

(1) Number of pages _____

(2) Date of repair _____

(3) Initials of the Referencer _____

MADRAS RECORD OFFICE

Government of Madras

Public Works DEPARTMENT

G.O. No.	1267.	Press
B.P. No.		Mis.
Dated	5-5.	1843.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
5th May 1873.*

No. 53. Read the following letter from Assistant Surgeon E. NICHOLSON, R. A., on special duty, Public Works Department, to Colonel G. W. WALKER, R.E., Chief Engineer and Secretary to Government, Public Works Department, dated Bangalore, 14th April 1873, No. 30 :—

I HAVE the honour to inform you of the progress made in the examination of limestones. I have now received specimens from the following districts :—

Districts.										Limestone.	Clay.
Malabar	...	...	...	...	...	...	...	...	...	2	
Presidency	...	...	...	...	...	...	...	...	...	1	
Chingleput	...	...	...	...	...	...	...	...	...	7	
North Arcot	...	...	...	...	...	...	...	...	...	4	
Coimbatore	...	...	...	...	...	...	...	...	...	25	1
Neilgherries	...	...	...	...	...	...	...	...	...	4	
South Arcot	...	...	...	...	...	...	...	...	...	5	1
Nellore	...	...	...	...	...	...	...	...	...	3	
Kistna	...	...	...	...	...	...	...	...	...	8	
Madura	...	...	...	...	...	...	...	...	...	7	
Tinnevely	...	...	...	...	...	...	...	...	...	8	6
Salem	...	...	...	...	...	...	...	...	...	37	
Nagpore	...	...	...	...	...	...	...	...	...	2	
Secunderabad	...	...	...	...	...	...	...	...	...	1	1
Mysore (Colar)	...	...	...	...	...	...	...	...	...	3	
Total...										117	9

I have also received notice of the despatch of specimens from the Godavery.

2. Out of these, thirty specimens of limestone have been analyzed, besides several specimens of the clay, decomposed gneiss, etc., found in them. As an early knowledge of the composition of these limestones may be useful to the Engineers who have forwarded them, I append the information in a tabulated form.

3. During the course of the analyses I have devised a new and very satisfactory process which will enable me to get through the remainder of them in half the time they would otherwise require. A furnace kiln for samples, built for me by the Commandant of the Sappers and Miners, is now ready for use, and I have a cement-testing machine nearly completed ; I shall thus be soon able to begin experimental work on the lime yielding by the samples analyzed.

4. It would be premature to form any conclusion regarding the limestones already examined, until I can compare the chemical composition with the properties found after burning ; yet I may say that the composition, as given in the appended table, points to many of them being of an eminently hydraulic character, and to some being capable, under proper treatment, of producing natural cements.

5. This character is not often recognized in the description accompanying the specimens ; and, as many of these are of good homogeneousness, nothing but defective burning can be the cause of the hydraulic character not being shown.

6. The earthy portions of the limestones consist either of clay or of minerals which, though apparently sand, are not inert silica, but mica, felspar, and other silicates, all of which are as capable of attack in the kiln as clay would be. But prolonged heat would be required, and I doubt whether the ordinary method of lime burning as practised in India would be effectual. It must be remembered that the production of a strong hydraulic lime or of a cement from mixtures of limestone and clay requires two successive chemical operations.

1st.—The formation of quicklime.

2nd.—The attack of the clay by quicklime; the second being only accomplished by great and prolonged heat. It would appear that the ordinary process of lime burning in India only effects the first part of the process, and this in a very incomplete manner.

7. When the lime is so generally found to contain a large proportion of undecomposed carbonate, it is evident that the clayey portions cannot have been attacked, and are therefore all but inert in the setting of the mortar.

8. That careful burning would bring out the hydraulic properties of these micaceous and felspathic limestones is shown by the favourable account which Mr. Nordmann gives of the limestones of the upper part of the Bhowany valley; that from Kodivelli, stated to be the best and giving good hydraulic lime, I find is perfectly free from clay, but containing upwards of 30 per cent. of silicates, principally mica (black mica and lepidolite). The burning in this case appears to be more carefully conducted than usual, and lasting several days.

9. As far as I have seen, very few of the limestones are of a sufficiently friable nature for the manufacture of artificial cement from them to be economical. Kunker is often soft when dug up; but it hardens rapidly, and the beds of it are so scattered that it could generally acquire considerable hardness by the time it reached the manufactory. Nevertheless, it is possible that prison labour might be utilized for reducing the limestone to powder, and a jail, such as that of Salem or Coimbatore, might be made a centre of manufacture for the materials found in these districts. Before taking any steps in this direction it will be well to see what can be done by simpler method.

1st.—By the addition of substances capable of imparting hydraulic properties to lime burnt in the ordinary kilns of the country.

2nd.—By method of burning calculated to develop hydraulic properties in the best samples of limestone.

10. As I am now entering on the experimental part of the present inquiry, I beg to submit the following estimate of workshop charges during the current official year:—

Furnace kiln for samples	80
Iron-shed over the kiln and working ground	120
Cement-testing machine	100
A kiln to burn one cubic yard of limestone when necessary	200
Fuel for the kilns	600
Cooly labour when required	100
Total	1,200

APPENDIX.

