

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

17th August 1881, No. 2,018 W.

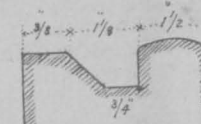
Buildings and Roads.
Civil Works.

Read the following papers:—

No. 65. MEMORANDUM by Major A. T. FRASER, R.E., on Steam Tramways for the Metalled Roads of India.

BEING at Wellington, New Zealand, in November 1879, where a steam tramway, two miles long, is in operation, I was much struck with the ease with which it was worked, the simplicity of construction, and the evident applicability of the system to Indian roads. The trains, consisting of an engine and two coupled omnibuses, were carried with steadiness and certainty, at a speed of ten miles an hour, over just such roads and gradients as are usual in India. There was no interruption of the ordinary traffic. The trains stopped like horsed omnibuses to take up and let down passengers, they turned sharp round the corners of streets, and went up inclines of one in thirty-five. It was marvellous with what unconcern stones, mud, and chance rubbish were passed at full steam, and though the groove in the rails was exceedingly slight the train showed no tendency to leave the line. The switches were simple hinged bars which the conductor got down and adjusted with his foot; the points, sidings, and crossings were all of the plainest and most obvious description, formed chiefly by common workmen out of the rails themselves. At one end of the line there was a shed to accommodate the rolling stock, and a small workshop for repairs. It was quite clear that if such a tramway could be run for two miles upon a comparatively uneven road, which accommodated at the same time a heavy traffic of quick moving vehicles; there was nothing to prevent its being successfully introduced for much longer distances on the metalled roads in India.

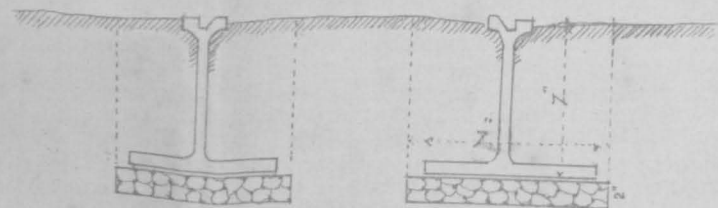
As regards its rails, the Wellington tramway is not a model for adoption. The rails are simple bars of iron, of about 3 inches by 1 inch in section, rolled with a groove. So far, being capable of being turned out in India, they have a useful form, but they require to be supported on a strong frame-work of longitudinal and cross sleepers, which would be much too costly for the ordinary roads. Perhaps if Portland cement concrete could be laid as a substructure instead of timber, bar rails could be fastened to slabs of concrete and thus employed. The plain bar is the handiest rail as well as the earliest pattern used on tramways, and experiment with concrete is desirable. In rolling however attention has to be given to the shape of the groove. Mr. Clark lays down the best form as that which has the side next the rolling surface vertical, and the whole of the slope on the inner side; or such a section as the following:—



It has been found that a depth of flange of only half an inch is sufficient to keep the wheels on the line. I saw a similar tramway to that at Wellington in work at Dunedin.

The only part of the Indian tramway problem which remained unsolved by what I observed in New Zealand was how to support the rails without the use of large quantities of expensive timber.

I happened to visit Manchester in April 1880, and there accidentally noticed a new description of steel tramway rail being laid in one of the streets, which was just the kind of permanent-way wanted for India. A diagram of the section is as under:—



Two parallel trenches were dug in the roadway, barely a couple of inches of concrete laid down, and upon this the flanges of two deep rolled steel joists having the top member formed into a tramway rail. The joists were rolled of one piece in 30 feet lengths, and I am informed the groove was subsequently planed out. When laid they were fished at the joints and the causeway was packed to restore the roadway.

It is obvious that such a rail is likely to keep a firm position imbedded in the metal of a road and, as it dispenses with all timber, is exactly suited to Indian requirements. Having been only recently introduced in England, so much so as not to be even noticed in the latest books on tramways, particulars as to its durability cannot be given, and in any case trial is necessary under Indian conditions before its advantages, which may be safely predicted, can be determined.

But if these steel rails turn out to be all they promise tramways can be opened with great rapidity. For unlike railways, which require surveys of new routes, a fresh set of cuttings and embankments and bridges, and supersede existing roads formed and maintained at considerable expense, tramways can be laid down on the roads as they stand, almost as quickly as the rails are delivered. No station buildings are required along the line, road and tramway maintenance can be amalgamated, and the ordinary traffic can still use the roads. But it is worth mentioning that while the traction on common macadamized roads is 44 to 67 lb. per ton on a level, it is only 17 to 25 lb. per ton on tramways. Hence it is probable that private enterprise would largely place cattle-drawn trucks on the line in addition to the public steam-trains, for which every facility could be given by appropriate crossings.

