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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

*Public Works.***DEPARTMENT**

G.O. No.	3336 W.	Press.
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Dated	21-8-1878	~~197~~ .

not to be folded or roughly handled

G. M.

3386

GOVERNMENT OF MADRAS
PUBLIC WORKS DEPARTMENT.

21st August 1878, No. 3,336 W.

Buildings and Roads.
Civil Works.

Read the following paper —

No. 235 Circular of the Government of India, Public Works Department (Civil Works—Irrigation), dated Simla, 23rd July 1878, No 63 P.W

In continuation of Circular No 53 P W of the 20th ultimo, the undersigned is directed to forward, for information, Mr Dejoux's report on cement experiments for the quarter ending 31st March 1878

(Signed) G. T. SKIPWITH, Major, R E,
Asst Secy to the Govt of India.

To the Secretary to the Government of Madras, Public Works Department, General Branch

MEMORANDUM by Major J. M. HEYWOOD, R E, Officiating Superintending Engineer, South-Western Circle (No 1,685, dated the 28th May 1878)

The following is forwarded, in original, to the Chief Engineer, Bengal, Irrigation Branch, for information

From P. DEJOUX, Esq, Executive Engineer, Cement Experiments Division, to the Officiating Superintending Engineer, South-Western Circle (No 2,071, dated the 21st May 1878)

I HAVE the honor to submit my Quarterly Progress Report ended 31st March 1878 upon experiments on limes, cements, and mortars

2 The following statement shows the number of limestones and clays received during the period under review, which brings the total, including former receipts, to 1,110 —

From whom received	SPECIMENS OF	
	Limestones	Clays
Executive Engineer, Simla, Water Works Division	41	1
Ditto ditto, Baroodcub Canal, Punjab	1	2
Ditto ditto, Amritshur Branch, Ganges Canal	16	
Ditto ditto, Gya Division	13	
Superintending Engineer, Sirhind Canal Circle, Punjab	4	
Executive Engineer, Balasore Survey Division	1	
Ditto ditto, Nuseerabad Division, Rajpootana Agency	1	
Ditto ditto, Swat Canal Division, Irrigation Branch, Punjab	1	
District Engineer, Rungpore	1	
Executive Engineer, Chittagong Division	2	
Superintending Engineer, Northern Division, Nasik		
Executive Engineer, New Delhi Branch Division, Western Jumna Canal	18	

From	Quantity	Value
Superintendent Engineer for Irrigation in Sind, through the Hon. Secy. to Govt., North Division	18	5
Assistant Engineer, 1st Sub-Division, S. R. C. Division, Punjab	2	..
Superintendent Engineer, South-Western Circle, Calcutta	5	..
Principal Engineer, Sindh Canal Circle, Punjab	1	..
Principal Engineer, North-Western Circle, Punjab	6	..
Principal Engineer, Sindh Canal Circle, Punjab	3	..
Principal Engineer, Ganges Canal, Calcutta	1	..
Assistant Engineer, Uppermost Sub-Division, Military Works	2	..
Executive Engineer, Road Works Sub-Division, Sindh Canal, Rojpur-Punjab	3	..
Deputy Engineer, Rojpur Division, Military Works	2	..
Deputy Engineer, New Main Line Division	1	..
Engineer-in-Chief, Sindhia (State) Railway, Agra	1	..
Executive Engineer, Ganges Division	12	..
Principal Engineer, Northern Drainage and Embankments Division	11	..
Principal Engineer, Ganges Division	4	..
Deputy Engineer, New Main Line Division	1	..
Deputy Engineer, Delhi and Umballa Road Division, Public Works Department, Punjab	3	..
	176	8
	184	926
Total	1,110	

The results of analyses conducted will be given from the annexed statement A.

4. The following conclusions were deduced from experiments on limestones analysed, denoted by letters which have already been submitted—

1st—Sindhia (State) Railway, Agra. A copy of the report of the analyses of the limestones received from the Sindhia (State) Railway, Agra, dated 11th December 1877, of which a copy was submitted to the Engineer-in-Chief, Sindhia (State) Railway, Agra, on 12th February last, is enclosed herewith. The limestones analysed were found to be of good quality, and the results of the analyses are given in the annexed statement B. The limestones were found to be of good quality, and the results of the analyses are given in the annexed statement B.

As it was considered necessary to allow a long time for the limestones to be analysed, the limestones were not analysed as yet, but when they are analysed a special report will be submitted.

However, as far as it can be judged now, it has been ascertained that, if the limestones were analysed as yet, the results would be of good quality, and the results of the analyses are given in the annexed statement B.

A subsequent report on the Rojpur Division, used in the Sindh Canal (Punjab) was sent during the quarter to the Superintendent Engineer, Sindh Canal (Punjab), a copy of which is enclosed herewith, and my letter to your address above quoted.

2nd—Superintendent Engineer's Office, South-Western Circle.

One specimen of kunkur, one of lime burnt, and three of mortars were sent from the Superintendent Engineer's Office without mention of the division from which they were obtained.

The kunkur was found to yield, if properly burnt, a good hydraulic cement-lime, the lime burnt was too coarse and the mortars were poor.

3rd—Sindh Canal, Punjab.

A sample of kunkur from the Sindh Canal was analysed and it was found to yield a very good hydraulic lime, good only for ordinary building.

4th—Chattagong Hill Tracts, sent by Superintendent Engineer, North-Eastern Circle.

8. This limestone ought to yield a feebly hydraulic lime very good for ordinary building purposes, which will answer as a good substitute for Sylhet lime. It is, in fact, a kind of Tuffa limestone.

5th—Sindh Canal Circle, Punjab.

9. The four specimens of kunkur received yielded very fair hydraulic limes requiring grinding, save one which can be used either sifted or ground.

6th—Ganges Canal Division, Calcutta.

10. The sample received is a kind of lime-cement requiring grinding and giving very fair results.

7th—Sindhia (State) Railway.

11. A report was sent to the Engineer-in-Chief, Sindhia (State) Railway, on the kunkur limes to be used on the Chumbul Bridge-works and on the advisability of its use either with sand or sorkee.

The kunkur was found to be of fair quality, a little sandy, but not requiring any admixture of sorkee for increasing its hydraulic properties.

Sand was recommended to be used.

Further experiments on the tensile strength of this lime are being conducted.

8th—Superintendent Engineer, North-Western Circle, Lucknow.

12. The specimens of kunkur received were from the Gaudik Circle and from Morghyr and Sahabganje.

Although the specimen from Sahabganje was reported upon more than once, yet fresh analyses and tests were deemed necessary in order to ascertain if the qualities or deposits were still yielding the same kind of material as before after deeper excavation.

There has been some difference, as the limestones are found to contain a little more clay and sand, although they continue to yield very fair hydraulic limes.

The limes obtained from the Gaudik kunkurs are rather poor, and can be mixed only with a small proportion of sand.

Of the other limes, the best is evidently the one obtained from the white kunkur of Mr. Bull at Sahabganje, which yields a good kind of natural cement, and on which four reports have already been sent.

9th—District Engineer, Rungpoor.

13. A fresh report on Mr. Bull's cement was sent to the District Engineer at his request, stating again the good quality of the cement when properly calcined.

10th—New Main Line Division, Kurat.

14. The black kunkur received yielded a kind of mixture of hydraulic magnesian lime and cement of good quality, which ought to be used with coarse sand or very hard burnt coarse soil.

11th—Rajpootana Agency, Nasirabad.

15. The limestone sent yielded a very meagre feebly hydraulic, which can be used only in the absence of any other kind of lime.

12th—Ranch Division, Nasik.

16. The two specimens—one of kunkur and one of limestone—yielded lime moderately hydraulic, but of fair quality.

13th—Gangetic Division, Morghyr.

17. The analyses of the four specimens were made, but the practical tests were not completed before the end of the quarter.

14th—Ranch Division.

18. Thirty more analyses and tests of specimens of limestones received from the Punjab North-Western Province and the Bombay Presidency, although commenced, were not completed during the quarter under notice, but their results will appear in the next Engineer's Report.

15th—Portland Cement with Kunkur or Gaudik.

19. Various experiments on the manufacture of Portland cement with kunkur or Gaudik have been commenced, but interesting results obtained, but a further period of two months is necessary to complete the whole in a satisfactory manner.

20. A further analysis has been made of the sample of the (old) river (clay) and the result is as follows: (with raw material) first-class Portland cement can be obtained.

28. As this question is of vast importance, it will be treated in a separate report hereafter.

A

Subject of the Analysis of the sample of the (old) river (clay) and the result is as follows: (with raw material) first-class Portland cement can be obtained.

