

Public Works (1895) Department.

RAILWAY BRANCH.

G.O., No. 10R

DATED 24th September

[Despatch Abstract.]

Engineering Workshops, — Estimate of Rs 20,000
for the proposed — at Arkonam, Madras Railway,
Sanctioned.

BACK PAPERS.

[illegible]

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

14TH MAY 1895, No. 349 R., PUBLIC WORKS.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following paper :—

From the Acting Agent, South Indian Railway, to the Consulting Engineer for Railways, dated Trichinopoly, 2nd May 1895, No. 408.

It is necessary, for reasons given in the attached memorandum by the Acting Chief Engineer, that the capital establishment rolls of the Mayavaram-Muttupet Railway for 1895-96, sanctioned by G.O., No. 641 R., dated 30th November last, should be revised, and I have the honour to request that sanction may be accorded to the accompanying amended rolls.

ENCLOSURES.

Memorandum to accompany revised proposition statement of the Māvaram-Muttupet Railway
for 1895-96.

In framing the schedule of demands and preliminary budget estimate for 1895-96, it was anticipated that the major portion of the works on the Mayavaram-Muttupet Railway would be finished and that only Rs. 38,000 would suffice to complete the remainder. On a further examination it was found that this sum would not be enough and that to bring the line to the proper standard of efficiency a sum of Rs. 1,23,863 will be required. The completion estimate for the increased amount is under preparation and will be forwarded as soon as possible.

The increased expenditure necessitated an increase in the establishment and the principal excess in the proposition statement now submitted is under Engineering due to the retention of Supervisor in charge and to additional clerical staff for the Divisional office.

The depôt stores at Tiruválár will be closed at the end of 1894-95, but in order that the accounts should be properly closed it is proposed to retain the stores establishment up to the end of September 1895.

TRICHINOPOLY,
April 1895,

(Signed) W. H. SPALDING,
Acting Chief Engineer.

MAYAVARAM-MUTTUPET RAILWAY.
REVISED proposition statement of Mayavaram-Muttupet Railway for 1895-96.

Number.	Designation.	Monthly salary of office.	Present scale—vide Madras G.O. No. 641 R. of 30th November 1894.				Proposed scale.					
			Per mensem.	Per annum.	Capital.	Revenue.	Total.	Per mensem.	Per annum.	Capital.	Revenue.	Total.
1895-96. 1895-96.												
4 3 1	1. DIRECTION OR GENERAL. <i>Office Establishment.</i>	Under Rs. 100 Do. Do. Office Expenses Total, Direction ..	105 85 7 10 207	1,260 1,020 84 120 2,484	1,260 1,020 84 120 2,484		1,294 1,254 89 240 2,877	139 202 12½ 20 373½	1,294 1,254 89 240 2,877		1,294 1,254 89 240 2,877	
1 3 1	2. ENGINEERING. Upper Subordinates. <i>Office Establishment.</i>	150 Under Rs. 100 Do. Total ..	.. 105 7 112 5 .. 10 127	.. 1,260 84 1,344 60 .. 120 1,524	.. 1,260 84 1,344 60 .. 120 1,524		.. 2,745 390 3,135 180 225 360 255 5,955	150 230 262½ 15 19 30 21 497½	1,800 2,745 390 3,135 180 225 360 255 5,955		1,800 2,745 390 3,135 180 225 360 255 5,955	
1 1 1 1	3. STORES. Depôt storekeeper Clerk Lascars and watchmen Travelling allowances Office expenses .. Total, Stores ..	.. Under Rs. 100 Do. Do. Total, Stores ..	40 20 7 5 10 82	280 140 49 35 70 574	280 140 49 35 70 574		280 175 35 70 560	40 25 5 10 80	280 175 35 70 560		280 175 35 70 560	

1	4. AUDIT AND ACCOUNTS.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
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(Signed) **T. H. LEMESURIER,** (Signed) **W. C. CAVE-BROWNE,** (Signed) **W. H. SPALDING,**
 for Ag. Agent, South Indian Railway. for Chief Auditor, South Indian Railway. Acting Chief Engineer.

Certified that the entries under head Present scale have been duly verified by me and that provision has been made in the completion estimate to be sanctioned for the general charges for 1895-96. The amount is Rs. 5,300 in excess of the provision made in the preliminary budget for 1895-96.

