Indian Minerals Yearbook 2016

(Part-III : Mineral Reviews)

55th Edition

LIMESTONE AND OTHER CALCAREOUS MATERIALS

(FINAL RELEASE)

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February, 2018

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Limestone is a sedimentary rock composed mainly of calcium carbonate ($CaCO_3$) in the form of the mineral calcite. The two most important constituents are calcite and dolomite. Limestone often contains magnesium carbonate, either as dolomite CaMg $(CO_3)_2$ or magnesite ($MgCO_3$) mixed with calcite. Such rocks are termed as 'dolomitic' or 'magnesian' limestone. Limestones altered by dynamic or contact metamorphism become coarsely crystalline and are referred to as 'marbles' and 'crystalline limestones'. Other common varieties of limestones are 'marl', 'oolite' (oolitic limestone), shelly limestone, algal limestone, coral limestone, pisolitic limestone, crinoidal limestone, travertine, onyx, hydraulic limestone, lithographic limestone, etc. However, the limestone which is used by industries in bulk quantity is a bedded type sedimentary limestone.

Other calcareous material used by industry is 'chalk', a white, extremely fine-grained, usually soft and friable variety of limestone, composed largely of microscopic small remains of foraminifera and broken shelly fragments; 'kankar', irregular nodules and concretions of impure calcium carbonate of all sizes found in the older surface alluvium or soils; and 'limeshell', the thick calcareous shells of molluscs deposited in the form of beds as well as present in ancient lakes and shallow seas. A limestone rock which separates well along the stratification into a few centimetres thick slab is termed 'flagstone'. The dimensional limestone is used for building and ornamental stone.

RESOURCES

The total reserves/resources of limestone of all categories and grades as per NMI data based on UNFC system as on 1.4.2015 have been estimated at 203,224 million tonnes of which 16,336 million onnes (8%) are placed under Reserves category and 1,86,889 million tonnes (92%) are under remaining resources category. Karnataka is the leading state having 27% of the total resources followed by Andhra Pradesh and Rajasthan (12% each), Gujarat (10%), Meghalaya (9%), Telangana (8%), Chhattisgarh and Madhya Pradesh (5% each) and remaining 12% by other states. Gradewise, cement grade (Portland) has leading share of about 70% followed by Unclassified grades (12%) and BF grade (7%). Remaining (11%) are Others [Table-1(A)].

The total resources of chalk of all categories and grades as per NMI data based on UNFC system as on 1.4.2015 have been estimated in Gujarat at 6.75 million tonnes of which 5.06 million tonnes (75%) are under reserves category and 1.69 million tonnes (25%) are under remaining resources category [Table-1(B)].

The total resources of marl of all categories and grades as per NMI data based on UNFC system as on 1.4.2015 have been estimated in Gujarat at 135.56 million tonnes of which 123.86 million tonnes (91%) are under reserves category and 11.70 million tonnes (9%) are under Remaining resources category [Table - 1 (C)].

EXPLORATION & DEVELOPMENT

Exploration was carried out by GSI in the state of Chhattisgarh, Madhya Pradesh, Gujarat, Jammu & Kashmir Himachal Pradesh, Meghalaya and Rajasthan. Directorates of Mining and Geology of Chhattisgarh, Maharashtra and Rajasthan and Mineral Exploration Corporation Limited in the state of Meghalaya also carried out exploration for limestone. Details of work carried out are furnished in Table-2.

Table – 1(A) : Reserves/Resources of Limestone as on 01.04.2015
(By Grades/States)

(In '000 tonnes)

Grade/State	Reserves				Remaining Resources								Total Resources (A+B)
	Proved STD111	Probable STD121	Probable STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221	Pre-feasibility STD222	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
All India: Total	**9438939**	**3015917**	**3880897**	**16335753**	**4870440**	**4852713**	**8623172**	**7111337**	**22629060**	**130787772**	**8014504**	**186888998**	**203224752**
By Grades													
Chemical	184411	98399	95562	378372	126704	113184	601969	19590	1825142	2372558	14268	5073415	5451787
S.M.S.(O.H.)	135571	853518	10146	999235	12497	280089	740140	512977	458258	1822480	239223	4065664	5064898
S.M.S.(L.D.)	2636	182	584	3402	821	108139	11468	7992	49894	223762	-	402075	405477
S.M.S.(O.H. & L.D. mixed)	-	-	-	-	-	-	-	-	-	167182	-	167182	167182
B.F.	247462	44404	51201	343068	139602	569999	77704	509245	1053678	11302892	6871	13659989	14003057
S.M.S. & B.F. mixed	40226	101941	27728	169894	32974	7234	49524	4712	122103	711755	240733	1169033	1338928
Cement (portland)	8373610	1693372	3549049	13616030	4282507	3601959	6651670	5069573	13298490	88338670	6895165	128138034	141754065
Cement (white)	133	23	115	270	4730	3054	2702	117000	-	2231	-	129716	129986
Cement (portland & white)	1776	-	930	2706	14125	8540	13707	338670	62101	506688	39000	982832	985538
Cement (blendable/ beneficiable)	183933	51087	64749	299769	165958	91508	340110	42227	44217	490999	-	1175019	1474788
B.F. & cement mixed	49731	208	35456	85394	1040	26623	6308	3869	45	89942	-	127828	213222
S.M.S.,chemical & paper	2207	-	273	2479	353	2169	1329	-	151	1228617	-	1232618	1235097
Paper	25551	-	-	25551	472	-	359	120738	27197	747971	-	896737	922289
Others	43906	41787	7861	93555	18419	15407	33432	102098	515719	2509307	232908	3427289	3520844
Unclassified	138164	108746	36731	283642	69172	17934	81277	217708	5092748	19027097	324804	24830740	25114381
Not-known	9623	22250	513	32385	1066	6876	11474	44938	79318	1245622	21532	1410827	1443212
By States													
Andhra Pradesh	1003483	19713	385133	1408329	269901	53722	706890	82112	268002	18666131	3466741	23513499	24921828
Arunachal Pradesh	-	-	-	-	-	-	-	-	49220	433575	1	482796	482796
Assam	25542	152546	-	178088	167902	21973	4257	154644	39859	901623	-	1290258	1468346
Bihar	12410	-	306	12715	3096	2558	1405	67926	38210	724118	10558	847872	860588
Chhattisgarh	1025180	7128	145576	1177885	1071824	751825	427410	1332250	485933	5558135	-	9627377	10805262
Daman & Diu	-	-	-	-	-	-	-	-	-	128670	-	128670	128670
Gujarat	750236	173244	76324	999804	277146	159554	120210	21110	906641	18772852	-	20257514	21257318

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Table-1(A) (Concld.)

Grade/State	Reserves				Remaining Resources								Total Resources (A+B)
	Proved STD111	Probable STD121	Probable STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221	Pre-feasibility STD222	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
Haryana	-	-	-	-	1425	15507	3382	-	2200	52163	-	74677	74677
Himachal Pradesh	555180	209851	69908	834938	191300	327757	40840	1530937	26121	3234938	37339	5389231	6224169
Jammu & Kashmir	443339	31917	79147	554404	54863	9008	20510	43611	370	1752569	207283	2088214	2642618
Jharkhand	88172	-	29116	117288	95008	13529	29265	89572	13220	354319	11803	606715	724003
Karnataka	461049	2154	1113795	1576998	497136	559903	1355522	1572501	13920771	34952588	-	52858420	54435419
Kerala	11472	-	-	11472	123106	77	-	21161	2888	35228	-	182459	193931
Madhya Pradesh	816293	1093490	545321	2455103	419938	256187	498590	566011	830331	4045838	269859	6886754	9341858
Maharashtra	424035	143115	39905	607055	583978	206162	136835	28595	234518	1056168	-	2246255	2853310
Manipur	-	-	-	-	-	-	-	10197	2138	33718	-	46053	46053
Meghalaya	135836	87904	1822	225562	68457	39289	46200	464670	2811179	14048758	-	17478553	17704116
Nagaland	-	-	-	-	825	-	-	-	1005500	745875	-	1752200	1752200
Odisha	255555	77879	61007	394442	173797	548527	420634	139924	50397	361350	32635	1727264	2121706
Puducherry	-	-	-	-	-	-	-	4433	4333	6966	-	15732	15732
Rajasthan	2471143	933889	863351	4268382	367799	1538090	4529048	596071	761855	11365794	939808	20098465	24366847
Sikkim	-	-	-	-	-	-	-	-	-	2380	-	2380	2380
Tamil Nadu	334445	82892	56572	473909	209632	99882	91350	92843	33440	598942	-	1126088	1599997
Telangana	625569	195	400766	1026529	254912	28110	92020	113416	921577	11710694	3038478	16159208	17185736
Uttar Pradesh	-	-	12849	12849	33360	129180	38375	142763	40000	31200	-	414878	427727
Uttarakhand	-	-	-	-	5035	91872	60429	29486	164879	1191059	-	1542760	1542760
West Bengal	-	-	-	-	-	-	-	7104	15482	22120	-	44706	44706

Figures rounded off.

Table – 1 (B) : Reserves/Resources of Chalk as on 01.04.2015
(By Grades/States)

(In'000 tonnes)

Grade/State	Reserves				Remaining Resources								Total Resources (A+B)
	Proved	Probable		Total (A)	Feasibility	Pre-feasibility		Measured	Indicated	Inferred	Reconnaissance	Total (B)	
	STD111	STD121	STD122		STD211	STD221	STD222	STD331	STD332	STD333	STD334		
All India : Total	**4215**	**529**	**319**	**5064**	**741**	**331**	**151**	**196**	**-**	**269**	**-**	**1687**	**6751**
By State													
Gujarat	4215	529	319	5064	741	331	151	196	-	269	-	1687	6751

Figures rounded off.

Table – 1 (C) : Reserves/Resources of Marl as on 01.04.2015
(By Grades/States)

(In tonnes)

Grade/State	Reserves				Remaining Resources								Total Resources (A+B)
	Proved	Probable		Total (A)	Feasibility	Pre-feasibility		Measured	Indicated	Inferred	Reconnaissance	Total (B)	
	STD111	STD121	STD122		STD211	STD221	STD222	STD331	STD332	STD333	STD334		
All India : Total	**117115856**	**4650000**	**2090000**	**123855856**	**11704870**	**-**	**-**	**-**	**-**	**-**	**-**	**11704870**	**135560726**
By Grade													
Unclassified	117115856	4650000	2090000	123855856	11704870	-	-	-	-	-	-	11704870	135560726
By State													
Gujarat	117115856	4650000	2090000	123855856	11704870	-	-	-	-	-	-	11704870	135560726

Figures rounded off.