Number	Materials whence obtained	Composition	Remarks
A1	Limestone, Thiruv	Clay .. 27.70 Free sand .. 19.60 Oxide of iron .. 0.10 Carbonate of lime .. 45.60 Do of magnesia .. 0.50 Sulphate of lime .. 4.00 Moisture and loss .. 2.00 Total .. 100.00	Mixture of lump and plate very poor
A2	Do do	Clay .. 23.60 Free sand .. 1.60 Oxide of iron .. 0.70 Carbonate of lime .. 66.00 Do of magnesia .. 0.50 Sulphate of lime .. 6.10 Moisture and loss .. 1.20 Total .. 100.00	Hydraulic lime containing sulphate of lime
A3	Do do	Clay .. 29.50 Free sand .. 23.00 Oxide of iron .. 1.00 Carbonate of lime .. 34.00 Do of magnesia .. 0.10 Sulphate of lime .. 3.00 Moisture and loss .. 1.00 Total .. 100.00	Same as No A1
A4	Do do	Clay .. 7.00 Free sand .. 10.00 Oxide of iron .. 1.00 Carbonate of lime .. 73.10 Do of magnesia .. 0.60 Sulphate of lime .. 5.00 Moisture and loss .. 2.10 Total .. 100.00	Very finely hydraulic, containing sulphate of lime
B1	Do Spoke	Clay .. 10.00 Free sand .. 1.00 Oxide of iron .. 1.00 Carbonate of lime .. 4.00 Do of magnesia .. 50.00 Sulphate of lime .. 7.00 Moisture and loss .. 1.80 Total .. 100.00	Mixture of lump and plate very poor

Number	Materials whence obtained	Composition	Remarks
B2	Limestone, Sajolee	Clay .. 8.00 Free sand .. 16.00 Oxide of iron .. 2.40 Carbonate of lime .. 63.00 Do of magnesia .. 2.00 Sulphate of lime .. 6.20 Moisture and loss .. 2.40 Total .. 100.00	Feetly hydraulic, contains sulphate of lime
B3	Clay, do	Clay .. 92.80 Free sand .. 1.40 Oxide of iron .. 1.20 Carbonate of lime .. 0.60 Do of magnesia .. Traces Sulphate of lime .. 3.00 Moisture and loss .. 1.00 Total .. 100.00	Clay nearly pure
C1	Deotee limestone down the river below Deotee	Clay .. 2.00 Free sand .. 2.00 Oxide of iron .. 85.00 Carbonate of lime .. Traces Do of magnesia .. 8.00 Sulphate of lime .. 3.00 Moisture and loss .. 3.00 Total .. 100.00	Fat lime containing sulphate of lime
C2	Do do down the river	Clay .. 0.60 Free sand .. 2.00 Oxide of iron .. Traces Carbonate of lime .. 88.00 Do of magnesia .. None Sulphate of lime .. 9.00 Moisture and loss .. 2.40 Total .. 100.00	Do
C3	Do do 1 mile from the river	Clay .. 20.00 Free sand .. 8.00 Oxide of iron .. 1.00 Carbonate of lime .. 62.80 Do of magnesia .. 1.40 Sulphate of lime .. 5.00 Moisture and loss .. 1.80 Total .. 100.00	Hydraulic lime containing sulphate of lime
C4	Do do 1 mile above the river	Clay .. 23.20 Free sand .. 6.00 Oxide of iron .. 1.40 Carbonate of lime .. 59.60 Do of magnesia .. 1.60 Sulphate of lime .. 6.00 Moisture and loss .. 2.20 Total .. 100.00	Do

Number	Materials whence obtained	Composition	Remarks
C5	Dootee limestone 1/2 mile above the river	Clay 8 00 Free sand 2 00 Oxide of iron 2 00 Carbonate of lime 55 00 Do of magnesia 21 00 Sulphate of lime 9 00 Moisture and loss 2 00 Total 100 00	Magnesian limestone of good quality, notwithstanding the presence of sulphate of lime
C6	Do do at the bottom of river below Dootee	Clay 3 00 Free sand 1 20 Oxide of iron 86 10 Carbonate of lime Traces Do of magnesia 8 50 Sulphate of lime 1 20 Moisture and loss Total 100 00	Same as C1
C7	Do do 1 mile 1/2 above river	Clay 13 00 Free sand 2 00 Oxide of iron 2 00 Carbonate of lime 75 20 Do of magnesia 1 60 Sulphate of lime 6 80 Moisture and loss 2 40 Total 100 00	Kinkurvery feebly hydraulic
C8	Do do do	Clay 36 00 Free sand 8 00 Oxide of iron 1 60 Carbonate of lime 17 60 Do of magnesia 1 20 Sulphate of lime 4 00 Moisture and loss 1 60 Total 100 00	Kind of puzzolanna
C3 bis	Do do 1/2 mile from the river	Clay 9 40 Free sand 0 60 Oxide of iron 2 00 Carbonate of lime 76 20 Do of magnesia 4 60 Sulphate of lime 6 00 Moisture and loss 1 20 Total 100 00	Same as C3
C4 bis	Do do 1 mile above the river	Clay 11 40 Free sand 1 60 Oxide of iron 2 00 Carbonate of lime 75 10 Do of magnesia 1 50 Sulphate of lime 6 70 Moisture and loss 1 70 Total 100 00	Same as C4

Number	Materials whence obtained	Composition	Remarks																
D	Limestone on the road to Tiprah	<table><tr><td>Clay</td><td>50 00</td></tr><tr><td>Sand</td><td>21 00</td></tr><tr><td>Oxide of iron</td><td>2 40</td></tr><tr><td>Carbonate of lime</td><td>13 60</td></tr><tr><td>Do of magnesia</td><td>4 00</td></tr><tr><td>Sulphate of lime</td><td>6 00</td></tr><tr><td>Moisture and loss</td><td></td></tr><tr><td>Total</td><td>100 00</td></tr></table>	Clay	50 00	Sand	21 00	Oxide of iron	2 40	Carbonate of lime	13 60	Do of magnesia	4 00	Sulphate of lime	6 00	Moisture and loss		Total	100 00	Very impure limestone (bad)
Clay	50 00																		
Sand	21 00																		
Oxide of iron	2 40																		
Carbonate of lime	13 60																		
Do of magnesia	4 00																		
Sulphate of lime	6 00																		
Moisture and loss																			
Total	100 00																		
E1	Do on the road from Anandale to the Glens, Glens side	<table><tr><td>Clay</td><td>51 00</td></tr><tr><td>Free sand</td><td>27 00</td></tr><tr><td>Oxide of iron</td><td>2 80</td></tr><tr><td>Carbonate of lime</td><td>14 60</td></tr><tr><td>Do of magnesia</td><td>2 00</td></tr><tr><td>Sulphate of lime</td><td>2 60</td></tr><tr><td>Moisture and loss</td><td></td></tr><tr><td>Total</td><td>100 00</td></tr></table>	Clay	51 00	Free sand	27 00	Oxide of iron	2 80	Carbonate of lime	14 60	Do of magnesia	2 00	Sulphate of lime	2 60	Moisture and loss		Total	100 00	Kind of puzzolanna
Clay	51 00																		
Free sand	27 00																		
Oxide of iron	2 80																		
Carbonate of lime	14 60																		
Do of magnesia	2 00																		
Sulphate of lime	2 60																		
Moisture and loss																			
Total	100 00																		
E2	Do do do	<table><tr><td>Clay</td><td>50 00</td></tr><tr><td>Free sand</td><td>26 00</td></tr><tr><td>Oxide of iron</td><td>2 80</td></tr><tr><td>Carbonate of lime</td><td>14 50</td></tr><tr><td>Do of magnesia</td><td>3 00</td></tr><tr><td>Sulphate of lime</td><td>3 70</td></tr><tr><td>Moisture and loss</td><td></td></tr><tr><td>Total</td><td>100 00</td></tr></table>	Clay	50 00	Free sand	26 00	Oxide of iron	2 80	Carbonate of lime	14 50	Do of magnesia	3 00	Sulphate of lime	3 70	Moisture and loss		Total	100 00	Do.
Clay	50 00																		
Free sand	26 00																		
Oxide of iron	2 80																		
Carbonate of lime	14 50																		
Do of magnesia	3 00																		
Sulphate of lime	3 70																		
Moisture and loss																			
Total	100 00																		
E3	Do do Anandale side	<table><tr><td>Clay</td><td>14 20</td></tr><tr><td>Free sand</td><td>0 80</td></tr><tr><td>Oxide of iron</td><td>5 20</td></tr><tr><td>Carbonate of lime</td><td>45 80</td></tr><tr><td>Do of magnesia</td><td>21 00</td></tr><tr><td>Sulphate of lime</td><td>8 00</td></tr><tr><td>Moisture and loss</td><td>2 00</td></tr><tr><td>Total</td><td>100 00</td></tr></table>	Clay	14 20	Free sand	0 80	Oxide of iron	5 20	Carbonate of lime	45 80	Do of magnesia	21 00	Sulphate of lime	8 00	Moisture and loss	2 00	Total	100 00	Lime moderately hydraulic, rather poor
Clay	14 20																		
Free sand	0 80																		
Oxide of iron	5 20																		
Carbonate of lime	45 80																		
Do of magnesia	21 00																		
Sulphate of lime	8 00																		
Moisture and loss	2 00																		
Total	100 00																		
E4	Do do do	<table><tr><td>Clay</td><td>10 40</td></tr><tr><td>Free sand</td><td>0 60</td></tr><tr><td>Oxide of iron</td><td>4 80</td></tr><tr><td>Carbonate of lime</td><td>66 60</td></tr><tr><td>Do of magnesia</td><td>10 00</td></tr><tr><td>Sulphate of lime</td><td>7 60</td></tr><tr><td>Moisture and loss</td><td></td></tr><tr><td>Total</td><td>100 00</td></tr></table>	Clay	10 40	Free sand	0 60	Oxide of iron	4 80	Carbonate of lime	66 60	Do of magnesia	10 00	Sulphate of lime	7 60	Moisture and loss		Total	100 00	Do
Clay	10 40																		
Free sand	0 60																		
Oxide of iron	4 80																		
Carbonate of lime	66 60																		
Do of magnesia	10 00																		
Sulphate of lime	7 60																		
Moisture and loss																			
Total	100 00																		
E5	Do do do	<table><tr><td>Clay</td><td>35 10</td></tr><tr><td>Free sand</td><td>15 00</td></tr><tr><td>Oxide of iron</td><td>3 80</td></tr><tr><td>Carbonate of lime</td><td>16 40</td></tr><tr><td>Do of magnesia</td><td>25 40</td></tr><tr><td>Sulphate of lime</td><td>4 00</td></tr><tr><td>Moisture and loss</td><td></td></tr><tr><td>Total</td><td>100 00</td></tr></table>	Clay	35 10	Free sand	15 00	Oxide of iron	3 80	Carbonate of lime	16 40	Do of magnesia	25 40	Sulphate of lime	4 00	Moisture and loss		Total	100 00	Kind of magnesian cement poor
Clay	35 10																		
Free sand	15 00																		
Oxide of iron	3 80																		
Carbonate of lime	16 40																		
Do of magnesia	25 40																		
Sulphate of lime	4 00																		
Moisture and loss																			
Total	100 00																		

PUBLIC WORKS DEPARTMENT, 21st AUGUST 1878, No. 3,336 W.

