Archives 1—10,000—6-10-76.

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(2) Date of repair 2-7-86 ?

(3) Initials of the Referencer Lava

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

P. W. D. DEPARTMENT

G.O. No. / B.P. No.	1278 (W)	Press. / Mis.
Dated	12. 3. 1878.	~~197~~ .

Not to be folded or roughly handled

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

12th March 1878, No. 1,278 W.

Buildings and Roads.

Civil Works.

Read the following paper :—

No. 163. From Colonel F. O'CONNELL, R.E., Superintending Engineer, Chingleput, to the Chief Engineer, Public Works Department, dated St. Thomas' Mount, 15th February 1878, No. 692.

I HAVE the honor to report that the iron bridge over the Cortelliar river has been tested with a load of 172 lbs. per square foot, of which 60 lbs. represent the weight of the roadway and 112 lbs. that of a crowd. The whole load was put on, at Mr. Mayler's request, without waiting until the asphalte was laid down, as that gentleman was pressed for time.

1 Register of Deflections.
1 Table showing maximum strain.
1 Copy of a letter from Mr. Fox, Assistant Engineer, South Indian Railway.
1 Tracing.

2. The load was applied in sand bags, weighing when filled two cwts. each; 764 bags being placed upon a single span, the main girders of which have a clear bearing of 51 feet and are 10·5 feet apart. With this load, which was applied successively to one span of the bridge after the other, the vertical deflections of the main and cross girders and the horizontal deflections towards one another of the upper string plates of the two main girders of each span, were as shown in the accompanying register.

3. Mr. A. D. Fox, Assistant Engineer, South Indian Railway, visited the bridge twice while it was being tested and examined it carefully. After the testing was over, I furnished him with a copy of the register of deflections, and he has been good enough to send me the accompanying report on the bridge. It will be seen that he considers that under the specified load of 172 lbs. per square foot, in addition to the weight of the bridge itself, the metal, especially that of the cross girders, is overstrained.

4. He expresses the opinion that the bridge is strong enough for the ordinary traffic of the road as he saw it, but that he does not consider that it could be relied upon if a dense crowd were added to the very light roadway which we shall put upon it, because it is thus specified when the contract for the bridge was made.

5. To this I would add that although a dense crowd of human beings would, perhaps, cause the heaviest strain to which the main girders are likely to be subjected, a loaded elephant might easily bring upon the cross girders a greater strain than a crowd of human beings. The weight of such a crowd has been estimated in this instance at 112 lbs. to the square foot. The superficial area of the roadway supported by a single cross girder is 10·5 × 3·1 = 60·15 square feet.; multiplying this by 112 lbs., we have for the distributed weight of the portion of the crowd supported upon one cross girder 6,737·4 lbs. The strain caused by this distributed load is the same as one-half or 3,368·7 lbs. placed in the centre of the girder, but this is less than 14 cwts. or 4,028 lbs., the maximum weight which it is usually estimated that a loaded elephant, putting down one fore-foot, brings to bear upon the surface upon which it treads. It will thus be seen that a single loaded elephant might bring to

bear about 46 per cent. more strain that that which a crowd would cause; allowing that out of the 10·41 tons per square inch strain which Mr. Fox calculates as that brought on the metal of the cross girders when a crowd is on the bridge, 6·5 is caused by the crowd itself. An elephant would add 46 per cent. of this or 3 tons, bringing up the total strain to 13·41 tons, which is quite sufficient to permanently injure every single cross girder, and to break any which may now be faulty or may in course of time become weakened.

6. I do not think, however, that Mr. Maylor has in any way failed in his contract. He has done what he undertook to do. He merely says in his contract that "the superstructure is calculated to safely carry a distributed load of 112 lbs. to the superficial foot in addition to its own weight and a mean thickness of 4 inches of asphalte and road metal." In my opinion it ought to have been calculated to carry more than this load; for, if the traffic becomes heavy, and no doubt it has sometimes been heavy and may hereafter be heavier, future road repairs will be sorely tempted to increase the thickness of the road metal, and this will bring additional strain upon a bridge already liable to be overtaxed.

