

Public Works (189 8) Department.

G.O., No. 1823 W

✓
DATED

19 July 58

27/7/58

[Despatch Abstract.]

Guide bridge : Estimate of Rs 7450 for
Anshetkurga — in the 40 mile of road
No: 10 from Raunad to Dimpalpur in
the Madras, sanctioned with remark.

100/14/58

9.

Estimate of Rs. 7,450 for constructing a — in the 4th mile of road No. 10 from Ramnad to Devipatam in the Madura district, sanctioned with remark.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

READ—the following papers :—

From Lieut.-Col. O. V. BODDY, R.E., Superintending Engineer, VI Circle, to the Chief Engineer, Public Works Department, dated Kodaikanal, 16th May 1898, No. 700 M.D.

I have the honour to forward herewith, for sanction, an estimate amounting to Rs. 6,580 for constructing a girder bridge at 4 miles 2 furlongs on road No. 10, Ramnad to Devipatam, in the Ramnad zemindari, Madura district.

2. At this point one of the outlets of the river Vaigai crosses the road, and there formerly existed an arch bridge of three spans over the outlet. This bridge is now in ruins, the cause of its collapse being attributed by the District Board Engineer to the gradual sinkage of the right abutment.

3. I forward herewith a copy of the District Board Engineer's letter, No. 2019, dated 28th March 1898. Six trial pits have been excavated across the outlet and hard red soil is found at about $5\frac{1}{2}$ feet below the surface. It is proposed to carry the foundations of piers and abutments $2\frac{1}{2}$ feet into this soil, which will be sufficient.

4. The waterway of the old bridge was 311 square feet. It is now proposed to construct the new bridge with three spans of 30' each giving a waterway of $637\frac{1}{2}$ square feet, or more than double that of the old bridge.

5. The probable maximum flood level is 44.50, and assuming a maximum flood of 2,000 cubic feet per second, this would be passed with a velocity of 5.5 feet per second.

6. The provision for waterway is ample.

7. The District Board Engineer originally proposed to carry the girders on wooden piles without flooring, which proposal I did not approve of, and consider that masonry piers with a suitable flooring to be indispensably necessary to the circumstances of the site.

8. The bridge as now designed is approved. The rates are fair.

9. The first estimate prepared was sanctioned in Board's resolution, No. 143, dated 13th December 1897.

From Lieut.-Col. O. V. BODDY, R.E., Superintending Engineer, VI Circle, to the Chief Engineer, Public Works Department, dated 14th July 1898, No. 964 M.D.

In continuation of my letter, No. 700 M.D., dated 16th May 1898, I have the honour to forward herewith copy of the District Board's resolution, No. 71, dated 11th July 1898, sanctioning the estimate of Rs. 6,580 for the construction of a girder bridge at 4 miles 2 furlongs on road No. 10, Ramnad to Devipatam, in the Ramnad zemindari, Madura district.

Note by the Chief Engineer, Public Works Department.

The Chief Engineer considers that the section $16'' \times 6''$ proposed for the girders is not deep enough, and that it should be altered to $18'' \times 7''$. He is also of opinion that a rough-stone apron with side revetments in rear, 20 feet long, the former 2 feet and the latter $1\frac{1}{2}$ feet thick, should be built, and that both should be backed by 6 inches gravel or broken stone. These alterations have raised the amount of estimate to Rs. 7,450.

(Signed) W. B. DEWINTON,
Chief Engineer.

11th July 1898.

ORDER—No. 1823 W., dated 19th July 1898.

The estimate amounting to Rs. 7,450, as altered by the Chief Engineer, for constructing a girder bridge in the 4th mile of road No. 10 from Ramnad to Devipatam in the Madura district, is sanctioned.

2. Attention is drawn to the Chief Engineer's note read above.

3. The countersignature of the President, District Board, to the estimate should be obtained.

4. The sanction accorded in paragraph 1 has been registered as Local No. 11 W. of 1898-99.

(True Extract.)

Under Secretary to Government.

To the Superintending Engineer, VI Circle.
" Local and Municipal Department,
with twelve enclosures.

Esd. T. K. Narayana Aiyangar.

Papers to be read in Proceedings:—

Again G.O., dated

189 , No.

Again G.O., dated

189 , No.

