the pocket of his Coat which he left
lodgings.

	...epartment.	C. No.	Year.	...itials of clerk taking the paper or of attender.	Date return...
14/2/36	MRe 18th	MOW	- 8/5/98		m
		MOSW	- 8/5/98		m
		MOW	8/5/98		m
		MOW	8/5/98		m
			8/5/98		m

8/6

Public Works (1898) Department.

G.O., No. 1092 W

DATED 2nd May 1898

8/5/98

[Despatch Abstract.]

Bridge; Estimate of Rs. 43,600 for constructing a steel plate girder — over the Yenamadurru drain in the Bhimavaram taluk, Godavari Dt., Sanction

100/4

Indexed. 3/5

[P. W. 26. 1,000—12-2-98.]

BACK PAPERS.

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

FURTHER PAPERS.

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

BUILDINGS AND ROADS.
CIVIL WORKS.

Government {1898} of Madras.

PUBLIC WORKS.

Recd. } 1898. *Enclosures*

Regd. *Spare copies*

G.O., No. 1092 W., 2nd May 1898.

MAY.

Bridge

Estimate of Rs. 43,600 for constructing a steel plate girder — over the Yenamadurru drain, in the Bhímavaram taluk, Gódávari district, sanctioned.

BACK PAPERS.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

Read—the following papers :—

From A. H. GARRETT, Esq., Superintending Engineer, I Circle, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st October 1895, No. 1715 G.D.

I have the honour to submit, herewith, plans and estimates amounting to Rupees 46,300 received from the District Board, Gódávari, for constructing an iron lattice girder bridge over Yenamadurru drain near the village of Bhímavaram on the road from Palakollu to Akeedu, and to request that you will be so good as to obtain the sanction of Government to the same.

2. The estimate has been scrutinized by this office and bears the counter-signature of the President, District Board.

3. A copy of extract from the Proceedings, No. 21, dated 13th July 1895, of the district board sanctioning the estimate is enclosed.

From J. C. LARMINIE, Esq., M.I.C.E., Superintending Engineer, I Circle, to the Chief Engineer, Public Works Department, dated Waltair, 8th June 1897, No. 628 G.D.

With reference to your memorandum, No. 4010 C., dated 10th November 1896, I have the honour to resubmit, for sanction, the plans and estimates for iron lattice girder bridge over Yenamadurru drain near Bhímavaram duly furnishing the details for iron work.

From W. C. DeMORGAN, Esq., M.I.C.E., Superintending Engineer, I Circle, to the Chief Engineer, Public Works Department, dated Cocanada, 4th March 1898, No. 2134 G.D.

With reference to your memorandum, No. 2965 C., dated 25th June 1897, and in continuation of my letter, No. 1544 G.D., of 27th November 1897, I have the honour to submit, herewith, fresh plan * and estimate * amounting to Rs. 43,600 for steel plate girder bridge over the Yenamadurru drain in lieu of the one returned with your memorandum under reply for your approval and sanction, as the District Board Engineer recommends this fresh design being simpler in construction than the former lattice type.

* As per details in the list attached.

2. A copy of resolution sanctioning this fresh estimate is also submitted.

3. The plan * and estimate * received with your memorandum quoted above are also resubmitted for your information.

Order—No. 1092 W., dated 2nd May 1898.

The estimate amounting to Rs. 43,600 for constructing a steel plate girder bridge over the Yenamadurru drain, in the Bhímavaram taluk, Gódávari district, is sanctioned.

2. This sanction has been registered as Local No. 5 W. of 1898–99.

(True Extract.)

Under Secretary to Government.

To the Superintending Engineer, I Circle.
" Local and Municipal Department, with plans and estimates.

Exd. Md. Pahilvan.

BACK PAPERS.

[40/500]

Public Works DEPARTMENT.

Papers to be read in proceedings :—

Again G.O., dated 189 , No.

Again G.O., dated 189 , No.

