

(1) Number of pages 182

(2) Date of repair 6-7-43

(3) Initials of the Referencer R

MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. 2543/44 Press
Mis.

466-468

Dated 20-8-1867.

Not to be folded or roughly handled

Lead
and

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

Read the following papers:—

No. 466. From the Superintending Engineer, 2nd Division, to the Secretary to Government, Department Public Works, dated Masulipatam, 10th July 1867, No. 47.

- * 13 Surveys and plans as per list attached. (By banghy.)
- 20 Detailed and Abstract Estimates.
- 8 Specification Reports.
- 1 General Abstract Estimate.

1. I have the honor to submit, for the sanction of Government, estimates and plans as per margin,* for works connected with the irrigation from the Kistna, amounting in value to Rupees 3,25,810.

2. These form part of the general scheme proposed by Colonel Anderson in his letter No. 143, embodied in Proceedings of Government, No. 250, dated 12th February 1864, which received the approval of the Secretary of State in his letter No. 33, dated 9th December 1864, to the Governor in Council, Fort St. George.
G. O. No. 135, dated 14th January 1865.

3. The estimates I now forward are for the enlargement of the Ellore canal and of the Central duct (commonly known as Ryves' canal) of the Masulipatam side of the Kistna Delta.

4. The Ellore canal is designed to discharge 274,000 cubic yards per hour, with a depth varying from 6½ to 8 feet, of which Ryves' canal will take off 192,000 cubic yards, leaving 71,000 cubic yards for irrigation under the Ellore canal, between Ryves' head and Ellore, and 11,000 cubic yards for surplus into the Boodemair, whence it will be utilized by the Mopurroo channel, which takes off from the calingulahs of that name already constructed across it.

5. Of the 192,000 cubic yards available for Ryves' channel, 51,000 cubic yards will be taken off by the Gudivada branch, and 141,000 will pass down the channel watering the lands adjacent, the surplus being discharged into the Poolairoo at Murryvada, whence it will pass into the various irrigation ducts branching from that stream.

6. It will be observed, by the sections forwarded, that the present scheme makes the channels flow on a considerably higher level than at present, whereby a large area of country for which water is not now available will become susceptible of cultivation.

- 1 Plan of head sluice and bridge.
- 1 Survey showing the proposed alternative lines.
- 3 Detailed and Abstract Estimates.
- 1 Specification Report.

7. I forward, for the decision of Government, plans and estimates as per margin, for an alternative line of Ryves' channel (proposed by Captain Ryves).

If it be adopted, the total sum required will be Rupees 4,06,110, being Rupees 80,300 in excess of the one proposed by Colonel Anderson, and specially alluded to in his report in paragraph 13. There are, no doubt, great advantages obtainable by adopting this line:—

1st.—In having the head of the chief irrigation channel at Bazorah, instead of seven miles distant. This would ensure greater control of the distribution and regulation of the water.

2ndly.—The ability that would be possessed for carrying on the execution of the work with vigor all the year round, instead of only during the time that the Ellore canal is dry, and when most of the available labor of the district is employed in clearing the channels from their silt deposits.

3rdly.—The diminishing of the current to a slight extent on the Ellore canal, rendering it more easy for navigation.

4thly.—A permanent reduction of Conservancy Establishment.

8. The disadvantages are—

1st.—The increased expense in construction, viz., Rupees 80,300.

2ndly.—The necessity of maintaining seven more miles of channel during all future years.

9. In the hope of getting a more economical line, I took levels in two other directions, which appeared favorable, as shown in the sketch map accompanying; but the expense of these projects, if they were adopted, would be Rupees 4,30,000 and 4,34,600 respectively, and they cannot, therefore, be recommended.

10. My own opinion is that the advantages of being able to control the water close to the head works, and of carrying on the work throughout the year, are so great, that the extra money would be well expended in adopting the first alternative line, and I may mention that latterly Colonel Anderson has expressed himself of the same opinion.

11. The various masonry works are designed to meet the objects desired. They are all of a substantial nature, and I think that the rates allowed will be found sufficient.

12. The probable increase of irrigated land is alluded to in Mr. Foord's letter, attached to the Proceedings of Government above quoted. It is impossible to say what the special works now submitted for sanction will return, nor does it appear to be necessary, as they form a portion of the great scheme which in its incomplete state last year returned 21 per cent.

No. 467. From the Superintending Engineer, 2nd Division to the Secretary to Government, Department Public Works, dated 1st August 1867, No. 62.

1. In reply to your Official Memorandum No. 159, dated 24th July, I have the honor to forward an abstract estimate for the alternative line referred to in paragraph 7 of my letter of 10th July, No. 47.

2. It will be seen that the sum of Rupees 4,06,110 includes compensation for land.

3. There will be no destruction of Trunk Road No. VI., nor will any masonry works be needed, excepting those entered in the abstract estimate. The bridge, combined with head sluice which I have proposed, will pass both the Ellore and the Masulipatam roads across the channel close to Bezwada, and as will be observed by the map, the Trunk (or Ellore) Road will not again cross it, till the existing Ryves' channel is reached, where a bridge has been duly allowed. Estimate Rupees 4,170.

DETAILED ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing two additional Arches to the Bridge at the head of Ellore Canal

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Foundation to Abutments ...	2	38 0	9 6	5 0	3,610 0
Wing-walls ...	4	34 0	11 0	5 0	7,430 0
Towing path ...		61 6	5 6	5 0	1,691 3
Retaining walls ...	2	29 0	1 3	2 6	181 3
Do. ...	2	23 6	1 3	2 6	146 10
Pedestals ...	4	4 6	0 3	5 0	22 6
<i>Superstructure.</i>					
Abutments ...	2	37 0	7 6	8 0	4,440 0
Do. ...	2	37 0	2 9	2 0	407 0
Backing to do. ...	2	37 0	9 0	1 0	333 0
Wing-walls ...	4	34 0	6 1 1/2	24 6	20,408 6
Do. ...	4	1 3	8 4 1/2	10 0	418 9
Do. ...	4	2 6	4 6 3/4	14 6	595 5
Do. ...	4	7 6	4 6 3/4	11 0	1,505 7
Piers including cut waters ...	2	33 6	2 0	8 0	536 0
Pedestals ...	4	4 6	0 3	24 6	110 3
Towing path ...		64 0	2 9	9 0	1,584 0
Parapet of do. ...		69 6	1 0	0 6	34 9
Face walls at abutments ...	4	15 0	2 0	3 6	420 0
Filling up spandrels ...	2	26 0	10 0	3 0	1,560 0
Spandrel walls ...	4	24 0	2 0	4 9	912 0
Cubic feet...					46,397 0
Deduct for ashlar work...					5,002 0
Net Cubic feet ...					41,395 0
Or Cubic yards of rubble stone-in-chunam ...					1,533 1/4
Arches ...	2	48 0	26 0	2 6	6,240 0
Cubic feet ...					6,240 0
Or Cubic yards of arch work, brick-in-chunam ...					231 1/4
<i>Plastering.</i>					
Intrados of arches ...	2	44 6	26 0		2,314 0
Square feet of plastering with two coats of chunam ...					2,314 0
Parapets, excluding over pillars ...	2	149 6	1 6	2 8	1,196 0
Cubic feet...					1,196 0
Or Cubic yards of brick-in-chunam...					44 1/4
Pointing chunam to parapet walls ...	2	270 0	2 0		1,080 0
Square feet of pointing to brick work neatly ...					1,080 0

Proceedings of the Madras Government, Public Works Department,
20th August 1867.