Current No. 4339 of 1898, dated 16th May 1898, from The S.E. VI Arch

" " 5-955 " 1898, " 14th May 1898, " — 50 —

" 189 , "

Print Note by the Chief Engineer, P.W.D. d/11/7/98

ORDER.

No. 1828 W d/19.7.98.

The estimate amounting to Rs 7.450, as altered by the Chief Engineer, for constructing a girder bridge in the 4th mile of road No 10 from Ramnad to Deripatam in the Madurai district, is sanctioned.

2 Attention is drawn to the Chief Engineer's note read above.

3 The countersignature of the President, District Board, to the estimate, should be obtained.

4 The sanction accorded in para 1 has been registered as Local No 11 W of 1898-99.

AOK
9-2-98

H.T.
12 7 98

P.K.S

Note.

The estimate has been dealt

To

The Secy to Govt. Ld in Dept
for Public Works

SP

2.9.98
14.7.98

T/A

B PKO

To

The S.E. VI Arch
Ld in Dept with 10 arches

dealt with in the accompanying technical note, and the note by the Chief Engineer.

ACK
9.7.98.
Cm
P.K.S

11.7.98
W



WP

Note by the Chief Engineer, P.W.D.

The Chief Engineer considers that the section 16"x6" proposed for the girders, is not deep enough, and that it should be altered to 18"x7". He is also of opinion that a rough stone apron with side revetments in rear, 20' long, the former 2' and the latter 1 1/2' thick, should be built, and that both should be backed by 6" gravel or broken stone. These alterations have raised the amount of estimate to Rs 7.450

ACK
9.7.98.
Cm
P.K.S
11.7.98
E.W.

Guide Bridge
Madura District

OW

Current no 5-955
was received after
the L.P. on the bridge
estimate had been
passed -

Proposed to
include the current
(top file) among
the papers to be
sent in Prov. in
the L.P. in the
lower file.

ACK
19-7-98.

OW
The alterations
made to the
estimate before
presenting
Rs 6580 to Rs 7450
pending

The alterations ordered by
W did be made in the estimate
& a draft G.O. with note main-
taining alterations, sent up for
approval A.H. 4-7-98.

Note

The estimate can be passed
with the alterations noted below
in para 4.

2. The waterway of the old
bridge was so inadequate that
the velocity of flow thro' the arches
during a major flood would be
so great as to almost certainly,
in the absence of flooring to the
bridge, undermine one of the
piers or abutments. It is stated,
however, that the old bridge did
not collapse owing to a heavy
flood, but owing to the foundations
of piers gradually sinking. This
has been stated how long the old
bridge stood. Probably a very
short time.

3. The foundations now allow-
ed, as well as the waterway &
headways, are ample. The major
discharge of the stream, viz 1940
cub. ft per sec, is the passed thro'
the bridge without any heading
up above it, the natural velocity
of the stream being as much as
5.86 cub. ft per sec. This is ad-
visable, though flooring has been
allowed.

4. The piers of 16" x 6" are
not deep enough. It should be altered
to 18" x 7" so that the depth of piers
shall not be less than $\frac{1}{20}$ of span.

5. The construction of the Piers
should be as per P.P.O. Board Engineer

Public Works Department.

Current No. 4339
Letter No. 700 M. D.
Dated 16th May 1898.
From the Sup^r Engineer II Circle

NOTE BY TECHNICAL SECTION.

Name of work... Constructing a Girder
Bridge in the 4th mile of
Road No 11. Ramnad to
Devipattanam. Madura District.
Est Rs 6,580.

The Sup^r Engineer II Circle
forwards for sanction an
estimate amounting to
Rs 6,580 for constructing
a Girder Bridge at 4 mile
2 furlongs on Road No 10.
Ramnad to Devipattanam - in
the Ramnad Zemindari,
Madura District.