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No.	Materials whence obtained	Composition	Remarks
F	Limestone from the 1st mile on Tibet road	Clay 8 40 Free sand 9 80 Oxide of iron 5 40 Carbonate of lime 50 00 Do of magnesia 2 00 Sulphate of lime 6 00 Moisture and loss 1 40 Total 100 00	Said as L3 and L4
G	Do on the 1/2 mile of the Tibet road	Clay 8 40 Free sand 1 20 Oxide of iron 5 00 Carbonate of lime 44 00 Do of magnesia 3 00 Sulphate of lime 8 40 Moisture and loss Total 100 00	Do
H	Do from Lukker Bazar	Clay 6 00 Free sand 8 00 Oxide of iron 3 40 Carbonate of lime 46 60 Do of magnesia 23 00 Sulphate of lime 8 00 Moisture and loss Total 100 00	Poor magnesian lime
I	Do from Putnalak beyond Jutog	Clay 2 40 Free sand 1 20 Oxide of iron 85 00 Carbonate of lime 1 00 Do of magnesia 8 00 Sulphate of lime 2 40 Moisture and loss Total 100 00	Fat lime containing sulphate of lime
J1	Do from Jutog near the station	Clay 1 20 Free sand 0 80 Oxide of iron 88 40 Carbonate of lime 0 40 Do of magnesia 7 00 Sulphate of lime 2 20 Moisture and loss Total 100 00	Do
J2	Do do on the road to Jutog	Clay 8 00 Free sand 10 00 Oxide of iron 4 50 Carbonate of lime 6 70 Do of magnesia 0 90 Sulphate of lime 6 00 Moisture and loss 1 60 Total 100 00	Meagre limestone

Number	Materials whence obtained	Composition	Remarks
J3	Limestone from Jutog below the burial-ground	Clay } 1 00 Free sand } 0 80 Oxide of iron } 87 60 Carbonate of lime } 0 40 Do of magnesia } 8 00 Sulphate of lime } 2 20 Moisture and loss } Total 100 00	Fat lime containing sulphate of lime.
J4	Do do on Jutog road	Clay } 9 00 Free sand } 11 60 Oxide of iron } 4 00 Carbonate of lime } 65 50 Do of magnesia } 1 20 Sulphate of lime } 6 50 Moisture and loss } 2 20 Total 100 00	Meagre limestone
J5	Do do down the slaughter-house	Clay } 1 40 Free sand } 5 00 Oxide of iron } 1 60 Carbonate of lime } 80 40 Do of magnesia } 1 00 Sulphate of lime } 9 00 Moisture and loss } 1 60 Total 100 00	Fat lime containing sulphate of lime
J6	Do do do	Clay } 7 40 Free sand } 14 00 Oxide of iron } 3 60 Carbonate of lime } 67 00 Do of magnesia } 1 40 Sulphate of lime } 6 60 Moisture and loss } Total 100 00	Meagre limestone
J7	Do do close to the burial-ground.	Clay } 1 60 Free sand } 26 40 Oxide of iron } 1 20 Carbonate of lime } 66 00 Do of magnesia } 1 40 Sulphate of lime } 1 40 Moisture and loss } 2 00 Total 100 00	Meagre limestone feebly hydratic.
K	Do from Kahanpore (beyond Deotee)	Clay } 4 00 Free sand } 1 40 Oxide of iron } 84 20 Carbonate of lime } 1 00 Do of magnesia } 8 00 Sulphate of lime } 1 40 Moisture and loss } Total 100 00	Fair fat lime containing sulphate of lime

Number	Materials whence obtained	Composition	Remarks
L1	Limestone on the Telegraph (Simla)	Clay 7 80 Free sand 1 80 Oxide of iron 4 80 Carbonate of lime 50 00 Do of magnesia 30 00 Sulphate of lime 5 00 Moisture and loss Total .. 100 00	Same as L3 and L4
L2	Do do do	Clay 12 00 Free sand 2 60 Oxide of iron 3 00 Carbonate of lime 61 60 Do of magnesia 10 60 Sulphate of lime 9 80 Moisture and loss Total .. 100 00	Do
M	Do from Boulour-gunge	Clay 12 80 Free sand 20 00 Oxide of iron 2 80 Carbonate of lime 62 10 Do of magnesia 0 50 Sulphate of lime 1 80 Moisture and loss Total .. 100 00	Very meagre lime stone
N	Do from Prospect Hill	Clay 17 00 Free sand 26 00 Oxide of iron 1 20 Carbonate of lime 46 00 Do of magnesia 1 20 Sulphate of lime 8 00 Moisture and loss Total .. 100 00	Do
O	Do below Kasum-tee Bazaar.	Clay 11 20 Free sand 2 00 Oxide of iron 6 00 Carbonate of lime 54 60 Do of magnesia 19 00 Sulphate of lime 7 20 Moisture and loss Total .. 100 00	Magnesian lime-stone rather poor.
P	Do found below Taradur.	Clay 5 00 Free sand 19 00 Oxide of iron 2 00 Carbonate of lime 67 50 Do of magnesia 1 50 Sulphate of lime 5 00 Moisture and loss Total .. 100 00	Very meagre lime-stone

Number	Materials whence obtained	Composition	Remarks
*12	Burnt lime from Puttiallah	Clay 4 00 Sand 1 80 Oxide of iron 1 00 Lime 70 00 Magnesia 1 50 Sulphate of lime 15 50 Carbonic acid 6 20 Moisture and loss Total .. 100 00	Fat lime containing sulphate of lime
A440	Limestone from Mohurbhunj Hills, Balasore Survey Division	Clay 0 50 Sand 1 00 Oxide of iron 0 80 Carbonate of lime 95 20 Do of magnesia 1 10 Loss, &c 1 40 Total .. 100 00	Rich fat limestone
A455(1)	Quoting from Superintendent Engineer, South-Western Circle	Clay 44 40 Sand 2 20 Oxide of iron 52 30 Carbonate of lime 1 10 Do of magnesia Total .. 100 00	Good hydraulic cement limestone
A455(3)	Lime mortar do do	Silica 56 40 Alumina and iron 7 20 Lime 23 40 Magnesia 1 00 Carbonic acid 12 00 Moisture and loss Total .. 100 00	Poor mortar
A455(4)	Roof mortar do do	Silica 58 60 Alumina and iron 7 40 Lime 22 70 Magnesia 6 80 Carbonic acid 10 50 Moisture and loss Total .. 100 00	Do
A455(5)	Brick masonry mortar do	Silica 63 60 Alumina and iron 6 60 Lime 17 30 Magnesia 1 00 Carbonic acid 11 50 Moisture and loss Total .. 100 00	Do

Num' r	Materials whence obtained	Composition	Remarks	
A444	Limestone from Chittagong Hill Tract near Ruma, Chittagong Division	Clay Sand Oxide of iron Carbonate of lime Do of magnesia Total	7 80 1 40 0 60 87 00 3 20 100 00	Feebly hydraulic lime good for ordinary buildings
A442	Kunkur block, Swat Canal Division, Irrigation Branch, Punjab	Clay Sand Oxide of iron Carbonate of lime Do of magnesia Sulphate of lime Total	5 20 0 80 93 00 1 00 Traces 100 00	Do
A456	Kunkur, Suhand Canal Circle	Clay Sand Oxide of iron Carbonate of lime Do of magnesia Sulphate of lime Total	39 00 2 00 58 20 0 80 Traces 100 00	Fair lime cement stone
A463	Do do do	Clay Sand Oxide of iron Carbonate of lime Do of magnesia Sulphate of lime Total	37 00 2 20 50 60 0 20 Traces 100 00	Very good hydraulic lime
A464	Do do do	Clay Sand Oxide of iron Carbonate of lime Do of magnesia Sulphate of lime Total	32 00 2 00 66 00 Traces 100 00	Do
A465	Do do, Punjab	Clay Sand Oxide of iron Carbonate of lime Do of magnesia Sulphate of lime Total	34 40 2 20 62 40 1 00 Traces 100 00	Do

