14. 11. 05

No. 1881 W a/14th August 1885

B

Comd. to the Examiner P.W.A. for guidance with reference to para 1 of the foregoing order, and in contn. of G.O. No. 1539 W. of 2d July/85

CV.
4. 8. 85

JJS
7. 8. 85

13 M/14/8

Ex. P.W. Accts ✓
Supt. M. H. Works ✓
Marine Dept ✓

Desp 14/8/85

Sd 20/8

Ayl. 13/8
R. 11-8-85
R 15/8
17/8
2/8

O 4/8/85
R. 10. 8-85

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[6]

Govt. of {188 } Madras.

To

The M. Dept

Recd. 1. 8. 85

(12)

Proceedings, dated 24 July 1885.
No. 301 Mn

Subject.

No. 1881 W a/14th August/85

Ordering that the Acct. Genl. be informed of all sums advanced on account of the Madras Harbour in view to the calculation of interest thereon

~~Do.~~
N

Marine Department.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

READ the following

from the Accountant General, Madras, dated 8th July 85 No. 1687.

A.G. No. 1539 W
2-7-85

With reference to your semi-official letter of 15th May 1885 to the Master Attendant, Madras, desiring him to arrange with me for the adjustment of interest now due on Capital outlay on the Madras Harbour, I have the honor to request that you will be so good as to inform me how the sum of Rs 1,85,357 shown as the amount spent up to 1st April 1882 in G.O. Marine No. 233, dated 6th June 1885, was arrived at. The Examiner of Public works accounts to whom a reference was made states that he is unable to check or agree this sum in his office. I request further that you will be good enough to furnish monthly details of this sum, as under Civil Account Code chapter 70, rule 9, interest on loan

Expenditure

expenditure by the Public works department should be calculated on the monthly outlay.

Order:- 24th July 1885, No. 301 (Pwi)

It is observed under the terms of the Secretary of States' despatch, No. 300,+ dated 18th October 1883 interest becomes payable only on sums advanced for the Harbour works since the 1st April 1883. The Examiner of Public works accounts will be instructed in the Public works department to keep the Accountant General informed of all such advances.

+ Cannot be traced - Vide No. 3378 W of 26-11-83 - S.L. 1-8-85

The figures (1,85,357) referred to by the Accountant General includes expenditure from November 1881 to 31st March 1882.

(True Extract)

Chief Secretary

To
The Accountant General
" Master Attendant.
" Public works Deptt.

[illegible]

22nd July 1885, No. 1721, Public.

GOVERNMENT OF MADRAS.

PUBLIC DEPARTMENT.

Read—the following paper :—

From F. C. DAUKES, Esq., C.S., Under Secretary to the Government of India, Home department (Public), to the Chief Secretary to Government, dated Simla, 6th July 1885, No. 26-1140.

I am directed to request that any representation which any officer of Government may wish to make in his official capacity to the English Royal Humane Society with reference to the grant of the Society's medals and certificates may in future be forwarded to the Local Government to which such officer is subordnate, and by the Local Government concerned to Her Majesty's Secretary of State for transmission to the Society. The practice of forwarding such applications direct to the Society should be discontinued.

Order—dated 22nd July 1885, No. 1721, Public.

Communicated to the departments of the Secretariat and to all heads of departments.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the departments of the Secretariat.
,, all heads of departments, including Collectors and Judges.

Exd. J. Wright.

22ND JULY 1885, No. 1721, PUBLIC.

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Chief Secretary.

To the departments of the Secretariat.
,, all heads of departments, including Collectors and Judges.

Exd. J. Wright.

No 1875 Wd/13th August/85.

Communicated to officers of the P.W. Dept. generally, for information and guidance.

(Signed) J.H.

Supdg. Engrs:
C.E. for Irrign
Exr P.W. Accts.
Consg. Engr. for Rys.
Supt. of Works T. M. scheme
Engr-in-Chief, M. S. Railways
Exr Guaranteed Ry. Accts.
Exr State Ry. Accts.
Supt. Madras Harbour Works
Consg. Archt. to Govt.
Engr.-in-Ch. Bellary
Kistna State Ry.

P.W.D.

Govt. of (1885) Madras.

PUBLIC.

Issued

Recd. Encs.

od

G.O., 22nd July 1885, No. 1721.

~~Communicated to the departments~~

No 1875 Wd/13th August/85.

JULY.

Royal Humane Society.

Communicating to all heads of departments a letter from the Government of India, ruling that any representation which any Government officer may as such wish to make to the — should not be forwarded direct, but to the Local Government to which the officer is subordinate.

With Order

22nd July 1885, No. 1721, Public.

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1875 Wd/13th August 1885.

Communicated to
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nd guidance.

(Signed) J.S.

Suptg: Engineers
C. E. for Irrign
Exr P. W. Accts
Consg: Engr: for Rys:
Supt. of Works I. M. Scheme.
Engr:-in-chief, M. S. Railways
Exr Guaranteed Ry: Accts.
Exr State Ry: Accts.
Suptt Madras Harbour Works
Consg: Archt to Govt.
Engr:-in-Ch. Bellary
Kistna State Ry:

P W D

Govt. of (1885) Madras.

PUBLIC.

Issued

Recd. Enc.

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(True Extract.)

Chief Secretary.

To the departments of the Secretariat.
„ all heads of departments, including Collectors and Judges.

Exd. J. Wright.

20-8-C

O 4/8/85 — R. 10-8-85

18

1875 W a/ 13th August /85

Communicated to officers of the P.W. Dept generally for information & guidance.

CS
3.8.85

6.8.85

Supg Engrs ✓
C.E. for Irriga ✓
Exr: P. W. Accts ✓
Cons: Engr for Rys ✓
Supt of Works Tank Maintenance Scheme ✓
Engr in Chief Madras State Railway ✓
Exr Guaranteed Railway Accts ✓
Exr State Railway Accts ✓
Supt Madras Harbour Works ✓
Cons. Architect to Govt. ✓
Engr in Chief Bellary Kistna State Railway ✓

20/8

13/8/85

13/8 R. 11-8-85 R. 13-8-85

8.85

Govt. of (1885) Madras.

PUBLIC.

20 S.C.

(11)

Issued

Recd. 3/8/85 Encs.

G.O., 22nd July 1885, No. 1721.

No. 1875 W a/ 13th August 1885

JULY.

Royal Humane Society.

Communicating to all heads of departments a letter from the Government of India, ruling that any representation which any Government officer may as such wish to make to the — should not be forwarded direct, but to the Local Government to which the officer is subordinate.

12th November 1883, No. 3205 W., Public Works.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Military Works.

Read—the following letter from Colonel G. CHESNEY, Secretary to the Government of India, Military Department, to the Secretary to the Government of Madras, Public Works Department, dated Simla, 30th October 1883, No. 1079 M.W.:—

In reply to your letter, No. 2802 W., dated 5th October 1883, I am directed to convey the sanction of the Government of India to the dismantlement of the old rest-house at Beypore referred to therein.

2. With reference to paragraph 2 of letter, No. 325 M.W., dated 19th April 1881, from the Government of India in the Public Works Department, I am directed to request that, in future, the Government of Madras will sanction, in ordinary cases like the present, the demolition of superfluous military buildings without reference to the former.

Order—dated 12th November 1883, No. 3205 W., Public Works.

Communicated to the Superintending Engineer, Fourth Circle, with reference to Proceedings of Government, No. 2801 W., dated 5th October 1883.

2. Paragraph 1217 of the Public Works Code will be modified with reference to paragraph 2 of the foregoing letter.

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To Superintending Engineers.
„ the Examiner, Public Works Accounts.
„ the Military Department, with copy of G.O., No. 2801 W., dated 5th October 1883.

Exd. A. F. Goodall.
Spare Copies

8/85 R. 10-8-85

BUILDINGS AND ROADS.
MILITARY WORKS.

Govt. of {1883} Madras.

PUBLIC WORKS.

Dated November, 12th.

Recd. *Encl.*

G.O., 12th Nov. 1883, No. 3205 W.

NOVEMBER.

Rest-house, Beypore

The demolition of the old —, sanctioned by the Government of India; and the Madras Government requested to sanction, in future, in ordinary cases, the demolition of superfluous military buildings.

No 667 West Coast Dn Office,
Calicut 30th July 1885

From
The Executive Engineer,
West Coast Division
To
The Collector of Malabar.

Sir,

I have the honor to bring to your notice that a portion of the old Huzur Cutcherry at Calicut has fallen down during the late heavy rains & that a good deal of the rest of the building is unsafe - under these circumstances I recommend that the building be dismantled

I

Oct/8/85 – R. 10.8.85 10/8

I have &c

(Sd) Ross Thompson Col R.E.

Executive Engineer

(True copy)

No 408

Forwarded to the Superintending Engineer, 4th Circle, for information with reference to para 1217 of the Public Works Code.

Ross Thompson Colonel R.E.

Executive Engineer

West Coast Divn

30th July/85.

No 321/EW

Submitted to the Chief Engineer P.W. Department who is requested to be good enough to obtain orders of Government to demolish the building.

Vide Code para: 1217 & G.O. 169 of 1884 - G.O. No 3205-W 12-11-83 - D.P.

L Beatty Col: R.E.

Coimbatore, 1st August/85. Supg Engineer, 4th circle

G: ENGINEER'S OFFICE
No. 531/WC.
1 AUG. 85
P. W. D.
FOURTH CIRCLE

From

The Exec: Engineer
West Coast Dn

Dated 30 } July / 85
Recd }

No. 408

Old Huzur Cutcherry building at Calicut –

– Forwarding for information copy of letter to the Collector of Malabar recommending that the — be dismantled

Written

16th July 1885, No. 477 L.F., Financial.

GOVERNMENT OF MADRAS.

FINANCIAL DEPARTMENT.

Read—again the following paper :—

G.O., dated 19th June 1885, Mis. No. 337 L.F., Financial.

Read—the following papers :—

From W. LOGAN, Esq., President of the District Board, Malabar, to the Chief Secretary to Government, dated Calicut, 4th June 1885, No. 33.

Referring to G.O., Financial department, 183 L.F., 19th May 1885, I have the honor to enclose, for your information, copy of a memorandum by the District Board District Engineer regarding the indent for iron work for the Irrity and Merumpoya bridges.

2. And I have the honor to draw your special attention to Mr. Anderson's remarks regarding the impossibility of getting a RIVETTED bridge put together in such out-of-the-way and deadly-feverish localities as those in which these two bridges are to be erected.

3. The question of having a RIVETTED bridge was deliberately discussed by the board, and was deliberately rejected in favor of pin-connected structures, for the ample reasons set forth by Mr. Anderson.

4. If the rivetted structures proposed to be supplied by the Secretary of State are sent out, Mr. Anderson, you will see, declines responsibility as to time and cost of erection.

5. Under these circumstances it seems to me to be absolutely necessary that a telegram should go to the Secretary of State requesting that pin-connected structures—and not rivetted ones—should be sent out. And it is of the very greatest importance that all corresponding parts of each superstructure should be interchangeable; the pins should therefore be uniform in size throughout each structure, and the dimensions of them should be governed by the largest tension eye-bars through which they pass. This also should be communicated by wire to the Secretary of State.

6. It should be specially noted that a maximum load of 80 lb. per square foot of roadway is all that is required for our bridges. This is what was already allowed for in Mr. Anderson's design and not 100 lb. as suggested by Mr. Batho.

7. Soliciting your very early attention to this very important matter.

8. The roadway must be placed in the bottom boom, as the headway is of the greatest importance in both bridges.

Enclosure.

Reply to General Hyde's report condemning my design for iron superstructures of Iritty and Merumpoya bridges, and recommending that a steel rivetted structure be supplied to the design and specification of Mr. Batho.

Paragraph 2 of General Hyde's letter.—The design is in accordance with the best American practice during the past fifteen years, and it will be hard for General Hyde to point to a single failure amongst any of the bridges of this type that have been constructed and erected on any of the best railway or roadway systems during the time referred to. Further, several of the most eminent English Engineers have since 1870 adopted this principle extensively, and with great success.

2. The Warren trusses for Kristna viaduct (Great Indian Peninsular Railway) which were constructed at the Skerne Iron Works, to the design of Mr. George Berkly, are on this system—pin-connected.

3. On the South Indian Railway the Whipple Murphy single trellis trusses for the following metre-gauge railway bridges were construcred in England to the designs of Mr. C. Douglas Fox, and are built on the principle now so sweepingly condemned by General Hyde :—

Palar	18 spans of	120 feet.	
Panar	16	do.	100 „
Guddalum	10	do.	100 „
Thundiar	2	do.	100 „
Paravanar	2	do.	150 „
Vettaur	4	do.	150 „
Coleroon	14	do.	150 „
Gingee	7	do.	150 „

4. *Paragraph 3 of General Hyde's letter.*—In England at the present time and during the past fifteen years the making of link bars similar to those adopted in the bridges referred to has been a *specialité* with several well-known manufacturers. Some of these firms form the links out of the soild bars by stamping out the eye by hydraulic pressure. Others again cut up the old scrap bars into a pile sufficiently thick to make a link of the full dimensions. After the pile is thoroughly hot and the ends of the link formed under the hammer, the pile is then taken to the mill and rolled out; the ends are then cut and there is the link finished in a substantial manner.

5. As to the cost of these trusses being higher than the cost of rivetted work, it may be worth mentioning that Mr. C. Douglas Fox stated—*vide* C.E., Vol. 54—that he had obtained links at a less price per ton than the rivetted works in the same contract.

6. Some idea of the price of such pinned work as that proposed by me for the Iritty and Merumpoya bridges may be gained from the following :—

(1) In 1870-1 with bridge plates at £10 per ton the Warren trusses for the Kristna viaduct referred to, cost, as per details shown below, about £16 per ton :—

	£	*s.*	*d.*
All cast-iron per ton	11	6	0
Main trusses, cross girders, bracing and struts, per ton	13	18	0
Rolled eye-bars "horizontal and diagonal links," per ton	16	0	0
Steel pins, per ton	35	0	0
Do. rollers	25	0	0

(2) In April 1879 with bridge plates at £8-10-0 a contract for 7 spans of 150 feet Whipple Murply truss—for carrying a metre-guage Guaranteed (Indian) Railway; to the design of an eminent English Engineer was let as the following details at an all round rate of £13-14-0 :—

		£	*s.*	*d.*
34	tons cast iron in bed plate and cape, at £6-17-6	233	16	0
242	tons Dt. iron in main girders exclusive of links, at £13-12-6	3,297	5	0
99	tons Dt. iron in links, at £15-12-6	1,546	17	6
111	tons Dt. iron in cross girders and rail bearers at £12-7-6.	1,373	12	6
8	tons iron in bolts and nuts, at £14-17-6	119	0	0
3½	tons Dt. iron in rollers and frames, at £28	98	0	0
15	tons steel in pins, at £23-17-6	358	2	6
512½		£7,026	13	6
	∴ for 1 ton =	£13	14	0

(3) In March 1883 with bridge plates at £9 another contract was let for 1—150 feet, 1—120 feet and 1—100 feet span Whipple Murppy trusses for carrying a metre-gauge Guaranteed (Indian) Railway; to the same design and specification as above as the following detail rates of £15-11-0 per ton :—

		£	*s.*	*d.*
20	tons cast iron in bed plate and washers, at £10	200	0	0
130	tons Dt. iron in main girder booms, struts and wind bracings, at £15-10-0	2,015	0	0
46	tons Dt. iron in horizontal and diagonal links, at £15-10-0	713	0	0
39	tons Dt. iron in cross girders and also rail bearers of 150 feet span £15-10-0	604	0	0
40	tons rolled beams and connectives, at £15-10-0	620	0	0
4	tons bolts and nuts, at £15-10-0	62	0	0

		£	*s.*	*d.*
1¾	tons rollers and frames, at £15-10-0	27	2	6
8½	tons steel in pins, at £30-4-0	256	14	0
1	ton lead in struts, at £15-10-0	15	0	0
290¼		£4,513	6	6
	∴ for 1 ton	15	11	0

(4.) I have also received an offer from a well-known Engineer in this country to supply from the same eminent firm who supplied most of the materials for the works referred to in (2) and (3) the whole of the iron works required for the Iritty and Merumpoya bridges, to my design and specification, at an all-round rate of Rs. 290 per ton delivered at Calicut or Tellicherry. This offer was based upon the following rates :—

	£	*s.*	*d.*	
(*a*).—Rate per ton F.O.B.	19	0	0	This quotation was made after the manufacturers had inspected and accepted my design and specification.
(*b*)	2	4	0	Freight.
(*c*)	0	3	6	Insurance.
(*d*)	0	10	0	Shipping charge at 2½ per cent.
Total cost per ton	21	17	6	

The £19 per ton rate F.O.B. must of course have included all profits; this would probably not be less than 15 to 20 per cent., or, say, about £3 to £3-10-0 per ton. The offer was considered too high, being about £3 over my estimate, copy of which is given in detail in the appendices A and B.

(5) In March last another contract was let for seven spans of 150 feet of same trusses as per item (2) at an all-round rate of £13-18-0 per ton F.O.B. Detailed rates are given below :—

		£	*s.*	*d.*
34	tons cast iron in bed plates at £8-15-0	297	10	0
242	tons Dt. iron in main girder exclusive of links (at £13-12-6)	3,297	5	0
111	tons Dt. iron in main girders, cross girders, rail bearers (at £13)	1,443	0	0
99	tons horizontal and diagonal links, at £14-10-0	1,435	10	0
8	tons bolts and nuts, at £24	192	0	0
3½	tons rollers and frames, at £34	119	0	0
15	tons steel in pins, at £21	315	0	0
	Total	7,099	5	0
512½	∴ for 1 ton	13	18	0

7. With these facts before me I am at a loss to understand how Mr. Batho arrives at an all-round rate of £20 per ton for these trusses, &c. I observe Mr. Batho suggests that the pins near the centre should be increased: this remark perhaps throws some light on the high cost £20 assumed.

8. The whole essence of the simplicity and accuracy of construction lies in having pins and eyes of an uniform diameter throughout the whole truss. So that all this work is simple repetition, and this of course admits of the work being performed rapidly and cheaply. If, on the other hand, the dimensions of pins and eyes varied throughout the truss to suit each member, it can easily be seen that the work would be tedious and troublesome, and the cost would no doubt be greatly enhanced and perhaps reach near the figure named by Mr. Batho.

9. The dimensions of the pins for the whole truss are governed by the largest tension eye-bars throughout which they pass.

10. *Paragraph 4 of General Hyde's letter.*—I should feel greatly indebted to General Hyde if he will inform in what respects or features "this design does not appear altogether satisfactory." Mr. Batho points out that "the bottom members are rather bare in area and might be increased with advantage," but this statement was based on an assumed load of 100 lb. per square foot.

11. The assumed load for such second class—as regards heavy and constant traffic, where crowding will only occur at long intervals—roads as we have lying outside our city and town limits is taken at 80 lb. per square foot; there is ample metal area to meet the strusses developed by this maximum loading in the bottom members, and the surface pressure on the pins is everywhere well within the safe working strain.

12. The reason for adopting the pin and link system was as follows.

13. The bridges are situated away out in the jungles at the foot of the western ghauts in perhaps the most unhealthy locality in Southern India.

14. It is with the greatest difficulty that we can keep even our regular road coolies on the section throughout the dry weather—December to May—which is our working season for the bridge works. As an instance of how great the difficulty has been in keeping and getting labor at these places since the bridge works were started, I may mention that the contractors should have employed on an average about 200 or 250 coolies daily, and departmentally we should have employed about 100, but instead of this, we have never been able to keep more than half the number. Fresh squads are brought in, and perhaps one or two coolies go down with fever, then there is a stampede of both old and new laborers. Again, we have had great difficulty in getting skilled subordinate supervision, and the little we have got has been almost useless, for the men have all succumbed to the climate, and out of the two bridge inspectors and two sub-inspectors only one man now remains on the job, but he is quite "a wreck" and of very little use.

15. The skilled laborers—masons and brick-layers, stone-cutters and brick-makers—who have been brought in (some from the adjoining villages, while others again were brought in from the east coast at a great expense), knowing as they do that both places have such a bad reputation and we cannot help ourselves or readily get fresh labor if we dismiss them—are all causing much trouble and loss of valuable time, by short outturn of work. If a man in a squad from any village is fined, the whole of his mates at once resign and the work is allowed to slide, and thus the best part of the working season is lost.