7. Whatever opinion this report and future discussion may lead Government to form, I would ask that I may be permitted to direct the Range Officer to pay up Mr. Maylor, for I do not see anything to be gained by delaying to do so. Early orders on this point are solicited.

From A. D. FOX, Esq., Assistant Engineer, South Indian Railway, to Colonel P. O'CONNELL, R.E., Superintending Engineer, Chingleput, dated 11th February 1878.

IN reply to your letter of the 5th instant, I have the honor to make the following report on the warren girder bridge over the Cortelliar river.

2. In calculating the strains, which you will find on a diagram attached to this letter, I have estimated the iron work which forms part of the permanent load actually borne by the two main girders, at 13·75 tons; that of the asphalte concrete and metalling at 25·77 tons; and the moving or live load at 48·10 tons. The diagram shows the maximum strains in tons induced on each part or member of the girder. I need scarcely add that the greatest strains in the top and bottom tables are found when the bridge is entirely covered by the moving load, whilst, on the contrary, those on the diagonal bracing connecting the top with the bottom of the girder are most intense when it partially covers the span and varies in position for each diagonal. The second diagram shows the sectional area in square inches of each part or member of the main girder, after the necessary deductions have been made for rivet holes and other causes which tend to diminish the strength of the iron. I have added a table from which you will be able to obtain with ease the maximum strain on any portion of the main girder.

3. Experience has shown that in wrought iron bridges the metal should not be strained to more than one-fourth of the breaking strain, or, in other words, to 5 tons to the inch exclusive of rivet holes when in tension, and to 4 tons inclusive of these when in compression. You will observe, on reference to the table showing the maximum strains per sectional inch, that these have in some cases been exceeded. In the lower table of the main girder it is as high in one case as 5·49 tons and in the upper as 4·64 tons. Some of the diagonals also show that they are subjected to strains considerably higher than the usual standard.

4. The deflection of the main girder, when the metal is strained to 5 tons to the inch, should be slightly over half an inch. If you refer to the register of deflections taken at the bridges you will find that they, in all cases, considerably exceed this, and show generally a considerable amount of permanent set. I attribute this set not to the over-straining of the metal, but to the yielding of the joints, some of which are bolted and not rivetted, making this the more probable.

5. The strain to which the rolled beams constituting the cross girders are subjected is excessive. The weight distributed over one of these the length of which is 19 feet 6 inches is 5 tons, the depth of the beam is 8 inches, and the sectional area of metal in its top and bottom flanges 1·76 inches. On calculating the bending moment at its centre, I find that the metal is strained to 10·41 tons to the sectional inch, or rather more than half its breaking strain. The average deflection of one of these beams was about an inch, and in every case there was a considerable amount of permanent set, which, as there are no joints in the beam, I can only account for by its being over-strained. I should perhaps add that wrought iron when strained to more than 8 tons to the inch is generally more or less injured and loses a certain amount of its elasticity.

6. The effect on the main girders by the excessive deflection of the rolled beams is a perceptible inward cant, which the testing shows to have been not unfrequently over ·75 of an inch, and in one case as high as 1·3 inches.

7. You ask for the expression of my opinion as to the strength of the bridge for the traffic that will pass over it. The ordinary traffic on the road does not appear to be heavy and there can be no doubt that the bridge will safely carry it. If, however, it should at any time be subjected, from a dense crowd or other cause, to a weight approximating to the load of 112 lbs. per superficial foot on any span, I do not think that it can be relied on. I do not attribute this weakness so much to the main as to the cross girders. In the former the iron, although strained to more than the usual standard, is within the limit at which it loses its elasticity and becomes permanently injured. In the latter it is beyond this limit.

8. I had no opportunity of seeing the bridge tested under a moving load and am therefore unable to report as to its effect. I may however remark that I do not anticipate that there would be much lateral motion, as such motion depends on the horizontal cross bracing immediately below the roadway. The buckle plates combined with the rolled beams form a very complete bracing of this description.

No. 163-A. From Colonel P. O'CONNELL, R.E., Superintending Engineer, Chingleput, to the Chief Engineer, Public Works Department, dated St. Thomas' Mount, 25th February 1878, No. 823.