Number	Materials whence obtained	Composition	Remarks
A466	Kunkur dug from a quarry in the village of Kakwan, Cawnpore District, on the Cawnpore Branch of the Ganges Canal	Clay 35 60 Sand 10 00 Oxide of iron 1 50 Carbonate of lime 51 90 Do of magnesia 1 00 Total ... 100 00	Meagre cement limestone
A471	Do dug from Jajow Sandia State Railway	Clay 28 00 Sand 10 00 Oxide of iron 2 10 Carbonate of lime 60 50 Do of magnesia 0 40 Sulphate of lime Traces Total . 100 00	Good hydraulic limestone (a little meagre,
A457	Kunkur (box marked A) Gunduk, North-Western Circle	Clay 31 60 Sand 11 00 Oxide of iron 2 60 Carbonate of lime 54 00 Do of magnesia 0 80 Total . 100 00	Cement stone of rather poor quality
A458	Kunkur with shells (do B) do.	Clay 32 60 Sand 8 40 Oxide of iron 2 00 Carbonate of lime 55 90 Do of magnesia 1 10 Total 100 00	Mixture of shells and kunkur
A459	Kunkur (do C) Monghyr do.	Clay 30 40 Sand 6 40 Oxide of iron 1 00 Carbonate of lime 62 20 Do of magnesia Traces Total 100 00	Good Hydraulic limestone
A460	Kunkur with shells (do D) Gunduk, North-Western Circle	Clay 28 50 Sand 12 80 Oxide of iron 1 80 Carbonate of lime 55 90 Do of magnesia 1 00 Total . 100 00	Fair hydraulic limestone mixed with clay
A461	Kunkur (do E) Sahagunge do	Clay 32 80 Sand 7 00 Oxide of iron 1 00 Carbonate of lime 58 20 Do of magnesia Traces Total .. 100 00	Good hydraulic limestone

Number	Materials whence obtained	Composition	Remarks
A402	White kunkur (box marked F) Sahibgunge, North-Western Circle	Clay .. . 32 00 Sand . . . 1 60 Oxide of iron . . . 2 70 Carbonate of lime .. 61 90 Do of magnesia 1 80 Total . 100 00	Very good natural white cement stone
A443	Limestone, Sahibgunge, from Mr Bull	Clay . . . 32 00 Sand . . . 1 60 Oxide of iron . . . 2 70 Carbonate of lime . . 61 90 Do of magnesia . . 1 80 Total . 100 00	Do
A470	Block kunkur, Bluslana, new Main Line Division	Clay . . . 30 80 Sand . . . 12 00 Oxide of iron . . . 3 00 Carbonate of lime . . 48 10 Do. of magnesia ... 6 10 Total .. 100 00	Good mixture of hydraulic magnesian lime and cement stone
A441	Limestone, Googra quarry, Nussurabad Division, Ryppootana Agency	Clay .. . 17 00 Sand .. . 20 00 Oxide of iron . . . 1 20 Carbonate of lime .. 59 80 Do. of magnesia . . 2 00 Total 100 00	Very meagre limestone feebly hydraulic
A445 (A)	Limestone, Northern Division, Nasik	Clay 11 00 Sand .. . 13 00 Oxide of iron * . . 3 80 Carbonate of lime . . 71 20 Do of magnesia . . 1 00 Total ... 100 00	Limestone moderately hydraulic
A445 (B)	Kunkur, do do.	Clay 15 00 Sand . . . 11 00 Oxide of iron . . . 1 40 Carbonate of lime . . 71 40 Do of magnesia .. 1 20 Total . 100 00	Do
A484 (1)	Do Arreraj, Gunduk Division	Clay . . . 36 20 Sand .. . 4 20 Oxide of iron . . . 2 00 Carbonate of lime . . 57 60 Do of magnesia .. Traces Total . 100 00	Hydraulic limestone of very fair quality

Number	Materials whence obtained	Composition	Remarks												
A484 (2)	Kunkur, Lowrah, Gunduk Division	<table> <tr> <td>Clay . . .</td> <td>12 40</td> </tr> <tr> <td>Sand ..</td> <td>38 00</td> </tr> <tr> <td>Oxide of iron .</td> <td>2 00</td> </tr> <tr> <td>Carbonate of lime .</td> <td>47 60</td> </tr> <tr> <td>Do of magnesia ..</td> <td>Traces</td> </tr> <tr> <td>Total .</td> <td>100 00</td> </tr> </table>	Clay . . .	12 40	Sand ..	38 00	Oxide of iron .	2 00	Carbonate of lime .	47 60	Do of magnesia ..	Traces	Total .	100 00	Very meagre limestone.
Clay . . .	12 40														
Sand ..	38 00														
Oxide of iron .	2 00														
Carbonate of lime .	47 60														
Do of magnesia ..	Traces														
Total .	100 00														
A484 (3)	Do Sickranah, do.	<table> <tr> <td>Clay . . .</td> <td>36 40</td> </tr> <tr> <td>Sand . . .</td> <td>8 20</td> </tr> <tr> <td>Oxide of iron ..</td> <td>1 80</td> </tr> <tr> <td>Carbonate of lime ..</td> <td>53 60</td> </tr> <tr> <td>Do of magnesia .</td> <td>Traces</td> </tr> <tr> <td>Total ...</td> <td>100 00</td> </tr> </table>	Clay . . .	36 40	Sand . . .	8 20	Oxide of iron ..	1 80	Carbonate of lime ..	53 60	Do of magnesia .	Traces	Total ...	100 00	Same as A484 (1)
Clay . . .	36 40														
Sand . . .	8 20														
Oxide of iron ..	1 80														
Carbonate of lime ..	53 60														
Do of magnesia .	Traces														
Total ...	100 00														
A484 (4)	Do Byah Nuttah, Gunduk Division	<table> <tr> <td>Clay ...</td> <td>37 00</td> </tr> <tr> <td>Sand</td> <td>10 00</td> </tr> <tr> <td>Oxide of iron ..</td> <td>2 00</td> </tr> <tr> <td>Carbonate of lime ..</td> <td>51 00</td> </tr> <tr> <td>Do. of magnesia ..</td> <td>Traces</td> </tr> <tr> <td>Total ...</td> <td>100 00</td> </tr> </table>	Clay ...	37 00	Sand	10 00	Oxide of iron ..	2 00	Carbonate of lime ..	51 00	Do. of magnesia ..	Traces	Total ...	100 00	Same as A484 (1).
Clay ...	37 00														
Sand	10 00														
Oxide of iron ..	2 00														
Carbonate of lime ..	51 00														
Do. of magnesia ..	Traces														
Total ...	100 00														

(Signed) P DEJOUX,
Executive Engineer, Cement Experiment Division

No. 236. ORDER THEREON, 21st August 1878, No 3,336 W.

COMMUNICATED to the officers concerned

(True Extract)

(Signed) E. A. FOORD, Colonel, R E,
Secretary to Govt., P W.D.

(True Copy.)

Majr, R E,
Under Secy. to Govt, P W.D.

To District Engineers
To the Chief Engineer for Irrigation
" Consulting Engineer for Railways
" Chief Engineer and Manager, Madras Irrigation and Canal Company.
" Superintendent, Madras Harbour Works

Exd J. W. Fisher
Spare Copies

BA
3.356

Circular No. 33 P. W.
GOVERNMENT OF INDIA
PUBLIC WORKS DEPARTMENT.

CIVIL WORKS

Irrigation

To

- THE GOVERNMENT OF MADRAS AND B. LAY, IN THE PUBLIC WORKS DEPARTMENT, GENERAL, IRRIGATION AND RAILWAY BRANCHES.
- THE GOVERNMENT OF BENGAL, IN THE PUBLIC WORKS DEPARTMENT, GENERAL BRANCH
- THE GOVERNMENTS OF NORTH-WESTERN PROVINCES AND OUDH, AND PUNJAB, IN THE PUBLIC WORKS DEPARTMENT, GENERAL AND IRRIGATION BRANCHES
- THE CHIEF COMMISSIONERS, CENTRAL PROVINCES, BRITISH BURMAH, MYSORE, AND COORG, AND ASSAM
- THE RESIDENT, HYDERABAD
- THE AGENTS OF THE GOVERNOR GENERAL FOR CENTRAL INDIA, AND RAJPUTANA
- THE SUPERINTENDENT OF PORT BLAIR, AND CHIEF COMMISSIONER, ANDAMAN AND NIKOBAR ISLANDS
- THE INSPECTOR GENERAL OF MILITARY WORKS
- THE DIRECTOR OF STATE RAILWAYS, CENTRAL, WESTERN, AND NORTH-EASTERN SYSTEMS
- THE DIRECTOR OF STATE RAILWAY STATIONS
- THE CONSULTING ENGINEERS TO THE GOVERNMENT OF INDIA FOR GUARANTEED RAILWAYS, CALCUTTA, LAHORE AND LUCKNOW
- THE SUPERINTENDING ENGINEER, SIMLA IMPERIAL CIRCLE

Simla, July 23rd, 1878

In continuation of Circular No 53 P. W. of the 20th ultimo, the undersigned is directed to forward, for information, Mr Dégoux's report on cement experiments for the quarter ending 31st March 1878.

Ray & Kipwith

Major, R. E.,
Asst. Secy to the Govt. of India.

*To The Secretary to the Govt of Madras.
P.W. Depart General Branch.*

*Chief Engineer, Madras - General Branch
Report of Mr Dégoux on cement experiments for the quarter ending 31st March 1878.*

GO No 3008 W of 26 July 1978

GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
CIVIL WORKS
Irrigation

To

Circular No 63 P W

Dated SIMLA, July 23rd, 1978.

Received

1001 - No 3335 W of 24 Aug 78

*Communicated to
the officers concerned.*

20/8

*Ch. E. S. D.
Ch. E. S. D.
Ch. E. S. D.
Ch. E. S. D.*

Forwards, for information, copy of Mr. Dejoux's report on cement experiments for the quarter ending March 1978.

Leaf 11-9-78

Cvt. C B I row, Simla, No 200 P W D-2-778-790

To anty 19-8 78

9
3335

Memorandum by MAJOR J. M. HAYWOOD, R. E., Officiating Superintending Engineer, South-Western Circle,—(No 1685, dated the 28th May 1978)

The following is forwarded, in original, to the Chief Engineer, Bengal, Irrigation Branch, for information.