Current No. 8514 of 1895, dated 4th November , from the S. E. I Circle

" " 5783 " 1897, " 14th June , " ——— do ———

" " 2259 " 1898, " 11th March , " ——— do ———

UP

B of Rev Civil works

ORDER. No 1092 W 2-5-98

The estimate amounting t

Rs. 43,600, for constructing a steel plat

girder bridge over the Zenamadurr

drain in the Bhimavaram Taluk

Godavari District, is sanctioned

2. This sanction has been registered as Local No: 5 W of 1898-99.

A.S.H 28.4.98

To The Local and Municipal Deptt, for favour of counter-initials

AEK 22.4.

Mas AT 23-4-98

22-4-98

T. A. B. PK

Note. This estimate has been dealt with in the accompanying technical note.

22-4-98

" S. E. I Circle

" L & M. Deptt with plans and estimates.

17/5/98

Mas

Public Works Department.

Current No. 2259

Letter No. 2134 G.D.

Dated 4th March 1898

From the Supdg. Engineer I Circle

NOTE BY TECHNICAL SECTION.

Name of work Constructing a Steel Plate Girder Bridge over Yenamadurru drain in the Bhimavaram Taluq, Godavari District.

Est Rs 43,600.

In current No 8514 the Supdg. Engineer I Circle submitted with his letter No 1715 G.D. dated 31st Octr 1895 an Estimate amounting to Rs 46,300 for constructing an Iron Lattice Girder Bridge over the Yenamadurru drain. This Estimate was reviewed in this Office note dated 13.12.95. In Chief Engineer's Memo No 4010 C dated 10-11-96 the Supdg. Engr. I Circle was asked to submit details of the iron work for which a lump sum of Rs 21,680 is provided in the Estimate

furnished in detail,

Estimate can be sanctioned, & I would add to the G.O. the following remark, in order to ensure that estimates are forwarded to this office in a complete shape in the first instance.

~~[illegible]~~

"As a great deal of original calculation, which might be avoided, is now thrown on the office of the Chief Engr. owing to the incomplete state in which the estimates are forwarded for sanction in the first instance, with the result that there is often a glut of estimates lying over in the Technical section of the office, S.Es are required to insist in future that all original calculations for strength of girders, hydraulic details, & all information necessary to enable the estimates for bridges & other works to be readily checked, shall accompany each estimate before it is forwarded on by them to Govt for sanction".

ACK
20-4.

P. W. 6
250-30-9-

Chief Engineer's

A circular to this office has been drawn up and is submitted herewith

20/4/98.

22.4.98

s without scale details ...

ron work cannot be checked.

With his No. 628 G.D. dated th June 1897 the Supg. Engineer I Circle re-submits for sanction the plans and estimates for the Iron Lattice Girder Bridge duly furnishing the details of iron work. The Chief Engineer in his No. 2965 C of 25th June 1897 brings to the notice of the Supg. Engineer that only an abstract of quantities equated to amounts aggregating Rs 21,680 was received, and no details supported by drawings of the iron work equated to cubic contents & equated to weights. As the sum involved was large it was thought details should not be dispensed with. This the Supg. Engineer promised to supply in his letter No. 1055 G.D. dated 3-9-97. A reminder from the Chief Engineer No. 4784 C dated 16-11-97 was sent to the Supg. Engineer I Circle for the required information and, in reply, the Supg. Engineer in his No. 1544 G.D. dated 27th Novbr 1897 submits a fresh design for a steel plate girder bridge estimated to cost Rs 43,600 in lieu of the one originally submitted for Rs 46,300 as being simpler in construction than the former one of Lattice type.

In the revised plan the same structural details are preserved as in the original, which was scrutinized and passed in this office, except that steel plate girders are substituted for Lattice girders.

From the calculation sheets attached it will be observed that for the main girders a section of 36"×14 will suffice - vide page 146 Dorman, Long & Co's Hand-Book but, as the depth for plate girders should be 1/12th the span the depth for the entire length 56'4" would be 4'8", and for a clean span of 50 feet 4'-2 inches.