DETAILED ESTIMATE.—(Continued.)

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
<i>Plastering.—(Concluded.)</i>					
Cordon work	2	176 6			353 0
Running feet of cut stone cordon...					353 0
Coping work	2	176 6			353 0
Running feet of cut-stone coping work...					353 0
<i>Vertical ashlar work.</i>					
Abutments and piers	3	26 0		8 0	780 0
Cut waters of piers	4	15 6	1 3	6 9	523 0
Do. of abutments	3	11 3	1 3	6 9	284 9
Tops of cut waters of piers	4	11 0	1 8	1 3	91 8
Do. do. of abutments...	4	8 3	2 3	1 3	92 9
Face walls over arches	4	34 0	1 3	4 6	765 0
Do. between columns	4	2 3	1 3	13 6	174 4
Do. at abutments	4	2 6	1 3	16 6	206 3
Wing-walls	4	28 9	1 3	14 6	2,084 4
Cubic feet					5,002 0
Or Cubic yards of vertical ashlar facing work					185 7
Plinths for pillars	4	9 6	1 6	1 0	57 0
Do. do. at abutments	4	8 3	1 6	1 0	49 6
Pillars	16	3 6	1 9	16 6	1,617 0
Parapet over the pillars	4	7 6	1 6	2 8	120 0
Do. do. abutments	4	7 3	1 6	2 8	116 0
Coping over the above parapet	4	7 6	1 6	0 9	33 9
Do. do. do.	4	7 3	1 6	0 9	32 7
Pedestals	4	4 6	1 6	2 8	72 0
Coping to pedestals	4	4 6	1 6	0 9	20 3
Cubic feet... ..					2,118 0
Or Cubic yards of ashlar facing work...					78 4
Concrete work		58 0	3 3	9 0	1,696 6
Cubic feet... ..					1,696 6
Or Cubic yards of concrete...					62 4
Metalling the roadway		156 0	23 0	1 4	4,983 6
Cubic feet... ..					4,983 6
Or Cubic yards of metalling...					183 4
Rough stone revetment at towing path side		225 0	13 0	1 7 1/2	4,753 0
Do. do. above do.		225 0	6 0	1 6	2,025 0
Do. do.		150 0	13 0	1 7 1/2	3,168 9
Do. do.		150 0	6 0	1 6	1,350 0
Do. do.		225 0	18 6	1 6	6,243 9
Do. do.		150 0	18 6	1 6	4,162 6
Cubic feet... ..					21,703 0
Or Cubic yards of rough stone...					803 1/2

Proceedings of the Madras Government, Public Works Department,
20th August 1867.

DETAILED ESTIMATE.—(Concluded.)

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
<i>Vertical ashlar work.—(Concluded.)</i>					
Turfing	2	225 0	15 6		6,975 0
Do.	2	150 0	5 6		4,650 0
Square feet					11,625 0
Square yards of turfing					1,291 3/4
Guard stones					4
Centerings					
Baling water					
Removing old work					
Excavating foundations and raising approaches					
Temporary bunds					
Sundries and Contingencies					

ABSTRACT ESTIMATE
KISTNA DISTRICT.

WORK.—Constructing two additional Arches to the Bridge at the head of Ellore Canal

Quantity.	Description of Charges.	Rate.		Amount.		Total.	
		RS.	A. P.	RS.	A. P.	RS.	P.
1,533 1/2	Cubic yards of rubble stone-in-chunam ...	2	10 2	4	040 9		
231 1/2	Do. of arch work, brick in do. ...	5	13 1	1,354	2 3		
2,314 0	Square feet of plastering with two coats of chunam ...	2	12 0	63	10 0		
44 1/2	Cubic yards of brick-in-chunam ...	5	0 0	221	7 0		
1,080 0	Square feet of pointing with chunam to brick work neatly ...	1	4 0	43	8 0		
353 0	Running feet of cut-stone cordon work ...	0	8 0	176	8 0		
353 0	Do. do. coping work ...	0	12 0	264	12 0		
185 1/2	Cubic yards of vertical ashlar stone work ...	7	8 0	1,389	7 1		
78 1/2	Do. ashlar work ...	12	0 0	941	5 4		
62 1/2	Do. of concrete work ...	1	8 0	94	4 0		
183 1/2	Do. of metalling with old brick kunkur ...	0	5 6	63	2 3		
803 1/2	Do. of rough stone revetment for slopes ...	1	0 0	803	13 0		
1,291 3/4	Square yards of turfing ...	0	3 0	20	2 9		
4	Guard stones ...	3	0 0	12	0 0		
	Centerings ...			250	0 0		
	Baling water ...			150	0 0		
	Removing old work ...			130	0 0		
	Excavating foundations and raising approaches ...			65	0 0		
	Temporary bunds ...			50	0 0		
	Sundries and Contingencies ...			256	5 9		
	Deduct value of old materials ...						
	Total Estimate ...					10,390	0 0
						50	0 0
						10,340	0 0

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

Specification Report to accompany Estimate of Rupees 10,340, for constructing two additional Arches to the Bridge at the head of Ellore Canal.

1. The foundations of the new wing-walls, abutments, and towing path are to be of rough stone-in-chunam, 5 feet deep, resting on natural soil.

2. Piers and abutments are to be connected by retaining walls in front and rear, 1 foot 3 inches thick and 2 feet 6 inches deep, and to be of rough stone-in-chunam.

3. The abutments are to be 8 feet 6 inches thick at the level of the bed of the channel, and 6 feet 6 inches at the springing of the arch, and raised to a uniform height of 8 feet; the versed sine of the arch to be $13\frac{1}{2}$ feet, giving a total height of $21\frac{1}{2}$ feet to the soffit. The thickness of the two additional arches to be 3 feet 6 inches, 3 feet, and 2 feet 6 inches at haunches (from the springing measured on the intrados of arch, 3 feet 9 inches each distance), and the remainder to be 2 feet thick, built of brick-in-chunam and pointed neatly.

4. The old abutments of the bridge will be used as piers of the new arches by adding masonry to the proper breadth of 11 feet, and taking away superfluous work.

5. The wing-walls 2 feet 3 inches thick at top and 10 feet at bottom, with a batter of 7 feet 9 inches at the back.

6. The superstructure of the wing-walls, spandrels, face walls of arches, piers, cut waters, and abutments are to be of rubble-in-chunam, faced with ashlar masonry.

