25%), Rajasthan (18%), Maharashtra (6%), Karnataka (4%) and West Bengal (2%). The remaining two percent of production was contributed by Kerala, Tamil Nadu and Uttar Pradesh.

About 56% of the total production of silica sand was contributed by 16 silica sand mines and two associated mines, each producing more than 50 thousand tonnes annually and about 41% by 68 silica sand mines and two associated mines, each producing five thousand to fifty thousand tonnes. The remaining 3% of the output was contributed by 52 silica sand mines and four associated mines, each producing less than 5000 tonnes annually (Tables - 9 to 12).

Mine-head stocks of silica sand at the end of the year 2013-14 were 53,975 thousand tonnes as against 6,088 thousand tonnes at the beginning of the previous year (Table- 13).

The average daily employment of labour in 2013-14 was 1,878 as against 2,902 in the previous year. Domestic prices of silica sand are furnished in the General Review on 'Prices'.

QUARTZ & OTHER SILICA MINERALS

**Table – 9 : Principal Producers of Silica Sand, 2013-14**

Name & address of producer	Location of mine	
	State	District
Sanghi Industries Ltd, 10 <sup>th</sup> Floor, Kataria Arcade, Opp. S.G.Highway, P.O. Makaraba, Distt. Ahmedabad- 380 051, Gujarat.	Gujarat	Kachchh
Mohd. Sher Khan Khwaja Bagh, P.O. Sawa-312 613, Distt. Chittorgarh, Rajasthan.	Rajasthan	Chittorgarh
Nishita Mines & Minerals, 6/160, East Street , Gudur, Distt. Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore
Bhavani Minerals, P.O.Bhilod-393 135, Distt. Bharuch, Gujarat.	Gujarat	Bharuch
Alimiya Imam Ali Saiyed, 22/FF-16,Smruddhi Complex , Nyay Mandir , P.O.Himmatnagar-383 001 Distt. Sabarkantha, Gujarat.	Gujarat	Bharuch

Table - 9 (Concl.)

Name & address of producer	Location of mine	
	State	District
Smt.D.Bhagyalakshmi, Door No.22, Vill. & Post. Chintavaram, Mandal. Chillakur, Distt. Nellore-524 412, Andhra Pradesh.	Andhra Pradesh	Nellore
Ish Kripa Minerals, Ish –Kripa Shopping Plaza, Station Road, Ankleshwar, Distt.Bharuch-393 001, Gujarat.	Gujarat	Bharuch
Bundi Silica Sand Supply Co., B-72, Ballabh Nagar, Kota – 324 007, Rajasthan.	Rajasthan	Bundi
Shanmuga Minerals, Main Road, Vill. & Post.Siddavaram, Mandal. Kota, Distt. Nellore-524 101, Andhra Pradesh.	Andhra Pradesh	Nellore
Esmo Trading Corporation, 255/A-1, Highway Park Aptt., Old Pune –Bengaluru Road, Kolhapur-416 003, Maharashtra.	Maharashtra	Sindhudurg

(Contd.)

**Table – 10 : Production of Silica Sand, 2011-12 to 2013-14 (P)  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2011-12		2012-13		2013-14(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>4867667</b>	<b>714062</b>	<b>4303883</b>	<b>1002046</b>	<b>3346114</b>	<b>864066</b>
Andhra Pradesh	1582312	142157	2128989	325572	1426819	254017
Gujarat	1959203	154387	869926	72208	844984	73408
Jharkhand	113265	36724	81088	20971	-	-
Karnataka	37607	11053	102854	37845	133619	57687
Kerala	62683	83680	91833	160183	47248	94029
Maharashtra	236307	75652	278138	82656	200053	80136
Rajasthan	755074	169043	626336	250040	611164	263490
Tamil Nadu	4502	6518	10916	13337	11476	12846
Uttar Pradesh	65584	13118	42051	8326	8336	1667
West Bengal	51130	21730	71752	30908	62415	26786

QUARTZ & OTHER SILICA MINERALS

**Table – 11 : Production of Silica Sand, 2012-13 and 2013-14 (P)**  
(By Sectors/States/Districts)

(Qty in tonnes; Value in ₹ '000)

State/District	2012-13			2013-14(P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>170(9)</b>	<b>4303883</b>	<b>1002046</b>	<b>136(8)</b>	<b>3346114</b>	<b>864066</b>
Public Sector	6	128311	46679	5	45811	30798
Private Sector	164(9)	4175572	955367	131(8)	3300303	833268
<b>Andhra Pradesh</b>	<b>74</b>	<b>2128989</b>	<b>325572</b>	<b>54</b>	<b>1426819</b>	<b>254017</b>
Kurnool	8	43865	8574	6	50203	13174
Nellore	57	2028056	311291	40	1290650	231595
Prakasam	9	57068	5707	8	85966	9248
<b>Gujarat</b>	<b>19(1)</b>	<b>869926</b>	<b>72208</b>	<b>18(1)</b>	<b>844984</b>	<b>73408</b>
Bharuch	14(1)	724737	59816	13(1)	473193	55906
Kachchh	1	63348	2407	1	326622	11649
Sabarkantha	1	15376	4997	1	5078	2031
Surat	1	60	7	1	9010	361
Surendranagar	2	66405	4981	2	31081	3461
<b>Jharkhand</b>	<b>1(1)</b>	<b>81088</b>	<b>20971</b>	-	-	-
Sahibganj	1(1)	81088	20971	-	-	-
<b>Karnataka</b>	<b>18</b>	<b>102854</b>	<b>37845</b>	<b>13</b>	<b>133619</b>	<b>57687</b>
Udupi	16	92734	33582	11	126289	54755
Uttar Kannada	2	10120	4263	2	7330	2932
<b>Kerala</b>	<b>23</b>	<b>91833</b>	<b>160183</b>	<b>16</b>	<b>47248</b>	<b>94029</b>
Alappuzha	23	91833	160183	16	47248	94029
<b>Maharashtra</b>	<b>12</b>	<b>278138</b>	<b>82656</b>	<b>14</b>	<b>200053</b>	<b>80136</b>
Kolhapur	1	5660	991	1	8865	1551
Ratnagiri	4	21262	4727	5	13106	4403
Sindhudurg	7	251216	76938	8	178082	74182
<b>Rajasthan</b>	<b>13(6)</b>	<b>626336</b>	<b>250040</b>	<b>13(6)</b>	<b>611164</b>	<b>263490</b>
Alwar	1	4342	1042	1	5251	1260
Barmer	-	-	-	1	480	120
Bharatpur	1	11647	2912	1	15194	3798
Bikaner	(1)	47101	9655	(3)	30004	6062
Bundi	1	98870	39548	1	94187	44990
Chittorgarh	(1)	292185	118627	(1)	296000	120176
Jaipur	(1)	4758	856	-	-	-
Jaisalmer	1	10775	7004	1	4940	3211
Karauli	1	20438	5110	1	18678	4670
Sawai Madhopur	5	115652	58401	5	139893	77554
Sikar	3(3)	20568	6885	2(1)	4367	1323
Udaipur	-	-	-	(1)	2170	326
<b>Tamil Nadu</b>	<b>7</b>	<b>10916</b>	<b>13337</b>	<b>6</b>	<b>11476</b>	<b>12846</b>
Kanchipuram	2	4212	4887	2	4489	5085
Nagapattinam	4	6704	8450	3	4415	5298
Villupuram	1*	-	-	1	2572	2463
<b>Uttar Pradesh</b>	<b>2</b>	<b>42051</b>	<b>8326</b>	<b>1</b>	<b>8336</b>	<b>1667</b>
Allahabad	2	42051	8326	1	8336	1667
<b>West Bengal</b>	<b>1(1)</b>	<b>71752</b>	<b>30908</b>	<b>1(1)</b>	<b>62415</b>	<b>26786</b>
Bankura	1(1)	71752	30908	1(1)	62415	26786