(Signed) **A. GRANT,**
 Examiner, Ry. Accts., Trichinopoly.

ABSTRACT.

Sub-head of establishment.	Present scale, 1895-96.	Proposed scale, 1895-96.	Distribution.			
			Capital.		Revenue.	
			1895-96.	1895-96.	1895-96.	1895-96.
	RS.	RS.	RS.	RS.	RS.	RS.
Direction or General	2,484	2,877	2,484	2,877	..	..
Engineering	1,524	5,955	1,524	5,955	..	..
Locomotive	..	..	..	..	..	..
Traffic	..	..	..	..	..	..
Stores	574	560	574	560	..	..
Audit and Accounts	4,300	4,790	4,300	4,790	..	..
Medical and Sanitation	..	..	..	..	..	..
Total ..	8,882	14,182	8,882	14,182	..	..

ORDER—dated 14th May 1895, No. 349 R., Public Works.

The revised Capital establishment roll, Máyavaram-Muttupet Railway, for 1895-96 is sanctioned subject to provision being made in and sanction obtained to the completion estimate.

(True Extract.)

Under Secy. to Govt., P.W.D.,
Railway Branch.

To the Agent, South Indian Railway,
,, Examiner, Railway Accounts, Madras,
,, Financial Department.

Exd. C. A. Munisawmy.
Spare Copies

RAILWAY.

Gobt. of {1895} Madras.
PUBLIC WORKS.

Dated May, 14th.

Recd.

Encl.

G.O., 14th May 1895, No. 349 R.

MAY.

Mayavaram-Muttupet
Railway

The revised Capital establishment roll,
—, for 1895-96, sanctioned subject to pro-
vision being made in and sanction obtained
to the completion estimate.

Memorandum to accompany revised Proposition Statement
of the Mayavaram Muttupet Railway for 1895-96.

In framing the Schedule of demands and Preliminary Budget
Estimate for 1895-96 it was anticipated that the major portion of
the works on the m. m. Ry would be finished and that only
₹ 38,000 would suffice to complete the remainder. On a further
Examination it was found that this sum would not be enough
and that to bring the line to the proper standard of efficiency
a sum of ₹ 1,23,863 will be required. The Completion Estimate
for the increased amount is under preparation and will be
forwarded as soon as possible.

The increased Expenditure necessitated an increase in the
Establishment and the Principal excess in the Proposition
Statement now submitted is under Engineering due to the
retention of the Supervisor in charge and to additional
Clerical Staff for the Divisional Office.

The Depot stores at Tiruvalur will be closed at the end of
1894-95 but in order that the accounts should be properly
closed, it is proposed to retain the Stores Establishment up to
the end of September 1895.

Chief Engineer's Office }
Trichinopoly April 1895 }

23

W. H. Spalding
Ag. Chief Engineer

ENC. NO. 1 TO E. P. S. G. No. 1968 of 1895
 LETTER NO. 4080 2/5/95
 A

Abstract

Establishment

M

Direction or General
 Engineering
 Locomotive
 Traffic
 Stores
 Audit and Accounts
 Medical and Sanitation

Present Proposed		Distribution			
Scale	Scale	Capital	Revenue		
1895-96	1895-96	1895-96	1895-96	1895-96	1895-96
2484	2877	2484	2877	"	"
1524	5955	1524	5955	"	"
"	"	"	"	"	"
574	560	574	560	"	"
4300	4790	4300	4790	"	"
"	"	"	"	"	"
8882	14182	8882	14182	"	"