7. The parapets are to be 1 foot 6 inches thick and 3 feet high, built of brick-in-chunam, pointed neatly with a cut-stone cordon work of 7 inches high, and 4 inches coping; the intrados of arches will be plastered with two coats of chunam.

8. Pillars over the cut waters are to be of ashlar work, with a capping of cut-stone over parapet; the diameter of the pillars at base 2 feet 6 inches, and at top 2 feet.

9. Roadway over the bridge will be metalled with old brick kunkur, at centre 1 foot 6 inches, and at sides 1 foot 3 inches thick. The roadway over the arches to be 23 feet wide and at wings 34 feet.

10. A towing path 9 feet above bed of channel, having parapet 6 inches high, will pass under the western arch. It will be built of rubble stone and chunam, and the interior space between outside and abutment of bridge will be filled with concrete.

(Signed) G. V. WINSCOM, Lieut-Colonel, R. E.,
Superintending Engineer 2nd Division.

MASULIPATAM.
10th July 1867.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE of the probable expense of enlarging the Ellore Canal from the head near Bezoarah to the head of Ryves' Channel, between the 7th and 8th mile.

Width of bed 120—150 feet, side slopes 2 to 1, fall $2\frac{1}{2}$ inches per mile.

	Average depth of cutting.	Width.	Area.	Length.	Cubical contents.
Section 1	$\frac{107.8}{10}$	90	970.2		
Side slopes	$\frac{20.7 \times 41.4}{2}$		428.49		
	$\frac{20.3}{2}$	40.6	412.09		
			1,810.78	3,420	6,192,867.6
Section 2	$\frac{94.5}{11}$	95	816.13		
Slopes	$\frac{2 \times 15.8}{2}$	$\frac{31.6}{2}$	249.64		
			1,065.77	4,000	4,263,080.0
Section 3	$\frac{112.1}{11}$	85	952.85		
Slopes	$\frac{13.9}{2}$	27.8	193.21		
	$\frac{15.3}{2}$	30.6	234.09		
			1,380.15	4,100	5,658,615.0
Section 4	$\frac{87.6}{11}$	100	796.36		
Slopes	$\frac{12.6}{2}$	25.2	158.76		
	$\frac{9.9}{2}$	19.8	98.01		
			1,053.13	4,100	4,317,833.0
Section 5	$\frac{82}{11}$	95	708.18		
	$\frac{8.3}{2}$	16.6	68.89		
	$\frac{9.1}{2}$	18.2	82.81		
			859.88	4,000	3,439,520.0
Section 6	$\frac{84.4}{11}$	100	767.27		
Slopes	$\frac{8.4}{2}$	16.8	70.56		
	$\frac{7.5}{2}$	15	56.25		
			894.08	4,000	3,576,320.0
Section 7	$\frac{74.1}{12}$	110	675.25		
Slopes	$\frac{10.1}{2}$	20.2	102.01		
	$\frac{8}{2}$	16	64.0		
			845.26	4,100	3,465,566.0

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

Estimate of the probable expense of enlarging the Ellore Canal, &c.—(Concluded.)
Width of bed 120—150 feet, side slopes 2 to 1, fall $2\frac{1}{2}$ inches per mile.

	Average depth of cutting.	Width.	Area.	Length.	Cubical contents.
Section 8 ...	87.5	105	835.22	4,000	3,996,280
Slopes ...	$\frac{11}{9.2}$	18.4	84.64		
	$\frac{2}{8.9}$	17.8	79.21		
	$\frac{2}{2}$		999.07		
Section 9 ...	63.4	90	631	5,000	3,851,250
	$\frac{9}{8}$	16	64		
	$\frac{2}{8.5}$	17	72.25		
	$\frac{2}{2}$		770.25		
Total Cubic feet...					33,761,331.6
Or Cubic yards...					1,435,605

Abstract.

RS. A. P.

1,435,605 Cubic yards of earth-work, at 2 Annas per cubic yard. 1,79,450 10 0
Contingencies, &c., at 5 per cent. ... 8,989 6 0

Total... 1,88,440 0 0

MASULIPATAM,
10th August 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.
KISTNA DISTRICT.

WORK.—Enlargement of the Head-sluice of Ryves' Channel.

Particulars of Work.	Number.	MEASUREMENTS.			Cubical contents.	
		Length.	Breadth.	Height or Depth.	Ft.	In.
<i>Foundation, rubble masonry in chunam.</i>						
Abutments	1	42 0	6 0	6 0	1,512	0
Do.	1	10 0	6 0	6 0	360	0
Wing	1	2 6	4 10	6 0	72	6
Do.	1	7 6	4 10	6 0	217	6
Piers	9	17 6	4 0	6 0	3,780	0
Front retaining wall	1	54 0	3 0	5 6	891	0
Rear do.	1	79 9	2 3	4 6	807	6½
Do. do.	1	22 0	2 3	4 6	222	9
Do. apron do.	1	130 6	3 0	6 0	2,349	0
<i>Superstructure.</i>						
Abutments	1	15 0	3 9	6 0	337	6
Do. backing	1	15 0	2 3	4 6	151	10½
Do.	1	26 0	3 1½	10 6	853	1½
Do.	1	10 0	3 1½	10 6	328	1½
Piers	9	13 9	3 0	6 0	2,227	6
Wing	1	7 6	2 7	11 0	213	1½
Do.	1	2 6	2 7	11 0	71	¾
Flooring	1	106 0	10 0	2 0	2,120	0
Do.	1	55 0	16 0	2 0	1,760	0
Blocking course	1	174 0	1 3	0 9	163	1½
Do.	1	54 0	1 3	0 9	50	7½
<i>Deduct.</i>						
Roughly chissel dressed stone					18,488	3½
Cut-stone and cut-stone grooves					2,350	6
					700	6
					3,051	0
Total rubble masonry in chunam, C. ft.					15,437	3½
Or Cubic yards...					571½	
Arch work brick-in-chunam	10 0	13 0	11 0	1 6	2,145	C. ft.
<i>Cut-stone work.</i>						
Grooves	20 0	1 0	0 9	11 0	165	0
Caps of cut waters	12 0	3 0	1 6	0 9	40	6
Face of arch	24 0	1 3	11 0	1 6	495	0
					Cubic feet...	700 6
					Or Cubic yards...	26
<i>Roughly chissel dressed stone.</i>						
Side or face walls	1	187 0	1 3	2 0	467	6
Cut waters	12	2 0	2 6	6 0	360	0
Rear faces of piers	12	1 3	3 0	6 0	270	0
Parapet	1	464 0	1 0	1 9	812	0
Abutment and wings	2	39 0	1 3	6 0	585	0
					Cubic feet...	2,494 6
					Or Cubic yards...	92½
Pointing in chunam	Squares...				78½	

Proceedings of the Madras Government, Public Works Department.
20th August 1867.

DETAILED ESTIMATE.—(Concluded.)

