M R O 1—77,006—8-6-37.

(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. 3703 Press Mis.
3468
Dated 20-12- 1871.

Not to be folded or roughly handled

No. 347. Read the following letter from the Officiating Superintending Engineer, 5th Division, to the Secretary to Government, Public Works Department, dated Salem, 7th November 1871, No. 177.—

I HAVE the honour to report that in obedience to the instructions contained in G O, No 2,513, dated 3rd October 1871, received by me while on circuit at Ahtoor on 8th idem, I at once telegraphed to Mr. Grainger and proceeded to Bangalore, which I reached on 12th, and there found Mr. Grainger waiting for me.

2. We at once proceeded to make a thorough inspection of the building, our report on which accompanies this

3. I may here summarise our proceedings by stating that we verified in every point the report of the Committee, as forwarded with my letter No. 126, of 5th September 1871, and that we examined, and in several places, the material used in every part of the building, the materials we find to be bad throughout. Further, by the kindness of Dr Nicholson, employed in the analysis of waters at Bangalore, I am enabled to offer an analysis of the composition of the mortar used in the building, as afforded by two specimens taken at random, one from the upper and one from the lower story of the building.

4. This analysis fully confirms the conclusions we had formed as to the very inferior quality of the mortar, and shows that even in the better of the two specimens experimented on, the proportion of lime is as 1 26 instead of 2 3 as it should have been, or that, in other words, the quantity of lime used in the mortar is only about one-seventeenth of what should have been used, further comment on this is unnecessary

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Report on the condition of the Government Bakery, Bangalore.

THE commencement of this building was ordered in G. O, No 3,530, dated 22nd November 1865, and the plan and estimate were sanctioned in G. O., No. 2,295, dated 23rd July 1866

2. According to agreement the building should have been completed by 1st July 1868; the Contractor failed to complete it on that date, the work was taken out of his hands on 20th August 1868, after which time, up to its final completion, on 31st March 1871, Rupees 2,738 were spent on departmental labour. The building may, therefore, be considered as very nearly finished more than three years ago.

3. Within a year of the commencement of the building repeated complaints were made, and remonstrances addressed to the Contractor regarding the progress of the work, and the inferior nature of the materials used, the copies of such memoranda being recorded in the Executive Engineer's office; it appears also that on these points information had been afforded to Government, as they are remarked on in paragraph 7 of G. O, No 100, dated 14th January 1869

4. The orders passed in the foregoing G. O relate, however, only to the manner of dealing with the Contractor, out of whose hands, as previously stated, the building had been taken on the preceding 20th August.

5 In accordance with these orders the Contractor was liberally dealt with as regarded the settlement of his claims, and a fine of Rupees 1,000 imposed on him by the Executive Engineer, Captain Wood, was remitted.

6 We have been unable to get information as to the rates for work executed by the Railway Company at and near Bangalore; but from almost universal experience we think ourselves justified in concluding that they are very much higher than the Department Public Works rates allowed, and assuming that the former are little, if at all, in excess of those required for first class work, we think it a just conclusion that our rates are too low, particularly as regards a building of the class of the bakery, also that a Contractor cannot be expected to supply the best materials and workmanship for such rates, and we consider it just possible that reasoning somewhat of this kind induced Government to adopt the very liberal course pursued towards the Contractor.

7. On 31st August of the current year, the Executive Engineer, Bangalore, forwarded the Proceedings of a special Committee assembled at his request to report on the bakery, and with this a letter in which he states that he had always experienced much anxiety with regard to the building, and that as the causes of this seemed to be increasing in magnitude, he had applied for a Committee to examine and report on it.

8. His letter and the report of the Committee will be found as accompaniments to letter No. 126, dated 5th September, from the Officiating Superintending Engineer, 5th Division, addressed to the Secretary to Government, Public Works Department.

9. With these preliminary remarks we proceed to record the results of our examination.

10. The general design has been adhered to, and alterations made have been sanctioned by competent authority.

11. The foundation of stone in-chunam is of the estimated depth, and may be considered safe, although the mortar used in it, like that used throughout the building, is of very inferior quality. The main walls of the lower-story, including store, machinery, and boiler-rooms, are built with a very inferior kind of brick; it was provided that the walls be faced with table-made bricks, but this has not been done, and not even whole bricks have been used; in such a building we could not with safety examine the interior of the walls, but such being the condition of the exterior, the part most readily examined, it seems a not unfair conclusion that a large proportion of brick-bats has been used throughout.