From P. DEJOUX, Esq., Executive Engineer, Cement Experiments Division, to the Officiating Superintending Engineer, South-Western Circle,—(No 2071, dated the 21st May 1978)

SIR,

I have the honor to submit my Quarterly Progress Report ended 31st March 1978 upon experiments on limes, cements and mortars.

2 The following statement shows the number of limestones and clays received during the period under review, which brings the total, including former receipts, to 1,110 —

From whom received.	SPECIMENS OF	
	Limestones	Clays
Executive Engineer, Simla, Water Works Division	41	1
Ditto ditto, Bareilly Canal, Punjab	1	2
Ditto ditto, Ampshur Branch, Ganges Canal	16	..
Ditto ditto, Gya Division	13	..
Superintending Engineer, Sirhind Canal Circle, Punjab	4	..
Executive Engineer, Balasore Survey Division	1	..
Ditto ditto, Nuseerabad Division, Rajpootana Agency	1	..
Ditto ditto, Swat Canal Division, Irrigation Branch, Punjab	1	..
District Engineer, Rangoon	1	..
Executive Engineer, Chittagong Division	1	..
Superintending Engineer, Northern Division, Nasik	2	..
Executive Engineer, New Delhi Branch Division, Western Jumna Canal	18	..
Superintending Engineer for Irrigation in Scinde, through the Executive Engineer, Nurrah Division	13	5
Assistant Engineer, 1st Sub-Division, S. R. C. Division, Punjab	2	..
Superintending Engineer, South-Western Circle, Calcutta	5	..
Ditto ditto, Sirhind Canal Circle, Punjab	1	..
Ditto ditto, North-Western Circle, Bankapore	6	..
Ditto ditto, Sirhind Canal Circle, Punjab	3	..
Executive Engineer, Ganges Canal, Cawnpore	1	..
Assistant Engineer, Umritsur Sub-Division, Military Works	2	..
Executive Engineer, Head Works Sub-Division, Sirhind Canal, Roopur-Punjab	3	..
Ditto ditto, Ferozepore Division, Military Works	2	..
Ditto ditto, New Main Line Division	1	..
Engineer-in-Chief, Scindia (State) Railway, Agra	1	..
Executive Engineer, Cossye Division	12	..
Ditto ditto, Northern Drainage and Embankments Division	11	..
Ditto ditto, Gunduk Division	4	..
Ditto ditto, New Main Line Division	1	..
Ditto ditto, Delhi and Umballa Road Division, Public Works Department, Punjab	3	..
	176	8
	181	..
	926	..
Add specimens received previously		
Total	1,110	

- 3 The results of analyses conducted will be seen from the annexed statement A
 4 The following conclusions were deduced from experiments on limestones analysed, detailed reports on which have already been submitted.

1st — Simla limestones for the new Water Works

5 Since writing my last report dated 1st December 1877, of which a copy was submitted to you with my No 2010 dated 26th February last, practical tests have been made on the four best kinds of hydraulic limestones found by myself from the neighbourhood of Simla. Thirty-six bricks have been made with them and also with the Roopur (Punjab) cement for comparison. These bricks have been alternately immersed and left dry, so as to ascertain exactly what the effect of the sulphate of lime contained in them will be.

As it was considered necessary to allow a long time for induration before testing the breaking weight, they have not been tried as yet, but when they are a special report will then be forwarded.

However, as far as it can be judged now, it has been ascertained that, if these limes are allowed to set slowly for a certain time in air (say a month) and then put in contact with water, the stability of the mortar will not be disturbed, but the only effect will be its becoming more porous when the sulphate of lime gets slowly dissolved in water.

A subsequent report on the Roopur lime-cement used in the Sirhind Canal (Punjab) was sent during the quarter to the Superintending Engineer, Simla Water Works Division, a copy of which also accompanied my letter to your address above quoted.

2nd — Superintending Engineer's Office, South-Western Circle

6 One specimen of kunkur, one of lime burnt and three of mortars, were sent from the Superintending Engineer's Office without mention of the division from whence they were obtained.

The ghooting was found to yield, if properly burnt, a good hydraulic cement-lime, the lime burnt was too coarse and the mortars were poor.

3rd — Soot Canal, Punjab

7 A sample of kunkur block was analysed and tested practically. It yielded a very feebly hydraulic lime, good only for ordinary buildings.

4th — Chittagong Hill Tracts, sent by Superintending Engineer, North-Eastern Circle.

8 This limestone ought to yield a feebly hydraulic lime very good for ordinary building purposes, which will answer as a good substitute for Sylhet lime. It is, in fact, a kind of Tuffa limestone.

5th — Sirhind Canal Circle, Punjab

9 The four specimens of kunkur received yielded very fair hydraulic limes requiring grinding, save one which can be used either sifted or ground.

6th — Ganges Canal Division, Cawnpore

10 The sample received is a kind of lime-cement requiring grinding and giving very fair results.

7th — Scindia (State) Railway

11 A report was sent to the Engineer-in-Chief, Scindia (State) Railway, on the kunkur limes to be used on the Chumbul Bridge-works, and on the advisability of its use either with sand or soorkee.

The kunkur was found to be of fair quality, a little sandy, but not requiring any admixture of soorkee for increasing its hydraulic properties.

Sand was recommended to be used.
 Further experiments on the tensile strength of this lime are being conducted.

8th — Superintending Engineer, North-Western Circle, Bankipore

12 The specimens of kunkur received were from the Gunduk Circle and from Monghyr and Sahibganje.

Although the specimen from Sahibganje was reported upon more than once, yet fresh analyses and tests were deemed necessary in order to ascertain if the quarries or deposits were still yielding the same kind of material as before, after deeper extraction.

There has been some difference, as the kunkurs are found to contain a little more clay and sand, although they continue to yield very fair hydraulic limes.

The limes obtained from the Gunduk kunkurs are rather poor, and can be mixed only with a small proportion of sand.

Of the other limes, the best is evidently the one obtained from the white kunkur of Mr. Bull at Sahibganje, which yields a good kind of natural cement, and on which four reports have already been sent.

9th — District Engineer, Rungpore

13 A fresh report on Mr. Bull's cement was sent to the District Engineer at his request, stating again the good quality of the cement when properly calcined.

10th — New Main Line Division, Kurnaul

14 The block kunkur received yielded a kind of mixture of hydraulic magnesian lime and cement of good quality, which ought to be used with coarse sand or very hard burnt coarse soorkee.

11th — Rajpootana Agency, Nussereabad

15 The limestone sent yielded a very meagre lime feebly hydraulic, which can be used only in the absence of any other kind of lime.

12th — Ranah Division, Nasik

16 The two specimens, one of kunkur and one of limestone, yielded lime moderately hydraulic, but of fair quality.

13th — Gunduk Division, Mozufferpore

17 The analyses of the four specimens were made, but the practical tests were not completed before the end of the quarter.

14th — Remarks

18 Thirty more analyses and tests of specimens of limestones received from the Punjab, North-Western Provinces, and the Bombay Presidency, although commenced, were not completed during the quarter under notice, but their results will appear in the next Progress Report.

15th — Portland Cement made with kunkur or ghooting

19 Various experiments on the manufacture of Portland cement with kunkur or ghooting have been commenced, and interesting results obtained, but a further period of two months is necessary to complete the whole in a satisfactory manner.

20 A fact has, at any rate, been fully proved, that with kunkur (either raw or burnt) and a mixture of either clay or pure limestone (either raw or burnt) first rate Portland cement can be obtained.

28 As this question is of vast importance, it will be treated in a special report hereafter.

Statement showing the results of the analysis of the most important specimens received by the
Executive Engineer, Cement Experiments Division

Cement Experiments Division				
Number	Materials whence obtained	Composition		REMARKS
A1	Limestone, Tiprah..	Clay ..	27 70	Mixture of knankur and slate very poor.
		Free sand ..	19 00	
		Oxide of iron ..	0 90	
		Carbonate of lime ..	45 00	
		Ditto of magnesia ..	0 50	
		Sulphate of lime ..	4 00	
		Moisture and loss ..	2 30	
		Total ..	100 00	
A2	Ditto ditto ..	Clay ..	23 60	Hydraulic lime-stone containing sulphate of lime
		Free sand ..	1 60	
		Oxide of iron ..	0 70	
		Carbonate of lime ..	66 00	
		Ditto of magnesia ..	0 50	
		Sulphate of lime ..	6 40	
		Moisture and loss ..	1 20	
		Total ..	100 00	
A3	Ditto ditto ..	Clay ..	30 50	Same as No A1
		Free sand ..	29 00	
		Oxide of iron ..	1 00	
		Carbonate of lime ..	31 00	
		Ditto of magnesia ..	0 60	
		Sulphate of lime ..	3 00	
		Moisture and loss ..	1 90	
		Total ..	100 00	
A4	Ditto ditto ..	Clay ..	7 00	Very feebly hydraulic, contains sulphate of lime
		Free sand ..	10 00	
		Oxide of iron ..	1 60	
		Carbonate of lime ..	73 40	
		Ditto of magnesia ..	0 60	
		Sulphate of lime ..	5 00	
		Moisture and loss ..	2 40	
		Total ..	100 00	
B1	Ditto Sajolee ..	Clay ..	10 00	Magnesian lime-stone contains sulphate of lime
		Free sand ..	1 60	
		Oxide of iron ..	6 00	
		Carbonate of lime ..	42 60	
		Ditto of magnesia ..	30 00	
		Sulphate of lime ..	7 00	
		Moisture and loss ..	1 80	
		Total ..	100 00	