Table – 2 : Details of Exploration Activities for Limestone, 2015-16

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
GSI							
Chhattisgarh							
Raigarh	Kharri-Parsadih	1:4000	8.5	50	-	-	G-2 stage exploration was carried out for assessment of limestone. Exposures are observed in nala sections, north of Jharapdih, south of Gadhabhata, south and east of Kharri, west of Parsadih villages. The limestone is grey to dark grey in colour, fine-grained in nature, and compact, bedded and at places massive. Out of 50 boreholes, 29 boreholes are positive, 06 boreholes are economically significant in which limestone has been intersected from 2.0 to 12 m below ground level and continued up to 30 m below ground level The thickness of limestone varies from 18 m to 28 m. CaO content of bedrock samples of limestone varies from 39% to 46.31%; SiO_2 content varies from 13.31% to 19.28% and MgO varies from 1.15% to 1.57%. The project is completed.
Madhya Pradesh							
Morena and Shivpuri	Sabalgarh and Garhi area	1:50000	200	6	-	20	The area exposes sediments comprising of ferruginous shale, limestone, blue shale, stromatolitic limestone, variegated shale at lower part; sandstone of Lower Bhander Group of Vindhyans on the top. It was observed that limestone occurs throughout the area, quality wise cement-grade limestone occurs in Upcha-Garhi area.Heavy minerals including zircon, epidote, pyrite and rutile were also observed. Limestone exposed in northwestern part of Sabalgarh town is impure.
	Garhi-Upcha area	1:12500	50	-	-	-	Towards southwestern part the thickness of limestone in Garhi-Upcha area varies from 8 m to 20 m; maximum exposed thickness recorded is 20 m near Upcha village. Similarly, in eastern part of Sabalgarh area, the thickness of limestone varied from 20 m to 40 m in Garpera Jalalgarh area. A total of four potential blocks were identified; viz. I. Garhi-Upcha block, II. Gulali block, III. Badretha block and IV. Hirawale block. Out of these blocks,

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Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							Garhi Upcha block has maximum resources of 159.45 million tonnes of limestone with 38.38% - 47.29% CaO; Badretha block has 129.5 million tonnes of limestone with 34.65% to 46.03% CaO. Whereas Hirawale Block has minimum resource of 20.57 million tonnes of low grade limestone with 37.68% -38.99% CaO. Gulali block exposes stromatolitic limestone, which is cherty and siliceous in nature with 33% CaO.
Meghalaya							
East Jaintia Hills	Shyrwang Block, Litang Valley	-	3	-	1816.75	-	G-2 level exploration was carried out for assessment of limestone in the area. The area under investigation exposes huge thickness of Prang limestone of cement grade classified as cement(Blendable/Benificiable), cement (Portland) and SMS (OH) grade.The upper sylhet limestone which is the most important limestone horizon,from the point of view of thickness and economic potentiality, varies in thickness from 14.45 to 120.40 m as intersected in the boreholes with average thickness of 94.57 m.
Jaintia Hills	Um-Maju Block west of Litang river	-	1.5	918	-	-	G-2 level exploration was carried out in the area during 2015-16. The upper sylhet limestone (Prang Limestone) which is the most important limestone horizon varies in thickness from 52.00 m to 69.70 m with an average thickness of 58.64 m as intersected in ten boreholes.Additionally, middle sylhet limestone (Umlatodh Limestone) underlying upper sylhet limestone (Prang Limestone) varies in thickness from 11.65 m to 15.55 m with an average thickness of 13.74 m. The upper sylhet limestone (Prang Limestone) is classified into cement (Portland), SMS (OH),Chemical and SMS (LD) grades and the middle Sylhet limestone (Umlatodh Limestone) is classified into cement (Portland) and SMS (OH) grades.

(Contd.)

Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
-do-	Jalaphet Block	-	1.5	902	-	-	G-2 level explortaion was carried out in the area during 2015-16. The area under investigation exposes huge thickness of Prang limestone;the thickness varies from 23.70 m to 111.50 m with an average thickness of 70.57 m. According to the 'End User Classification 'the limestone was classified as Cement (Portland) grade,Cement (Bledndable) grade, SMS (OH) grade.
Gujarat							
Junagadh	Khodada Khanbaliya block	-	-	63	2057	-	G-2 level exploration was carried out during 201-16. Chaya limestone is the only exposed litho unit in the study area. The limestone is white to dirty white,consolidated to semi-consolidated,porous and highly fossiliferous. Chemical, SMS and Cement grade limestone has been intersected during the course of exploration.
Himachal Pradesh							
Solan	Krol Group	-	-	-	-	-	A G-4 stage investigation of limestone and dolomite was carried out in the area. CaO content varies from 28.78% to 39.72%. MgO content varies from 12.78% to 19.9% and SiO_2 varies from 0.05% to 4.71%. Using Frolova's classification (1959) of dolomite-magnesite-calcite series on the basis of CaO/ MgO ratio, most of the samples fall in 'slightly calcitic-dolomite, to calcitic dolomite' categories.
Jammu and Kashmir							
Udhampur	Batot Sudh Mahadev Latti area	-	-		-	-	A G-4 stage investigation for limestone has been carried out during 2015-16 in Udhampur district.The Baila formation comprises Persistent exposures of limestone,argillite and carbonaceous argillite sequence. The limestone bands of the Baila formation delineated from Sudh Mahadev to Jakhed for a strike length of 15 km shows 15 m to 120 m thick greywish, thinly to very thinly bedded limestone with argillite intercalations or partings. The analytical results of the limestone samples, received so far, indicate average value of CaO 38.91%, MgO 1.8%, Al_2O_3, 3.3%, Fe_2O_3 1.8% and SiO_2 11.56%.

(Contd.)

Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Rajasthan							
Jaisalmer	Jiraj Ka Toba-Asu Tar (southeast) Block	1:5000	7	25	1200	-	Detailed mapping with G-3 level exploration has been carried out during the year 2015-16. The main lithounits recorded are hard foraminiferal limestone, fragmentary iron stone and gritty sandstone. The beds are horizontal to sub horizontal. The western part of the area is mostly covered with NE-SW to NNE-SSW trending sand dunes. Rocks intersected in boreholes are sub bentonitic clays,impure clayey limestone, gritty limestone, hard and compact limestone, fragmentary ironstone and blown sand in an ascending order. Visually it is interpreted that about 40%-50% of limestone intersected will be of SMS (LD) grade. 2 to 4 bands of hard and compact limestone and impure clayey limestone have been intersected in different boreholes. Thickness of limestone band intersected in different boreholes varies from 15 m to 29 m and limestone is intersected from 0.50 m to a depth of 58.73 m below ground level. Analytical results are awaited.
Jaisalmer	Minyun ki dhani (North)	1:5000	4	16	800	792	Detailed mapping at G-3 level exploration has been carried out during the year 2015-16. The area forms flat topography with isolated exposures of bioclastic limestone, clayey foraminiferal limestone,fullers earth and ironstone fragments. Ironstone fragments are mainly present on top of foraminiferal limestone as capping and as pebble spread at other places. The beds are horizontal to sub-horizontal. Selenite variety of gypsum is also observed at few places on the surface as well as in borehole intersection. Visually it is interpreted that about 20% of limestone intersected will be SMS (LD) grade. 1 to 2 bands of hard and compact limestone and impure clayey limestone and chalky limestone have been intersected in different boreholes. Thickness

(Contd.)

Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							of limestone band intersected in different boreholes varies from 25 m to 40 m and limestone was intersected from 2 m below ground level to a depth of 50 m below ground level. Analytical results are awaited.
-do-	Minyun ki Dhani (Main Block)	-	-	50	2500	2203 8 (for XRD analysis) 7 (for petrographic studies)	G-2 level exploration was carried out in the area during the year 2015-16. The area covers north western part of Jaisalmer basin which comprises a thick pile of sediments ranging from continental deposit of Lathi formation of lower Jurassic age (Lias) to Shumar Formation of Quaternary age with intervening sequence of Mesozoic-Tertiary rocks. The area in general is structurally undisturbed with mostly subhorizontal to horizontal beds.Tertiary limestone,popularly known as Khuiala Limestone occurs in the form of a sickle shaped exposure covering more than 900 sq.km. area. It has been assessed largely as chemical /SMS grade. About 60% area is covered by the recent alluvium or blown sand. The fragmentary iron stone belonging to Shumar formation of Quaternary age is developed in the north eastern part of the area. Marl, calcrete/pebbles spread is also observed in the area. Small exposures of light pink to pinkish white, hard and massive nodular limestone were recorded in the southern part of the area. All the 50 boreholes have intersected both hard and compact limestone which is expected to be of SMS grade and impure limestone which is expected to be of cement grade. Hard and compact limestone has been encountered in the form of bands in the impure limestone, whose thickness varies from 1 m to 16 m along borehole. Thin bands of gypseous clay have been recorded in the boreholes located in the northern parts of the area. After receiving analysis data for all the core samples, nearly 5% of samples will be selected from all the boreholes for decrepitation test.

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Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
DGM							
Chhattisgarh							
Raipur	Kesla Area	1:50000 1:4000	80 1.74	38	1178.10	1260	The rock formation belongs to Chandi formation of Raipur Group of Chhattisgarh supergroup. Main litho units are limestone, shale and laterite. Limestone is mostly horizontally bedded, trending NE-SW. Depth of limestone is confined up to 34.00m . Limestone of the area is grey to pink, hard compact, massive with stromatolites 5.37 million tonnes of cement grade limestone under indicated mineral resources (332) and 69.91 million tonnes of limestone inferred mineral resources (333) were estimated.
Rajnandgaon	Tekapar Kalkasa area	1:50000 1:4000	100 1.00	41	1272.95	1340	Regionally the limestone deposit belongs to Chandi formation of Raipur group of Chhattisgarh supergroup and extends almost E-W. The explored area is mostly occupied by residual soil with sporadic outcrops of purple grey stromatolitic limestone.Purple and grey shale bands are encountered in boreholes. The formation is horizontally bedded with E-W elongation. 7.09 million tonnes of cement grade limestone is indicated mineral resources (332) and 44.027 million tonnes of limestone inferred mineral resources (333) were estimated.
Janjgir-Champa	Dhabadih II area	1:50000 1:4000	405 3	41	1276.60	1121	The area is occupied by limestone dolomite and shale. Limestone is grey to pinkish brown with stromatolites and it belongs to Chandi formation of Raipur group of Chhattisgarh supergroup. 74 million tonnes of limestone is inferred mineral resources (333).
Bastar	Chitapur Area	1:50000 1:4000	215 1.20	39	772.55	459	The area is occupied by limestone of Jagdalpur formation of Indravati Group of Chhattisgarh Supergroup. Limestone is grey to pinkish grey and horizontally bedded. Approximately, 10 millon tonnes of limestone is inferred mineral resources.
Maharashtra							
Chandrapur	Kondala	1:50000 1:5000	5 4	18	1701.15	112	Analytical result is awaited.

(Contd.)

Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Chandrapur	Jewara Tulsi	1:50000 1:5000	10.42 2.80	10	1647.25	32	The limestone bearing zone forms syncline plunging NW. The limestone strike NNW-SSE with varying dip 10° to 30°. The area mainly comprises of limestone, dolomite and non separable argilaceous limestone with alternate bands. Analytical result is awaited.
Yavatmal	Welabai Kurai Kurli Block	1:25000	26.15	54	4975.45	59	The Welabai-Kurli belt is about 20 km SSE of Wani town. The limestone bands are observed alternately with Dolomite, Magnesium Limestone and argilaceous limestone bands. The limestone band range in length from 600 m to a kilometre and has a width range of 10 metre to 40 metre. The thickness of limestone beds in these bands ranges from 1 to 15 metre.
Yavatmal	Dongargaon Wadgaon Block Tah. Wani	1:25000	5	18	1866.85	55	Drilling in progress.
Rajasthan Jaisalmer	N/v Sam	1:50000(RMS) 1:10000 (RGM) 1:2000 (DGM)	50 15 4	26	1200	763	Area comprises an outcrops of hard compact bouldary limestone underlain by chalky limestone of Khuiala formation and overlain by pseudoconglomeratic ironstone of shumar formation with sand. The limestone is horizontally disposed. It is cream pinkish to whitish in colour, hard and compact, chalky & fossiliferous in nature. 202.39 million tonnes cement grade limestone and 55.49 million tonnes SMS grade limestone were estimated.
Jaisalmer	N/v Jajiya	1:50000 (RMS) 1:10000 (RGM) 1:2000 (DGM)	100 10 3	-	-	-	Area comprises outcrops & escarpment of yellowish fossiliferous limestone of Jaisalmer formation trending N-S direction. The yellow limestone is horizontal to subhorizontal dip towards NW/W. About 1.0 sq.km. potential area of yellow fossiliferous limestone suitable for dimensional stone having thickness from 0.50 to 2.0 m have been located near village Mayajal.

