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MADRAS RECORD OFFICE

Government of Madras

Public Works DEPARTMENT

G.O. No.	2580-81	Press
~~B.P. No.~~		~~Mis.~~
224-227		
Dated	10-9-1874	~~105~~ .

Not to be folded or roughly handled

Read the following papers:—

No. 224. From Lieutenant-Colonel J. H. M. SHAW-STEWART, R.E., Consulting Engineer for Railways, to Colonel G. W. WALKER, R.E., Secretary to Government, Public Works Department, dated Madras, 20th July 1874, No. 422.

In continuation of my letter, No. 368, dated 24th ultimo, I have the honor to submit, for the consideration of His Excellency in Council, a letter* from the Agent of the Madras Railway Company, giving what information is available upon the two points noted by the Government of India: first, as to the probable life of an iron sleeper road; and, second, as to the price which old cast iron may be expected to realize in this part of India.

* No. 585, 6th July 1874, with enclosures.

2. After furnishing the information called for by the Government of India, the Chief Engineer of the Madras Railway, in the letter forwarded by the Agent, takes exception to the mode of calculation adopted in the memorandum forwarded with the letter from that Government. For reasons stated in his letter, Mr. Going prefers the mode of calculation adopted previously* by him, and he submits three statements showing the various results thus obtained.

* *Vide* Procs. of Govt., 24th April 1874, No. 1,053.

In Statement No. I. the life of wooden sleepers is taken at 10 years, and that of iron sleepers at 25 years; and it is shown that the saving arising from the use of iron sleepers would be Rupees 8,09,301. There is apparently an error in this statement, inasmuch as provision is made for maintaining the wooden road for 35 instead of 25 years. After correcting this error, the difference in favor of the iron road is reduced to Rupees 2,12,039.

In Statement No. II. the life of wooden sleepers is again taken at 10 years, while the life of iron sleepers is taken at 50 years; and the saving arising from the use of iron sleepers is shown to be Rupees 32,43,781.

In Statement No. III. it is shown that, assuming the cost of the wooden sleeper road with a life of 10 years to be Rupees 7,536 per mile, and iron sleeper road, with a life of 25 years, would be more economical, provided that its original cost did not exceed Rupees 20,659 per mile. This statement also is apparently affected by an error similar to that pointed out in the case of No. I. The correction of the error reduces the amount from Rupees 20,659 to Rupees 17,310.

3. As regards the respective lives which are assumed in these calculations for the two descriptions of sub-way, it is clear that the duration of the iron sleepers is still a matter of speculation. Sir John Hawkshaw claims for them a life twice as long as that of creosoted wooden sleepers in Bengal, or 24 years; while Mr. Going thinks that their duration is not over-estimated at 50 years. No one has apparently ventured to claim for them a longer life than 50 years. In considering this point, regarding which opinions vary so widely, it is right to bear in mind that the results recorded upon the Madras Railway have been obtained in comparatively dry climates, and that the effect upon iron sleepers of

the heavy rain-fall and generally moist climate of the west coast yet remains to be proved. In my opinion the changed conditions would affect an iron road to a considerable degree.

On the other hand, the life of sleepers of creosoted pine may be safely assumed at 12 years, that being the result of actual experience gained in Bengal, where the climate greatly resembles that of Malabar.

4. With regard to the mode of calculation adopted by Mr. Going, it seems to me, after giving the matter careful consideration, that it does not fairly represent the comparative financial results from the use of the two kinds of sub-way. It altogether fails, as Mr. Going allows, to provide for the renewals which must become necessary during the term, whatever it may be, that is assumed as the life of the road; but, putting that consideration aside, it tends greatly to exaggerate, in my opinion, the comparative cost of the wooden sleepers.

5. It seems to me that, in order to arrive at a correct estimate of the probable financial results of relaying the road with each description of material, the actual capital outlay due to the relaying should not be entered as an item upon either side. Interest at 5 per cent. upon such outlay should, of course, form an annual charge upon each side of the comparative estimate; and, in addition to the interest, an annual sum should be charged sufficient to cover the probable annual wear and tear of the road. With regard to the latter item, it is without doubt true, as stated by Mr. Going, that, in the case of a wooden sleeper road with an estimated life of 10 years, the renewals would not be divided regularly in the proportion of one-tenth per annum; and that in the case of an iron sleeper road, with an estimated life of 25 years, the renewals would not be divided regularly in the proportion of one-twenty-fifth per annum. It may, however, be asserted that the road will suffer an annual deterioration to the extent of one-twenty-fifth in the second; and that the road will suffer an annual deterioration to the extent of one-tenth of its value in the first instance, and to the extent of one-twenty-fifth in the second; and that corresponding annual charges to provide against that deterioration should appear in the comparative estimates. It was upon this principle that the calculation given in my letter,* dated the 21th March 1874, was framed; and, after giving the matter careful consideration, it still seems to me to be the simplest and fairest mode of comparing the results.

* Procs. of Govt., 24th April 1874, No. 1,053.

6. In the appended statement, marked A, the life of an iron sleeper road has been taken at 50 years, and that of a creosoted pine road at 12 years. With regard to the former figure, it is, I believe, the maximum duration that has yet been anywhere suggested, and it is greater than I should be inclined to assign to it under the circumstances. The life named for the pine sleeper road is the period derived from actual experience in Bengal. The statement shows a balance of Rupees 3,44,737 in favor of the wooden road after 50 years.

7. In Statement B, Sir John Hawkshaw's estimate of the respective lives has been taken, viz., 12 years for the wooden road and 24 years for the iron road. The balance shown in favor of the wooden road, at the end of the 24 years, is Rupees 7,44,618. It may be here observed that Mr. Going's mode of calculation, applied to Sir John Hawkshaw's estimates of the respective lives, gives a balance in favor of the wooden road of Rupees 2,60,508.

a timber sleeper, while for solidity and firmness, and as the means of keeping the rails in true gauge, a road on bowl sleepers connected by iron tie bars, must compare most favourably with the soundest wooden road that can be constructed.

No. 225. Endorsement of the Consulting Engineer for Railways, dated Madras, 8th August 1874, No. 482.

From R. B. ELWIN, Esq., Agent and Manager of the Madras Railway Company, to Lieutenant-Colonel J. H. M. SHAW-STEWART, R.E., Consulting Engineer for Railways, dated Madras, 7th August 1874, No. 705.