16 With skilled laborers, such as mechanics and fitters brought in from the east coast, it can be easily seen—supposing we are able to get the men to come in—that it will be almost impossible to retain such men and handle them so as to get a fair day's work turned out.

17. As regards the actual difficulty to be overcome in the matter of erecting the iron work of these bridges, I pointed out in my report as follows:—

18. "In the erection of bridge trusses, having rivetted connections, the iron work is cheaper at first cost than trusses having pin-connections, but the erecting and fitting of such girders require a certain amount of skilled labor—mechanics and rivetters. In this country, with the skilled labor usually available for temporary field works in ordinary localities, it is exceedingly difficult to get the rivetting done so as to make a perfect joint, and one or two slack rivets in a joint will be sufficient to allow the whole girders to sag and get out of shape; such defects however cannot always be discovered at the time of erection, and generally speaking the weakness will not show till some months after, when atmospheric influences and vibration caused by traffic have affected the clutching and frictional power of the bad rivets. Certain iron bridges on this type erected in the Wynaad some years ago are generally sagged and now nearly all out of shape; and rivets are constantly being found loose."

19. To get the necessary skilled labor required to put such rivetted connection together in such places as Iritty and Merumpoya will be almost impossible, except at exorbitant and prohibitive rates, and even supposing we succeeded in getting this labor to these localities it would be impossible to keep them all constantly at work during the season. There is also the great difficulty in getting and keeping good and qualified subordinate supervision to look after the rivetting, and without this, work although apparently finished satisfactorily would certainly be fudged and have all to be done over again and not once only, but perhaps many times.

20. "With the pin system, the case is different, all the joints and the various details are carefully and accurately fitted at the factory or shops, which involves a high rate for the iron work in England, but as a setoff against this, we gain a most important advantage in having everything connected with the girders in a condition that makes it easy to put the various parts rapidly together, and thus admits of a quick, economical, and perfect fitting up and erecting of the trusses and platform into their permanent position, without the aid of skilled labor, and leaves no chance of bad workmanship at site, as the bridge must be put together properly or not at all."

21. The question of erecting and fitting the connections of truss at bridge-site is such a serious one that all other matters as to weight and original cost of trusses must give way to it. We know what we have to pay for good work at home, even for such expensive trusses as those designed by me for Iritty and Merumpoya, and further we know that we can get such trusses in the home market, but as regards the erecting and fitting of these rivetted girders, although we may know that we can get such structures and the actual costof them at home or delivered at Calicut, we neither know what we may have to pay for skilled labor, nor are we sure that we can get this labor, and, even supposing we can get it, it is highly probable that we will not be able to keep it, and in fact it is very doubtful if we could—within any reasonable time—succeed in putting the girders together in a satisfactory manner so as to get the full amount of efficiency out of them.

21. (*a*). If girders or trusses, having rivetted connection to be put together in this country, are supplied for Iritty and Merumpoya, I must refuse to accept any responsibility as to time and cost of erection of the same.

22. The ordinary coast cooly laborers—Moplah coolies—will very soon be trained to fit up the joints of pin-connected trusses. These men will receive 6 to 8 annas per day and will turn out a full day's work and the erecting charges will not exceed Rs. 40 or 45 per ton. If east coast mechanics and fitters are brought in to do rivetting they will probably cost one-and-a-half rupees per day, and will most likely never do more than half or three-quarters of a day's work. This combined with losses in advance made to these men—when they decamp before clearing or working off advances, as many of them certainly will do, if ever we succeed in bringing them in—will soon run up our erecting charges to perhaps not less than Rs. 80 or 90 or near 100 per ton. To these charges I would add the very low estimate of, say, two months' additional time for staff required to superintend the fitting up of these rivetted structures at, say, Rs. 1,200 per month, a total of 2,400.

23. The roadway must be carried on the bottom boom as the headway is of every importance in both bridges.

24. The appendices A to D give full details as to total cost of erection of the pin-connected superstructure according to estimates by Mr. Maylor and myself and appendices E and F give details for steel rivetted superstructure according to rates quoted (£15-10-0 supposed to be F.O.B.) by General Hyde and Mr. Batho.

25. It will be seen from appendix G that even with Mr. Maylor's high rate of £19 F.O.B. we can place the pin-connected superstructure (if old rails are allowed) in permanent position at not more than Rs. 1,500 in excess of the lighter (and cheaper to purchase) steel rivetted structure proposed by Mr. Batho and General Hyde.

26. I may mention that the rails for this work have already been purchased.

(Signed) GEO. ANDERSON, M.I.C.E.,
District Board District Engineer, Malabar.

4th June 1885.

APPENDIX A.

DETAILS of cost of main girders for the seven bays in England as well as the charges on freight, &c., from England to the site of work and also the cost of putting up in position on the bridge.

Quantity.	Item of charges.	Rate.			Per	Amount.			Total amount.		
		£	s.	d.		RS.	A.	P.	RS.	A.	P.
TON. 1	Cost of materials in England as per over-leaf .. £ 16 s. 6	16	6	0	Ton.	..					
1	Cost of shipping from England to Tellicherry include freight and primage, insurance and shipping charges	2	17	6	"	..					
	Total ..	19	3	6	..	249	0	0			
1	Cost of landing	..			"	10	0	0			
1	Cost of carriage from Tellicherry to Irrity bridge-site (27 miles), at 4 annas per cart conveying 1,900 lb.	..			"	15	0	0			
1	Cost of erecting and fitting up	..			"	40	0	0			
I	Cost of tarring after fitting up without scraping ..	..			"	3	0	0			
	Total cost per ton of main girder fitted up on the bridge complete	..			..	..			317	0	0

Note.—£1 = 12 rupees.

ABSTRACT estimate of the cost.

Quantity.	Particulars.	Rate.			Per	Amount.			Total amount.		
						RS.	A.	P.	RS.	A.	P.
7 × 14	Tons of main girders fitted up on bridge	317	0	0	Ton.	31,060	0	0	..		
	Total of main girder thoughout the bridge ..	..			..	..			31,060	0	0

MALABAR CIRCLE.

Local Fund Department.

Data for the determination of the rate per ton of main girders for the iron superstructure of the proposed Irrity bridge.

Class.	Description of work.	Weight of each item as per detailed estimate for iron work.	Total weight under each class.
		TONS.	TONS.
1st ..	Angles and flats	5·880	
	Bracing plates, 128 lb. in each	·114	
	Hand rails	·240	
	Total of the first class ..	..	6·234
2nd..	Patent weldless die forged link bars	1·380	
	Do. do. do.	·860	
	Total of the second class ..	..	2·240
3rd ..	Plates and fees (1·680—·114)	1·566	
	Lateral and wind bracing	1·920	
	Total of the third class ..	..	3·486
4th ..	Rivets in top boom	·290	
	Do. in web compression	·120	
	Total of the fourth class ..	..	·410
5th ..	Steel pins	·630	
	Total in the fifth class ..	..	·630
6th ..	Cast iron	1·690	..
	Total in the sixth class ..	..	1·690
	Total in two main girders ..	..	14·690

Calculation of percentage of each description of work to the total weight.

Class.	Description of work.	Weight of each divided by the total weight.	Percentage or ratio which each work bears to a ton.
1st ..	Angles and flats	$\frac{6·234}{14·}$	0·4242
2nd..	Patent weldless die forged link bars	$\frac{2·24}{14·}$	0·1525
3rd ..	Plates and fees and lateral and wind bracing	$\frac{3·486}{14·}$	0·2374
4th ..	Rivets	$\frac{0·410}{14·}$	0·0279
5th ..	Steel pins	$\frac{0·639}{14·}$	0·0429
6th ..	Cast iron	$\frac{1·690}{14·}$	0·1151
	Total of all the percentages ..	..	1·0000

Cost price of the following different description of iron work in the proportion they occur in a ton of main girder.

Ratio in a ton.	Description of materials.	Rate.	Per	Amount in decimal of £.	Amount in £.	Total amount.
		£ s. d.		.	£ s. d.	£ s. d.
	Cost of Materials.					
0·3891	Angles and flats	7 0 0	ton.	2·7237		
0·1665	Patent weldless die forged link bars ..	16 0 0	,,	2·6640		
0·2384	Plates and tees..	8 10 0	,,	2·0264		
0·0476	Rivets	12 0 0	,,	·3672		
0·0476	Steel pins	33 0 0	,,	1·5708		
0·1278	Cast iron	10 0 0	,,	1·2780		
1·000	Total cost price of the above per ton ..	..	..	10·6301	10 12 1	10 12 1
	Charges in Workshop.					
	Waste	5 0 0	cent.	..	0 10 5	
	Plating	1 16 0	ton.	..	1 16 0	
	Rivetting	0 11 0	,,	..	0 11 0	
	Painting	0 6 0	,,	..	0 6 0	
	Tools, stores and general charges	..	..	..	2 10 0	
	Total charges in Workshop per ton ..	..	..	..	..	5 13 5
	Total cost of main girder per ton in England ..	..	..	..	..	16 5 6

APPENDIX B.

Details of cross girders for the seven bays in England as well as the charges on freight, &c., from England to Tellicherry and then to site of work, and also cost of putting up position on the bridge.

Note :— £1 = Rs. 12.

Quantity.	Item of charges.	Rate.	Per	Amount.	Total amount .
		£ s. d.		RS. A. P.	RS. A. P.
1	Cost of materials in England as per over-leaf ..	13 0 0	ton.		
1	Freight and primage	2 4 0	,,		
1	Insurance	0 3 6	,,		
1	Shipping	0 10 0	,,		
	Total ..	15 17 6	..	206 0 0	
1	Cost of landing	..	..	10 0 0	
1	Cost of carriage from Tellicherry to Irrity bridge site (27 miles), at 4 annas per cart	..	..	15 0 0	
1	Cost of erecting and painting	..	..	32 0 0	
	Total cost per ton of cross girders and fitted on the bridge complete	..	..	..	263 0 0

Abstract Estimate.

Quantity.	Particulars.	Rate.	Per	Amount.	Total amount.
		£ s. d.		RS. A. P.	RS. A. P.
7 × 3	Tons of cross girders fitted up on bridge	263 0 0	ton.	5,523 0 0	
	Total cost of cross girder throughout the bridge ..	..	..	..	5,523 0 0

MALABAR CIRCLE.

Local Fund Department.

Data for the determination of the rate per ton of cross girders for the iron superstructure of the proposed Irrity bridge.

Class.	Description of work.	Weight of each item as per detailed estimate for iron work in one cross girder.	Weight of each item of iron work in seven cross girders.	Total weight under each class in seven cross girders.
		TONS.	TONS.	TONS.
1st	Angles and flats	0·350	2·450	
2nd	Plates	0·111	0·777	
3rd	Rivets and bolts	0·025	0·196	
	Total weight of 7 cross girders in on truss .	..	..	3·42

Calculation of percentage of each description of work in seven cross girders in each day to the total weight in those seven cross girders.

Class.	Description of work.	Weight of each class divided by the total weight.	Percentage or ratio which each class bears to a ton.
1st ..	Angles and flats	$\frac{2\cdot45}{3\cdot42}$	0·716
2nd ..	Plates	$\frac{\cdot775}{3\cdot42}$	0·227
3rd ..	Revets and bolts	$\frac{\cdot195}{3\cdot42}$	0·057
	Total of all percentage ..	..	1·000

Cost price of each description of work hereunder mentioned in the proportion they occur in a ton of cross girder.

Ratio in a ton.	Description of materials.	Rate.	Per	Amount in decimal of a £.	Amount in £.	Total amount.
	Cost of Materials.	£ s. d.		£	£ s. d.	£ s. d.
0·716	Angles and flats	7 10 0	ton	5·370		
0·227	Plates	9 0 0	,,	2·043		
0·057	Rivets and bolts	12 10 0	,,	0·712		
1·000	Total cost price of the above per ton ..	..	..	8·125	8 2 6	8 2 6
	Charges in Workshop.					
	Waste	5 0 0	cent.	..	0 8 6	
	Plating	1 13 0	ton.	..	1 13 0	
	Rivetting	0 6 0	,,	..	0 6 0	
	Painting	0 5 0	,,	..	2 5 0	
	Tools, stores, and general charges ..	..	..	..	2 5 0	
	Total charges in workshop per ton ..	..	..	..	..	4 17 6
	Total cost of cross girder per ton in England.	..	..	..	..	13 0 0

MALABAR CIRCLE C.

Local Fund Department.

Data for the determination of the rate per ton and also per running foot of old rail (Madras Railway pattern) delivered wrought and put up on the Irrity bridge as Stringer beams.

Quantity.	Items of charges.	Rate.	Per	Amount.	Total amount.
		RS. A. P.		RS. A. P.	RS. A. P.
$103\frac{5}{13}$	Running feet of old rails at 65 lb. per running yard weighing 1 ton delivered at the Local Fund Engineer's office at Calicut as per office returns.	0 8 0	rg. ft.	51 11 1	
2	Carts for conveying 1 ton from Calicut to Irrity bridge site (70 miles) at 3½ annas per mile per cart.	15 5 0	each.	30 10 0	
1	Ton of old rails ($103\frac{5}{13}$ running feet) fitted up as Stringer beams on the bridge inclusive of workmanship for drilling holes and repairing damaged portions.	20 0 0	ton.	20 0 0	
1	Ton tarring per ton after fitted up without scraping ..	1 0 0	,,	1 0 0	
	Sundries	..	..	0 1 1	
	Total cost of old rails erected and fixed complete per ton on the bridge.	..	..	..	103 6 2
	∴ Cost per running foot of old rail as measured on the bridge.	..	..	..	1 0 0

APPENDIX D.

Mr. Maylor's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
1.	Cost of F.O.B.	19 10 0	
2.	Freight and primage	2 4 0	
3.	Insurance	0 3 6	
4.	Shipping	0 10 0	
	Total ..	22 7 6	
	(£22-7-6 × 13 Rs.)	..	290 0 0
5.	Landing	..	10 0 0
6.	Cartage	..	15 0 0
7.	Erecting and painting	..	43 0 0
	Total ..		358 0 0

APPENDIX E.

General Hyde's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
1.	Cost of F.O.B.	15 10 0	
2.	Freight and primage	2 4 0	
3.	Insurance	0 3 6	
4.	Shipping	0 10 0	
	Total ..	18 7 6	
	(£18-7-6 × 13 Rs.)	..	238 0 0
5.	Landing	..	10 0 0
6.	Cartage	..	15 0 0
7.	Erecting, fitting up and painting	..	90 0 0
	Total ..		353 0 0

MALABAR CIRCLE.

LOCAL FUND DEPARTMENT.

DATA for the determination of the rate per ton of cross girders for the iron superstructure of the proposed Irrity bridge.

Class.	Description of work.	Weight of each item as per detailed estimate for iron work in one cross girder.	Weight of each item of iron work in seven cross girders.	Total weight under each class in seven cross girders.
		TONS.	TONS.	TONS.
1st	Angles and flats	0·350	2·450	
2nd	Plates	0·111	0·777	
3rd	Rivets and bolts	0·025	0·196	
	Total weight of 7 cross girders in on truss .	..	..	3·42

CALCULATION of percentage of each description of work in seven cross girders in each day to the total weight in those seven cross girders.

Class.	Description of work.	Weight of each class divided by the total weight.	Percentage or ratio which each class bears to a ton.
1st ..	Angles and flats	$\frac{2·45}{3·42}$	0·716
2nd ..	Plates	$\frac{·775}{3·42}$	0·227
3rd ..	Revets and bolts	$\frac{·195}{3·42}$	0·057
	Total of all percentage ..	..	1·000

COST price of each description of work hereunder mentioned in th[illegible] proportion they occur in a ton of cross girder.

Ratio in a ton.	Description of materials.	Rate.	Per	Amount in decimal of a £.	[illegible] in	Total amount.
	Cost of Materials.	£ s. d.		£	£ s. d.	£ [illegible] d.
0·716	Angles and flats	7 10 0	ton	5·370		
0·227	Plates	9 0 0	,,	2·043		
0·057	Rivets and bolts	12 10 0	,,	0·712		
1·000	Total cost price of the above per ton ..	..	..	8·125	8 2 6	8 2 6
	Charges in Workshop.					
	Waste	5 0 0	cent.	..	0 8 6	
	Plating	1 13 0	ton.	..	1 13 0	
	Rivetting	0 6 0	,,	..	0 6 0	
	Painting	0 5 0	,,	..	2 5 0	
	Tools, stores, and general charges ..	..	..	..	2 5 0	
	Total charges in workshop per ton ..	..	..	..	..	4 17 6
	Total cost of cross girder per ton in England.	..	..	..	..	13 0 0

MALABAR CIRCLE C.

LOCAL FUND DEPARTMENT.

DAT[illegible]etermination of the rate per ton and also per running foot of old rail (Madras [illegible] pattern) delivered wrought and put up on the Irrity bridge as Stringer beams.

[illegible]ity.	Items of charges.	Rate.	Per	Amount.	Total amount.
		RS. A. P.		RS. A. P.	RS. A. P.
$103\frac{5}{13}$	Running feet of old rails at 65 lb. per running yard weighing 1 ton delivered at the Local Fund Engineer's office at Calicut as per office returns.	0 8 0	rg. ft.	51 11 1	
2	Carts for conveying 1 ton from Calicut to Irrity bridge site (70 miles) at $3\frac{1}{2}$ annas per mile per cart.	15 5 0	each.	30 10 0	
1	Ton of old rails ($103\frac{5}{13}$ running feet) fitted up as Stringer beams on the bridge inclusive of workmanship for drilling holes and repairing damaged portions.	20 0 0	ton.	20 0 0	
1	Ton tarring per ton after fitted up without scraping ..	1 0 0	,,	1 0 0	
	Sundries	..	..	0 1 1	
	Total cost of old rails erected and fixed complete per ton on the bridge.	..	..	..	103 6 2
	∴ Cost per running foot of old rail as measured on the bridge.	..	..	..	1 0 0

APPENDIX D.

Mr. Maylor's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
	1. Cost of F.O.B.	19 10 0	
	2. Freight and primage	2 4 0	
	3. Insurance	0 3 6	
	4. Shipping	0 10 0	
	Total ..	22 7 6	
	(£22-7-6 × 13 Rs.)	..	290 0 0
	5. Landing	..	10 0 0
	6. Cartage	..	15 0 0
	7. Erecting and painting	..	43 0 0
	Total ..		358 0 0

A[illegible]DIX E.

General Hyde's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
	1. [illegible]t of F.O.B.	15 10 0	
	2. Freight and primage	2 4 0	
	3. Insurance	0 3 6	
	4. Shipping	0 10 0	
	Total ..	18 7 6	
	(£18-7-6 × 13 Rs.)	..	238 0 0
	5. Landing	..	10 0 0
	6. Cartage	..	15 0 0
	7. Erecting, fitting up and painting	..	90 0 0
	Total ..		353 0 0

MALABAR CIRCLE.

Local Fund Department.

Data for the determination of the rate per ton of cross girders for the iron superstructure of the proposed Irrity bridge.

Class.	Description of work.	Weight of each item as per detailed estimate for iron work in one cross girder.	Weight of each item of iron work in seven cross girders.	Total weight under each class in seven cross girders.
		TONS.	TONS.	TONS.
1st	Angles and flats	0·350	2·450	
2nd	Plates	0·111	0·777	
3rd	Rivets and bolts	0·025	0·196	
·	Total weight of 7 cross girders in on truss .	..	..	3·42

Calculation of percentage of each description of work in seven cross girders in each day to the total weight in those seven cross girders.

Class.	Description of work.	Weight of each class divided by the total weight.	Percentage or ratio which each class bears to a ton.
1st ..	Angles and flats	$\frac{2·45}{3·42}$	0·716
2nd ..	Plates	$\frac{·775}{3·42}$	0·227
3rd ..	Revets and bolts	$\frac{·195}{3·42}$	0·057
	Total of all percentage ..	..	1·000

Cost price of each description of work hereunder mentioned in the proportion they occur in a ton of cross girder.

