

(1) Number of pages _____

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MADRAS RECORD OFFICE

Government of Madras

Public Works DEPARTMENT

G.O. No.	2582	(Ry)	Press
B.P. No.			Mis.
Dated	9-9-		1875.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
9th September 1875.*

No. 198. Read the following letter from Lieutenant-Colonel J. H. M. SHAW-STEWART, R.E., Consulting Engineer for Railways, to Major-General G. W. WALKER, R.E., Secretary to Government, Public Works Department, dated Madras, 31st August 1875, No. 489:—

ADVERTING to the Proceedings of Government, under date the 15th April 1875, No. 1,049, I have the honor to submit for consideration a letter from the Agent of the Madras Railway forwarding, in accordance with the instructions received from his Directors, a Memorandum drawn up by the Chairman of the Company upon the comparative advantages, as to first cost and permanent maintenance, of creosoted wood and cast iron pot sleeper roads in a financial point of view.

2. With regard to Colonel Smith's Memorandum it should be remarked that the comparison made by him is a general statement of the comparative financial results which may be expected from laying a certain length of line, *de novo*, with wooden and

* *Vide* Proceedings of Government, 24th April 1874, No. 1,053.

Do.	do.	13th June 1874, No. 1,573.
Do.	do.	22nd July " " 1,973.
Do.	do.	10th Sept. " " 2,580.

with iron roads respectively, whereas the previous * calculations were made with reference to a particular section of the Madras Railway which has already been laid with wooden sleepers, and is there-

fore fully equipped with chairs and trepails. Colonel Smith seems to be in error when, at the close of his Memorandum, he applies the results obtained from the general comparison to this particular section of the line, 79½ miles in length, where the question is affected by special conditions.

3. It will also be seen that the data upon which Colonel Smith's calculations are based differ greatly from those hitherto employed, which were furnished by the Chief Engineer of the Madras Railway. The cost of laying down, *de novo*, a wooden sleeper road, according to Mr. Going, is Rupees 10,790 per mile, and the cost of an iron road, Rupees 17,440 per mile. Colonel Smith's inquiries have led him to the conclusion that the cost of the two descriptions of road per mile may be reckoned at Rupees 10,374 for wood, and Rupees 10,836 for iron. If the last figures are correct, calculations founded upon the first figures must be altogether untrustworthy; and there can be but little doubt that, if the original cost of a wooden road approaches so nearly to that of an iron road, the latter will, in the end, prove to be the more economical, even under the conditions which obtain upon the Palghaut-Beyapore section.

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, 28th August 1875, No. 899.

In accordance with the instructions conveyed to me by the Secretary, in his letter of the 30th ultimo, No. 556, a copy of which is enclosed, I have the honor to forward, herewith, for submission to Government, a Memorandum by Colonel J. T. Smith, R.E., Chairman of the Madras Railway Company, on the comparative advantages of wooden and iron pot sleeper roads.

*Proceedings of the Madras Government, Public Works Department,
9th September 1875.*

From JULIAN BYRNE, Esq., Secretary, Madras Railway Company, to R. B. ELWIN, Esq.,
Agent and Manager of the Madras Railway Company, dated 33, New Broad Street,
London, 30th July 1875, No. 556.

ADVERTING to paragraphs 34 and 35 of 1,157, with which you forwarded copies of the
Proceedings of Government, dated 22nd July 1874, 10th September 1874, and 16th April 1875,
Nos. 1,973, 2,580, and 1,049, relating to the comparative advantages of wooden and iron sleeper
roads; and, with reference to the last-named Proceedings, in which the opinion of the Government
of India is recorded in favor of the use of wooden sleepers, I am directed to forward, herewith,
a Memorandum by the Chairman on the subject, and to desire that it may be submitted for the
consideration of the Government before the indent for pine sleepers for the remaining 71 miles
between Boppore and Palghat is prepared.

MADRAS RAILWAY COMPANY.

MEMORANDUM, by the Chairman, on the comparative advantages, as to first cost and permanent
maintenance, of creosoted wood and cast-iron pot sleeper roads, in a financial point of view.

METHOD OF CALCULATION.—There are various methods of calculating the present and future
cost.