With reference to your letter of the 3rd instant, No. 725, I have the honor to send you herewith an amended copy of the Acting Chief Engineer's letter, No. 436, of the 4th ultimo, which, with the statements alluded to therein, I shall be obliged by your submitting to Government with my letter of the 6th ultimo, No. 585.

2. On the subject of the mistake which was made in the statements first submitted, for pointing out which I beg to thank you, Mr. Going remarks as follows:—

"I regret that the error which has been brought to notice should have been passed unobserved by me. It does not, however, in any way affect Statement No. 2, which is the only one of any importance to my own arguments in support of the financial advantages of an iron sleeper road as expressed in my letters Nos. 163 and 436."

From T. H. GOING, Esq., Acting Chief Engineer, to R. B. ELWIN, Esq., Agent and Manager of the Madras Railway Company, dated Madras, 4th July 1874, No. 436.

With reference to your endorsement on Consulting Engineer's letter, No. 579 of 24th ultimo, enclosing copies of Proceedings of Government, under date 24th April and 13th June 1874, Nos. 1,053 and 1,573, I beg to state that the actual experience which we have had in the use of iron sleepers does, I think, fully warrant me in placing their life at not less than 50 years. The 1st Division, North-West Line, (which is the oldest of our iron sleeper road,) has been worked over for an average period of 12½ years. During that time the renewals of iron sleepers have amounted to 3,220 or $\frac{1}{151}$ part of the whole, 132¾ miles, including sidings, being at the rate of $\frac{1}{1637}$ part per annum. Most of the sleepers thus removed from the road had been broken either by accidental causes, such as a vehicle getting off the line or in the original laying of the road. Breakages have also occurred in some instances when the bottom ballast was too coarse, mixed with boulders; and in one instance, on the South-West Line, a large number of iron sleepers was found to be broken at a locality where the bottom ballast very improperly consisted of a soda earth, which became caked into a hard solid mass within the sleeper. The largest number of breakages, however, is, in my opinion, due to carelessness in the original laying of the line; sleepers which are then cracked become broken after a time, and are discovered in subsequent openings up of the road. It is thus probable, after the lapse of a certain number of years has afforded time for the removal of all sleepers so broken, that the proportion of renewals will decrease. On the other hand, the increase of traffic will have a contrary effect. Still it is extremely improbable that any cause which we can foresee will so increase the destruction of iron sleepers as to raise the proportion from $\frac{1}{1637}$ per mile per annum, which it has hitherto been, to $\frac{1}{25}$th per mile per annum, which it should become on the assumption that the life of iron sleepers is only 25 years.

2. The number of broken sleepers above stated to have been renewed in the road during the last 12½ years on 1st Division, North-West Line, does not include those broken in transit and hand-

ling previous to the laying of the road, but these form too small a proportion to affect the estimate in any appreciable degree. Thus out of a stock of 150,000 iron sleepers in Goriattum Depôt 455 were broken, or only ·30 per cent.; of 255,737 iron sleepers in Arconum Depôt 804 were broken, or only ·31 per cent.

3. There is a ready sale in Madras for old cast iron at Rupees 30 per ton; we have disposed of large quantities of it at this price for several years past, and have now offers for some at Rupees 35 per ton.

4. With regard to paragraph 2 of Colonel Shaw-Stewart's letter and the memorandum to which it refers, prepared by the Government of India, Public Works Department, I would respectfully submit that three important modifications should be made in the mode of comparing financially the relative advantages of laying the two kinds of road.

First.—The renewals of a creosoted sleeper road are not $\frac{1}{10}$ per annum. The very large proportion of sleepers, if good and of uniform quality, as they should be, would last the entire ten years, and would then have to be renewed all at once at the end of that term. This fact is confirmed by what is stated in paragraph 2 of Sir John Hawkshaw's letter of 24th March 1874.

Second.—The renewals of an iron sleeper road are not $\frac{1}{25}$ per annum. I have shown from actual experience that they are only $\frac{1}{1637}$ per annum at least for the first 12½ years of their life.

From the foregoing it will, I think, be evident that the system of calculation by gradual renewals proposed by the Consulting Engineer would introduce an error in the opposite direction, of far greater amount than that arising from the supposition on which, for the sake of simplicity, my original calculation was based, viz., that the renewals would all take place at the end of the average life of a sleeper.

Third.—And this is by far the most important. Both in the memorandum and in the Consulting Engineer's statement, when estimating interest, account has been taken only of that which would accrue on the first capital outlay for the creosoted sleepers, and not on the two subsequent sums which would be expended during the period of 25 years embraced by the operations.

5. I would submit that no comparison of the financial results to be expected from the two operations can be correct, unless it combines a consideration of the amount of interest to be derived from the several sums expended on the entire period of comparison.

6. The statement embodied in my letter, No. 163, of 19th February 1874, was made out in accordance with this principle. It omitted, however, to give credit for the value of old iron at the end of the lines of the two descriptions of roads compared. I shall, therefore, now annex a revised statement, (No. I.), correcting this omission and adopting the other corrections suggested in my figures by Colonel Shaw-Stewart, although I do not fully concur in the propriety of such corrections. I shall also take 25 years instead of 50 as the life of iron sleepers, so as to render this statement more comparable with that furnished by the Government of India in the memorandum herein referred to.

7. It appears from Statement No. I., that even on the supposition that the iron sleepers would last only 25 years there would be a saving in employing them of Rupees 2,12,035.

Supposing them to last 50 years, which, as already stated, I consider to be the more correct estimate of the two, the saving, as shown by the accompanying Statement No. 2, would be Rupees 32,43,781.

Statement No. 3 is prepared with a view to show the limit up to which it would be economical to use iron sleepers, assuming the cost of one mile of a pine sleeper road to be only Rupees 7,536-6-0, and the respective lives of wood and iron to be 10 and 25 years.

From this statement it will appear that an iron sleeper road would be economical if its original cost did not exceed Rupees 17,310-2-0.

In the three accompanying statements it is assumed that a pine sleeper road will only cost Rupees 7,536-6-0, because in the special case in question there is a full equipment of chairs and trenails. Had these to be provided the pine sleeper road would cost Rupees 10,789-10-0, and the comparison would then be still more to the advantage of the iron sleeper road.

Proceedings of the Madras Government, Public Works Department,
10th September 1874.

8. I would venture to express a hope that, in disposing of this important question, the Government of India will not attach undue weight to the conclusions to be derived from the statistics of other Indian Companies, whose experience in the use of iron sleepers cannot be justly weighed against that of the Madras Railway Company.