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Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Pali	Bali Desuri and Raipur	1:50000 (RMS) 1:10000 (RGM) 1:2000 (DGM)	300 20 2	-	-	77	The area is occupied by limestone, calc-silicate rocks and biotite schist of Kumbhalgarh of Delhi.Supergroup and Erinpura granites traversed by acid and basic instructions of Phulad ophiolite suits at places. In Bhill colony one limestone bed of 1400x700 m, in the north east of Bijapur village, one limestone bed of 1.5 km x 600 m and in Kundal a small limestone bed of 500 x 600 m were mapped.
Border of Ajmer and Nagaur	Pilwa Chinwali and Dhandata	1:50000 (RMS) 1:10000 (RGM) 1:2000 (DGM)	200 15 2	-	-	31	Geologically rocks of the area belong to Ajabgarh group of Delhi Supergroup along with intrusives Phulad ophiolite suite, sendra Ambaji synorogenic granite and Erinpura granite. Rock types encountered in the area are mica schist, qartzite, conglomerate, limestone,dolomite,dolomitic limestone calc-silicate granite, amphibolite, pegmatite and vein quartz. General trend of rock formations is NE-SW with 50° to 70° dips due west. Two dolomitic limestone bands measuring 780x80-100 m and 500 m x 90-100 m (highly ferruginous) were mapped N/v Mehgaon.
Ajmer	Shyamgarh Pakriyawas Kanakheda Kesarpura Teh. Beawar	1:10000 (RGM) 1:2000 (DGM)	10 3	-	-	91	Geologically the area comprises calc gneisses, cale, silicate, limestone, quartzite, mica schist of Kumbhalgarh group of Delhi Super group alongwith intrusive of granites, pegmatitite and vein quartz etc. General strike of rock formation in NNE-SSW with 70° to 80° due westerly dips. 12 parallel limestone bands measuring about 780x55-60m, 900x45-65 m, 1250x40-50 m, 1000x110-120 m, 550x75-80 m, 780x90-220 m, 800x45-60 m,1900x25-60 m, 1150x55-60 m,1900x130-450 m, 2100x400-800 m were mapped from village Kesarpura in the north to village Karwai in the south.
Tonk	Khalilpura Dodwari Davri, Jabriya etc.	1:10000 (RGM) 1:2000 (DGM)	10 3	-	-	25	Geologically, the rocks of the area belong to Rajmahal formation of Bhilwara supergroup alongwith post Bhilwara intrusive. General trend of rock formation is NE-SW. Limestone band interacted with calc-silicate, calc-schist/calc-gneiss and mapped alternatively N/v Khalilpura and Dodwari measuring about 400 x 45-50 m, 600 x 52-55 m, 100 x 40-42 m , 320x35-40 m, 100x30-35 m, 140x60-62 m, 60x80-82 m, 68x25-30 m, 82x55-60 m.

(Contd.)

Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Dungarpur	Rama,Dad Munger Bhatoli Tehsil, Aspur & Sabla	1:50000(RMS) 1:10000(RGM) 1:4000 2 (DGM)	150 10	8 2	807	98 (spot sample) 152 (Core sample)	Geologically, the area comprises phyllite, mica schist of Balicha formation and Crystalline limestone of Banswara formation belonging to Udaipur Group of Aravalli Supergroup with general litho trend N-NW to S-SE with almost vertical dip. The light grey to pinkish coloured, fine grey to medium grained, hard and compact, bedded granite/amphibole gneiss other east extending for about 5 km strike length with 10-80 m width N/v Sabla-Tapra, Bhatoli to Mahi river. An another band of 500 m length & 14-30 m width dimension also mapped parallel existed on the west of it & SW of Sabla hill. Lithologically, the limestone band is trending N-NW to S-SE with almost vertical dips, at places showing 5^0 to 10^0 variation on either sides.
Sawai Madhopur	N/v Pali, Dharmpuri Bohna Sonkachh & Narola	1:50000 (RMS) 1:10000 (RGM)	100 10	-	-	4	Geologically, the area comprises sirbu shale and limestone formation of Bhander group of Vindhyan Supergroup. The limestone was observed along chambal river bed in about 3000 m x250-850 m area N/v Pali, in about 8000 x300-500 m area N/v Dharmpuri, in about 2000 m x50-400 m area N/v Bohna and in about 1800 m x10-80 m area N/v Sonkachh and in about 150 m x15-20 m area N/v Narola tah Khandar. The limestone is mainly chocolate brown, greay and yellowish coloured.
Bundi	Kathoda,Mani Bishan Pura Kalyani, Karwar Ariali, Antarda etc.	RMS RGM DGM	150 15 1.5	-	-	-	Topographically, the area is occupied by hills N/v Antarda, Jhira, Bud, Karwar, Ghati and Kishanpura and rest of the area is occupied by plains and agriculture fields. Geologically, the area comprises phyllite, shale sandstone and quartzite. It belongs to Hindoli group of Bhilwara supergroup. Greenish and chocolate brown coloured, hard, thinly bedded shales are exposed in plain and nalah cuttings below thick soil cover.
Jhalawar	Pirawa, Pach-Pachar Gangadhar,A Klera Manoparthana and Khanpur	RMS RGM DGM	150 15 1.5	-	-	-	Topographically, the area is occupied by plains and mounds. Gcologically, the area comprises Deccan Traps (Basalt).The basalt is greyish to blackish in colour, hard, weathered and fractured in nature.

(Contd.)

Table-2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Alwar	Dangarwada Dhamrer,Thonsra Digawada,Todagyan singh,Chhillori	RMS RGM DGM	100 10 03	-	-	44	The area comprises rocks of Ajabgarh group of Delhi Supergroup.It is represented by quartzite, gritty quartzite limestone, phillite, inter bedded by quartzite and meta volcanic. These are intruded by quartz veins. The limestone is bluish grey to light grey in colour, hard, compact and fresh & highly jointed & fractured and have worked extensively in old pits. The average depth of limestone pits is 25 metres.
Rajsamand	Solankiyon ki Bhagal, Lalmadri Rebarion ki Dhani Mal Ka Guda, Karauli Ki Dhani Mandak ka Guda, Semal.	RGM DGM	20 3	-	-	-	About 8 km strike length, dolomite outcrops with average width of 850 m were mapped which is part of 37 km long dolomite belt of Nathdwara.
Sirohi	Aburoad	55	-	-	-	13	A recrystallized limestone band extending for strike length of more than 800 m with exposed width up to 300 m was mapped NW of village Dhanbor in tehsil Aburoad district Sirohi. Another recrystallized limestone band extending for strike length of more than 500 m with exposed width up to 50 m was seen about 1 km north of village Taleti in tehsil Aburoad, district Sirohi.
Alwar & Jaipur	N/v Bithloda Mandha, Bhakri Karoi, Nayabas etc.	DGM	1.25	9	672.5	119	The proposed explored block comprises of limestone,calc, silicate,Phyllite,Schist etc.Rocks belonging to Ajabgarh group of Delhi supergroup intruded by quartz,pegmatite of post Delhi age.Tentatively about 51 million tonnes indicated resource and 23 million tonnes inferred resources of limestone have been estimated in both Bhaisalana and Kujota blocks up to 31.03.2016.
Chittorgarh	Rasulpura, Bansa & Pirkhera Phachar Ahiran Tehsil-Nimbahera	-	-	15	611	203	Geologically, the area comprises Nimbahera limestone and shales of khorip group of lower Vindhyans belonging to proterozoic era. These are trending in N-S with 10^0 to 25^0 rolling dips. These conformably lie over Binota shale and underlained by Nimbahera limestone.

(Contd.)

Table-2 (Concld.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
MECL Meghalaya Jaintia Hill	West of Litang river valley	1:5000	3	10	134800	383 (primary) 34 (checked) 160 (composite) 18 (XRD) 18 (Spectroscopy) 25 (Petrography) 30 (Special Gravity) 1 (Beneficiation studies)	The block is covered by rock types of Kopili formation & Prang limestone of Jaintia group of tertiary age. The outcrop of Kopili formation are observed in the Western and North Western part of the block. The limestone is a bedded deposit having strike N 15^0E-S15^0W to NE-SW and dip varying from 2^0 to 5^0. Out of gross in situ resources of 530.502 million tonne, Measured category 217.88 million tonnes,Indicated category 174.880 million tonnes and Inferred Category 114.301 million tonnes were estimated.

PRODUCTION AND STOCKS

Limestone

The production of limestone in 2015-16 at 303.8 million tonnes increased by about 4% as compared to that of the previous year.

There were 792 reporting mines in 2015-16 as against 785 during the previous year. Twenty six mines, each producing more than 3 million tonnes per annum contributed about 43% of the total production of limestone in 2015-16. The share of 13 mines, each in the production range of 2 to 3 million tonnes was 10% of the total production. About 22% of the total production was contributed by 49 mines, each producing 1 to 2 million tonnes, annually. The remaining 25% of the total production was reported by 704 mines and one associated mine during the year. Twenty five principal producers contributed about 79% of the total production. About 3.7% of the production was reported by public sector mines as against 4.1% in the previous year.

About 97% of the total production of limestone during 2015-16 was of cement grade, 2% of iron & steel grade and the rest 1% consisted of chemical grade.

Rajasthan was the leading producing state accounting for (22%) of the total production of limestone, followed by Madhya Pradesh (12%), Andhra Pradesh (11%), Karnataka & Chhattisgarh (9% each),Gujarat & Telangana (8% each),Tamil Nadu(7%) , Himachal Pradesh & Maharashtra (4% each) and the remaining 6% was contributed by Meghalaya, Odisha,Uttar Pradesh, Jharkhand, Assam, Kerala, Bihar and Jammu & Kashmir.

Mine-head closing stock of limestone in 2015-16 was 12.5 million tonnes as against 13.1 million tonnes in previous year.

Average daily labour employment in limestone mines in 2015-16 was 22,797 as against 23,801 in the previous year (Tables - 3 to 7).

Table – 3 : Principal Producers of Limestone, 2015-16

Name and address of producer	Location of mine	
	State	District
Ultra Tech Cement Ltd, 'B' Wing,Ahura Centre, 2nd Floor, Mahakali Caves Road, Andheri (E), Mumbai-400 093, Maharashtra.	Andhra Pradesh	Kurnool
	Chhattisgarh	Raipur
	Gujarat	Amreli
		Kutch
	Karnataka	Kalaburagi
	Madhya Pradesh	Neemuch
	Maharashtra	Chandrapur
	Rajasthan	Chittorgarh
		Jaipur
		Nagaur
		Pali
	Tamil Nadu	Ariyalur
Ambuja Cement Ltd, Elegant Business Park, MIDC Cross Road B Off Andheri Kurla Road, Andheri-(East), Mumbai - 400 059 Maharashtra	Chhattisgarh	Baloda Bazar
		Raipur
	Gujarat	Junagadh
	Himachal Pradesh	Solan
	Maharashtra	Chandrapur
	Rajasthan	Pali
The ACC Ltd, Cement House, 121, Maharshi Karve Road, Mumbai – 400 020, Maharashtra.	Chhattisgarh	Durg
	Himachal Pradesh	Bilaspur
	Jharkhand	Singhbhum (W)
	Karnataka	Kalaburagi
	Madhya Pradesh	Katni
	Maharashtra	Yavatmal
	Rajasthan	Bundi
	Tamil Nadu	Coimbatore
	Odisha	Bargarh
Jaiprakash Associates Ltd, Sector – 128, Noida – 201 304, Uttar Pradesh.	Andhra Pradesh	Krishna
	Gujarat	Kutch
	Madhya Pradesh	Rewa
		Sidhi
		Satna
	Himachal Pradesh	Solan
	Uttar Pradesh	Sonbhadra
Shree Cement Ltd, Post Box No. 33 Bangur Nagar, Beawar – 305 901, Rajasthan.	Chhattisgarh	Raipur
	Rajasthan	Ajmer
		Pali
The India Cement Ltd, Coromandel Towers, 93, Santhome High Road, Karpagam Avenue, Raja Annamalai Puram, Chennai – 600 028, Tamil Nadu.	Andhra Pradesh	Kadapa
	Telangana	Nalgonda
		Ranga-Reddy
	Tamil Nadu	Ariyalur
		Perambalur
		Salem
		Namakkal
		Tirunelveli
		Thoothukudi
		Tiruchirappalli
		Virudhunagar

Table - 3 (Contd.)