Particulars of Work.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height or Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Concrete to fill spandrels ...	1	60 0	13 0	2 6	1,950 C. ft.
Or Cubic yards...					72½
Rough stone apron ...	1	63 0	15 6	2 3	2,197 1½
	1	61 6	12 0	2 0	1,476 0
	1	62 6	20 0	2 0	2,500 0
Total Rough stone ...					6,173½
Or Cubic yards...					228½
Teak-wood shutters ...	10	6 6	12 6	0 2½	169 3¼
Iron bar ...	20	6 9	0 2	0 2	3½
Do. ...	20	6 9	0 3	0 3	8½
Cubic feet...					12½
Or lbs...					5,923
Excavating foundation. Cu' e yards...					1,320
Centering ...					
Add for removing old abutment, &c. ...					
Metalling ...	1	130 0	8 6	0 6	552½ C. ft.
Or Cubic yards...					20½
Sundries and Contingencies ...					

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Enlargement of the Head-sluice of Ryves' Channel.

Quantity.	Description of Work.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS.
571½	Cubic yards of rubble masonry in chunam ...	3 0 0	1,715 5 4	
2,145	Cubic feet of arch work, brick-in-chunam ...	0 4 0	536 4 0	
28	Cubic yards of cut-stone work ...	12 0 0	312 0 0	
921½	Do. of roughly chissel-dressed stone in chunam ...	8 0 0	738 15 5	
78½	Squares of pointing in chunam ...	1 8 0	117 6 0	
72½	Cubic yards of concrete ...	2 6 0	171 8 6	
228½	Rough stone apron ...	1 0 0	228 10 8	
169-3¼	Cubic feet teak-wood shutters wrought and put up ...	3 0 0	507 13 0	
5,923	lbs. of iron bar ...	0 1 4	493 9 4	
1,320	Cubic yards excavating ...	0 1 0	82 8 0	
	Centering ...	16 0 0	160 0 0	
	Add for removing old abutment, &c. ...		20 0 0	
20½	Cubic yards of metalling with brick kunkur ...	1 8 0	30 2 0	
	Sundries and Contingencies, at 5 per cent. ...		5,114 7 285 5	5,400
	Total Estimate...			5,400

Proceedings of the Madras Government, Public Works Department,
20th August 1867.

Specification Report to accompany Plan and Estimate for enlarging the Head-sluice of Ryves' Channel from 3 to 13 vents.

The bed of the channel is alluvial soil.

The head-sluice to consist of 13 vents, having dimensions as follows:—

1. The foundation of the piers and abutments to be 5 feet and 7½ feet at bottom, 3 feet and 4½ feet at the floor, and 6 feet deep resting on natural soil.
2. The abutments above to be 4½ feet at the floor and 3 feet at top in thickness, and 6 feet high, and the piers to be 3 feet wide and 6 feet high.
3. The foundation of wings to be 6 feet at bottom, and 3 feet 8 inches at the floor, and 6 feet deep: and above, 3 feet 8 inches at the floor, and 1½ feet at top, and 11 feet high.
4. The arches of vents to have each a versed sine of 3 feet, and to be 1½ feet thick.
5. The three vents constructed in 1861-62 are shown in lake in the plan. The parts colored green show the existing work to be removed.
6. Iron bars, 2 inches square, will be placed across the vents in front as shown in the plan, and support the teak-wood shutters, which will be worked in grooves cut in hard stones in the abutments and piers.
7. Four steps to be built on each side of the abutments as shown in the plan, to facilitate the Lascars to work the planks.
8. The flooring under the arches and in rear to be 2 feet thick, and the retaining walls between front and rear wings to be 4 and 2½ feet at bottom, 2 feet at top, and 5½ and 4½ feet deep respectively.
9. Retaining wall between aprons and connecting revetments to be 4 and 2 feet thick, and 5½ feet deep.
10. Rough stone apron in front to be 14 feet wide and in rear 20 and 12 feet wide, all 2 feet thick. Revetments to be 2½ feet in average thick, 6 feet high, slope 1½ to 1.

11. The foundation and superstructure to be of rubble masonry, and arch-work to be of brick-in-chunam.

12. Grooves, caps of cut waters, and face of arch to be of cut-stone; and face walls, cut waters, rear face of piers, parapets, abutments, and wings, to be of roughly chissel-dressed stone, and the whole work to be pointed neatly.

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE.

KISTNA DISTRICT.

WORK.—Enlarging and improving Ryves' Canal from Head Sluice to Pullairu near Murrovada.

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
1	660	622-0 $\frac{1}{2}$	2,777,910	
2		580-0 $\frac{1}{2}$		
3		466-11 $\frac{3}{4}$		
4		390-9 $\frac{1}{2}$		
5		455-1 $\frac{1}{2}$		
6		498-7 $\frac{1}{2}$		
7		574-5 $\frac{1}{2}$		
8		620-11 $\frac{3}{4}$		
9	660	4,209-0 $\frac{7}{8}$	3,244,560	
10		604-9 $\frac{1}{2}$		
11		603-0 $\frac{1}{2}$		
12		559-11 $\frac{3}{4}$		
13		616-0 $\frac{1}{2}$		
14		655-0 $\frac{1}{2}$		
15		620-10 $\frac{3}{4}$		
16		624-11 $\frac{1}{2}$		
17	660	631-7 $\frac{1}{2}$	2,428,140	
18		4,916-2 $\frac{1}{2}$		
19		600-0 $\frac{5}{8}$		
20		415-4 $\frac{3}{4}$		
21		287-8 $\frac{1}{2}$		
22		432-3 $\frac{1}{2}$		
23		502-1 $\frac{1}{2}$		
24		433-7 $\frac{1}{2}$		
25	660	477-6 $\frac{1}{2}$	1,855,590	
26		530-3 $\frac{1}{2}$		
27		3,678-11 $\frac{3}{4}$		
28		476-3 $\frac{1}{2}$		
29		419-4 $\frac{1}{2}$		
30		354-0 $\frac{1}{2}$		
31		331-6 $\frac{1}{2}$		
32		340-6 $\frac{1}{2}$		
33	660	270-3	1,573,770	
34		255-10 $\frac{5}{8}$		
35		363-6 $\frac{1}{4}$		
36		2,811-5 $\frac{1}{4}$		
37		377-2 $\frac{1}{2}$		
38		336-10 $\frac{1}{2}$		
39		328-0 $\frac{5}{8}$		
40		297-0 $\frac{1}{2}$		