STATEMENT No. I.

SHOWING a comparison of the relative advantages financially of a creosoted Pine sleeper road lasting 10 years as against an Iron sleeper road lasting 25 years.

Road laid with Iron pot sleepers.

					RS.	A.	P.
Pot sleepers,	3,696	at Rs.	3 8 0	... ...	12,936	0	0
Tie bars,	1,848	,, ,,	2 4 7	... ...	4,225	6	0
Cotters, Gibs,	3,696 / 3,696	,, ,,	0 1 2½	... ...	279	2	0
				Cost of one mile...	17,440	8	0
Deduct 35 tons old chairs at Rupees 30 per ton ...					1,050	0	0
7,392 old trenails at 7 pies each					269	8	0
					1,319	8	0
					16,121	0	0
Add interest for 25 years at 5 per cent. per annum					20,151	4	0
					36,272	4	0
Deduct sales of iron after 25 years, 3,696 pots at 85 lbs. each = 140 tons at Rupees 30 per ton					4,200	0	0
				Cost per mile...	32,072	4	0

Road laid with creosoted Pine sleepers.

					RS.	A.	P.
Pine sleepers,	1,848	at Rupees	3 13 1	... ...	7,055	2	0
Cast iron chairs,	3,696	,, ,,	0 13 10	(10 per cent.) ...	319	9	0
Trenails,	7,392	,, ,,	0 1 2	(30 ,,) ...	161	11	0
				Cost of one mile...	7,536	6	0
Add interest for	25 years	... ...			9,420	7	6
Cost of relaying after	10 ,,	... ...			7,536	6	0
Add interest for	15 ,,	... ...			5,652	4	6
Cost of relaying after	10 ,,	... ...			7,536	6	0
Add interest for	5 ,,	... ...			1,884	1	6
					39,565	15	0
Less value of road after 5 years					3,768	3	0
					35,797	12	6
Deduct sales of iron 3,696 chairs at 21 lbs. each = 35 tons at Rupees 30 per ton					1,050	0	0
				Cost per mile...	34,747	12	6
Difference in favor of Iron road per mile					2,675	8	6
For 79¼ miles					2,12,035	0	0

STATEMENT No. II.

SHOWING the relative advantages financially of a Creosoted sleeper road lasting 10 years as against an Iron sleeper road lasting 50 years.

Road laid with Iron pot sleepers.

										Rs.	A.	P.
Pot sleepers,	3,696	at Rupees	3	8	0	...	..	...		12,936	0	0
Tie bars,	1,848	,,	,,	2	4	7	...	...	..	4,225	6	0
Cotters,	3,696	,,	,,	0	1	2½	...	...	...	279	2	0
Gibs,	3,696											
										17,440	8	0
Deduct 35 tons old chairs at Rupees 30 per ton.										1,050	0	0
7,392 old trenails at 7 pies each								...		269	8	0
										1,319	8	0
								Cost per mile ..		16,121	0	0
Add interest for 50 years at 5 per cent. per annum ...								...	...	40,302	8	0
										56,423	8	0
Deduct sales of iron, 3,696 pots at 85 lbs. each = 140 tons at Rupees 30 per ton ...							...	...	...	4,200	0	0
								Total...		52,223	8	0

Road laid with creosoted Pine sleepers.

									Rs.	A.	P.
Pine sleepers,	1,848	at Rupees	3	13	1	...	...	...	7,055	2	0
C. J. chairs,	3,696	,,	,,	0	13	10	(10 per cent.)	...	319	9	0
Trenails,	7,392	,,	,,	0	1	2	(30 ,,)	...	161	11	0
							Cost of one mile...		7,536	6	0
Add interest for	50 years ...	...	...	...	...	...			18,840	15	0
Cost of relaying after	10 ,, ...	...	...	...	...	...			7,536	6	0
Add interest for	40 ,, ...	...	...	...	...	...			15,072	12	0
Cost of relaying after	10 ,, ...	...	...	...	...	...			7,536	6	0
Add interest for	30 ,, ...	...	...	...	...	...			11,304	9	0
Cost of relaying after	10 ,, ...	...	...	...	...	...			7,536	6	0
Add interest for	20 ,, ...	...	...	...	...	...			7,536	6	0
Cost of relaying after	10 ,, ...	...	...	...	...	...			7,536	6	0
Add interest for	10 ,, ...	...	...	...	...	...			3,768	3	0
									94,204	11	0
Deduct sales of iron, 3,696 chairs at 21 lbs. each = 35 tons at Rupees 30 per ton ...							...	...	1,050	0	0
								Cost per mile...	93,154	11	0
Difference in favor of iron road per mile							...	...	40,931	0	0
For 79¼ miles	...	...	...	...	...	...	...	...	32,13,781	0	0

Proceedings of the Madras Government, Public Works Department,
10th September 1874.

STATEMENT No. III.

SHOWING the limit of original cost of an iron sleeper road up to which it would be economical as compared with a creosoted Pine sleeper road, the respective lives of each description of road being assumed at 25 and 10 years.

Wooden sleeper road, creosoted Pine.

							Rs.	A.	P.
Cost of road one mile	...	...	...	...	...	...	7,536	6	0
Add interest for 25 years	...	...	...	...	...	...	9,420	7	6
Cost of relaying after 10 years	...	...	...	...	...	...	7,536	6	0
Add interest for 15 years	...	...	...	...	...	...	5,652	4	6
Cost of relaying after 10 years	...	...	...	...	...	...	7,536	6	0
Add interest for 5 years	...	...	...	...	...	...	1,884	1	6
							39,565	15	6
Less value of road after 5 years			...	...	...	...	3,768	3	0
							35,797	12	6
Deduct sales of iron, 3,696 chairs at 21 lbs. each = 35 tons at Rupees 30 per ton			...	...	...	...	1,050	0	0
						Cost per mile...	34,747	12	6

Iron Road.

							Rs.	A.	P.
Cost of road one mile	...	...	...	...	...	...	*17,310	2	0
Add interest for 25 years	...	...	...	...	...	...	21,637	10	6
							38,947	12	6
Deduct sales of iron, 3,696 pots at 85 lbs. each = 140 tons at Rupees 30 per ton			...	...	...	...	4,200	0	0
						Total...	34,747	12	6

* Whereas the cost of an iron road is only Rupees 16,120 per mile.