Name and address of producer	Location of mine	
	State	District
Century Textiles & Industries Ltd, Century Bhawan, Dr. Annie Besant Road, Worli, Mumbai– 400 030, Maharashtra.	Chhattisgarh	Raipur
	Madhya Pradesh	Satna
	Maharashtra	Chandrapur
The Ramco Cement Ltd, 5th Floor, Auras Corporate Centre, 98, Dr Radhakrishanan Salai, Mylapore- 600 004, Chennai.	Andhra Pradesh	Krishna
	Karnataka	Chitradurga
	Tamil Nadu	Ariyalur
		Perambalur
		Thoothukudi
		Virudhunagar
Lafarge India Private Ltd, Equinox Business Park Tower-3, East Wing 4th Floor, Off Bandra Kurla Complex, LBS Road, Kurla-West, Mumbai-400 070.	Chhattisgarh	Janjgir-Champa
		Raipur
	Rajasthan	Chittorgarh
J. K. Lakshmi Cement Ltd, JK Puram, Basantgarh Pindwara -307 019, Rajasthan.	Chhattisgarh	Durg
	Rajasthan	Sirohi
J. K. Cement Limited, Kamla Tower, Kanpur-208 001, Uttar Pradesh.	Rajasthan	Chittorgarh
		Nagaur
	Karnataka	Bagalkot
Dalmia Cement Ltd (Bharat) Dalmiapuram, Main Road, Lalgudi, Tiruchirappalli- 621 651, Tamil Nadu.	Andhra Pradesh	Kadapa
	Tamil Nadu	Ariyalur
		Tiruchirap-palli
Chettinad Cement Corp. Ltd, 4th Floor, Rani Seethai Hall Building, 603, Anna Salai, Chennai – 600 006, Tamil Nadu.	Tamil Nadu	Ariyalur
		Dindigul
		Karur
		Perambalur
	Karnataka	Kalaburagi
Birla Corporation Ltd, Birla Building, 9/1 R. N. Mukherjee Road, Kolkata – 700 001, West Bengal.	Madhya Pradesh	Satna
	Rajasthan	Chittorgarh
Kesoram Industries Ltd, 9/1, R. N. Mukherjee Road, 8th Floor, Kolkata – 700 001.	Telangana	Karimnagar
	Karnataka	Kalaburagi

(Contd.)

Table - 3 (Contd.)

Name and address of producer	Location of mine	
	State	District
Binani Cement Ltd, 37/2,Chinar Park New Town,Rajarhat Main Road, P.O. Hatiara Kolkata-700 157 West Bengal	Rajasthan	Sirohi
Zuari Cement Ltd, Krishna Nagar, Yerraguntla-516 311, Andhra Pradesh.	Andhra Pradesh Telangana	Kadapa Nalgonda
A.P. Mineral Dev. Corpn. Ltd; 3rd Floor Rear Block, HMWSSB, Premises, Khairatabad, Hyderabad – 500 004, Andhra Prdesh.	Telangana	Adilabad
Prism Cement Ltd, Kurnool 305, Laxmi Niwas Apartments, Ameerpeth, Hyderabad-500 016, Andhra Pradesh.	Andhra Pradesh Madhya Pradesh	 Satna
My Home Industries Ltd, 9th Floor, Block-3, My Home Hub, Madhapur, Hyderabad-500 081, Andhra Pradesh.	Telangana	Nalgonda

Table - 3 (Concld.)

Name and address of producer	Location of mine	
	State	District
Wonder Cement Ltd. R.K.Nagar, Nimbahera,-301 601,	Rajasthan	Chittorgarh
Penna Cement Industries Ltd, Lakshmi Nivas Plot No.-705, Road No.-03, Banjara Hills, Hyderabad-500 034, Andhra Pradesh.	Andhra Pradesh Telangana	Anantapur Kurnool Nalgonda
Sanghi Industries Ltd, 10th Floor, Kataria Arcade, Opp.S.G. Highway, P.O. Makaraba, Ahmedabad-380 051, Gujarat.	Gujarat	Kutch
OCL India Ltd. Rajgangpur Cement Works, Rajgangpur Odisha-770017	Odisha	Sundargarh
Heidelberg Cement India Limited, 9th Floor, Infinity Tower C, DLF Cyber City, Phase-II Gurgaon-122 002 Haryana.	Madhya Pradesh Karnataka	Damoh Tumakuru

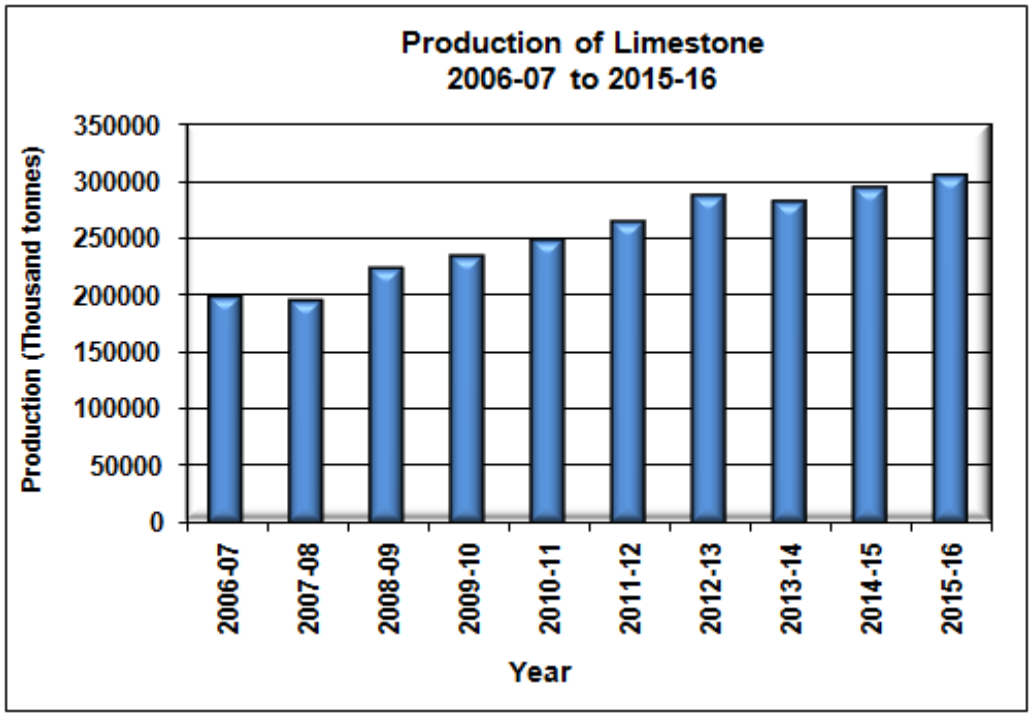

Table – 4 : Production of Limestone, 2013-14 to 2015 -16 (By States)

(Qty in '000 tonnes; Value in ₹'000)

State	2013-14		2014-15		2015-16 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	**280863**	**51332006**	**293273**	**58000375**	**303815**	**60529552**
Andhra Pradesh	34331	5495772	34676	6145183	33084	6174113
Assam	203	50378	665	172962	777	212382
Bihar	549	247877	473	119709	459	110293
Chhattisgarh	21217	4249587	23588	5095514	27553	6662045
Gujarat	23373	3159255	26010	4041937	25169	4166949
Himachal Pradesh	11935	1663036	12710	1969904	12309	2115060
Jammu & Kashmir	193	26996	130	17986	522	152752
Jharkhand	1678	646546	792	355281	1076	498054
Karnataka	21590	2833943	24008	3782551	27056	4314555
Kerala	501	234597	511	271081	487	264194
Madhya Pradesh	37832	6330551	39530	7024166	37870	6356868
Maharashtra	10997	1629631	12085	2338475	13034	2253611
Meghalaya	3616	2344472	3691	2399582	3847	2511989
Odisha	3718	1578044	3409	1189212	4501	1324352
Rajasthan	56754	10604183	61844	12515775	66706	13314687
Tamil Nadu	24112	5538596	22227	5989520	22715	5492331
Telangana	25120	3986981	23972	4043053	24054	4208863
Uttar Pradesh	3144	711561	2952	528484	2596	396454

Table – 5 : Production of Limestone, 2014-15 and 2015-16 (By Frequency Groups)

Production group (In tonnes)	No. of mines		Production for the group ('000 tonnes)		Percentage in total production		Cumulative percentage	
	2014-15	2015-16 (P)	2014-15	2015-16 (P)	2014-15	2015-16 (P)	2014-15	2015-16 (P)
All Groups	**785(5)**	**792(1)**	**293273**	**303815**	**100.00**	**100.00**	**-**	**-**
Up to 10000	334(4)	326	869	832	0.30	0.27	0.30	0.27
10001 - 50000	147(1)	141(1)	3714	3707	1.27	1.22	1.57	1.49
50001 - 100000	62	61	4775	4459	1.63	1.47	3.20	2.96
100001 - 200000	52	62	7485	9075	2.55	2.99	5.75	5.95
200001 - 300000	17	28	4407	6972	1.50	2.30	7.25	8.25
300001 - 400000	22	23	7887	7942	2.69	2.61	9.94	10.86
400001 - 500000	15	12	6821	5527	2.33	1.82	12.27	12.68
500001 - 600000	18	17	9963	9474	3.40	3.12	15.67	15.80
600001 - 700000	4	7	2608	4407	0.89	1.45	16.56	17.25
700001 - 800000	8	8	5954	5992	2.03	1.97	18.59	19.22
800001 - 900000	15	8	12678	6770	4.32	2.23	22.91	21.45
900001 - 1000000	8	11	7555	10496	2.58	3.46	25.49	24.91
1000001 - 2000000	45	49	65883	67822	22.46	22.32	47.95	47.23
2000001 -3000000	13	13	31791	30880	10.84	10.16	58.79	57.39
3000001 & above	25	26	120883	129460	41.21	42.61	100.00	100.00

Figures in parentheses indicate associated mine of limestone with dolomite & shale.