Figures in parentheses indicates number of associated mines with agate, ball clay, clay(others), felspar, fireclay, kaolin & quartz.

\* Only labour reported.

QUARTZ & OTHER SILICA MINERALS

**Table – 12 : Production of Silica Sand, 2012-13 & 2013-14 (P)  
(By Frequency Groups)**

(Qty in tonnes)

Production group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2012-13	2013-14(P)	2012-13	2013-14(P)	2012-13	2013-14(P)	2012-13	2013-14(P)
<b>All Groups</b>	<b>170(9)</b>	<b>136(8)</b>	<b>4303883</b>	<b>3346114</b>	<b>100.00</b>	<b>100.00</b>	-	-
Up to 500	29	18	3956	4090	0.09	0.12	0.09	0.12
501 to 1000	7	2	4968	1630	0.12	0.05	0.21	0.17
1001 to 3000	16	23(3)	31709	53770	0.74	1.61	0.95	1.78
3001 to 5000	20(4)	9(1)	96390	43877	2.24	1.31	3.19	3.09
5001 to 10000	23	21	157258	145679	3.65	4.35	6.84	7.44
10001 to 15000	18	11(1)	219025	139441	5.09	4.17	11.93	11.61
15001 to 25000	12(2)	13(1)	265310	268194	6.16	8.02	18.09	19.63
25001 to 50000	21(1)	23	767881	808446	17.84	24.16	35.93	43.79
50001 and Above	24(2)	16(2)	2757386	1880987	64.07	56.21	100.00	100.00

**Table – 13 : Mine-head Stocks of Silica Sand  
2013-14 (P)  
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>6087809</b>	<b>5397487</b>
Andhra Pradesh	2452728	2354041
Gujarat	2732803	2067645
Jharkhand	60773	-
Karnataka	68447	64803
Kerala	48413	24386
Maharashtra	166391	208775
Odisha	656	656
Rajasthan	450949	621335
Tamil Nadu	734	661
Uttar Pradesh	105915	55185

There were 28 reporting mines during the year as against 34 in the previous year. Besides, production of quartzite was reported by ten associated mines in the current year and nine associated mines in the previous year. During the year under review five principal producers accounted for about 59% of the total production. Entire output of quartzite was reported from mines in the private sector.

Andhra Pradesh was the leading producing state during the year under review contributing about 68% of total production which was followed by Maharashtra (11%), Chhattisgarh (6%), Odisha (6%), Bihar (4%), Karnataka (3%), West Bengal (1%), Rajasthan (1%). Nominal production was also reported by Jharkhand (Tables - 14 to 16).

Mine-head stocks of quartzite at the end of the year 2013-14 were 216 thousand tonnes as against 152 thousand tonnes at the beginning of the year (Table - 17).

## QUARTZITE

Production of quartzite at 530 thousand tonnes in 2013-14 increased by 6% as compared to that in the previous year.

The average daily employment of labour during the period under review was 591 as against 830 in 2012-13. Domestic prices of quartzite are furnished in the General Review on 'Prices'.

QUARTZ & OTHER SILICA MINERALS

**Table – 14 : Principal Producers of Quartzite, 2013-14**

Name & address of producer	Location of mine	
	State	District
Dinesh Das & Son's Mines & Steel Pvt. Ltd Srikakulam, Post - Bahalda, Bahalda Road, Distt - Mayurbhanj, Odisha.	Andhra Pradesh	Vizianagaram, Srikakulam
*Gahra Minerals, Habib Nagar,Teka Naka, Nagpur-440 017, Maharashtra.	Maharashtra	Bhandara
Dadi Ramana Chitti, 2-54,Old Pendurthy, Visakhapatnam-531 173, Andhra Pradesh	Andhra Pradesh	Vizianagaram
K.Subramanya Raju, Vill.Totlalpalli, Post.Alamanda, Distt. Vizianagaram, Andhra Pradesh.	Andhra Pradesh	Vizianagaram
Venkateswara Mines and Minerals, Vill. & Post.Balagudaba, Parvathipuram-535 501, Distt.Vizianagaram, Andhra Pradesh.	Andhra Pradesh	Vizianagaram

\* Producing as an associated mineral with quartz and pyrophyllite.

