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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

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*Proceedings of the Madras Government, Public Works Department,
14th December 1864.*

No. 287. Read the following letter from Captain J. MULLINS, R. E., Consulting Engineer for Irrigation and Canal Company, to Colonel C. A. ORR, R. E., Secretary to Government, Department Public Works, dated Madras, 24th November 1864, No. 155 :—

SIR,

1 Original letter from Agent, No. 1,398, General No. 829,
dated 17th November 1864.
5 Estimates.

- I. Abstract estimate.
- II. Detailed estimate for masonry works.
- III. Do. do. for Calingulah apron.
- IV. Do. for 14 feet culvert.
- V. Do. for building.

1 Plan of 14 feet culvert,
1 Do. of 8 do. do.
2 Do. of calingulah aprons, received with General No. 846.

• No. 1,047, 9th instant, with Agent's No. 1,898, 17th instant.

1. I have the honor to submit, for the consideration of Government, a supplemental estimate, Rupees 45,980, for works in the 4th Section, 44th to 60th miles of the main Canal, together with the Chief Engineer's letter as per margin,* explaining the reason and necessity for this additional outlay.

2. The estimate as received includes works under more than one main head, and requires therefore re-arranging thus :—

	RS.
<i>Main Supply.</i>	
Masonry works, 4th Section	45,558
<i>Buildings.</i>	
Office and Store, Jupaud	204
<i>Distribution.</i>	
Sluice No. 7	218

3. As the supplemental estimate received from the Chief Engineer mixes up additional work with increase of rates, I have had an abstract† prepared which exhibits more distinctly the

additional outlay due to extra rates for original work, and to extra work respectively. From this it will be seen, that the increase on work provided for in the original estimates (Column 4) is Rupees 7,399 and deducting from this the savings shewn in Column 7, the net increase on original work is Rupees 2,138-5-0. The difference between this and the total of the estimate

Rupees 45,980 is, with the exception of Rupees 825 which provides for a general increase of the former allowance for contingencies, due to additional work, so that the division of the increase stands thus :—

	RS.	A.	P.
On original work	2,138	5	0
On contingencies	825	0	0
On additional work	43,016	11	0

4. The bridges Nos. 1 and 2 are on the same plan, and were originally estimated at 7,000 Rupees each. No. 1 has been finished with the exception perhaps of a portion of the approaches, and the supplemental sanction required for it is Rupees 3,736. The principal items of excess are due to the substitution of 7 feet for 2 feet foundations, to the absence of any allowance for approaches in the original estimates, and to an excess of 90 per cent. on the centring. Bridge No. 2 is to differ in no respect from the bridge just noticed, except that the rate for ordinary masonry has been doubled, and that for cut-stone raised from 6-12-0 to 9-0-0. This latter rate is not, I think, more than is necessary, but the ordinary masonry ought to be done for less than 5 Rupees, looking at the description of stone available for the work, and the facilities it affords for building.

It must be noticed also, that the quantities in these two estimates should not agree so precisely. The longitudinal section shews that the cutting at bridge No. 1 is 4½ feet, and that at bridge No. 2, 2 feet; the transverse slope of the ground at the two sites is very different; and it is at least somewhat singular that in each case, though the sites are 15 miles apart and the soil by no means similar, the foundations should have needed increase from 2 to 7 feet. There

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14th December 1864.*

has been ample time to prepare the revised estimate for the second bridge on the carefully ascertained data of its site.

5. The intention to alter the 6 feet culvert No. 4, in the 53rd mile, to one of 14 feet, was mentioned in the Chief Engineer's report on the heavy rain-fall near Puggydial. The revised plan for this work forms one of the enclosures, and it may be doubted whether even with the greatest care in filling in and consolidating the earth behind the abutments, these walls which are 2 feet only in average thickness will suffice to bear the thrust of a 14 arch. Leaving the earth out of consideration, the abutments offer a resistance to thrust in the proportion of 4 to 5 nearly, and with water in the canal very nearly the same, and it would seem therefore to be advisable to increase the average thickness of the new abutment, or, if it be built, to add counter-

One abutment was built before the rains. forts to it. The old abutment should also be buttressed.

6. Supplemental sanction to the extent of 24,395 Rupees is applied for to add rear aprons to the four calingulahs of this section. These four calingulahs represent five which were originally sanctioned, but the amount of water-way, totalling 800 lineal yards, remains the same. The original sanction for the five calingulahs was Rupees 21,400 giving an average, on the four, of Rupees 5,350, and the supplemental estimate raises the average to Rupees 5,350 + 6,099 = 11,449 Rupees.