The engines on the Wellington tramway bore the name of Messrs. Merryweather and Sons, the makers of steam fire-engines in London. I have called at their office in Greenwich and obtained rough estimates of the plant needed to work a tramway.

Messrs. Merryweather can furnish a passenger tramway car, like those in photographs A and B, weighing 50 cwts. unloaded, and 5 tons loaded with 26 passengers inside and 20 outside for £250.

A locomotive of about 20 horse-power, weighing 7 to 8 tons, capable of a speed of 15 miles an hour, would, for occasional gradients of 1 in 30, draw three such cars and cost from £850 to £1,000.

They can supply goods wagons weighing 40 to 60 cwts., according as they are covered or open, at a cost of £180 to £200. The wagons will carry from 3 to 4 tons of goods.

A cheaper kind of passenger car seated for 20 placed back to back, as in photograph C, can be supplied for £60 to £80 each, and the cross seated pattern of photograph B for £130 each.

For India the working parts of the engine would have to be lifted out of reach of the dust which is so prevalent on the roads, and the furnace would have to be adapted to burn wood.

Merryweather's engine is stated to require 550 lb. coke per 100 miles run at $8\frac{1}{2}$ miles an hour average speed, from which basis calculations can be made of the demand of fuel for an Indian tramway.

It would not be difficult, as part of a tramway scheme, to have enough land taken up and forest planted to yield a constant supply of firewood along each line. India has no coal in the south, but can make up for this by the rapidity with which the growth of timber proceeds. Firewood could indeed be produced in India with far greater ease than the cattle food which would contribute an equal tractive force.

Although there are many tramways working, chiefly, however, in towns, I have not seen a single example which combines the rough and ready characteristics of the New Zealand lines with the use of the Manchester steel rail.

To give this system therefore a fair trial it would be necessary to lay down a few miles of tramway on a selected metalled road in India. There are obtainable at once in the market, the rails, cars and locomotives suited for the experiment.

For a length of 15 miles, or one and-a-half hours run at 10 miles an hour, the rough estimate would be as follows:—

	£.
2,541 tons of steel rail (10 per cent. spare) at £11-15	29,857
Freight ...	3,811
3 Locomotives at £850	2,550
6 Passenger cars at £250	1,500
2 Open passenger cars at £80	160
4 Goods wagons at £200	800
Weight ...	75
	38,753
at 1/9d per Re.	Rs. 4,42,891
15 miles laid, &c., in India at Rs. 2,000	30,000
Sheds and Workshop	8,000
	Rs. 4,80,891

so that for Rs. 4,81,000, or at the rate of Rs. 32,000 a mile, an experimental tramway 15 miles long could be set in operation.

Mr. Clark, an authority on tramways, mentions that the locomotives made by Messrs. Merryweather, from their moderate speed and indraught, only consume from a third to a fourth the fuel that a railway engine does per square foot of grate.

Six trains each way on 15 miles would give a train mileage of 180 miles, and a consumption of 990 lb. of coke, equivalent to 2,970 lb. or $1\frac{1}{3}$ tons of inferior firewood, during a day. Beyond fuel the working expenses would consist of the wages of a conductor for each car, a couple of stokers for each locomotive, a clerk or two to keep accounts, oil and petty stores, and a certain sum, yet to be ascertained, for renewals and repairs.

A mere allusion may be made at present to the prospect opened up by Colonel Beaumont's compressed air locomotive. It is stated that one of these, weighing $4\frac{1}{2}$ tons, with reservoirs for air at 1,000 lb. per square inch pressure affording 65 cubic feet space, can run for $6\frac{1}{2}$ miles on a level with a load of 4 to 5 tons. This type of engine will no doubt be further improved.

It would be convenient to have stationary compressing engines at fixed intervals, and that the locomotives should only carry air. Still more so when economical means of transferring power to a distance at pleasure through electro-motors has been discovered.

Meantime the question is whether rolled steel rails can be laid profitably as tramways on Indian roads. For better forms of rolling stock can hardly be imagined than those now procurable.

It may be asked why, if tramways are so cheap and simple, they are not universally put on the roads. As a matter of fact the system meets with a good deal of prejudice, and the countries which have adopted them in towns are those in which for the country a higher rate of speed is demanded than tramways can pretend to give. But nothing seems to have retarded their introduction more than the cumbrous staging which has hitherto formed the permanent-way of tramways.