**Table – 15 : Production of Quartzite, 2011-12 to 2013-14 (P)  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2011-12		2012-13		2013-14(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>272141</b>	<b>139207</b>	<b>501399</b>	<b>276777</b>	<b>529988</b>	<b>301094</b>
Andhra Pradesh	98955	44330	221885	96019	360615	165519
Bihar	35707	16895	109495	54829	21345	9683
Chhattisgarh	32626	36368	42524	43514	31671	33420
Jharkhand	44726	9840	30771	7307	1981	436
Karnataka	10134	4155	10000	4900	13000	6370
Maharashtra	37630	21111	55117	43160	58073	51976
Odisha	4715	3181	26818	26289	32026	30426
Rajasthan	7648	3327	4489	669	4187	1256
West Bengal	-	-	300	90	7090	2008

QUARTZ & OTHER SILICA MINERALS

**Table – 16 : Production of Quartzite, 2012-13 & 2013-14 (P)**  
(By Sectors/States/Districts)

(Qty in tonnes; Value in ₹'000)

State/District	2012-13			2013-14 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>34(9)</b>	<b>501399</b>	<b>276777</b>	<b>28(10)</b>	<b>529988</b>	<b>301094</b>
Private Sector	34(9)	501399	276777	28(10)	529988	301094
<b>Andhra Pradesh</b>	<b>18(4)</b>	<b>221885</b>	<b>96019</b>	<b>14(4)</b>	<b>360615</b>	<b>165519</b>
Cuddapah	1	500	227	1	1038	500
Kurnool	(1)	600	90	(2)	1137	110
Srikakulam	3	32806	15152	2	79058	38344
Vizianagaram	14(3)	187979	80550	11(2)	279382	126565
<b>Bihar</b>	<b>2(1)</b>	<b>109495</b>	<b>54829</b>	<b>1(1)</b>	<b>21345</b>	<b>9683</b>
Munger	2	21147	16398	1	10670	4802
Nawada	(1)	88348	38431	(1)	10675	4881
<b>Chhattisgarh</b>	<b>6</b>	<b>42524</b>	<b>43514</b>	<b>6</b>	<b>31671</b>	<b>33420</b>
Durg	3	5423	2111	3	3200	1761
Raigarh	3	37101	41403	2	28421	31618
Rajnandgaon	-	-	-	1	50	41
<b>Jharkhand</b>	<b>2</b>	<b>30771</b>	<b>7307</b>	<b>1</b>	<b>1981</b>	<b>436</b>
Singhbhum (East)	2	30771	7307	1	1981	436
<b>Karnataka</b>	<b>1</b>	<b>10000</b>	<b>4900</b>	<b>1</b>	<b>13000</b>	<b>6370</b>
Belgaum	1	10000	4900	1	13000	6370
<b>Maharashtra</b>	<b>(4)</b>	<b>55117</b>	<b>43160</b>	<b>(4)</b>	<b>58073</b>	<b>51976</b>
Bhandara	(3)	41019	30162	(3)	35907	30571
Chandrapur	(1)	14098	12998	(1)	22166	21405
<b>Odisha</b>	<b>3</b>	<b>26818</b>	<b>26289</b>	<b>3(1)</b>	<b>32026</b>	<b>30426</b>
Jharsuguda	2	25122	24933	2	30248	29580
Keonjhar	-	-	-	(1)	1533	736
Mayurbhanj	1	1696	1356	1	245	110
<b>Rajasthan</b>	<b>1</b>	<b>4489</b>	<b>669</b>	<b>1</b>	<b>4187</b>	<b>1256</b>
Sawai Madhopur	1	4489	669	1	4187	1256
<b>West Bengal</b>	<b>1</b>	<b>300</b>	<b>90</b>	<b>1</b>	<b>7090</b>	<b>2008</b>
Bankura	1	300	90	1	7090	2008

Figures in parentheses indicates number of associated mines of quartz,kyanite and pyrophyllite.

**Table – 17 : Mine-head Stocks of Quartzite**  
**2012-13 & 2013-14 (P)**  
(By States)

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>152161</b>	<b>215580</b>
Andhra Pradesh	49433	107844
Bihar	55397	48006
Chhattisgarh	20891	23118
Jharkhand	2222	1197
Karnataka	1524	3014
Maharashtra	6117	12738
Odisha	11482	13655
Rajasthan	4847	4627
Tamil Nadu	-	1243
West Bengal	248	138

**SAND (OTHERS)**

The production of sand (others) at 2553 thousand tonnes in 2013-14 decreased by 3% as compared to that of previous year.

There were sixteen reporting mines in 2013-14 as against eleven primary and one associated mines in the previous year. The Singareni Collieries Co. Ltd, having seven mines in Andhra Pradesh contributed 79% of the total production of sand (others). 18% from three mines of Western Coal Fields Ltd 3% from 2 mines of MOIL Ltd in Balaghat district of Madhya Pradesh and the remaining small quantity was from Rajasthan (Tables - 18 to 20).

All mines were captive in nature and contract labour were employed by the producers.

Mine-head stocks at the end of 2013-14 were 555 thousand tonnes as against 426 thousand tonnes in the beginning of the year (Table-21).

QUARTZ & OTHER SILICA MINERALS

**Table – 18 : Producers of Sand (Others), 2013-14**

Name & address of producer	Location of mine	
	State	District
Singareni Collieries Co.Ltd, P.O. Kothagudam, Distt- Khammam-507 101, Andhra Pradesh.	Andhra Pradesh	Adilabad Karimnagar
Western Coal fields Ltd, Coal Estate, Civil Lines, Nagpur- 440 001, Maharashtra.	Maharashtra	Chandrapur
MOIL Limited, MOIL Bhavan,I-A Katol Road, Nagpur-440 013, Maharashtra	Madhya Pradesh	Balaghat

**Table –19 : Production of Sand (Others), 2011-12 to 2013-14(P)  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2011-12		2012-13		2013-14(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>2625111</b>	<b>162965</b>	<b>2638424</b>	<b>201821</b>	<b>2552918</b>	<b>253458</b>
Andhra Pradesh	2157012	134198	1874624	150997	2032004	216617
Madhya Pradesh	-	-	-	-	66091	6345
Maharashtra	435159	23628	750877	49759	449543	29693
Meghalaya	32940	5139	12923	1065	-	-
Rajasthan	-	-	-	-	5280	803

**Table – 20 : Production of Sand (Others), 2012-13 & 2013-14 (P)  
(By Sectors/States/Districts)**

(Qty in tonnes; Value in ₹'000)