13. The mortar used is of very inferior description; it has neither adhesion nor cohesion, and can very easily be removed from the joints by the point of the finger and, indeed, when the pointing was removed, the inferior mortar sometimes ran as if it were sand.

13. A comparatively light blow proved in almost every case sufficient to loosen and displace the bricks struck, and the bricks lining the windows and doorways were loosened by a blow of the hand.

14 The bricks appear to have been made of very inferior soil, and not to have been well burned; the outside of the wall, which should have been formed of table-made bricks, has been painted with red ochre, and on this the bond of good brick-work has been painted in white, such bond having been by no means observed in the wall.

Proceedings of the Madras Government, Public Works Department,
20th December 1871.

15. The verandah walls have been built with very roughly dressed stones, an intimate examination of these we could not of course make; but it is to be feared that large cavities, owing to the use of roughly dressed stones, have been filled with the very inferior mortar, which we may here observe seems throughout the building to be very bad. Further, owing to pipes for conveying the drainage water from the roofs having been led down through the middle of the verandah piers, and to leakage (we presume) through their joints, the mortar of these piers is more or less damp, and must be subject to accessions of moisture after every shower of rain, a defect and source of danger, it need scarcely be remarked, of a very serious nature.

16. The dampness of these walls, induced as it must have been from the cause afore-mentioned, affords strong corroboration of the worthless nature of the mortar.

17. The beams supporting the upper-story are almost all pieced, in order to comply with the scantling of the specification, and the pillars on which these beams rest seem to be of material very little better than above remarked on, although the workmanship is better.

18. The stone paving of the verandahs, and some of the lower rooms, is of the kind usually laid at Bangalore, the stones are very easily displaced by bandycoots and rats working under them; the whole of the lower-story, indeed, seems to be infested with vermin, which are even making their way into the walls

19. The material used in the upper-story seems inferior to that in the lower, and the same applies to the workmanship

20. The trusses of the roof are very faulty in design, and have been badly made; what are intended as suspending pieces perform the office of struts, and have caused sagging of the tie-beams, while at the same time the purlins have been drawn from the rafters, which rest mainly on the ridge pole and on the walls, producing an outward thrust in the latter

21. The material used in the terracing of the verandah of the upper-story is so bad that water percolates through it everywhere; the tiles of the roof are of such bad material, and so badly burnt, that they can be broken between the fingers with the greatest ease, and the mortar forming the ridge of the roof is so bad that the rain has acted on it as it would had it been mud

22. We think it unnecessary to enumerate in detail all the defects reported by the Committee, each of which defects we verified, and to whose report we entirely assent.

23 We would observe, however, that the machinery appears to have been well fixed, and that vibration from it would not, in our opinion, at all endanger the building had the material of the latter been ordinarily good; as things have proved, we think the working of the machinery a hazardous experiment.

24. On the whole, looking to the failure already observable, and to our knowledge of the bad material used more or less throughout the building, having also regard to the fact that what cannot be examined, and which we therefore did not see, is presumably rather inferior than otherwise to what we have seen, we would recommend that the machinery room walls be removed to the basement, also the entire upper-story; and that a further examination be then made of the walls of the lower story, also that, in the event of the upper-story being re-built, the bowstring trusses now used be superseded by queen post trusses, or other of a more simple design, and less liable to settlement and failure.

25. We would further recommend that no time be lost in removing the roof of the building, as we consider it decidedly unsafe.

26 While, however, regretting to be obliged to report thus unfavourably of the material used in the building, we cannot help an expression of opinion that the facts now brought forward should afford less cause for surprise if due weight be attached to the lowness of rates and the forcing of the contract system of work

27. With regard to the first, we think it would be instructive were Government to call for a return of the Department Public Works and Railway rates (for brickwork more particularly) at stations where railway work has been done or is in progress

28. We do not suppose it necessary that in all buildings the expensive work used in railway constructions should be adopted, but many of our buildings, the bakery among them, are surely of a class demanding as good material and workmanship as most of the railway structures, and it is very difficult to understand how this can be arrived at when the rates are, to the best of our belief, so very much lower in one case than in the other.