Table showing the proximate Composition of Limestones analyzed up to 31st March 1873.

Locality.	Water.	Sili- cates.	Magni- sium Carbo- nate.	Calci- um Carbo- nate.	Total.	Remarks as to probable quality.	
<i>Malabar.</i>							
Walliar	3.5	19.7	2.3	75.2	100.7	} Hydraulic and described as such.	
Modalamodai	1.0	18.4	3.0	74.7	97.1		
<i>Coimbatore.</i>							
Coimbatore { I	2.0	19.6	1.4	76.2	99.2	} Hydraulic. and described as such.	
Coimbatore { II	2.2	18.7	1.0	77.2	99.1		
Coimbatore { III	2.0	13.4	1.6	82.8	99.8		
Upper Bhowany Velamun- divally.	.5	16.6	4.5	76.8	98.4	} Hydraulic.	
Do. { Danaikenkota	.6	20.8	4.3	74.3	100.		
Do. { Kodivelli	1.6	32.3	...	66.0	99.9	} Hydraulic.	
Do. { Satiangalam	1.0	17.2	1.2	79.7	99.1		
Kottamanglam	2.0	60.9	6.1	29.0	98	Too meagre.	
A	.3	39.6	26.7	33.6	100.2	A handsome marble, not homogeneous enough, for lime burning.	
Bhowany {	B	.5	18.4	29.5	51.0	99.4	Not homogeneous; con- tains nodules of magne- site.
	C	2.0	25.3	3.1	68.2	99.1	Probably hydraulic, if great heat be used.
	D	.5	9.0	5.5	85.2	100.2	Somewhat hydraulic.
<i>Presidency.</i>							
—	1.0	6.1	1.4	90.7	99.2	} Very slightly hydraulic.	
<i>Chingleput.</i>							
Sent from the Pre- sidency.	Trivellore 1	.7	7.1	6.8	85.8	100.4	} Hydraulic.
	Do. 2	1.6	20.4	28.3	49.6	99.9	
	Do. 3	.7	4.9	5.6	88.9	100.1	} Very slightly hydraulic.
	Sydapet 4	1.7	21.1	11.0	66.7	100.5	
	Do. 5	2.8	19.2	1.8	76.7	100.5	} Hydraulic.
	Do. 6	1.5	9.6	1.3	88.1	100.5	
Eastern Canal Range	2.7	34.0	4.2	59.0	99.9	Slightly hydraulic. Probably a cement stone.	
<i>North Arcot.</i>							
Vellore	.5	5.6	2.1	91.3	99.5	} Very slightly hydraulic.	
Wallajah	.5	5.8	2.3	91.4	100.		
Potur	1.4	30.6	5.5	62.3	99.8	} Sandy, but strongly hydrau- lic.	
Tripetty	1.2	28.8	8.9	62.0	100.8		
<i>Mysore (Colar).]</i>							
Palar river	1.8	30.5	5.3	59.4	97.0	} Strongly hydraulic.	
Baitmangalam	1.2	17.9	3.5	76.2	98.8		
Mittoor	1.1	29.0	.7	63.4	99.2	Hydraulic. Strongly hydraulic.	
<i>Salem.</i>							
Valavendy	1.8	10.4	Traces.	87.3	99.5	Very slightly hydraulic; very friable.	

NOTE.—The sand, clay, felspar, mica and other silicates were separated as much as possible by the use of weak acid in the solution of the limestone; any alumina and ferric oxide nevertheless dissolved was separated from the calcium and magnesium and returned to the silicates. The amount dissolved varied from 0.1 to 1 per cent., except in the Kodivelli stone, the silicates of which were so readily decomposable as to yield 9 per cent. to weak acid.

(Signed) E. NICHOLSON, R. A.
Assistant Engineer.

*Proceedings of the Madras Government, Public Works Department,
5th May 1873.*

No. 54.

ORDER THEREON, 5th May 1873, No. 1,267.

ESTABLISHMENT, No. 9.

ORDERED to be printed and circu-
lated for information.

(True Extract.)

(Signed) G. W. WALKER, Colonel, R.E.,
Secretary to Government.

To Dr. Nicholson, R. A.
„ District Engineers.
„ Inspecting Engineers.
To the Special Executive Engineer, Wynaad.
„ Controller of Public Works Accounts.
„ Military Department.
„ Consulting Engineer for Railways.
„ Chief Engineer for Irrigation.

*Ordered to be
printed and cir-
culated for in-
formation.*

L.W.W.

*To Dr. Nicholson
„ District Engineers
„ Inspecting Engineers
„ Controlling Eng. Wynaad
„ Controlling Eng. W. G. S.
„ Chief Eng. Wynaad
„ Chief Eng. W. G. S.
„ Chief Eng. W. G. S.*

Date 15-5-73.

Chs 2389.

Govt. of 1873 Madras.

PUBLIC WORKS.

To S. Nicholson B.A.

Dated

Recd.

1873

5 May 1873 No 1267

Nos. 53 & 54

Limestone. Report from
S. Nicholson on the
examination of Limestones
ordered to be printed and
circulated.