Rates. Detailed data has been furnished in support of the rates for Concrete, Rubble-work, & Dry Stone pitching and are found to be fair.

The Estimate for the Steel superstructure has been furnished in detail,

Yes

Steel plate girder

50' clean span. 4.5 ft depth

Web 54" × 3/8"

Flange plates 15" × 3/8"

details have been checked & found to be correct, & the rates compare favorably with recently sanctioned Estimates. The Plan & Estimate has been countersigned by the President District Board & a copy of District Boards' Resolution sanctioning this Estimate dated 29-1-98 is also submitted.

H.C.W.
13.4.98

Taking the formula for a W.S plate girder

Breaking wt in tons = $75 \cdot \frac{ad}{L}$

$= \frac{75 \times 15.88 \times 54}{50 \times 12} = 108$

or about 6 times the weight at the centre of each girder, which is sufficient

Again

Max^m strain on lower flange

$= \frac{WL}{8d} = \frac{37 \times 50}{8 \times 4.5}$

$= 51.5$ tons

Safe working strain for steel is 7.5 tons per sq. inch

∴ Area of flange required to stand max^m strain $= \frac{51}{7.5}$

= 7 inches nearly

or less than one half what is allowed.

AEK

Calculations for Main Girder

Weight on One Span

	Cwt.
9 Rolled Steel Cross Girders	49-2-23
Flooring plates complete	115-1-14
Wrought Iron Standards &c	5-2-16
Gas pipe in hand rail	5-0-7
Holding down plates	1-2-12
Angle brackets &c	6-0-0
Total	183-1-16
lbs	20,540

Metalling over flooring plates

$50 \times 13\frac{1}{4} \times \frac{3}{4} \times 146$ lbs $= 72,543$

Live load $120 \times 50 \times 12 = 72,000$

Grand Total lbs 165,083

Tons 73.7 say 74.

$\frac{74}{2} = 37$ Tons, weight that each main girder should carry.

From Dorman & Long & Co's Hand-book page 146 – a girder of section 36" × 14" will suffice.

Safe load that proposed Girder will carry –

Safeload $= \frac{8 \times ad \times 4}{L}$

a = Effective sectional area of top & bottom flange

d = depth in inches $= 54\frac{3}{4}$

L = span from center to center of bearing.

Section of plates $15" \times \frac{3}{4}" = 11.25$ Sq in

2 angle irons – $3\frac{1}{2} \times 3 \times \frac{1}{2} \times 2 = 6.5$

17.75

← – – Deduct for rivet holes 1.87

15.88 Sq in

$2 \times \frac{3}{4} \times \frac{3}{4} = 1\frac{1}{8}$

$2 \times \frac{3}{4} \times \frac{1}{2} = \frac{3}{4}$ $1\frac{7}{8}$ or 1.87.

$$W = \frac{8 \times 15.88 \times 54.75 \times 7.5}{54 \times 12} =$$

80.5 Tons.

H.R.H.
13.4.98

Note

The girder, being of steel, is of ~~ample~~ sufficient strength, and the proportion of depth to span is suitable.

2. The surface soil & sub soil is stiff clay, & the high velocity of 7' allowed is thus permissible.
4 spans of 50' are allowed to pass the flood discharge, whereas it is stated the same drain is crossed at "Pippapad" (presumably near) by a bridge of 3 spans of 48'. The waterway is thus sufficient. The cross sections shd have been forwarded. For some reason or other they have been kept back, & it is stated the surface fall of drain has been "assumed" at 5' per mile as ascertained from the P.W.D. This remark is next door to unintelligible. It is presumed, however, actual levels were taken.

A.K.
20.4.98.

Estimate for an iron Lattice girder bridge over the Yenamaduru drain near Bhimavaram Godavari Dt.

DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

READ the following

From the Suptg. Engineer, I Circle, No. 1715-G.D. dt 31st October 1
Note by the Chief Engineer dt

1. Should not ~~the~~ information as to the details of the iron-work be insisted upon before the Estimate is sanctioned?
2. Why has there been so much delay, a year, in submitting the estimate for sanction? (31st Oct 1895)

R.S.H.
31.10.96

The Honourable the Chief Secretary
In favour of sanction

The estimate, amounti
to Rs 46,300, for constructin
an iron Lattice girder brid
over the Yenamaduru dra
near Bhimavaram in t
Godavari District, is sanct
2. This sanction ha
been registered as Loca
No. W of 1896-97.

27.10.96

24/10/96

C.A.D.H.
23/10 96

To The S.E. I Circle
" Exar. P.W. Accts
" L & M Dept with 8 enclos.

[P. W. 40. / 50—2-9-96.]

C.S. 26/19.

85-14/85

W

~~Dist~~

(2) Ch 2259 Off J 16

Submitted with reference to S.E.'s note of 31-10-96.

(1) If details of iron-work are considered necessary, the plans & estimates must be returned to the S.E. to obtain them.

(3) The delay can only be ascribed to the long block of work in I section, to relieve which two upper subordinates have been attached to the office.

Ch
2/11/96

CWM
2/11/96

No 2259 Off J 16

Note by the Chief Engr. P.W.

The estimate of Rs. 43,600 for constructing a steel plate gird bridge over the Yerramadurru drain in the Bhimavaram Taluk, Godavari District, is recommended for sanction with the following remarks:-

(1). The girder being of steel, is of ~~ample~~ sufficient strength, and the proportion of depth to span is suitable.

(2) The surface soil and subsoil is stiff clay, and the high velocity of 7 ft per sec is allowed. ~~to the permissible.~~ 4 spans of 50' are allowed to pass the flood ~~damage~~ discharge, whereas it is stated the same drain is crossed at "Pippara" (presumably near) by a bridge of 3 spans of 48'. The waterway is thus sufficient. The cross sections should have been forwarded. For some reason or other they have been kept back, and it is stated the surface

was done till 8th inst: when Sergt. Cornwell wrote his note of that date (flagged B). I then completed my note dated 10-10-96 flagged C, having in January last written paras (I), (II), and (III) at which place I had stopped, pending receipt of a record called for in my note flagged A.

CWH
16.10.96.

This matter seems to have been rather complicated owing to delay: but I see no reason why the estimate should not be sanctioned as it is [illegible] that the work [illegible] cannot be checked owing to want of details.

21/10/96

The foundation seems to be sufficient

Approved accordingly
CWH 22/10

Ch. 2259 Off/6

Dw.

A revised draft order is submitted herewith for your initials.

A few G.Os. containing C.W's ~~notes~~ on bridges are also submitted for your perusal.

AOK
21. 4. 98.

Mal 22/4/98-

Keep back from circulation

These remarks were simply intended to summarise for W some of the main points connected with the design. My experience of iron bridges is very limited, and I would prefer not to write original notes until some more ~~cost~~ estimates have passed thro' my hands, & I ~~have seen~~ what is usually embodied in W's covering notes. I should like to see a few C.E's with such notes

AOK
21. 4.

Note by the Chief Engr. P.

The estimate of Rs. 43,600 for constructing a steel plate gir bridge over the Yenamadurr drain in the Bhimavaram Taluk, Godavari District, is recommended for sanction with the following remark

(1). The girder being of steel is of ~~ample~~ sufficient strength, and th proportion of depth to span is suitable.

(2) The surface soil and subsoil is stiff clay, and th high velocity of 7 ft per sec is allowed. ~~to tha~~ ~~permissible.~~ 4 spans of 50' are allowed to pass the flood ~~damage~~ discharge, whereas it is stated the same drain is crossed at "Pippara" (presumably near) by a bridge of 3 spans of 48'. The waterway is thus sufficient. The cross sections should have been forwarded. For some reason or other they have been kept back, and it is stated the surface

fall of drain has been "assumed" at 5' per mile as ascertained from the P. W. D. This remark is next door to unintelligible. It is presumed, however, actual levels were taken.