SUBMITTED for the information of Government, with reference to memorandum No. 576, dated 31st July 1874.

(Signed) J. H. M. SHAW-STEWART, Lieut.-Colonel, R.E.,
Consulting Engineer for Railways.

No. 226. ORDER THEREON, 10th September 1874, No. 2,580.

RAILWAY, No. 28.

ORDERED that these papers be forwarded for the consideration of the Government of India.

(Here enter No. 2,581, dated 10th September 1874.)

(True Extract.)

Colonel, R.E.,
Secretary to Government.

To the Consulting Engineer for Railways.
Exd. S. T. Austin.
Spare Copies

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PUBLIC WORKS DEPARTMENT,
OOTACAMUND, 10*th September* 1874.

No. 227.

No. 2,581.

FROM

COLONEL G. W. WALKER, R.E.,
Secretary to the Government of Madras,
Public Works Department,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,
Public Works Department.

RAILWAY, No. 29.

SIR,—With reference to the letter from the Government of India, No. 1,109, dated 21st May, and docket from this Government, dated 22nd July 1874, No. 1,973, I am directed to forward the accompanying further papers on the subject of the comparative advantages of wooden and iron sleeper roads.

2. The conclusions arrived at by the Chief Engineer of the Company in the first instance, as to the comparative financial results of laying down creosoted pine and cast iron sleepers, having been considered as partially vitiated by the discrepancies pointed out by the Consulting Engineer, Mr. Going was allowed an opportunity of revising his calculations. Mr. Going endeavours to show that assuming the life of wooden sleepers at 10 years, and that of iron sleepers at 25 and 50 years, respectively, the use of the latter would, in either case, be more economical. The Consulting Engineer, on the other hand, contends that the balance of advantage rests with the wooden sleeper road, and supports his conclusions by two figured Statements marked A and B.

3. There is however a considerable difference of opinion as to the details which should enter into the calculations required to arrive at correct results, but it is hoped that the elaborate manner in which the subject has been discussed from different points of view will enable the Government of India to decide finally on the question.

4. The Agent of the Madras Railway points out that apart from the financial aspect of the case there is an important consideration which should not be lost sight of in arriving at a decision, viz., the increased safety which an iron sleeper road affords, the decay of wooden sleepers being a source of considerable anxiety which it is not at all times possible to guard against.

5. Adverting to the concluding paragraph of your letter under reply, it will be observed from the papers submitted that no reliable information from actual experience can be brought forward for fixing the life of an iron sleeper road at 50 years; but the Chief Engineer considers that from the 12½ years' experience already acquired he is warranted in assuming their life to be not less than 50

years. The breakages in transit and handling are held to form too small a proportion to affect the estimate in any appreciable degree. It is also explained that old iron is readily bought up at from Rupees 30 to Rupees 35 a ton.

I have the honor to be,

Sir,

Your most obdient servant,

(Signed) G. W. WALKER, Colonel, R.E.,

Secretary to Government.

A.

Statement, showing the comparative financial results of relaying the line between Palghaut and Beypore with creosoted pine sleepers, and with cast-iron pot sleepers; — the life of the former being taken at 12 years, and that of the latter at 50 years; — the rates being those given by the Chief Engineer of the Madras Railway Company.

Wooden Road.

Original cost per mile		£536
Interest at 5 per cent	£377	
Depreciation at 12 per annum — to form a permanent way renewal fund	628	
Annual charge per mile		£1005

Iron

B.

Statement showing the comparative financial results of relaying the line between Palghaut and Beypore with creosoted pine sleepers, and with cast-iron pot sleepers;— the life of the former being taken at 12 years, and that of the latter at 24 years;— the rates being those given by the Chief Engineer of the Madras Railway Company.

Iron Road.

Original cost per mile— 1631		Rs.
Chairs, &c^a, in hand		16120
Interest at 5 per cent	806	
Depreciation at 30 per annum— as above— upon Rs 17,420	349	
Annual charge per mile		1155
Difference in annual charge in favour of wooden road per mile		150
—Ditto— during 50 years, and over 79 ¼ miles		5911,375
Add— sale of iron— 35 tons per mile at Rs 30 per ton— over 79 ¼ miles		83212
		6994,587
Deduct— sale of iron— 140 tons per mile at Rs 30 per ton over 79 ¼ miles		332,550
Balance in favour of wooden road after 50 years		3441,737

Wooden Road.

Original cost per mile		7536
Interest at 5 per cent	377	
Depreciation at ½ per annum— to form a permanent way renewal fund	628	
Annual charge per mile		1,005

Iron

Iron Roads.

Original cost per mile - Iron chairs, &c., in hand	16120	Rs
Interest at 5 per cent	806	
Depreciation at 2½ per cent annum, as above - upon Rupees 17,1440	427	
Annual charge per mile	1,533	
Difference in annual charges in favour of wooden road per mile	528	
Ditto - during 24 years, and over 79¼ miles	1,01,256	
Add - Sale of iron - 35 tons per mile at Rs 30 per ton - over 79¼ miles	83219 / 10,54,475	
Deduct - sale of iron - 140 tons per mile at Rs 30 per ton	3,32,850	
Balance in favour of wooden road, after 24 years	7,44,618	

W Mauntenant
Lieut. R.E.
Cons. Engr for Railways

No. 585,

MADRAS RAILWAY. 1979

AGENT AND MANAGER'S OFFICE.

Madras, 6th July 1874.

From

R B Elwin Esqre.
Agent and Manager. of the M & C.

To

Lieutt Col. J Hills Shaw Stewart R.E.
Consulting Engineer for Railways.

SIR,

With reference to your letter No 579 of the 24th of June and to the Proceedings of Government forwarded therewith, I have the honour to enclose for your information a Copy of the Actg Chief Engineer's letter of the 4th instant, No 436 and also Copies of the Statements, Nos 1 - 2 and 3, therein referred to.

x No 1053 - 24th April
x 1573 - 13th June

2. Mr. Going in his letter furnishes the information called for by the Government of India as to the experience gained upon the Madras Railway in the use of Iron Pot sleepers from which the life of that description of sleeper may be estimated, and states that in Madras there is and for some time past has been a ready sale for old cast iron at Rs 30 per ton at least.

3. Mr. Going then proceeds to review the Memorandum, referred to in your letter, which has been

the

prepared by the Government of India in the Public Works Department as shewing the relative advantages of Pine and Cast iron sleepers, and I quite agree with him in thinking that the method adopted in the Memorandum does not result in a Correct Comparison between the relative expenditure required for laying the two kinds of road.