State/District	2012-13			2013-14(P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>11(1)</b>	<b>2638424</b>	<b>201821</b>	<b>16</b>	<b>2552918</b>	<b>253458</b>
Public Sector	11	2625501	200756	13	2547638	252655
Private Sector	(1)	12923	1065	3	5280	803
<b>Andhra Pradesh</b>	<b>8</b>	<b>1874624</b>	<b>150997</b>	<b>8</b>	<b>2032004</b>	<b>216617</b>
Adilabad	3	1004791	103033	3	992350	135420
Karimnagar	4	860484	46608	4	1031866	80300
Vizianagaram	1	9349	1356	1	7788	897
<b>Madhya Pradesh</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>66091</b>	<b>6345</b>
Balaghat	-	-	-	2	66091	6345
<b>Maharashtra</b>	<b>3</b>	<b>750877</b>	<b>49759</b>	<b>3</b>	<b>449543</b>	<b>29693</b>
Chandrapur	3	750877	49759	3	449543	29693
<b>Meghalaya</b>	<b>(1)</b>	<b>12923</b>	<b>1065</b>	<b>-</b>	<b>-</b>	<b>-</b>
Jaintia Hills	(1)	12923	1065	-	-	-
<b>Rajasthan</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>5280</b>	<b>803</b>
Jaisalmer	-	-	-	3	5280	803

Figures in parenthesis indicates associated mines with limestone.

QUARTZ & OTHER SILICA MINERALS

**Table – 21: Mine-head Stocks of Sand (Others), 2013-14 (P)**  
(By States)

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>425948</b>	<b>555012</b>
Andhra Pradesh	359300	508380
Maharashtra	64519	43671
Rajasthan	2129	2961

**AGATE**

The production of agate was 100 tonnes in 2013-14 as compared to 493 tonnes during the preceding year. The only private sector mine of agate was situated in Bharuch district, Gujarat (Tables - 22 to 24).

Mine-head stocks of agate at the end of the year 2013-14 was 21 tonnes as against 56 tonnes at the beginning of the year (Table - 25).

The average daily employment of labour was 14 in 2013-14 as against 9 in the previous year.

**Table – 22 : Producer of Agate, 2013-14**

Name & address of producer	Location of mine	
	State	District
Alimiya I. Saiyed, 16, Vyapar Bhawan, Himmatnagar, Sabarkantha -383 001 Gujarat.	Gujarat	Bharuch

**Table – 23 : Production of Agate, 2011-12 to 2013-14 (P)**  
(By States)

(Qty in tonnes; Value in ₹'000)

State	2011-12		2012-13		2013-14(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India/ Gujarat</b>	<b>476</b>	<b>238</b>	<b>493</b>	<b>247</b>	<b>100</b>	<b>50</b>

**Table – 24 : Production of Agate, 2012-13 & 2013-14 (P)**  
(By Sectors/States/Districts)

(Qty in tonnes; Value in ₹'000)

State/District	2012-13			2013-14(P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India/Private Sector</b>	<b>1</b>	<b>493</b>	<b>247</b>	<b>1</b>	<b>100</b>	<b>50</b>
Gujarat/ Bharuch	1	493	247	1	100	50



## QUARTZ & OTHER SILICA MINERALS

**Table – 25 : Mine-head Stocks of Agate  
2013-14 (P)  
(By States)**

State	(In tonnes)	
	At the beginning of the year	At the end of the year
India/Gujarat	56	21

### JASPER

No production of jasper was reported since 2009-10. The only mine which reported production in 2008-09 wound up its operation due to lack of demand.

### 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 located at Mahabubnagar district in Andhra Pradesh with crushing capacity of 45 tonnes and 1000 tonnes a month, respectively. Besides, Maharashtra Minerals Corp. Ltd having a 50,000 tonnes per year beneficiation plant at Phondaghat in Sindhudurg district. The plant has advanced technology in washing both by water and chemicals and further grading it in required fractions.

### HEALTH HAZARDS

Respirable silica is still a cause of major concern to miners and consumers since many minerals especially, industrial sand and gravel contain crystalline silica. There is a potential threat of workers getting subjected to "silicosis"

in quartz, silica sand and gravel mines. Occupational safety measures & regulations to monitor the levels of crystalline silica in these mines are mandatory. In the USA, the Occupational Safety and Health Administration (OSHA) listed "crystalline silica" as one of their top five priorities for formulation of necessary rules. The OSHA, on the basis of significant information put out by 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 & construction sectors and as a natural abrasive. Known for 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; its application as a filler in acid proof cements, putty, paints, epoxy & polyester resins is inevitable. Besides, it is widely used in horticulture, as a filtration medium, and for ornamental purposes as well. 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 is 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, filter sand, glass sand and grinding & 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. Most of the glass demand in India currently comes from container glass, which accounts for 50% of the country's glass consumption by value. It is reported that a large fraction of the requirement of flat glass, container glass, glass fibre and glass tablewares is being produced by about 100 large-scale producers. Most of them are located in Gujarat, Mumbai, Kolkata, Bengaluru and

Hyderabad. There are more than 600 medium and small cottage-scale industries. The production of glass sheet, toughened glass, fibre glass and glass bottles during 2013-14 was 128,040.00 thousand sq m, 3,283.46 thousand sq m, 38.27 thousand tonnes and 999.63 thousand tonnes, respectively and during 2014-15 (April 2014 to Nov.2014) have been 70,722 thousand sq m, 2669.25 thousand sq m, 30.24 thousand tonnes and 732.30 thousand tonnes, respectively.

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

## QUARTZ & OTHER SILICA MINERALS

BIS has laid down specifications for glass making sands vide IS:488-1980 (Second Revision, Reaffirmed 2008).

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 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

Ceramic industry comprises ceramic tiles, sanitaryware and crockeryware items. These products are manufactured both in large and small-scale sectors. 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 tpy installed capacity and 7 units for sanitaryware with 143,000 tpy capacity in the country.

In the small-scale sector, there were over 210 units of sanitaryware with capacity of 53,000 tpy and over 1400 plants of potteryware with a capacity of 3 lakh tpy (Table - 26).

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 is used in enamels. The silica flour normally contains 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. BIS has prescribed the specifications of quartz for ceramic industry vide IS: 11464-2011 (First Revision).

**Table – 26 : Ceramic Industry**

Industry	Unit	2011-12		2012-13(e)	
		No. of Units	Production	No. of Units	Production
Ceramic Tiles	million sq m	16 + 200 SSI Units	450.00	16 +200 SSI Units	513.00
Potteryware	million tonnes	16 + 1400 SSI Units	85.40	16 + 1400 SSI Units	92.23
Sanitaryware	million tonnes	7 + 210 SSI Units	0.53	7 + 210 SSI Units	0.58

*Source: Ministry of Commerce & Industry, Department of Industrial Policy & Promotion, Annual Report, 2012-13.*

### Foundry

The Indian foundry industry is the 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.