Monthly Salary of Office	Present Scale vide Madras G. O. No. 641 R of 30 th November 1894					Proposed Scale				
	Per Mensem		Distribution of charges			Per Mensem		Distribution of 95		
	Annun		Capital	Revenue	Total	Annun		Capital	Revenue	Total
100	✓ 40	✓ 280	✓ 280	✓	✓ 280	✓ 40	✓ 280	✓ 280	✓	✓ 280
20	✓ 20	✓ 140	✓ 140	✓	✓ 140	✓	✓	✓	✓	✓
20	✓ 7	✓ 49	✓ 49	✓	✓ 49	✓ 25	✓ 175	✓ 175	✓	✓ 175
	✓ 5	✓ 35	✓ 35	✓	✓ 35	✓ 5	✓ 35	✓ 35	✓	✓ 35
	✓ 10	✓ 70	✓ 70	✓	✓ 70	✓ 10	✓ 70	✓ 70	✓	✓ 70
	✓ 82	✓ 574	✓ 574	✓	✓ 574	✓ 80	✓ 560	✓ 560	✓	✓ 560
1000	✓ 174 $\frac{1}{2}$	✓ 2089	✓ 2089	✓	✓ 2089	✓ 180	✓ 2080	✓ 2080	✓	✓ 2080
1000	✓ 140	✓ 1680	✓ 1680	✓	✓ 1680	✓ 190	✓ 2280	✓ 2280	✓	✓ 2280
100	✓ 7	✓ 84	✓ 84	✓	✓ 84	✓ 7	✓ 84	✓ 84	✓	✓ 84
	✓ 4 $\frac{1}{2}$	✓ 50	✓ 50	✓	✓ 50	✓	✓ 23	✓ 23	✓	✓ 23
	✓ 17	✓ 203	✓ 203	✓	✓ 203	✓ 17	✓ 203	✓ 203	✓	✓ 203
	✓ 16 $\frac{1}{2}$	✓ 194	✓ 194	✓	✓ 194	✓ 10	✓ 120	✓ 120	✓	✓ 120
	✓ 358 $\frac{1}{2}$	✓ 4300	✓ 4300	✓	✓ 4300	✓ 204	✓ 4790	✓ 4790	✓	✓ 4790
1000	✓ 8882	✓ 8882	✓	✓	✓ 8882	✓ 1355	✓ 14182	✓ 14182	✓	✓ 14182

W. Chas. Carrington
Chief Auditor
S. J. By.

M. Spalding
Ag. Chief Engineer

certified that the entries under head Present Scale have been
by verified by me and that Provision has been made in
Completion Estimate to be sanctioned for the General charges for 1895-96. The amount is Rs 5330/- in
of the provision made in the preliminary Budget for 1895-96

Ag. Chief Engineer
Examiner By Accounts

to Railway

3

Madras Railway for 1895-96

Monthly Present Scale vide Madras G.O. No. 641
R of 30 November 1894

Proposed Scale

Office	Per mensum	Per Annum	Distribution of charges		Per mensum	Per Annum	Distribution of charges		Per mensum	Per Annum
			Capital	Revenue Total			Capital	Revenue Total		
3000	105	1260	1260	1260	139	1294	1294	1294		
25	85	1020	1020	1020	202	1254	1254	1254		
20	7	84	84	84	12 1/2	89	89	89		
10	10	120	120	120	20	240	240	240		
	207	2484	2484	2484	373 1/2	2877	2877	2877		
1500					150	1800	1800	1800		
400	105	1260	1260	1260	230	2745	2745	2745		
20	7	84	84	84	32 1/2	390	390	390		
	112	1344	1344	1344	262 1/2	3135	3135	3135		
	5	60	60	60	15	180	180	180		
					19	225	225	225		
					30	360	360	360		
	10	120	120	120	21	255	255	255		
	127	1524	1524	1524	497 1/2	5955	5955	5955		

Number

1895-96 1895-96

Designation

3 Stores

1	1	Dehot Storekeeper
1	1	Clerk
1	4	Lascars and Watchmen
		Travelling Allowances
		Office Expenses

Total Stores

4 Audit and Accounts

1	1	Accountant 3 rd Grade
		Office Establishment
4	6	Clerks
1	1	Peon
		Travelling Allowances
		Pension and Leave Contributions
		Office Expenses

Total Audit and Accounts

Total General Charges

J. H. L. Meunier
for Acting Agent
S. I. Ry

2
408 1968 5
2/5/95

URGENT.

South Indian Railway Co., Ltd.

AGENT'S OFFICE,

TRICHINOPOLY, 2nd May 1895.

From

Ag.
THE AGENT,

SOUTH INDIAN RAILWAY,

To

THE CONSULTING ENGINEER

FOR RAILWAYS,

MADRAS.

Sir,

It is necessary, for reasons given in the attached memorandum by the Acting Chief Engineer, that the Capital Establishment Rolls of the Mayavaram Mutpet Railway for 1895-96, sanctioned by G. O. N^o 641.R dated 30th November last, should be revised, and I have the honor to request that sanction may be accorded to the accompanying amended Rolls.