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE.—(Continued.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
41	660	260-3 $\frac{1}{2}$	1,255,980	
42		237-0 $\frac{1}{2}$		
43		241-6 $\frac{1}{2}$		
44		258-1 $\frac{1}{2}$		
45		295-6 $\frac{1}{2}$		
46		227-3 $\frac{1}{2}$		
47		140-6 $\frac{1}{2}$		
48		239-6 $\frac{1}{2}$		
49	660	1,902-9 $\frac{1}{2}$	1,600,830	
50		282-4 $\frac{1}{2}$		
51		277-4 $\frac{1}{2}$		
52		257-6 $\frac{1}{2}$		
53		223-6 $\frac{1}{2}$		
54		275-1 $\frac{1}{2}$		
55		304-7 $\frac{1}{2}$		
56		382-1		
57	660	422-11 $\frac{1}{2}$	1,823,745	
58		2,425-7 $\frac{1}{2}$		
59		358-5 $\frac{1}{2}$		
60		360-5		
61		340-9 $\frac{1}{2}$		
62		302-2 $\frac{1}{2}$		
63		333-3 $\frac{1}{2}$		
64		371-4		
65	660	420-7 $\frac{1}{2}$	1,463,830	
66		276-2 $\frac{1}{2}$		
67		2,763-3 $\frac{1}{2}$		
68		249-5 $\frac{1}{2}$		
69		233-3 $\frac{1}{2}$		
70		255-3 $\frac{1}{2}$		
71		282-9 $\frac{1}{2}$		
72		342-5 $\frac{1}{2}$		
73	660	356-8 $\frac{1}{2}$	799,920	
74		257-4 $\frac{1}{2}$		
75		248-1 $\frac{1}{2}$		
76		2,223-5 $\frac{1}{2}$		
77		252-2 $\frac{1}{2}$		
78		161-6 $\frac{1}{2}$		
79		160-1 $\frac{1}{2}$		
80		150-3 $\frac{1}{2}$		
81	660	127-3 $\frac{1}{2}$	799,920	
82		131-1 $\frac{1}{2}$		
83		125-4 $\frac{1}{2}$		

Proceedings of the Madras Government, Public Works Department.
20th August 1867.

ESTIMATE.—(Continued.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
84	660	67.7 $\frac{1}{2}$	580,140	
85		102.1 $\frac{1}{2}$		
86		116.11 $\frac{1}{2}$		
87		177.2 $\frac{1}{2}$		
88		211.10 $\frac{1}{2}$		
		879.1 $\frac{1}{2}$		
89		126.9 $\frac{1}{2}$		
90		75.4 $\frac{1}{2}$		
91		81.7 $\frac{1}{2}$		
92		77.6 $\frac{1}{2}$		
93	660	125.8 $\frac{1}{2}$	665,940	
94		136.11 $\frac{1}{2}$		
95		152.6 $\frac{1}{2}$		
96		232.3 $\frac{1}{2}$		
		1,008.10 $\frac{1}{2}$		
97		207.1 $\frac{1}{2}$		
98		150.2 $\frac{1}{2}$		
99		156.2 $\frac{1}{2}$		
100		144.5 $\frac{1}{2}$		
101		89.1 $\frac{1}{2}$		
102	660	81.0 $\frac{1}{2}$	618,090	
103		81.8 $\frac{1}{2}$		
104		26.5 $\frac{1}{2}$		
		936.4 $\frac{1}{2}$		
105		67.9 $\frac{1}{2}$		
106		152.6 $\frac{1}{2}$		
107		91.1 $\frac{1}{2}$		
108		18.7		
109		24.5 $\frac{1}{2}$		
110		21.11 $\frac{1}{2}$		
111	660	10.4 $\frac{1}{2}$	264,330	
112		13.9 $\frac{1}{2}$		
		400.6 $\frac{1}{2}$		
113		13.11 $\frac{1}{2}$		
114		11.2 $\frac{1}{2}$		
115		15.3 $\frac{1}{2}$		
116		16.11 $\frac{1}{2}$		
117		13.1 $\frac{1}{2}$		
118		10.4 $\frac{1}{2}$		
119		10.8 $\frac{1}{2}$		
120	660	7.4 $\frac{1}{2}$	65,340	
		99.0 $\frac{1}{2}$		
121		8.3 $\frac{1}{2}$		
122		19.10 $\frac{1}{2}$		
123		37.10 $\frac{1}{2}$		
124		71.0 $\frac{1}{2}$		
125		104.2 $\frac{1}{2}$		
126		92.9 $\frac{1}{2}$		
127		59.6 $\frac{1}{2}$		

Proceedings of the Madras Government, Public Works Department,
20th August 1867.

ESTIMATE.—(Concluded.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
128	660	39.9 $\frac{1}{2}$	286,110	
		433.5 $\frac{1}{2}$		
129		83.3 $\frac{1}{2}$		
130		116.10 $\frac{1}{2}$		
131		159.7 $\frac{1}{2}$		
132	660	271.0 $\frac{1}{2}$	603,900	
133		284.3 $\frac{1}{2}$		
		915.1 $\frac{1}{2}$		
Total Cubic feet...		•.....	21,913,155	
Or Cubic yards...			811,598 $\frac{1}{2}$	

ABSTRACT.

8,11,598 Cubic yards of earth-work at 1 Anna 3 Pies	RS.	A.	P.
per cubic yard	63,406	1	0
Sundries at 5 per cent...	3,173	15	0

Total Estimate... 66,580 0 0

MASULIPATAM,
10th July 1867.

(Signed) G. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.
KISTNA DISTRICT.

WORK.—Constructing a Bridge of five arches 20 feet span on Ryves' Channel, at crossing of the Ellore Road.

Particulars of Work.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Feet.	Feet.	Feet.	Feet.
Foundations to abutments (counted square) ...	2	21½	6	5	1,290
Do. to piers including cut waters, do. ...	4	21½	4½	5	2,066½
Do. to wings ...	4	21½	6½	5	2,615½
Do. pilaster to the end ...	4	2	½	5	10
Retaining walls ...	2	98½	1½	1	296½
Do. do. ...	2	92½	2½	4	1,855
Flooring ...	5	19½	11½	1	1,135½
<i>Superstructure.</i>					
Abutments (counted square) ...	2	20½	4½	7½	1,509½
Piers including cut waters, do. ...	4	20½	3½	7½	2,152½
Wings ...	4	21½	3½	10½	2,942½
Do. ...	4	½	4½	14½	61½
Pilasters ...	4	2	½	7	14
Skew-backs for piers ...	4	14½	3½	½	169½
Do. do. abutments ...	2	14½	3½	1½	146½
Spandrels ...	4	14½	5	½	217½
Backing to arches ...	2	14½	7½	½	180½
Face walls ...	2	94	1½	1½	423
Do. ...	2	35	1½	2	210
Blocking course ...	2	167	1½	1	501
Do. do. for pilaster ...	4	2	2	1	16
Total Cubic feet rubble in chunam ...	...	...	...	...	17,813
Or Cubic yards of do. ...	...	...	...	...	659½
<i>Brick-in-chunam.</i>					
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Arch work ...	5	24 6	14 6	1 10	3,256 5½
Parapet ...	2	167 0	1 3	1 9	730 7½
Pilasters ...	4	2 0	2 0	1 9	28 0
Total Cubic feet brick-in-chunam ...	...	...	...	...	4,015 1
Or Cubic yards of do. ...	...	...	...	...	148-19-1
<i>Cut-stone Work.</i>					
Stringing course for abutments ...	2	21 0	2 0	0 6	42 0
Do. do. for piers ...	4	21 0	4 0	0 6	168 0
Caps ...	10	3 6	2 0	0 8	46 8
Cordon work for parapets ...	2	167 0	1 8	0 6	278 4
Pilasters ...	4	2 5	2 5	0 6	11 8
Coping for parapets ...	2	167 0	1 6	0 9	375 9
Do. for pilasters ...	4	2 3	2 3	0 9	15 2½
Total Cubic feet of cut-stone work ...	...	...	...	...	937 7½
Or Cubic yards of do. ...	...	...	...	...	34-19-7½
Pointing ... Squares...	...	...	...	...	99
Excavating foundation Cubic yards...	...	...	...	...	540
Guard-stones ...	...	...	...	...	
Centerings... ..	4	...	...	...	
Baling water ...	...	...	...	...	
Sundries and Contingencies ...	...	...	...	...	