## QUARTZ & OTHER SILICA MINERALS

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%. BIS has laid down specifications of high silica sand for use in foundries vide IS: 1987-2002 (Second Revision, Reaffirmed 2007).

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 (Reaffirmed 2008), 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 & cores and also as essential ingredient in the moulding sand mixtures. It is also used to obtain elevated temperature strength, high density and resistance to metal penetration in cores. Silica flour is 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. BIS has laid down

specifications of silica flour for use in foundries vide IS: 3339-1975 (Reaffirmed 2008).

### 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 LD 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 they 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 that get 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 for this purpose must be as high as 90% with minor amounts of impurities like iron and alumina up to 1.5% maximum. BIS has laid down IS: 13676-1993 (Reaffirmed 2008) for quartzite for iron making in blast furnace.

### 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.

QUARTZ & OTHER SILICA MINERALS

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. BIS has laid down IS: 13054-1991(Reaffirmed 2008) for use of quartz/quartzite for production of ferro-alloys.

The production of ferro-silicon was estimated at around 90 thousand tonnes each in 2012-13 and 2013-2014. List of principal producers of ferro-silicon is furnished in Table - 27.

**Table – 27 : Principal Producers of Ferro-silicon**

Name of the plant	Installed capacity (tpy)
Ferro Alloys Corp. Ltd, (Ferro Alloys Division), Vizianagaram, Andhra Pradesh.	72500 (Total)
Navbharat Ferro Alloys Ltd, Paloncha, Distt- Khammam, Andhra Pradesh.	9300
VBC Ferro Alloys Ltd, Medak, Andhra Pradesh.	19000
GMR Technologies & Ind. Ltd, Ravivalasa, Distt- Srikakulam, Andhra Pradesh.	25000 (Total)
Akshay Ispat & Ferro Alloys Ltd, Namchi Distt- South Sikkim, Sikkim.	6000
Hindustan Malleables & Forgings Ltd, Dhanbad, Jharkhand.	1800
Anjaney Ferro Alloys Ltd, Mihijam, Distt- Dumka, Jharkhand.	NA

(Contd.)

(Table -27 Concltd.)

Name of the plant	Installed capacity (tpy)
Sandur Manganese & Iron Ore Ltd, Vyasankere, Bellary, Karnataka (closed).	24000
Sri Laxmi Electro Smelters (Pvt.) Ltd, Erumathala, Aluva, Kerala.	NA
Indsil Electrosmelts Ltd, Pallabhari, Distt- Palakkad, Kerala.	NA
Indian Metals & Ferro Alloys Ltd, Therubali, Distt- Cuttack, Odisha.	53000
The Silical Metallurgic Ltd, Puducherry.	10560
Snam Alloys Ltd, Village Kariamanickam, Puducherry.	12000
V.S.K. Ferro Alloys Ltd, Thuthipet, Puducherry.	3000
Hindustan Ferro Alloys & Industries Ltd, Hamirpur, Uttar Pradesh.	3200

QUARTZ & OTHER SILICA MINERALS

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 carbon & low carbon silico-manganese) which was about 237 thousand tonnes in 2012-13 decreased to 225 thousand tonnes in 2013-14. The details of silicon ferro-alloys are also discussed in the review on 'Ferro-Alloys'.

**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 Table - 28.

**Table – 28 : 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 2008 & 2013)	-	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 2008 & 2014)	-	-	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.	
Iron (BF)	Quartzite	IS:13676 -1993 (Reaffirmed 2008 &) 2014	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%.	

(Contd.)

## QUARTZ & OTHER SILICA MINERALS

(Table -28 Concl.d.)

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 (%)	
	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 foundaries (IS : 1987-2002; Second Revision), Quartz, quartzite for production of ferro-alloys (IS : 13054-1991; Reaffirmed 2003).

### CONSUMPTION

The consumption of quartz and silica sand was estimated at 1.77 million tonnes in 2013-14. Major consuming industries were glass (42%), cement (18%), ferro-alloys (15%), foundry (8%), fertilizer (6%) and ceramic (5%). Other industries such as iron & steel, alloy steel, insecticide, refractory, abrasive, etc. consumed the remaining 6%.

The consumption of quartzite was estimated around 318 thousand tonnes out of which iron and steel industry consumed about 56%, followed by refractory (16%), sponge iron and ferro-alloys (14% each).

The estimated consumption of moulding sand in 2013-14 was 47,500 tonnes. Major consuming industries were foundry (88%), followed by mining machinery (9%) and iron & steel (3%).

The total ferro-silicon consumed by various industries in 2013-14 was estimated at 41,800 tonnes. Major consuming industries were iron & steel (86%), alloy steel (8%) and foundry (15%). Besides, reported consumption of ferro-silico-magnesium was 13 tonnes in foundry industry in 2013-14 (Tables - 29 to 33).

### POLICY

Foreign Trade Policy (FTP) for 2009-2014 and the amended Export and Import Policy

incorporated in the FTP, the imports of natural sands will subject to Plant quarantine (Regulation of imports in to India) Order, 2003. However, the exports of river sand to Maldives under bilateral agreements between Government of India and Government of the Republic of Maldives is permitted, subject to 'No Objection Certificate' by CAPEXIL within the annual ceiling of 2, 2.5 & 3 lakh metric tonnes for the year 2014-15, 2015-16 and 2016-17, respectively.

### 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. It has been estimated that about 10 billion quartz crystals and oscillators per year are manufactured and installed world wide in all types of electronic devices.

QUARTZ & OTHER SILICA MINERALS

**Table – 29 : Consumption\* of Quartz/Silica Sand, 2011-12 to 2013-14 (P)**  
(By Industries)

(In tonnes)			
Industry	2011-12	2012-13(R)	2013-14(P)
<b>All Industries</b>	<b>1873000</b>	<b>1713500</b>	<b>1770800</b>
Alloy steel	14400(9)	2900(9)	2900(9)
Cement	355600(16)	381900(17)	322500(17)
Ceramic	87100(38)	88200(38)	88200(38)
Ferro-alloys	279100(44)	276100(45)	272800(45)
Fertilizer	105800(4)	105800(4)	105800(4)
Foundry	148100(32)	141400(32)	141400(32)
Glass	799400(54)	628100(54)	734900(54)
Iron & Steel	25100(3)	30200(5)	43900(5)
Others (Abrasive, asbestos, chemical, dry cell battery, electrical, paint, pesticide, refractory and rubber)	58400(85)	58700(89)	58400(89)

Figures rounded off.