29. We would further point out that, according to the form prescribed and *insisted on*, certificates must state that materials and workmanship are of the best description, in the nature of things, this certificate must become a mere formal matter. In regard of the second point, namely, the contract system, we would remark that its advantages are so obvious that it may be safely left to the discretion of an executive officer to utilize it to the greatest possible extent; but that in a country like this, where dishonesty and corruption is so rampant, and where it is found almost impossible to get a man to carry out work unless he is allowed to supply the material, we would urge that much more latitude be allowed to executive officers with regard to the adoption of the contract system. It may be said that an executive officer is at liberty to work departmentally if he please, nominally so, perhaps, but in reality every discouragement and obstacle is thrown in his way, if he holds more than a most paltry quantity of stock he is looked upon as a criminal of the deepest dye, and his name is prominently brought to the notice of Government, the consequence is that he has to go into the market and take what he can get, it may be good, it may be bad, but his work must not be delayed.

30 We would suggest that, especially in a place like Bangalore, where large works are always in progress, the Executive Engineer should have his own brickfield and lime kilns.

31. There is always a very large demand for native buildings of the cheaper kind of bricks, and, even were they paid for it, contractors are not easily induced to provide the better and larger kind

32 As regards chunam, there are but two ways of testing it, namely, by chemical analysis, or by experiment when made into mortar. If either of these be insisted on, an executive officer's whole time might very well be conceived spent on a single work; while, moreover, in the matter of chemical analysis certain qualifications are required, and some expenditure is necessary

33 We consider it then as beyond doubt that in practice the *only* way to secure good bricks and mortar is that the Executive Engineer should make his own bricks and burn his own lime.

Proceedings of the Madras Government, Public Works Department,
20th December 1871.

34. To such an extent has the contract system been pushed at Bangalore, that Captain Wood informs us it is very difficult to procure labour except through the medium of a Contractor; so convinced are we of the evils of the system as existing that we are glad to learn that he has been authorized to introduce at Bangalore the Madras system of suppliers, men of approved character and considerable means, who agree to supply the whole of certain materials required for the year on a schedule of rates, lodging adequate security and executing a bond for the due fulfilment of their undertaking.

35. Lastly, we would remark that the frequent change of executive officers during the erection of the building must have had any but a beneficial tendency

36. Appended to this is an analysis of two specimens of mortar used in the building, the one taken from the upper, the other from the lower story.

(Signed) J. VERTUE, Captain, R E,
Offg. Superintending Engineer, 5th Division
(Signed) J. N GRAINGER, C E,
General Supt. of P. W. Stores and Workshops.

Soojee Mill and Bakery at Bargalore

—	—	Remarks
	RS	
Colonel E A Foord gave over charge to Lieut -Colonel R A. Roberts on 5th April 1870 Lieut -Colonel Roberts, to Colonel A Boileau, on the 28th January 1871 Captain Tulloch, R E, from December 1865 to January 1867. Expenditure	36,966	This work is progressing most satisfactorily. The Mechanical Engineer has been dangerously ill and unable to attend the works As soon as he recovers the putting up of the machinery will be pushed on One oven has as an experiment been completed It is found to be perfectly successful. It draws admirably
Lieutenant Pennycuick, R E, from February 1867 to September 1867. Expenditure	9,141	Walls and roof of lower-story completed Upper-story verandah, arches, etc, nearly all completed, and terracing in progress Inner walls built up to full height and trusses being laid Machinery room roofed and plastered and ready for reception of machinery.
Captain Meade, R E, from October 1867 to December 1867. Expenditure	7,451	All the arches of the lower-story completed, except a few arches in the bullock room, progress very unsatisfactory
Captain Mayne, R E, from January 1868 to May 1868. Expenditure ..	5,352	Main portion of building completed, chimney completed, roofing of end room in progress
Captain Wood, R E, from June 1868 to date. Expenditure	28,090	Completed, save engine fitting

SALEM,
7th November 1871.

(Signed) J VERTUE, Captain, R.E,
Offg Superintending Engineer, 5th Division

Analysis of two samples of mortar from the Bakery, Bangalore, received from Captain Vertue, R E, 17th October 1871.