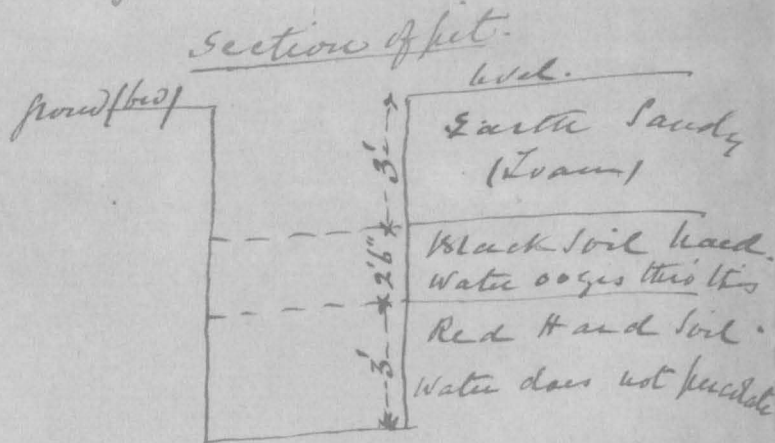
The bridge is to be con-
structed over one of the
outlets of the River Vaigai
which crosses the road.
There formerly existed an
arch bridge of 3 spans over
this outlet which is now in
ruins, the cause of collapse
is attributed by the District
Board Engineer

not to want of an apron to bridge.

2nd. The foundations of abutments of piers not being carried into firm soil but only up to it, which caused the gradual sinking of the right abutment, the subsequent thrust of the arches causing the ultimate destruction of the bridge.

Six trial pits have now been excavated across the outlet at proposed site of bridge and hard red soil into which water does not percolate is found 5'6" below the surface for 5 feet in depth, the soil above - black soil - for 2'6" in depth, & sandy earth for 3 feet up to ground level. It is proposed to carry the foundations of piers and abutment 2½ feet into this hard red soil which it is thought would be ample. The bridge has been designed with piers 3'6" broad (and foundations carried down to 32.92^{ft} with one footing 4'6" wide and concrete below 6'6" broad and 4'6" deep. The lower stream ends of piers have rounded ends

This may be so, but the very insufficient waterway of the old bridge, & consequently much head - ing up above it, & far too great velocity thro' the arches, is quite sufficient to account for the failure of a bridge unprotected by any flooring. Scour at foundations was inevitable during a major flood.



Yes, with the waterway now provided & with an apron, scour is not possible, & the new foundations proposed are ample.

Bottom of concrete.

and cutwaters only placed upstream side. A floor with triable retaining walls is allowed.

It is proposed to build the masonry of brick in Dutch mortar plastered with cement. The proposed bridge will consist of 3 arches each 30 feet span, spanned by rolled steel girders carrying a wooden platform with a roadway of 9 feet. It is presumed that the width of 9 feet has been duly considered by the District Board Engineer.

The proposed floor is - 39.92
M.W. L - 43.00
H.W. L - 44.50
Bottom of girder - 47.97

giving a headway of 3.42^{ft}. The new bridge piers & may cause a head of 0.50 ft. but the headway would be 2.92 ft. If water here above 45 feet level - vide C.S. No 3, it must surplus over the country well above bridge. A longitudinal and 3 cross sections of the stream are given from which the Velocity Discharge, & waterway required

Ample, but ^{major} flood levels above but the headway would be 2.92 ft. If water here above 45 feet level - vide C.S. No 3, it must surplus over the country well above bridge. A longitudinal and 3 cross sections of the stream are given from which the Velocity Discharge, & waterway required

have been deduced - vide
Calculation sheet attached.
A waterway of 90 ft clear
will be provided for.

The area of the old bridge
was 311 sq. ft., that of the
proposed 637.50 sq. ft. or
double the waterway of the old
bridge.

Rates. Fair - data for brick
concrete in Chumam and
cut stone is furnished.

The plans & estimates have
not been counter signed by
the President District Board.

H.C.W.
22.6.98.

H.H. If girder section as per
Calculation sheet is approved
there will be an excess of

Rs. 183.2-4 over Estimate

10-7-98.
AOK
25.6.98

T for favour of
necessary alterations
in the estimate
2/7/98

The waterway now allowed is
suitable, but is none too great,
the velocity of the stream being
quite as much (5.8 ft. per sec.)
as is permissible for a bridge
so founded, without any head-
ing up at all above bridge.
The old waterway was clearly
wholly insufficient, & the
max^m flood velocity far too
great.

This must be done.

Girders 18" x 7" are necessary,
in order that depth of girder
shall not be less than $\frac{1}{20}$ th
of span.

Estimate may be sanctioned
with 18" x 7" girders, a rough
stone apron & settlement
in rear, the former 2' thick
& the latter 1 1/2', & 20'
long with haunches by 6" panels
in limestone rubble
20.6.98

Calculation of discharges &c.