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

\*Includes actual reported consumption and/or estimates made wherever required.

**Table – 30 : Consumption\* of Quartzite, 2011-12 to 2013-14 (P)**  
(By Industries)

(In tonnes)			
Industry	2011-12	2012-13(R)	2013-14(P)
<b>All Industries</b>	<b>255400</b>	<b>293300</b>	<b>318100</b>
Cement	1100(2)	++(2)	++(2)
Ferro-alloys	40300(13)	39900(13)	43100(13)
Foundry	100(5)	100(5)	100(5)
Iron & steel	141000(29)	158500(29)	179500(29)
Pelletisation (Iron & steel)	++(1)	++(1)	++(1)
Refractory	28000(12)	49900(12)	50500(12)
Sponge iron	44900(2)	44900(2)	44900(2)

Figures rounded off.

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

\*Includes actual reported consumption and/or estimates made wherever required.

**Table – 31 : Consumption\* of Moulding Sand, 2011-12 to 2013-14 (P)**  
(By Industries)

(In tonnes)			
Industry	2011-12	2012-13(R)	2013-14(P)
<b>All Industries</b>	<b>47500</b>	<b>47500</b>	<b>47500</b>
Foundry	41700(14)	41700(14)	41700(14)
Iron & steel	1600(6)	1600(6)	1600(6)
Mining machinery	4100(3)	4100(3)	4100(3)
Others (Sugar & Textile)	100(7)	100(7)	100(7)

Figures rounded off.

Figures in parentheses denote the number of units in the organised sector.

\* includes reported consumption and/or estimates, whenever required.



QUARTZ & OTHER SILICA MINERALS

**Table – 32 : Reported Consumption\* of Ferro-Silicon 2011-12 to 2013-14 (By Industries)**

(In tonnes)			
Industry	2011-12	2012-13(R)	2013-14(P)
<b>All Industries</b>	<b>41200</b>	<b>41700</b>	<b>41800</b>
Alloy steel	3300 (8)	3300 (8)	3300 (8)
Foundry	2200 (22)	2200 (22)	2200 (22)
Iron & steel	35300 (27)	35900 (27)	36000 (27)
Others (Electrode & Ferro-alloys)	400 (7)	300 (7)	300 (7)

Figures rounded off.

Figures in parentheses denote no. of units in organised sector.

\*Includes actual reported consumption and/or estimates made wherever required.

**Table – 33 : Reported Consumption of Ferro-Silicon-Magnesium, 2011-12 to 2013-14 (By Industries)**

(In tonnes)			
Industry	2011-12	2012-13(R)	2013-14(P)
<b>All Industries</b>	<b>13</b>	<b>13</b>	<b>13</b>
Foundry	13 (2)	13 (2)	13 (2)

Figures in parenthesis denote the number of units in organised sector.

\*Includes actual reported consumption and/or estimates made wherever required.

## WORLD REVIEW

Basically, silica is abundant in the earth's crust. Sand and gravel reserves of the world are large. Quartz-rich sand and sandstone are the main sources of industrial silica sand which occurs throughout the world. Reserves of natural quartz crystal suitable for electronics or optical use in the world are limited. The world's dependence on these reserves will continue to decline because of the increased usage 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 - 34.

**Table – 34: World Production of Sand and Gravel (Industrial), 2011 to 2013 (By Principal Countries)**

(In '000 tonnes)			
Country	2011	2012	2013
<b>World: Total (rounded)</b>	<b>138000</b>	<b>140800</b>	<b>152000</b>
Australia	5300	5300	5500
Belgium	1800	1800	-
Canada	1430	1590	1690
Chile	1240	1270	1360
Czech Republic	1350	1340	1340
Egypt	1800	1800	-
Finland	2250	2400	2400
France	5000	6290	6290
French Guyana	1500	1500	-
Gambia	-	1200	-
Germany	7770	7500	7500
India*	1800	1900	1210
Iran	1500	1500	-
Italy	19800	16400	16400
Japan	2900	3200	3000
Latvia	1360	1360	-
Malaysia	-	1200	1000
Mexico	2570	3590	3590
Moldova	-	2970	3000
Norway	1200	1000	1000
Poland	2460	2570	2300
South Africa	2900	2600	2110
Spain	5000	5000	3400
Turkey	5000	7000	15000
UK	3760	3760	3760
USA	43700	50700	62100
Other countries (rounded)	14310	4060	8050

Source: Mineral Commodity Summaries, 2013 & 2014.

\* For India's production of silica minerals during 2011-12, 2012-13 and 2013-14, Tables-5, 10, 15 and 19 of this Review may be referred. Besides, sand is also produced as a minor mineral for use in building construction applications.

## FOREIGN TRADE

### Exports

Exports of quartz and quartzite (natural) increased to 308,409 tonnes in 2013-14 from 233,274 tonnes in the previous year. Out of total exports, quartz comprised 238,930 tonnes (77%) and quartzite 69,479 tonnes (23%). Exports were mainly to Bangladesh & Bhutan (14% each), Japan, Korea Rep of & Malaysia (9% each), UAE & Vietnam (8% each). Exports of silica sand decreased slightly to 4,497 tonnes in 2013-14 from 4,689 tonnes in the previous year. Exports were mainly to UAE (28%), Kenya & Nigeria (15% each) and Malaysia & Saudi Arabia (5% each). Exports of sand (excluding metal bearing) decreased slightly to 5,444 tonnes in 2013-14 from 7,342 tonnes in the previous year. Exports were mainly to Iran (39%), Saudi Arabia (18%), Bangladesh (10%) and Malaysia (6%). Exports of agate (uncut) decreased slightly to 767 tonnes in 2013-14 from 785 tonnes in the previous year. China (95%) and USA & Germany (1% each) were the main buyers in 2013-14. Exports of agate (cut) increased considerably to 1,533 thousand carat in 2013-14 from 1,265 thousand carat in the previous year. USA (37%), UK (27%), Hong Kong (16%) and China (14%) were the main buyers of agate (cut) in 2013-14. Exports of flint increased substantially to 2,524 tonnes in 2013-14 from 717 tonnes in the previous year. Egypt (48%), Indonesia (14%), Djibouti (13%) and Saudi Arabia (6%) were the main buyers in 2013-14. Exports of silicon decreased slightly to 84 tonnes in 2013-14 from 93 tonnes in the previous year. Sri Lanka (44%), Nigeria (29%), China, Bangladesh and UAE (5% each) were the main consumers of silicon in 2013-14 (Tables - 35 to 43).