Table – 6 : Production of Limestone, 2014-15 & 2015 -16
(By Sectors/States/Districts/Grades)

(Qty in '000 tonnes; Value in ₹'000)

State/District	2014-15							2015-16 (P)						
	Grades					Total		Grades					Total	
	No.of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value	No. of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value
India	**785(5)**	**284314**	**5983**	**2976**	**-**	**293273**	**58000375**	**792(1)**	**293899**	**6526**	**3390**	**-**	**303815**	**60529552**
Public sector	23	8243	3642	-	-	11885	3703762	25	7501	3693	-	-	11194	3487086
Private sector	762(5)	276071	2341	2976	-	281388	54296613	767(1)	286398	2833	3390	-	292621	57042466
Andhra Pradesh	**73(3)**	**34300**	**365**	**11**	**-**	**34676**	**6145183**	**77**	**32499**	**547**	**38**	**-**	**33084**	**6174113**
Anantapur	11(1)	1423	4	-	-	1427	234169	13	1471	30	-	-	1501	240185
Cuddapah	8(1)	10283	-	-	-	10283	1467870	7	9306	2	-	-	9308	1431486
Guntur	8	3761	-	-	-	3761	654037	11	4076	70	34		4180	679198
Krishna	11	6344	344	-	-	6688	1747901	11	5815	354	-	-	6169	1773631
Kurnool	35(1)	12489	17	11	-	12517	2041206	35	11831	91	4	-	11926	2049613
Assam	**2**	**665**	**-**	**-**	**-**	**665**	**172962**	**3**	**777**	**-**	**-**	**-**	**777**	**212382**
Karbi Anglong	1	112	-	-	-	112	41757	1	171	-	-	-	171	64206
North Cachar Hills	1	553	-	-	-	553	131205	2	606	-	-	-	606	148176
Bihar	**1**	**473**	**-**	**-**	**-**	**473**	**119709**	**1**	**459**	**-**	**-**	**-**	**459**	**110293**
Rohtas	1	473	-	-	-	473	119709	1	459	-	-	-	459	110293
Chhattisgarh	**63**	**23217**	**371**	**-**	**-**	**23588**	**5095514**	**65**	**27212**	**341**	**-**	**-**	**27553**	**6662045**
Baloda bazar	1*	-	-	-	-	-	-	3	15	-	-	-	15	2233
Bastar	10	32	-	-	-	32	11752	9	50	-	-	-	50	17625
Durg	28	1691	371	-	-	2062	733134	27	2842	341	-	-	3183	907070
Janjgir-Champa	2	2196	-	-	-	2196	552942	2	1941	-	-	-	1941	522589
Kabirdham	1	++	-	-	-	++	42	1	++	-	-	-	++	24
Raigarh	1	7	-	-	-	7	2147	1	8	-	-	-	8	2388
Raipur	19	19291	-	-	-	19291	3795497	21	22356	-	-	-	22356	5210105
Rajnandgaon	1*	-	-	-	-	-	-	1	++	-	-	-	++	11

(Contd.)

Table - 6 (Contd.)

State/District	2014-15							2015-16 (P)						
	Grades					Total		Grades					Total	
	No.of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value	No. of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value
Gujarat	**119**	**23200**	**-**	**2810**	**-**	**26010**	**4041937**	**108**	**22072**	**-**	**3097**	**-**	**25169**	**4166949**
Amreli	2	5572	-	-	-	5572	873668	2	5259	-	-	-	5259	922456
Jamnagar	25	1010	-	151	-	1161	157141	22	1224	-	123	-	1347	218525
Junagadh	60	6392	-	1095	-	7487	1050202	52	6550	-	1342	-	7892	1172569
Kutch	6	8670	-	++	-	8670	1279891	7	7167	-	-	-	7167	1023557
Porbandar	25	1556	-	1564	-	3120	681035	24	1693	-	1632	-	3325	801058
Surat	1*	-	-	-	-	-	-	1	179	-	-	-	179	28784
Himachal Pradesh	**17**	**12431**	**279**	**-**	**-**	**12710**	**1969904**	**17**	**12106**	**196**	**7**	**-**	**12309**	**2115060**
Bilaspur	1	3579	-	-	-	3579	518926	1	3549	-	-	-	3549	596211
Mandi	1*	-	-	-	-	-	-	-	-	-	-	-	-	-
Sirmaur	13	619	279	-	-	898	277650	14	710	196	7	-	913	286033
Solan	2	8233	-	-	-	8233	1173328	2	7847	-	-	-	7847	1232816
Jammu & Kashmir	**2**	**125**	**5**	**-**	**-**	**130**	**17986**	**6**	**516**	**6**	**-**	**-**	**522**	**152752**
Anantnag	-	-	-	-	-	-	-	1	1	-	-	-	1	419
Pulwama	2	125	5	-	-	130	17986	4	249	6	-	-	255	59124
Srinagar	-	-	-	-	-	-	-	1	266	-	-	-	266	93209
Jharkhand	**9**	**792**	**-**	**-**	**-**	**792**	**355281**	**11**	**1076**	**-**	**-**	**-**	**1076**	**498054**
Garhwa	3*	-	-	-	-	-	-	3*	-	-	-	-	-	-
Palamu	-	-	-	-	-	-	-	1*	-	-	-	-	-	-
Ramgarh	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ranchi	-	-	-	-	-	-	-	2*	-	-	-	-	-	-
Singhbhum (West)	5	792	-	-	-	792	355281	5	1076	-	-	-	1076	498054
Karnataka	**62**	**23437**	**571**	**-**	**-**	**24008**	**3782551**	**63**	**26244**	**812**	**-**	**-**	**27056**	**4314555**
Bagalkot	41	2998	533	-	-	3531	802045	42	2791	771	-	-	3562	993908
Belagavi	8	91	12	-	-	103	44157	7	98	12	-	-	110	33931
Chitradurga	3	88	-	-	-	88	21229	3	94	-	-	-	94	21854
Kalaburagi	7	20067	-	-	-	20067	2840261	8	23032	-	-	-	23032	3181850
Shivamogga	1	-	25	-	-	25	6026	1	-	29	-	-	29	7032
Tumakuru	2	193	1	-	-	194	68833	2	229	-	-	-	229	75980

(Contd.)

Table - 6 (Contd.)

State/District	2014-15							2015-16 (P)						
	Grades					Total		Grades					Total	
	No.of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value	No. of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value
Kerala	**1**	**511**	**-**	**-**	**-**	**511**	**271081**	**1**	**487**	**-**	**-**	**-**	**487**	**264194**
Palakkad	1	511	-	-	-	511	271081	1	487	-	-	-	487	264194
Madhya Pradesh	**127(1)**	**37484**	**1971**	**75**	**-**	**39530**	**7024166**	**114(1)**	**35442**	**2362**	**66**	**-**	**37870**	**6356868**
Damoh	2	3759	-	-	-	3759	477762	2	3618	-	-	-	3618	454786
Dhar	15	136	-	-	-	136	24182	12	84	-	-	-	84	13827
Jabalpur	1	-	18	-	-	18	6405	1	-	18	-	-	18	3143
Katni	43(1)	3999	1908	75	-	5982	1121204	38(1)	3575	2114	66	-	5755	1104730
Narsinghpur	1	20	-	-	-	20	2031	-	-	-	-	-	-	-
Neemuch	2	4649	-	-	-	4649	567100	2	4000	-	-	-	4000	539459
Rewa	8	5609	-	-	-	5609	997862	8	4413	-	-	-	4413	780553
Sagar	2*	-	-	-	-	-	-	-	-	-	-	-	-	-
Satna	51	17707	45	-	-	17752	3643020	47	18404	230	-	-	18634	3259771
Sidhi	2	1605	-	-	-	1605	184600	4	1348	-	-	-	1348	200599
Maharashtra	**17**	**12082**	**3**	**-**	**-**	**12085**	**2338475**	**16**	**13033**	**1**	**-**	**-**	**13034**	**2253611**
Chandrapur	8	9248	1	-	-	9249	1759527	6	10178	-	-	-	10178	1951970
Yavatmal	9	2834	2	-	-	2836	578948	10	2855	1	-	-	2856	301641
Meghalaya	**14**	**3624**	**-**	**67**	**-**	**3691**	**2399582**	**13**	**3803**	**-**	**44**	**-**	**3847**	**2511989**
Jaintia Hills	11	1598	-	-	-	1598	317576	10	1796	-	-	-	1796	412256
Khasi Hills East	3	2026	-	67	-	2093	2082006	3	2007	-	44	-	2051	2099733
Odisha	**6(1)**	**3334**	**75**	**-**	**-**	**3409**	**1189212**	**6**	**4495**	**6**	**-**	**-**	**4501**	**1324352**
Bargarh	1	515	-	-	-	515	194581	1	703	-	-	-	703	444660
Koraput	1	29	-	-	-	29	8395	1	215	-	-	-	215	61207
Sundergarh	4(1)	2790	75	-	-	2865	986236	4	3577	6	-	-	3583	818485

(Contd.)

Table - 6 (Concld.)

State/District	2014-15							2015-16 (P)						
	Grades					Total		Grades					Total	
	No.of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value	No. of mines	Cement	Iron & Steel	Chem.	Others	Qty	Value
Rajasthan	**28**	**59731**	**2113**	**-**	**-**	**61844**	**12515775**	**34**	**64719**	**1861**	**126**	**-**	**66706**	**13314687**
Ajmer	1	1635	-	-	-	1635	292719	1	1408	-	-	-	1408	322777
Banswara	1	1231	-	-	-	1231	211713	1	1373	-	-	-	1373	241235
Bundi	1	585	-	-	-	585	170169	1	792	-	-	-	792	223888
Chittorgarh	9	18233	-	-	-	18233	3465683	10	21433	-	-	-	21433	3896130
Jaipur	1	4189	-	-	-	4189	745536	1	4240	-	-	-	4240	830753
Jaisalmer	2	601	2113	-	-	2714	1231174	2	506	1861	-	-	2367	1114302
Kota	1	2435	-	-	-	2435	504124	1	2378	-	-	-	2378	510924
Nagaur	5	1041	-	-	-	1041	335240	5	1187	-	126	-	1313	419770
Pali	3	17747	-	-	-	17747	2965915	6	19921	-	-	-	19921	3314355
Sikar	1	5	-	-	-	5	969	1	38	-	-	-	38	7535
Sirohi	3	12029	-	-	-	12029	2592533	3	11443	-	-	-	11443	2433018
Udaipur	-	-	-	-	-	-	-	2*	-	-	-	-	-	
Tamil Nadu	**209**	**21984**	**230**	**13**	**-**	**22227**	**5989520**	**226**	**22309**	**394**	**12**	**-**	**22715**	**5492331**
Ariyalur	41	10828	77	-	-	10905	3044322	40	10919	213	-	-	11132	2503035
Coimbatore	4	986	-	-	-	986	270435	4	874	-	-	-	874	295403
Dindigul	15	2340	15	10	-	2365	516132	20	1891	7	5	-	1903	448741
Karur	18	666	40	-	-	706	183364	19	814	41	-	-	855	233121
Krishnagiri	2	-	++	-	-	++	101	1	-	2	-	-	2	666
Madurai	7	46	16	3	-	65	34017	7	107	19	7	-	133	61460
Namakkal	10	1	15	-	-	16	5583	13	6	14	-	-	20	6752
Perambalur	21	3279	-	-	-	3279	797174	31	3448	-	-	-	3448	785829
Salem	19	414	9	-	-	423	191623	27	382	13	-	-	395	130762
Thoothukudi/Tuticorin	7	633	2	-	-	635	227283	8	888	6	-	-	894	307745
Tiruchirappalli	13	1948	5	-	-	1953	315354	13	2036	3	-	-	2039	290152
Tirunelveli	40	690	42	-	-	732	335092	32	462	59	-	-	521	266620
Virudhunagar	12	153	9	-	-	162	69040	11	482	17	-	-	499	162045
Telangana	**33**	**23972**	**-**	-	-	**23972**	**4043053**	**29**	**24054**	**-**	**-**	**-**	**24054**	**4208863**
Adilabad	3	4380	-	-	-	4380	743899	2	4035	-	-	-	4035	801905
Karimnagar	2	850	-	-	-	850	372334	2	845	-	-	-	845	456087
Nalgonda	24	14854	-	-	-	14854	2366895	21	15260	-	-	-	15260	2390241
Ranga Reddy	4	3888	-	-	-	3888	559925	4	3914	-	-	-	3914	560630
Uttar Pradesh	**2**	**2952**	-	-	-	**2952**	**528484**	**2**	**2596**	-	-	-	**2596**	**396454**
Sonbhadra	2	2952	-	-	-	2952	528484	2	2596	-	-	-	2596	396454