Area and of Cross Sections

$$\begin{array}{r} 10.1. 440.40 \\ 2. 258.25 \\ 3. 289.70 \\ \hline 3/992.35 \\ 330.784 \text{ ft}^2 \end{array}$$

$$\begin{array}{r} \text{Wetted border ho } 1. 2.00 \\ 2. 70 \\ 3. 105 \\ \hline 3/375 \\ 12.5 \end{array}$$

Fall of stream 8.02 ft. per mile

$$\begin{aligned} \text{Velocity} &= .9 \sqrt{2 \times \text{head}} \\ &= .9 \sqrt{2 \times 8.02} \times \frac{330.78}{12.5} \\ &= .9 \sqrt{16.04 \times 2.646} \\ &= .9 \times 6.514 \\ &= 5.86 \text{ ft. per second} \end{aligned}$$

$$\begin{aligned} \text{Discharge} &= 330.78 \times 5.86 = 1938.37 \\ &= 1939 \text{ Cub ft. per second nearly} \end{aligned}$$

Velocity which stream would take
due to $\frac{1}{2}$ foot of head (abflong).

$$\begin{aligned} \frac{1}{2} &= \frac{1}{64} (1.1V_1^2 - V^2) \\ \text{where } V &= 5.86 \\ \therefore \frac{1}{2} &= \frac{1}{64} (1.1V_1^2 - 5.86^2) \\ \text{multiplying both sides by } 64 & \\ 32 &= 1.1V_1^2 - 5.86^2 \\ \text{adding } 5.86^2 \text{ to both sides of the equation} & \\ 32 + 5.86^2 &= 1.1V_1^2 \\ 32 + 34.33 &= 1.1V_1^2 \\ 66.33 &= 1.1V_1^2 \\ 1.1V_1^2 &= 66.33 \\ V_1^2 &= \frac{66.33}{1.1} \\ &= 60.3 \\ V_1 &= 7.7 \text{ ft. per second.} \end{aligned}$$

$$\begin{aligned} \therefore \text{discharge being } 1939 \text{ Cub ft. per second} & \\ \text{and Velocity } 7.7 \text{ ft. per second} & \\ \text{the required waterway would be} & \\ \frac{1939}{7.7} &= 251.8 \text{ sq. ft.} \end{aligned}$$

average depth of water = 3.86'
 therefore waterway required would
 be $\frac{257.8}{3.86} = 65$ feet with $\frac{1}{2}$ ' head.
 but 7.7 being too great a velocity
 the water may be allowed
 to pass through a larger space
 of bridge.

∴ discharge being 1939 Cub Ft per second
 + Velocity 5.86 ft per second
 the area would be 330 sq
 feet nearly.

The depth of water being 3.86'
 and area required 330 sq ft
 the length of waterway would be
 $\frac{330}{3.86} = 85 \frac{1}{2}$ feet

Bridge provides 90 feet.
 3 spans of 30 feet each

10-2-01.
 Aek
 25.6.98.

+ 1.8 allowing only the
 natural max^{im} velocity of
 streams to pass thro the arches
 of the bridge, and giving to
 the bridge the full waterway
 of the river

A bridge of this class, with
 9' roadway only, will prob-
 ably never have to carry a
 load of anything like
 120 lbs to the sq. foot. It
 may however, in accordance
 with the standard hitherto
 adopted, be allowed for.

Calculations for rolled steel girders.

Weight of platform.

Top + bottom rails $4 \times 30 \times \frac{1}{3} \times \frac{1}{3} = 13.33$
 Centre rail $2 \times 30 \times \frac{1}{4} \times \frac{1}{8} = 1.87$
 Posts $2 \times 6 \times 3 \times \frac{1}{3} \times \frac{1}{3} = 4$
 Struts $13 \times 4 \times \frac{3}{4} \times \frac{1}{3} \times \frac{1}{4} = 5.1$
 Guard rails $2 \times 30 \times \frac{1}{2} \times \frac{1}{3} = 10$
 Cross Timber girders long $6 \times 16 \times \frac{1}{2} \times \frac{1}{8} = 16$
 short $6 \times 10 \times \frac{1}{2} \times \frac{1}{3} = 10$
 Planking $30 \times 9 \frac{1}{2} \times \frac{1}{4} = 71.2$
 Veneer Wood Cub Ft 131.52