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ABSTRACT ESTIMATE.
KISTNA DISTRICT.

WORK.—Constructing a Bridge of five arches of 20 feet span on Ryves' Channel, at crossing of the Ellore Road.

Quantity.	Description of Work.	Rate.			Amount.			Total.		
		RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
660	Cubic yards rough stone in chunam ...	3	2	0	2,062	8	0			
149	Do. of brick-in-chunam ...	6	0	0	894	0	0			
35	Do. of cut-stone in chunam ...	11	15	1	417	15	11			
99	Squares of pointing ...	1	0	0	99	0	0			
540	Cubic yards of earth-work for excavating foundations ...	0	1	0	33	12	0			
4	Guard-stones ...	3	0	0	12	0	0			
	Centerings... ..				200	0	0			
	Baling water ...				250	0	0			
	Sundries and Contingencies ...							3,979	3	11
								190	12	1
	Total Estimate ...							4,170	0	0

Specification to accompany the Plan and Estimate for Bridge proposed for construction on Ryves' Channel at the crossing of Ellore Road.

1. The bridge to consist of five arches of 20 feet span, the rise being 5 feet. The height* of the piers and abutments to be 8 feet, the former being 3½ and the latter 5 feet in breadth. The arches to be 2 feet 2 inches in thickness at the springing line, and 1½ at the crown.

2. The wings to be 15½ feet in height at the abutment, and 8 feet at the extremities.

3. The depth of the foundation to be reduced by steps of ½ foot up and 2 feet on, for a length of 16 feet, and carried on this level 5½ feet, making the total length 21½ feet.

4. The road-way to be 12 feet in breadth with parapets of 3 feet in height.

5. The cordon work and coping to parapets, stringing course, and curved caps to be of dressed cut-stone in chunam.

6. Arch work and parapets to be of brick-in-chunam, and the rest rubble masonry; the whole to be pointed with chunam.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
MASULIPATAM,
10th July 1867.
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.
KISTNA DISTRICT.

WORK.—Constructing accommodation Bridge with elevating platform on Ryves' Channel for the use of the villagers and the maintenance of district navigation.

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.	
		Length.	Breadth.	Depth.		
<i>Foundations.</i>		Ft. In.	Ft. In.	Ft. In.	Ft. In.	
Abutments	1	16 0	4 0	4 0	256 0	
Do. to elevating platform ...	1	17 9	4 9	4 0	337 3	
Do. do.	1	17 9	4 4	4 0	310 7½	
Piers	2	17 9	3 3	4 0	461 6	
Wing-walls	4	11 6	3 6	4 0	614 0	
Retaining walls	1	42 8½	1 9	2 0	219 5	
<i>Superstructure.</i>						
Abutment	1	16 0	3 6	3 9	210 0	
Abutments, including cut waters and caps ...	2	14 9	4 0	9 9	1,150 6	
Piers, including skew backs	2	15 2	4 0	3 0	465 1	
Caps to piers	4	1 4	2 6	1 14	17 9	
Wing-walls	2	11 6	2 6	9 3	531 10½	
Do.	2	0 8	2 0½	5 6	21 1	
Do.	2	1 4	1 10½	3 9	18 9	
Wing-walls at elevating platform side ...	2	11 6	2 16	9 3	531 10½	
Face walls at abutment	2	10 8	1 0½	1 4½	55 10	
Filling up spandrels	2	12 6	1 16	2 10	106 3	
Do. do.	2	12 6	2 9	1 0	68 9	
Face walls	4	18 6	1 9	0 10½	113 4	
Do. at elevating platform	2	8 0	1 7½	0 7½	16 3	
Parapet walls excluding cordon and coping work	2	82 6	1 3	2 0	412 6	
Total					5,948 7½	
Deduct for arches	1	12 6	2 2	1 6	40 7½	
Net Cubic feet					5,908 0	
Or Cubic yards of brick work in chunam ...					218½	
Arches	3	22 0	12 6	1 6	1,237 6	
Cubic feet					1,237 6	
Or Cubic yards of arch work, brick-in-chunam ...					45½	
<i>Pointing with chunam.</i>						
Side walls and intrados of arches	3	26 9	12 6		1,003 0	
Cut waters of piers including caps	4	5 0	6 9		135 0	
Wing-walls including faces and cut waters	4	15 6	9 3		573 6	
Abutments of elevating platform	2	12 6	9 9		243 9	
Cut waters including caps of do.	12	6 0	11 9		141 0	
Face walls over arches	2	8 0	2 5		232 0	
Spandrel walls over cut waters of piers ...	4	1 2 6	4 0		40 0	
Parapets in and out, &c.	2	69 9	2 0		679 0	
Square feet of pointing chunam					3,047 3	
Cut-stone cordon work	2	82 6			165 0	
Running feet of cut-stone cordon work ...					165 0	
Cut-stone coping work	2	82 6			165 0	
Running feet cut-stone coping					165 0	

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

KISTNA DISTRICT.—(Concluded.)

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
<i>Wood Work.</i>		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Posts	4	16 2	0 10	0 10	45 0
Cross beams over posts	2	13 2	1 0	0 8	17 7
Beams to platform	3	17 6	0 9½	0 6	20 9
Tie struts	2	14 6	0 9½	0 7	13 4
Planks	...	17 6	10 0	0 2	29 2
Projections of planks for railing	6	1 0	0 6	0 2	0 6
Top and side rails including projections ...	2	19 0	0 2½	0 3	2 0
Railing posts do. do.	6	2 6	0 2½	0 3	0 9
Struts	6	2 9	0 2½	0 3	0 10
Cubic feet of teak-wood					130 0
Chains, iron	4	16 0			64
Running feet of iron chain					64
Iron weights, nails, and straps, &c.					3,600
Total lbs. of iron					3,600
Iron rings with screw and nuts	4				
Iron pulleys with do. do.	4		1.....		
Metalling roadway		73 0	0 0	0 7½	456½
Cubic feet					456½
Or Cubic yards of metalling with kunkur					16½
Centerings					
Baling water					
Fitting up elevating platform					
Excavating foundation and raising approaches, &c.					
Sundries and Contingencies					