Ratio in a ton.	Description of materials.	Rate.	Per	Amount in decimal of a £.	Amount in £.	Total amount.
	Cost of Materials.	£ s. d.		£	£ s. d.	£ s. d.
0·716	Angles and flats	7 10 0	ton	5·370		
0·227	Plates	9 0 0	,,	2·043		
0·057	Rivets and bolts	12 10 0	,,	0·712		
1·000	Total cost price of the above per ton ..	..	..	8·125	8 2 6	8 2 6
	Charges in Workshop.					
	Waste	5 0 0	cent.	..	0 8 6	
	Plating	1 13 0	ton.	..	1 13 0	
	Rivetting	0 6 0	,,	..	0 6 0	
	Painting	0 5 0	,,	..	2 5 0	
	Tools, stores, and general charges ..	..	..	..	2 5 0	
	Total charges in workshop per ton ..	..	..	..	..	4 17 6
	Total cost of cross girder per ton in England.	..	..	..	..	13 0 0

MALABAR CIRCLE C.

Local Fund Department.

Data for the determination of the rate per ton and also per running foot of old rail (Madras Railway pattern) delivered wrought and put up on the Irrity bridge as Stringer beams.

Quantity.	Items of charges.	Rate.	Per	Amount.	Total amount.
		RS. A. P.		RS. A. P.	RS. A. P.
$103\frac{5}{13}$	Running feet of old rails at 65 lb. per running yard weighing 1 ton delivered at the Local Fund Engineer's office at Calicut as per office returns.	0 8 0	rg. ft.	51 11 1	
2	Carts for conveying 1 ton from Calicut to Irrity bridge site (70 miles) at 3½ annas per mile per cart.	15 5 0	each.	30 10 0	
1	Ton of old rails ($103\frac{5}{13}$ running feet) fitted up as Stringer beams on the bridge inclusive of workmanship for drilling holes and repairing damaged portions.	20 0 0	ton.	20 0 0	
1	Ton tarring per ton after fitted up without scraping ..	1 0 0	,,	1 0 0	
	Sundries	..	..	0 1 1	
	Total cost of old rails erected and fixed complete per ton on the bridge.	..	..	..	103 6 2
	∴ Cost per running foot of old rail as measured on the bridge.	..	..	..	1 0 0

APPENDIX D.

Mr. Maylor's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
1.	Cost of F.O.B.	19 10 0	
2.	Freight and primage	2 4 0	
3.	Insurance	0 3 6	
4.	Shipping	0 10 0	
	Total ..	22 7 6	
	(£22-7-6 × 13 Rs.)	..	290 0 0
5.	Landing	..	10 0 0
6.	Cartage	..	15 0 0
7.	Erecting and painting	..	43 0 0
	Total ..		358 0 0

APPENDIX E.

General Hyde's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
1.	Cost of F.O.B.	15 10 0	
2.	Freight and primage	2 4 0	
3.	Insurance	0 3 6	
4.	Shipping	0 10 0	
	Total ..	18 7 6	
	(£18-7-6 × 13 Rs.)	..	238 0 0
5.	Landing	..	10 0 0
6.	Cartage	..	15 0 0
7.	Erecting, fitting up and painting	..	90 0 0
	Total ..		353 0 0

APPENDIX F.

General Hyde's Estimate for steel rolled Stringer beams.

Item No.	Particulars.	Amount. £	s.	d.	Total. RS.	A.	P.
1.	Cost of F.O.B.	12	10	0			
2.	Freight and primage	2	4	0			
3.	Insurance	0	3	6			
4.	Shipping	0	10	0			
	Total ..	15	7	6			
	(£15-7-6 × 13 Rs.)				199	0	0
5.	Landing				10	0	0
6.	Cartage				15	0	0
7.	Erecting and painting				21	0	0
	Total ..				245	0	0
	Total for 30 tons Rs. 245 × 30 ..				7,400	0	0

APPENDIX G.

Abstract statement showing comparative costs of bridge superstructure erected complete.

Particulars.	Amount. RS.	A.	P.	Total. RS.	A.	P.
1. Mr. Anderson's estimate for the whole, of the iron work in trusses, cross girders, and bracings with an all-round rate of £16-6-0 per ton for F.O.B. as per appendices A and B, Rs. 307 × 170 tons	52,190	0	0			
Old rails as per appendix C, 33 tons at Rs. 103	3,400	0	0			
				55,590	0	0
2. Mr. Maylor's estimate for the whole of the do. do. do. as per appendix D Rs. 358 × 170	60,860	0	0			
Old rails as per appendix C, tons 33 at Rs. 103	3,400	0	0			
				64,260	0	0
3. General Hyde's estimate for whole of steel superstructure at an all-round rate of £15-10-0 as per appendix E, Rs. 353 × 150	52,950	0	0			
General Hyde's estimate for Stringer beams rolled steel 30 tons at £12-10-0 as per appendix F, Rs. 30 × 245	7,400	0	0			
Cost of establishment for two months (additional time required to complete the erecting of rivetted superstructure) at Rs. 1,263 per mensem	2,526	0	0			
				62,876	0	0

No. 120.

Referred to the Public Works department for *early* remarks.

2. It is observed that the plans and estimates for these bridges were approved and sanctioned in G.O., dated 2nd June 1884, No. 1373 W.

(By Order.)

Madras,
9th June 1885.

(Signed) M. HAMMICK,
Ag. Under Secy. to Govt.

To the Public Works department.

From Colonel J. SHAW-STEWART, R.E., Secretary to Government, Public Works department, to the Chief Secretary to Government, dated Ootacamund, 15th June 1885, No. 231 E.

Your endorsement, No. 120, dated 9th June 1885,* referring to the Public Works department, for early remarks, the reply of the District Board, Malabar, to Proceedings, No. 183, L.F., dated 19th May 1885, relative to iron work for bridges over the Irrity and Merumpoya rivers.

* Received 15th June 1885.

2. The President, District Board, urges that a telegram be sent to the Secretary of State requesting that iron work of the design originally indented for be supplied.

3. The papers must be examined by the technical branch of my office at Madras, but meanwhile I would advise that a telegram to the following effect be despatched to the Secretary of State:—

> "Your despatch, No. 6, Financial, Stores, of 9th April 1885.
> "Please suspend supply of iron work for bridges pending receipt of further communication."

4. If Mr. Anderson's arguments in favor of adhering to the original design be concurred in, the detailed reasons can be sent home by letter.

5. The matter will be regarded as *urgent* in the Public Works department.

Order—dated 19th June 1885, Mis. No. 337 L.F., Financial.

Ordered that the following telegram be sent to the Secretary of State for India:—

> "Chelys (your Financial despatch No.) 6 dirutu (9th April 1885). Vexavi (Please suspend supply of) iron work for bridges mulgeo (pending receipt of further communication")."

(True Extract.)

(Signed) E. F. WEBSTER,
Chief Secretary.

Copy to the President, District Board, Malabar.

Read—also the following paper:—

Memorandum by the Secretary to Government, Public Works department, dated Ootacamund, 22nd June 1885, No. 255 E.

In returning the papers referred under Financial department endorsement, No. 120, dated 9th June 1885, and in continuation of this office No. 231 E., dated 15th June 1885, the undersigned has the honor to submit the following remarks.

2. The point at issue between Mr. Anderson, the District Board's Engineer, and General Hyde, is whether the design worked out by the former, a Whipple-Murphy girder bridge, or a rivetted bridge in steel, as recommended by the latter, shall be adopted for the Irrity and Merumpoya bridges in the Malabar district.

3. The undersigned agrees with Mr. Anderson as to the difficulties likely to be experienced in erecting *rivetted* girders at sites such as those of the bridges in question; and he is not aware of any peculiar difficulties in procuring in England the link and pin-connections of Mr. Anderson's design.

4. It appears to the undersigned that Mr. Anderson has entirely refuted the objections raised to his design, although this office is not in a position to offer an opinion as to the prices quoted.

5. It is observed that a *steel* girder is proposed by General Hyde and Mr. Batho; and with respect to this (a point not touched upon by Mr. Anderson) it may be remarked that the revitting up of steel would involve still more risk than that of iron girders. Further, steel is liable to a more rapid process of oxidation than iron; and that liability is a serious evil, which will be intensified if steel be used in such places as the localities of the proposed bridges, where supervision and over-hauling will be infrequent and perfunctory.

6. It is considered that Mr. Anderson's design may well be adhered to, with the modification of bracing suggested in paragraph 3 of Mr. Batho's report. The substitution of new bars of proper section for the old rails which it is proposed to use would also be advisable. The old rails, which appear to have been purchased already, may possibly be utilised elsewhere.

(Signed) J. SHAW-STEWART, Col., R.E.,
Secretary to Government, P.W.D.

To the Financial department, with papers returned.

Order—dated 16th July 1885, No. 477 L.F., Financial.

Ordered that the Secretary of State be addressed.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the President, District Board, Malabar.
„ Public Works department.

Exd. T. O'Connor.

P. W. D.

No 1870 Wd/12th August/85

Govt. of (1885) Madras.

FINANCIAL.

Comd to the Supdg. Engr: IV C for information

(Signed) JHS

Issued

Recd. Encl.

G.O., 16th July 1885, No. 477 L.F.

No 1870 Wd/12th August/85

JULY.

S. E. IV C.

Local Fund Bridges.

Ordering that the Secretary of State be addressed on the subject of the supply of iron works for the Irrity and Merumpoya bridges in Malabar.

With order

GOVERNMENT OF MADRAS.

FINANCIAL DEPARTMENT.

Read—again the following paper :—

G.O., dated 19th June 1885, Mis. No. 337 L.F., Financial.

Read—the following papers :—

From W. LOGAN, Esq., President of the District Board, Malabar, to the Chief Secretary to Government, dated Calicut, 4th June 1885, No. 33.

Referring to G.O., Financial department, 183 L.F., 19th May 1885, I have the honor to enclose, for your information, copy of a memorandum by the District Board District Engineer regarding the indent for iron work for the Irrity and Merumpoya bridges.

2. And I have the honor to draw your special attention to Mr. Anderson's remarks regarding the impossibility of getting a RIVETTED bridge put together in such out-of-the-way and deadly-feverish localities as those in which these two bridges are to be erected.

3. The question of having a RIVETTED bridge was deliberately discussed by the board, and was deliberately rejected in favor of pin-connected structures, for the ample reasons set forth by Mr. Anderson.

4. If the rivetted structures proposed to be supplied by the Secretary of State are sent out, Mr. Anderson, you will see, declines responsibility as to time and cost of erection.

5. Under these circumstances it seems to me to be absolutely necessary that a telegram should go to the Secretary of State requesting that pin-connected structures—and not rivetted ones—should be sent out. And it is of the very greatest importance that all corresponding parts of each superstructure should be interchangeable; the pins should therefore be uniform in size throughout each structure, and the dimensions of them should be governed by the largest tension eye-bars through which they pass. This also should be communicated by wire to the Secretary of State.

6. It should be specially noted that a maximum load of 80 lb. per square foot of roadway is all that is required for our bridges. This is what was already allowed for in Mr. Anderson's design and not 100 lb. as suggested by Mr. Batho.

7. Soliciting your very early attention to this very important matter.

8. The roadway must be placed in the bottom boom, as the headway is of the greatest importance in both bridges.

ENCLOSURE.

REPLY to General Hyde's report condemning my design for iron superstructures of Iritty and Merumpoya bridges, and recommending that a steel rivetted structure be supplied to the design and specification of Mr. Batho.

Paragraph 2 of General Hyde's letter.—The design is in accordance with the best American practice during the past fifteen years, and it will be hard for General Hyde to point to a single failure amongst any of the bridges of this type that have been constructed and erected on any of the best railway or roadway systems during the time referred to. Further, several of the most eminent English Engineers have since 1870 adopted this principle extensively, and with great success.

2. The Warren trusses for Kristna viaduct (Great Indian Peninsular Railway) which were constructed at the Skerne Iron Works, to the design of Mr. George Berkly, are on this system—pin-connected.

3. On the South Indian Railway the Whipple Murphy single trellis trusses for the following metre-gauge railway bridges were construcred in England to the designs of Mr. C. Douglas Fox, and are built on the principle now so sweepingly condemned by General Hyde :—

Palar	.. ..	18	spans of	120 feet.
Panar	.. ..	16	do.	100 „
Guddalum	.. ..	10	do.	100 „
Thundiar	.. ..	2	do.	100 „
Paravanar	.. ..	2	do.	150 „
Vettaur	.. ..	4	do.	150 „
Coleroon	.. ..	14	do.	150 „
Gingee	.. ..	7	do.	150 „

4. *Paragraph* 3 *of General Hyde's letter.*—In England at the present time and during the past fifteen years the making of link bars similar to those adopted in the bridges referred to has been a *specialité* with several well-known manufacturers. Some of these firms form the links out of the soild bars by stamping out the eye by hydraulic pressure. Others again cut up the old scrap bars into a pile sufficiently thick to make a link of the full dimensions. After the pile is thoroughly hot and the ends of the link formed under the hammer, the pile is then taken to the mill and rolled out; the ends are then cut and there is the link finished in a substantial manner.

5. As to the cost of these trusses being higher than the cost of rivetted work, it may be worth mentioning that Mr. C. Douglas Fox stated—*vide* C.E., Vol. 54—that he had obtained links at a less price per ton than the rivetted works in the same contract.

6. Some idea of the price of such pinned work as that proposed by me for the Iritty and Merumpoya bridges may be gained from the following :—

(1) In 1870-1 with bridge plates at £10 per ton the Warren trusses for the Kristna viaduct referred to, cost, as per details shown below, about £16 per ton :—

	£	s.	d.
All cast-iron per ton	11	6	0
Main trusses, cross girders, bracing and struts, per ton	13	18	0
Rolled eye-bars "horizontal and diagonal links," per ton ..	16	0	0
Steel pins, per ton	35	0	0
Do. rollers	25	0	0

(2) In April 1879 with bridge plates at £8-10-0 a contract for 7 spans of 150 feet Whipple Murply truss—for carrying a metre-guage Guaranteed (Indian) Railway; to the design of an eminent English Engineer was let as the following details at an all round rate of £13-14-0 :—

		£	s.	d.
34	tons cast iron in bed plate and cape, at £6-17-6 ..	233	16	0
242	tons Dt. iron in main girders exclusive of links, at £13-12-6	3,297	5	0
99	tons Dt. iron in links, at £15-12-6	1,546	17	6
111	tons Dt. iron in cross girders and rail bearers at £12-7-6.	1,373	12	6
8	tons iron in bolts and nuts, at £14-17-6	119	0	0
3½	tons Dt. iron in rollers and frames, at £28	98	0	0
15	tons steel in pins, at £23-17-6	358	2	6
512½		£7,026	13	6
	∴ for 1 ton =	£13	14	0

(3) In March 1883 with bridge plates at £9 another contract was let for 1—150 feet, 1—120 feet and 1—100 feet span Whipple Murppy trusses for carrying a metre-gauge Guaranteed (Indian) Railway; to the same design and specification as above as the following detail rates of £15-11-0 per ton :—

		£	s.	d.
20	tons cast iron in bed plate and washers, at £10	200	0	0
130	tons Dt. iron in main girder booms, struts and wind bracings, at £15-10-0	2,015	0	0
46	tons Dt. iron in horizontal and diagonal links, at £15-10-0	713	0	0
39	tons Dt. iron in cross girders and also rail bearers of 150 feet span £15-10-0	604	0	0
40	tons rolled beams and connectives, at £15-10-0	620	0	0
4	tons bolts and nuts, at £15-10-0	62	0	0
1¾	tons rollers and frames, at £15-10-0	27	2	6
8½	tons steel in pins, at £30-4-0	256	14	0
1	ton lead in struts, at £15-10-0	15	0	0
290¼		£4,513	6	6
	∴ for 1 ton ..	15	11	0

(4.) I have also received an offer from a well-known Engineer in this country to supply from the same eminent firm who supplied most of the materials for the works referred to in (2) and (3) the whole of the iron works required for the Iritty and Merumpoya bridges, to my design and specification, at an all-round rate of Rs. 290 per ton delivered at Calicut or Tellicherry. This ofter was based upon the following rates :—

	£	s.	d.	
(*a*).—Rate per ton F.O.B.	19	0	0	This quotation was made after the manufacturers had inspected and accepted my design and specification.
(*b*)	2	4	0	Freight.
(*c*)	0	3	6	Insurance.
(*d*)	0	10	0	Shipping charge at 2½ per cent.
Total cost per ton ..	21	17	6	

The £19 per ton rate F.O.B. must of course have included all profits; this would probably not be less than 15 to 20 per cent., or, say, about £3 to £3-10-0 per ton. The offer was considered too high, being about £3 over my estimate, copy of which is given in detail in the appendices A and B.

(5) In March last another contract was let for seven spans of 150 feet of same trusses as per item (2) at an all-round rate of £13-18-0 per ton F.O.B. Detailed rates are given below :—

		£	s.	d.
34	tons cast iron in bed plates at £8-15-0	297	10	0
242	tons Dt. iron in main girder exclusive of links (at £13-12-6)	3,297	5	0
111	tons Dt. iron in main girders, cross girders, rail bearers (at £13)	1,443	0	0
99	tons horizontal and diagonal links, at £14-10-0 ..	1,435	10	0
8	tons bolts and nuts, at £24	192	0	0
3½	tons rollers and frames, at £34	119	0	0
15	tons steel in pins, at £21	315	0	0
512½	Total ..	7,099	5	0
	∴ for 1 ton ..	13	18	0

7. With these facts before me I am at a loss to understand how Mr. Batho arrives at an all-round rate of £20 per ton for these trusses, &c. I observe Mr. Batho suggests that the pins near the centre should be increased : this remark perhaps throws some light on the high cost £20 assumed.

8. The whole essence of the simplicity and accuracy of construction lies in having pins and eyes of an uniform diameter throughout the whole truss. So that all this work is simple repetition, and this of course admits of the work being performed rapidly and cheaply. If, on the other hand, the dimensions of pins and eyes varied throughout the truss to suit each member, it can easily be seen that the work would be tedious and troublesome, and the cost would no doubt be greatly enhanced and perhaps reach near the figure named by Mr. Batho.

9. The dimensions of the pins for the whole truss are governed by the largest tension eye-bars throughout which they pass.

10. *Paragraph* 4 *of General Hyde's letter.*—I should feel greatly indebted to General Hyde if he will inform in what respects or features "this design does not appear altogether satisfactory." Mr. Batho points out that "the bottom members are rather bare in area and might be increased with advantage," but this statement was based on an assumed load of 100 lb. per square foot.

11. The assumed load for such second class—as regards heavy and constant traffic, where crowding will only occur at long intervals—roads as we have lying outside our city and town limits is taken at 80 lb. per square foot; there is ample metal area to meet the strusses developed by this maximum loading in the bottom members, and the surface pressure on the pins is everywhere well within the safe working strain.

12. The reason for adopting the pin and link system was as follows.

13. The bridges are situated away out in the jungles at the foot of the western ghauts in perhaps the most unhealthy locality in Southern India.

14. It is with the greatest difficulty that we can keep even our regular road coolies on the section throughout the dry weather—December to May—which is our working season for the bridge works. As an instance of how great the difficulty has been in keeping and getting labor at these places since the bridge works were started, I may mention that the contractors should have employed on an average about 200 or 250 coolies daily, and departmentally we should have employed about 100, but instead of this, we have never been able to keep more than half the number. Fresh squads are brought in, and perhaps one or two coolies go down with fever, then there is a stampede of both old and new laborers. Again, we have had great difficulty in getting skilled subordinate supervision, and the little we have got has been almost useless, for the men have all succumbed to the climate, and out of the two bridge inspectors and two sub-inspectors only one man now remains on the job, but he is quite "a wreck" and of very little use.

15. The skilled laborers—masons and brick-layers, stone-cutters and brick-makers—who have been brought in (some from the adjoining villages, while others again were brought in from the east coast at a great expense), knowing as they do that both places have such a bad reputation and we cannot help ourselves or readily get fresh labor if we dismiss them—are all causing much trouble and loss of valuable time, by short outturn of work. If a man in a squad from any village is fined, the whole of his mates at once resign and the work is allowed to slide, and thus the best part of the working season is lost.

16 With skilled laborers, such as mechanics and fitters brought in from the east coast, it can be easily seen—supposing we are able to get the men to come in—that it will be almost impossible to retain such men and handle them so as to get a fair day's work turned out.