IN reference to my No. 692, dated 15th instant, I have the honor to forward copy of a letter received from Mr. Maylor, relative to the recent testing of the Cortelliar bridge, which it will be observed has been written upon information given to him by his Overseer. In regard to Mr. Maylor's request for the payment of the balance due to him, I request that early orders may be passed on the subject, with the view of avoiding having to pay interest on the amount due.

From W. MAYLOR, Esq., to Colonel P. O'CONNELL, R.E., Superintending Engineer, Chingleput, dated Beypore, 21st February 1878.

I WAS glad to learn from my Overseer at the Cortelliar bridge that the result of the testing of the several spans was so satisfactory. In the statement I received I observed that the deflections of the cross girders or flooring joists included the deflections of the main girders, and to ascertain the deflections of the cross girders I had to deduct the depressions of the main girders. I also noticed that the deflections of the five spans, which had the flooring laid with asphalte concrete, were less than the others, and this was no doubt due to the binding effect of the asphalte.

2. I trust that you can now sanction the payment to me of the final balance of Rupees 11,600. The superstructure was completed in August last, except the painting, and I did not get permission to do the painting until the whole of the iron work had been thoroughly examined by several workmen, as well as the Foreman from the Department Public Works Workshops.

3. The loss of interest on the final balance amounts to about Rupees 80 per month.

4. I presume there is now no necessity for me to retain the services of an Overseer at the bridge.

No. 163-B. From Colonel P. O'CONNELL, R.E., Superintending Engineer, Chingleput, to the Chief Engineer, Public Works Department, dated St. Thomas' Mount, 6th March 1878, No. 957.

IN reference to my letter No. 692 of the 13th February 1878, I have the honor to inform you that, pending the receipt of the orders of Government thereon, I have instructed the Range Officer not to open the Cortelliar bridge for traffic.

No. 164. ORDER THEREON, 12th March 1878, No. 1,278 W.

HIS GRACE the Governor in Council is far from satisfied with the result arrived at in testing the Cortelliar bridge. From the records on the subject, though tenders for the construction of the bridge were correctly submitted to the Chief Engineer and sanctioned by Government, the Chief Engineer pointed out that the drawings supplied

were not in sufficient detail, which fact ought to have been noticed by the Local Fund Board, who should have obtained and submitted the requisite detailed drawings before finally concluding their contract with Mr. Maylor. As matters stand there appears to be no reason why Mr. Maylor's account should not be adjusted at once.

2. His Grace in Council desires that the addition of central girders receive the promptest consideration, while temporary arrangements must be made to keep the traffic from the centre of the bridgeway. Gates should be placed at both ends to prevent the assembly of large crowds at any one time on the bridge, and elephants should on no account be permitted to cross the bridge. These remarks will be communicated to the Local Fund Board through the Financial Department for careful observance.

(True Extract.)

Colonel, R.E.,
Secretary to Government, P.W.D.

To the District Engineer, Chingleput.
" Financial Department.

Exd. E. C. Shanker.
Spare Copies

1278/3

3

BUILDINGS AND ROADS.
CIVIL WORKS.

Gobt. of (1878) Works.

PUBLIC WORKS.

To

The DISTRICT ENGINEER,
CHINGLEPUT.
&c., &c., &c.

Dated March 12th.

Recd.

Recd.

Recd.

G. O. No. 119, Home Dept., No. 1111.

MADRAS.

Noon 16th 1878.

On the Bridge, Chingleput District.—The result arrived at in testing the — cwt. dowell for satisfactory. Mr. Mayhew's claim in connection therewith to be adjusted as soon, and certain remarks communicated to the Local Fund Board for needful observance.

Register of tests made to the Cornelian Bridge. Test Load 76 Tons. 8 Cwt.