Number	Materials whence obtained	Composition	REMARKS																								
B2	Limestone, Sajolce...	<table><tr><td>Clay</td><td>..</td><td>8 00</td></tr><tr><td>Free sand</td><td>..</td><td>16 00</td></tr><tr><td>Oxide of iron</td><td>..</td><td>2 40</td></tr><tr><td>Carbonate of lime</td><td>..</td><td>63 00</td></tr><tr><td> Ditto of magnesia</td><td>..</td><td>2 00</td></tr><tr><td>Sulphate of lime</td><td>..</td><td>6 20</td></tr><tr><td>Moisture and loss</td><td>..</td><td>2 40</td></tr><tr><td>Total</td><td>..</td><td>100 00</td></tr></table>	Clay	..	8 00	Free sand	..	16 00	Oxide of iron	..	2 40	Carbonate of lime	..	63 00	Ditto of magnesia	..	2 00	Sulphate of lime	..	6 20	Moisture and loss	..	2 40	Total	..	100 00	Feebly hydraulic, contains sulphate of lime
Clay	..	8 00																									
Free sand	..	16 00																									
Oxide of iron	..	2 40																									
Carbonate of lime	..	63 00																									
Ditto of magnesia	..	2 00																									
Sulphate of lime	..	6 20																									
Moisture and loss	..	2 40																									
Total	..	100 00																									
B3	Clay, ditto ..	<table><tr><td>Clay</td><td>..</td><td>92 80</td></tr><tr><td>Free sand</td><td>..</td><td>1 40</td></tr><tr><td>Oxide of iron</td><td>..</td><td>1 20</td></tr><tr><td>Carbonate of lime</td><td>..</td><td>0 60</td></tr><tr><td> Ditto of magnesia</td><td>..</td><td>Traces</td></tr><tr><td>Sulphate of lime</td><td>..</td><td>3 00</td></tr><tr><td>Moisture and loss</td><td>..</td><td>1 00</td></tr><tr><td>Total</td><td>..</td><td>100 00</td></tr></table>	Clay	..	92 80	Free sand	..	1 40	Oxide of iron	..	1 20	Carbonate of lime	..	0 60	Ditto of magnesia	..	Traces	Sulphate of lime	..	3 00	Moisture and loss	..	1 00	Total	..	100 00	Clay nearly pure
Clay	..	92 80																									
Free sand	..	1 40																									
Oxide of iron	..	1 20																									
Carbonate of lime	..	0 60																									
Ditto of magnesia	..	Traces																									
Sulphate of lime	..	3 00																									
Moisture and loss	..	1 00																									
Total	..	100 00																									
C1	Deotee limestone down the river be- low Deotee ..	<table><tr><td>Clay</td><td>..</td><td>2 00</td></tr><tr><td>Free sand</td><td>..</td><td>2 00</td></tr><tr><td>Oxide of iron</td><td>..</td><td>85 00</td></tr><tr><td>Carbonate of lime</td><td>..</td><td>Traces</td></tr><tr><td> Ditto of magnesia</td><td>..</td><td>8 00</td></tr><tr><td>Sulphate of lime</td><td>..</td><td>3 00</td></tr><tr><td>Moisture and loss</td><td>..</td><td></td></tr><tr><td>Total</td><td>..</td><td>100 00</td></tr></table>	Clay	..	2 00	Free sand	..	2 00	Oxide of iron	..	85 00	Carbonate of lime	..	Traces	Ditto of magnesia	..	8 00	Sulphate of lime	..	3 00	Moisture and loss	..		Total	..	100 00	Fat lime containing sulphate of lime
Clay	..	2 00																									
Free sand	..	2 00																									
Oxide of iron	..	85 00																									
Carbonate of lime	..	Traces																									
Ditto of magnesia	..	8 00																									
Sulphate of lime	..	3 00																									
Moisture and loss	..																										
Total	..	100 00																									
C2	Ditto ditto down the river ..	<table><tr><td>Clay</td><td>..</td><td>0 60</td></tr><tr><td>Free sand</td><td>..</td><td>Traces</td></tr><tr><td>Oxide of iron</td><td>..</td><td>88 00</td></tr><tr><td>Carbonate of lime</td><td>..</td><td>None</td></tr><tr><td> Ditto of magnesia</td><td>..</td><td>9 00</td></tr><tr><td>Sulphate of lime</td><td>..</td><td>2 40</td></tr><tr><td>Moisture and loss</td><td>..</td><td></td></tr><tr><td>Total</td><td>..</td><td>100 00</td></tr></table>	Clay	..	0 60	Free sand	..	Traces	Oxide of iron	..	88 00	Carbonate of lime	..	None	Ditto of magnesia	..	9 00	Sulphate of lime	..	2 40	Moisture and loss	..		Total	..	100 00	Ditto ditto.
Clay	..	0 60																									
Free sand	..	Traces																									
Oxide of iron	..	88 00																									
Carbonate of lime	..	None																									
Ditto of magnesia	..	9 00																									
Sulphate of lime	..	2 40																									
Moisture and loss	..																										
Total	..	100 00																									
C3	Ditto ditto ½ mile from the river ..	<table><tr><td>Clay</td><td>..</td><td>20 00</td></tr><tr><td>Free sand</td><td>..</td><td>8 00</td></tr><tr><td>Oxide of iron</td><td>..</td><td>1 00</td></tr><tr><td>Carbonate of lime</td><td>..</td><td>62 80</td></tr><tr><td> Ditto of magnesia</td><td>..</td><td>1 40</td></tr><tr><td>Sulphate of lime</td><td>..</td><td>5 00</td></tr><tr><td>Moisture and loss</td><td>..</td><td>1 80</td></tr><tr><td>Total</td><td>..</td><td>100 00</td></tr></table>	Clay	..	20 00	Free sand	..	8 00	Oxide of iron	..	1 00	Carbonate of lime	..	62 80	Ditto of magnesia	..	1 40	Sulphate of lime	..	5 00	Moisture and loss	..	1 80	Total	..	100 00	Hydraulic lime containing sul- phate of lime
Clay	..	20 00																									
Free sand	..	8 00																									
Oxide of iron	..	1 00																									
Carbonate of lime	..	62 80																									
Ditto of magnesia	..	1 40																									
Sulphate of lime	..	5 00																									
Moisture and loss	..	1 80																									
Total	..	100 00																									
C4	Ditto ditto 1 mile above the river ..	<table><tr><td>Clay</td><td>..</td><td>23 20</td></tr><tr><td>Free sand</td><td>..</td><td>6 00</td></tr><tr><td>Oxide of iron</td><td>..</td><td>1 40</td></tr><tr><td>Carbonate of lime</td><td>..</td><td>59 60</td></tr><tr><td> Ditto of magnesia</td><td>..</td><td>1 60</td></tr><tr><td>Sulphate of lime</td><td>..</td><td>6 00</td></tr><tr><td>Moisture and loss</td><td>..</td><td>2 20</td></tr><tr><td>Total</td><td>..</td><td>100 00</td></tr></table>	Clay	..	23 20	Free sand	..	6 00	Oxide of iron	..	1 40	Carbonate of lime	..	59 60	Ditto of magnesia	..	1 60	Sulphate of lime	..	6 00	Moisture and loss	..	2 20	Total	..	100 00	Ditto ditto.
Clay	..	23 20																									
Free sand	..	6 00																									
Oxide of iron	..	1 40																									
Carbonate of lime	..	59 60																									
Ditto of magnesia	..	1 60																									
Sulphate of lime	..	6 00																									
Moisture and loss	..	2 20																									
Total	..	100 00																									

11
3336

Number	Materials whence obtained	Composition	REMARKS
C5	Deotce limestone 1/2 mile above the river	Clay .. 8 00 Free sand .. 2 00 Oxide of iron .. 2 00 Carbonate of lime .. 53 00 Ditto of magnesia .. 21 00 Sulphate of lime .. 9 00 Moisture and loss .. 2 00 Total .. 100 00	Magnesian limestone of good quality, notwithstanding the presence of sulphate of lime
C6	Ditto ditto at the bottom of river below Deotce	Clay .. 3 00 Free sand .. 1 20 Oxide of iron .. 86 10 Carbonate of lime .. Traces Ditto of magnesia .. 8 50 Sulphate of lime .. 1 20 Moisture and loss .. 1 20 Total .. 100 00	Same as C1
C7	Ditto ditto 1 mile 1/2 above river	Clay .. 10 00 Free sand .. 2 00 Oxide of iron .. 2 00 Carbonate of lime .. 75 20 Ditto of magnesia .. 1 10 Sulphate of lime .. 6 80 Moisture and loss .. 2 10 Total .. 100 00	Kunker very finely hydraulic
C8	Ditto ditto ditto ..	Clay .. 35 00 Free sand .. 8 00 Oxide of iron .. 1 60 Carbonate of lime .. 47 60 Ditto of magnesia .. 1 20 Sulphate of lime .. 4 00 Moisture and loss .. 1 60 Total .. 100 00	Kind of puzzolanna
C3 bis	Ditto ditto 1/2 mile from the river ..	Clay .. 9 40 Free sand .. 0 60 Oxide of iron .. 2 00 Carbonate of lime .. 76 20 Ditto of magnesia .. 4 60 Sulphate of lime .. 6 00 Moisture and loss .. 1 20 Total .. 100 00	Same as C3
C4 bis	Ditto ditto 1 mile above the river ..	Clay .. 11 40 Free sand .. 1 60 Oxide of iron .. 2 00 Carbonate of lime .. 75 10 Ditto of magnesia .. 1 50 Sulphate of lime .. 6 70 Moisture and loss .. 1 70 Total .. 100 00	Same as C4