4. Without repeating the arguments brought forward by the Acting Chief Engineer to shew that three most important modifications should be made in the mode of Comparison adopted by the Government of India in order to shew a Correct result, it appears to me that the Memorandum itself bears on its face evidence of inaccuracy, inasmuch as while it is granted that a sleeper road has a life of 10 years, it is assumed in Calculating the annual charge that 50 per cent of the sleepers in the road have a life of only 5 years. And so with regard to an iron road to which a life of 25 years is granted, it is assumed in the calculation that 50 per cent of the sleepers have a life of only 12½ years.

5. I trust however that

the

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer
for Railways

Dated

Read

No.

the three Statements which accompany the acting Chief Engineer's letter will shew beyond a doubt that looked at from any points, the financial advantages of an iron road are certain, and I trust also that the Government of India will consider that we have good reason for estimating the life of such a road on the Madras Railway at 50 instead of 25 years.

6. In addition to the financial part of the question, it should also be borne in mind that an iron road is safer than a wooden sleeper road. In the Report of the Deputy Consulting Engineer's Inspection of the South West Line received from your office this morning it is observed with regard to the removal of wooden sleepers that most of them were "so much decayed as to "go to pieces during removal". This is a source of danger which may always be looked for on a wooden road, for even the most careful examination may fail to detect a decayed sleeper without actual removal, and as a matter of fact,

many

many serious railway accidents have been occasioned by an undetected flaw in a timber sleeper, while for holding and fixing the rails in the means of keeping the rails & sleepers true gauge, as road on board should be connected by iron ties, must Company must therefore carefully watch the removed that can be connected.

Please the Company to the
Yours most obedient Servant
Agent and Manager.

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer
for Railways

Dated 187

Recd.

No.

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer
for Railways.

Dated 6th July 1874

No. 585

Concerning the
Conference adjourned
- ment of Queen's Pleasure

M. 1481/74.
5

P.G. Dis 8/7/74
S. Sec 9/7/74

279

Railway Department.

CONSULTING ENGINEER'S OFFICE.

No. 622

From

LIEUT.-COLONEL J. H. M. SHAW STEWART, R.E.,

Consulting Engineer for Railways,

To

COLONEL G. W. WALKER, R.E.,

Secretary to Government,
Public Works Department.
Fort Saint George.

SIR,

In continuation of my letter No 568 dated 24 ultimo, I have the honour to submit, for the consideration of His Excellency in Council, a letter from the Agent of the Madras Railway Company giving what information is available upon the two points noted by the Government of India; first, as to the probable life of an iron sleeper road; and, second, as to the price which

× No 585 6 July 74 with enclosure

which old cast iron may be expected to realise in this part of India.

2 After furnishing the information called for by the Government of India, the Chief Engineer of the Madras Railway, in the letter forwarded by the Agent, takes exception to the mode of calculation adopted in the Memorandum forwarded with the letter from that Government for reasons stated in his letter, M: Going prefers the mode of calculation adopted previously by him, and he submits three statements showing the various results thus obtained.

In statement No I the

* Vide Govt Circular No 1065.

29

the life of wooden sleepers is taken at 10 years, and that of iron sleepers at 25 years; and it is shown that the saving arising from the use of iron sleepers would be Rs 8,09,301. There is apparently an error in this statement, in-as-much as provision is made for maintaining the wooden road for 35, instead of 25 years. After correcting this error, the difference in favour of the iron road is reduced to Rs 2,12,039.

In statement No II the life of wooden sleepers is again taken at 10 years, while the life of iron sleepers is taken at 50 years, and the saving arising from the

use

ruse of iron sleepers is shown to be
Rs 32,43,781.

In Statement No III
it is shown that, assuming the
cost of the wooden sleeper road..
with a life of 10 years to be—
Rs 7,536 per mile, and iron sleeper
road, with a life of 25 years,..
would be more economical pro-
vided that its original cost did
not exceed Rs 20,659 per mile.
This statement also is apparently
affected by an error similar to
that pointed out in the case of
No I. The correction of the error
reduces the amount from Rs 20,659 to
Rs 17,310.

As regards the —
respective

respective lives which are assumed
in these calculations for the two
descriptions of sub-way, it is clear
that the duration of the iron sleepers
is still a matter of speculation.
Sir John Hawkshaw claims for
them a life thrice as long as that
of creosoted wooden sleepers in
Bengal, or 24 years; while by
going thus to that their duration
is not over-estimated at 50 years.
No one has apparently ventured
to claim for them a longer life
than 50 years. In considering
this point, regarding which
opinions vary so widely, it is
right to bear in mind that the
results recorded upon the Madras
Railway

Railway have been obtained in comparatively dry climates, and that the effect upon iron sleepers of the heavy rainfall and generally moist climate of the west coast yet remains to be proved. In my opinion the changed conditions would affect an iron road to a considerable degree.

On the other hand, the life of sleepers of creosoted pine may be safely assumed at 12 years, that being the result of actual experience gained in Bengal, where the climate greatly resembles that of Malabar

4. With regard to the mode of calculation adopted by Mr. Going, it seems to me, after giving the matter careful consideration, that it does not fairly represent the comparative financial results from the use of the two kinds of sub-way. It altogether fails, as Mr. Going allows, to provide for the renewals which must become necessary during the term, whatever it may be, that is assumed as the life of the road; but, putting that consideration aside, it tends greatly to exaggerate, in my opinion, the comparative cost of the wooden sleepers.

5. It seems to me that, in order to arrive at a correct estimate of

of the probable financial results of relaying the road with each description of material, the actual capital outlay due to the relaying should not be entered as an item upon either side. — Interest at 5 per cent upon each outlay should of course form an annual charge upon each side of the comparative estimate; and, in addition to the interest, an annual sum should be charged sufficient to cover the probable annual wear and tear of the road. With regard to the latter item, it is without doubt true, as stated by Mr Going, that in the case of a wooden sleeper road with an estimated life of 10 years, the renewals would not be divided regularly in the proportion of one-tenth per annum: and that in the case of an iron sleeper road with an estimated life of 25 years, the renewals would not be divided regularly in the proportion of one-twenty-fifth per annum. It may however be asserted that the road will suffer an annual deterioration to the extent of one-tenth of its value in the first instance, and to the extent of one-twenty-fifth in the second; and that corresponding annual charges to provide against that deterioration should appear in

the

the comparative estimate. It was upon this principle that the calculation given in my letter dated the 24th March 1874 was framed; and, after giving the matter careful consideration, it still seems to me to be the simplest and fairest mode of comparing the results.