Number of Bay from North	Lines of Deflections	Deflections in inches. When Loaded.	Permanent.	If the Asphalte only	Lower deflections of upper girder plates when fully loaded.	Remarks.
No 1	Girder Westside middle	1.03125	.27			
	" East Do Do	1.03125	.24			
	Centre of roadway Do	2.22	.4			
No 2	" Westside "	1.0	.2			
	" East Do "	.875	.125			
	Centre of roadway "	1.98	.24			
No 3	" Westside "	1.0	.2			
	" East Do "	1.025	.325			
	Centre of roadway Do	2.06	.3			
No 4	" Westside "	1.1	.325			
	" East Do "	.975	.3			
	Centre of roadway Do	1.74	.24			
No 5	" Westside "	.9	.175			
	" East Do "	.95	.25			
	Centre of roadway Do	2.04	.307			
No 6	" Westside "	.95	.12		.7	
	" East Do "	1.075	.265		1.0	
	Centre of roadway Do	1.98	.47			
No 7	" Westside "	.81	.185		.9	
	" East Do "	.9	.175		.6	
	Centre of roadway Do	1.85	.5			
No 8	" Westside Do	1.1	.3		1.0	
	" East Do "	1.05	.275		.75	
	Centre of roadway Do	2.016	.4			
No 9	" Westside Do	.9	.25		1.0	
	" East " Do	.975	.125		.4	
	Centre of roadway Do	2.088	.4			
No 10	" Westside "	.91	.235		.65	
	" East Do "	.925	.30		.8	
	Centre of roadway Do	1.93	.432			

E11	Under footside	1·15	·32		1·2
	" East Do	1·1	·25		·5
	Centre of roadway	1·98	·6		
E12	" West Do	·98	·28		·25
	" East Do	·875	·175		·75
	Centre of roadway Do	2·16	·48		
E13	" West side Do	1·0	·25		1·0
	" East Do Do	·9	·125		·5
	Centre of roadway Do	2·2	·49		
E14	" West side Do	·95	·2		·8
	" East Do Do	1·0	·25		·9
	Centre of roadway Do	2·2	·41		
E15	" West side Do	1·1	·375		·85
	" East Do Do	·925	·175		·8
	Centre of roadway Do	1·94	·37		
E16	" West side Do	1·05	·3		·9
	" East Do Do	·87	·27		·8
	Centre of roadway Do	2·016	·43		
E17	" West side Do	1·1	·3		·8
	" East Do Do	·9	·25		·6
	Centre of roadway Do	2·004	·41		
E18	" West side Do	1·05	·25		1·3
	" East Do Do	·925	·175		·2
	Centre of roadway Do	1·908	·4		
E19	" West side Do	·85	·25	·24	·95
	" East Do Do	·76	·21	·21	·3
	Centre of roadway Do	1·848	·44	·264	
E20	" West side Do	·925	·225	·04	·9
	" East Do Do	·91	·34	·00	·4
	Centre of roadway Do	1·78	·5	·11	

Table showing maximum Strain per square inch on each part or member of Main Girder.

1928

Comar Co.

Member of main girder.	Area of section in sq. ins.	Strain in tons.	Compressive strain per sq. inch.	Tensile strain per sq. inch.
A B	1·64	6·15		3·75
B.C	1·87	6·15	3·29	
C.D.	1·64	11·11		6·77
D.E.	2·50	11·11	4·44	
E.F.	3·28	16·31		4·97
F.G.	2·63	16·31	6·20	
G.H.	3·84	22·18		5·78
H.I	3·00	22·18	7·39	
I K	4·16	25·26		6·07
K.L	10·82	21·90	2·02	
B.b.	13·56	62·97	4·64	
b.D.	13·56	59·83	4·41	
D.f	13·56	50·38	3·72	
F.H.	11·87	34·64	2·92	
H.K.	11·87	12·60	1·07	
A.C.	10·88	59·83		5·49
C.E.	10·88	50·39		4·63
E.G.	7·25	34·64		4·78
G.I	7·25	12·60		1·74

Pliquet A.D. Jose
Asst. Engineer

(Lune copy)

Thomas Cloudesley
Life Engineer, Chinglepet.