E. W.

Maj

P. W. D

Note by the Chief Engineer

—

It is observed that the iron work cannot be checked owing to want of details

24/10/96

E. W.

CMMS
23/10/96.

Cm

Cml

Lattice Girder Bridge over the Yenamduru Drain

Calculation of Strength of Piers.

Let H = Height of column of material of which the pier is built corresponding to given pressure.

a = area of section of top of pier

A = area of horizontal section at depth h.

h = depth measured from top

r = number whose hyperbolic log $= \frac{1}{H}$

(I) Supposing level of floor fixed at 0.00 as shewn in plan. If we eliminate the unnecessary down- cut-waters on the ~~up-stream~~ side, the length l = 26' (about)

Then $A = 26 + 6 = 156$

$a = 24 \times 5 = 120$

$\frac{1}{H} = \frac{1}{13.34}$, $h = 19.34$

$r =$ number whose hyp. log is $\frac{1}{13.34}$ i.e. number whose hyperbolic log = .075

That number = 1.08

$A = a \times r^h = 120 \times 108^{19.34}$

$\therefore \log A = \log 120 + 19.34 \log 108$

$\log 120 \; .. = 2.07918$

$\log 1.08 = .03342$

19.34

13368
10026
30078
3342

0.6463428

$\therefore 19.34 \log 108 \; .. = 0.64634$

And log $a \times r^h$ becomes 2.72552

the number corresponding to which is 531. But A = 120

∴ a is much larger than necessary

(II.) Supposing we build the piers on a block of concrete 3' thick the top of which is at −5.00 on plan, & supposing the earth filled in to ± 0.00 be all scoured out

Then $H' = 13.34 + 5.00 = 18.34$

$h' = 19.34 + 5.00 = 24.34$

Eliminating cut-waters as before

$a = 120$, $A' = 26 \times 8 = 208$

$r' =$ number whose hyperbolic log $= \frac{1}{18.34}$ i.e. the number whose hyp: log: = .05452

That number = 1.06

$A' = 120 \times 1.06^{24.34}$

$\therefore \log A' = \log 120 + 24.34 \log 1.06$

$\log 120 \; .. = 2.07918$

$\log 1.06 = 0.02531$

24.34

10124
7593
10124
5062

0.6160454

$\therefore 24.34 \log 1.06 \; .. = 0.6160$

$\therefore \log 120 + 24.34 \log 1.06 = 2.695$

$\therefore a \times r'^{h'} = 496$ (corresponding

So though the piers be 24.34' above foundation the top area will still be theoretically unnecessarily large, as regards resisting lateral pressure.

The weight 24.5 tons of each girder will be distributed over 5 square feet of pier surface giving a pressure of 4.9 tons per square foot which is not excessive. But 5 tons per sq: ft: would be quite enough. Thus the necessity for 5 ft. of width is established.

Abutments and Wings.

(III) A simple calculation will shew them to be strong enough.

From the ~~accompanying~~ marginal remarks on the accompanying note by T dated 13-12-95 it will be seen that I wrote the above on 17-1-96, and sent it to the office for further information with a view to completing this note. There it has remained ever since.

IV Foundations. From the Supplemental note by T (dated 5-10-96) it will be seen that putting in foundations as proposed by me in my note dated 17-1-96 will entail an estimated excess of Rs 951 which is not much on a big estimate of Rs 46,300. For a case in point, in support of this suggestion, attention is invited to that of Kath[illegible]vary Bridge* (vide linked file). It is recommended that this form of foundations be adopted.

* Sent to H.E. on 6-10-96. but not yet returned. C.H.S. 12/10/96.

V Velocity. The accompanying calculations, dated 5-10-96, shew that the velocity will not exceed 10 feet per second.

VI The iron-work can not be checked for want of details.

C.H.S.
10-10-96

H.C.
Put this up as a linked file.