6. In the appended statement marked A, the life of an iron sleeper road has been taken at 50 years, and that of a creosoted pine road at 12 years. With regard to the former figure, it is believed the maximum duration that has yet been anywhere suggested, and

× Pro of Gf. 24 April 1874 No 1053

and it is greater than I should be inclined to assign to it under the circumstances. The life named for the pine sleeper road is the period derived from actual experience in Bengal. The statement shows a balance of £3,44,737 in favour of the wooden road after 50 years.

In statement B, Sir J. John Hawkshaw's estimate of the respective lines has been taken, — namely, 12 years for the wooden road, and 24 years for the iron road. The balance shown in favour of the wooden road, at the end of the 24 years, is £7,44,618. It may be here observed that Sir Giorgio's mode of calculation, applied

to

MADRAS RAILWAY.

AGENT AND MANAGER'S OFFICE.

No. 708

Madras, 1874.

From

Agent and Manager.

To

Consulting Engineer for Railways.

Sir,

RAILWAY DEPARTMENT.

From

The Consulting Engineer
for Railways,

To

The Secretary to Government,
P. W. Department,
Fort Saint George.

Dated 20th July 1874.
Recd. 21st July
Encls: 4

No. 422

CO. No: 2580. 10-9-74.

Submitting letter from the Agent the R. Ry. respecting the subject of relative advantages of laying the Line between Pakkbut & Beypore & the R. R. metre recommended in lieu of the Line sanctioned before.

439

Statement A to I.

Showing a comparison of the relative advantages financially of Concrete Iron Sleeper Road lasting 10 years as against Steel Sleeper Road lasting 25 years.
Iron Sleeper Road Laid with Iron Pot Sleepers.

Cost of Line 36 miles at Rs. 3.8.0 per mile	Rs. 12,936.0.0
Cost of Rails 1248 tons at Rs. 3.7.0 per ton	4225.0.0

419

I have the honour to be,
Sir,
Your most obedient Servant.

Agent and Manager.

Cost of Line for 5 years	7.30.0.0
Interest for 5 years	1864.1.6
	Rs. 39,565.15.6
Value of Road after 5 years	3768.3.0
	Rs. 35797.12.6
Deduct Value of Iron 36 miles chains at the rate of 35 tons at Rs 30 per ton	Rs. 1050.0.0
Cost per mile Rupees	34747.12.6
Difference in favour of Iron road per mile	Rs. 2675.8.6
For 77½ miles	Rs. 212085.0.0

439

Statement A. I.

Showing a comparison of the relative advantages financially of the Creosoted Sawn Timber Road lasting 10 years as against an Iron Girder Road lasting 25 years.

Road laid with Iron Cast Sleepers.

Cost of Sleepers	3696 at Rs. 3.8.0		Rs. 12936.0.0
Fish Bolts	1248 " " 3.4.7		" 4225.8.0
Collars	3696 } " " 0.1 7½		" 279.2.0
Pins	3696 }		
		Cost of one Mile	Rs. 17440.8.0
Ballast	35 Lacs of Chains at Rs. 30 per Lac	Rs. 1050.—	
	79.02 Mile Lengths at 169.8 "	Rs. 1319.8.0	
			Rs. 16121.0.0
4% Interest	for 25 years at 5 per cent per annum	" 20151.4.0	
			Rs. 36272.4.0
Deduct	Sales of Iron after 25 years. 3696 Pots at 85 lbs		
	each = 140 Lacs at Rs. 30 per Lac		Rs. 4200.0.0
	Cost per Mile	Rupees	32072.4.0

Road laid with Creosoted Pine Sleepers.

Pine Sleepers	1848 at Rs. 3.13.1		Rs. 7055.2.0
Cast Iron Chairs	3696 " " 0.13.10 (10%)		" 319.9.0
Trenails	7392 " " 0.1.2 (30%)		" 161.11.0
		Cost of one Mile	Rs. 7536.6.0
			" 9420.7.6
4% Interest	for 25 years		" 7536.6.0
Cost of renewing	after 10 years		" 5652.4.6
4% Interest	for 15 years		" 7536.6.0
Cost of renewing	after 15 years		" 1884.1.6
4% Interest	for 5 years		Rs. 39565.15.6
			" 3768.3.0
Sinking Value of Road after 5 years			Rs. 35797.12.6
Deduct	Sales of Iron 3696 Chairs at 2 lbs each = 35 Lacs at Rs. 30 per Lac		Rs. 1050.0.0
	Cost per Mile	Rupees	34747.12.6
Difference in favour of Iron Road per Mile			Rs. 2675.8.6
	For 79½ Miles		Rs. 212085.—.—

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer

for Railways

Dated 7th November 1874.

Ref. No. 1055.

Enclosing copy of an Abstract Statement showing the Cost of Chairs and Trenails on the Madras Railway.

Copy of this Abstract is also forwarded to the Secretary of State for India in Council.

P. P. Boase Esq.

M.I.C.E.

12 Queen Square

Westminster S.W.

Statement No. II

Shewing the relative advantages financially of a Creosoted Sleeper Road lasting 10 years as against an Iron Sleeper Road lasting 50 years.

Road laid with Iron Pot Sleepers.

Pot Sleepers	3696	at Rs. 3 8. "	Rs. 12,936. " "
Fir Chairs	1848	" " 2. 4. 7	" 4,225. 6. "
Cotters	3696		
Gibs	3696	" " " 1-2½	" 279. 2. "
			Rs 17,440. 8. "

Deduct 35 tons old chairs at Rs 30 per ton } Rs. 1050. " "

7392 old Treenails at 7 pies each } " 269. 8. " Rs. 1319. 8. "

Cost per mile Rs 16,121. " "

Rs. 40,302. 8. "

Add interest for 50 years at 5 per cent per annum Rs. 56,423. 8. "

Deduct Sales of Iron - 3696 Pots at 85 lbs each = 140 tons at Rs. 30 per ton } Rs. 4200. " "

Total Rupees 52223. 8.

Road laid with Creosoted Pine Sleepers.