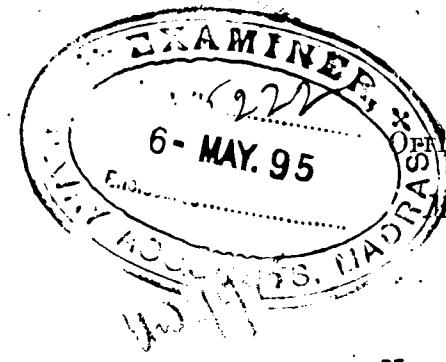
I have the honor to be
Sir

Your most obedient servant

David Logan
Ag. Agent

2 Enclosures by book post

65



OFFICE OF THE CONSULTING ENGINEER FOR RAILWAYS,
Madras, 4th May 1895.

No. 1467

OFFICE NOTE.

Letter from the Agent, South Indian Railway, No. 408,
dated 2nd May 1895, forwarded to the Examiner of Railway
Accounts, for favour of remarks -

[Signature]
for E.R.

EXAMINER'S REPLY.

The Capital Establishment Roll might
be sanctioned by the Local Government,
subject to provision being made in, and
sanction obtained to, the Completion esti-
-mate.

Agent should be asked to submit
proposals for a reappropriation to cover
the excess over the budget provision for
general charges.

No appointments exceeding Rs 250 have been
provided for in the rolls.

8.5.95

[Signature]
Major R.E.

[Handwritten signature]

S
9/5

From
The Agent,
South Indian Railway,
Trichinopoly,
To
The Consulting Engineer for
Railways,
Madras.
Dated
Received
No.
189
ENCLOSURE.

1768

From the Under Secretary to the Government of India, Public Works Department (Railway Construction), to the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, dated Simla, the 8th May 1895, No. 535 R.C.

In continuation of Government of India letter No. 413 R.C., dated 16th April 1895, communicating the sanction of the Government of India to the estimate amounting to Rs. 79,888 of the cost of strengthening the weak girder bridges on the South Indian Railway, I am directed to observe that the cost of the temporary diversion required in connection with the bridge of 5 spans of 30 feet (Rs. 1,050) has been allocated to Revenue.

2. This, I am to remark, is not in accordance with the accepted practice in such cases, viz., that the incidence of cost of temporary works should follow that of the main works in connection with which they were required, or, where the necessity for temporary works arises in connection with works debitable partly to Capital and partly to Revenue, their cost should be divided between the two in rateable proportions.

3. The cost of the temporary diversion above referred to should therefore be debited to Capital, the cost of the alterations to the 5-30 feet span bridge for which it is required being charged to that head. With this alteration the allocation of the estimate for Rs. 79,888 will stand as follows:—

To Capital	...	...	...	...	...	...	...	...	Rs.
To Revenue	...	...	...	...	...	...	...	...	75,954
									3,934

4. The sanction accorded in Government of India letter No. 443 R.C., dated 16th April 1895, has been registered as No. 2, South Indian Railway, of 1895.

ORDER—dated 15th May 1895, No. 353 R., Public Works.

Communicated to the Agent, South Indian Railway, for information.

2. This sanction has been registered as No. 1 R. of 1895-96.

(True Extract.)

(Signed) F. R. UPCOTT,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

To the Agent, South Indian Railway.
„ Examiner, Guaranteed Railway Accounts.

RAILWAY.

Gobt. of {1895} Madras.
PUBLIC WORKS.

Dated May, 15th.

Recd.

Encl.

G.O., 15th May 1895, No. 353 R.

MAY.

Bridges

The sanction of the Government of India to the estimate of Rs. 79,888 for strengthening the weak girder — on the South Indian Railway, communicated to the Agent.

APRIL 1895, No.

R., PUBLIC WORKS.

GOVERNMENT OF MADRAS.
PUBLIC WORKS DEPARTMENT.

Railway.

Read the following papers:—

From the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, to the Secretary to the Government of India, Public Works Department, dated 22nd September 1894, No. 2942 C.

I am directed to forward, for the sanction of the Government of India, an estimate amounting to Rs. 79,888 chargeable in the proportion of Rs. 74,904 to capital and Rs. 4,984 to Revenue, for strengthening the weak girder bridges on the South Indian Railway.