1st Method.—The one adopted by Major Luard, R.E., is not quite accurate and is not very
easy. It is open to the objection that it is based upon an hypothesis which is at variance with
the facts; the truth being, not that the sleepers begin to wear out the first year, and continue to
do so during the whole term of their existence, but that they all remain serviceable during 12 and
24 years respectively. According to Major Luard's calculation only $\frac{1}{12}$ th part of the wooden,
and $\frac{1}{24}$ th part of the iron sleepers are reckoned as doing full duty; all the rest, in varying
proportions of the whole time, are in reality treated as unserviceable.

This inaccuracy would be of comparatively little consequence if the calculation included and
set forth the expenses for all future time; for then the undue destruction of the sleepers during
the first period of 12 or 24 years would not so materially affect a calculation embracing an
indefinite futurity.

2nd Method.—Such a calculation is easily made, by reckoning the first cost, plus a sum which
invested at 5 per cent. would yield, for ever, the amount requisite to pay the annual expense of
renewal according to Major Luard's hypothesis. This would be according to his data

For Wood Rupees 7,536 + (Rupees 628 $\times$ 20) Rupees 12,560 or Rupees 20,096
For Iron Rupees 16,120 + (Rupees 496 $\times$ 20) Rupees 9,920 or Rupees 26,040 } 77-17%
making the iron road about 23 per cent. more costly than the wooden one. The comparison
thus obtained is more correct than that arrived at by Major Luard's method, but still it is not
exact.

3rd Method.—In order to carry out this, it is necessary to add to the first cost of each road
such a sum as will, at 5 per cent. interest, yield the amount required for the renewal of the whole
work at each stated interval; that is, for replacing the sleepers of the wooden line at the end of every
12th, and of the iron one at the end of every 24th, year, for ever. To find this sum the formula
 $\frac{1}{(1+r)^n} - 1$ (where r is the rate of interest, and n the number of years of interval) is applied.
By means of it the table A appended, showing the factor to be used for the several intervals, has
been calculated

According to this method, the wooden sleepers for first cost and all future renewals, on the
data assumed, require the equivalent of a present outlay of Rupees 17,005, and the iron sleepers
Rupees 21,477, thus showing the former to be 79-18 per cent. of the latter. By the second
method of calculation they were 77-17 per cent., and by Major Luard's method the ratio appears
to be 70-94 per cent.

*Proceedings of the Madras Government, Public Works Department,
9th September 1875.*

DATA.—But it is now necessary to point out that there is a very considerable inaccuracy in
the data used by Major Luard, from his having assumed the expense of the two systems to be in
the proportion of Rupees 7,536 to Rupees 16,120.

In Mr. Going's letter of the 4th July 1874, it was explained that the cost of the wooden
sleeper road was assumed to be only Rupees 7,536, because, for the special case in question, there
happened to be a full equipment of chairs and trenails, but that, including them, the proper cost
is Rupees 10,789. It is evident, therefore, that for the purpose of a general comparison the latter
figure, if correct, ought to be used; because, in the first place, the cost of these materials must be
charged to the road, and secondly, because, on the first and every subsequent renewal, the whole
cost of the pine sleeper road has to be made good.

Substituting the cost, Rupees 10,789, as that of the pine sleeper road, the comparison,
according to the 3rd method of calculation, is as follows, for 12 and 24 years respectively:—

Wood.—First cost, Rupees 10,789; cost of renewal at the end of every 12 years, $(10,789 \times 1-25651)$ Rupees 13,556. Total Rupees 24,345.

Iron.—First cost, Rupees 16,120; cost of renewal at the end of every 24 years, deducting
value of old iron $(16,120 - 4,200 \times 449418)$, Rupees 5,357. Total Rupees 21,477. Difference,
Rupees 2,868 per mile in favor of the iron road, which is 11-78 per cent. cheaper than the
wooden one.

These figures, it must be particularly noticed, show the ready money payments which in each
case provide for the first cost of construction, and the future maintenance of the roads for an
indefinite period.

CORRECTION OF DATA.—But there is good reason to believe that even the figures last quoted
from Mr. Going's letter do not give a fair representation of the truth. Sir John Hawkshaw's
carefully prepared estimate gives the costs of iron and wooden roads as £1,663 (Rupees 18,142) and
£1,386 (Rupees 15,120) respectively. A comparison of his estimate with that of Mr. Going for the
pine sleeper road shows the reason of their difference, which arises from Mr. Going having
omitted the "fang bolts and nuts" included by Sir John Hawkshaw, and only included trenails,
at a difference of cost of Rupees 1,479, and having also estimated for much lighter cast iron
chairs (21lbs. against 35lbs.), making a difference in cost of Rupees 1,844, and less expensive
sleepers, at a difference of Rupees 1,009. These differences show that Mr. Going's estimate
does not provide for the substantial roadway which Sir John Hawkshaw had in view when he
attributed to it a life of 12 years, and the cost of which ought to be allowed for.

