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MADRAS RECORD OFFICE

Government of Madras

Public Works

DEPARTMENT

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Dated	13-7	6876
		195

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
13th September 1876. No. 2,444.*

No. 197. Read the following Circular from the Government of India in the Public Works Department, (Civil Works—Irrigation) to the Governments of Madras and Bombay in the Public Works Department, General, Irrigation and Railway Branches; the Governments of Bengal, North-western Provinces and the Punjab in the Public Works Department, General and Irrigation Branches; the Chief Commissioners, Oudh, Central Provinces, British Burmah, Mysore and Coorg, and Assam; the Resident at Hyderabad; the Agents of the Governor-General for Central India and Rajpootana; the Superintendent of Port Blair, and the Chief Commissioner of the Andaman and Nicobar Islands; the Inspector-General of Military Works; the Director of State Railways; the Consulting Engineers to the Government of India for Guaranteed Railways at Calcutta, Lahore, and Lucknow; dated Simla, 26th July 1876, No. 43, Public Works:—

THE undersigned is directed to forward for information extracts from Mr. Dejoux's Report on Cement Experiments for the quarter ending 31st March 1876.

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

Extract paragraphs 13 to 23 from the Quarterly Progress Report ending 31st March 1876, upon experiments on limes, cements, and mortars by P. Dejoux, Esq., C.E., Executive Engineer, Cement Experiments Division, No. 877, dated 18th April 1876, addressed to the Superintending Engineer, South-western Circle.

MARGOHI CEMENT.

Para. 13.—As mentioned in my last quarterly report, I have analysed and tested the new specimens of cement stones found in the Margohi quarries.

Of five specimens discovered, 1A.375A. yields a very quick setting cement; it exists in large beds. Another, 1A.375E., takes rather a long time in setting, viz., eighteen hours; gets very hard afterwards, and will yield a very good material either by itself or mixed with stones of other layers, giving a quicker setting cement. This kind of stone is found in very extensive beds, of thickness varying from 3 to 6 feet. This cement used pure obtains after fifteen days a strength of 400 lbs. for an area of $1\frac{1}{2} \times 1\frac{1}{2}$."

14. I must here notice that it has been found that if in a kiln loaded with the materials used before which produced good magnesian cement, you reburn at a higher temperature, next to vitrification, all the stones, difficult to recognize from the others before burning, which have a greenish color and are friable when burnt, you will obtain a kind of Portland Cement which when used pure will break after two months under a strength of 640 lbs., and if mixed with one part of sand will reach a strength as high as 820 lbs.

It is thus remarkable that with all the cements obtained from the magnesian calcareous and argillaceous beds of the Kymore Hills, a greater strength is obtained when the cement is mixed with sand instead of being used pure. These cements are much more plastic than Portland Cement, and consequently they are not affected by immediate immersion, and have better binding properties than Portland Cement, which is wanting in plasticity.

15. The more I consider the question of the cements obtained from the strata of the Kymore Hills, the more I feel convinced that they ought to be extensively used in future hydraulic works of India, of course on the distinct understanding that the quarries are worked on an extensive scale under proper supervision.

TEST OF MESSRS. KER, DODS AND COMPANY'S PORTLAND CEMENT, MANUFACTURED AT CALCUTTA.

16. I made a series of trials on the cements manufactured by Messrs. Ker, Dods and Company, in accordance with orders received from the Government of India, Public Works Department,

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with your No. 665, dated 21st February last, and submitted a report on the results thereof with my No. 874* of the 6th April, in which it was mentioned that these cements were originally manufactured according to my advice; and I may here say that I was indeed glad of another opportunity of proving the possibility of manufacturing good Portland Cement in India.

EFFECTS OF ALKALI ON PORTLAND CEMENT.

17. I noticed in my letter just quoted that in my opinion the use of alkali (either soda or potash) in cement made with the proper kind of clay would prove more detrimental to it than otherwise. It will certainly increase the cost of the cement without any real advantage.

I have been induced to dwell upon this point because my attention was again drawn to the use of alkali by Mr. Dupeyron, who conducted experiments for Messrs. Ker, Dods and Company, and who found that by mixing (after calcination) two per cent. of carbonate of soda with the cement ready for use, extraordinary results in many cases would ensue.

His cements, as tried by me, containing an excess of lime, broke when used pure at a strength of 160 lbs. per $1\frac{1}{2}'' \times 1\frac{1}{2}''$, and when mixed with two per cent. of carbonate of soda broke at 715 $\frac{1}{2}$ lbs.

These extraordinary results were, so far as I can judge, obtained from no other cements than those containing an excess of lime.

Certainly to a cement containing the exact proportions with which I have obtained such high results as 900 lbs. after eight days, the addition of the carbonate of soda will cause no difference; but in a cement rich in lime it seems to produce the contrary effect. I can only at present explain the cause of the difference thus:—

In a cement too rich in lime a feeble portion of it remains in the state of quicklime; to this of course the addition of the carbonate of soda (the lime being stronger than the soda) gives the whole or a portion of the carbonic acid to the quicklime, and therefore, transforming it into a sub-carbonate of lime, quick setting.

I must, however, say that the whole question requires a good deal of investigation, and I am at present making as many experiments on the subject as possible, although I may already mention that a fat lime mixed with twenty per cent. of carbonate of soda sets under water after six days, and that its hardness under water increases very sensibly, and keeps increasing when left exposed to air more than when the fat lime was used by itself.