2. The work included in this estimate comprises the strengthening of such bridges as were found to be weak by Sir George Bruce, the Company's Consulting Engineer. A copy of this gentleman's investigations was sent to you with letter No. 32/O., dated 30th May 1894, from the Senior Government Inspector of Railways, Madras. It will be remembered that Sir George Bruce's calculations are based on the Board of Trade rules, but the estimate now submitted provides for the girders being strengthened to the standard recently laid down by the Government of India, and with the adjusted wheel weights of the "O" class engine as given in Sir G. Bruce's report. A tabular statement showing in detail the programme embodied in the present estimate is attached.

3. As it has been ruled that the strengths of Indian railway bridges are to be investigated under the rules laid down in the enclosure to Government of India, No. 1369 R.C., dated 13th December 1892, the estimate now submitted will not be final, and a supplementary estimate including the bridges which are weak under the new rules will be prepared hereafter.

From the Under Secretary to the Government of India, Public Works Department (Railway Construction), to the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, dated Simla, the 16th October 1894, No. 1015 R.C.

With reference to your letter No. 2942 C., dated 22nd September 1894, submitting for sanction an estimate amounting to Rs. 79,888 of the cost of strengthening the weak girder bridges on the South Indian Railway, I am directed to request, in the first instance, that a copy of the Board of Directors' orders on the subject may be furnished for the information of the Government of India.

From the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, to the Secretary to the Government of India, Public Works Department, dated Calcutta, 24th November 1894, No. 628 R.

With reference to your letter No. 1015 R.C., dated 16th October 1894, I am directed to forward herewith an extract from letter from the Board of Directors, South Indian Railway, No. 139, dated 26th October 1894, regarding the estimate amounting to Rs. 79,888 of the cost of strengthening the weak girder bridges on the South Indian Railway.

Here print extract from Board of Directors copy attached.

Please take number of copies
Please see
corrections
sent
9/2/95
18.5

Statement showing in detail the programme in bonded in the estimate submitted to the Govt of India with letter No 2742 C dated 22 September 1894.

Mileage of bridge.	Number of spans.	Span in feet and type of girder.	Portion of bridge to be strengthened.	Method of strengthening.	Main girder.				Cross girder.				Remarks.
					Flange areas square inches.		Flange stresses tons per square inch.		Flange areas square inches.		Flange stresses tons per square inch.		
					Before strengthening.	After strengthening.	Before strengthening.	After strengthening.	Before strengthening.	After strengthening.	Before strengthening.	After strengthening.	
231/16	3	80 B	Cross girder	Addition of plates 12 feet long on both flanges centrally placed on the cross girder length of 14' 6". The section of the plates will vary, the following sizes being added:- 9" X 3/4" iron. 8" X 1/2" " 8" X 3/4" steel. Addition of plates 12' X 1/2" (iron). Addition of plates 12' X 3/4" (steel). Substitution of stronger steel span. Do. do. Do. do. Do. do. Addition of plates 12" X 1/2" (iron). Do.	..	..	..	..	3.89	6.80	12.23	7.00	For section 9" X 3/4" " For section 8" X 1/2" " For section 8" X 1/2" (steel).
232/11	4	30 B	Do.		..	..	..	..	3.89	7.76	12.23	6.13	
233/3	4	30 B	Do.		..	..	..	..	3.89	7.26	12.23	6.55	
234/4	4	30 B	Do.		..	..	..	..	3.89	6.42	12.23	7.41	
235/2	8	30 B	Do.		..	..	..	..	3.89	..	12.23	..	
236/10 N	5	30 B	Do.		..	..	..	..	3.89	..	12.23	..	
237/2 N	9	30 B	Do.		..	..	..	..	3.89	..	12.23	..	
238/3 N	2	30 B	Do.		..	..	..	..	3.89	..	12.23	..	
247/2 N	3	30 B	Do.		..	..	..	..	3.89	..	12.23	..	
266/2 N	7	30 B	Do.		..	..	..	..	3.89	..	12.23	..	
169/9	2	20 G	Main girder	5.25	9.75	10.68	6.75	..	..	..	..	The decking of these bridges forms part of the upper flanges of the cross girders.	
219/8	10	20 A	Do.	4.38	10.01	9.62	4.21	3.75	3.75	4.67	4.67		
248/5	1	20 A	Do.	4.38	6.59	9.62	6.39	3.75	3.75	4.67	4.67		
248/9	3	20 A	Do.	4.38	6.59	9.62	6.39	3.75	3.75	4.67	4.67		
288/5	1	20 A	Do.	4.38	6.59	9.62	6.39	3.75	3.75	4.67	4.67		
378/8	1	20 A	Do.	4.38	6.59	9.62	6.39	3.75	3.75	4.67	4.67		
57.7 A	1	20 G	Do.	4.38	6.59	9.62	6.39	3.75	3.75	4.67	4.67		
255/16 N	3	20 A	Do.	5.25	9.75	10.68	6.75	..	..	..	..		
261/15	4	20 D	Cross girder	4.38	8.89	9.62	4.74	2.55	4.33	12.38	7.29		
263/4	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
260/10	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
265/6	4	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
272/8	3	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
279/11	5	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
284/0	2	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
293/4	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
305/13	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
310/2	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
319/15	2	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
313/2	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
316/12	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
323/4	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
329/2	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
340/6	2	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
344/10	1	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
369/10	2	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
378/15	2	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
380/2	4	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
380/4	3	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		
892/17	2	20 D	Do.	..	..	..	..	2.55	4.33	12.38	7.29		