As the real cost of each kind of sleeper is of the utmost importance to the attainment of a true
result, it has been thought advisable, instead of adopting Sir John Hawkshaw's figures, to inquire
into the practical experience of those Companies which have used the two kinds of sleepers in
question, and first in regard to

CREOSOTED WOODEN SLEEPERS.

Sir John Hawkshaw's estimate for these, including all accessories, together with freight
and charges up to delivery in India, is for one set complete, of which there are 1,848 in
a mile—15 shillings.

The East Indian Railway Company on the average of the past 7 years reckon the price of
each sleeper delivered in India 6s 6d., adding to which the estimated cost of chairs
and spikes 3s. 10d., the total is 10s. 4d.

The Great Indian Peninsula Railway give as the average cost of 250,000 sleepers sent out to
India in 1869, 6s. 5½d., adding to which the estimated cost of chairs and spikes, as
before, 3s. 10d., the total is 10s. 3½d.

The South Indian Railway Company give as the average cost of 8,800 sleepers sent to India
in 1870, 5s. 2d. each, adding to which the estimated cost of chairs and spikes, as before,
the total comes to 9 shillings; but it must be remarked that these sleepers were of an
inferior description, only half round instead of rectangular.

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9th September 1875.

The Madras Railway Company as the average cost of 18,664 sleepers sent to India in 1874 paid 7s. 9d., adding to which, as before, the estimated cost of chairs and spikes 3s. 10d., the total comes to 11s. 7d. per set.
Taking an average of all these deliveries, the result is an average cost of 10s. 5½d. per set, or £950 19s. (Rupees 10,374) per mile (closely agreeing with the 7 years' experience of the East Indian Line), as compared with Sir John Hawkshaw's fifteen shillings per set, or £1,386 (Rupees 15,120) per mile, showing that the material has been actually provided at the rate of only 68·61 per cent. of his estimate. To proceed now to

IRON SLEEPERS.

These Sir John Hawkshaw estimates, including all accessories, besides freight, insurance and every charge for delivery in India, at 18s. per set, of which there are 1,848 in a mile, as before.

The Great Indian Peninsula Railway Company give as the actual cost of 21,428 tons (499,987) of iron sleepers, sent to India in 1869, including all accessories, besides freight, charges, and every expense, 12s. 7d. per set, on the average.

The South Indian Railway Company state as the actual cost including all accessories, besides freight, and all charges, of 12,000 tons (336,000) of iron sleepers sent to India in 1870, the average price of each complete set, at 9s. 10½d.

The Madras Railway Company paid for 4,500 tons (120,000) of iron sleepers with all their accessories complete, including freight and all charges, delivered in India in 1869, the average rate of 9s. 9½d. per set.

Taking the mean of these three it amounts to 10s. 9d. per set, or £993 6s. (Rupees 10,836) per mile, as compared with Sir John Hawkshaw's estimate of 18s. per set, or £1,663 (Rupees 18,141) per mile. In other words the materials have been, during the last six years, practically supplied at the rate of 59·72 per cent. of Sir John's estimate.

From the above facts it appears that, although it has been found practicable in all cases to work below Sir John Hawkshaw's estimate, yet that the reduction of expense has been greater in respect to the iron than the wooden sleepers.

It may be doubted perhaps whether the truest economy would not have dictated a nearer approach to the qualities and prices allowed for by Sir John Hawkshaw, but without stopping to consider this, it may be remarked that, taking past experience as the guide in the final calculations now to be made, the cost of the two descriptions of sleepers for one mile will be reckoned at Rupees 10,374 for wood, and Rupees 10,836 for iron, as shown above.