Pine Sleepers	1848	at Rs. 3. 13. 1	Rs. 7055. 2.
C. I. Chairs	3696	" " 13. 10 (10%)	" 319. 9.
Treenails	7392	" " 1. 2 (30%)	" 161. 11.
		Cost of one mile	Rs. 7536. 6.
			Rs. 18840. 15.
Add interest for 50 years			" 7536. 6.
Cost of relaying after 10 years			" 15072. 12.
Add interest for 40 years			" 7536. 6.
Cost of relaying after 10 years			" 11304. 9.
Add interest for 30 years			" 7536. 6.
Cost of relaying after 10 years			" 7536. 6.
Add interest for 20 years			" 7536. 6.
Cost of relaying after 10 years			" 3768. 3.
Add interest for 10 years			Rs. 94204. 11.

Deduct Sales of Iron - 3696 chairs at 21 lbs each = 35 tons at Rs. 30 per ton } Rs 1050. " "

Cost per mile Rupees 93154. 11.

Cost per mile — Rs. 40931. 0.

Rs. 3243781. " "

Cost of iron roads per mile

Statement No. III

Shewing the limit of original cost of our Iron Sleeper Road up to which it would be economical as compared with Creosoted Pine Sleeper Road the respective lives of each description of Road being assumed at 25 and 10 years

Wooden Sleeper Road Creosoted Pine.

Cost per road one Mile	Rs. 7536. 6. 0
6% Int. thereon for 25 years	" 9420. 7. 6
Cost per relaying after 10 years	" 7536. 6. 0
4½ Int. thereon for 15 years	" 5652. 4. 6
Cost per relaying after 10 years	" 7536. 6. 0
4½ Int. thereon for 5 years	" 1884. 1. 6
	Rs 39565. 15. 6
Less Value of road after 5 years	" 3768. 3.
	Rs 35797. 12. 6
Deduct Cost of Iron 3696 Chairs at 21 lbs each = 35 tons at Rs 30 per ton	1050. 0.
Cost per Mile	Rupees 34747. 12.

Iron Road

Cost of road one Mile	*Rs 17,310. 2. 0
6% Int. thereon for 25 years	" 21637. 10. 6
	Rs. 38947. 12. 6
Deduct Cost of Iron 3696 Chairs at 65 lbs each = 140 tons at Rs 30 per ton	4200. 0. 0
Total Cost	Rupees 34747. 12. 6

* Whereas the cost of our Iron Road only Rs. 16120 per Mile.

S. R. No. 5245/74
2

V.G.'s Dn dated 4/11/74
Ln No 2225

Madras Railway Company
Chief Engineer's Office
Madras 4th July 1874.

c/o 1136.

The Agent and Manager,

Dear Sir,

With reference to your endorsement on Executive Engineer's letter c/o 579 of 24th ultimo enclosing copies of Proceedings of Government under date 24th April and 15th June 1874 c/o 1055 and 1073 I beg to state that the actual experience which we have had in the use of Iron sleepers does, I think, fully warrant me in placing their life at not less than 50 years. The 1st Division North-West Line (which is the oldest of our Iron sleeper road) has been worked over for an average period of 12½ years during that time the renewals of Iron sleepers have amounted to 220 or 1/21 part of the whole 102¾ miles including sidings being at the rate of 1/637 part per annum. Most of the sleepers thus removed from the road had been broken either by accidental causes such as a vehicle getting off the line or in the original laying of the road. Breakages have also occurred in some instances when the bottom Ballast was too coarse, mixed with Boulders; and in one instance on the S W Line a large number of Iron sleepers was found to be broken at a locality where the bottom Ballast very improperly consisted of a sodden earth which became caked into a hard, solid mass with in the sleeper. The largest number of breakages however is, in my opinion, due to carelessness

in the original laying of the Line. A sleepers which are then cracked become broken after a time and are discovered in subsequent openings up of the Road. It is thus probable, after the lapse of a certain number of years has afforded time for the removal of all sleepers so broken, that the proportion of renewals will decrease. On the other hand the increase of Traffic will have a contrary effect. Still it is extremely improbable that any cause which we can foresee will so increase the destruction of Iron sleepers as to raise the proportion from 1/637 per mile per annum which it has hitherto been to 1/25th per mile per annum which it should become on the assumption that the life of Iron sleepers is only 25 years.

2. The number of broken sleepers above stated to have been renewed in the road during the last 12½ years on 1st Division S.W. Line does not include those broken in transit and handling previous to the laying of the Road, but these form too small a proportion to affect the estimate in any appreciable degree. Thus out of a stock of 150,000 Iron sleepers in Jorhat Depôt 455 were broken or only .30 per cent, of 255737 Iron sleepers in Dhoomun Depôt 804 were broken or only .31 per cent.

3. There is a ready sale in Cherabua for old Cast Iron at Rs. 30 per ton we have disposed of large quantities of it at this price for several years past and have now offers for some at Rs. 35 per ton.

4. With regard to para 2 of Colonel Shaw Stewart's letter and the memorandum it forms to which

it refers, prepared by the Government of India P.W.D. I would respectfully submit that three important modifications should be made in the mode of comparing financially the relative advantages of laying the two kinds of Road.

First. The renewals of a re-sleeper road are not 1/10 per annum. The very large proportion of sleepers, if good and of uniform quality, as they should be, would last the entire 10 years and would then have to be renewed all at once at the end of that term. This fact is confirmed by what is stated in para 2 of Sir John Hawksham's letter of 24th March 1874.

Second. The renewals of Iron sleepers on road are not 1/25 per annum. I have known from actual experience that they are only 1/637 per annum at least for the first 12½ years of their life.

From the foregoing it will I think be evident that the system of calculation by gradual renewals proposed by the Consulting Engineer would introduce an error in the opposite direction of far greater amount than that arising from the supposition on which, for the sake of simplicity, my original calculation was based, viz. that the renewals would all take place at the end of the average life of a sleeper.

Third. And this is by far the most important point in the memorandum and in the Consulting Engineer's statement, when estimating interest, account has been taken only of that which would accrue on the first capital outlay for

the creosoted sleepers, and on the less frequent renewals which would be necessary during the period of 25 years embraced by the operations.

5. I would submit that no omission of the financial results to be derived from the two operations, can be deemed unless the omission is considerable and of amounts of interest to be derived from the amounts thus expended on the rival lines by comparison.