Figures in parentheses indicate associated mine of limestone with dolomite and shale.
(*) Only labour reported.
(++); Negligible

Table – 7 : Mine-head Closing Stocks of Limestone, 2014-15 & 2015-16 (By States/Grades)

(In '000 tonnes)

State	2014-15					2015-16 (P)				
	Grades					Grades				
	Cement	Iron & Steel	Chem.	Others	Total	Cement	Iron & Steel	Chem.	Others	Total
India	**9883**	**2165**	**1029**	**-**	**13077**	**9537**	**2172**	**825**	**-**	**12534**
Andhra Pradesh	625	28	3	-	656	557	77	6	-	640
Assam	42	-	-	-	42	44	-	-	-	44
Chhattisgarh	198	26	-	-	224	167	20	-	-	187
Gujarat	2323	-	1000	-	3323	1815	3	745	-	2563
Himachal Pradesh	44	44	-	-	88	92	55	-	-	147
Jammu & Kashmir	1	1	-	-	2	30	1	-	-	31
Jharkhand	36	160	-	-	196	14	163	-	-	177
Karnataka	2098	468	-	-	2566	2161	433	-	-	2594
Kerala	6	-	-	-	6	39	-	-	-	39
Madhya Pradesh	1405	396	13	-	1814	1426	502	27	-	1955
Maharashtra	13	21	-	-	34	6	6	-	-	12
Meghalaya	78	-	2	-	80	30	-	4	-	34
Odisha	119	440	-	-	559	132	434	-	-	566
Rajasthan	1343	357	-	-	1700	1491	245	37	-	1773
Tamil Nadu	482	224	11	-	717	409	233	6	-	648
Telangana	1070	-	-	-	1070	1124	-	-	-	1124

Limeshell

The production of limeshell at 10,029 tonnes during 2015-16 decreased by 39% as compared to the preceding year.

There were 7 reporting mines in both the years 2014-15 and 2015-16.Three principal producers accounted for 81% of the total production during the year. There were no public sector mines reporting production in the current year as compared to one mine in the previous year.

Eighty eight percent of the total production of limeshell was reported from Kerala and remaining 12% from Karnataka (Tables - 8 to 10).

Mine-head closing stock of limeshell in the year 2015-16 was 896 tonnes as against 2,468 tonnes in the previous year (Table - 11).

The average daily employment of labour during the year 2015-16 was 499 as against 533 in the previous year.

Table – 8 : Principal Producers of Limeshell 2015-16

Name and address of producer	Location of mine	
	State	District
The Vaikom Limeshell Co.op Society Ltd, No. 3145, P.O. Pallippurathussery, Vaikom-686 606, Distt. Kottayam, Kerala.	Kerala	Kottayam
Karappuram White Limeshell Vyavasaya Co-op. Society Ltd., Muhamma,Taluk: Cherthala Alappuzha-688 525 Kerala.	Kerala	Alappuzha
Muhamma Clam Marketing Society Ltd, Vill. Thanneermukom South, Taluk: Cherthala Alappuzha-688 525 Kerala.	Kerala	Alappuzha

Table – 9 : Production of Limeshell, 2013-14 to 2015-16
(By States)

(Qty in tonnes; Value in ₹'000)

State	2013-14		2014-15		2015-16 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	**18750**	**35162**	**16353**	**37137**	**10029**	**27259**
Karnataka	-	-	200	240	1221	1222
Kerala	18690	35102	16123	36867	8808	26037
Tamil Nadu	60	60	30	30	-	-

Table – 10 : Production of Limeshell, 2014-15 & 2015-16 (P)
(By Sectors/States/Districts)

(Qty in tonnes; Value in ₹'000)

State/District	2014-15			2015-16 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	**7**	**16353**	**37137**	**7**	**10029**	**27259**
Public sector	1	3263	3589	-	-	-
Private sector	6	13090	33548	7	10029	27259
Karnataka	**1**	**200**	**240**	**2**	**1221**	**1222**
Uttar Kannada	1	200	240	2	1221	1222
Kerala	**5**	**16123**	**36867**	**4**	**8808**	**26037**
Alappuzha	2	4809	13471	2	4591	13806
Kottayam	3	11314	23396	2	4217	12231
Tamil Nadu	**1**	**30**	**30**	**1***	**-**	**-**
Cuddalore	1	30	30	1	-	-

(*) Only labour reported

Table – 11 : Mine-head Closing Stocks of Limeshell, 2014-15 & 2015-16 (P)
(By States)

(In tonnes)

State	2014-15	2015-16 (P)
India	**2468**	**896**
Karnataka	2151	704
Kerala	293	168
Tamil Nadu	24	24

(P) :Provisional

Limekankar

As per GOI Notification S.O.423 (E) dated 10th February 2015, limekankar has been declared as 'Minor Mineral'. Hence, the production beyond January, 2015 is not available with IBM.

Table – 12 : Producers of Limekankar

Name and address of producer	Location of mine	
	State	District
The Ramco Cements Ltd, Auras Corporate Centre 5th Floor, 98-A Dr. Radhakrishna Road, Mylapore, Chennai-600 004, Tamil Nadu.	Tamil Nadu	Virudhunagar

Chalk

As per GOI notification S.O.423 (E) dated 10th February 2015,chalk has been decleared as 'Minor Mineral'. Hence,the production beyond January, 2015 is not available with IBM.

Table – 13 : Producers of Chalk

Name & address of producer	Location of mine	
	State	District
Porbandar Industrial Products, Harish Mansion, Post, Box.27, Porbandar-360 575, Gujarat.	Gujarat	Porbandar
Rambhai Kanabhai Sagar, At – Aditpara, Adityana- 360 545, Distt. Porbandar, Gujarat.	Gujarat	Porbandar
Saurashtra Minerals Pvt. Ltd, East Kadia Plots, Porbandar-360 575, Gujarat.	Gujarat	Porbandar
Hashim Nazr Ali Merchant, 1st Floor, Hawda Building, Near Bhavsinhji Park, Porbandar-360 575 Gujarat.	Gujarat	Porbandar
Shreenathji White Chalk Co., Near Patel Samaj, Opp. Civil Hospital, Upelta-364 90, Rajkot, Gujarat.	Gujarat	Rajkot
Patel Jivabhai Kalahai & Thakershi Kalabhai & Co., P.O. Adityana, Taluka- Ranavav, Porbandar - 360 545, Gujarat.	Gujarat	Porbandar
P. Dattani & Co., M. G. Road, Porbandar-360 575, Gujarat.	Gujarat	Porbandar

(Contd..)

Table - 13 (Concld.)

Name & address of producer	Location of mine	
	State	District
Khyati Minerals, Adityana, Panchayat Chowk, Ranavav - 360 545, Gujarat.	Gujarat	Porbandar
Girdhar Hemraj & Co., Panjarapole Road, Porbandar - 365 575 Gujarat.	Gujarat	Porbandar
Universal Mineral Industries, Barvan Ness, Ranavav-360 560, Distt. Porbandar, Gujarat.	Gujarat	Porbandar
Indian Clay Industries, Taluka- Ranavav, Adityana- 360 545, Distt. Porbandar, Gujarat.	Gujarat	Porbandar
Shreenathji Minerals &, Chemical Industry, P.O. Adityana, Ranavav - 360 545, Gujarat.	Gujarat	Porbandar
Shreenathji Minerals, Adityana, P.O. Adityana, Ranavav - 360 545, Gujarat.	Gujarat	Porbandar
Vasudev Minerals, 1st Floor, Opp.Mama Kotha, Near Bhavsinji Park, Distt. Porbandar- 360 575, Gujarat.	Gujarat	Porbandar
Shree Geeta Trading Co. Adityana, Distt. Porbandar- 360 545 Gujarat.	Gujarat	Porbandar

Marl

Production of marl during 2015-16 was 2,390 thousand tonnes as compared to 2,179 thousand tonnes in the preceding year. The entire production of marl was reported as associate mineral with limestone in both the years. There were five associate mines reporting production of marl during 2015-16 as against six during the previous year. The entire production was reported by private sector mines (Tables-14 & 16).

Entire production of marl during 2015-16 was reported from Gujarat state (Table -15).

Mine-head closing stock of marl at the end of 2015-16 was 1,230 thousand tonnes as against 1,022 thousand tonnes at the begining of the year (Table - 17).

Table – 14 : Principal Producers of Marl, 2015-16 (P)

Name and address of producer	Location of mine	
	State	District
*Ultratech Cement Ltd, B-Wing, 2nd Floor, Ahura Centre, Mahakali Caves Road, Andheri (E), Mumbai– 400 093.	Gujarat	Amreli
* Ambuja Cement Limited, Elegant Business Park, MIDC, Cross Road B Off Andheri, Kurla Road Andheri East, Mumbai - 400 059	Gujarat	Amreli
*Gujarat Sidhee Cement Ltd, N.K.Mehta International House, 178, Backbay Reclamation, Mumbai-400 020.	Gujarat	Junagadh
*Saurashtra Cement Ltd, N.K.Mehta International House, 178, Backbay Reclamation, Mumbai-400 020.	Gujarat	Porbandar

** Producing as an associated mineral with Limestone.*

Table – 15 : Production of Marl, 2013-14 to 2015-16 (By States)

(Qty in tonnes, Value in ₹'000)

State	2013-14		2014-15		2015-16 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	**3254486**	**280571**	**2179488**	**257598**	**2389706**	**319146**
Gujarat	3216915	270164	2177449	257030	2389706	319146
Tamil Nadu	37571	10407	2039	568	-	-

Table – 16 : Production of Marl, 2014-15 to 2015-16 (By Sector/States/Districts)

(Qty in tonnes; Value in ₹'000)

State/District	2014-15			2015-16 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India/ Private Sector	**(6)**	**2179488**	**257598**	**(5)**	**2389706**	**319146**
Gujarat	**(5)**	**2177449**	**257030**	**(5)**	**2389706**	**319146**
Amreli	(2)	1733789	220633	(2)	1692416	256437
Junagadh	(2)	429326	35451	(2)	169814	27896
Porbandar	(1)	14334	946	(1)	527476	34813
Tamil Nadu	**(1)**	**2039**	**568**	**-**	**-**	**-**
Perambalur	(1)	2039	568	-	-	-

Figures in parentheses indicate associated mines with limestone.

Table – 17 : Mine-head Stocks of Marl, 2014- 15 & 2015-16
(By States)

(Qty. in tonnes)

State	2014-15	2015-16 (P)
India	**1021997**	**1229593**
Gujarat	804945	1013979
Tamil Nadu	217052	215614

MINING & MARKETING

In India, limestone mines are worked by opencast method. Captive mines are mechanised and supply feed to cement and iron & steel units. Some mines have well laid road-cum-rail routes. The large mines are developed by forming benches in overburden and limestone bed. The face length, width and height of the benches correspond to the mining machinery deployed and production schedule. Heavy earth-moving machinery like 3.3 to 4 cu m capacity hydraulic excavators in combination with 10-35 tonnes dumpers are normally used. Other mines are mainly worked by semi-mechanised and manual opencast mining methods.

Limestone produced in Kurnool, Andhra Pradesh and from Adilabad in Telangana are used in paper mills, sugar, cement and steel plants. Tile, mossaic, chip and polished stonemakers also use limestone.