7

Girder Work in side .75 .1
" Bed Do .7 .1
" Cantilever Do 1.404 .4
Roadway Do .6·75 .175 .06
" Bed Do .7 .1 .0
Cantilever Roadway Do 1.404 .44 .0

Girder Work in side .69 .07 .12
" Bed Do .6 .02 .0
Cantilever Roadway " 1.35 .00 .0

Pliquet G.E. Mitchell
Asst. Engineer

(Lune copy)

Public Works Department.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the

Read the following:—

From

The Supg Engr Chingleput (Ltr No 692 dt 15th July 1878)

Do Do (" 823 " 25 ")

Communicated to the Board of Revenue through the Financial Department.

There appears no reason that Mr Traylor should not be paid, but it is evident that elephants should not be permitted to cross the bridge. It is also necessary that gates should be placed at both ends to prevent the assembly of a large crowd on the bridge at any time.

20.2.79.

This Department has had under the Limit of Rs 5 the Amount of Rs 5 the Expenditure of Rs 3 the Rs Rs Note inserted in Item.

S.E. Chingleput
Civil Dept

P. W. D.

Letter from the Supg: Engineer, Chunjeshwar
No 692 dated 15th Feb: 1878.

For Orders.

18

I have the honor to
to enclose herein
copy of letter dated
the 9th instant from the Executive
Engineer Ghazipore in
which he reports
that the Zamania
Bridge is fit to carry
the traffic that is
likely to pass over it,
it is not as strong
as a bridge as a
Permanent road should be
& prevent accidents, it
will be necessary to
prohibit the passage
of elephants and to
adopt measures to
prevent over crowding
at any time. With
this view, if it is intended
to keep tolls, besides
the gate at which the

Executive Engineer Ghazipore
Letter No 1 dated 9th Jan: 1878
Forwarding copy of Report
of Assistant Engineer
Mr Wheeler
Report that
it is safe for Elephants
Enquires to be furnished
over the Bridge. That

money is usually
taken, there should
be another at the
opposite end of the
bridge, for use
when the records
are
There is not any reason
for withholding
payment from the
Contractor Mr Mayor
when he puts up the
bridge in accordance
with his Contract
His contract the
late Superintending
Engineer states was
prepared by the Local
Fund Board, who
should have obtained
the services of an
Engineer acquainted
with the details of
such bridge Construction

Reasons must be
adopted by Engineers
a Safe at both ends.
Insurance work
Brindisi accounts
on the Books. Shillings
insurance £7.11.1 Shillings
Corporation 3 Returning
any Risk 2 Life. D
Cuttle Fish Bone
Shingstone?

Accordance Form
Certificate Contract
Specification Drawings
Tenders Advertisement
Work Tenders
Mr Martin Tenders
Work to be Inches

The original Design
for all surface Gear
Specification Drawings
Steel Trough Flow
Ram Cattleway 2 Cranes
under Ground
Contractors Men
Level screw rod
for speed Cranes
Flow 1 Pair 15 Ft
Tons in Compartment
Rails
Cranes under Ground
Cage and Signalling
Cage in Shaft
Cage on the Surface
Cradle Cart
Cattle Pen
Removal Pumps
Steam Crane

in preparing a document
of this kind

187 19/2

Stock at the Station
Permit Goods
Goods Traffic
a certain Company
to keep the Capital
Accounts Separate
Common Shareholders
Contractors Profit
Preferential Shares
Interest on
become impaired by
Steam Plough

For Orders.

No. 692

Chingleput Superintending Engineer's Office.

Saint Thomas' Mount, 15th July 1878.

From

THE SUPERINTENDING ENGINEER,

Chingleput.

To

The Chief Engineer
Public Works Department.

Sir,

I have the honor to report that the iron bridge over the Cortelier River has been tested with a load of 172 lbs per square foot of which 60 lbs represent the weight of the roadway and 112 lbs that of a crowd. The whole load was put on, at Mr. Mayor's request, while weighing, until the asphalte was laid down as that gentleman was pressed for time.

2. The load was applied in equal bags, weighing when filled two Cwt each, 784 bags being placed upon a single span the main girders of which have a clear bearing of 95 feet and are 19.5 feet apart. This load which was applied over precisely one span of the bridge after the other, the vertical deflections

Enc:
1 Register of Deflections
1 Table shewing maximum stress
1 Copy of a letter from Mr. Assn. Engr. P. I. Roadways
1 Tracing

12878

of the main and cross girders and the horizontal depressions towards one another of the upper flang plates of the two main girders of each span were as shown in the accompanying Register.