In the previous calculations both kinds of sleepers are considered to be worn out and useless at the end of their respective lives, but the iron road is credited at the end of the 24 or 50 years with the value of the old iron remaining, at the rate of Rupees 30 per ton. No such credit has been hitherto given to the wooden sleepers, although the cast-iron chairs belonging to them may be fairly reckoned to last as long as the cast-iron bowls, and to be equally saleable at the end of the time. This allowance will, therefore, now be made, and also for the breakage of 5 per cent. of the chairs on each renewal of the wooden road at the end of 12 years. Moreover, as there seems to be the strongest evidence that the cast-iron may be reckoned as serviceable for much more than 24 years, the results will be stated for 36 years, as well as 24 and 50. The old iron remaining from the chairs is reckoned, as in Mr. Goings's letter of the 7th August 1874, No. 705, as 35 tons, at Rupees 30, or Rupees 1,050 per mile. The original cost of the chairs is taken at three-fourths of the 5s. estimated by Sir John Hawkshaw, or 3s. 9d. per pair, or £396 (Rupees 4,320) per mile.

24 YEARS.

CREOSOTED WOOD SLEEPERS, CHAIRS, &c.

Duration of the Wood Do. of Cast-Iron Chairs	Years.	First Cost.
...	12	RS. 6,054
...	24	4,320
Total first cost of the Sleepers complete	...	10,374

Proceedings of the Madras Government, Public Works Department,
9th September 1875.

To be replaced in 12 years:—							RS.	RS.
Wood, &c.	...	...	...	...	...	...	6,054	
Chairs	...	...	...	...	...	...	216	
							6,270	

Cost of replacing Rupees 6,270 every 12 years 6,270 × 1·25651 =							7,878	
First cost	...	...	...	...	...	...	6,270	
Total first cost and maintenance of wood, &c.								14,148

To be replaced in 24 years:—							RS.	RS.
First cost of Chairs	...	...	...	...	...	...	4,320	
Deduct value of old iron	...	...	...	...	...	...	1,050	
Value to be replaced in 24 years							3,270	
Cost of replacing Rupees 3,270 every 24 years 3,270 × 0·449436 =							1,469	
First cost of Chairs	...	...	...	...	...	...	4,320	
Total first cost and maintenance of the iron chairs								5,789

SUMMARY.

Total first cost and maintenance of the wood, &c.	...	...	...	14,148
Do. do. of iron chairs	...	...	...	5,789
Total first cost and maintenance of wooden sleepers				19,937

THE SAME FOR 36 YEARS.

If the ironwork (chairs) of the wooden sleepers be supposed to last 36 years, the calculation is as follows:—

	RS.	RS.
Rupees 3,270 × 0·2086891 =	...	682
First cost of the chairs	...	4,320
Total first cost and maintenance of the iron chairs		5,002

SUMMARY.

Total first cost and maintenance of the wood, as before	...	...	14,148
Do. do. iron chairs	...	...	5,002
Total first cost and maintenance of the wooden sleepers		...	19,150

THE SAME FOR 50 YEARS.

If the ironwork (chairs) of the wooden sleepers be supposed to last 50 years, the calculation becomes as follows:—

	RS.	RS.
Rupees 3,270 × 0·0955347 =	...	312
First cost of the chairs	...	4,320
Total first cost and maintenance of the iron chairs		4,632

Proceedings of the Madras Government, Public Works Department,
9th September 1875.

SUMMARY.		
Total first cost and maintenance of the wood, as before	Rs.	
Do. iron chairs ...	14,148	
Total first cost and maintenance of the wooden sleepers	4,632	
	18,780	

IRON SLEEPERS.

24 YEARS.		
First cost of the sleepers complete ...	10,836	
Cost of renewal, Rs. 10,836, less old iron, Rs. 4,200, = Rs. 6,636		
x .449418 =	2,982	
Total first cost and future renewal	13,818	
36 YEARS.		
First cost of the sleepers complete ...	10,836	
Cost of renewal every 36 years, Rupees 6,636 x .2086391 =	1,385	
Total first cost of future renewals	12,221	
50 YEARS.		
First cost of sleepers complete	10,836	
Cost of renewal every 50 years, Rs. 6,636 x .0955347 =	634	
	11,470	

SUMMARY.