Mileage of bridge.	Number of spans.	Span in feet and type of girder.	Portion of bridge to be strengthened.	Method of strengthening.	Main girder.				Cross girder.				Remarks.	
					Flange areas square inches.		Flange stresses tons per square inch.		Flange areas square inches.		Flange stresses tons per square inch.			
					Before strengthening.	After strengthening.	Before strengthening.	After strengthening.	Before strengthening.	After strengthening.	Before strengthening.	After strengthening.		
383/19	3	20 D	Cross girder	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
414/6	8	20 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
415/10	8	20 D	1 c.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
428/10	2	20 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
431/12	1	20 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
429/4 T	1	20 D	1 c.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
429/6 T	1	20 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
430/15 T	3	20 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
442/13 T	1	20 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
218/8	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
271/12	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
285/16	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
314/9	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
321/14	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
323/2	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
325/17	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
326/5	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
339/5	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
357/14	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
361/8	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
364/9	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
370/1	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
371/8	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
379/14	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
380/9	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
383/13	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
387/15	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
413/14	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
414/2	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
421/8	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
430/14	1	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
431/16 T	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
434/10 T	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
439/1 T	2	15 D	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
213/6	1	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
317/4	1	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
317/16	1	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
318/7	1	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
322/7	2	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
323/10	3	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
324/14	2	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
324/17	2	12 B	Do.	..	..	..	..	..	..	2.55	4.33	12.38	7.29	
				Addition of steel plates 6" x 1/2" to the bottom flanges.				..	..	2.55	4.33	12.38	7.29	

332/10	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
342/16	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
345/13	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
346/5	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
349/13	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
351/11 T	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
356/13	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
358/3	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
360/9	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
366/7	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
367/10	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
384/15	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
392/4	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
399/1	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
401/1	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
406/4	2	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
407/15	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
410/9	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
412/7	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
422/14	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
440/3	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
442/4	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
426/8 T	2	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
435/1 T	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
435/7 T	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
437/15 T	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
438/2 T	2	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
438/11 T	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
441/6 T	2	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
443/2 T	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	
443/11 T	1	12 B	Do.		..	..	..	..	2.55	4.33	12.38	7.29	

6. The railway authorities do not propose to strengthen the main girders of the bridges at mileages 231/16, 232/11, 233/3, 234/4, 235/2, 236/10 N., 237/2 N., 238/3 N., 247/2 N., 262/2 N., 266/5 N. The Company's Consulting Engineer, in taking out the stresses, arrived at the conclusion that, under Board of Trade rules, the main girders were sufficiently strong. As far as I can make out he has treated these bridges as having non-continuous spans of 30 feet, whereas, with the exception of the bridge at 247/2 N., the girders are continuous and in all cases the clear span should be taken as 35 feet. Making these corrections I find that, under the Board of Trade rules, there is a deficiency of nearly half a square inch in the flanges of the continuous girders, and about $1\frac{1}{2}$ square inches in those of the discontinuous spans. Under the Government of India rules the continuous girders are deficient 3.84 square inches in the top and 3.90 square inches in the bottom flange, while the non-continuous flanges are short to the extent of 5 square inches approximately. The areas of metal in the top and bottom flanges are 11.75 and 11.5 square inches, or, deducting rivet holes 9.31 and 9.25 square inches respectively.