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing accommodation Bridge with elevating platform on Ryves' Channel for the use of the villagers and the maintenance of district navigation.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS.
218½	Cubic yards of brick-in-chupam ...	5 8 0	1,203 7 8	
45½	Do. of arch work, brick-in-chunam ...	6 12 0	309 6 0	
3,047.	Square feet of pointing ...	1 8 0	45 11 3	
105	Running feet of cut-stone cordon work ...	0 4 0	41 4 0	
165	Do. of do. coping work ...	0 6 0	61 14 0	
130	Cubic feet of teak-wood wrought and put up.	2 8 0	325 0 0	
61	Running feet of iron chain ...	1 0 0	64 0 0	
3,600	lbs. of iron for weights, nails, and straps, &c.	0 1 6	337 8 0	
4	Iron rings with screw and nuts ...	2 8 0	10 0 0	
4	Iron pulleys with do. do. ...	13 0 0	52 0 0	
16½	Cubic yards of metalling roadway with brick kunkur ...	1 8 0	25 5 7	
	Centerings ...		125 0 0	
	Baling water ...		60 0 0	
	Fitting elevating platform ...		25 0 0	
	Excavating foundations and raising approaches, &c. ...		75 0 0	
	Sundries and Contingencies ...	2 8 0	69 7 6	
				2,830
	For another similar bridge ...			2,830
	Total ...			5,660

Specification for accommodation Bridges on Ryves' Channel.

- These bridges are for the accommodation of the neighbouring villagers, who would otherwise be cut off by the water of canal from the adjacent country.
- They will consist of three arches of 16 feet span and one bay with an elevating platform, which will be balanced by counterpoise weights, so that they can be raised or lowered by the strength of one man.
- The arches will have a rise of 4 feet, and be oval in form as shown on plan.
- Each pier will be 3 feet 9 inches in height, and 2 feet 6 inches in thickness.
- The width of roadway will be 10 feet, and the parapets will be 1 foot 3 inches thick, and 2 feet 3 inches in height, including cornice work.
- The whole will be built of brick and chunam, pointed very neatly.
- The elevating bridge will be of teak-wood of the scantlings shown in estimate. The counterpoises will be formed of old iron. The pulleys, chain, &c., will be obtained from the stores at Madras.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

MASULIPATAM,
10th July 1867.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing accommodation Bridge across Pullairu at Murrevada, below junction of Ryves' Channel.

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Feet.	Feet.	Feet.	Feet.
Foundations to abutments, counted Squares.	3	18½	4½	4	1,054½
Do. to piers, do.	3	18½	3½	4	721½
Do. to wings ...	4	11½	3½	4	644
Retaining wall ...	1	94½	1½	2	329½
<i>Superstructure.</i>					
Abutments ... counted Square	1	17	3½	3	178½
Do. ... do.	2	17	4½	11½	1,518½
Piers ... do.	3	17	2½	3	352½
Wings ...	4	11½	2½	11½	1,284½
Do. ...	2	½	2½	4½	17½
Do. ...	2	1½	1½	6	30
Caps ...	6	2½	1½	1½	33½
Backing to abutment ...	1	12½	1½	1½	20½
Do. to arch ...	1	12½	3½	½	18½
Spandrels ...	3	12½	9	½	253½
Do. ...	1	12½	4	½	33½
Face walls ...	2	67½	1½	½	185½
Do. ...	2	12½	12½	2	625
Do. ...	2	10	12½	½	104½
Blocking course ...	2	91	1½	½	182
Parapets ...	2	118	1½	2	590
Total brick-in-chunam, Cubic feet...	...	...	...	...	8,206
Or do. do. Cubic yards.	...	...	...	...	303½
Arch work ...	4	27½	12½	1½	2,177
Total arch work-in-chunam, Cubic yards...	...	...	...	...	80½
Cut-stone cordon work ... Running feet...	2	114	...	...	228
Total Running feet...	...	...	...	...	228
Cut-stone coping work ...	2	114	...	...	228
Total Running feet...	...	...	...	...	228
<i>Wood Work.</i>					
Posts ...	4	16½	½	½	45
Cross beams over posts ...	2	13½	1	½	17½
Beams for platform ...	3	17½	½	½	20½
Tie struts ...	2	14½	½	½	13½
Planks ...	...	17½	10	½	29½
Projection of planks for railing ...	6	1	½	½	½
Top and side rails including projections ...	2	19	½	½	2
Railing posts do. do.	6	2½	½	½	½
Struts ...	6	2½	½	½	½
Total teak-wood wrought and put up, Cubic feet	...	...	...	...	130
Pointing ... Squares	...	...	...	...	49

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.—(Concluded.)

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Feet.	Feet.	Feet.	Feet.
Chains, iron	4	16	...	...	64
Total Running feet of iron chain...	...	...	...	...	64
Iron weights, nails, and straps, &c. ...	...	...	...	...	3,600
Total lbs. of Iron...	...	...	...	...	3,600
Iron rings with screw and nuts	4	...	...	...	...
Do. pulleys with do.	4	...	...	...	...
Metalling	...	108	9½	...	769½
Total Metalling, Cubic yards	...	...	...	...	28½
Centerings	...	...	...	...	...
Baling water... ..	...	...	...	...	...
Fitting up elevating platform	...	...	...	...	...
Excavating foundations and raising approaches	...	...	...	...	...
Sundries and Contingencies	...	...	...	...	...

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing accommodation Bridge across Pullairu at Murrevada, below junction of Ryves' Channel.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS. A. P.
304	Cubic yards of brick-in-chunam	5 8 0	1,672 0 0	
81	Do. of arch work in do.	6 12 0	516 12 0	
49	Squares of pointing	1 8 0	73 8 0	
228	Running feet of cut-stone cordon work ...	0 5 6	78 6 0	
228	Do. do. of coping work	0 6 0	85 8 0	
130	Cubic feet teak-wood wrought and put up	2 8 0	325 0 0	
64	Running feet of iron chain	1 0 0	64 0 0	
3,600	lbs. of iron for weights, nails, and straps, &c.	0 1 6	337 8 0	
4	Iron rings with screw and nuts	2 8 0	10 0 0	
4	Iron pulleys with do.	13 0 0	52 0 0	
28½	Cubic yards of metalling	1 8 0	42 12 0	
	Centerings... ..	0 0 0	120 0 0	
	Baling water	...	100 0 0	
	Fitting up elevating platform	...	25 0 0	
	Excavating foundation and raising approaches ...	...	50 0 0	3,582 6 0
	Sundries and Contingencies	...	...	127 10 0
	Total Estimate	...	...	3,710 0 0

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

Specification for accommodation Bridges on Ryves' Channel.