Number	Materials whence obtained	Composition	REMARKS
D	Limestone on the road to Tiprah ..	Clay .. 50 00 Sand .. 24 00 Oxide of iron .. 2 40 Carbonate of lime .. 13 60 Ditto of magnesia .. 4 60 Sulphate of lime .. 6 00 Moisture and loss .. 6 00 Total .. 100 00	Very impure limestone (bad)
I1	Ditto on the road from Anendale to the Glens, Glens side ..	Clay .. 51 00 Free sand .. 27 00 Oxide of iron .. 2 80 Carbonate of lime .. 14 60 Ditto of magnesia .. 2 00 Sulphate of lime .. 2 60 Moisture and loss .. 2 60 Total .. 100 00	Kind of puzzolanna
E2	Ditto ditto ditto ..	Clay .. 50 00 Free sand .. 26 00 Oxide of iron .. 2 80 Carbonate of lime .. 14 50 Ditto of magnesia .. 3 00 Sulphate of lime .. 3 70 Moisture and loss .. 3 70 Total .. 100 00	Ditto ditto
I3	Ditto ditto Anendale side ..	Clay .. 14 20 Free sand .. 0 80 Oxide of iron .. 5 20 Carbonate of lime .. 45 80 Ditto of magnesia .. 24 00 Sulphate of lime .. 8 00 Moisture and loss .. 2 00 Total .. 100 00	Lime moderately hydraulic, rather poor
E4	Ditto ditto ditto ..	Clay .. 10 40 Free sand .. 0 60 Oxide of iron .. 4 80 Carbonate of lime .. 66 60 Ditto of magnesia .. 10 00 Sulphate of lime .. 7 60 Moisture and loss .. 7 60 Total .. 100 00	Ditto ditto
E5	Ditto ditto ditto ..	Clay .. 35 40 Free sand .. 15 00 Oxide of iron .. 3 80 Carbonate of lime .. 16 40 Ditto of magnesia .. 25 40 Sulphate of lime .. 4 00 Moisture and loss .. 4 00 Total .. 100 00	Kind of magnesian cement, poor

121
3336

(8)

Number	Materials where obtained	Composition	REMARKS
F	Limestone from the 1st mile on Thibet road	Clay .. 8.10 Free sand .. 0.80 Oxide of iron .. 5.10 Carbonate of lime .. 70.00 Ditto of magnesia .. 28.10 Sulphate of lime .. 6.70 Moisture and loss .. 1.10 Total .. 100.00	Same as E3 and 14
G	Do ditto on 1/2 mile on 1st mile road	Clay .. 8.10 Free sand .. 1.20 Oxide of iron .. 5.00 Carbonate of lime .. 14.00 Ditto of magnesia .. 33.00 Sulphate of lime .. 8.40 Moisture and loss .. 8.40 Total .. 100.00	1 to 2
H	Do ditto from Lukher P. near	Clay .. 8.00 Free sand .. 8.00 Oxide of iron .. 2.10 Carbonate of lime .. 16.60 Ditto of magnesia .. 28.00 Sulphate of lime .. 8.00 Moisture and loss .. 8.00 Total .. 100.00	1 to 2
I	Do ditto from Lukher P. near	Clay .. 2.10 Free sand .. 1.20 Oxide of iron .. 1.20 Carbonate of lime .. 85.00 Ditto of magnesia .. 10.00 Sulphate of lime .. 8.00 Moisture and loss .. 2.40 Total .. 100.00	1 to 2
J	Do ditto from Lukher P. near	Clay .. 1.20 Free sand .. 0.80 Oxide of iron .. 0.80 Carbonate of lime .. 70.00 Ditto of magnesia .. 28.10 Sulphate of lime .. 6.70 Moisture and loss .. 1.10 Total .. 100.00	1 to 2
K	Do ditto from Lukher P. near	Clay .. 8.10 Free sand .. 0.80 Oxide of iron .. 5.10 Carbonate of lime .. 70.00 Ditto of magnesia .. 28.10 Sulphate of lime .. 6.70 Moisture and loss .. 1.10 Total .. 100.00	1 to 2

(9)

Number	Materials where obtained	Composition	REMARKS
J3	Limestone from Jutog below the burial ground	Clay .. 1.00 Free sand .. 0.80 Oxide of iron .. 5.70 Carbonate of lime .. 0.10 Ditto of magnesia .. 8.60 Sulphate of lime .. 2.20 Moisture and loss .. 2.20 Total .. 100.00	Fat lime containing sulphate of lime
J4	Do ditto on Jutog road	Clay .. 9.00 Free sand .. 11.00 Oxide of iron .. 4.00 Carbonate of lime .. 65.50 Ditto of magnesia .. 1.20 Sulphate of lime .. 6.50 Moisture and loss .. 2.20 Total .. 100.00	Meagre limestone
J5	Do ditto down the slaughter-house	Clay .. 1.40 Free sand .. 5.00 Oxide of iron .. 1.00 Carbonate of lime .. 80.40 Ditto of magnesia .. 1.00 Sulphate of lime .. 9.00 Moisture and loss .. 1.60 Total .. 100.00	Fat lime containing sulphate of lime
J6	Do ditto ditto	Clay .. 7.10 Free sand .. 14.00 Oxide of iron .. 3.60 Carbonate of lime .. 67.00 Ditto of magnesia .. 1.40 Sulphate of lime .. 6.00 Moisture and loss .. 6.00 Total .. 100.00	Meagre limestone
J7	Do ditto close to the burial ground	Clay .. 1.60 Free sand .. 26.40 Oxide of iron .. 1.20 Carbonate of lime .. 68.00 Ditto of magnesia .. 1.40 Sulphate of lime .. 1.10 Moisture and loss .. 2.00 Total .. 100.00	Meagre limestone, feebly hydraulic
K	Do ditto from Kahanpore (beyond Deotek)	Clay .. 4.00 Free sand .. 1.40 Oxide of iron .. 84.20 Carbonate of lime .. 1.00 Ditto of magnesia .. 8.00 Sulphate of lime .. 1.40 Moisture and loss .. 1.40 Total .. 100.00	Fair fat lime containing sulphate of lime

13
3056

Number	Materials whence obtained	Composition	REMARKS
L1	Limestone on the Telegraph (Simla) ..	Clay .. 7 80 Free sand .. 1 80 Oxide of iron .. 4 80 Carbonate of lime .. 50 80 Ditto of magnesia .. 30 00 Sulphate of lime .. Moisture and loss .. } 5 00 Total .. 100 00	Same as E3 and L4.
L2	Ditto ditto ditto ..	Clay .. 12 40 Free sand .. 2 80 Oxide of iron .. 3 00 Carbonate of lime .. 61 60 Ditto of magnesia .. 10 60 Sulphate of lime .. Moisture and loss .. } 9 80 Total .. 100 00	Ditto ditto.
M	Ditto from Boular-gunge ..	Clay .. 12 80 Free sand .. 20 00 Oxide of iron .. 2 80 Carbonate of lime .. 62 10 Ditto of magnesia .. 6 50 Sulphate of lime .. Moisture and loss .. } 1 80 Total .. 100 00	Very meagre lime-stone.
N	Ditto from Prospect Hill ..	Clay .. 17 00 Free sand .. 26 00 Oxide of iron .. 1 20 Carbonate of lime .. 46 60 Ditto of magnesia .. 1 20 Sulphate of lime .. Moisture and loss .. } 8 00 Total .. 100 00	Ditto ditto.
O	Ditto below Kassum-tee Bazaar ..	Clay .. 11 20 Free sand .. 2 00 Oxide of iron .. 6 00 Carbonate of lime .. 54 60 Ditto of magnesia .. 19 00 Sulphate of lime .. Moisture and loss .. } 7 20 Total .. 100 00	Magnesian lime-stone rather poor.
P	Ditto found below Taradeir ..	Clay .. 5 00 Free sand .. 19 00 Oxide of iron .. 2 00 Carbonate of lime .. 67 50 Ditto of magnesia .. 1 50 Sulphate of lime .. Moisture and loss .. } 5 00 Total .. 100 00	Very meagre lime-stone.

Number	Materials whence obtained	Composition	REMARKS
I2	Burnt lime from Put-tallah ..	Clay .. 4 00 Sand .. 1 80 Oxide of iron .. 1 00 Lime .. 70 00 Magnesia .. 1 50 Sulphate of lime .. 15 50 Carbonic acid .. Moisture and loss .. } 6 20 Total .. 100 00	Fat lime containing sulphate of lime.
A440	Limestone from Mohurbhunj Hills, Balasore Survey Division ..	Clay .. 0 50 Sand .. 1 00 Oxide of iron .. 0 80 Carbonate of lime .. 95 20 Ditto of magnesia .. 1 10 Loss, &c. .. 1 40 Total .. 100 00	Rich fat limestone.
A455½(1)	Ghooting from Superintending Engineer, South-Western Circle ..	Clay .. 44 40 Sand .. 2 20 Oxide of iron .. 52 30 Ditto of magnesia .. 1 10 Total .. 100 00	Good hydraulic cement limestone.
A455½(2)	Lime mortar ditto ..	Silica .. 56 40 Alumina and iron .. 7 20 Lime .. 23 10 Magnesia .. 1 00 Carbonic acid .. Moisture and loss .. } 12 00 Total .. 100 00	Poor mortar.
A455½(4)	Roof mortar ditto ..	Silica .. 58 60 Alumina and iron .. 7 40 Lime .. 22 70 Magnesia .. 0 80 Carbonic acid .. Moisture and loss .. } 10 50 Total .. 100 00	Ditto ditto.
A455½(5)	Brick masonry mortar ditto ..	Silica .. 63 60 Alumina and iron .. 6 60 Lime .. 17 30 Magnesia .. 1 00 Carbonic acid .. Moisture and loss .. } 11 50 Total .. 100 00	Ditto ditto.