CWM
10-10-96.

D.W.

This file is not here. It was sent to H.C. on the 8th October 1896

[illegible]
10/10/96

D.W.

For case in point, please see File for Katthoovary Bridge. Current No 1370 sent up from this office on 30th ult., in which Concrete flooring is ordered.

Difference in cost due to modifications suggested is an excess on the Estimate of Rs ~~[illegible]~~ 951 calculated as under:—

Excess Items

Concrete in Surki mortar
Flooring. 4 × 46.635 × 31 × 3 = 17720 c.ft.

Earthwork.
Excavation 4 × 46.635 × 21 × 6 = 23504 c.ft.

177.2	Units Concrete at 19/- =	3367
23.5	" Earthwork at 2/14/3 =	68
	Total Excess.	Rs 3435

Savings

Concrete in Surki mortar.
Under retaining walls as per Est. 3733 c.ft.

Rubble in surki mortar.
Retaining walls as per Est. 3940
Cutwaters below M.F.L.
3 × 14.13 × 13' 4" = 568
Total. 4508 c.ft.

Rubble in mortar
Cut waters above M.F.L
3 × 9.82 × 4' 3" = 117 c.ft.

Dry stone pitching.
Flooring as per Estimate.. 7200 c.ft.

Gravel backing.
Under flooring as per Est. 2400 c.ft.

		Rs
37.33	units Concrete at 19/- =	709.
45.08	" Rubble in surki at 21/- =	947
1.17	" " mortar at 18/- =	21
72	" Dry stone pitching at 9/- =	648
24	" Gravel backing at 6/10/- =	159
		Rs 2484

Excess = 3435 - 2484 = Rs 951

For velocity please see overleaf

For 1 span.

$A = 50.6 \times 13.34 = 675.004$

$B = 50.6 + 26.68 = 77.28$

$\frac{A}{B} = 77.28)\ 675.004\ (8.73$

```
61824
 56764
 54096
  26680
  23184
```

$r = 8.73.$

By Mullins Table III page 141

For rubble masonry with $r = 8.75$

$c = 111.80$

$s = \frac{5}{5280} = \frac{1}{1056} = .00095$

$v = c\sqrt{rs}$

$= 111.80\sqrt{8.73 \times .00095}$

$= 111.80\sqrt{.0082035}$

$= 111.80 \times .09$

$= 10.06$

or say. 10 ft per sec:

FWL
5/x/96

CWS
10-10-96.

I do not think that the foundations will do: but before making any alteration would like to see orders passed in similar cases — one case will do — to the effect that it is considered desirable to build the piers on 2 or 3' concrete in one mass which will answer the purpose of floor should the filling in above it be scoured out.

This will add to the expense, but the present floor which is, I consider, at too low a level will be saved. What will be the net excess supposing we build up on 3' concrete one mass under abutments piers continued between spans?

The piers need not be as long as shown in plan for cut waters on the ~~upstream~~ downstream side may be omitted. There will thus be some saving in the superstructure as well as by eliminating the dry stone & retaining wall floor.

I calculate velocity

Public Works Department.

Current No. 8514

Letter No. 1715 G.D.

Dated 31st October 1895

From the Supdg Engineer I Circle.

NOTE BY TECHNICAL SECTION.

Name of work Constructing an iron lattice Girder bridge over the Yenamadurru drain, on the road from Palcole to Akeedu, in the Godavari District.

Amount of Estimate Rs 46,300.

The road from Palcole to Akeedu is stated to be an important main line of communication, running through the heart of Bheemavaram Taluq and linking 3 feeder canals. The proposed bridge is stated to be a much felt want as the drain in question is the only stream left unbridged on the road. The drain is also reported to be one of the largest ones in the District & in floods it is stated to be quite impassible for traffic and only fordable 2 or 3 months in the year & that during the dry weather.