17. As regards the actual difficulty to be overcome in the matter of erecting the iron work of these bridges, I pointed out in my report as follows:—

18. "In the erection of bridge trusses, having rivetted connections, the iron work is cheaper at first cost than trusses having pin-connections, but the erecting and fitting of such girders require a certain amount of skilled labor—mechanics and rivetters. In this country, with the skilled labor usually available for temporary field works in ordinary localities, it is exceedingly difficult to get the rivetting done so as to make a perfect joint, and one or two slack rivets in a joint will be sufficient to allow the whole girders to sag and get out of shape; such defects however cannot always be discovered at the time of erection, and generally speaking the weakness will not show till some months after, when atmospheric influences and vibration caused by traffic have affected the clutching and frictional power of the bad rivets. Certain iron bridges on this type erected in the Wynaad some years ago are generally sagged and now nearly all out of shape; and rivets are constantly being found loose."

19. To get the necessary skilled labor required to put such rivetted connection together in such places as Iritty and Merumpoya will be almost impossible, except at exorbitant and prohibitive rates, and even supposing we succeeded in getting this labor to these localities it would be impossible to keep them all constantly at work during the season. There is also the great difficulty in getting and keeping good and qualified subordinate supervision to look after the rivetting, and without this, work although apparently finished satisfactorily would certainly be fudged and have all to be done over again and not once only, but perhaps many times.

20. "With the pin system, the case is different, all the joints and the various details are carefully and accurately fitted at the factory or shops, which involves a high rate for the iron work in England, but as a setoff against this, we gain a most important advantage in having everything connected with the girders in a condition that makes it easy to put the various parts rapidly together, and thus admits of a quick, economical, and perfect fitting up and erecting of the trusses and platform into their permanent position, without the aid of skilled labor, and leaves no chance of bad workmanship at site, as the bridge must be put together properly or not at all."

21. The question of erecting and fitting the connections of truss at bridge-site is such a serious one that all other matters as to weight and original cost of trusses must give way to it. We know what we have to pay for good work at home, even for such expensive trusses as those designed by me for Iritty and Merumpoya, and further we know that we can get such trusses in the home market, but as regards the erecting and fitting of these rivetted girders, although we may know that we can get such structures and the actual costof them at home or delivered at Calicut, we neither know what we may have to pay for skilled labor, nor are we sure that we can get this labor, and, even supposing we can get it, it is highly probable that we will not be able to keep it, and in fact it is very doubtful if we could—within any reasonable time—succeed in putting the girders together in a satisfactory manner so as to get the full amount of efficiency out of them.

21. (*a*). If girders or trusses, having rivetted connection to be put together in this country, are supplied for Iritty and Merumpoya, I must refuse to accept any responsibility as to time and cost of erection of the same.

22. The ordinary coast cooly laborers—Moplah coolies—will very soon be trained to fit up the joints of pin-connected trusses. These men will receive 6 to 8 annas per day and will turn out a full day's work and the erecting charges will not exceed Rs. 40 or 45 per ton. If east coast mechanics and fitters are brought in to do rivetting they will probably cost one-and-a-half rupees per day, and will most likely never do more than half or three-quarters of a day's work. This combined with losses in advance made to these men—when they decamp before clearing or working off advances, as many of them certainly will do, if ever we succeed in bringing them in—will soon run up our erecting charges to perhaps not less than Rs. 80 or 90 or near 100 per ton. To these charges I would add the very low estimate of, say, two months' additional time for staff required to superintend the fitting up of these rivetted structures at, say, Rs. 1,200 per month, a total of 2,400.

23. The roadway must be carried on the bottom boom as the headway is of every importance in both bridges.

24. The appendices A to D give full details as to total cost of erection of the pin-connected superstructure according to estimates by Mr. Maylor and myself and appendices E and F give details for steel rivetted superstructure according to rates quoted (£15-10-0 supposed to be F.O.B.) by General Hyde and Mr. Batho.

25. It will be seen from appendix G that even with Mr. Maylor's high rate of £19 F.O.B. we can place the pin-connected superstructure (if old rails are allowed) in permanent position at not more than Rs. 1,500 in excess of the lighter (and cheaper to purchase) steel rivetted structure proposed by Mr. Batho and General Hyde.

26. I may mention that the rails for this work have already been purchased.

(Signed) GEO. ANDERSON, M.I.C.E.,
4th June 1885. *District Board District Engineer, Malabar.*

APPENDIX A.

Details of cost of main girders for the seven bays in England as well as the charges on freight, &c., from England to the site of work and also the cost of putting up in position on the bridge.

Quantity.	Item of charges.	Rate.	Per	Amount.	Total amount.
TON.	£ s.	£ s. d.		RS. A. P.	RS. A. P.
1	Cost of materials in England as per over-leaf.. 16 6	16 6 0	Ton.	..	
1	Cost of shipping from England to Tellicherry include freight and prixage, insurance and shipping charges	2 17 6	,,	..	
	Total ..	19 3 6	..	249 0 0	
1	Cost of landing	..	,,	10 0 0	
1	Cost of carriage from Tellicherry to Iritty bridge-site (27 miles), at 4 annas per cart conveying 1,000 lb.	..	,,	15 0 0	
1	Cost of erecting and fitting up	..	,,	40 0 0	
I	Cost of tarring after fitting up without scraping ..	..	,,	3 0 0	
	Total cost per ton of main girder fitted up on the bridge complete	..	..	..	317 0 0

Note.— £1 = 12 rupees.

Abstract estimate of the cost.

Quantity.	Particulars.	Rate.	Per	Amount.	Total amount.
				RS. A. P.	RS. A. P.
7 × 14	Tons of main girders fitted up on bridge	317 0 0	Ton.	31,060 0 0	..
	Total of main girder thoughout the bridge ..	..	..	..	31,060 0 0

11. The assumed load for such second class—as regards heavy and constant traffic, where crowding will only occur at long intervals—roads as we have lying outside our city and town limits is taken at 80 lb. per square foot; there is ample metal area to meet the strusses developed by this maximum loading in the bottom members, and the surface pressure on the pins is everywhere well within the safe working strain.

12. The reason for adopting the pin and link system was as follows.

13. The bridges are situated away out in the jungles at the foot of the western ghauts in perhaps the most unhealthy locality in Southern India.

14. It is with the greatest difficulty that we can keep even our regular road coolies on the section throughout the dry weather—December to May—which is our working season for the bridge works. As an instance of how great the difficulty has been in keeping and getting labor at these places since the bridge works were started, I may mention that the contractors should have employed on an average about 200 or 250 coolies daily, and departmentally we should have employed about 100, but instead of this, we have never been able to keep more than half the number. Fresh squads are brought in, and perhaps one or two coolies go down with fever, then there is a stampede of both old and new laborers. Again, we have had great difficulty in getting skilled subordinate supervision, and the little we have got has been almost useless, for the men have all succumbed to the climate, and out of the two bridge inspectors and two sub-inspectors only one man now remains on the job, but he is quite " a wreck " and of very little use.

15. The skilled laborers—masons and brick-layers, stone-cutters and brick-makers—who have been brought in (some from the adjoining villages, while others again were brought in from the east coast at a great expense), knowing as they do that both places have such a bad reputation and we cannot help ourselves or readily get fresh labor if we dismiss them—are all causing much trouble and loss of valuable time, by short outturn of work. If a man in a squad from any village is fined, the whole of his mates at once resign and the work is allowed to slide, and thus the best part of the working season is lost.

16 With skilled laborers, such as mechanics and fitters brought in from the east coast, it can be easily seen—supposing we are able to get the men to come in—that it will be almost impossible to retain such men and handle them so as to get a fair day's work turned out.

17. As regards the actual difficulty to be overcome in the matter of erecting the iron work of these bridges, I pointed out in my report as follows:—

18. " In the erection of bridge trusses, having rivetted connections, the iron work is cheaper at first cost than trusses having pin-connections, but the erecting and fitting of such girders require a certain amount of skilled labor—mechanics and rivetters. In this country, with the skilled labor usually available for temporary field works in ordinary localities, it is exceedingly difficult to get the rivetting done so as to make a perfect joint, and one or two slack rivets in a joint will be sufficient to allow the whole girders to sag and get out of shape; such defects however cannot always be discovered at the time of erection, and generally speaking the weakness will not show till some months after, when atmospheric influences and vibration caused by traffic have affected the clutching and frictional power of the bad rivets. Certain iron bridges on this type erected in the Wynaad some years ago are generally sagged and now nearly all out of shape; and rivets are constantly being found loose."

19. To get the necessary skilled labor required to put such rivetted connection together in such places as Iritty and Merumpoya will be almost impossible, except at exorbitant and prohibitive rates, and even supposing we succeeded in getting this labor to these localities it would be impossible to keep them all constantly at work during the season. There is also the great difficulty in getting and keeping good and qualified subordinate supervision to look after the rivetting, and without this, work although apparently finished satisfactorily would certainly be fudged and have all to be done over again and not once only, but perhaps many times.

20. " With the pin system, the case is different, all the joints and the various details are carefully and accurately fitted at the factory or shops, which involves a high rate for the iron work in England, but as a setoff against this, we gain a most important advantage in having everything connected with the girders in a condition that makes it easy to put the various parts rapidly together, and thus admits of a quick, economical, and perfect fitting up and erecting of the trusses and platform into their permanent position, without the aid of skilled labor, and leaves no chance of bad workmanship at site, as the bridge must be put together properly or not at all."

21. The question of erecting and fitting the connections of truss at bridge-site is such a serious one that all other matters as to weight and original cost of trusses must give way to it. We know what we have to pay for good work at home, even for such expensive trusses as those designed by me for Iritty and Merumpoya, and further we know that we can get such trusses in the home market, but as regards the erecting and fitting of these rivetted girders, although we may know that we can get such structures and the actual costof them at home or delivered at Calicut, we neither know what we may have to pay for skilled labor, nor are we sure that we

can get this labor, and, even supposing we can get it, it is highly probable that we will not be able to keep it, and in fact it is very doubtful if we could—within any reasonable time—succeed in putting the girders together in a satisfactory manner so as to get the full amount of efficiency out of them.

21. (*a*). If girders or trusses, having rivetted connection to be put together in this country, are supplied for Iritty and Merumpoya, I must refuse to accept any responsibility as to time and cost of erection of the same.

22. The ordinary coast cooly laborers—Moplah coolies—will very soon be trained to fit up the joints of pin-connected trusses. These men will receive 6 to 8 annas per day and will turn out a full day's work and the erecting charges will not exceed Rs. 40 or 45 per ton. If east coast mechanics and fitters are brought in to do rivetting they will probably cost one-and-a-half rupees per day, and will most likely never do more than half or three-quarters of a day's work. This combined with losses in advance made to these men—when they decamp before clearing or working off advances, as many of them certainly will do, if ever we succeed in bringing them in—will soon run up our erecting charges to perhaps not less than Rs. 80 or 90 or near 100 per ton. To these charges I would add the very low estimate of, say, two months' additional time for staff required to superintend the fitting up of these rivetted structures at, say, Rs. 1,200 per month, a total of 2,400.

23. The roadway must be carried on the bottom boom as the headway is of every importance in both bridges.

24. The appendices A to D give full details as to total cost of erection of the pin-connected superstructure according to estimates by Mr. Maylor and myself and appendices E and F give details for steel rivetted superstructure according to rates quoted (£15-10-0 supposed to be F.O.B.) by General Hyde and Mr. Batho.

25. It will be seen from appendix G that even with Mr. Maylor's high rate of £19 F.O.B. we can place the pin-connected superstructure (if old rails are allowed) in permanent position at not more than Rs. 1,500 in excess of the lighter (and cheaper to purchase) steel rivetted structure proposed by Mr. Batho and General Hyde.

26. I may mention that the rails for this work have already been purchased.

(Signed) GEO. ANDERSON, M.I.C.E.,
District Board District Engineer, Malabar.

4th June 1885.

APPENDIX A.

Details of cost of main girders for the seven bays in England as well as the charges on freight, &c., from England to the site of work and also the cost of putting up in position on the bridge.

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	Total ..	19 3 6	..	249 0 0	
1	Cost of landing	..	,,	10 0 0	
1	Cost of carriage from Tellicherry to Irrity bridge-site (27 miles), at 4 annas per cart conveying 1,900 lb.	..	,,	15 0 0	
1	Cost of erecting and fitting up	..	,,	40 0 0	
I	Cost of tarring after fitting up without scraping ..	..	,,	3 0 0	
	Total cost per ton of main girder fitted up on the bridge complete	..	..	..	317 0 0

Note.— £1 = 12 rupees.

Abstract estimate of the cost.

Quantity.	Particulars.	Rate.	Per	Amount.	Total amount.
				RS. A. P.	RS. A. P.
7 × 14	Tons of main girders fitted up on bridge	317 0 0	Ton.	31,060 0 0	..
	Total of main girder thoughout the bridge ..	..	..	..	31,060 0 0

MALABAR CIRCLE.

Local Fund Department.

Data for the determination of the rate per ton of main girders for the iron superstructure of the proposed Irrity bridge.

Class.	Description of work.	Weight of each item as per detailed estimate for iron work.	Total weight under each class.
		TONS.	TONS.
1st ..	Angles and flats	5·880	
	Bracing plates, 128 lb. in each	·114	
	Hand rails	·240	
	Total of the first class ..	..	6·234
2nd..	Patent weldless die forged link bars	1·380	
	Do. do. do.	·860	
	Total of the second class ..	..	2·240
3rd ..	Plates and fees (1·680—·114)	1·566	
	Lateral and wind bracing	1·920	
	Total of the third class ..	..	3·486
4th ..	Rivets in top boom	·290	
	Do. in web compression	·120	
	Total of the fourth class ..	..	·410
5th ..	Steel pins	·630	
	Total in the fifth class ..	..	·630
6th ..	Cast iron	1·690	..
	Total in the sixth class ..	..	1·690
	Total in two main girders ..	..	14·690

Calculation of percentage of each description of work to the total weight.

Class.	Description of work.	Weight of each divided by the total weight.	Percentage or ratio which each work bears to a ton.
1st ..	Angles and flats	$\frac{6·234}{14·}$	0·4242
2nd..	Patent weldless die forged link bars	$\frac{2·24}{14·}$	0·1525
3rd ..	Plates and fees and lateral and wind bracing	$\frac{3·486}{14·}$	0·2374
4th ..	Rivets	$\frac{0·410}{14·}$	0·0279
5th ..	Steel pins	$\frac{0·639}{14·}$	0·0429
6th ..	Cast iron	$\frac{1·690}{14·}$	0·1151
	Total of all the percentages ..	..	1·0000

Cost price of the following different description of iron work in the proportion they occur in a ton of main girder.

Ratio in a ton.	Description of materials.	Rate.	Per	Amount in decimal of £.	Amount in £.	Total amount.
		£ s. d.			£ s. d.	£ s. d.
	Cost of Materials.					
0·3891	Angles and flats	7 0 0	ton.	2·7237		
0·1665	Patent weldless die forged link bars ..	16 0 0	,,	2·6640		
0·2384	Plates and tees..	8 10 0	,,	2·0264		
0·0476	Rivets	12 0 0	,,	·3672		
0·0476	Steel pins	33 0 0	,,	1·5708		
0·1278	Cast iron	10 0 0	,,	1·2780		
1·000	Total cost price of the above per ton ..	..	..	10·6301	10 12 1	10 12 1
	Charges in Workshop.					
	Waste	5 0 0	cent.	..	0 10 5	
	Plating	1 16 0	ton.	..	1 16 0	
	Rivetting	0 11 0	,,	..	0 11 0	
	Painting	0 6 0	,,	..	0 6 0	
	Tools, stores and general charges	..	..	..	2 10 0	
	Total charges in Workshop per ton ..	..	..	..	..	5 13 5
	Total cost of main girder per ton in England ..	..	..	..	..	16 5 6

APPENDIX B.

Details of cross girders for the seven bays in England as well as the charges on freight, &c., from England to Tellicherry and then to site of work, and also cost of putting up position on the bridge.

Note :— £1 = Rs. 12.

Quantity.	Item of charges.	Rate.	Per	Amount.	Total amount .
		£ s. d.		RS. A. P.	RS. A. P.
1	Cost of materials in England as per over-leaf ..	13 0 0	ton.		
1	Freight and primage	2 4 0	,,		
1	Insurance	0 3 6	,,		
1	Shipping	0 10 0	,,		
	Total ..	15 17 6	..	206 0 0	
1	Cost of landing	..	..	10 0 0	
1	Cost of carriage from Tellicherry to Irrity bridge site (27 miles), at 4 annas per cart	..	..	15 0 0	
1	Cost of erecting and painting	..	..	32 0 0	
	Total cost per ton of cross girders and fitted on the bridge complete	..	..	..	263 0 0

Abstract Estimate.

Quantity.	Particulars.	Rate.	Per	Amount.	Total amount.
		£ s. d.		RS. A. P.	RS. A. P.
7 × 3	Tons of cross girders fitted up on bridge	263 0 0	ton.	5,523 0 0	
	Total cost of cross girder throughout the bridge ..	..	..	..	5,523 0 0

MALABAR CIRCLE.

Local Fund Department.

Data for the determination of the rate per ton of cross girders for the iron superstructure of the proposed Irrity bridge.

Class.	Description of work.	Weight of each item as per detailed estimate for iron work in one cross girder.	Weight of each item of iron work in seven cross girders.	Total weight under each class in seven cross girders.
		TONS.	TONS.	TONS.
1st	Angles and flats	0·350	2·450	
2nd	Plates	0·111	0·777	
3rd	Rivets and bolts	0·025	0·196	
	Total weight of 7 cross girders in on truss .	..	..	3·42

Calculation of percentage of each description of work in seven cross girders in each day to the total weight in those seven cross girders.

Class.	Description of work.	Weight of each class divided by the total weight.	Percentage or ratio which each class bears to a ton.
1st ..	Angles and flats	$\frac{2{\cdot}45}{3{\cdot}42}$	0·716
2nd ..	Plates	$\frac{{\cdot}775}{3{\cdot}42}$	0·227
3rd ..	Revets and bolts	$\frac{{\cdot}195}{3{\cdot}42}$	0·057
	Total of all percentage ..	..	1·000

Cost price of each description of work hereunder mentioned in the proportion they occur in a ton of cross girder.

Ratio in a ton.	Description of materials.	Rate.	Per	Amount in decimal of a £.	Amount in £.	Total amount.
	Cost of Materials.	£ s. d.		£	£ s. d.	£ s. d.
0·716	Angles and flats	7 10 0	ton	5·370		
0·227	Plates	9 0 0	,,	2·043		
0·057	Rivets and bolts	12 10 0	,,	0·712		
1·000	Total cost price of the above per ton ..	..	..	8·125	8 2 6	8 2 6
	Charges in Workshop.					
	Waste	5 0 0	cent.	..	0 8 6	
	Plating	1 13 0	ton.	..	1 13 0	
	Rivetting	0 6 0	,,	..	0 6 0	
	Painting	0 5 0	,,	..	2 5 0	
	Tools, stores, and general charges ..	..	..	..	2 5 0	
	Total charges in workshop per ton ..	..	..	..	..	4 17 6
	Total cost of cross girder per ton in England.	..	..	..	..	13 0 0

MALABAR CIRCLE C.

Local Fund Department.

Data for the determination of the rate per ton and also per running foot of old rail (Madras Railway pattern) delivered wrought and put up on the Irrity bridge as Stringer beams.

Quantity.	Items of charges.	Rate.	Per	Amount.	Total amount.
		RS. A. P.		RS. A. P.	RS. A. P.
$103\frac{5}{13}$	Running feet of old rails at 65 lb. per running yard weighing 1 ton delivered at the Local Fund Engineer's office at Calicut as per office returns.	0 8 0	rg. ft.	51 11 1	
2	Carts for conveying 1 ton from Calicut to Irrity bridge site (70 miles) at 3½ annas per mile per cart.	15 5 0	each.	30 10 0	
1	Ton of old rails ($103\frac{5}{13}$ running feet) fitted up as Stringer beams on the bridge inclusive of workmanship for drilling holes and repairing damaged portions.	20 0 0	ton.	20 0 0	
1	Ton tarring per ton after fitted up without scraping ..	1 0 0	,,	1 0 0	
	Sundries	..	..	0 1 1	
	Total cost of old rails erected and fixed complete per ton on the bridge.	..	..	..	103 6 2
	∴ Cost per running foot of old rail as measured on the bridge.	..	..	..	1 0 0

APPENDIX D.