LONDON,
2nd September 1880.

(Signed) A. T. FRASER.

No. 65-A. *Note by the Consulting Engineer for Railways on relative Cost of Broad and Metre Gauge Railways.*

For purposes of comparison based on the experience obtained in this Presidency, we may take the South Indian Railway which has constructed lines on both gauges. The cost of the 168 miles of broad gauge between Negapatam and Erode averaged, on 30th June 1870, £7,902 per mile. It had then been open on an average for nearly six years; and, on 30th June 1874, the cost had risen to £8,470 per mile. Since the latter date no separate accounts of it have been kept.

The cost of the 215 miles of metre gauge line south of Trichinopoly averaged, at the end of 1878, when it had been open for more than three years, a little over £5,000 per mile. The cost of the line from Madras to Tanjore is somewhat higher, and will probably average at the present time about £6,000 per mile.

The sections between Negapatam and Erode, and between Trichinopoly and Tuticorin, compare fairly as to the nature of the country traversed. Both have the same ruling gradient (1 in 100), and the amount of waterway per mile is probably nearly equal. Figures are not at hand for the old line; but the openings provided on the other section average 45 lineal feet per mile, which is somewhat below the average of other lines in this Presidency.

The permanent-way for the metre gauge lines was purchased when the price of iron was at its maximum; and, at present prices, a considerable saving would be effected.

The Madras Railway has cost £11,800 per mile; but the country traversed is more difficult than in the case of the South Indian Railway.

Owing to the experience gained in past years, it may be assumed that broad gauge lines could now be constructed somewhat more cheaply. The Nilgiri branch of the Madras Railway cost about £8,000 per mile, exclusive of rolling stock; and it is estimated that a branch to Cochin would not cost more than £9,000 per mile; also excluding rolling stock.

The figures here given provide for a first-class line of broad gauge railway. We have no experience of *light* broad gauge lines with rails weighing 56 or 60 lb. per yard, and with engine wheel-weights to correspond. The rails for the Madras Railway, and South Indian broad gauge, weigh 75 and 68 lb. respectively.

The accompanying Proceedings of Government contain some information respecting the cheapest lines of railway yet constructed in this country. The Muttra-Hathras line, therein referred to, has yielded an average dividend of 4.9 per cent. during the last three years.

The class of line to be selected must depend much on the nature of the country traversed, and the speed required. In difficult country the difference in cost between the broad and narrow gauge would probably be much greater than shown on the South Indian Railway. A metre gauge line can be opened out at reasonable cost, even through difficult country, *e.g.*, the line from Karwar to Gadak is estimated at £7,560 per mile only, including land, and interest during construction. In moderately easy country a metre gauge line could probably be opened out for Rs. 45,000 to Rs. 50,000 per mile, at present prices of iron, if station accommodation be restricted to actual wants and the speed be limited to 15 miles an hour. As the Vizagapatam lines will link in with the metre gauge extension of the Nagpur branch probably this would be the best gauge to adopt; but the country might be opened up at first by a tramway, if considered sufficient for the traffic expected. Some useful information on this point could probably be obtained from the Government of India, in regard to the Darjeeling tramway.

The following extract is a summary of Mr. Molesworth's conclusions respecting the broad and metre gauges:—

1st.—The capacity of the metre gauge is sufficient for all purposes of railway transport.

2nd.—The carriages and wagons on the metre gauge railway are nearly equal in capacity to the ordinary stock of English railways.

3rd.—The locomotives designed for low speed on the metre gauge are equal in tractive force to the large express engines designed for high speed on English railways.

4th.—The rolling-stock of the metre gauge will be perfectly safe at a speed twice as great as that proposed for the State Railways of India.

5th.—The metre gauge, in my (Mr. Molesworth's) opinion, is sufficient for all commercial and military purposes.

6th.—The cost of a broad gauge railway (60 lb. rails), with structures designed for the engines and other rolling-stock of the Guaranteed Railways, will (excluding very large bridges) exceed the cost of the narrow gauge by £1,650 or £2,000 per mile.

7th.—The cost of a broad gauge railway (45 lb. rails), with structures designed only for the carriage and wagon stock of the Guaranteed Railways, (but not for the engines,) will exceed the cost of a narrow gauge railway by £720 or £1,000 per mile.

8th.—The cost of a broad gauge railway (40 lb. rails), with structures designed for the same axle-loads as the narrow gauge, will exceed the cost of a narrow gauge railway by £350 or £500 per mile.