Composition on 100 parts

	1st Lower story	2nd Upper story
Coarse and fine sand 1st 92 2nd 87	96 5	93 5
Very fine sand and clay . 4 5 6 5		
Carbonate of lime	3 5	6 5
	100	100
The quantities of carbonate of lime correspond to—		
Quick lime	1 96	3 64
Theoretically 31 per cent increase / Slaked lime		
Practically 40 per cent increase for absorption of water on slaking \ at 40 per cent increase	2 74	5 1
The proportion of materials used in making the mortars were therefore by weight—		
Sand	35 parts to 1 part	18½ parts to 1 part.
Slaked lime		

Enclosed* are the actual constituents extracted in the analysis of the above mortars, 184 grains and 147 grains being respectively taken The carbonate of lime may be taken as more than equal, bulk for bulk, to the slaked lime in the fresh mortar.

* In two packets each containing three papers.

BANGALORE,
19th October 1871

(Signed) E NICHOLSON,
Assistant Surgeon, R A,
Analyst of Waters, Mysore, Northern and Ceded Districts.

No 347A Memorandum by the Chief Engineer and Secretary to Government, Department Public Works, dated 19th December 1871.

I BEG to report, for the information of Government, that I proceeded to Bangalore to inspect the new Bakery, and that I concur generally in the Committee's Report. Nothing could be worse than the quality of the mortar used in the building throughout In the lower story the bricks I would call good, but in the upper portion of the building they are very inferior, and much of the bricklayer's work is very bad. I was somewhat surprised to find the indications of failure in the building and of the collapse of the roof not very serious, and I do not go so far as to say that I consider there is danger of the roof falling in and the walls being thrown down. At the same time I must admit that the trusses are much out of shape, and they are supposed to have so altered their form from want of stability to sustain the weight of the tiles that the roof is covered with. Bearing this in mind, and knowing that the weight would be greatly increased in heavy rain, I hesitate to say that I think the roof will not sink more, and if it does, it must be expected to thrust out the walls and to fall in. I would accordingly support the Committee's recommendation to remove the roof and the walls of the upper story, and looking to the bad construction of the walls in the machinery room, and

the purpose for which it is to be used, I also approve of the Committee's proposal to dismantle that portion of the building to the basement.

No. 348. ORDER THEREON, 20th December 1871, No. 3,203.

MILITARY WORKS, No. 10.

THE Government direct that immediate measures be taken for carrying out the suggestions made to ensure the safety of the Government Bakery at Bangalore by the Committee appointed to examine the structure. The roof of the building, together with the entire upper story, should accordingly be removed without delay by the Acting Superintending Engineer and the walls of the machinery room dismantled to the basement.

2. Funds for the work will probably be available from the Budget allotment* for the Ulsoor Project, the anticipated saving under which grant should be reported as early as practicable.

* Rupees 25,000.

3. The responsibility attaching to the several officers employed in the execution or superintendence of this building will be noticed hereafter.

(True Extract.)

Colonel, R.E.,
Secretary to Government.

To the Acting Superintending Engineer, 5th DIVISION
„ Controller of Public Works Accounts

Exd. S. T. Augustin.

Report on the condition of the Government Bakery Bangalore

The commencement of the Building was ordered in G O No 3530 dated 22d November 1865 and the plan and Estimate were sanctioned in G O No 2295 dated 28th July 1866

2. According to agreement the Building should have been completed by 1st July 1868, the Contractor failed to complete it on that date, the works was taken out of his hands on 20th August 1868, after which time up to its final completion on 31st March 1871, Rupees 2738 were spent on departmental labor, the Building may therefore be considered as very nearly finished more than three years ago.

3. Within a year of the commencement of the Building repeated complaints were made and remonstrances addressed to the Contractor regarding the progress of the work, and the inferior nature of the materials used, the copies of such memoranda being recorded in the Executive Engineer's office, it appears also that on these points information had been afforded to Government, as they are remarked on in para 7 of G O No 100 dated 14th December 1869.

The orders passed in the foregoing G O relate however, only to the manner of dealing with the Contractor, out of whose hands as previously stated, the Building had been taken on the preceding 20th August.

In

In accordance with these orders the Contractor was liberally dealt with, as regarded the settlement of his claims, and a fine of Rupees 1000 imposed on him by the Executive Engineer, Captain Wood, was remitted.