7. There can be no doubt of the necessity for the addition of aprons to these calingulahs to receive the overfall, but an examination of the detailed estimate and plans, appears to me to make it doubtful, whether the work included therein, is likely to be secure. To calingulahs Nos. 1 and 2 it is proposed to give an apron one foot thick, and to Nos. 3 and 4, 1½ feet thick; the aprons have a slope of one in six, but their outer ends are unsupported by retaining walls, and at this point, where there will be the greatest wear, it would seem to be necessary that there should be such a wall, and beyond it a loose stone horizontal apron, otherwise undermining will probably result, and though it may not be likely that the damage at any one time would extend far enough back to place the body walls of the calingulahs in danger, yet the cost of repairs would most likely be heavy, and it is not advisable, that works which will in the end have cost a large sum, should be in any remediable respect inefficient or unstable. I do not understand how in the cross sections C D, for Nos. 2, 3 and 4, the ground level is shown below the floor of under-slucies, when, in the sections through the body A B, the ground is so much above the same level, and as it would certainly be advisable, if practicable, to make the sluice aprons horizontal, it seems probable that the level of the ground is such as to admit of such an arrangement. As the stone available is all a sort of slate stone, it would seem to be necessary that all the aprons as specified for Nos. 1 and 2 should be of stone on edge, and if so, the note to No. 3, "Large stones 2' x 2' x 6" difficult to procure" would be inconsistent with the thickness 1½ feet of the apron in the estimate. The rate 5 Rupees a cubic yard is, I think, high for each site, and the sites are differently circumstanced, and the same rate is not equally appropriate to all. Calingulah No. 4 is close to bridge No. 2, the rate entered in each case is the same, and yet bridge work, much of which is face work, should require a different rate to stone pitching for a calingulah apron.

8. I beg therefore to recommend that the items for calingulah aprons be deducted, the Chief Engineer being requested to re-consider the plans, and that for the present, the sanction to be given be:—

Main supply	...	...	...	...	...	RS.
Buildings	...	...	...	...	...	21,163
Distribution	...	...	...	...	...	204
						218

Total ... 21,585

9. In paragraph 8 of his letter the Chief Engineer says: "The aprons to the calingulahs were not included in the original estimate as the sites had not been fixed, and it was expected

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14th December 1864.*

"to find rocky sites where no aprons would be necessary," and I am afraid that the omission to determine the sites before designing the works will in this case, as it must in most cases, make the works more expensive in the end than they need have been. From the estimate it would seem, that the length of apron for 200 yards of water-way is 809 + 18½ feet = 827½ feet = 275 yards. A few yards, perhaps 15, must be deducted from this to obtain the total length of the body of the calingulah, and then the difference between 200 and 260 is due to the stone piers which carry the towing path. This arrangement was a good and perhaps comparatively a cheap one, in the supposed absence of a necessity for aprons, but it is probable that the design might and would have been modified with advantage, had it been known how much extra length of body would add to the expense of the aprons, and that these aprons would become really the principal consideration, seeing that they are even as they are shown, estimated considerably more than the calingulahs themselves, the amounts will perhaps be ultimately considerably in excess of those at present entered in the estimate.

No. 288. ORDER THEREON, 14th December 1864, No. 3,576.

1. With this letter the Consulting Engineer, Madras Irrigation and Canal Company submits a supplemental estimate amounting to Rupees 44th to 60th mile. 45,980, arranged under the following heads, for the works in the 4th Section of the Company's Main Canal:—

	RS.
Main Supply.	
Minor work, 4th Section	... 45,558
Buildings.	
Office and Store at Jupaud	... 204
Distribution.	
Sluice No. 7	... 218

2. Of this sum, Rupees 2,138-5-0 are due to increased rates, Rupees 825, to an increase of the allowance for contingencies in the original estimate, and Rupees 43,016-11-0 to additional work stated to be required.

3. On the recommendation of the Consulting Engineer in paragraph 8, the Governor in Council sanctions a sum of Rupees 21,585 as follows:—

	RS.
Main supply	... 21,163
Buildings	... 204
Distribution	... 218
Total	... 21,585

and directs that the plans of the rear aprons proposed to be added to four calingulahs in this Section be re-considered by the Chief Engineer, with reference to Captain Mullins' remarks in paragraph 7, and that his attention be directed to the remarks on the weakness of the abutments to the enlarged culvert.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the Consulting Engineer, Irrigation and Canal Company.
" Manager for do. do.
" Secretary and Treasurer, Bank of Madras.