The bridge is designed to consist of 4 spans each of 50 feet clear between corbels & the platform composed of compound girders of Warren & Lattice type 6'2" in depth & divided into 8 bays of 6'8" from centre to centre. The roadway will be carried on Horbury's patent flooring plates resting on rolled

rolled iron girders of a section 12"×5 spaced 6' 8" between centres, with wheel guards, hand rails &c., as per plan.

The main girders will have a bearing of 18 inches on each pier & abutment & will be laid 19' 4" above floor level & fitted with the necessary expansion plates between the spans.

The main girders are designed to carry a live load of 2.58 tons per bay or 20 tons per span at 112 lbs per sq. ft. & the dead load is stated to be 3 tons per bay or 24.5 tons on each girder, this is difficult to examine for want of sufficient detail of ironwork.

The waterway provided is 200 feet made up of 4 spans of 50 feet which is sufficient as per calculations noted in the report. The fall of the drain is taken at 5 feet per mile & the velocity 7.05 feet per second.

The soil is stated to be stiff clay.

The abutments, piers & wings will be built of coursed rubble laid in surki mortar & built on foundations laid to a depth of 8 feet, the lower 4 feet of which will be of concrete & the upper 4 feet built in 2 footings with coursed rubble in surki mortar. The floor between the piers & abutments will be 18" thick laid with dry stone over 6 inches of gravel & the sides protected with retaining walls built of rubble in surki, 4 feet in depth over a bed of concrete 2 feet in depth. The piers & abutments will be raised to a height of 19' 4" above floor level to bottom of main girders, as shown on plan.

The roadway over the bridge 1

approaches will be metalled to a width of 15 feet with 6 inches of stone metal & blinded with gravel 3 inches thick.

The girders are proposed to be obtained from Messrs. Richardson & Cruddas of Bombay for a lump sum of Rs 21,680 exclusive of landing charges & fitting &c.

The rates are fair.

The estimate & plans have been countersigned by the President Dist. Board and approved Dist. Boards proceedings dated 13th July 1895.

13. XII. 95

The main girders will be placed 17' 8½ apart from centre to centre & the width of roadway between wheel guards will be 15 feet. etc.

take one span. area = 50.6 × 13.34

wetted border = 50.6 + 26.68

16.12.95

$V = c\sqrt{rs}$. c for various kinds of masonry is given in Molesworth's manual.

I will finish the accompanying note, which is incomplete, on receipt of the above information.

CWH

17.XII

Public Works (1898) Department.

CURRENT No. 2259

From W. De Morgan Esquire
Executive Engineer in charge I Circle

Order

No. 2134 G.D.

Dated 4th March 1898

Received
Registered } 11 - 3 - 98

Enclosures ~~15~~ 24 (6 of which are plans)

Spare copies

SUBJECT.

Steel Plate girder bridge over Yenamadurru drain in Bhimavaram Taluq Godavari Dist. — Submitting fresh plans and Estimates for Rs 43,600 for Constructing a — in lieu of those returned with Chief Engineer's memo No 2966 C 25-6-97, which are also resubmitted for information

For comments

15/3/98.

0. L. S. 16 / 22/5

BACK PAPERS.

No.	Date.
5373 C	10-12-97
4784 C	16-11-97
3907 C	17-9-97
2965 C	25-6-97
4010	10-11-96

8

FURTHER PAPERS.

No.	Date.

No. 2134 G.D.

Office of the Suptg Engineer 7 Circle
Camp Cocanada 4.3.98.
Despd 6.3.1898

From
W C De Morgan Esqr M.I.C.E.
Suptg Engineer 7 Circle

To
The Chief Engineer
P.W. Department.
Madras

Sir,

Enclos 15

No. 5373 C of 10.12.97

as per details in the list attached

With reference to your memorandum No: 2965 C dated 25 6/97 and in continuation of my letter No: 1544 G.D of 27 November 1897, I have the honour to submit herewith fresh plan and Estimate amounting to Rs 43600 for steel plate girder Bridge over the Yenamaderru drain in lieu of the one returned with your memorandum under reply for your approval and sanction as the District Board Engineer recommends this fresh design being simpler in Construction than the former lattice type

2. A Copy of resolution sanctioning this fresh estimate is also submitted.

3. The plan and Estimate received with your memo quoted above are also re-submitted for your information.

I have the honour to be
Sir
Your most obedt Servt
W De Morgan
4/3 98 Suptg Engnr 7 Circle

Public Works (1897) Department.