We have been unable to get information as to the rates for work executed by the Railway Company at and near Bangalore, but from almost universal experience, we think ourselves justified in concluding that they are very much higher than the DPW rates allowed, and assuming that the former are correct, if at all, in excess of those required for first class work, we think it a just conclusion that our rates are too low, particularly as regards a Building of the class of the Battery, also that a Contractor cannot be expected to supply the best materials and workmanship for such rates, and we consider it just possible that a reasoning somewhat of this kind induced Government to adopt the very liberal course pursued towards the Contractor.

On 31st August of the current year the Executive Engineer Bangalore forwarded the Proceedings of a special Committee assembled at his request to report on the Battery, and with this a letter in which he states that he had always experienced much anxiety with regard to the Building, and that, as the causes of this seemed to be increasing in magnitude, he had applied for a Committee to examine and report on it.

This letter and the report of the Committee will be found as accompaniments to letter No 126 dated 5th Sept. from the Officiating Superintending Engineer 5th Division addressed

addressed to the Secretary to Government P.W.D.

With these preliminary remarks, we proceed to record the results of our examination.

The General design has been adhered to, and alterations made have been sanctioned by competent authority.

The Foundation of Stone in chunam is of the estimated depth, and may be considered safe, although the mortar used in it, like that used throughout the building is of very inferior quality. The main walls of the Lower Story, including Store, Machinery, and Boiler rooms, are built with a very inferior kind of Bricks; it was proposed that the walls be faced with Cube-made Bricks, but this has not been done, and not even whole Bricks have been used in such a Building we could not with safety examine the interior of the walls, but such being the condition of the exterior, the part most readily examined, it seems a not unfair conclusion that a large proportion of Brick-bats has been used throughout.

The mortar used is of very inferior description, it has neither adhesion or cohesion, and can very easily be removed from the joints by the point of the finger, and, indeed, when the pointing was removed, the interior mortar sometimes ran as if it were sand.

A comparatively light blow proved in almost every case sufficient to loosen and displace the Bricks struck, and the Bricks lining the windows and door ways were loosened by a blow of the hand.

The

The Bricks appear to have been made of very inferior soil, and not to have been well burned; the outside of the wall, which should have been formed of table-made Bricks, has been painted with Red-ochre, and on this the Bond of good Brick work has been painted in white, such Bond having by no means observed in the wall.

The verandah walls have been built with very roughly dressed stones; an intimate examination of these we could not of course make, but it is to be feared that large cavities owing to the use of roughly dressed stone have been filled with this very inferior mortar, which we may here observe seems throughout the Building to be very bad. Further, owing to pipes for conveying the drainage water from the roofs having been led down through the middle of the verandah piers, and to leakage (we presume) through their joints, the mortar of these piers is more or less damp, and must be subject to accessions of moisture after every shower of rain, a defect, and source of danger, it need scarcely be remarked, of a very serious nature.

The dampness of these walls, induced as it must have been, from the cause afore-mentioned, affords strong corroboration of the worthless nature of the mortar.

The Beams supporting the Upper Story are almost all pieced, in order to comply with the scantling of the specification, and the pillars on which these Beams rest seem to be of material, very little better than above remarked on, although the workmanship is better.

The Stone paving of the verandahs and some of the lower rooms, is of the kind usually laid at Bangalore, the

the stones are very easily displaced, by Bandy-coots and rats working under them; the whole of the lower story indeed, seems to be infested with vermin, which are even making their way into the walls.

The material used in the Upper-Story seems inferior to that in the Lower, and the same applies to the workmanship.

The Trusses of the roof are very faulty in design, and have been badly made; what are intended as suspending pieces perform the office of struts, and have caused sagging of the Tie-beams, while at the same time the Purlins have been drawn from the Rafters, which rest mainly on the Ridge Pole and on the walls, producing an outward thrust in the latter.

The material used in the Terracing of the verandah of the upper story is so bad that water can percolate through it every where, the Tiles of the roof are of such bad material, and so badly burnt, that they can be broken between the fingers with the greatest ease, and the mortar forming the Ridge of the roof is so bad that the rain has acted on it as it would, had it been mud.