24 YEARS.		
Iron ...	Rs. 13,818	
Wood ...	19,937	
Saving by using iron 30 1/2 per cent		
Saving per mile Rs. 6,119		
Do. on 79 1/2 miles	4,84,931	
36 YEARS.		
Rs. 12,221		
" 19,150		
36 per cent.		
" 6,929		
" 5,49,123		
50 YEARS.		
Rs. 11,470		
" 18,780		
39 per cent.		
" 7,310		
" 5,79,317		

Even according to Major Luard's system of calculation, the iron sleepers, upon the data founded on experience, are shown to be much the most economical; for the wood at Rs. 10,374 in 24 years would amount to Rupees 71,929, and the iron at Rupees 10,836 to Rupees 55,039, a difference in favor of the iron of 23 1/2 per cent.

The following tables will be useful in considering this question:—Table A above referred to, showing the amount in pounds sterling necessary to be set aside in order to provide, from interest at 5 per cent., successive payments of one pound each at the end of various intervals of time; Table B showing the amount of one pound accumulated at 5 per cent. compound interest; and Table C showing the amount of one pound per annum accumulated at 5 per cent. compound interest in any number of years:—

TABLE A.	
Years.	
1	= £20·000000
2	= 9·756098
5	= 3·619497
10	= 1·590092
12	= 1·256510

TABLE B.	
Years.	
1	= £1·05000000
2	= 1·10250000
5	= 1·27628156
10	= 1·62889463
12	= 1·79585633

TABLE C.	
Years.	
1	= £1·000000
2	= 2·050000
5	= 5·525631
10	= 12·577893
12	= 15·917127

Proceedings of the Madras Government, Public Works Department,
9th September 1875.

TABLE A.		TABLE B.		TABLE C.	
Years.		Years.		Years.	
20	= 604854	20	= 2·65329771	20	= 33·065954
24	= 449418	24	= 3·22509994	24	= 44·501999
25	= 419050	25	= 3·38635494	25	= 47·727099
30	= 301028	30	= 4·32194238	30	= 66·438848
36	= 208689	36	= 5·79181614	36	= 95·836323
40	= 165563	40	= 7·03998871	40	= 120·799774
50	= 955534	50	= 11·46739978	50	= 209·347996

J. T. SMITH.

4th August 1875.

No. 199.

ORDER THEREON, 9th September 1875, No. 2,582.

RAILWAY, No. 19.

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

(Here enter No. 2,583, dated 9th September 1875.)

(True Extract.)

(Signed) G. W. WALKER, Major-General, R.E.,

Secretary to Government.

To the Consulting Engineer for Railways.

Exd. S. T. Austin.

Spare Copies

PUBLIC WORKS DEPARTMENT,
OOTACAMUND, 9th September 1875.

No. 200.

No. 2,583.

FROM

MAJOR-GENERAL 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. 20.

SIR,—Adverting to the correspondence
ending with Major Luard's letter, No.
779 R., dated 20th March 1875, on the

subject of the comparative cost of wood and iron sleeper roads on the Madras Railway,
I am directed to submit the accompanying papers relating to a memorandum drawn
up by the Chairman of the Board of the Madras Railway Company, in which he claims
to have proved the superiority of iron over wooden sleepers in a financial point of
view. The Board request the consideration and orders of the Government of India
prior to submission and sanction of an indent for pine sleepers for 71 miles of road
between Palghaut and Beypore, the preparation of which is now deferred.

I have the honor to be,

Sir,

Your most obedient servant,

Major-General, R.E.,
Secretary to Government.

30.
Send of previous indent

Ed. S. T. Austin.

pare Copies

Govt. of Madras

PUBLIC WORKS

To

THE SECRETARY TO THE GOVERNMENT

OF INDIA

Dated September 9th.

Issued

Recd.

Encl.

G. O., 3th September 1875, No. 25,83.

SEPTEMBER.

No. 200

SUBMITTING papers relating to a memorandum drawn up by the Chairman of the Board of the Madras Railway Company, in which he claims to have proved the superiority of iron over wooden sleepers in a financial point of view, and intimating that the preparation of the 71 miles of road between Palghat and Beypore is deferred till a decision is given on this subject.

Way Department.

CONSULTING ENGINEER'S OFFICE.

No. 489 Madras August 1875

From

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

Consulting Engineer for Railways,

To

Maj. General.

Colonel G. W. WALKER, R.E.,

Secretary to Government,

Public Works Department,

Fort Saint George.

SIR,

Adverting to the Proceedings of Government under date the 15 April 1875, No 1049, I have the honour to submit for consideration a letter from the Agent of the Madras Railway, forwarding, in accordance with the instructions received from his Director, a Memorandum drawn up by the Chairman of the Company, upon the comparative advantages, as to first cost and permanent maintenance, of cross-tied wood and cast iron post sleeper roads, in a financial point of view.