$131.5 \times 56 \text{ lbs} = 7364 \text{ lbs}$
 Accidental load
 $30 \times 9 \times 120 = 32400 \text{ lbs}$
 Bolts, Nuts & Screws = 100 lbs
 Total 39864 lbs
 $\frac{39864}{2240} = 18 \text{ Tons on 2 girders}$
 one span

$W = L \times W$
 $= 30 \times 9 = 270$

See page 24 Down & Long plate
 65 a section of 12"x6" with 54
 lbs to the foot run will suffice,
 but as no girder should be
 less than $\frac{1}{20}$ of the span

$\frac{1}{20}$ of 30 = 1.5 = 18 inches
 so that a girder of 18" x 7" will
 be necessary against 16" x 6"
 provided in estimate.

A girder 18" x 7" with 75 lbs to the
 foot run would be, 6 being required
 $6 \times 33 \times 75 \text{ lbs} = 14850 \text{ lbs}$
 $= 132 \frac{1}{2} \text{ Cwt}$

$132.5 \times 8 = 1060 \text{ R}^3$
 $1060 - 876 - 13 - 8 = \text{R}^3 183.24$
 which will be in excess
 of estimate. Aek
 25.6.98 22.6.98

Public Works (1898) Department.

CURRENT No. 4339

Order

From

The Super Engineer
61. Circle

No. 700. L. D.

Dated 16th May 1898.

Received 18.5.98

Enclosures 8. 10 (2 plans)

Spare copies

SUBJECT.

Grinder Bridge in the
4th mile of Road No. 11.
Kannad to Devipatnam.
Forwards with remarks
for sanction an bill of
Rs 6580 for Constructing
a —.

1/2 for sanctioning
on 18/5/98

Rs. 200

Rs. 223

BACK PAPERS.

FURTHER PAPERS.

h. 700. L. D.

Survey Engineer's Office, Orcher
Kodaikanal 16th May 1895.

June

L. leob. A. V. Baddy P.C.

Super Engineer, *Wichita*



The Chief Engineer

J. W. D.

Sir,

Frucht: 8.

I have the honor to forward herewith for sanction an estimate amounting to Rs 6,580 for constructing a Girder Bridge at 4 miles 2 fms. on Road No: 10. Ramnad to Dedipalam in the Ramnad Zemindari, Madurai District.

2. At this point one of the outlets of the River Vaigai crosses the road, and there formerly existed an arch bridge of 3 spans over the outlet. This bridge is now in ruins, the cause of its collapse being attributed by the District Board Engineer to the gradual subsidence of the Right abutment.

3. I forward herewith a copy of the District Board Engineer's letter No. 2019 dated 28-3-98. Six trial pits have been excavated across the outlet and hard red soil is found at about $5\frac{1}{2}$ feet below

Public Works (1898) Department.

CURRENT No. 5955

Order

From

The Supr Insgrnt
McIrish

No. 964 Ind.

Dated 14 July 1898

Received 16-7-98

Enclosures 2

Spare copies

SUBJECT.

Girdle Bridge on Road
No. 10. Racine & Desjardins
— Forwarding Copy of
Dt. Board Resolution, No. 71.
of 11-7-98. sanctioning the
estimate of \$6580 for con-
-structing a —

BACK PAPERS.

FURTHER PAPERS.

No. 964 Ind.

OFFICE OF THE SUPERINTENDING ENGINEER,
6TH CIRCLE,
Trichinopoly, 14th July 1898.

From

L. Rob. C. T. Boddy R.E.
Superintending Engineer,
6th Circle.

To

The Chief Engineer,

P. W. D.

SIR,

ENCLOSURES.

x CN^o 4 339/88
sent to w on
9-7-98

In continuation of my letter No: 700 M.D. dated 16 May 1898, I have the honor to forward herewith Copy of the District Board's resolution, No: 71 dated 11th July 1898 sanctioning the estimate of Rs 6,580 for the construction of a girder bridge at 4 miles, 2 furlongs, on Road No: 10, Ramnad to Desipattanam in the Ramnad Zemindari, Madras Dk.

I have the honor to be
Sir,

Yours most obed^t Servant.

O.V. Noddy, Lt. Col. R.E.
Engineer, W. Circle

1877/11