We think it unnecessary to enumerate in detail all the defects reported by the Committee, each of which defects we verified, and to whose report we entirely assent.

We would observe, however, that the machinery appears to have been well fixed, and that vibration from it would not in our opinion at all endanger the building, had the material of the latter been ordinarily good;

as

as things have proved we think the working of the Machinery a hazardous Experiment

On the whole—looking to the failure already observable, and to our Knowledge of the bad material used more or less throughout the Building, having also regard to the fact that what cannot be examined, and which we therefore did not see, is presumably rather inferior, than otherwise, to what we have seen, we would recommend that the Machinery room walls be removed to the basement, also the entire upper story and that a further examination be then made of the walls of the lower story, also that, in the event of the Upper story being rebuilt, the Bowstring Trusses now used be superceded by Queen post trusses, or other of a more simple design, and less liable to settlement and failure.

We would further recommend that no time be lost in removing the roof of the Building, as we consider it decidedly unsafe.

While however regretting to be obliged to report thus unfavorably of the material used in the Building, we cannot help an expression of opinion that the facts now brought forward should afford less cause for surprize, if due weight be attached to the lowness of rates and the forcing of the Contract system of work.

With regard to the first we think it would be instructive were Government to call for a return of the DPW and Railway rates (for Brickwork more particularly) at stations where railway work has been done or is in progress.

We do not suppose it necessary that in all Buildings the expensive work used in Railway Constructions should be adopted, but many of our Buildings, the Bakery among them, are surely of a class demanding as good material and workmanship as most of the Railway structures, and it is very difficult to understand how this can be arrived at when the rates are, to the best of our belief, very lower so much, in one case than in the other.

We would further point out that, according to the Form prescribed and insisted on, certificates must state that materials and workmanship are of the best description; in the nature of things, this certificate must become a mere formal matter. In regard of the 2nd point viz. the Contract system we would remark that its advantages are so obvious that it may be safely left to the discretion of an Executive Officer to utilize it to the greatest possible extent, but that in a country like this, where dishonesty and corruption is so rampant, and where it is found almost impossible to get a man to carry out work unless he is allowed to supply the material, we would urge that much more latitude be allowed to Executive Officers with regard to the adoption of the Contract system. It may be said that an Executive Officer is at liberty to work Departmentally if he please. Nominally so, perhaps

perhaps, but in reality every discouragement and obstacle is thrown in his way; if he holds more than a most paltry quantity of Stock, he is looked upon as a criminal of the deepest dye, and his name is promptly brought to the notice of Government; the consequence is that he has to go into the market and take what he can get, it may be good, it may be bad, but his work must not be delayed.

We would suggest that, especially in a place like Bangalore, where large works are always in progress, the Executive Engineer should have his own Bricks-field and Lime-kilns.

There is always a very large demand for native buildings of the cheaper kind of Bricks, and, even were they paid for it, Contractors are not easily induced to provide the better and larger kind.

As regards Chunam there are but two ways of testing it. Viz by Chemical Analysis, or by experiment, when made into mortar. Neither of these be resorted on, an executive Officer's whole time might very well be concerned spent on a single work, while, moreover, in the matter of Chemical Analysis certain qualifications are required, and some expenditure is necessary.

We consider it then as beyond doubt that in practice the only way to secure good bricks and mortar is that the Executive Engineer should

should make his own bricks and burn his own lime.

To such an extent has the contract system been pushed at Bangalore that Captain Wood informs us it is very difficult to procure labor except through the medium of a Contractor, so convinced are we of the evils of the system as existing that we are glad to learn that he has been authorised to introduce at Bangalore, the Madras system of suppliers, men of approved character and considerable means, who agree to supply the whole of certain materials required for the year on a schedule of rates, lodging adequate security and executing a bond for the due fulfilment of their undertaking.

Lastly we would remark that the frequent change of executive officers during the erection of the building must have had any but a beneficial tendency.

Appended to this is an analysis of two specimens of mortar used in the Building, the one taken from the Upper, the other from the Lower story.

James Bertram Captain R.E
Offg. Supg. Engineer 5th Div.

J. H. Spranger C.E
General Superintendent
of P.W. Stores & Workshops.

Analysis of 2 samples of mortar from the Bakery, Bangalore received from Captain Vertue RE. 17th October 1871.