9th.—The last of these three would practically be as great an obstacle to the interchange of traffic as if a break of gauge existed.

10th.—There will be no appreciable difference between the working expenses of the broad and narrow gauge railways.

11th.—The break of gauge in a commercial point of view, though an evil, is not one sufficient to justify the condemnation of the narrow gauge.

(Signed) J. SHAW-STEWART, Col., R.E.,
Consulting Engineer for Railways.

6th October 1880.

No. 65-B. *Steam Tramways for India, an introductory pamphlet by Mr. CLAUDE VINCENT, A.M.I.C.E., Under Secretary to Government, Public Works Department, Irrigation Branch.*

No. 66. *Note by the Chief Engineer, Public Works Department.*

THE questions now under the consideration of Government with reference to the Famine Code, as also the correspondence as yet incomplete with the Government of India on the subject of "Protective" works, appear to invite special attention to the applicability of steam tramways for certain selected lines in the famine zone of this Presidency.

2. The Famine Commission (page 169 to 171, Part I of their Report) have gone at length into the subject of railways as a means of distributing food in famine, and they have assumed as an ideal system a series of lines, each 300 miles long, serving 25 miles of country on either side.

3. This was much the same as the plan Sir Andrew Clarke had previously in view when, in his speech in the Viceroy's Council on famine works, he observed that, "the railway system must continue to expand and will expand till every inhabitant of India is within 50 or 100 miles of a railway."

4. When applied, however, to the actual circumstances of the famine zone in this Presidency there are two very patent difficulties to be encountered:—

- (1.) Neither the Indian nor the metre gauge railways can be built with any hope in ordinary years of yielding any adequate return on their prime cost.
- (2.) Unless a sufficiently close net-work of lines be established, the means for distributing food grains will not meet the requirements of extreme famine, accompanied, as was the case in the last calamity, by the great loss of draught cattle.

5. Sir Andrew Clarke well observed in his speech that, "A grass famine may be said to be as bad as a grain famine," and the Famine Commission remark, "In

time of drought and famine the substitution of mechanical for animal power for purposes of transport is another very important advantage which it is not possible to reckon by any money standard."

6. Again, in his late pamphlet on steam tramways, Mr. Vincent remarks that the block at the Raichore Railway Station during the last famine, owing in very great measure to the thousands of bullocks that had died, "must have been seen to be believed."

7. Although it cannot for a moment be supposed that by the adoption of a cheap system of steam tramways for aiding in the distribution of food-grains during famine, the difficulties above adverted to can by any means be entirely overcome, it is still clear that they can be in great extent minimised.

8. As regards the question of expense, it will be seen from the annexed memorandum by Colonel Shaw-Stewart that, "In a moderately easy country a metre gauge line could probably be opened out for Rs. 45,000 to Rs. 50,000 per mile at present prices of iron, if station accommodation be restricted to actual wants and the speed be limited to 15 miles an hour."

9. In his pamphlet Mr. Vincent gives, as an approximate estimate, for a steam tramway on the standard $5\frac{1}{2}$ feet gauge, 15 miles in length, with Bessemer steel rails, 35 lb. to the yard, £2,500 (or Rs. 30,000 at 1s. 8d. per rupee) per mile; and for a similar work on the metre gauge, with steel rails 30 lb. to the yard, £2,200 or Rs. 26,400 to the mile.

10. Major Fraser, in his memorandum of the 2nd September 1880, gives also as his estimate for 15 miles of tramway on the Merryweather system the probable cost at Rs. 32,000 per mile.

11. Colonel Shaw-Stewart's estimate for a metre gauge railway does not, it is believed, include the cost of locomotives and rolling stock, while these are included in the above; it may therefore apparently be accepted *prima facie* that steam tramways on even the broad gauge could be built at two-thirds the prime cost of metre gauge railways.

12. But as the problem to be solved requires as a *sine qua non* that all outlay shall be reduced to an absolute minimum compatible with the attainment of the immediate object in view, it does not appear improbable that a very sensible reduction could be effected even on the low estimates above.

13. It is, in the first place, well recognised that the metre gauge for State Railways was a compromise of conflicting opinions, and that $2\frac{1}{2}$ feet represented much more nearly the width of a truly narrow gauge. The Port Modoc line is only 1 foot $11\frac{1}{2}$ inches gauge and works up to 30 miles per hour.

14. There may be technical objections to a gauge of 2 feet in reference to the most economical form for the engines, but if these could be overcome there is no other reason apparently against its adoption.