### Imports

Imports of quartz and quartzite (natural) were 377 tonnes in 2013-14 as compared to 1,652 tonnes in 2012-13. Out of the total imports in 2013-14, those of quartzite were 40 tonnes and mainly from Italy (85%) and Germany (10%) while quartz imports were 337 tonnes mainly from Belgium (67%), China (16%), Germany (14%) and Thailand (4%). Imports of silica sand increased substantially to 97,526 tonnes in 2013-14 from 54,380 tonnes in the previous year. Bhutan (68%), Saudi Arabia (10%) and China & Egypt (3% each) were the main suppliers. Imports of sand (excluding metal bearing) was increased to 15,688 tonnes in 2013-14 from 12,785 tonnes in the

previous year and imports were mainly from Cambodia (74%), Nepal (18%) and Germany (4%). Imports of agate (uncut) decreased slightly to 50 tonnes in 2013-14 from 52 tonnes in the previous year. Imports were mainly from USA (30%), China (26%), Turkey and Tanzania (20% each). Imports of agate (cut) increased substantially to 12 thousand carat in 2013-14 from 1 thousand carat in 2012-13. Hong Kong (67%), China (25%) and USA (8%) were the main suppliers of agate (cut). Imports of silicon increased to 37,411 tonnes in 2013-14 from 36,882 tonnes in previous year. Imports were mainly from China (95%) and Australia (3%) (Tables - 44 to 52).

**Table – 35 : Exports of Quartz And Quartzite (Natural) : Total (By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>233274</b>	<b>1608025</b>	<b>308409</b>	<b>2233315</b>
Japan	33982	430334	29118	398659
Vietnam	12282	96103	26135	233773
Malaysia	15700	126862	27674	210487
Bangladesh	31982	122475	45635	160851
Korea Rep. of	4933	41304	27439	155122
Bhutan	44297	144205	46968	144507
UAE	22780	94430	23688	109276
Israel	7946	84861	7898	98170
Italy	1834	19786	7072	80777
Oman	6329	40460	10095	59390
Other countries	51209	407205	56687	582303

**Table – 36 : Exports of Quartzite (Natural) (By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>48617</b>	<b>491493</b>	<b>69479</b>	<b>838777</b>
Japan	6743	129013	10381	203415
Vietnam	4796	41693	10473	98863
Malaysia	1824	32807	5070	84163
Israel	6043	64859	6316	75246
Italy	408	7383	5833	67521
Turkey	1929	20774	3834	47258
Bangladesh	10033	41193	10382	31839
Germany	681	8172	1171	21401
Kenya	1085	7806	1299	19225
France	70	5009	115	15670
Other countries	15005	132784	14605	174176

QUARTZ & OTHER SILICA MINERALS

**Table – 37 : Exports of Quartz (Natural)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>184657</b>	<b>1116532</b>	<b>238930</b>	<b>1394538</b>
Japan	27239	301321	18737	195244
Korea, Rep. of	3571	30123	26261	146394
Bhutan	39328	120705	46968	144507
Vietnam	7486	54410	15662	134910
Bangladesh	21949	81282	35253	129012
Malaysia	13876	94055	22604	126325
UAE	22319	92149	23293	106554
Oman	4964	29235	8003	45566
USA	++	6	1142	43210
Thailand	2969	28588	2327	29444
Other countries	40956	284658	38680	293372

**Table – 39 : Exports of Sand  
(Excl. Metal Bearing)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>7342</b>	<b>455905</b>	<b>5444</b>	<b>369627</b>
Iran	426	252045	2141	227246
Saudi Arabia	1310	155823	1000	102467
Oman	377	11992	423	14182
Bangladesh	823	5583	537	11898
UAE	121	594	320	3593
Kuwait	25	77	50	2425
Malaysia	919	4219	347	1171
Uganda	-	-	33	1114
Korea, Rep. of	50	380	10	826
Egypt	-	-	360	817
Other countries	3291	25192	223	3888

**Table –38 : Exports of Silica Sand  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>4689</b>	<b>43188</b>	<b>4497</b>	<b>33142</b>
UAE	159	1560	1245	6364
Kenya	533	5409	658	6173
Nigeria	189	916	656	6001
UK	79	960	46	1879
Saudi Arabia	108	659	232	1660
USA	74	1017	127	1360
Malaysia	907	12173	235	1242
South Africa	-	-	216	1112
Chinese Taipei/Taiwan	-	-	140	949
Cameroon	307	1660	224	891
Other countries	2333	18834	718	5511

**Table – 40 : Exports of Agate (Uncut)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>785</b>	<b>96044</b>	<b>767</b>	<b>84003</b>
China	690	38178	726	31768
USA	14	18161	8	23620
Saudi Arabia	39	19102	5	10080
Australia	1	2060	1	3050
Italy	7	2662	2	2277
Germany	++	1073	7	2095
Canada	1	1735	1	1514
France	1	675	++	1364
UK	23	3511	1	1080
Norway	++	290	++	890
Other countries	9	8597	16	6265

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**Table – 41 : Exports of Agate: (Cut)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (‘000 carats)	Value (₹‘000)	Qty (‘000 carats)	Value (₹‘000)
<b>All Countries</b>	<b>1265</b>	<b>70546</b>	<b>1533</b>	<b>76910</b>
USA	290	19304	571	25131
China	424	18285	208	13995
UK	31	3041	416	11189
Hong Kong	386	18432	246	6974
Japan	17	2003	47	4546
Korea, Dem. Rep.of	-	-	3	3100
Australia	17	1153	5	2861
Turkey	++	102	3	2703
Saudi Arabia	22	667	1	1562
Thailand	16	728	16	1299
Other countries	62	6831	17	3550