CURRENT No. 5783

Order

From J. C. Larminie, Esq.
Supg. Engineer, 1st Circle
To The Chief Engineer, P.W.D.

No. 628 G.D.

Dated 8-6-97.
Received 14. 6. 97
Enclosures 10+ (74 plans)
Spare copies

SUBJECT.

Iron Lattice Girder Bridge over Yenamadurru Drain near Bhimavaram — Resubmits plans and Estimates for Constg. an — with the information required.

I/ For Secretary —
Cis
15/8/97

O.Z.S. 220 R 25/6

BACK PAPERS.

G.O.	No.	Department.	Date.
	4010 C	P.W.	10 11 96

FURTHER PAPERS.

G.O.	No.	Department.	Date.

S. E. I. / 5 1000—20-2-97.

No. 628 G.D.

mP

From

J. C. Larminie Esq. M. I. C. E.
Superintending Engineer,
First Circle.

Enclosures. 10. To

The Chief Engineer
P.W. Department
Madras

Waltair,
~~Camp~~
8th June 1897.

Sir,

With reference to your Memorandum No: 4010C dated 10th November 1896, I have the honour to resubmit for sanction the plans and estimates for Iron Lattice Girder Bridge over Yenamaduru Drain near Bhimavaram duly furnishing the details for ironwork.

3

I have the honour to be,
Sir,
Your Most obedt Servt

J. C. Larminie
Superintending Engineer
1st Circle

8/6

6/7.6

S. F. L. / 6 — 500—31-7-94

8514

FROM A. H. Garrett Esqr.
SUPERINTENDING ENGINEER
FIRST CIRCLE.

TO
THE CHIEF ENGINEER
PUBLIC WORKS DEPARTMENT.

DATED 31st } October } 1895.
DESPATCHED 1st } November }
RECEIVED

NO. 1715 G.D.

ENCLOSURES. 8

SUBJECT.

Iron Lattice Girder bridge over Yenamaduru Drain on the road from Palakol to Akeed — submits plans and estimates for Rs. 46,300 received from the District Board Godavari for constructing same — for favor of sanction

Proceedings No 21 dated 13th July 1895 of the District Board sanctioning the estimate is enclosed.

I have the honor to be
Sir,
Your most obedt. Servt.

(Signed) A. H. Garrett
Supdg. Engineer
I Circle

(True Copy)

Executive Engr
for Supdg. Engineer 1st Circle

Recd 4.11.95
En: 8
(+4 tracings)

Ef. 31/10

CMG
5/11.95

O.L.S. 471

No. 1715 (G.I).

FROM

A. H. Garrett Esqr.
SUPERINTENDING ENGINEER

FIRST CIRCLE,

Enclosures; 8

- 1 Estimate ✓
- 1 Detailed data ✓
- 1 Report ✓
- 1 Plan of details of girders ✓
- 1 Bridge plan ✓
- 1 Survey ✓
- 1 Section drawing ✓
- 1 Copy of extract from the proceedings

TO

THE CHIEF ENGINEER

PUBLIC WORKS DEPARTMENT.

DOWLAISHWERAM, 31st October 1895.
Desp 1-11-95.

SIR,

I have the honor to submit herewith plans and estimates amounting to Rs 46300 received from the District Board Godavari for constructing an Iron Lattice Girder Bridge over Yenamadurru drain near the village of Bhimavaram on the road from Palakollu to Akidu, and to request that you will be so good as to obtain the sanction of Government to the same.

2. The estimate has been scrutinized by this Office and bears the countersignature of the President District Board.

3 A copy of extract from the