15. Speeds again of 15 and 20 miles per hour are solely accepted on the demands of the British travelling public, but are by no means applicable to the case under consideration, 6 or 7 miles per hour average speeds with 10 miles as a maximum would, it is thought, amply suffice.

Throughout the famine zone the beds of large streams and rivers are quite dry excepting for a very few days in the year, and they might easily be crossed by causeways, thus saving the cost of all large bridging.

These principles accepted, a corresponding reduction in the metals to 20 lb. or at most 25 lb. per yard might, it is believed, be effected. No fencing and few or no stations would be needed, as pointed out by Major Fraser.

On the whole, therefore, it is not too much to assume that lines of steam tramways might be established along selected routes for Rs. 20,000, or at most Rs. 25,000, per mile, or at little more than double the cost of a metalled and bridged cart road.

It may also be assumed that before very long, by employing compressed air, electro-motors, or other economical means as noticed by Major Fraser, great reductions may be effected in the working expenses.

It is now sufficiently recognized that in the famine zone of this Presidency navigable canals and new irrigation works of a promising, much less of a paying character are out of the question; there would thus appear to be only a choice of two alternatives if famine is to be effectually combated: (1) the people must move to the food on the one line of railway at present existing, or (2) mechanical means of distribution by steam tramways or road engines must be adopted.

For an agricultural population, who require to be sufficiently near the fields to take instant advantage of a favorable change in the weather, the first plan could hardly be adopted as a general working policy, though no doubt in some cases applicable.

Mechanical means for distribution seem therefore alone left for choice, and of these the ordinary road engine, at least in its present form (excessively cumbersome and expensive to work), is apparently not suitable for adoption.

If the Government are satisfied that an effort should be made in the direction above indicated, the following points might be made subject of early inquiry among selected Revenue and Public Works Officers, viz.:—

(1.) To what tracts tramways as protective works would specially apply.

Bellary.
Kurnool.
Cuddapah.
Nellore.
Chingleput.

North Arcot.
South Arcot.
Salem.
Coimbatore.
Madura.

(2.) The lines in order of importance within the famine zone (which consists of the marginally noted districts) which it might be desirable to carry out.

(3.) The probable cost per mile, the gauge rate of speed, &c.

(4.) A rough estimate of the traffic returns in ordinary years.

(5.) A general idea of the advantages that might result from the lines in famine years.

(6.) Whether, and if so to what extent, applicable outside the famine zone.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

4th August 1881.

No. 67.

ORDER THEREON, 17th August 1881, No. 2,018 W.

THE Honorable the Governor in Council fully concurs in the desirability of instituting the inquiries indicated by the Chief Engineer. The questions brought forward will therefore be considered and reported on as follows by Public Works Officers and such officers of the Revenue Department as may be nominated by the Board of Revenue:—

(1.)—By Superintending Engineers and Collectors.

(2.)—By do. do. do.

(3.)—By the Consulting Engineer for Railways.

(4.)—By Collectors.

(5.)—By do.

(6.)—By the Board of Revenue, through whom the replies of Revenue officers will be submitted.

2. The papers will also be forwarded to gentlemen not immediately in Government service who may be disposed to favor the Government with an expression of their views on the subject.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Govt., P.W.D.

To Superintending Engineers.
To the Consulting Engineer for Railways.
" Board of Revenue.
" Revenue Department.
" Financial "

Exd. S. T. Austin.

Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Gobt. of (1881) Madras.
PUBLIC WORKS.

To

SUPERINTENDING ENGINEERS,
&c., &c., &c.

Dated August, 17th.

Issued

Recd.

Encl.

G. O., 17th August 1881, No. 2,018 W.

AUGUST.
Nos. 65-67.

Introduction of Steam-tramways in the
Madras Presidency.

SUPERINTENDING ENGINEER'S OFFICE,

No. 177

Madras, 3rd Circle.

Bellamy 19th Decr 1881..
Chepauk.

From

Major J. Pennycook R.E.
THE SUPERINTENDING ENGINEER,

3rd ~~1st~~ CIRCLE,

To

THE Chief Engineer
Public Works Dept.
Madras.

SIR,

Enclosures.

With reference to your No. 3047 of
16th instant, I have the honour to state
that the location of the head quarters of the
C. Project Division must depend upon the
works to be taken up

2. At present the only irrigation projects
of importance with which I am acquainted
are the Paddum and Hindupuram
projects, and for the investigation of these,
Pernakonda would probably be the best
head quarters.