Composition in 100 parts.

	1°	2°	1° Lower Story	2° Upper Story.
Coarse and fine sand	92	87	96.5	93.5
Very fine sand & clay	4.5	6.5	3.5	6.5
Carbonate of lime			100	100

The quantities of carbonate of lime correspond to—

Quick lime	1.96	3.64
Theoretically 31 p% increase / Practically 40 p% increase for absorption of water slaking } slaked lime &c 40 p% increase	2.74	5.1

The proportion of materials used in making the mortars were therefore, by weight.

Sand	35 parts to	18⅓ parts to
Slaked lime	1 part	1 part.

Enclosed* are the actual constituents extracted in the analysis of the above mortars 184 grs and 147 grs being respectively taken. The Carbonate of lime may be taken as more than equal, bulk for bulk, to the slaked lime in the fresh mortars.

* in 2 packets each containing 3 papers.

(sd) Edward Nicholson
Apth Surgeon R.A.
Analyst of Waters Mysore, Northern & Ceded Districts.

Bangalore
19th October 1871

(True Copy)

James Vertue Captain R.E.
Offg. Supg. Engineer 5th Dn

Enclosure in Ex. Engr's Letter No. 5444 of 19th October 1871 to the Commandant Kistna Field Force Bangalore.

Report on the Examination of Mortar Received from Captain Vertue R.E. Bangalore.

Enclosure in letter from Lieut Colonel R.A. Roberts dated 5th April 1870.
Lieut Colonel Roberts to Colonel A Boileau dated 28th January 1871.
No. 5445/71.

Joojee Mill and Bakery at Bangalore.

			Remarks.
Colonel E.A. Frood gave over charge to Lieut Colonel R.A. Roberts on 5th April 1870. Lieut Colonel Roberts to Colonel A Boileau on the 28th January 1871.			
Captain Tulloch R.E. from December 1866 to January 1867.	Expenditure	36,966	This work is progressing most satisfactorily. The Mechanical Engineer has been dangerously ill, and unable to attend the works. As soon as he recovers, the putting up of the Machinery will be pushed on. One oven has as an experiment been completed. It is found to be perfectly successful. It draws admirably.
Lieut. Bunnycastle R.E. from February 1867 to September 1867	do	3140	Walls & roof of lower story completed. Upper story verandah, arches &c nearly all completed, and terracing in progress. Lumber walls built up to full height & trusses being laid. Machinery room roofed & plastered & ready for reception of machinery.
Captain Meade R.E. from October 1867 to December 1867	do	7451	All the arches of the lower story completed except a few arches in the bullock room; progress very unsatisfactory.
Captain Mayne R.E. from January 1868 to May 1868.	do	5352	Main portion of building completed, Chimney completed, roofing of end room in progress.
Captain Wood R.E. from June 1868 to date.	do	28090	Completed, save Engine fittings

James Tulloch
Captain R.E.
Offg Supg Engineer 5th Div

Supg Engr's Office 5th Div
Salem 7th November 1871

No 1117.

Suppg. Engrs Office 5th Divn
Salem 7th November 1871.
23d

From,

The Offg. Suppg. Engineer
5th Division.

To The Secretary to Government
M. & W.

Sir,

I have the honor to report that
Enclosures 3. in obedience to the instructions contained
in G. O. No. 2513 dated 3d October 1871
received by me while on circuit at
Ahtoor on 8th Idem, I at once telegraphed
to Mr Grainger and proceeded to
Bangalore, which I reached on 12th, and
there found Mr Grainger waiting for
me.

2. We at once proceeded to make
a thorough inspection of the Building,
our report on which accompanies this.

3. I may here summarise our proceedings by stating that we verified in every
point the report of the Committee, as
forwarded with my letter No 126 of 5th
September 1871, and that we examined,

The Secy to Govt
Public Works Dept
Madras

P. W. 345-71.

and in several places, the material used in every part of the Building, the materials are find to be bad throughout. Further, by the kindness of Dr. Nicholson, employed in the Analysis of waters at Bangalore I am enabled to offer an Analysis of the Composition of the mortar used in the Building, as afforded by 2 Specimens taken at random, one from the upper, and one from the Lower Story of the Building.