7. Some of the plate girder bridges of 70, 50 and 30 feet spans have tee iron cross girders on the upper flanges. The web of the tee is secured by one or three rivets to angle iron chubs which are either bolted or rivetted to the main girder flanges. All these cross girders are theoretically very weak, particularly some of those on the 70 feet spans, whose section is stated by the railway authorities to be $4" \times 4" \times \frac{7}{8}"$. The smallest section I could find during inspection was $4" \times 4" \times \frac{7}{8}"$, but of course I was unable to measure every cross girder, and the lighter type may be in the road. In my opinion all these cross girders are unsafe and should be thrown out of use either by lifting the road and putting in a stronger section or by substituting cross sleepers. The former seems to me the better method as the stronger cross girders, of which I understand there is a considerable spare stock, could be easily inserted, and, moreover, the longitudinals are generally in good condition with several years' life left in them. Sir George Bruce, the Company's Consulting Engineer, does not consider the condition of these cross girders to be dangerous, and is of opinion that the weakest section, viz., $4" \times 4" \times \frac{7}{8}"$ is practically safe though strained to a greater extent than desirable. He has also tested a similar section of girder under conditions which he considered the same as those actually obtaining on these spans, and found that, in the worst case, failure commenced under 17 tons dead load. As Sir George Bruce arranged for the testing span to be the distance between the inner edges of the main girder flanges, or 4 feet, while the span in reality is $5\frac{1}{2}$ feet or the distance between the main girder centres, his experiments give a more favorable result than ought to be taken. It was doubtless intended when the girders were designed that a fair bearing should be obtained on the flanges of the main girders, but owing to the latter being sometimes bent and to imperfections in fitting, about 50 per cent. of the cross girders are suspended from the angle iron chubs quite clear of the main girders. I found on examination that all the tee iron cross girders were weakened by the boring of numerous holes, of which fact Sir George Bruce was of course ignorant. I also noticed that nearly every alternate cross girder is supported on the rivet head of the horizontal diagonal bracings which intersect immediately under the web of the tee. The cross girders were carefully examined for signs of failure, but nothing was found except on two spans of the bridge of 7×70 feet spans at mileage 353/8. On this bridge 5 spans have cross girders $4" \times 5" \times \frac{1}{2}"$ and 2 have cross girders $4" \times 4" \times \frac{7}{8}"$; the former showed no indications of weakness, but on the latter the web of the tee iron and the girder flange had in several cases slightly cut into each other. Knowing the theoretical weakness of these cross girders I can only regard this as incipient failure and a warning that collapse is but a matter of time. I think that immediate steps should be taken to secure the longer bearing of the cross on the main girders, and to give the former a broader bearing than the bottom edge of the tee iron. This action should be taken in anticipation of the measures to be adopted in connection with the replacement of the cross girders, and can easily be effected by the insertion of thin packings.

8. In connection with this type of girder it was noticed that frequently the angle iron chubs do not rest fairly on the flanges; in a few cases one end was so much raised that the finger could be inserted in the opening. I am unable to say whether this is due to the wrenching action of the weak cross girder, or to original faulty construction, but I incline dubiously to the latter alternative. These chubs are some-

From the Under Secretary to the Government of India, Public Works Department (Railway Construction), to the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, dated Simla, the 16th April 1895, No. 443 R.C. *the*

I am directed to acknowledge the receipt of your letter No. 628 R., dated the 24th November 1894, forwarding copy of the sanction of the Board of Directors of the South Indian Railway Company, to the estimate amounting to Rs. 79,888 of the cost of strengthening the weak girder bridges on that railway submitted with your letter No. 2942 C., dated 22nd September 1894. *ov/-*

2. With reference thereto I am to communicate the sanction of the Government of India to the estimate in question.

3. The question of allocation is still under consideration, and orders will issue on the subject later.

ORDER—dated April 1895, No. R., Public Works.

Communicated to the Agent, South Indian Railway, for information.

2. This sanction has been registered as No. R. of 1895-96.

(True Extract.)

Captain, R.E.,
Under Secy. to Govt., P.W.D.,
Railway Branch.

To the Agent, South Indian Railway.
„ Examiner, Guaranteed Railway Accounts.

Exd. Shaik Karim.
Spare Copies

RAILWAY. Bridges

The sanction of the Government of India to the estimate of Rs. 79,888 for strengthening the weak girder — on the South Indian Railway, communicated to the Agent.