3. At first however, and until Mr.
Garrett has made himself thorough

acquainted with the previous history of these projects, it will probably be better for him to remain in Bellary.

4. I have as yet but an imperfect acquaintance with these proposed works, but it certainly seems doubtful whether either of them will be worth further investigation, and if not, it is questionable whether it is wise, for the present at all events, to maintain a project (Division in this Circle, and whether the staff might not be more usefully employed elsewhere.

5. The opportunities for Irrigation works of importance seem very limited, and it is probably to the better maintenance ~~of~~ and perhaps to the improvement of existing works that we must look for improvement in the circumstances of these Districts.

6. I am at present making enquiries as to the traffic on the different roads, in order to see whether there is any prospect of light railways or tramways being used, but I have not in my own mind

the smallest hope that such will be the case.

7. I have been intending for some time to address you upon this subject, but prep of other work has prevented my doing so. For the present I can only say, as the result of much study, that light rail-ways* may possibly be of use in some parts of the Presidency, but I doubt whether they will be so in this neighbourhood.

8. Tramways in the true sense, will nowhere be sufficiently remunerative to justify their being taken up by the State.

I have the honour to be

Sir

Your most obed^t serv^t.

John Penn and J. Rogers
Superintending Engineer
30/11/81

* What Mr Vincent has been advocating though he persistently calls them "tramways" are really light railways -

P. W. C. No. 7557

From

The Superintending Engineer,

~~III~~ 1st Circle,

To

The Chief Engineer
P. W. C.

Dated 19th } (December, 1881.

Recd. 21.

ENCLOSURES.

Bellary will, for
Bellary will, for
the present, be
regarded as the
Head Quarters of
the C Project &c.

21.12.81

24/12/81

50 201820. 17.8.81
68 2644. 10.11.81
68 10.1.81.

7/1/82

3 Circle.

7/1/82

Bellary will, for
Bellary will, for
the present, be
regarded as the
Head Quarters of
the C Project &c.

No. 177

Subj. in Receipt Regr.

Moddum & Hindurum

Project.

Reporting that Penkora
da would be the best place
for the C Project &c. and
that Mr. Garrett may
remain at Bellary until
thoroughly acquainted with the
previous history of—

Major Pennington
Should employ the
existing staff as
much as possible
on the work

Att

22/12/4

L.W.

C's office note
939 of 13 Dec 81.

No orders have been
issued on the subject.

R.S.
14-12.

C.S.W.

Please request the
Supdy Engrs concerned
to report where they
wish to be stationed
of the B.C. & D.
Project Division located

14/12/81

Dy. W.

Memor. submitted
as regards the B.C. Project
Division - The D. Project
Division is under the Ch.
Engrs for J., & the S.
Engrs in charge works in
S.D.'s office. C.S.
15/12

Any but the
P.F. have quite
lately called in
programmes for
Jumme works in
all districts and
in the community
the Roddam and
bundhoojoo Projects
will certainly have
to be investigated
two possibly the
may not finally
be sanctioned -

It is clear that in
Bellary, Kurnool &
Cuddalore at least
any thing in the
shape of useful
work in all hands
will have to be
investigated and

No 2644 of 10 November 81. P.W.D.

Memorandum

Office note from the Examiner P.W.
Accts No 791 of 8 November 81.

W. Please inform me if the head
quarters of A. Project Division have
been fixed, and if so, where.

(By G.B.
Dy. C.
For C.)
Office note to C.

So long as the Executive Engr.
is engaged on the Ganjam Gopalpore
Canal Project, the former place
must be regarded as his head
quarters.

Copy of the above forwarded
to the Superintending Engineer First
Circle for information and guidance.
(By order)

Sd/- Ross Thompson.

Lt Col R.E.
Aq. Dy. Ch. Engr P.W.D.
To The Supdy Engr
1st Circle Dated 11-11-81-
Ex: P.W. accts.

C. R. W.

So long as the E. R.
is engaged in the Suez
Suez Canal
Project - the former
place must be regarded
as his head quarters

C. R. W. 2644 of 10-11-87.

Att

5.11.87

indexed 11/11

by W

C's office to
791 d / 8th Nov. 81.

No Head Quarters
have been fixed.

L.S.
9-11

9-11-81

To by W

It seems necessary
that something should
be done about this.

If W is not in a
position to fix the
Head Quarters, a
reference might be
made to the Suptg.
Eng^r?

L.S.
9.11.

W. In Orders

9/11