**Table – 43 : Exports of Silicon  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹‘000)	Qty (t)	Value (₹‘000)
<b>All Countries</b>	<b>93</b>	<b>10506</b>	<b>84</b>	<b>17642</b>
Sri Lanka	5	848	37	5937
Nigeria	++	122	24	3865
China	++	1162	4	3756
Bangladesh	-	-	4	656
South Africa	-	-	2	552
UAE	10	2137	4	514
Spain	-	-	2	475
Nepal	3	422	3	442
Italy	1	179	2	436
Kenya	10	1097	2	391
Other countries	64	4539	++	618

**Table – 42 : Exports of Flint  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹‘000)	Qty (t)	Value (₹‘000)
<b>All Countries</b>	<b>717</b>	<b>2883</b>	<b>2524</b>	<b>18156</b>
Egypt	-	-	1200	9826
Indonesia	-	-	350	2333
Djibouti	-	-	337	1765
Vietnam	-	-	125	892
Saudi Arabia	117	494	151	826
China	-	-	88	681
Oman	-	-	112	667
Ethiopia	360	1816	97	515
Japan	-	-	40	478
Chinese Taipei/Taiwan	-	-	24	172
Other countries	240	573	++	1

**Table – 44 : Imports of Quartz and Quartzite  
(Natural) : Total  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹‘000)	Qty (t)	Value (₹‘000)
<b>All Countries</b>	<b>1652</b>	<b>26982</b>	<b>377</b>	<b>10924</b>
Belgium	101	1549	224	4678
Germany	62	1481	50	3521
Italy	52	2001	34	1545
China	380	11366	54	544
Thailand	51	1008	12	388
Israel	-	-	1	220
USA	21	1465	2	28
Other countries	985	8112	-	-

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**Table – 45 : Imports of Quartzite (Natural)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>922</b>	<b>15167</b>	<b>40</b>	<b>2627</b>
Italy	52	2001	34	1545
Germany	51	920	4	733
Israel	-	-	1	220
China	343	9537	1	62
Belgium	-	-	++	57
USA	2	134	++	10
Other countries	474	2575	-	-

**Table – 46 : Imports of Quartz (Natural)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>730</b>	<b>11815</b>	<b>337</b>	<b>8297</b>
Belgium	101	1549	224	4621
Germany	11	561	46	2788
China	37	1829	53	482
Thailand	51	1008	12	388
USA	19	1332	2	18
Other countries	511	5536	-	-

**Table – 47 : Imports of Silica Sand  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>54380</b>	<b>579833</b>	<b>97526</b>	<b>938842</b>
Bhutan	842	4762	66357	474005
China	2215	60487	2899	80457
Saudi Arabia	16082	101264	9932	68089
USA	943	39476	786	48244
Egypt	23071	92966	2934	43764
Chinese Taipei/Taiwan	413	58492	431	41867
Korea, Rep. of	272	5840	1855	40307
Italy	4370	64178	1423	24779
Belgium	1287	23269	1146	24355
Thailand	639	18835	828	19450
Other countries	4246	110264	8935	73525

**Table – 48 : Imports of Sand  
(Excl. Metal Bearing)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>12785</b>	<b>42747</b>	<b>15688</b>	<b>61432</b>
Germany	167	5478	592	19747
Cambodia	-	-	11640	16379
Chinese Taipei/Taiwan	30	3796	79	7464
China	307	5797	117	4911
USA	132	4290	17	2650
UK	20	798	44	1943
Thailand	118	2030	67	1506
Italy	44	3455	36	1388
Nepal	11608	10480	2900	1313
Belgium	235	3342	81	1263
Other countries	124	3281	115	2868

**Table – 49 : Imports of Flint  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>28</b>	<b>1086</b>	-	-
China	27	971	-	-
Italy	1	115	-	-

**Table – 50 : Imports of Agate: Uncut  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>52</b>	<b>17336</b>	<b>50</b>	<b>9551</b>
China	34	12655	13	4119
Turkey	++	512	10	1618
USA	2	1813	15	1247
Hong Kong	++	56	1	1028
Tanzania Rep	11	477	10	792
South Africa	-	-	1	621
Japan	-	-	++	125
Other countries	5	1823	++	1

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**Table – 51 : Imports of Agate: Cut  
(By Countries)**

Country	2012-13		2013-14	
	Qty (‘000 Carats)	Value (₹‘000)	Qty (‘000 Carats)	Value (₹‘000)
<b>All Countries</b>	<b>1</b>	<b>10495</b>	<b>12</b>	<b>22179</b>
Hong Kong	1	8746	8	17962
China	++	1124	3	1984
USA	++	612	1	1531
Thailand	-	-	++	454
Germany	-	-	++	236
France	-	-	++	12
Other countries	++	13	-	-

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

Country	2012-13		2013-14	
	Qty (t)	Value (₹‘000)	Qty (t)	Value (₹‘000)
<b>All Countries</b>	<b>36882</b>	<b>4536760</b>	<b>37411</b>	<b>4682391</b>
China	33591	4041054	35717	4373190
Australia	1043	171250	946	139857
UK	235	37787	190	29794
USA	4	2768	7	21187
Chinese Taipei/Taiwan	36	31796	8	20519
South Africa	240	25675	120	13801
Norway	22	5679	34	13170
Singapore	20	7676	24	12636
Hong Kong	121	14853	72	9757
Netherlands	80	10162	60	8771
Other countries	1490	188060	233	39709

## FUTURE OUTLOOK

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 and glass sand, etc. However, the main use of silica minerals is in manufacture of different types of glasses, natural silica sand being the preferred material in the glass industry. In India, quartz, quartzite and silica sand are used mainly in glass, foundry, ferro-alloys, refractory industries and also as building materials.

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 and steel industry including alloy steel production. Further, setting up foundries and enhancing their capacities are also linked with metallurgical industry.

As per the report of the Sub-Group on 12<sup>th</sup> Plan, Planning Commission of India, the domestic demand of quartz and silica minerals was estimated at 3.15 million tonnes by 2011-12 and at 4.85 million tonnes by 2016-17 at 9% growth rate.

The total resources of quartz and other silica minerals are 4,750 million tonnes as on 1.4.2010. There are very good prospects of increasing the production and also the export of quartz and silica minerals to the neighbouring countries.