2.

With regard to Colonel Smith's Memorandum, it should be remarked that the comparison made by him is a general statement of the comparative financial results which may be expected from laying a certain length of line, de novo, with wooden and with iron roads respectively; whereas the previous calculations were made with reference to a particular section of the Madras Railway which has already been laid with wooden sleepers, and is therefore fully equipped with chains and herails. Colonel Smith seems to be in error when, at the close of his Memorandum, he applies the results obtained from the general comparison to this particular section of the line, $79\frac{1}{4}$ miles in length, where the

quest.

With reference to the 24 April 74 to 1853
 13 June 74 - 1873
 22 July 74 - 1873
 10 Sept 74 - 1870

3.

question is affected by special conditions. It will also be seen that the data upon which Colonel Smith's calculations are based differ greatly from those hitherto employed, which were furnished by the Chief Engineer of the Madras Railway. The cost of laying down, de novo, a wooden sleeper road, according to Mr. Spring, is Rs 10,790 per mile; and the cost of an iron road, Rs 17,440 per mile. Colonel Smith's inquiries have led him to the conclusion that the cost of the two descriptions of road per mile may be reckoned at Rs 10,374 for wood, and Rs 10,836 for iron. If the last figures are correct, calculations founded upon the first figures must be altogether untrustworthy; and there can be but little

17 3
Little doubt that, if the original cost
of a wooden road approaches so nearly
to that of an iron road, the latter will,
in the end, prove to be the more eco-
nomical, even under the conditions which
obtain upon the Palghat-Beylore
section.

I have the honor to be
Sir

Your most obedient servant

Maintenant Lt. Col. R.E.

Comm. Engineer for Railways

Yours

0: 26 23

No 2582 Public Works Dept.

Proceedings of the Madras Government
Under date the 9 Sept. 1895
Read the following

From The Engr. Engr. for } (P.C. No. 489 of 31st Augt/95)
Railways

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

(P.C. No. 2583 of 9 Sept/95)

No 2583
To, The Secy. to the Govt of India
Public Works Dept.

Sir,
Adverting to the
correspondence

Engr. Engr. for Pys: 12
Office 17
8-9-75 Govt of India 30

2015-42/7512 334-335
-24-174-2396-337-
-13-174-206-267-
-22-174-486-488
-10-174-224-229.

RAILWAY DEPARTMENT.
No: 5653.
From
The Consulting Engineer,
for Railways,
To
The Secretary to Government,
P. W. Department,
Fort Saint George.
Dated 25th Sept 1895
Recd 25th Sept 1895

E. 3. V. No. 489

No. 2582. 9-9-95.

Submitting Letter
from the Engr. Engr. for
forwarding copy of Minutes
by the Chairman of the
Committee on the subject
of the construction of
a bridge of masonry and
iron, and the following

Engr. Engr. for Pys: 12
Office 17
8-9-75 Govt of India 30

correspondence ending
with Major Luard's
letter No. 779 R, dated
20th March 1875, on the
subject of the compara-
tive cost of wood and
iron sleeper roads on the
Madras Railway, I
am directed to submit
the accompanying papers
relating to a Memoran-
dum drawn up by the
Chairman of the Board
of the Madras Railway
Company in which he
claims to have proved
the superiority of iron
over wooden sleepers in
a financial point of
view. The Board
request

request the consideration
and orders of the Govt.
of India, prior to sub-
mission and sanction
of an Indent for Pine
Sleepers for 71 miles
of road between Pal-
ghat and Beypoor,
the preparation of which
is now deferred.

G.M.

6 SC of No 2583 & £30 SC
of previous No 2582 D
28-9-75

5653

Govt. of 1875: Madrid.

PUBLIC WORKS.

To

W. J. Phelps

Dist.

Recd.

Encl.

W. J. Phelps
C. O. of 1875, No. 2582
2583

Nov. 198-199

2.00

Comparative advantages
of Wooden & Iron Pot.
Deeper roads. - Passing
orders on letter from the
Consulting Engr: for Rys:
submitting with remarks
a letter from the Agent
M. Ry. Co., forwarding
copy of Memo. by the
of the Co. on the subject
of the

19199