14
3386

Number	Materials whence obtained	Composition	REMARKS
A444	Limestone from Chittagong Hill Tract near Rumi, Chittagong Division ..	Clay 7 80 Sand 1 10 Oxide of iron .. 0 60 Carbonate of lime .. 57 00 Ditto of magnesia .. 5 20 Total .. 100 00	Fairly hydraulic lime good for ordinary buildings
A442	Kunkur block, Swat Canal Division, Irrigation Branch, Punjab ..	Clay 5 20 Sand 0 80 Oxide of iron .. 93 00 Carbonate of lime .. 1 00 Ditto of magnesia .. Traces Sulphate of lime .. Total .. 100 00	Ditto ditto.
A450	Kunkur, Sirhind Canal Circle ..	Clay 39 00 Sand 0 00 Oxide of iron .. 55 20 Carbonate of lime .. 0 80 Ditto of magnesia .. Traces Sulphate of lime .. Total .. 100 00	Fair hydraulic stone.
A463	Ditto, ditto ditto ..	Clay 37 00 Sand 2 20 Oxide of iron .. 60 60 Carbonate of lime .. 0 20 Ditto of magnesia .. Traces Sulphate of lime .. Total .. 100 00	Very good hydraulic lime
A464	Ditto, ditto ditto ..	Clay 32 00 Sand 2 00 Oxide of iron .. 66 00 Carbonate of lime .. Traces Ditto of magnesia .. Sulphate of lime .. Total .. 100 00	Ditto ditto.
A465	Ditto, ditto ditto, Punjab ..	Clay 31 40 Sand 2 20 Oxide of iron .. 62 10 Carbonate of lime .. 1 00 Ditto of magnesia .. Traces Sulphate of lime .. Total .. 100 00	Ditto ditto.

Number	Materials whence obtained	Composition	REMARKS
A466	Kunkur dug from a quarry in the Village of Kikwan, Cawnpore District, on the Cawnpore Branch of the Ganges Canal ..	Clay 35 60 Sand 10 00 Oxide of iron .. 1 50 Carbonate of lime .. 51 90 Ditto of Magnesia .. 1 00 Total .. 100 00	Meagre cement limestone.
A471	Ditto dug from Tajow Scindia State Railway ..	Clay 23 00 Sand 10 00 Oxide of iron .. 2 10 Carbonate of lime .. 69 50 Ditto of magnesia .. 0 40 Sulphate of lime .. Traces Total .. 100 00	Good hydraulic limestone (a little meagre).
A457	Kunkur (box marked A) Gunduk, North-Western Circle ..	Clay 31 60 Sand 11 00 Oxide of iron .. 2 60 Carbonate of lime .. 51 00 Ditto of magnesia .. 0 80 Total .. 100 00	Cement stone of rather poor quality.
A458	Kunkur with shells (ditto B) ditto ..	Clay 32 60 Sand 8 40 Oxide of iron .. 2 00 Carbonate of lime .. 55 90 Ditto of magnesia .. 1 10 Total .. 100 00	Mixture of shells and kunkur.
A459	Kunkur (ditto C) Monghyr ditto ..	Clay 30 40 Sand 6 40 Oxide of iron .. 1 00 Carbonate of lime .. 62 20 Ditto of magnesia .. Traces Total .. 100 00	Good hydraulic limestone
A460	Kunkur with shells (ditto D) Gunduk, North-Western Circle ..	Clay 28 50 Sand 12 80 Oxide of iron .. 1 80 Carbonate of lime .. 55 90 Ditto of magnesia .. 1 00 Total .. 100 00	Fair hydraulic limestone mixed with clay
A461	Kunkur (ditto E) Sahabgunge ditto ..	Clay 32 80 Sand 7 00 Oxide of iron .. 1 90 Carbonate of lime .. 54 30 Ditto of magnesia .. Traces Total .. 100 00	Good hydraulic limestone.

15
3336

(14)

Number	Materials whence obtained	Composition	REMARKS
A462	White kunkur (box marked F) Sahelgunge, North Western Circle	Clay .. 32 00 Sand .. 1 60 Oxide of iron .. 2 70 Carbonate of lime .. 61 90 Ditto of magnesia .. 1 80 Total .. 100 00	Very good natural white cement stone.
A443	Limestone, Sahelgunge, from Mr Bull	Clay .. 32 00 Sand .. 1 60 Oxide of iron .. 2 70 Carbonate of lime .. 61 90 Ditto of magnesia .. 1 80 Total .. 100 00	Ditto ditto
A470	Black kunkur, Bhushina, New Main Line Division	Clay .. 30 50 Sand .. 12 00 Oxide of iron .. 3 60 Carbonate of lime .. 48 10 Ditto of magnesia .. 6 10 Total .. 100 00	Good mixture of hydraulic magnesian lime and cement stone.
A441	Limestone, Gogri quarry, Nuseeralad Division, Rypootina Agency	Clay .. 17 00 Sand .. 20 00 Oxide of iron .. 1 20 Carbonate of lime .. 59 50 Ditto of magnesia .. 2 00 Total .. 100 00	Very meagre limestone (feebly hydraulic)
A445(A)	Limestone, Northern Division, Nasik	Clay .. 11 00 Sand .. 13 00 Oxide of iron .. 3 50 Carbonate of lime .. 71 20 Ditto of magnesia .. 1 00 Total .. 100 00	Limestone moderately hydraulic.
A445(B)	Kunkur, ditto ditto	Clay .. 13 00 Sand .. 11 00 Oxide of iron .. 1 40 Carbonate of lime .. 71 40 Ditto of magnesia .. 1 20 Total .. 100 00	Ditto ditto.
A481(1)	Ditto, Arrary, Gunduk Division	Clay .. 26 20 Sand .. 4 20 Oxide of iron .. 2 00 Carbonate of lime .. 57 60 Ditto of magnesia .. Traces Total .. 100 00	Hydraulic limestone of very fair quality

(15)

Number	Materials whence obtained	Composition	REMARKS
A484(2)	Kunkur, Lowrah, Gunduk Division	Clay .. 12 40 Sand .. 38 00 Oxide of iron .. 2 00 Carbonate of lime .. 47 60 Ditto of magnesia .. Traces Total .. 100 00	Very meagre limestone.
A484(3)	Ditto, Sickranah, ditto	Clay .. 36 40 Sand .. 8 20 Oxide of iron .. 1 50 Carbonate of lime .. 53 60 Ditto of magnesia .. Traces Total .. 100 00	Same as A484(1)
A484 (4)	Ditto, Byah Nuttah, Gunduk Division	Clay .. 37 00 Sand .. 10 00 Oxide of iron .. 2 00 Carbonate of lime .. 51 00 Ditto of magnesia .. Traces Total .. 100 00	Same as A484 (1)

P. DEJOUX,

Exc. Engr, Cement Experiments Divn

17
3336

Circular No. C3 P. W.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

CIVIL WORKS.

Irrigation.

To

THE GOVERNMENTS OF MADRAS AND BOMBAY, IN THE PUBLIC WORKS DEPARTMENT,
GENERAL, IRRIGATION AND RAILWAY BRANCHES
THE GOVERNMENT OF BENGAL, IN THE PUBLIC WORKS DEPARTMENT, GENERAL
BRANCH
THE GOVERNMENTS OF NORTH-WESTERN PROVINCS AND OUDH, AND PUNJAB, IN THE
PUBLIC WORKS DEPARTMENT, GENERAL AND IRRIGATION BRANCHES
THE CHIEF COMMISSIONERS, CENTRAL PROVINCES, BRITISH BURMAH, MYSORE, AND
COORG, AND ASSAM
THE RESIDENT, HYDERABAD.
THE AGENTS OF THE GOVERNOR GENERAL FOR CENTRAL INDIA, AND RAJPUTANA
THE SUPERINTENDENT OF PORT BLAIR, AND CHIEF COMMISSIONER, ANDAMAN AND
NICOBAR ISLANDS
THE INSPECTOR GENERAL OF MILITARY WORKS
THE DIRECTOR OF STATE RAILWAYS, CENTRAL, WESTERN, AND NORTH-EASTERN SYSTEMS
THE DIRECTOR OF STATE RAILWAY STORES
THE CONSULTING ENGINEERS TO THE GOVERNMENT OF INDIA FOR GUARANTEED RAILWAYS,
CALCUTTA, LAHORE AND LUCKNOW
THE SUPERINTENDING ENGINEER, SIMLA IMPERIAL CIRCLE

Simla, July 23rd, 1878

In continuation of Circular No 53 P. W. of the 20th ultimo, the under-
signed is directed to forward, for information, Mr Dejour's report on cement
experiments for the quarter ending 31st March 1878

Frederick Smith

Major, R. E.,
Asst. Secy to the Govt of India

*To The Joint Secy to the Govt of Madras
P.W. Departt. Irrigation Branch.*

GOVERNMENT OF INDIA
PUBLIC WORKS DEPARTMENT.

CIVIL WORKS

Irrigation

To

Circular No. 63 P. W.

Dated SIMLA, July 23rd, 1878.

Received

Forwards, for information, copy of Mr. Dejoux's report on cement experiments for the quarter ending March 1878

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18
3336

Circular No. 63 P. W.

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PUBLIC WORKS DEPARTMENT.

CIVIL WORKS.

Irrigation.

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W. R. E. De la Roche

Major, R. E.,
Asst. Secy. to the Govt of India

*To be sent to the Govt of Madras
Mr. De la Roche, Railway Branch*

19

GOVERNMENT OF INDIA
PUBLIC WORKS DEPARTMENT.

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222

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Cement experiments

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Emilia Negre