Exd. T. O'Connor.

Consulting Engineer's Office,
Irrigation & Canal Company,
Madras, 24 November 1865

N^o 155.

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Enclosures

1 Brief letter from Agent
N^o 1898 of 11: 826

5 Estimates

1. Abstract estimate

11. 5. 1/2 to Est. for masonry

11. do do for Calm apron

11. do do for 1/2 ft. cut short

11. do do for building

1 Plan of the 1/2 ft. cut short

1 1/2 ft. cut short

2 1/2 ft. cut short

read in the 11: 826

Sir,

Captain, J. Mullins R.E.
Consulting Engineer for I.C.C.

The Secretary to Government
Department of Pub. Works.

Sir,

N^o 1047-9 inst. with a per margin, explaining the reason and necessity for
Agent's N^o 1898-17

1. I have the honor to submit for the consideration of Government a Supplemental Estimate, Rupees 4,5980 for works in the 4th section - 44 to 60 miles of the Main Canal - together with the Chief Engineer's letter of the 11: 826, explaining the reason and necessity for this additional outlay.

2. The estimate as received includes works under more than one main head, and requires therefore rearranging thus:-

Main Supply.	Rs.
Masonry works 4 th section	4,5558
Buildings.	
Office and Store buildings	204
Distribution.	
Sluice N ^o 7	218

Form enclosed.

3. As the supplemental estimate received from the Chief Engineer mixes up additional work with increase of rates, I have had an abstract prepared which exhibits more distinctly the additional outlay due to extra rates for original work, and to extra work respectively. From this it will be seen, that the increase on work provided for in the original estimates (Column 4) is Rupees 7,349 and deducting from this the

the savings shown in column 7, the net increase on original work is Rupees 2,132-5-. The difference between this and the total of the estimate Rupees 4,598-0 is, with the exception of Rupees 825 which provides for a general increase of the former allowance for contingencies, due to additional work, so that the division of the increase stands thus,

On original work - Rupees 2,132-5-
on contingencies - 825-
on additional work - 4,301-11-

4. The Bridges Nos 1 and 2 are on the same plan, and were originally estimated at 7,000 Rupees each. No 1 has been finished with the exception perhaps of a portion of the approaches, and the supplemental sanction required for it is Rupees 3,736. The principal items of excess are due to the substitution of 7 feet for 2 feet foundations, to the absence of any allowance for approaches in the original estimates, and to an excess of 90 per cent on the cutting. Bridge No 2 is to differ in no respect from the Bridge just noticed, except that the rate for ordinary masonry has been doubled, and that for cut stone raised from 6-12-0 to 9-0-0. This latter rate is not, I think, more than is necessary, but the ordinary masonry ought to be done for less than 5 Rupees, looking at the description of stone available for the work, and the facilities it affords for building.

It must be noticed also that the quantities in these two estimates should not agree so precisely. The longitudinal section shows that the cutting at Bridge No 1 is $4\frac{1}{2}$ feet, and that at Bridge No 2 2 feet, the transverse slope of the ground at the

two sites is very different, and it is at least somewhat singular that in each case, though the sites are 15 miles apart and the soil by no means similar, the foundations should have needed increase from 2 to 7 feet. There has been ample time to prepare the revised estimates for the 2nd Bridge on the carefully ascertained data of its site.

Vide letter to Govt. No 103
of 21st Sep 87.

One abutment was
built before the rains.

5. The intention to alter the 6 feet culvert at No 4 in the 53rd mile, to one of 14 feet, was mentioned in the Chief Engineer's report on the heavy rain fall near Puzzydial. The revised plan for this work forms one of the enclosures, and it may be doubted, when viewed with the greatest care, in filling in and consolidating the earth behind the abutments, these walls which are 2 feet only in average thickness will suffice to bear the thrust of a 14 arch. Leaving the earth out of consideration, the abutments offer a resistance to thrust in the proportion of 4 to 5 nearly, and with water in the canal very nearly the same, and it would seem therefore to be advisable to increase the average thickness of the new abutment, or if it be built, to add counterforts to it. The old abutment should also be buttressed.

6. Supplemental sanction to the extent of 24,395- Rupees is applied for roads near aprons to the 4 canals of this section. There 4 canals represent 5 which were originally sanctioned, but the amount of waterway, totalling 800 lineal yards, remains the same. The original sanction for the 5 canals was Rupees 24,400 giving an average, on the 4, of 5,350, and the supplemental estimate raises the

the average $\frac{5350+6099}{2}=11,449$ Rupees.