Mr. Maylor's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
1.	Cost of F.O.B.	19 10 0	
2.	Freight and primage	2 4 0	
3.	Insurance	0 3 6	
4.	Shipping	0 10 0	
	Total ..	22 7 6	
	(£22-7-6 × 13 Rs.)	..	290 0 0
5.	Landing	..	10 0 0
6.	Cartage	..	15 0 0
7.	Erecting and painting	..	43 0 0
	Total ..		358 0 0

APPENDIX E.

General Hyde's Estimate.

Item No.	Particulars.	Amount.	Total.
		£ s. d.	RS. A. P.
1.	Cost of F.O.B.	15 10 0	
2.	Freight and primage	2 4 0	
3.	Insurance	0 3 6	
4.	Shipping	0 10 0	
	Total ..	18 7 6	
	(£18-7-6 × 13 Rs.)	..	238 0 0
5.	Landing	..	10 0 0
6.	Cartage	..	15 0 0
7.	Erecting, fitting up and painting	..	90 0 0
	Total ..		353 0 0

APPENDIX F.

General Hyde's Estimate for steel rolled Stringer beams.

Item No.	Particulars.	Amount. £	s.	d.	Total. RS.	A.	P.
1.	Cost of F.O.B.	12	10	0			
2.	Freight and primage	2	4	0			
3.	Insurance	0	3	6			
4.	Shipping	0	10	0			
	Total	15	7	6			
	(£15-7-6 × 13 Rs.)				199	0	0
5.	Landing				10	0	0
6.	Cartage				15	0	0
7.	Erecting and painting				21	0	0
	Total				245	0	0
	Total for 30 tons Rs. 245 × 30				7,400	0	0

APPENDIX G.

Abstract statement showing comparative costs of bridge superstructure erected complete.

Particulars.	Amount. RS.	A.	P.	Total. RS.	A.	P.
1. Mr. Anderson's estimate for the whole, of the iron work in trusses, cross girders, and bracings with an all-round rate of £16-6-0 per ton for F.O.B. as per appendices A and B, Rs. 307 × 170 tons	52,190	0	0			
Old rails as per appendix C, 33 tons at Rs. 103	3,400	0	0			
				55,590	0	0
2. Mr. Maylor's estimate for the whole of the do. do. do. as per appendix D Rs. 358 × 170	60,860	0	0			
Old rails as per appendix C, tons 33 at Rs. 103	3,400	0	0			
				64,260	0	0
3. General Hyde's estimate for whole of steel superstructure at an all-round rate of £15-10-0 as per appendix E, Rs. 353 × 150	52,950	0	0			
General Hyde's estimate for Stringer beams rolled steel 30 tons at £12-10-0 as per appendix F, Rs. 30 × 245	7,400	0	0			
Cost of establishment for two months (additional time required to complete the erecting of rivetted superstructure) at Rs. 1,263 per mensem	2,526	0	0			
				62,876	0	0

No. 120.

Referred to the Public Works department for *early* remarks.

2. It is observed that the plans and estimates for these bridges were approved and sanctioned in G.O., dated 2nd June 1884, No. 1373 W.

(By Order.)

Madras,
9th June 1885.

(Signed) M. HAMMICK,
Ag. Under Secy. to Govt.

To the Public Works department.

From Colonel J. SHAW-STEWART, R.E., Secretary to Government, Public Works department, to the Chief Secretary to Government, dated Ootacamund, 15th June 1885, No. 231 E.

Your endorsement, No. 120, dated 9th June 1885,* referring to the Public Works department, for early remarks, the reply of the District Board, Malabar, to Proceedings, No. 183, L.F., dated 19th May 1885, relative to iron work for bridges over the Irrity and Merumpoya rivers.

* Received 15th June 1885.

2. The President, District Board, urges that a telegram be sent to the Secretary of State requesting that iron work of the design originally indented for be supplied.

3. The papers must be examined by the technical branch of my office at Madras, but meanwhile I would advise that a telegram to the following effect be despatched to the Secretary of State:—

"Your despatch, No. 6, Financial, Stores, of 9th April 1885.
"Please suspend supply of iron work for bridges pending receipt of further communication."

4. If Mr. Anderson's arguments in favor of adhering to the original design be concurred in, the detailed reasons can be sent home by letter.

5. The matter will be regarded as *urgent* in the Public Works department.

Order—dated 19th June 1885, Mis. No. 337 L.F., Financial.

Ordered that the following telegram be sent to the Secretary of State for India:—

"Chelys (your Financial despatch No.) 6 dirutu (9th April 1885). Vexavi (Please suspend supply of) iron work for bridges mulgeo (pending receipt of further communication").

(True Extract.)

(Signed) E. F. WEBSTER,
Chief Secretary.

Copy to the President, District Board, Malabar.

Read—also the following paper:—

Memorandum by the Secretary to Government, Public Works department, dated Ootacamund, 22nd June 1885, No. 255 E.

In returning the papers referred under Financial department endorsement, No. 120, dated 9th June 1885, and in continuation of this office No. 231 E., dated 15th June 1885, the undersigned has the honor to submit the following remarks.

2. The point at issue between Mr. Anderson, the District Board's Engineer, and General Hyde, is whether the design worked out by the former, a Whipple-Murphy girder bridge, or a rivetted bridge in steel, as recommended by the latter, shall be adopted for the Irrity and Merumpoya bridges in the Malabar district.

3. The undersigned agrees with Mr. Anderson as to the difficulties likely to be experienced in erecting *rivetted* girders at sites such as those of the bridges in question; and he is not aware of any peculiar difficulties in procuring in England the link and pin-connections of Mr. Anderson's design.

4. It appears to the undersigned that Mr. Anderson has entirely refuted the objections raised to his design, although this office is not in a position to offer an opinion as to the prices quoted.

5. It is observed that a *steel* girder is proposed by General Hyde and Mr. Batho; and with respect to this (a point not touched upon by Mr. Anderson) it may be remarked that the revitting up of steel would involve still more risk than that of iron girders. Further, steel is liable to a more rapid process of oxidation than iron; and that liability is a serious evil, which will be intensified if steel be used in such places as the localities of the proposed bridges, where supervision and over-hauling will be infrequent and perfunctory.

6. It is considered that Mr. Anderson's design may well be adhered to, with the modification of bracing suggested in paragraph 3 of Mr. Batho's report. The substitution of new bars of proper section for the old rails which it is proposed to use would also be advisable. The old rails, which appear to have been purchased already, may possibly be utilised elsewhere.

(Signed) J. SHAW-STEWART, Col., R.E.,
Secretary to Government, P.W.D.

To the Financial department, with papers returned.

Order—dated 16th July 1885, No. 477 L.F., Financial.

Ordered that the Secretary of State be addressed.

(True Extract.)

M Hammick
for *Chief Secretary.*

To the President, District Board, Malabar.
„ Public Works department.

Exd. T. O'Connor.

G.O. 1373 W A 12-6-84

No. 1870 W A/12th August/85
B

Comd to the
Supdg. Engr.
IV C. for information.

4. 8. 85

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B Maj

S. E. IV C.
12/8/85

E 13/8
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B. 10-8-85
R. 12-8-85
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R. 10-8-85
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6851

Govt. of (1885) Madras.

FINANCIAL.

(4)

8 S.C.

Issued

Recd. 4/8/85.   *Encl.*

G.O., 16th July 1885, No. 477 L.F.

No. 1870 W A/12th August/85

JULY.

Local Fund Bridges.

Ordering that the Secretary of State be addressed on the subject of the supply of iron works for the Irrity and Merumpoya bridges in Malabar.

20TH JULY 1885, No. 1884, JUDICIAL.

GOVERNMENT OF MADRAS.

JUDICIAL DEPARTMENT.

READ—again G.O., dated 9th January 1885, Mis. No. 52, Judicial.

READ—also the following papers:—

From the Inspector-General of Police,			dated	22nd March	1885,	No.	1593-A.
From	do.	do.	,,	23rd	,,	,,	1612.
From	do.	do.	,,	26th	,,	,,	1668.
From	do.	do.	,,	23rd April	,,	,,	2233.
From	do.	do.	,,	15th May	,,	,,	2640.

From Colonel H. D. CLOETE, Inspector-General of Police, to the Chief Secretary to Government, dated Madras, 15th April 1885, No. 2087.

Having completed my inspection of the police in the districts of Ganjam, Vizagapatam, Jeypore, and Godávari, I have the honor (for easier reference) to embody in this letter the several recommendations regarding the reserves I have made in the reports already sent to you, and which recommendations meet with the approval of the different Agents and District Magistrates:—

At Chatrapur, I recommend the abolition of the present instruction reserve, and in its stead a permanent reserve of 2 head constables and 30 constables to be armed with sniders.

At Baliguda, an increase of 20 constables to the present reserve.

At Kimedi, an inspector to be placed in charge of the reserve. A pensioned jemadar or havildar, who knows drill thoroughly, should be selected.

At Parvátipur, the present instruction reserve to be abolished, and in its stead a permanent reserve of 1 inspector and 5 head constables and 50 constables.

At Jeypore (*Koraput*), an increase of 3 head constables and 31 constables (one man as a bugler).

At Vizagapatam, the present instruction reserve to be abolished, and in its stead a permanent reserve of 2 head constables and 31 constables (one man as bugler) should be established. The cavalry pattern breech-loading sniders are in use with this instruction reserve. Lines would not be required; the arms are lodged in the old native infantry barracks.

2. All these reserves should, if possible, be armed with the artillery pattern breech-loading snider with sword-bayonet. If the Government will be pleased to accede to my proposals they will, in a very short time, have thoroughly reliable bodies of police capable of dealing with any disturbance likely to arise in hill tracts. The concentration of any three or more of these parties of police on any given point will be sufficient to quell any rising of hill tribes; the men will be in a great measure acclimatized and accustomed to hill work, and (as has already been proved) capable of making long and rapid marches without transport or commissariat. The employment of military necessitates both, and in a fortnight half of them would be prostrated with fever. I can recollect the time when the northern division had part of an European regiment, two batteries of artillery, and seven or eight regiments of native infantry. Now it has one-and-a-half regiment of native infantry, and a half-armed, half-drilled, half-desciplined, and numerically weak police to do all that the former strong force was expected to do. I leave it to the Government to consider whether this state of

O 7/8/85 — R. 10-8-85 17/8

4

No. 1869 Wd/ 12 August/85

Com^d to the

Supt. Engr. I Circle

for information.

(Signed) J.S.

S. E. I C.

P.W.D.

Govt. of {1885} Madras.

JUDICIAL.

Issued

Recd. Encl.

G.O., 20th July 1885, No. 1884.

No. 1869 Wd/ 12 August/85

JULY.

Police Reserves.

Passing orders on communications from the Inspector-General recommending certain increases to the — in the Ganjam, Vizagapatam, Jeypore, and Godavari districts.

With order

Water Supply.

No. 122 G (21)

From

Bellary 7th July 1885

Brigadier General W. A. Gib CB
Commanding Ceded Districts

To

The Quarter master General
Ootacamund

Sir/

In continuation of my letter No. G/99 dated 18th May 1885. I have the honor to inform you that the Superintending Engineer IIIrd Circle under date 8th June in reply to a letter dated 28th May calling upon him to furnish an Estimate for the simple repair of the channel leading from the Artesian to the dip wells stated that the repairs had been already carried out both as regards the dip wells and the channel.

2. On learning this I requested that, as expense had been already incurred, contrary to my desire, in repairing the channel instead of waiting for the decision of Government in regard to piping, the channel might be recovered to admit of its use and enable me to dispense with the two extra water carts× at a monthly cost of Rs 35 sanctioned in O.G. No. 1616 dated 25th March 1885. I again took the opportunity to ask what had been expended on this work.

× These have been dispensed with from 12th July 1885.
D.M.

(3)

No. 1869 W.A./12th August/85

Comd. to the

Supdg. Engr. I Circle

for information.

(Signed) J.S.

S. E. I. C

P. W. D.

Govt. of {1885} Madras.

JUDICIAL.

Issued

Recd. Encl.

G.O., 20th July 1885, No. 1884.

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With order

No. 1869 W.A./12th August/85

Comd. to

the S. E. I. C.

for information.

C.S.
4.8.85

W.S.
6.8.85

S. E. I. C. ✓

Desp. 12/8/85

I.d. 15/8

O.H.S. 19/7

O. 4/8/85 — R. 10.8.85

Fh. E. ~~12/8~~

Incl. 6852

Govt. of {1885} Madras.

JUDICIAL.

(3) 8 S.C.

5 S.C.

Issued

Recd. 4/8/85. Encl.

G.O., 20th July 1885, No. 1884.

No. 1869 W.A./12th August/85

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Police Reserves.

Passing orders on communications from the Inspector-General recommending certain increases to the — in the Ganjam, Vizagapatam, Jeypore, and Godavari districts.

No 1869 W.A. 12th August/85

Comd to the Supdg Engr I Circle for information.

(Signed)

S.E.I.C

P.W.D.

Govt. of {1885} Madras.

JUDICIAL.

Issued

Recd.

Encl.

G.O., 20th July 1885, No. 1884.

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Passing orders on communications from the Inspector-General recommending certain increases to the — in the Ganjam, Vizagapatam, Jeypore, and Godavari districts.

With order

No 1869 W.A. 12th August/85

B.

Comd to the S.E.I.C for information.

Cd 4.8.85

6.8.85

S.E.I.C ✓

Desp 12/8/85

Id 15/8

O.S. 19/7

O 4/8/85 — R. 10.8.85

12/8

Incl. 6852

Govt. of {1885} Madras.

JUDICIAL.

(3)

8 S.C

5 S.C

Issued

Recd. 4/8/85

Encl.

G.O., 20th July 1885, No. 1884.

No 1869 W.A. 12th August/85

JULY.

Police Reserves.

Passing orders on communications from the Inspector-General recommending certain increases to the — in the Ganjam, Vizagapatam, Jeypore, and Godavari districts.

20th July 1885, No. 1884, Judicial.

GOVERNMENT OF MADRAS.

JUDICIAL DEPARTMENT.

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From do. do. " 23rd April " " 2233.
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Water Supply.

No. 122 G

From

Bellary 7th July 1885

Brigadier General W. A. Gib CB
Commanding Ceded Districts

To

The Quartermaster General
Ootacamund

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× These have been dispensed with from 12th July 1885.
DM.

No 1869 W a/12th August/85

Comd. to the S.E.I.C. for information.

Cd. 4.8.85

6.8.85

S.E.I.C. ✓

Desp. 12/8/85

Id 15/8

O/S. 19/7

O/s 18/85 — D. 10.8.85

Judl. 6852

Govt. of {1885} Madras.

JUDICIAL.

(3)

8 S.C

5 S C

Issued

Recd. 4/8/85.

Encl.

G.O., 20th July 1885, No. 1884.

No 1869 W a/12th August/85

JULY.

Police Reserves.

Passing orders on communications from the Inspector-General recommending certain increases to the — in the Ganjam, Vizagapatam, Jeypore, and Godavari districts.

20th July 1885, No. 1884, Judicial.

GOVERNMENT OF MADRAS.

JUDICIAL DEPARTMENT.

Read—again G.O., dated 9th January 1885, Mis. No. 52, Judicial.

Read—also the following papers :—

From the Inspector-General of Police,			dated	22nd March 1885,	No.	1593-A.
From	do.	do.	„	23rd „	„	1612.
From	do.	do.	„	26th „	„	1668.
From	do.	do.	„	23rd April	„	2233.
From	do.	do.	„	15th May	„	2640.

From Colonel H. D. CLOETE, Inspector-General of Police, to the Chief Secretary to Government, dated Madras, 15th April 1885, No. 2087.

Having completed my inspection of the police in the districts of Ganjam, Vizagapatam, Jeypore, and Godávari, I have the honor (for easier reference) to embody in this letter the several recommendations regarding the reserves I have made in the reports already sent to you, and which recommendations meet with the approval of the different Agents and District Magistrates :—

At Chatrapur, I recommend the abolition of the present instruction reserve, and in its stead a permanent reserve of 2 head constables and 30 constables to be armed with sniders.

At Baliguda, an increase of 20 constables to the present reserve.

At Kimedi, an inspector to be placed in charge of the reserve. A pensioned jemadar or havildar, who knows drill thoroughly, should be selected.

At Parvátipur, the present instruction reserve to be abolished, and in its stead a permanent reserve of 1 inspector and 5 head constables and 50 constables.

At Jeypore (*Koraput*), an increase of 3 head constables and 31 constables (one man as a bugler).

At Vizagapatam, the present instruction reserve to be abolished, and in its stead a permanent reserve of 2 head constables and 31 constables (one man as bugler) should be established. The cavalry pattern breech-loading sniders are in use with this instruction reserve. Lines would not be required; the arms are lodged in the old native infantry barracks.

2. All these reserves should, if possible, be armed with the artillery pattern breech-loading snider with sword-bayonet. If the Government will be pleased to accede to my proposals they will, in a very short time, have thoroughly reliable bodies of police capable of dealing with any disturbance likely to arise in hill tracts. The concentration of any three or more of these parties of police on any given point will be sufficient to quell any rising of hill tribes; the men will be in a great measure acclimatized and accustomed to hill work, and (as has already been proved) capable of making long and rapid marches without transport or commissariat. The employment of military necessitates both, and in a fortnight half of them would be prostrated with fever. I can recollect the time when the northern division had part of an European regiment, two batteries of artillery, and seven or eight regiments of native infantry. Now it has one-and-a-half regiment of native infantry, and a half-armed, half-drilled, half-desciplined, and numerically weak police to do all that the former strong force was expected to do. I leave it to the Government to consider whether this state of

20TH JULY 1885, No. 1884, JUDICIAL.

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(21)

Water Supply.

Bellary 7th July 1885

From

Brigadier General W. A. Gib CB
Commanding Ceded Districts

To

The Quartermaster General
Ootacamund

Sir/

In continuation of my letter No. G/99 dated 18th May 1885. I have the honor to inform you that the Superintending Engineer IIIrd Circle under date 8th June in reply to a letter dated 28th May calling upon him to furnish an Estimate for the simple repair of the channel leading from the Artesian to the dip wells stated that the repairs had been already carried out both as regards the dip wells and the channel.

2. On learning this I requested that, as expense had been already incurred, contrary to my desire, in repairing the channel instead of waiting for the decision of Government in regard to piping, the channel might be recovered to admit of its use and enable me to dispense with the two extra water carts at a monthly cost of Rs 35 sanctioned in O.G. No 1616 dated 25th March 1885. I again took the opportunity to ask what had been expended on this work.

× These have been dispensed with from 12th July 1885.
DM.

(3)

3. The Superintending Engineer under date 3rd July forwarded for countersignature with a view to Sanction under the head of repairs an estimate for repairing both the dip wells and the channel and re-covering the latter, amounting to Rs 500, stating that the channel had been tested and found nearly water tight 15 gallons in 190 only being wasted in transit.

4. The covering of the duct will be completed in four or five days when the water carts will be immediately discontinued.

5. I have never maintained that it would be impossible or even difficult to repair the Masonry channel so as to render it watertight but I look on all work of this Kind as only putting off for a little longer laying down pipes of some kind as it is impossible to exclude the roots of trees and grass, and it will always be a matter of extreme importance to husband every drop of water from the artesian well as it has never of late years been very abundant and I regret that this year, with every care, and supplying the Royal Artillery with drinking water from another well in their Officers Mess compound, the level of the water is steadily but surely going down.

It may dry up. then whats the good of the pipes?

6. It may be that, on account of its depth this well is not so quickly affected by local rainfall as others more shallow but I also fear that the pipe which runs down 40 feet from the bottom is a good deal choked, and the Public Works Department have hitherto failed to clear more than the top 15 feet or so.

I have the honor to be
Sir
Your most Obedient Servant
W.Hill Brigadier General
Commanding Ceded Districts

B11-7-85

O.W. 2/6346/B.
6804

From

The General Officer
Commanding Ceded Districts

To

The Quartermaster General
Ootacamund

No. 1226

Bellary 7th July 1885

Regarding repair of Channel leading from the Artesian to the Dip Wells.

MD W 11/7/85

Qr Mr GENERAL'S OFFICE
RECEIVED 11 JUL 85
Dy. No. 2108. B

Water Supply
Bellary.