6. The statement embodied in my letter No. 163 of 19th February 1874 was made out in accordance with this principle. It omitted however to give credit for the value of old iron at the end of the 25 years of the two descriptions of roads compared. I shall have further occasion to amend statement (No. 1) accompanying this minute and adopting the corrections suggested in my frequent letters on the subject although I do not fully concur in the propriety of such corrections. I shall also take occasion to give instead of so as the basis of the comparisons under this statement more comparable results than furnished by the Government of India in the memorandum herein referred to.

7. It appears from statement No. 1 that even on the supposition that the Iron Sleepers would last only 25 years there would be a saving in employing them of Rs. 12,035 supposing them to last 30 years which as already stated I consider to be the more correct estimate of the two, the saving would be shewn by the accompanying statement No. 2 to be Rs. 32,48,781

Statement No. 3 is prepared with a view to shew the limits up to which it would be economical to use Iron Sleepers assuming the cost of one mile of Pine Sleeper Road to be only Rs. 7536.6.– and the respective lives of wood and Iron to be 10 and 20 years.

From this statement it will appear that an Iron Sleeper road would be economical if its original cost did not exceed Rs. 17,310.2.0.

In the three accompanying statements it is assumed that a Pine Sleeper Road will only cost Rs. 7536.6.– because in the special case in question there is a full equipment of chairs and trenails. Had these to be provided the Pine Sleeper Road would cost Rs. 10789.10.– and the comparison would then be still more to the advantage of the Iron Sleeper Road.

8 I would venture to express a hope that, in disposing of this important question, the Government of India will not attach undue weight to the conclusions to be derived from the statistics of other Indian Companies whose experience in the use of Iron Sleepers cannot be fairly compared with that of the Madras Railway Company.

Yours faithfully
Sd/ H. Fleming
Acting Chief Engineer

True Copy

Agent and Manager

P. W. Dept. 1555

Proceedings of the Madras Govt.
Read the following
from the Consg Engr for Rys: / 14. E. Leo 4227, 2 Aug 74
10 24
539(a) 82 8 Aug 74

No. 482

SUBMITTED for the information of Government with
reference to Memorandum No 596 dated 31st
July 1874. —

Mauthwood
Lt Col, R.E.,
Consg. Engineer for Railways.

CONSULTING ENGINEER'S OFFICE,
Madras, 8th August 1874.

To

The Secretary to Government,
Public Works Department,
Fort Saint George.

...that there
...warded for
...n of the
...of India.

...y to the
...India P.W.D.

...ference to the
letter from the Govt. of
India No 1109 dated 21st
May and docket from
the

P. W. Dept.
Letter No. 225
8 August 74

P. W. 1874 Depart.
Original Letter Register
RAILWAY DEPARTMENT.

1874

From No. 5003.

The Chief Engineer
and Consulting Engineer
for Railways,

To

The Secretary to Government,
P. W. Department,
Fort St. George.

EB. No. 2580. 10-8-74.

Dated 8th August 1874

Received 10th August 1874

Encl. 3. No. 682

Submitting Letter from the Agent, S.M.Ry. regarding the comparative advantages of wood and wood-cum-steel sleepers.

No. 225
P. Work Cir.
Despd 16 Aug 10 Aug 74

P. W. Department 459

Proceedings of the Madras Govt.
Read the following

From the Secy. Govt. for Rys: I.N. E. Do. No. 4229, 20th July 1874
" " Do " " " 4824, 8th Aug. 1874

2580

Ordered that these papers be forwarded for the consideration of the Government of India.

C.L. for Govt. Rys.
Despd. No. 21/9/74.

To

The Secretary to the
Govt. of India P.W.D.

No. 2581

Sir,

With reference to the letter from the Govt. of India No. 1109 dated 21st May and docket from the

this Lpool. dated 21st
July 1874 M. Lean
directed to forward the
accompanying further
papers on the subject of
the comparative advantages
of wooden and iron
sleeper roads.

The conclusions
arrived at by the Chief En-
gineer of the Company in
the first instance as to
the comparative
the financial results
of laying down creosoted
pine and cast iron
sleepers having been
considered as partially
vitiated

vitiated by the discre-
pancies pointed out by
the Consulting Engineer,
Mr Going was allowed an oppor-
tunity of revising his
calculations, ~~which he~~
~~has done in his letter of~~
~~the 9th Oct. 1874 p. 436~~
~~&c &c &c~~

Mr Going endeavours to
show that assuming the
life of wooden sleepers at
ten years and that of
iron sleepers at 25 and
50 years, respectively, the ex
of the latter would, in either
case, be more economical
the Consulting Engineer in the

the other hand contends that the balance of advantage rests with the wooden sleeper road, and cash horts his conclusions by two figured statements marked A and B.

There is however a considerable difference of opinion as to the details which should enter into the calculations required to arrive at correct results. but it is hoped that the elaborate manner in which the subject has been treated discussed

from different points of view will enable the Govt. of India to decide finally on the question.

The Agent of the Madras Railway points out that apart from the financial aspect of the case there is an important consideration which should not be lost sight of in arriving at a decision. viz: the increased safety which an iron sleeper road affords. the decay of wooden sleepers during a course of consider-
able

considerable discretion
it is not at all times
possible to guard against.

Attention to the con-
-ditions para. 5 of your
letter under reply should
be observed from the
papers submitted that
no reliable information
from actual experience
can be brought forward
for fixing the life of
an iron sleeper head
at 50 years, but the Chief
Engineer considers that
from the 12½ years' ex-he-
-rience already acquired

he

he is warranted in assu-
-ming that life to be not
less than 50 years. The bank
in tunnel and landing
are held to form too small
a proportion to affect
the estimate in any ap-
-preciable degree. If is
also explained that the
iron is nearly bought
up to 1931 to 1935
at the

Engr.

b.d. Copies 830 Copies of Previous
proceedings dated 21/5/31.

Forwarding further
papers in the case
of the comparative
advantages of
wooden and iron
sleeper Roads.

224 - 227.

4481 / 5003

Govt. of 1874 Madras.

PUBLIC WORKS.

☆

To The Commissioner for Railways
+
Secy. to Govt. of India

Read

Rec'd Encl 5

G. O. 16 Sept. 1874. No. 2580
7581

Nos. 226-227

Sleepers - (Madras Ry)

Papers on the subject of the comparative advantages of wooden & iron sleepers ~~[illegible]~~ for roads - ordered to be forwarded to the Govt of India -

224 - 227.

Rly Majority
Sec Notes