7. There can be no doubt of the necessity for the addition of aprons to these calingulaks to receive the overflow, but an examination of the detailed estimate and plans, appears to me to make it doubtful, whether the work included therein, is likely to be secure.

The report No. 40 of July paras: 67, 71, 76, 77.

To Calingulaks Nos 1 and 2 it is proposed to give an apron one foot thick, and to Nos 3 and 4, $\frac{1}{2}$ feet thick; the aprons have a slope of one in six, but their outer ends are unsupported by retaining walls, and at this point, where there will be the greatest wear, it would seem to be necessary that there should be such a wall, and beyond it a loose stone horizontal apron otherwise undermining will probably result, and though it may not be likely that the damage at any one time would extend far enough back to place the body walls of the calingulaks in danger, yet the cost of repairs would most likely be heavy, and it is not advisable, that works which will in the end have such a large sum, should be in any remediable respect inefficient or unstable. I do not understand how in the cross sections CD, for Nos 2, 3 and 4, the ground level is shown below the floor of under sluices, when, in the sections through the body AB, the ground is so much above the same level, and as it would certainly be advisable, if practicable, to make the sluice aprons horizontal, it seems probable that the level of the ground is such as to admit of such an arrangement. As the stone available is all a sort of slate stone, it would seem to be necessary that all the aprons as specified for Nos 1 and 2 should be of stone on edge, and if so, the note to No 3 "Large stones"

stones $2' \times 2' \times 6'$ difficult to procure" would be inconsistent with the thickness $\frac{1}{2}$ feet of the apron in the estimate. The rate 5 Rupees a cubic yard is, I think, high for each site, and the sites are differently circumstanced, and the same rate is not equally appropriate to all. Calingulak No 4 is close to the bridge No 2, the rate entered in each case is the same, and yet bridge work, much of which is face work, should require a different rate to stone pitching for a calingulak apron.

8. I beg therefore to recommend that the items for Calingulak Aprons be deducted, the Chief Engineer being requested to reconsider the plans, and that for the present, the sanction to be given be,

Main Supply	Rupees 21163
Buildings	204
Distribution	218
Total	21585

9. In para. 8 of his letter the Chief Engineer says - "The aprons to the Calingulaks were not included in the original estimate as the sites had not been fixed, and it was expected to find rocky sites where no aprons would be necessary," and I am afraid that the omission to determine the sites before designing the work will in this case, as it must in most cases, make the works more expensive in the end than they need have been. - From the estimate it would seem, that the length of apron for 200 yards of waterway is $809 + 18\frac{1}{2}$ feet = $827\frac{1}{2}$ feet = 245 yards. - A few yards perhaps 15- must be deducted from this to obtain the total length of the body of the calingulak, and then the difference between 200 and 260 is due to the stone piers which carry the

[Handwritten signature]

Main Supply

Main Works 4th Section — 45.558

Building

Office and Store^{at} Inland — 204

Distribution

Since 1st July — 218

Of this sum,

(Rs. 2138-5-0) are due to

increased rates, Rs. 825 to

an increase of the allow-

ance for contingencies in

the original Estimate.

(Rs. 43016-11-0) to additional

work stated to be required.

On the recommendation

of the Comptroller, in

para 8, the Governor

in Council & sanction

a sum of Rs. 21,585 as

follows,

Main Supply — Rs. 21163

Building — " 204

Distribution — " 218

Total — 21585

and directs that the

plans of the new aprons

proposed to be added to

4 Calingulaku in this

Section be reconsidered by

the Chief Engrs., with reference

to Captain Mullins's re-

marks in para 7, and

that his attention be directed to the

remarks on the weakness of the abut-

ments to the enlarged culvert.

and that the attention of the
Chief Engrs. should be directed
to the remarks on the weakness
of the abutments to the enlarged
culvert. W.D.

To The Consulting Engineer I & C Co.

Manager — do —

Secretary and Treasurer

Quatre of Madras

21

Dec 15th December

Copy in a Letter to England.
Dy 24th January 1865. No. 8.

1864 Depts
No. of Dept for Dist

No. 3576
No. of the Alcott
Dy 14 Decr/64

Proc 1528/65

A Supplemental
grant of Rs. 24,580
sanctioned for works
in the 4th Section
of the Masrad & C.
Main Canal.

No. 287. 288.