2

QUARTERMASTER-GENERAL'S OFFICE,
Ootacamund,
17th July 1885.

No. 1642B.

From

THE QUARTERMASTER-GENERAL.

To

THE SECRETARY TO GOVERNMENT,
MILITARY DEPARTMENT.

SIR,

With reference to O.G. No. 3760 dated 11 July 1885, I have the honor, by order, to forward for the information of Government letter No. 1226 dated 7 July 1885 from the General Officer Commanding Ceded Districts, relative to the repair of the channel leading from the Artesian well to the dip wells at Bellary. The Commander in Chief is of opinion that General Gib should have been consulted by the Superintending Engineer third circle before the repairs were executed to the masonary channel and His Excellency concurs with General Gib in thinking that it would have

been

been more satisfactory for the reasons mentioned in para 5 of the letter if the permanent remedy of providing iron piping had been carried out.

2. A careful examination of the pipe running down from the bottom of the well has been ordered.

I have the honor to be

Sir

Your Obedient Servant.

N Stewart

Brigdr Genl

Quarter Master General

Feb
Pr 25 March/85 No 357. 358
11 July/85 " 2110-2111 R

No 3923 Transferred to the Public Works Department, with reference to Q. G. No 1651 W. dated 15th July 1885 and previous correspondence.

(By order)

A. Kenney Herbert Lieut Col.

Offg. Secy. to Govt.

Ootacamund
18th July 1885

No 1265 C dated 23rd July/85

Referred to the Superintending Engineer III Circle for early report

(By order)

C. Unwin. Major R.E.

Under Secy to Govt P.W.D.

Put up all correspondence
H. W.
24/7/85

Ags. copy
Received 5/8/85

Publ. 6340

Military (1885) Department. 6804/R

No. 4147

From

THE QUARTERMASTER-GENERAL,

To

THE SECRETARY TO GOVERNMENT,
MILITARY DEPARTMENT.

S.E. III Circle Reg. No 289 W
1885/6

No. 1642 B

Dated 17th } July
Recd. 18th }
Rec 20

No. 1867 W of 12th August/85

ENCLOSURES. One

Relative to the repairs of the channels leading from the Artesian wells to the dip wells at Bellary

---

SUPERINTENDING ENGINEER'S OFFICE,
~~MADRAS,~~

No. 966

Bellary ~~Chepauk~~, 1st Augt 1885.

From
Lt. Col. H. M. Vibart R.E.
THE SUPERINTENDING ENGINEER,
III ~~1st~~ CIRCLE,

To
THE Chief Engineer
P.W.D.
Madras

Enclosures.
1 Original Endt No 1265 C
+ With C. 66 49 sent to O.B.G. 21-7-85
D. B.
3-8-85

SIR,

With reference to No. 1265 C dated 23rd July, I have the honor to state that on the 11th Feby the Executive Engineer wrote to the Dy Asst. Qr. Mr. Genl., asking him to inform when he could arrange to supply water to European Barracks direct from the large well as it would be impossible to repair the masonry duct properly as long as any water was flowing thro' it. — On 13th, the Dy Asst. Qr. Mr. Gl. replied that as soon as the Executive Engineer had made certain necessary arrangements the duct could be disused. On 25th the Executive Engineer informed the Dy Asst. Qr. Mr. Genl. that it was proposed to repair the duct — on the same day the Executive Engineer was informed that the duct could be disused from 1st March and that the Brigadier Genl. thought that it would be inadvisable to expend money in repairing the present Channel

In reply to this letter of 25th February Major Clarke wrote to say that he had received instructions from me to repair the duct as I was of opinion that it should be maintained in order, until the Govt sanctioned the laying down of pipes.— No further letter on this point appears to have been received, and the repair of the duct was carried out.

I venture to think that under the circumstance it was our duty to repair the trough and keep it in good order as long as no sanction was received for the new project of piping, and I am of opinion that the officers of the D P W would have been open to censure had they not taken steps to carry out this work.

2. I may add that the cost of opening up the duct for inspection was Rs 100-3-6. The cost of repairing the dip wells Rs 28. Both these works were essential in any case. The cost of repairing the trough was merely Rs 78, while the cost of recovering the trough and repairing the weirs gear over the Channel Rs 245-13-11. This last work was undertaken at the request of the Brigadier General in a letter dated 15th June. I beg to add that the expenditure of Rs 78 on the trough in no way interfered with the realization of the other project of pipes as the latter would have been laid in the repaired duct.

3. It is probable that the Iron piping would be more permanently satisfactory than the masonry Channel; but I am still of opinion that at present that expensive project is not by any means urgently required, and I think the Channel as repaired will remain in good order for some years.—

4. In conclusion I wish to add that I hardly consider I should have been justified in allowing the duct to remain in a state of disrepair because the Military authorities had under consideration a project which might or might not be carried out.— For two reasons I considered it improbable that the project would be at once sanctioned for execution— one reason being want of funds and another that the larger expenditure was under the circumstances, hardly called for.

I have the honor to be
Sir
Your most obdt Servant

Lt Col. RE
Superintending Engineer
III Circle

(Pr. 25 March/85 No 357. 358)

Military (188) Department

From

The Superintending Engineer,

III ~~1st~~ Circle,

To

The Chief Engineer

P.W.D.

Madras

(14)

Dated 18th } Augt 1885.
Recd. }

ENCLOSURES.

No. 1867 W d/12th August/85

No. 966

Water Supply to European Barracks

Reporting about the —

A.J.S. 23/8.
O5/8/85 O. 12-8-85

PUBLIC WORKS DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the

READ the following

ow the Supdg: Engr. III Circle H.E. No. 966 d/18th August 1885

Superseded

Ordered that copy of the Superintending Engineer's letter above recorded be forwarded to the Military Department, with reference to endorsement No. 3923 dated 18th July 1885.

2. The Government in the Public Works Department remark that, even had the project of laying down iron pipes been sanctioned for immediate execution, (which however was ~~utterly~~ impossible owing to the present financial

financial pressure) considerable time would necessarily have elapsed before the piping was ready for use. Meanwhile the quantity of water lost by reason of the disrepair of the duct would have been considerable

3. It is observed that, after the Executive Engineer was informed that Brigadier General Gib considered it unadvisable to expend money on repairing the masonry channel, he replied that he had received instructions from the Supdg Engr. to proceed with the work. This was in February, and, as no further communication was made respecting ~~as to~~ Brigadier General Gib's wishes, the

work was carried out

work

work was carried out.

Cf
5.8.85

To
The Military Dept
" S.E. III C.

(14)

Submission.

~~Gw~~
15

B/

Public Works Department.

W 1867 W

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Under date the 12th August/85

Read the following

Letter from the Quarter master-General — A.E. No. 1642 B d/ 17th July/85

Endt. thereon by the Mily. Dept. " " 3923 d/ 18th July/85

Letter from the Suptg: Engr. III Circle " " 966 d/ 1st August/85

The Suptg: Engineer's letter above recorded will be communicated to the Mily. Department, with adverlence to endorsement in that department No. 3923 d/ 18th July 1885.

2. In the circumstances reported, the Government i

the P. W. Department are of opinion that the Executive Engineer was justified in carrying out necessary repairs to the masonry duct.

3. The question as regards replacing the masonry duct by iron piping was disposed of in G. O. No. 1651. W d/ 15th July 1885.

7.8.85

No. 422 E d/ 7.8.85
" 412 E d/ 5.8.85
" 393 E d/ 31-7-85
" 1265 C d/ 23.7.85
" 1651 W d/ 15.7.85
1547 W d/ 2-7-85
1413 W d/ 16-6-85
2964 W d/ 1-12.84

14.8

13/8

13/8

13-8-85 15-8-85

No. 1867 W d/ 12th August/85

PW For perusal

S. E. III Circle
Mily: Dept.

Despd
12/8/85

Reference to Madras P. W. D. Code.
Para. 2019.

500. W.C.

SUPG. ENGINEER'S
20 JUL. 85
P. W. D.
FOURTH CIRCLE

P. W. D. Form.
No. M 89.

Division— West Coast.

Station— Calicut

Report of the Survey of Stores which have become unserviceable.

No. 2597 Dated 29th November 1884.

Submitted to the Superintending Engineer IV Circle for orders, with reference to Para. 2019 of the Code.

(Sd) Ross Thompson Lt. Coll. R. E.
Executive Engineer.

No. 72/W.C. Dated 6th December 1884.

Returned to the Executive Engineer for necessary action as per orders noted within.

(Sd) J. Beatty Coll. R. E.
Superintending Engineer,
IVth Circle.

No. ______ Dated ______ 188

Forwarded to the Examiner, P. W. Accounts, with the Accounts for the month of ______ 188

Executive Engineer.

No. 381

True Copy. Forwarded to the Supg: Engineer with reference to his No. 351/W.C. dated 15th July 1885

Ross Thompson
Coll. R. E.
17th July /85
Executive Engineer

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7·8·85

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14·8

13/8

13/8

No. 1867 W d/ 12th August/85

S. E. III. Circle

Mily: Dept:

12/8/85

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500. W.C.

20 JUL. 85
P. W. D.
FOURTH CIRCLE

REFERENCE TO MADRAS P. W. D. CODE.
PARA. 2019.

P. W. D. FORM.
No. M 89.

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Ross Thompson
17th July 1885 Coll. R.E.
Executive Engineer

Number or Quantity.	Description of Articles.	Value on the Stock Books. Rate	Value on the Stock Books. Amount.	Date of Receipt.	Remarks by the Subordinate in charge explaining the cause of the Articles becoming unserviceable.	Remarks by the Executive Engineer.	Orders of the Superintending Engineer.
		Rs.	Rs. A. P.				
1250	Laterite Stones				Materials dismantled from the old Sea Custom House at Tanur being of no use to the Department may be disposed of by Public Auction.	The sale of the Articles recommended	Sanctioned to be sold by public Auction. /Sd/ J. Beatty Coll R.E. Supg: Engineer 4th Circle
1 Heap	Do Broken lumps						
4.	Doors						
2.	Big windows						
4.	Small Do						
44.	Roof Rafters						
3	Cross Beams						
27	Ceiling planks						
12	Joists						
14,000	Roof tiles						
1 Heap	Reepers						

Station Calicut
Dated 25th November 1884.

/Sd/ John Nicholson
Sub Divl Officer

/Sd/ Ross Thompson Lt Coll
Executive Engineer.

Circl. to S.E. No. 317/E.W d/29/7/85

P.W. E.1/6765/85

C No. 402 West Coast Division Office
Calicut 25th July 1885

From
The Executive Engineer
West Coast Division

To
The Superintending Engineer
4th Circle

Sir,

In reply to memo No. 371/W.C of 21st July 1885 I have the honor to state, that as the demolition of the old Sea Custom's House at Tanur was carried out by the Calicut Sub Divisional Officer on the authority of Mr. Davidson the then Executive Engineer of the Coimbatore Division, and as the new building had to be built on the old site, the Executive Engineer

Encl. to G.O. No. 317 d/29.7.85

524 W.C.

7 JUL. 85

P.W.D.

From

The Executive Engineer
West Coast Divn.

Dated 25
Recd } July 1885

No. 402

Old Sea Customs House
at Tanur

Explains the circumstances under which the the demolition of the ——
was carried out. ——

No. 331

West Coast Division office,
Calicut 24th June 1885.

From,

The Executive Engineer
West Coast Division.

To,

The Superintending Engineer
IV Circle.

Sir,

In reply to your Memorandum No. 283 W.C., dated 13th June 1885, I have the honor to state, that the Old Sea Custom's House at Tanur, having been in a ruinous condition, the Collector of the District recommended its demolition and the construction of a new building in its stead.

2. The building was accordingly dismantled and the materials obtained therefrom, sold by public auction, as authorized in your No. 72 W.C. dated 6th December 1884.

To N.P.W. Dept.

1884.

I have etc etc.

(Signed) Ross Thompson,
Colonel R.E.
Executive Engineer.

No. 274
W.

Copy-submitted to the Chief Engineer, Public Works Department, with a request that he will be good enough to obtain the sanction of Government for the demolition of the building as directed in para 1217 of the Public Works Code. The Executive Engineer has been reminded that buildings should not be demolished in anticipation of the sanction of Government.

F. Beatty. Colonel R.E.
Superintending Engineer
4th Circle

Coimbatore
30th June/85.

S.G.

No. 1559 Day 17th July/85

Memo

With reference to his No. 274 E.W. of 30th June/85, the S.E. IV C. is requested to submit a copy of his 72 W.C. of 6th December/84.

CG.
3.7.85

Sec
4/7/85

To The Supg Engr IV Circle
On/8/85 2.8.8.85

Incl. 5810

From
The Supg. Engineer,
Fourth Circle.

(5)

No. 1559 Day 7-7-85

Dated 30th June
Despd: 1st July } 1885
Recd 3

No. 274
E.W.

Old Sea Customs House
Tanna:—

Requesting to obtain the sanction of Government for the demolition of the —.

With approval

No. 1559 Da/ 17.7.85

C. 5810 26769

No. B. 1866 W a/ 12th August /85

The demolition of the old Sea Customs House at Tanur is approved.
The previous sanction of Govt. sh^d. have been obtained in accordance with para 1217 of the P. W. Code

The demolition of the old Sea Customs House at Tanur is approved.

2. The previous sanction of Govt. should have been obtained in accordance with para 1217 of the P. W. Code.

CS
3.8.85

WS
6.8.85

Supdg. Engineer IV Circle ✓

S. E. IV. C

Exr. P. W. Accounts ✓

Exr. P.W.A

D 12/8/85

B Maj

Sd 15/8

B. 10.8.85 R. 12.8.85 R 11.8.85

A.S. 10/8

O. 4/8/85 R. 8.8.85

H. S. 13/8 17/8

P. W. Cho. 6769

From
The Supg. Engineer
Fourth Circle

(5)

Dated 29th } July 1885.
Desp^d. 30th }
Recd. 1 Aug: 85.

No. 1866 W a/ 12th August /85

No. 317 / E. W.

Enclosure. One.

Old Sea Customs House at Tanur.

Forwards as requested Copy of the Report of Survey of Stores in the West Coast D^n. bearing this office No. 72/W.C. of 6th December 1884 with regard to the demolition of the ——

1184.

India Office,
London; 16th July 1885.

Public Works.
No. 5.

Sir,

In reply to Your Excellency's Public Works Despatch, of the 18th May 1885, No. 7/1168 W, I have to state that I approve of the salary of Mr. Gunther, the Foreman Engineer of the Madras Harbour Works, being raised from Rupees 300 to Rupees 350 per mensem, with effect from the 1st April 1885.

I have the honor to be,
Sir,
Your most obedient,
humble Servant,
(signed). Randolph S. Churchill

His Excellency,
The Right Honorable,
The Governor in council,
Fort St. George.

To
M. P. W. Dept.

No 1559 Dd 7.7.85

No 1

Public Works
16 July 1885

Copy
Letter to Fort St George
No 5

PW7034/85

Recd 13 August 85

B No 1865 W
12-8-85

With original

Sent to Madras on 7th Aug

13/8

PWL 23/8
W

With approval

04/8/85

1184.

India Office,
London; 16th July 1885.

Public Works.

No 5.

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I have the honor to be,
Sir,
Your most obedient,
humble Servant,
Randolph S Churchill

His Excellency,
The Right Honorable,
The Governor in Council,
Fort St. George.

To P.W. Dept

No 1559 Dd

Nos 3574W. 14.12.83.
Des: 47/3574W. 14.12.83.
609W. 5.3.84.
989W. 27.4.85.
990W. 27.4.85.
1168W. 18.5.85.
No 1168W. 18.5.85

12th August/85

Communicated to the Supt Madras Harbour Works, with advertence to G.O. No 1168W dated 18th May 1885

W.S.
7.8.85

Supt M H Works
Exr P.W. Accts
Marine Dept

12/8/85

Desp 23/8

R. 10-8-84 R. 12.8.84

No 2

Incl 7034
18

Public Works
16 July 1885

The Letter to Fort St George
No 5

G.O. 412, Mar, d/ 3.5.'97

Recd. 6 August/85
Rd 10

No 1865W d/ 12th August/85

With order

from disposal

12th March 1885, No. 589 W., Public Works.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Account.

Read—the following letter From W. B. deWinton, Esq., General Superintendent, Public Works Stores, to the Superintending Engineer, V Circle, dated Madras, 2nd March 1885, No. 1396 S. :—

I have the honor to forward, for submission to Government, indent, in triplicate, for stores required from England by the Superintendent, Madras Harbour Works, for use in reconstructing the damaged portions of the harbour, together with explanatory note.

2. None of the articles required by the Superintendent are available in the Public Works Stores, neither do they appear in the lists of surplus stock of the Madras or South Indian Railways.

[illegible] paragraphs 2 and 3 of Mr. Thorowgood's letter to obtain [illegible] it may be possible [illegible] which he has applied. In the event of his doing so, [illegible] out of this indent.

Enclosures.

Explanatory note to accompany indent from Superintendent, Madras Harbour Works.

Files of sorts.—These are not made in India but are obtainable in the local market of Europe manufacture of bad quality.

Portland cement.—That made at the Madras cement works cannot be supplied in sufficiently large quantities of undoubted good quality to admit of its being substituted for English cement. Much cement is, however, being received from the local works. English Portland cement can be purchased locally at Rs. 42 per ton, and the country-made cement at Rs. 40 per ton.

Leather belting.—Can be had of local manufacture but of hide imported from Europe. Country hide belting soon becomes unserviceable, and twists and warps when dried after wetting in the rain. English made leather belting preferable both on account of economy and durability.

(Signed) W. B. deWinton,
General Superintendent, Public Works Stores.

From F. N. Thorowgood, Esq., M. Inst. C.E., Superintendent, Madras Harbour Works, to the General Superintendent, Public Works Stores, dated Madras, 24th February 1885, No. 4 S.

I have the honor to forward, herewith, an indent upon England for cement and other articles required upon these works, which indent is supplemental to that of 15th October 1884.

2. Items No. 1 to No. 39 are simply files, which I find very hard to get of good quality here in Madras; but I would ask a special note to be made that, possibly, the necessary files may be obtained from Colombo harbour works, and I only await a report as to whether what is for sale at Colombo is of a new and serviceable quality.

3. I apprehend it will not be difficult to cancel a portion of this indent if it be afterwards found that the necessary files are obtainable from Colombo.

To the P.W. Dept

Nos 3574W. 14.12.83.
Dcs: $\frac{47}{3574W.}$ 14.12.83.
609W. 5.3.84.
989W. 27.4.83.
990W. 27.4.83.
1168W. 18.5.83.
Dcs: $\frac{7}{1168W}$

No. 1858 W d/ 12th August/85

Communicated to the Supt Madras Harbour Works, with reference to G.O. No 1168W dated 18th May 1886

7.8.85

Supt M. H. Works
Exr P.W. Accts
Marine Dept

12/8/85

13/8

Agl. 23/8

D. 10.8.84 R. 12.8.84

No 2

Arch 7034

Public Works
16 July 1885

The Letter to Fort St George
No 5

G.O. 412, Mar, d/ 3.5.97

Recd. 6 August/85

No. 1865 W d/ 12th August/85

With order.

No 1864 W d/ 12th August/85
B.

Conv. to Officers

Communicated to officers concerned, with reference to G.O. No. 589 W d/ 12th March 1885.

3.8.85

6.8.85

Suptg. Engineer V Circle
Supt. Madras Harbour Works.

12/8/85

15/8

Agl. 12/8
B. 10.8.85
O. 4/8/85
R. 12.8.85
11.8.85
R. 8.8.85

13/8 17/8

Govt. of {188 } Madras.

To

The P.W. Dept

Recd 1.8.85

(9)

No 1864 W d/ 12th August/85

Proceedings, dated 24 July 1885.
No. 455 M

Subject.

Conv. to the depts Concerned Secy of State despatch sanctioning Indents for Stores for the Rajahmundry College Salt Dept & Harbour Works

Nos 3574W. 14.12.83.
Des: 47/3574W. 14.12.83.
809W. 5.3.84.
989W. 27.4.83.
990W. 27.4.83.
1168W. 18.5.83.
Des: 7/1168W
No 1865W d 12th August/85

Communicated to the Supt Madras Harbour Works, with advertence to G.O. No 1168W dated 18th May 1885

[illegible]
7.8.85

Supt M H Works
Exr P. W. Accts
Marine Dept

12/8/85

Ansd 15/8
Ans. 23/8
R. 10.8.84 R. 12.8.84 13/8

No 2

Incl 7034

Public Works
16 July 1885

The Letter to Fort St George
No 5

G.o. 412, Mar, d 3.5.97

Recd. 6 August/85
No 10

No 1865W d/ 12th August/85

With order

Educational Department.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

READ the following

Despatch from the Secretary of State for India
No 10. dated 23d June 1885.