18. A further report, however, on this interesting subject will be submitted afterwards.

ARTIFICIAL HYDRAULIC LIME.

19. I reported in my quarterly report, No. 552,* dated 4th November 1874, on the advantages which will be derived from the use, in Calcutta specially, of an artificial hydraulic lime made with chalk and blue clay. I again beg to invite attention to the subject.

Numerous experiments since confirm the opinion therein expressed, and besides some lime of the above description was used by Mr. Mansfield for plastering one side of Writers' Buildings close to similar work (plastering), made with ordinary Sylhet lime nearly two years ago, and the difference between the two may be observed; though I should say that while the plastering made with hydraulic lime is as hard as cement plastering, the other is crumbling to pieces.

In fact, owing to dampness in Lower Bengal, hydraulic mortar only ought to be used for plastering, as being more lasting.

ARTIFICIAL MAGNESIAN CEMENTS.

20. The question of artificial magnesian cements made with an admixture of dolomite or common magnesian limes and pure clays, on which I reported in my quarterly report, No. 715,† dated 14th July 1875, being a new one, I cannot yet furnish a definite opinion about it,

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at present that though all the experiments on artificial cements have proved that I must wait longer to report full particulars about them.

REMARKS ON INVESTIGATION OF LIMES AND CEMENT STONES OF INDIA.

I may add some remarks now about what has been done in my department, and also what I consider necessary to be done hereafter.

As in conducting cement experiments were extended, shortly after my appointment, to the test of all the limes found in Bengal in the Irrigation Branch of the Department, and eventually by orders of Government of India, Public Works Department, to do the same with all the specimens of materials received from places like the Presidencies of Madras and Bombay), and in these were included General and Military Branches of the Public Works Department, together with the several State Railways. Lately, however, some limestones have been from Bombay Presidency and experimented upon.

The Government have long since been put in possession of reports stating that the object of my appointment, viz., "to ascertain whether a cement at all equal to English manufactured in this country," has been fully achieved, from the fact of series of experiments proved beyond a shadow of doubt that a cement equal to, if not better than, English Cement can be manufactured in Calcutta at a comparatively cheaper rate.

It is also reported that the discovery by me of natural stones from the quarries at Dehra has led to the manufacture of the Margohi Cement, and the construction of it at Dehra.

It is being extensively used for works on the Sone Circle, and from repeated tests found equal to the best brand of the American Rosendale Cement.

I may now be permitted to state that my discoveries of many other natural hydraulic limes from quarries close to the works have effected considerable savings in cost of carriage, &c., and the same may be adduced as regards the successful use of sand mortar in place of soorkee, the latter being an expensive item in materials.

It may be mentioned that the analyses, practical tests, and reports upon limes have been of great importance in all the works that have been either under construction or in progress.

In such circumstances, I venture to hope the Government will not only recognize the savings rendered, calculate the savings effected, but now determine upon the importance of certain portions of the year, to explore the localities mentioned in the reports of the survey of India, as being of calcareous formation and situated in the vicinity of which will enable me to complete a series of investigation in regard to the limes and cements of India.

My time will be occupied in the analysis and practical tests of the specimens

selected that the selection of limestones beforehand and the timely analysis and tests will be of vast importance, and the consequent results may lead to the discovery of materials which may remain undiscovered, as they have doubtless been up to now left to the investigation of local officers not possessing professional experience

The works I propose to be done are of the same nature as those executed in France, at Ingenieur Des Ponts et Chansees, for over thirty years, and which led to the discovery of series in hydraulic materials.

*Proceedings of the Madras Government, Public Works Department,
13th September 1876. No. 2,444.*

No. 198. ORDER THEREON, 13th September 1876, No. 2,444.

IRRIGATION, No. 24.

COMMUNICATED in continuation of
G.O., No. 78, dated the 10th November
1875, to all District Engineers.

(True Extract.)

Colonel,
Offg. Under Secy. to Govt., P.W.D.

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Govt. of 1876 Madras.
PUBLIC WORKS.

To

Neelast Engineers.

Dated

Issued

Recd

Encl.

G. O., 13th Sept 1876, No. 2444

Nos. 197/98

Mr.
Dejoux's report on Cement
experiments for Quarter
ending 31st March 1876.

Circular from the Govt.
of India forwarding extracts
from ~~the~~ Comd. to
S^r Engrs.

Sub in Reg. 2-10-76

P.W.D.
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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 Governments of Bengal, the North-
Western Provinces and the Punjab, in the
Public Works Department, General and
Irrigation Branches.
The Chief Commissioners of Oudh, the Central
Provinces, British Burmah, Mysore and
Coorg, and Assam.
The Resident at Hyderabad.
The Agents of the Governor General for Central
India and Rajpootana.
The Superintendent of Port Blair and Chief
Commissioner of the Andaman and Nicobar
Islands.
The Inspector General of Military Works.
The Director of State Railways.
The Consulting Engineers to the Government
of India for Guaranteed Railways at Cal-
cutta, Lahore, and Lucknow.

Circular No. 43 Public Works.

Dated SIMLA, July 26, 1876.

Received

E.I. No 2444 d/13th Sept/76
Communicated, in
continuation of G.O. No. 78
dated the 10th November,
1875, to all District
Engineers.

Mr. 13/9

Forwards for information extracts from Mr.
Dejoux's report on cement experiments for quarter
ending 31st March 1876.

Dr. 30/9/76
Chrg. Engr. S. B. Co.
Chrg. Engr. S. B. Co.
Chrg. Engr. S. B. Co.