3. Mr. A. D. Foss Assistant Engineer of the South Indian Railway visited the bridge twice while it was being tested and examined it carefully. After the testing was over, I furnished him with a copy of the Register of deflections, and he has been good enough to send me the accompanying report on the bridge. It will be seen that he considers that under the specified load of 112 lbs per square foot in addition to the weight of the bridge itself, the metal, especially that of the cross girders is overstrained.

4. He expresses the opinion that the bridge is strong enough for the ordinary traffic of the road as he saw it, but that he does not consider that it could be relied upon if a large crowd were added to the very light roadway which we shall put upon it, because it is

that

that thereby when the contract for the bridge was made.

5. To this I would add that although a large crowd of human beings would perhaps cause the heaviest strain to which the main girders are liable to be subjected, a loaded elephant might easily bring upon the cross girders a greater strain than a crowd of human beings. The weight of such a crowd has been estimated at 112 lbs to the square foot. The superficial area of the roadway supported by a single cross girder is $19.5 \times 3.1 = 60.45$ square feet, multiplying this by 112 lbs we have for the distributed weight of the portion of the crowd supported upon one cross girder 6770.4 lbs. The strain caused by this distributed load is the same as one half of 3385.2 lbs placed in the centre of the girder, but this is less than 44 cwt or 4928 lbs, the maximum weight which is usually estimated that a loaded elephant putting down one force foot, brings

& bear upon the surface upon which it treads. It will thus be seen that a single loaded elephant might bring & bear about 46 per cent more strain than that which a crowd would cause, allowing that out of the 10·41 tons per square inch strain which Mr Fox calculates as that brought on the metal of the cross girders when a crowd is on the bridge, 6·5 is caused by the crowd itself. An elephant would add 46 per cent of this or 3 tons, bringing up the total strain to 13·41 tons, which is quite sufficient to permanently injure every single cross girder, and to knock any which may now be faulty or may in course of time become weakened.

6. I do not think however that Mr Taylor has in any way failed in his contract. He has done what he undertook to do. He merely says in his contract that "the superstructure is calculated to safely carry a distributed load of 112 lbs to the superficial foot in addition to its own weight and a mean thickness of 4 inches of asphalte and road metal". In my opinion it ought & have been calculated to carry more than this load - for, if the traffic becomes heavy, and no doubt it has sometimes been heavy, and may hereafter be heavier, and if future road repairers will be sorely tempted to increase the thickness of the road metal, and this will bring additional strain upon a bridge already liable to be overtaxed.

7. Whatever opinion this report and future discussions may lead Government to form, I would ask that I may be permitted to direct the Cause Officer to pay up Mr Taylor for I do not see any thing to be gained by delaying to do so. Early orders on this point are solicited.

I have the honor to be
Sir
Your most obedient servant

P Yonnell Colonel RE
Supt Engineer, Chief Depth

G.B. 2nd Jany 1875 No 1 W.
Insp 30 Aug 1877 No 2446 W.
Insp 6 June 1877 No 1646 W
Insp 31 May 1877 No 2454 W
Insp 19 Dec 1876 No 151.
Insp 26 Septr 1876 No 1246 W.
Insp 21 Septr 1876 No 123.
Insp 15 July 1876 No 132

From the Safety Engineer
Christchurch Dr

No 692

Dated 15th Feby 1878
Recd

No of Enclosures 4

Plan with Sketch

Canterbury Bridges —
Reports relating to the
testing of the — requesting
permission for passing
Wr Maylor.

Ordered to be filed

R-C 28-2-78.
Cr. G. 2-78

Christchurch Office
Resident Engineer's Office
Dated 14th February 1878

From
A. D. Fox Esqre
Resident Engineer

To
Colonel O'Connell R.E.
Superintending Engineer.

Sir,

In reply to your letter of the 5th instt I have the honor to inform the following report on the Waimari Gorge Bridge on the Christchurch Akaroa Road.