Letter from Chief Secretary to Govt. of Madras in the Educational Department No 795 d/ 22 Decr./84
(Apparatus &c for Rajahmundry College)

Letter from Secretary to Govt. of Madras in the Rev: Department No 7 d/ 3d February 1885-
(Weighing machines for Salt Deptt.)

Madras Public Works letter No. 4/589 W. d/ 12 March/85
(Stores for Madras Harbour works with the Exception of the Piles)

Letter from Secretary to Govt. of Madras in the Rev: Department No 16 dated 1st April 1885:
(Coal for Salt Department)

With reference to the letters noted in the margin I have to inform your Excellency that I have sanctioned compliance with the Indents for stores therewith forwarded.

Order thereon 24th July 1885 No 455 Mis:-

Communicated to the Director of Public Instruction and to the Revenue and Public Works Departments.

(True Extract)

A Memmick
Ag Under Secretary

To
The Revenue Department
" P. W. Department
" Director of Public Instruction

Dep. 4/589 W a/12.3.–
G.O. 4/589 W a/ do

No 1864 W a/12th August/85
B.

Comn. to officers

Communicated to
concerned, with
officers concerned, with
reference to G.O
reference to G.O.
No. 589. W d 12th
No. 589 W d/ 12th
March 1885
March 1885.

CW
3.8.85

W.
6.8.85

Supdg. Engineer V Circle
S.E. V C
Supt. Madras Harbour Works.
S. M. H. W.

Desd
12/8/85

Sd
15/8

Exd 12/8
B.16.8.85
O.4/8/85
R. 12.8.85
11.8.85
R. 8.8.85

E 13/8
H
17/8

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[6]

Govt. of {188 } Madras.

To

The P.W. Dept.

Recd 1.8.85

(9)

No 1864 W a/12th August/85

Proceedings, dated 24 July 1885.
No. 455 W

Subject.

Comy to the depts Concerned Secy of State's despatch sanctioning Indent for Stores for the Rajahmundry College Salt Dept & Harbour works

DW

GOVT. OF MADRAS.

PUBLIC WORKS DEPARTMENT.

LETTER to the Right Honorable the Secretary of State for India.

No. $\frac{4}{589\ \text{W.}}$, dated 12th Mar. 1885.

Forwarding supplemental indent for stores required for the Madras harbour works and requesting that the supply of files already asked for may be deferred.

No. 1559 Dd 7.7.85

Desp. $\frac{4}{589}$ W d/ 12.3.

G.O. $\frac{4}{589}$ W d/ do

No. 1864 W d/ 12th August/85
B

Communicated to officers concerned, with reference to G.O. No. 589 W d/ 12th March 1885.

3.8.85

6.8.85

Supdg. Engineer V Circle

Supdt. Madras Harbour Works.

12/8/85

1578

12/8

B. 16.8.85

0.4/8/88

12.8.85

11.8.85

8.8.85

13/8

17/8

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[6]

Govt. of {188 } Madras.

To

The P.W. Dept.

Recd. 1.8.85

(9)

No. 1864 W d/ 12th August/85

Proceedings, dated 24 July 1885.
No. 455 Mi.

Subject.

Comy. to the depts. concerned Secy. of State's despatch sanctioning Indents for stores for the Rajahmundry College Salt Dept. & Harbour works

---

12th March 1885, No. $\frac{4}{589 \text{ W.}}$, Public Works.

PUBLIC WORKS DEPARTMENT.

Letter—to

The Right Honorable the SECRETARY of STATE for INDIA.

My Lord,

We have the honor to forward a supplemental indent for stores required for the Madras harbour works, and to request that no action may be taken for the present with respect to the supply of the files asked for, as inquiries are being made whether these articles can be procured from the Colombo harbour works. On this point we shall again address your Lordship.

We have the honor to be,
My Lord,
Your Lordship's most obedient, humble servants,

Fort St. George,
12th March 1885.

Exd. E. Fernandez.

To
The P.W. Dept.

GOVT. OF MADRAS.

PUBLIC WORKS DEPARTMENT.

LETTER to the Right Honorable the Secretary of State for India.

No. $\frac{4}{589\ \text{W.}}$, dated 12th Mar. 1885.

Forwarding supplemental indent for stores required for the Madras harbour works and requesting that the supply of files already asked for may be deferred.

GENERAL.
ACCOUNT.

Govt. of {1885} Madras

PUBLIC WORKS.

Dated March, 12*th.*

Recd. *Encl.*

G.O., 12th March 1885, No. 589 W.

MARCH.

Madras Harbour Works

Supplemental indent for stores for the —, ordered to be forwarded to the Home Government.

To/ Me P.W. Dept

GOVT. OF MADRAS.

PUBLIC WORKS DEPARTMENT.

LETTER to the Right Honorable the Secretary of State for India.

No. $\frac{4}{589\text{ W.}}$, dated 12th Mar. 1885.

Forwarding supplemental indent for stores required for the Madras harbour works and requesting that the supply of files already asked for may be deferred.

12th March 1885, No. 589 W., Public Works.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Account.

READ—the following letter From W. B. deWINTON, Esq., General Superintendent, Public Works Stores, to the Superintending Engineer, V Circle, dated Madras, 2nd March 1885, No. 1396 S. :—

I have the honor to forward, for submission to Government, indent, in triplicate, for stores required from England by the Superintendent, Madras Harbour Works, for use in reconstructing the damaged portions of the harbour, together with explanatory note.

2. None of the articles required by the Superintendent are available in the Public Works Stores, neither do they appear in the lists of surplus stock of the Madras or South Indian Railways.

3. I beg to invite attention to paragraphs 2 and 3 of Mr. Thorowgood's letter No. 4 S., of the 24th instant (copy enclosed), in which he states that it may be possible to obtain many of the files now indented for from the Colombo harbour works, to which he has applied. In the event of his doing so, the files will have to be struc out of this indent.

ENCLOSURES.

EXPLANATORY note to accompany indent from Superintendent, Madras Harbour Works.

Files of sorts.—These are not made in India but are obtainable in the local market of Europe manufacture of bad quality.

Portland cement.—That made at the Madras cement works cannot be supplied in sufficiently large quantities of undoubted good quality to admit of its being substituted for English cement. Much cement is, however, being received from the local works. English Portland cement can be purchased locally at Rs. 42 per ton, and the country-made cement at Rs. 40 per ton.

Leather belting.—Can be had of local manufacture but of hide imported from Europe. Country hide belting soon becomes unserviceable, and twists and warps when dried after wetting in the rain. English made leather belting preferable both on account of economy and durability.

(Signed) W. B. deWINTON,
General Superintendent, Public Works Stores.

From F. N. THOROWGOOD, Esq., M. Inst. C.E., Superintendent, Madras Harbour Works, to the General Superintendent, Public Works Stores, dated Madras, 24th February 1885, No. 4 S.

I have the honor to forward, herewith, an indent upon England for cement and other articles required upon these works, which indent is supplemental to that of 15th October 1884.

2. Items No. 1 to No. 39 are simply files, which I find very hard to get of good quality here in Madras; but I would ask a special note to be made that, possibly, the necessary files may be obtained from Colombo harbour works, and I only await a report as to whether what is for sale at Colombo is of a new and serviceable quality.

3. I apprehend it will not be difficult to cancel a portion of this indent if it be afterwards found that the necessary files are obtainable from Colombo.

Re P W Dept

Endorsement on the above.

No. 4541.

Forwarded to the Chief Engineer, Public Works Department.

2. It may be advisable to show in the remarks column that files will probably be obtained from Colombo, in which case notice will be sent subsequently.

9th March 1885. (Signed) H. L. PRENDERGAST, Colonel, R.E.,
Superintending Engineer, V Circle.

ORDER—dated 12th March 1885, No. 589 W., Public Works.

The indent will be forwarded to the Secretary of State for India, who will be requested to suspend supply of the files for the present.

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintending Engineer, V Circle.
„ Superintendent, Madras Harbour Works.

Exd. E. Fernandez.
Spare Copies

17.7.85

GENERAL.
ACCOUNT.

Govt. of {1885} Madras

PUBLIC WORKS.

Dated March, 12th.

Recd. *Encl.*

G.O., 12th March 1885, No. 589 W.

MARCH.

Madras Harbour Works

Supplemental indent for stores for the —, ordered to be forwarded to the Home Government.

2nd Circle, Camp Madras.
31st July 1885.

From —
The Superintending Engineer,
2nd Circle.

To
The Chief Engineer,
Public Works Department.
Madras.

Sir,

At the request of the Collector of Nellore, the Executive Engineer, Nellore Division has submitted to me an Estimate amounting to Rs 225 for fixing Iron bars to the windows of the Nellore Tâluk Cachéri and to sink the new Iron safe in the floor of the Cachéri. The Police guard cannot be withdrawn until these works are carried out. To meet this amount, I request you will be good enough to allot the requisite funds under Provincial, minor works, Civil Buildings, as the existing grant of Rs 185 to the Nellore Division is required for other work and as no other Division in this Circle has funds available

For transfer.

I have the honor to be,
Sir,
Your most Obdt. Servant.
J. L. L. Morant.
Lieut-Colonel R.E.
Superintendent of Works
in charge of 2nd. Circle.

N. P. W. Dept.

No. 1859 W d/ 12th August/85

B/

A sum of Rs 225 is allotted from the reserve with Government to the Nellore Division under Provincial Civil Buildings, minor works, in order to meet the cost of fixing iron bars to the windows of the Taluk office at Nellore and of sinking the new iron safe in the floor of the office.

CS.
3. 8. 85

WS.
1. 8. 85

Note.
This leaves a balance of Rs: 832/. only.
FB.

Yes – but the work is evidently an urgency. CS

B Maj

Desp 12/8/85

To
The Supdg Engr: II Circle
" Examiner P. W. Accts
" Revenue Department.

14/8

0. 4/8/85 R. 8-8-85

17/8

PWC No 67

From
The Supg: Engineer,
2nd Circle.

(10)

To
The Chief Engineer
P. W. Department
Madras.

Dated 31st July 1885.
Recd 1. 8. 85

No. 125 C

No. 1859 W d/ 12th August/85

Nellore Taluk Cacheri –

Requesting to allot the requisite funds for fixing Iron bars to the windows & for sinking the new Iron Safe in the floor of the –

Financial Department.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

READ ~~the following~~ again

G. O. 2701 W. d/ 3rd November 1884, P. W. Department
– do – 1253 W. d/ 29th May 1885, – do –

Order thereon, 27th July/85 No. 1128 Fin.

There being urgent need of accommodation for the Asst: Superintendent of Police at Ramnad, the estimate for the work sanctioned in the Proceedings of Govt. of the 3rd November 1884 read above, will be immediately put in hand by the Public Works Department and carried to completion as early as practicable.

2. The current year's allotment for the work, Rs 3950*, surrendered in Public Works Proceedings of the 29th May 1885, No. 1253 W. is replaced at the disposal of the P. W. Department.

* three thousand nine hundred & fifty.

(True Extract.)

Chief Secretary

To
the P. W. Dept.

No. 2701 Wd/3.11.84.
" 574 Wd/11.3.85
" 1253 Wd/29.5.85
" 1458 Wd/23.6.85.

P W C No. 6840

30/7

No. 1655 W d/12th August /85

No. 387 Ed/ July 30th 1885

Papers

No. 387 Ed/ July 30. 1885 P. W. Dept.

Deposit

Telegram.

To,

Works - Simla.

Your Circular one of tenth February × Accommodation urgently needed for Assistant Superintendent Police Ramnad × Proposed to convert old police hospital into residence at cost Rupees 3950 + Estimate sanctioned last November and funds now available × Please

Telegram despatched. 30/7/85

wire sanction ×

30·7·85

No 387 Ed/ July 30. 1885

PUBLIC WORKS DEPARTMENT.

No 1855 W

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the 12th August /85

READ the following

Pros. in the Financial Dept No 1128 mis d 27th July 85.
Telegram from the E. of S. in — d 8th August 85.

Communicated to the S. E. VI Circle, who will at once put in hand the estimate sanctioned in G.O. No 2701 W dated 3rd November 1884.

2. The requisite funds are allotted in the Finl dept Pros. above recorded.

10·8·85

S. E. VI Circle
Genl P.W.A.
Indl Dept
Desptd 12/8/85

No. 387 E d/ 30-7-85
G.O. 1458 W d/ 23-6-85
" 1253 W d/ 29-5-85
" 574 W d/ 11-3-85
" 2701. W d/ 3-11-84

No. 1855 W d/ 12 15 Augst/85

B Maj

P 12/8

Rd. 14-8-85
B. 13-8-85 } Or. 15-8-85

DW

Tanjore Collector's Office
No. 4788 Tanjore 2nd ~~July~~ August 1885

From, J. B. Pennington Esquire,
Collector,
Tanjore;

To, The Secretary to Government,
Public Works Department,
Madras.

Sir,

I have the honour to inform you that a piece of land measuring 2 3/16 cents in Pudu Devanvada Tottam within the Municipal limits of Kumbakonam, Kumbakonam Taluq, belonging to the Estate of His Highness the Late Rajah of Tanjore is required for the extension of the Town Police Station at Kumbakonam.

As

No 385 dt 30-7-85

As it is desirable, in order to ensure to Government an indefeasible title, to acquire the land under the provisions of the Land Acquisition Act X of 1870, I herewith forward a draft declaration under section 6 of the Act that it is needed for a public purpose and request that you will be good enough to order the same to be published in the Fort Saint George Gazette.

I have the honor to be,
Sir
Your most Obedt. Servant,

Encl.

J. Pennington
Collector

[Ref./4]
15,000—13-2-06.

R.K.W.

DEPARTMENT.

Paper taken out of the Records from the charge of the Referencer.

~~Press~~ Miscellaneous ~~Routine~~ No 1851, dated 11-8-~~190~~85

Date taken out.	For what purpose.			Initials of clerk taking the paper or of attender.	Date returned.	Initials of attender.
	Department.	C. No.	Year.			
10-12-07	R.W.D.	11283	/07		10-12-07	
15/10/10	Edl Supdt				25/10/10	
20/2/11	M.R. 701 P.W.D. 1872		/11			
12/7/11	Supdt-Rd Section M.R. 2464		/11		26/1/12	
18-8-20	W.R.	3106	/20		8-11-20 Ver	

No 1851 Wd/ 11th August/85

Communicated
for the information of
Supdg. Engineers

(Sd) J.S.S.

Supdg. Engineers
Ch. Engr for Irrgn.
Consg. E. to Govt.

S.W.D.

Govt. of {1885} Madras.

EDUCATIONAL.

Issued

Recd. Encl.

G.O, 16th July 1885, No. 443.

No 1851 Wd/ 11th August/85

JULY.

Civil Engineering College.

Approving of a draft notification embodying the proposals approved by Government in connection with the reorganization of the —.

With order

shall be issued under the signatures of the Principal of the College and of the Director of Public Instruction, in proof that the student concerned has satisfactorily completed the prescribed practical course.

(*b*) A candidate who has failed to obtain a certificate from the Board at the final examination may appear before the Board for examination at any subsequent year, provided he is certified to have put in the necessary attendance at the college and pays a fee as follows :—

	RS.	A.	P.
Civil and Mechanical Engineers	25	0	0
Engineer subordinates	15	0	0
Other classes	7	8	0

(*c*) The names of the candidates so passing shall be published in a separate list, and they shall simply be declared to have satisfied the Board of Examiners.

Article VII.

The following scholarships and prizes are allowed for students during their college course :—

One scholarship of Rs. 30 per mensem tenable for three years, to the candidate who passes first in the admission examination for the Civil and Mechanical Engineer classes; to be forfeited for misbehaviour or other good cause.

Two scholarships of Rs. 10 per mensem each tenable for two-and-a-half years, to the two candidates highest on the list in the admission examination for the Engineering Subordinate class. These scholarships shall, however, be reawardable after each annual examination.

A gold medal of the value of Rs. 120 will be awarded to the student who passes first in the final examination for Civil and Mechanical Engineers.

A gold medal of the value of Rs. 60 will be awarded to the student who passes first in the final examination for Engineer subordinates.

Silver medals of the value of Rs. 10 each will be given to the student who passes first in the final examination in each of the other branches.

Article IX.—Practical courses.

Civil and Mechanical Engineers.

During the final year of practical training on works, subsistence allowance of Rs. 50 per mensem for Europeans and Eurasians and Rs. 25 per mensem for natives will be granted. Such allowances will, however, be contingent on the good conduct and satisfactory progress of the student under instruction; and on proof of misconduct or idleness the allowances may be cut down or withdrawn altogether by the officers in charge of the works.

Engineering Subordinates.

As in the case of the Civil and Mechanical Engineer pupils, no fee will be exacted during the workshop year; and during the year of practical study on works stipends will be granted of Rs. 30 per mensem for Europeans and Eurasians and Rs. 20 per mensem for natives, subject to the conditions of good conduct, regular attendance, &c.

Soldier students will, during the workshop course, draw pay, rations, and clothing from their regiments, and the stipends prescribed for the theoretical course. During their year of practical training on works, they will cease to draw those allowances, and will be brought on to the Public Works department scale of establishment as apprentice overseers, drawing the pay and allowances laid down in the Public Works regulations.

All scholarships and other allowances during the practical course will be debitable to the Department of Public Works.

Article X.

Prospects of Students.

(1) *Civil and Mechanical Engineers.*

One appointment annually as Assistant Engineer, 3rd grade, in the Public Works department, will for the present be conferred on the student highest on the list at the final examination, who has also obtained the Degree of B.C.E. To those next on the list appointments as supervisors, 2nd grade, will be offered, in order of merit. The number of appointments to be so awarded will be in proportion to the requirements of the service, and will be fixed by the Chief Engineer. The number so determined on will be announced annually, at least six months before the final college examination. It is to be understood, however, that all vacancies in the supervisor grade will not be filled by selection from the most distinguished of the passed students of this class, as a portion of such vacancies must be reserved for the best qualified subordinates of the overseer grade.

(2) *Engineer Subordinates.*

Vacancies in the overseer grades of the Public Works establishment will be filled by passed men in the order of merit. Prior to each entrance examination, notice will be given of the number of such appointments likely to become available for competition by the then entering batch of candidates.

(3) *Other classes.*

Surveyors.

There are no permanent appointments available in the Public Works establishment for surveyors only; but, when the services of temporary men are required for special surveys not undertaken by the Public Works subordinate staff, the officers in charge are instructed to select for such employment only passed surveyors of the Civil Engineering College.

Draughtsmen.

Certificated students of this class will be appointed to the Public Works department as draughtsmen and estimators as vacancies occur. The course of instruction having been extended and the standard for certificate having been raised, passed students under these rules will be entitled to the improved salaries for the different classes of draughtsmen which will be notified hereafter.

Note.—It is the duty of the Principal to render all reasonable assistance to passed students, who have failed to obtain a footing in the Public Works department, in seeking employment under Local and Municipal boards and other agencies. With this view, lists of qualified men, with remarks as to their attainments, conduct, &c., will be circulated annually to Local Fund boards and municipalities, with recommendations that they may be employed in suitable posts when opportunities offer.

Article XI.

General.

(1) Students in the Civil and Mechanical Engineer classes are expected to appear for the B.C.E. degree examination, but they are discouraged from appearing until they have completed the three years' theoretical course.

(2) All students must provide themselves with the text-books in use and with the necessary apparatus, instruments (except surveying instruments), &c. They will, with the exception of military students, be non-resident. Strict observance of the standing rules of the institution as regards attendance, discipline, &c., will be expected from all.

(3) Students during their practical course shall not be under the supervision of the Principal of the College, but officers under whom they are serving will be required in the Public Works department to furnish to the Principal half-yearly reports of their progress in such form as may from time to time be prescribed by Government.

Order—dated 16th July 1885, No. 443, Educational.