4. This Analysis fully confirms the Conclusions we had formed as to the very inferior quality of the mortar, and shows that even in the better of the 2 Specimens experimented on, the proportion of Lime is as 1:26 instead of 2:3 as it should have been, or that in other words, the quantity of Lime used in the mortar is only about $\frac{1}{17}^{th}$ of what should have been

used; further comment on this is unnecessary.

I have the honor to be
Sir,
Your most obt. Servt.
James Mylne Captain R.E.
Offg. Supg. Engineer
5th Div.

and in several places, the material

No. 3203.

~~With reference to the report of the Committee appointed to examine the Government Bakery at Bangalore which is now before Government, His Excellency the Governor in Council is pleased to~~

The Government direct that immediate measures be taken for carrying out the suggestions made to ensure the safety of the

reported

No. 3 Bdy/1832-33

P.W. 1871 Mad. No. 5445

The Offg. Supdg. Engineer, 5th Division

To The Secy to Government

Dated 15th November
Recd. 15th November

No. 4114

Enclosure 3.

Bellary and Bangalore

Submitting report on the condition of the Government Bakery at Bangalore

No. 3203-20 Decr/71.

and Railway at Bangalore be appointed to examine the structure.

~~of the structure~~ The roof of the building together with the entire upper story should accordingly be removed without delay by the Actg Supg Engineer and the walls of the Machinery room dismantled to the basement.

Funds for the work will probably be available from the budget allotment for the Ulsoor Project, the anticipated saving under which ground should be reported as early as practicable.

Initialled
14th

To The Actg Supt Engr 5th Circle
Controller
Bgde 22/12/71

Memorandum by the Chief Engineer and Secretary to Govt P.W.D. dd 19th December 1871.

I beg to report for the information of Government that I proceeded to Bangalore to inspect the new Bakery, and that I concur generally in the Committee's report. Nothing could be worse than the quality of the mortar used in the building throughout. In the lower story the bricks I would call good, but in the upper

upper portion of the building they are very inferior, and much of the bricklayer's work is very bad. I was somewhat surprised to find the rustications of failure in the building and of the collapse of the roof not very serious, and I do not go so far as to say that I consider there is danger of the roof falling in and the walls being thrown down. At the same time I must admit

that the trusses are much out of shape, and they are supposed to have so altered their form from want of stability to sustain the weight of the tiles that the roof is covered with. Bearing this in mind, and knowing that the weight [illegible] would be greatly increased in heavy rain I hesitate to say that I think the roof will not sink more, and if it does, it must be expected to [illegible] thrust out the walls and to fall in - I [illegible]

I would accordingly support the Committees recommendation to remove the roof and the walls of the upper Story, and looking to the bad construction of the walls in the Machinery room, and the purpose for which it is to be used, I also approve of the Committee's proposal to dismantle that portion of the building to the basement.

Dec. 19th

For Orders

I would adopt the suggestion of the Committee as to the work done, a report should be called for shewing exactly the dates of the different Executive Officers took charge & left charge. The same respecting the Superintendent, Engineer

The report of the Committee appointed to enquire into the condition of the new Bakery at Bangalore is circulated.

This report shews both the workmanship and the materials, especially the bricks and mortar, used were of the most inferior

inferior kind, the mortar indeed being mortar only in name. The greater portion of the building by far appears to have been constructed while Captain St Vallock was the Executive Engineer and Mr. St. Standish Lee and Patrick Lee the Contractors.

The Committee it will be observed recommend that no time be lost in removing the roof of the building as they consider it decidedly unsafe: they also recommend the removal of the whole of the upper story of the building and that the walls of the Machinery room should be dismounted to the basement and I am afraid that the Committee's opinion, taken in connection with the report of the other Committee which is printed with G.C. No 2513, 3rd October 1871 leaves no option in the matter.

employed in the 5th Division during the progress of the work.

Nov. 21st

R. Anders

Clic. Subs.
Ltr

Govt. of [1871] Madras.

PUBLIC WORKS.

To Executive Engineer
5th Circle

Dated

Rec'd

G 020 Received No. 3203.

Nos. 347 & 348

Bakery & Lorjee Mill at Bapatla

Forwarding a letter from the Supt. of the 5th Div. Inclosing report on the condition of the Govt. Bakery & Lorjee Mill at Bapatla—

P. 4 Orders