Limestone produced in Bihar is supplied mainly to cement plants, foundries and lime kiln units.

In Raipur and Durg districts of Chhattisgarh, the limestone produced is suitable for Iron & Steel Industry. The Bhilai Steel Plant obtains its requirements of limestone from Nandini mines in Durg district. The cement grade limestone is also produced in the region and there is large cluster of cement plants in and around Raipur.

Limestone produced in Gujarat is consumed mainly in cement and chemical industries and also in textile, foundries and steel plants. The dolomitic limestone in Gujarat is used for making slabs and tiles.

Limestone produced in Himachal Pradesh is supplied to cement plants, paper industry, sugar mills and lime kilns. The production from Bilaspur district is despatched to fertilizer unit of National Fertilizers Ltd, (NFL) at Naya Nangal.

Limestone produced in Jammu & Kashmir is suitable for cement manufacturing.

In Karnataka, limestone is supplied generally to paper mills and cement plants. However, limestone of Kalaburagi district, commonly known as 'Shahabad stones', is used as flag stone or flooring stones.

Limestone from Madhya Pradesh is used in cement, sugar, paper, steel and lime industries.

In Maharashtra, apart from cement and sugar industries, limestone is used in Ferro-manganese Industry as flux and also in Tanning Industry.

Limestone mined in Rajasthan is consumed in captive cement plants on a large scale. Limestone of Nagaur district is utilised as feed for white cement plants as well as in steel plants as low silica SMS grade flux and in Chemical Industry. Crystalline limestone of Rajasthan is widely known as a decorative ornamental stone. The limestone worked in Bundi district and Raghunathgarh in Jaipur district is an excellent flagstone, for use as a paving stone.

The limestone produced in Dehradun-Garhwal areas of Uttarakhand used to be supplied to Sugar, Paper, Steel, Glass, Chemical and Cement Industries in the past.

Limestone in Tamil Nadu is consumed by various industries like Cement, Steel, Paper, Foundry, Fertilizer and Chemicals.

Limeshell from Kerala is used mainly in Chemical, Cement and White cement Industries. It is also used in the manufacture of polyfibre and in Tanning industry.

USES

Limestone used for industrial purpose falls under 'Major Mineral', while the use of limestone in lime kilns and for building purposes comes under 'Minor Mineral' as per Mines and Minerals (Development and Regulation) Act, 1957.

The threshold value of limestone has been revised by IBM, through a Notification in 2009, as follows:

(i) For limestone deposits in Chhattisgarh, Gujarat, Himachal Pradesh, Madhya Pradesh, Maharashtra, Rajasthan, Uttarakhand & Uttar Pradesh - CaO - 34% (min), MgO - 4% (max).

(ii) For limestone deposits of Andhra Pradesh, Jharkhand, Karnataka, Kerala, Odisha & Tamil Nadu - CaO - 35% (min), MgO - 4% (max), SiO_2 - 18% (max) & Alkalies - 0.5% (max).

The principal use of limestone is in the Cement Industry. Other important uses are as raw material for the manufacture of quicklime (Calcium Oxide), slaked lime (Calcium hydroxide) and mortar. Pulverized limestone is used as a soil conditioner to neutralize acidic soils (agricultural lime). It is used in sculptures because of its suitability for carving. It is often found in medicines and cosmetics. In some circumstances, limestone is used for glass making. As a reagent in fuel-gas desulfurization, it reacts with sulphur dioxide for air pollution control. Geological informations of limestone are among the best petroleum reservoirs. It can supress methane explosions in underground coal mines. It is added to toothpaste, paper,plastic,paint, tiles and other materials as both white pigment and cheap filler. In blast furnaces,limestone binds with sillica and other impurities to remove them from the iron.

Lime is prepared by heating limestone in kilns up to 1000 ^{O}C. The CO_2 released is effluxed and 'quicklime' (CaO) formed remains as hard white lumps. This when slaked with water and mixed with sand, forms mortar or plaster. Commonly, the commercial lime is prepared as dry hydrated lime $Ca(OH)_2$ by adding to quicklime the right amount of water (18 parts to 56 parts of CaO). The value of lime for most purposes depends upon its CaO (or CaO + MgO) content.

The manufacture of metallic calcium is one of the latest uses of lime. Calcium is used in reducing organic compounds, desulphurising petroleum, debismuthising lead production of hard lead alloys and calcium-silicon alloys, and in the manufacture of calcium hydride which is further used as an efficient hydrogen carrier.

Limeshell is used mainly in Chemical and White cement Industries. It is also used in the manufacture of polyfibre and in Tanning industry. Lime kankar is used in Cement Industry.

SPECIFICATIONS

Cement Industry

Cement is a binder, a substance used in construction that sets,hardens and adheres to other materials. Cement used in construction are usually inorganic,often lime or calcium silicate based. Magnesia, sulphur and phosphorus are regarded as deleterious elements. Limestone should have less than 3% magnesium oxide (MgO), maximum tolerance being 5 percent. The presence of P as P_2O_5 more than 1% slows down considerably the setting time of Portland Cement. Indian cement manufacturers prescribed that the limestone should have CaO 42% (min), Al_2O_3 1 to 2%, Fe_2O_3 1 to 2%, SiO_2 12 to 16% and MgO 4% (max). The broad chemical specifications of cement grade limestone (r.o.m.) for cement manufacture suggested by the National Council for Cement and Building Materials, New Delhi, are given in Table-18.

Table – 18 : Broad Chemical Specifications of Cement Grade (Run-of-Mine) Limestone (Clause 6.1.1)

Oxide component/ Other Constituents	Acceptable range for manufacture of Ordinary Portland Cement (33, 43 & 53 Grade) (percent)	Limiting values taking into consideration other types of cements, scope of beneficiation and blending (percent)
CaO	44-52	40(min)
MgO	3.5(max.)	5.0(max)
SiO_2	To satisfy LSF, silica	–
Al_2O_3	Modules and alumina	–
Fe_2O_3	Modules	–
TiO_2	<0.5	<1.0
Mn_2O_3	<0.5	<1.0
R_2O ($Na_2O + K_2O$)	<0.6	<1.0
Total S as SO_3	<0.6	<0.8
P_2O_5	<0.6	<1.0
Cl	<0.015	<0.05
Free silica	<8.0	<10.0

Source: *Report on Norm for limestone deposits for cement manufacture by National Council for Cement and Building Materials, New Delhi, May 2001.*

Iron & Steel Industry

In Iron & Steel Industry, limestone is used both in blast furnace and steel melting shop as a flux after calcining. It is also added as flux in self-fluxing iron ore sinters. It has two basic functions in steel making, first to lower the temperature of melting and second to form calcium silicate which comes out as a slag as it combines with silica in iron ore.

For use in the blast furnace, the calcium carbonate ($CaCO_3$) content in limestone should not be usually less than 90 percent. The combined SiO_2 and Al_2O_3 should not exceed 6% though up to 11.5% is allowed; MgO should be within 4% and sulphur and phosphorus as low as possible.

In Steel Melting Shop (SMS), insolubles in limestone should not exceed more than 4 percent. Good fluxing limestone should naturally be low in acid constituents like silica, alumina, sulphur and phosphorus. Limestone should be dense, massive, preferably fine-grained, compact and non-fritting on burning.

BIS has prescribed specifications for flux grade limestone for use in steel plants as per IS : 10345 - 2004 (Second Revision; Reaffirmed 2009).

Glass Industry

Glass Industry requires high calcium limestone (94.5% $CaCO_3$) and 97.5% of combined $CaCO_3$ and $MgCO_3$. Iron and other colouring matters are regarded as objectionable and Fe_2O_3 should be up to 0.20% (max). For colourless glass, limestone should contain 98.5% $CaCO_3$ (min), iron content as Fe_2O_3 should not be more than 0.04%; and for bottle glass, Fe_2O_3 up to 0.05% is used. The BIS specifications (IS : 997 - 1973); First Amendment, (Reaffirmed Feb.2013) for limestone for use in Glass Industry are as follows:

Silica as SiO_2	2.5%
Total iron (Fe_2O_3)	
a) Calcite or marble	0.05%
b) Limestone	0.10%
c) Dolomitic limestone or dolomite	0.15%
Lime (as CaO)	53.0%
Total lime and magnesia (as CaO + MgO)	54.50%

Chemical Industry

The calcium carbide manufacturers generally prefer lime containing 95% CaO (min) with limitations of not more than 3% SiO_2, not more than 0.95% phosphorus and other impurities not exceeding more than 2%. For the manufacture of bleaching powder, lime containing 95% and above CaO is required. Total $Fe_2O_3 + Al_2O_3 + MnO_2$ should be less than 2%; MgO should be below 2% and SiO_2 less than 1.5%. Bleaching powder is prepared by absorption of chlorine by dry hydrated lime. The hydrated lime should not contain more than 2% excess water. Iron

and manganese oxides lead to unsuitability of the product and iron oxides tend to discolour the bleached material. Magnesia renders the bleaching powder hygroscopic. Silica and clay impede solution and settling of bleaching powder.

BIS has prescribed specification for limestone for use in chemical industry as per IS: 3204:1978 (First revision.Feb, 2009).

The BIS specifications of limestone for chemical industries are furnished in Table-19.

Sugar Industry

In Sugar Industry, lime is used for clarification of cane and beet juice, viz, removing the impurities from the juice and also for precipitating sugar from impurities. Milk of lime 1% in volume of cane juice is added to pre-heated juice. Limestone used in Sugar Industry must be high in active lime (CaO 80% min), but low in iron, alumina and silica. Magnesia should be less than one percent. Excess silica is undesirable because it separates as a gelatinous precipitate which covers the sugar crystals and retards their growth and filteration. Magnesia is objectionable because magnesium carbonate is soluble in sugar juice. Presence of iron tends to colour the finished product.

Fertilizer Industry

Limestone is used only as carrier in the manufacture of calcium ammonium nitrate fertilizer. For this purpose, limestone should contain $MgCO_3$+$CaCO_3$ 85% (min), SiO_2 5% (max) and acid insolubles 14% (max).

Foundry Industry

The chemical requirements of limestone for use in foundries as per BIS specification (IS : 4140 -1978); has been withdrawn.

Table – 19 : Specifications of Limestone for Chemical Industry (Bleaching Powder, Caustic Soda, Calcium Carbide and Sugar Industries) (IS : 3204 - 1978;First Revision, Reaffirmed 2013)

Characteristics	Requirement in percent by mass for			
	Bleaching powder	Caustic soda	Calcium carbide	Sugar
Loss on ignition	46.00	46.00	46.00	44.00
SiO_2 (max)	0.75	–	1.00	2.00
Fe_2O_3 (max)	0.15	–	0.25	–
CaO (min)	54.00	53.00	54.00	50.00
MgO (max)	2.00	1.00	0.80	1.00
Mn_2O_3 (min)	0.06	–	–	–
CO_2 (min)	42.00	42.00	42.00	41.00
S (max)	–	–	0.10	–
P (max)	–	–	0.01	–
Al_2O_3+Fe_2O_3 (max)	–	–	0.50	1.50
SiO_2+Al_2O_3+Fe_2O_3 (max)	–	3.00	–	–

INDUSTRY & CONSUMPTION

India was the second largest cement producing country in the world after China. There were 210 large cement plants having an installed capacity of 410 million tonnes in 2015-16 in addition to more than 350 mini cement plants having estimated capacity of around 11.10 million tonnes per annum. The total installed capacity of cement in 2015-16 was thus about 421.10 million tpy against 356 million tpy in the preceding year. Besides, there are three white cement plants having a total 990,000 tpy capacity. The total production of cement reached 283.45 million tonnes in 2015-16 registering a growth of about 6.52% over the preceding year.