The draft notification is approved and will be published in three successive issues of the *Fort St. George Gazette*. The reference suggested in paragraph 4 will be made in the Revenue department.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Public Works department.
" Revenue "
" Military "
" Director of Public Instruction.

Exd. J. Wright.

(2) *Engineer Subordinates.*

Vacancies in the overseer grades of the Public Works establishment will be filled by passed men in the order of merit. Prior to each entrance examination, notice will be given of the number of such appointments likely to become available for competition by the then entering batch of candidates.

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(1) Students in the Civil and Mechanical Engineer classes are expected to appear for the B.C.E. degree examination, but they are discouraged from appearing until they have completed the three years' theoretical course.

(2) All students must provide themselves with the text-books in use and with the necessary apparatus, instruments (except surveying instruments), &c. They will, with the exception of military students, be non-resident. Strict observance of the standing rules of the institution as regards attendance, discipline, &c., will be expected from all.

(3) Students during their practical course shall not be under the supervision of the Principal of the College, but officers under whom they are serving will be required in the Public Works department to furnish to the Principal half-yearly reports of their progress in such form as may from time to time be prescribed by Government.

Order—dated 16th July 1885, No. 443, Educational.

The draft notification is approved and will be published in three successive issues of the *Fort St. George Gazette*. The reference suggested in paragraph 4 will be made in the Revenue department.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Public Works department.
" Revenue "
" Military "
" Director of Public Instruction.

Exd. J. Wright.

GOVERNMENT OF MADRAS.

EDUCATIONAL DEPARTMENT.

Read—the following paper :—

Memorandum by the Chief Engineer, Public Works department, dated Ootacamund, 9th July 1885, No. 345 E.

With advertence to G.O., dated 4th October 1883, No. 670, Educational, and No. 1640 W., dated 1st July 1884, the undersigned has the honor to submit, for the approval of Government in the Educational department, and for publication in the *Fort St. George Gazette*, a draft notification embodying the proposals approved by Government in connection with the reorganisation of the Civil Engineering College, Madras.

2. The draft notification has been drawn up after much careful consultation with the Principal of the College and the Director of Public Instruction.

3. Under article X, "Prospects of students," it is considered that something may be added respecting the prospects of employment in the Revenue Survey department to be held out to passed surveyors and draughtsmen. There has, however, been so much delay in the issue of the notification, from unavoidable causes, that the undersigned is unwilling to delay it further by references to the Superintendent, Revenue Survey.

4. It is thought that the notification may be published at once; and that, after its issue, the suggested reference may be made to the Superintendent, Revenue Survey, either by the Educational or the Public Works department; any addition which may be approved being subsequently published as an addendum to article X.

(Signed) J. SHAW-STEWART, Col., R.E.,
Chief Engineer, Public Works Dept.

Enclosure.

NOTIFICATION.

The following code of rules relating to the constitution and work of the Madras Civil Engineering College, the subsequent training of students, and their selection by the Department of Public Works, has been sanctioned by Government and will have effect from 1st January 1886 :—

Preamble.—The college, which is affiliated to the Madras University, will afford theoretical and practical instruction in subjects qualifying Europeans and Natives of India for the professions and callings set forth in article III, in view of fitting them for employment in such capacity by Government, by Local and Municipal boards, and by other agencies.

Students passing the higher course in engineering are at the same time prepared for the B.C.E. degree of the Madras University.

Article I.

The responsibility for the discipline and management of the college is vested in the Principal, under the control of the Director of Public Instruction.

ARTICLE II.

All final examinations will be conducted by an independent Board of Examiners, consisting of a President and two members, to be appointed by Government for a term of three years. They shall receive such remuneration as shall from time to time be fixed by Government. When necessary, the Board may, with the sanction of Government, employ assistant examiners. The decision of the Board of Examiners in regard to the qualifications of any students appearing for examination shall be final. The names of all students declared by the Board to have passed a final examination shall be published in the *Fort St. George Gazette*.

ARTICLE III.

The classes to be formed are—

(1) Civil Engineers.
(2) Mechanical Engineers.
(3) Engineer subordinates.
(4) Surveyors.
(5) Draughtsmen.
(6) Sub-overseers, Maistries, and artizans.

ARTICLE IV.

Admission.

(1) The number of students to be admitted annually will for the present be limited to 15 in the Civil and Mechanical Engineering classes, taken together; to 30 in the class for Engineer subordinates; to 15 in the class for surveyors; to 20 in the class for draughtsmen.

N.B.—These numbers will be liable to reduction, which will be notified one month before the entrance examination, until the college-accommodation has been improved and enlarged to meet requirements.

The number to be admitted to the other classes will be notified yearly. Admission shall be once a year. (1) For the Engineer classes, on last Monday in January; (2) for the upper subordinate classes, on first Monday in August; (3) for the junior classes, on last Monday in January.

(2) Candidates for admission to the Civil and Mechanical Engineering classes must be between the ages of 17 and 21 years, to the Engineer subordinate class between the ages of 16 and 20 years, and to the other classes between the ages of 16 and 22 years, on the 31st December preceding the year of admission.

(3) Candidates for admission to the Civil and Mechanical Engineering classes must produce a certificate of having passed the first examination in arts of the Madras or of any other Indian University; to the Engineering subordinate class, a certificate of having passed Matriculation examination of the Madras or any other Indian University; to the surveyors and draughtsmen classes, except when specially exempted, a certificate of having passed the Middle School examination. For the sixth class selection will be made from the sons of artizans or maistries, or from youths who have already had practical training in some of the building trades.

(4) All candidates must produce satisfactory testimony of good character, physical fitness, age, and freedom from liability to small-pox. Candidates whose certificates are unsatisfactory in any respect will be excluded from the test for admission.

(5) Admission to the Civil and Mechanical Engineering classes shall be decided by open competition in the following branches of mathematics; but, to insure a high standard of general knowledge, to the total marks obtained in mathematics will be added one-half of the marks obtained in the F. A. examination :—

	Marks.
Arithmetic	100
Algebra, including quadratic equations and the binomial theorem ..	75
Geometry, the first four books, and the sixth book of Euclid	75
Mensuration	50
Trigonometry, including the solutions of plane triangles	100
Total ..	400
F. A. Examination ..	300
Grand total ..	700

Candidates failing to obtain one-third of the combined total marks shall not be admitted. Selection shall be made in order of merit; provided that, if four Europeans and Eurasians and three Muhammadans are not within the first fifteen, the number under each may be made good in order of merit from the other qualified candidates. Before joining the college, the candidates shall inform the Principal whether they intend to be civil or mechanical engineers.

(6) The fee for admission to this examination shall be Rs. 10.

(7) Admission to the engineer subordinates class shall, except in the case of soldier students, *mutatis mutandis*, be made on the same principles. The examination in mathematics shall be as follows :—

	Marks.
Arithmetic	125
Algebra	75
Geometry	100
	300
Proportion of marks in the Matriculation examination	225
Total ..	525

(8) The names of candidates who have qualified in the above examination shall be published in the *Fort St. George Gazette.* The fee for admission to this examination shall be Rs. 5. From this fee soldiers will be exempted.

(9) *Soldier Students.*—Non-commissioned officers and soldiers of Her Majesty's British service, desirous of qualifying for employment in the Public Works department, will, to the number of five annually, be admitted to the college on passing an entrance examination in arithmetic and English. After one year's study of arithmetic, algebra, and vernacular language, they will, provided they pass a satisfactory examination in these subjects, join the subordinate class for the ordinary theoretical and practical courses. Each student will draw a stipend of Rs. 10 per mensem for three-and-half years, commencing from the date of joining the subordinate class. His pay, rations and clothing will be drawn from his regiment throughout the whole course of study. A fixed proportion between the number of soldiers and civilians to be appointed to the Public Works department will be established.

(10) Admission to the remaining classes shall be regulated by the order in which the candidates have passed the middle school or some higher examination, the selection proceeding from those that have passed a higher examination to those who have passed a lower.

ARTICLE V.

The course and subjects of study in the several classes shall be as follows :—

(1) *Civil and Mechanical Engineering.*

(*a*) Theoretical—three years. The theoretical course will comprise the following studies :—

I. Pure Mathematics.

Arithmetic and Algebra, Plane Geometry, and Mensuration, Trigonometry and Algebraic Geometry.
Differential and Integral calculus.

II. Applied Mathematics.

Mechanics and Hydro-mechanics.

III. Physics.

Experimental Physics. Inorganic Chemistry, theoretical (including Metallurgy) and practical (including elementary knowledge of qualitative analysis).
Elementary Geology.

IV. Drawing.

Practical or Descriptive Geometry.
Orthographic projection. Architectural Drawing. Machine Drawing.
Freehand, Perspective and Model Drawing.

V. Language.

Tamil or Telugu.

(NOTE.—Tamil to be obligatory for Natives of Telugu districts, and *vice versa*. The choice of one of these two languages to be open to all other students).

VI.—Engineering.

Building materials.
Building construction and architecture.
Applied mechanics.
Earthwork, roads, and railways.

Hydraulics, including bridges and irrigation works.
Principles of mechanism.
Prime-movers, steam-engines, and hydraulic machinery.
Designs, specifications, and estimates.

VII.—Surveying.

Instruments.
Surveying and levelling in the field.
Calculations and topographical drawing.

(*b*) The final examination in the following subjects :—

FIRST YEAR.

I.—Pure Mathematics.

Arithmetic and Algebra.
Plane Geometry.
Mensuration.
Trigonometry.

IV—Drawing.

Practical or Descriptive Geometry.

SECOND YEAR.

I.—Pure Mathematics.

Algebra and Geometry.

II.—Applied Mathematics.

Mechanics and Hydro-mechanics.

V.—Language.

Tamil or Telugu.

VI.—Engineering.

Building materials.
Building construction.
Hydraulics.

Shall be held at the end of the first and second year respectively. The marks obtained in these examinations shall be included in the grand total of marks at the final examination.

NOTE.—The term examinations shall cover all the subjects studied during the term, but the subjects mentioned above will be finally disposed of at the end of first and second years respectively.

(*c*) The final examination at the termination of the whole course shall be confined to the following subjects :—

Pure Mathematics.

Differential and Integral Calculus.
Physics.
Experimental Physics.

Inorganic Chemistry, theoretical (including Metallurgy) and practical (including elementary knowledge of qualitative analysis).

Drawing.

Orthographic projection.
Architectural drawing.
Machine drawing.
Freehand, perspective and model drawing.

Engineering.

Architecture.
Applied mechanics.
Earthwork, roads and railways.
Principles of mechanism.
Prime-movers, steam engines, and hydraulic machinery.
Designs, specifications and estimates.

Surveying.

Instruments.
Surveying and levelling in the field.
Calculations and topographical drawing.

Candidates obtaining one-third of the marks under each head, and half on the whole, shall pass. They shall be arranged in two classes in order of merit, the first or honor class containing those who have obtained at least three-fourths of the total marks.

(*d*) The progress of students in their studies is tested by periodical examinations and by assigning values to the drawing, surveying notes, &c., executed by them ; these marks shall count towards the final total examination marks.

(*e*) PRACTICAL COURSE.

Civil Engineers.

After completing the theoretical course, the pupils of the Civil Engineer class will spend one year in the Public Works Workshop, going through the carpenters' shop, the smithy, the foundry, and the fitting shop. They will then be placed for one year under the Public Works department, and will be stationed at places where large works are in progress. They will be regularly instructed in the practical details of brick-making, brick-laying, quarrying, blasting, masonry, building of all sorts, the management of labor, accounts, &c.

Mechanical Engineers.

The course will comprise two years of practical study at the chief workshops of the presidency.

(2) *Engineering Subordinates.*

(*a*) The theoretical course, which extends over 2½ years, will embrace the following subjects :—

I. Mathematics.

Arithmetic and Algebra.
Geometry and Mensuration.
Trigonometry.
Elementary statics.

II. Drawing.

Geometrical drawing.
Orthographic projection.
Mechanical drawing (buildings, irrigation works, models, and machines).
Freehand drawing.

III. Language.

Tamil or Telugu.

IV. Surveying.

Chain and compass.
Box sextant and plane table.
Theodolite.
Levelling.
Topographical drawing.

V. Engineering.

Building materials and construction.
Hydraulics, bridges, and irrigation works.
Earthwork and roads.
Strength of materials.
Elements of mechanism and the steam engine.
Designing and estimating.

(*b*) The final examination in the following subjects :—

FIRST YEAR.

I. Mathematics.

Arithmetic and Algebra.
Geometry and Mensuration.

II. Drawing.

Geometrical Drawing.

SECOND YEAR.

III. Language.

Tamil or Telugu.

V. Engineering.

Building materials.
Building construction.

Shall be held at the end of the first and second years, respectively. The marks obtained in these examinations shall be included in the grand total of marks at the final examination.

NOTE.—The term examinations shall cover all the subjects studied during the term; but the subjects mentioned above will be finally disposed of at the end of the first and second years respectively.

(*c*) The final examination shall be in the following subjects:—

Mathematics.

Trigonometry.
Elementary statics.

Drawing.

Orthographic projection.
Mechanical drawing (buildings, irrigation works, models, and machines).
Freehand drawing.

Surveying.

Chain and compass.
Box sextant and plane table.
Theodolite.
Levelling.
Topographical drawing.

Engineering.

Hydraulics, bridges, and irrigation works.
Earthwork and roads.
Strength of materials.
Elements of mechanism and the steam engine.
Designing and estimating.

Candidates obtaining one-third of the marks under each head, and half on the whole, shall pass. They shall be arranged into two classes in order of merit, the first containing those who have obtained at least three-fourths of the total marks.

(*d*) The progress of students in their studies is tested by periodical examinations and by assigning values to the drawing, survey notes, &c., executed by them; but these marks shall count towards the final total examination marks.

(*e*) The practical course will comprise one year of practical study in workshops, and one year on large engineering works, on which instruction will be afforded similar in character to that given to the Civil Engineer pupils.

Surveyor's Class.

The courses of study, which extend over two years, shall be as follows:—

First year.

Printing, scales, conventional signs, chain surveys.
Prismatic compass surveys.
Adjustment of levels.

Second year.

Levelling.
Theodolite and sextant.
Traverse.
Plane tables.

Term examinations will be held for the class at the close of each year, and a final examination on the completion of the course.

The rules regarding examinations shall be the same as those of the Engineering Subordinate class, and the papers set shall be the same as those set to that class in the above subjects.

Three classes of certificate to be awarded on the following percentages of marks, total and for each subject respectively:—

First class	75	66
Second class	66	50
Third class	50	33

(4) *Draughtsmen's Class.*

The courses of study, which will extend over two years, shall be as follows:—

(*a*) Preliminary, including the use of drawing instruments, printing, geometrical drawing, scales, &c.

(*b*) Copying and coloring architectural and topographical drawings.

(*c*) Drawing buildings, bridges, and irrigation works from specification, from models, and from actual measurements.

(*d*) Estimating, comprising taking out the quantities for buildings, bridges and irrigation works, from plans and notes.

(*e*) Mechanical drawing.

(*f*) Freehand drawing.

Term examinations will be held for the class at the close of each year, and a final examination on the completion of the course.

The rules regarding examinations shall be the same as those of the Engineering Subordinate class, and the papers set shall be the same as those set to that class in the above subjects.

On the aggregrate results, first-class, second-class or third-class certificates will be awarded.

Candidates obtaining 75 per cent. in each subject, and 85 per cent. on the total, shall receive first-class certificates. Those obtaining 66 per cent. in each subject and 75 per cent. on the total, second-class certificates. Those obtaining 50 per cent. in each subject and 66 per cent. on the total, third-class certificates.

(5) *Sub-Overseers, &c.*

The courses of study shall be—

Arithmetic.
Elementary Geometry.
Mensuration.
Scales.
Plan drawing.
Elements of Engineering.

No examinations will be held, but a certificate of attendance shall be given by the Principal after a minimum period of one year's regular study. The instruction shall be given in Tamil and Telugu; the class an evening one.

ARTICLE VI.—FEES.

(*a*) *Civil and Mechanical Engineer Class.*

The fee is fixed at Rs. 85 for each term of six months, payable in advance; or, if candidates so desire they will be permitted to pay same by monthly instalments at the discretion of the Principal of the College; but in either case a deposit of Rs. 100 will be demanded at the outset.

A student may compound for the whole theoretical course by the payment of a fee of Rs. 400 in advance. No fee will be demanded for the practical course.

(*b*) *Engineer subordinate class.*

The fee is fixed at Rs. 25 for each term of six months, payable in advance; or by monthly instalments as above, with a deposit of Rs. 50 at the outset; or Rs. 125 for the whole theoretical course payable in advance. No fee will be demanded for the practical course.

(*c*) For the surveyors and draughtsmen classes, a terminal fee of Rs. 15 to be paid in advance.

(*d*) For the sub-overseer and maistry class, no fee shall be required except a registration fee of one rupee.

NOTE.—Fees will, under no circumstances, be returned after a student has been admitted to the institution.

ARTICLE VII.—CERTIFICATES.

(*a*) The Board of Examiners shall issue under their signatures a certificate to each candidate, setting forth the class of study in which he has qualified; but, in the case of students of the Engineer and Engineering subordinate classes, the final certificate in the nature of a diploma shall be issued under the signatures of the Principal of the College and of the Director of Public Instruction, in proof that the student concerned has satisfactorily completed the prescribed practical course.

(*b*) A candidate who has failed to obtain a certificate from the Board at the final examination may appear before the Board for examination at any subsequent year, provided he is certified to have put in the necessary attendance at the college and pays a fee as follows :—

	RS.	A.	P.
Civil and Mechanical Engineers	25	0	0
Engineer subordinates	15	0	0
Other classes	7	8	0

(*c*) The names of the candidates so passing shall be published in a separate list, and they shall simply be declared to have satisfied the Board of Examiners.

ARTICLE VII.

The following scholarships and prizes are allowed for students during their college course :—

One scholarship of Rs 30 per mensem tenable for three years, to the candidate who passes first in the admission examination for the Civil and Mechanical Engineer classes; to be forfeited for misbehaviour or other good cause.

Two scholarships of Rs. 10 per mensem each tenable for two-and-a-half years, to the two candidates highest on the list in the admission examination for the Engineering Subordinate class. These scholarships shall, however, be reawardable after each annual examination.

A gold medal of the value of Rs. 120 will be awarded to the student who passes first in the final examination for Civil and Mechanical Engineers.

A gold medal of the value of Rs. 60 will be awarded to the student who passes first in the final examination for Engineer subordinates.

Silver medals of the value of Rs. 10 each will be given to the student who passes first in the final examination in each of the other branches.

ARTICLE IX.—PRACTICAL COURSES.

Civil and Mechanical Engineers.

During the final year of practical training on works, subsistence allowance of Rs. 50 per mensem for Europeans and Eurasians and Rs. 25 per mensem for natives will be granted. Such allowances will, however, be contingent on the good conduct and satisfactory progress of the student under instruction; and on proof of misconduct or idleness the allowances may be cut down or withdrawn altogether by the officers in charge of the works.

Engineering Subordinates.

As in the case of the Civil and Mechanical Engineer pupils, no fee will be exacted during the workshop year; and during the year of practical study on works stipends will be granted of Rs. 30 per mensem for Europeans and Eurasians and Rs. 20 per mensem for natives, subject to the conditions of good conduct, regular attendance, &c.

Soldier students will, during the workshop course, draw pay, rations, and clothing from their regiments, and the stipends prescribed for the theoretical course. During their year of practical training on works, they will cease to draw those allowances, and will be brought on to the Public Works department scale of establishment as apprentice overseers, drawing the pay and allowances laid down in the Public Works regulations.

All scholarships and other allowances during the practical course will be debitable to the Department of Public Works.

ARTICLE X.

Prospects of Students.

(1) *Civil and Mechanical Engineers.*

One appointment annually as Assistant Engineer, 3rd grade, in the Public Works department, will for the present be conferred on the student highest on the list at the final examination, who has also obtained the Degree of B.C.E. To those next on the list appointments as supervisors, 2nd grade, will be offered, in order of merit. The number of appointments to be so awarded will be in proportion to the requirements of the service, and will be fixed by the Chief Engineer. The number so determined on will be announced annually, at least six months before the final college examination. It is to be understood, however, that all vacancies in the supervisor grade will not be filled by selection from the most distinguished of the passed students of this class, as a portion of such vacancies must be reserved for the best qualified subordinates of the overseer grade.