In calculating the strains, which will result on the diagonal attached to each girder, I have assumed a load of 1 ton per foot run which passes first over the furthest end, which is actually borne by the two main girders and is equal to 13·75 tons, that of the asphalte concrete and metalling at 25·75 tons and the moving or live load at 28·10 tons. The diagram shows the area of influence strongly in favor of the girder on each portion of the girder. It need scarcely add that the greatest strains in the top and bottom tubes are found when the bridge is entirely covered by the moving load, whilst, on the contrary those on the diagonal bracing connecting the top with the bottom of the girder are most intense when it partially covers the span and varies in position for each diagonal. The second diagram shows the sectional area in square inches of each part or member of the main girder after

the necessary deductions have been made for rivet holes and other causes which tend to diminish the strength of the iron. I have added a table from which you will be able to obtain with ease the maximum strain on any portion of the main girder.

Experience has shewn that in wrought iron bridges the metal should not be strained more than one fourth of the breaking strain or in other words 5 tons to the inch exclusive of rivet holes when in tension and 4 tons inclusive of these when in compression. You will observe, on reference to the table shewing the maximum strains per sectional inch, that these have in some cases been exceeded. In the former table of the main girder this as high in one case as 5.49 tons and in the upper as 4.64 tons. Some of the diagonals also shew that they are subjected to strains considerably higher than the usual standard.

The deflection of the main girder, when the metal is strained 5 tons to the inch, should be slightly over half an inch. In your report on the register of deflections taken at the bridges you will find that they in all cases considerably exceed this, and shew generally a considerable amount of permanent set. I attribute this set not to the over straining of the metal, but to the yielding of the joints, some of which are bolted and not riveted, making these the more probable.

The strain to which the rolled beams constituting the cross girders are subjected is excessive. The weight, estimated over one of these, the length of which is 19-8 is 5 tons, the depth of the beam 8 inches and the sectional area of metal in its top and bottom flanges 1.75 inches. On calculating the bending moment at its centre I find that the metal is strained to 10-4 tons to the sectional inch, or rather more than half its breaking strain. The average deflection of one of these beams was about an inch, and in every case there was a considerable amount of permanent set, which, as there are no joints in the beam, I can only account for by its being over strained. I should perhaps add that wrought iron when strained to more than 5 tons to the inch is generally more or less injured, and loses a certain amount of its elasticity.

The effect on the main girders by the excessive deflection of the rolled beams is a parasitic inertia, which the testing shows to have been unfortunately very frequently as much as one fifth of an inch, and in one case as high as 1/3 inches.

You ask for the expression of my opinion as to the strength of the bridge for the traffic that will pass over it. The ordinary traffic on the road does not appear to be heavy and there can be no doubt that the bridge will safely carry it. If however it should at any time be subjected, from a dense crowd or other cause, to a weight approximating to the

...the...per superficial foot on any span...
I do not think that it can be relied on...
do not attribute this weakness so much
to the manner as to the cross girders. In the
former the iron although strained to more
than the usual standard is within the
limit at which it loses its elasticity
and becomes permanently injured. In
the latter it is beyond this limit.

I had no opportunity of seeing the
bridge tested under a moving load and
am therefore unable to report as to its
effect. I may however remark that
I do not anticipate that there would
be much lateral motion as such motion
depends on the horizontal cross bracing
immediately below the roadway. The
brackets & plates combined with the rolled
beams form a very complete bracing
of this description.

I have &c
Signed A. D. Fox
Asst Engineer.

(True copy)

Brevet Colonel R.E.
Supg Engineer Chinglepute.

No. 523

CHINGLEPUT SUPERINTENDING ENGINEER'S OFFICE,
SAINT THOMAS' MOUNT, 25th February 1878

From

THE SUPERINTENDING ENGINEER,
CHINGLEPUT.

To

The Chief Engineer
Public Works Department

Sir,

In reference to my No. 692 dated 15th instant, I have the honor to forward
Exc.
Copy of a letter Copy of a letter received from the Mayor
from Commr & the record testing of the Cow-
to Mayor 21st elair Bridge, which it will be
Feby 1878 observed has been written upon
information given by him by his
Overseer. In regard to the Mayor's
request for the payment of the balance
due to him, I request that an order
may be passed, on the subject, with
the view of awarding Interest @ five
per cent per annum on the amount due.