In 2015-16, the total cosumption of limestone & other calcareous minerals/ materials, as reported by different industries was 307.35 million tonnes. Cement was the major consuming industry accounting for 94% consumption, followed by iron & steel (4%) and chemical (2%). The remaining consumption was reported by aluminium, alloy steel, sugar, paper, fertilizer, glass, metallurgy, foundry, etc. Consumption of limestone and other calcareous materials from 2013-14 to 2015-16 is given in Tables - 20(A), 20(B) and 20 (C). Information on consumption of limestone in Iron & Steel industry by principal plants is given in Table - 20 (D).

Table - 20 (A) : Consumption* of Limestone, 2013-14 to 2015-16 (By Industries)

(In tonnes)

Industry	2013-14	2014-15 (R)	2015-16 (P)
All Industries	**244265100**	**266432500**	**277425800**
Aluminium	203100	213200	213200
Alloy steel	39100	44100	75200
Cement	224847600	248500800	259893800
Chemical	4352900	4649800	4887700
Fertilizer	149800	700	2200
Ferro-alloys	11800	1700	800
Foundry	23500	500	500
Glass	141300	76400	93800
Iron & Steel	12172300	11482700	10763800
Metallurgy	60600	22600	2300
Paper	121900	5200	5200
Sugar (e)	856200	993100	918800
Others**	1285000	441700	568500

Figures rounded off.
** Includes actual reported consumption and/or estimates made wherever required and due to paucity of data, coverage may not be complete.*
*** Includes alumina,calcination,ceramic,electode,refractory,sponge iron & thermal power.*

Table –20 (B) : Consumption* of Other Calcareous Minerals/Materials, 2013-14 to 2015-16 (By Industries)

(In tonnes)

Industry	2013-14	2014-15 (R)	2015-16 (P)
All Industries (A+B+C+D)	**31014000**	**30506300**	**29929500**
(A) Cement {(i) + (ii)}	30991100	30483400	29906600
(i) Other Calcareous Material	28663300	28767000	28190000
B F Slag	6032500	5862200	5933300
Fly ash/blue dust	22369300	22644300	21844100
$CaCO_3$ sludge / Lime sludge	261500	260500	412600
(ii) Other Calcareous Minerals	2327800	1716400	1716600
Limeshell	13300	13300	13300
Marble	642400	642400	696400
Marl	1672100	1060700	1006900
(B) Paper/Limeshell	13400	13400	13400
(C) Glass/ B F Slag	9100	9100	9100
(D) Fertilizer/Limeshell	400	400	400

Figures rounded off.
** Includes actual reported consumption and/or estimates made wherever required and due to paucity of data, coverage may not be complete.*

Table – 20 (C) : Consumption*of Limestone & Other Calcareous Minerals/Materials, 2013-14 to 2015-16 (By Industries)

(In tonnes)

Industry	2013-14	2014-15 (R)	2015-16 (P)
All Industries	**275278700**	**296938800**	**307355300**
Aluminium	203100	213200	213200
Alloy steel	39100	44100	75200
Cement	255838700	278984200	289800400
Chemical	4352900	4649800	4887700
Fertilizer	149800	700	2200
Ferro-alloys	11800	1700	800
Foundry	23500	500	500
Glass	141300	76400	93800
Iron & Steel	12172300	11482700	10763800
Metallurgy	60600	22600	2300
Paper	135300	18600	18600
Sugar	856200	993100	918800
Others**	1294100	451200	578000

Figures rounded off.
** Includes actual reported consumption and/or estimates made wherever required and due to paucity of data, coverage may not be complete.*
*** Includes alumina,calcination ceramic electrode,oil well drilling refractory,spong iron & thermal power.*

Table – 20 (D) : Consumption* of Limestone in Iron & Steel Industry, 2013-14 to 2015-16 (By Principal Plants)

(In tonnes)

Plant	2013-14	2014-15 (R)	2015-16 (R)
Bhilai Steel Plant	NA	1310662	1448069
Bokaro Steel Plant	870034	806394	761925
Durgapur Steel Plant	566832	547518	464579
IISCO Steel Plant	26763	116159	NA
Rourkela Steel Plant	762313	921641	862154
Visvesvaraya Iron & Steel Plant	6021	22889	NA
Visakhapatnam Steel Plant	6021	NA	NA
JSW Steel Ltd	74307@	65164@	59849 @
Tata Steel Ltd	2823939	2862638	2947033
IDCOL, Kalinga Iron Works Ltd	3514	1419	NIL
Tata Metallics Limited	84811	81761	58102
Kirloskar Ferrous Industry Ltd	NA	49365	41062
KIOCL Ltd	51553	21485	1863
VISA Steel Plant	NA	6401	13082
Neelachal Ispat Nigam Ltd	NA	84722	82230
Jayaswal Neco Industries Ltd	96779	95520	76917
Sunflag Iron & Steel Co.Ltd	25667	25667	30566

** Includes actual reported consumption and/or estimates made wherever required and due to paucity of data, coverage may not be complete.*

@ Salem plant

FOREIGN TRADE

Exports

As per the foreign trade policy 2015-20, the exports of limestone, lime kankar, lime shell and chalk are free. Exports of limestone decreased slightly to 3.23 million tonnes in 2015-16 from 3.81 million tonnes in the previous year. Limestone in bulk was exported mainly to Bangladesh (95%), UK (2%) & Bhutan (1%). During the same period, exports of chalk also decreased marginally to 481 tonnes from 490 tonnes in the previous year. Chalk was exported mainly to Nepal (81%), Bangladesh (6%), Bhutan (4%) and Egypt (2%).

Exports of bleaching powder were at 16,562 tonnes in 2015-16 as compared to 16,976 tonnes in the previous year. Bleaching powder was exported mainly to Bangladesh (55%), Sri Lanka & USA (9% each) , Nepal (7%), Algeria (5%) and Kenya (3%) besides other countries.

In 2015-16, about 371 tonnes of calcium carbide was exported as against 412 tonnes in the previous year mainly to Bangladesh (38%) ,Oman (16%),UAE (13%),China (12%) and Equatorial Guinea (6%) (Tables- 21 to 24).

Imports

As per the foreign trade policy 2015-20, the imports of limestone, lime kankar, lime shell and chalk are free. Imports of limestone increased to 17.18 million tonnes in 2015-16 from 13.94 million tonnes in the previous year. Imports of chalk in 2015-16 drastically decreased to 6,174 tonnes as against 26,734 tonnes in the previous year. Limestone was imported mainly from UAE (74%) & Oman (17%), while chalk was imported mainly from Vietnam (96%) & France (2%) besides other countries.

Imports of calcium carbide decreased drastically to 61,936 tonnes in 2015-16 from 78,331 tonnes in the previous year. Calcium carbide was imported mainly from China (59%), Bhutan (32%) and South Africa (8%). The imports of bleaching powder was not available for both current and previous years (Tables- 25 to 28).

Table – 21 : Exports of Limestone (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**3812759**	**4671971**	**3236010**	**4694273**
Bangladesh	3684066	3542496	3063174	2929791
UK	35929	351812	71891	751802
Bhutan	28510	177263	27482	215400
USA	4036	65859	6015	185042
Ireland	6869	59323	8168	79831
Belgium	6024	64558	6302	67549
France	4329	41332	6317	64978
Nepal	16134	67352	16342	46285
Korea, Rep. of	1837	21276	3233	41791
Japan	2489	32522	2094	34473
Other countries	22536	248178	24992	277331

Table – 22 : Exports of Chalk (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**490**	**2978**	**481**	**3816**
Nepal	358	1211	391	2438
Bhutan	-	-	19	273
Kenya	++	8	1	207
Oman	25	239	2	198
Bangladesh	-	-	27	166
Egypt	23	193	12	127
UAE	1	4	1	119
Malaysia	1	71	1	71
USA	++	1	10	42
South Africa	21	114	6	41
Other countries	61	1137	11	134

Table – 23 : Exports of Bleaching Powder (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**16976**	**667839**	**16562**	**568546**
Bangladesh	7408	144042	9171	179733
USA	1349	99799	1437	122858
Algeria	1938	117835	786	52866
Sri Lanka	825	25480	1493	44695
Kenya	308	24620	416	33723
Iran	-	-	254	16456
Nepal	1336	15757	1220	15551
Madagascar	536	36656	208	14407
Mauritius	322	21534	168	11556
Angola	126	7951	168	10366
Other countries	2828	174165	1241	66335

Table – 24 : Exports of Calcium Carbide (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**412**	**22973**	**371**	**20636**
Bangladesh	153	9207	144	9266
Oman	1	106	60	3233
UAE	233	12022	48	2484
Nepal	++	242	34	1854
China	--	--	45	1561
Equatorial Guinea	--	--	24	1289
Suriname	--	--	16	942
Qatar	--	--	++	6
Djibouti	24	1370	--	--
Kenya	1	26	++	1

Table – 25 : Imports of Limestone (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**13943781**	**22138585**	**17187164**	**23772767**
UAE	10610965	14066632	12722921	14391609
Oman	2132145	2984367	2981700	3901617
Malaysia	499560	2136958	572171	2321059
Vietnam	262582	1667673	278773	1565974
Thailand	199747	485422	173279	581347
Indonesia	32306	35845	155655	331559
Egypt	26289	134100	17504	88441
Philippines	60900	109042	44000	73381
Australia	21094	158227	50976	71266
Unspecified	-	-	7695	69279
Other countries	98193	360319	182490	377235

Table – 26 : Imports of Chalk (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**26734**	**47715**	**6174**	**46310**
Vietnam	6516	39250	5943	38276
France	20106	2194	106	2656
Sri Lanka	-	-	15	1406
Denmark	20	403	36	1263
China	53	3268	53	1024
Italy	15	1171	12	924
Japan	7	329	2	319
UK	2	205	3	250
Germany	7	688	4	184
Chinese Taipei/Taiwan	8	185	++	8
Other countries	++	22	--	--

Table – 27 : Imports of Calcium Carbide (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**78331**	**3152508**	**61936**	**2542902**
China	46136	1727767	36252	1409268
Bhutan	19509	901180	20055	869578
South Africa	4157	173891	4687	207983
Russia	-	-	672	45161
Malaysia	-	-	205	9324
Hong Kong	-	-	23	887
Indonesia	8526	349513	42	698
Germany	++	16	++	3
New Zealand	3	83	-	-
Thailand	++	51	-	-
Other countries	++	7	-	-

Table – 28 : Imports of Bleaching Powder (By Countries)

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**++**	**55**	**++**	**3**
UK	++	2	++	2
Germany	++	7	++	1
USA	++	46	-	-
Other countries	-	-	-	-

FUTURE OUTLOOK

India has huge resources of limestone distributed over different parts of the country. It is comfortably placed in terms of annual capacity and production of cement. Cement-grade limestone occurs in all the limestone-bearing areas, while SMS, BF and chemical-grade limestones occur in selective areas. Concerted efforts to locate SMS and BF grade limestone along with cement- grade limestone are imperative to meet the growing demand.

As on 09.01.2017, total 21 blocks were auctioned. Out of these 21 blocks, 8 blocks were limestone blocks. (1 in Andhra Pradesh, 2 in Jharkhand, 2 in Chhattisgarh and 3 in Rajasthan)

As per the Report of the Working Group, formerly Planning Commission of India, the total limestone requirement during 12th Plan (2012-2017) with growth scenario of cement @ 10%, 11% and 12% for the respective GDP growth of 8%, 9% and 10% is projected at 3,163 million tonnes, 3,253 million tonnes and 3,385 million tonnes, respectively.