I have the honor &c
Sd/-
Brevet Colonel R.E.
Supg Engineer, Chinglepute.

August last, except the painting, and I did not get permission to do the painting until the whole of the iron work had been thoroughly examined by several workmen, as well as the Foreman from the D. P. W. Workshops.

The loss of interest on the paid balance amounts to about Rs 80 per month.

I presume there is now no necessity for me to retain the services of an Overseer at the Bridge.

I have &c.

Signed J. B. Naylor.

(True copy)

Lt Colonel R.E.
Supt Engineer, Chingleput

Encl Nil

No. 957

CHINGLEPUT SUPERINTENDING ENGINEER'S OFFICE,
SAINT THOMAS' MOUNT, 6th March 1878

From

THE SUPERINTENDING ENGINEER,
CHINGLEPUT.

To

The Chief Engineer
Public Works Department.

C. No. 1960 dated 8th
in Circuit Misc. 2/3

In reference to my letter No. 692 of 13th January 1878 I have the honor to inform you that pending the receipt of the orders of Government thereon, I have instructed the Range Officer not to open the Conjeeveram Bridge for traffic.

I have the honor to be
Sir
Your most obedient servant

Lt Colonel R.E.
Supt Engineer, Chingleput.

1278/8

From the Secretary of Legation
Christiania

No 957

Dated 6th
Rec'd 8 March 187

Consulate Bridge
Informs that pending
that receipt of the orde
of Government he has
instructed the Ranger
Officer at Lo
for Lerwick

R F R
Chingleput

No. 1278 W Public Works Department

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the 12th March 1878

Read the following :—

From the Supg Engr Chingleput (Tel. No. 692 d/ 15th February 1878).
— do — do — (Tel. No. 823 d/ 25th February 1878).
— do — do — " " 957 " 6th March 1878

His Grace the Governor in Council is far from satisfied with the result arrived at in testing the Cortalier Bridge. From the records on the subject, though tenders for the construction of the Bridge were correctly submitted to the Chief Engineer and sanctioned by Government, the Chief Engineer pointed out that the drawings supplied were not in sufficient detail, which fact ought to have been noticed by the Local Fund Board

Board who should have obtained and submitted the requisite detailed drawings before finally concluding their contract with Mr. Naylor. As matters stand there appears to be no reason why Mr. Naylor's account should not be adjusted at once.

2. His Grace in Council ~~direct~~ the addition of central girders ~~should~~ to receive the most attentive consideration while temporary arrangements ~~&c.~~ be made to keep the traffic from the centre of the Bridge way. Gates should be placed at both ends to prevent the assembly of large crowds at any one time on the Bridge.

Further

Further elephants should on no account be permitted to cross the Bridge. The above ~~arrangements~~ will be communicated to the Board through the Financial Department for ~~their~~ observance.

Just

5.37.

GD.T

D. E. Chief Engr. MS Brief 12-3-78
Asst Engr SE 20-3-78
Asst Supt Brief 20-3-78

Bridge

The Madras Local Funds' Act 1871-

Gen 2 Jan^{y} 1878 Rs 14
Mad 31 Oct 1877 " 1374 W
" 30 Nov^{r} " " 244 W
" 6 June " " 15 W
" 31 May " " 1850 W
" 14 Dec^{r} 1876 " 157-
" 25 Sep^{r} " " 154
" 21 " " " 123
" 15 Feb^{y} " " 132
" 30 July 1875 " 298
Gen^{l} of Fuil: Gr 29 July 1875 Rs 1581-
" 3 June 1874 " 55
Gen 4 Mar " " 581-

22

57

Dept. of War, Engineers.

PUBLIC WORKS.

to U.S. Engineer Office

Buffalo N.Y. 12 Mar 1878. No. 12576

Nos. 163 - 164

Cortelyou Bridge,

Kings County N.Y. The award

received at meeting the

Commissioners for Gran

Satisfactory to the majority

Claims in connection here

with have adjusted at once.

And certain remarks commu

to the U.S. Board for careful

Observance.