1. This bridge is for the accommodation of the neighbouring villagers, who would otherwise be cut off by the water of canal from the adjacent country.
2. It will consist of four arches of 20 feet span each and one bay with an elevating platform, which will be balanced by counterpoise weights, so that it can be raised or lowered by the strength of one man.
3. The arches will have a rise of 6 feet and be oval in form as shown on plan.
4. Each pier will be 3 feet in height and 2 feet 6 inches in thickness.
5. The width of roadway will be 10 feet and the parapets will be 1 foot 3 inches thick and 2 feet 3 inches in height, including coping.
6. The whole will be built of brick-in-chunam pointed very neatly.
7. The elevating bridge will be of teak-wood, of the scantlings shown in estimate. The counterpoises will be formed of old iron. The pulleys, chain, &c., will be obtained from the stores at Madras.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

MASULIPATAM,
10th July 1867.

DETAILED ESTIMATE.
KISTNA DISTRICT.

WORK.—Alterations and additions to Komatigoonta Calingulah and Ryves' Branch
Head Sluice as now proposed.

Particulars of Works.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
<i>Calingulah.</i>					
<i>Foundation.—Rubble masonry or brick-in-chunam.</i>					
Body wall ...	1	21 9	4 0	6 0	522 0
Wing-wall ...	1	8 0	5 0	6 0	240 0
Abutment ...	1	11 3	5 9	3 6	226 5½
Do. ...	1	8 0	2 0	3 6	56 0
Wing ...	1	7 6	4 0	3 6	106 0
Piers including cut waters ...	2	12 6	4 0	3 6	350 0
Rear retaining wall ...	1	4 6	3 0	6 0	81 0
Front do. to the bridge ...	1	49 0	2 6	4 0	490 0
Flooring ...	1	21 0	15 3	2 0	640 6
<i>Superstructure.</i>					
Body wall, new work ...	1	8 6	2 9	2 6	58 5½
Do. do. throughout ...	1	45 6	1 10½	1 5½	125 3
Wing ...	1	20 0	3 3	10 0	650 0
Abutment ...	1	11 3	4 9	3 0	160 3½
Do. ...	1	8 0	1 6	3 0	36 0
Do. backing ...	2	11 3	3 6	1 6	118 1½
Wing ...	1	7 6	2 6	9 9	182 9½
Piers including cut waters ...	2	12 6	3 0	3 9	281 3
Rear retaining wall ...	1	54 0	2 0	1 6	162 0
Spandrels ...	2	11 3	3 6	1 9	137 9½
Side or face walls ...	2	52 0	2 0	1 8	346 8
Blocking course ...	2	52 0	1 6	0 6	78 0
Parapet ...	1	145 0	1 3	2 0	362 6
Total rubble masonry, Cubic feet ...	...				5,411 0½
Or Cubic yards ...	...				200 1½
Arch work, brick-in-chunam ...	3	11 3	21 0	1 6	1,063 1½
<i>Pointing in chunam.</i>					
Body wall, new ...	1	8 6	7 6		63 9
Do. throughout ...	1	45 6	5 6		250 3
Wing do. ...	1	11 0	14 0		154 0
Abutments ...	2	11 3	3 0		67 6
Piers including cut waters ...	4	14 6	3 3		188 6
Wing ...	1	12 0	9 0		108 0
Intrados of the arch ...	3	11 3	22 0		742 6
Side or face walls ...	2	71 0	2 9		390 6
Parapets ...	2	71 0	2 7½		372 9
Rear retaining wall, above ...	1	54 0	3 6		189 0
Flooring ...	1	21 0	15 3		320 3
Total pointing, Square feet ...	...				2,816½
Or Squares ...	...				28½
Rough stone apron in rear of bridge ...	{ 2	23 0	2 6	12 6	1,437 6
Do. backing in front of calingulah ...	{ 1	64 6	20 0	2 0	2,570 0
	1	13 0	2 7½	12 6	426 6½
Total rough stone, Cubic feet ...	...				4,434 0½
Or Cubic yards ...	...				164 ½

DETAILED ESTIMATE.—(Concluded.)

Particulars of Works.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Excavating foundation ...	...				18½
Centering and baling ...	...				...
Metalling ...	...				...
Add for removing old materials ...	...				...
Sundries and Contingencies ...	...				...
<i>Head Sluice.</i>					
<i>Foundation.—Rubble masonry or brick-in-chunam.</i>					
Abutment ...	1	11 3	4 0	4 0	180 0
Wing ...	1	15 0	3 0	4 0	180 0
Do. ...	1	6 0	4 0	4 0	96 0
Front retaining wall ...	1	11 0	2 0	6 0	132 0
Rear do. ...	1	4 0	2 0	6 0	48 0
Flooring ...	1	13 0	9 6	1 6	185 3
Do. ...	2	17 0	4 0	1 6	204 0
<i>Superstructure.</i>					
Abutment ...	1	11 3	3 0	4 0	135 0
Do. backing ...	1	11 3	1 0	4 0	45 0
Wing ...	1	15 0	1 9	6 0	157 6
Do. ...	1	6 0	1 9	8 0	84 0
Side or face walls including binding wall ...	2	14 0	1 1½	1 0	31 6
Total rubble stone or brick-in-chunam, Cubic feet ...	...				1,478 3
Or Cubic yards ...	...				54½
Arch work, brick-in-chunam... Cubic feet.	2	11 3	8 0	1 6	270
Pointing in chunam ... Squares.	...				6½
Rough stone apron in rear ...	{ 2	26 0	2 6	10 3	1,332 6
	1	31 0	13 0	2 0	806 0
Total rough stone, Cubic feet ...	...				2,138 6
Or Cubic yards ...	...				79½
Teak-wood shutters ... Cubic feet.	2	4 6	8 0	2½	15
Cut-stone grooves ... Running feet.	...				32
Excavating foundation ...	...				...
Centering and baling ...	...				...
Metalling... Cubic yards.	...				6½
Add for removing old materials ...	...				...
Sundries and Contingencies ...	...				...

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Alterations and additions to Komatigoonta Calingulah and Ryves' Branch Head Sluice as now proposed.

Quantity.	Particulars of Works.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS. A. P.
	<i>Calingulah.</i>			
200 1/2	Cubic yards of rubble masonry or brick-in-chunam ...	5 8 0	1,102 3 10	
1,063-1 1/2	Cubic feet of arch work, brick-in-chunam ...	0 4 0	265 12 6	
28 1/2	Squares, pointing, chunam ...	1 8 0	42 12 0	
164 1/2	Rough stone revetment ... per C. yd.	2 10 0	43 1 4	
	Excavating foundation ...		50 0 0	
	Centering and baling ...		150 0 0	
18 1/2	Cubic yards metalling with brick kunker ...	1 8 0	27 12 0	
	Add for removing old materials ...		10 0 0	
	Sundries and Contingencies at 5 per cent. ...		110 6 4	2,190 0 0
	<i>Head Sluice.</i>			
54 1/2	Cubic yards of rubble masonry or brick-in-chunam ...	5 8 0	301 13 0	
270	Cubic feet of arch work, brick-in-chunam ...	0 4 0	67 8 0	
6 1/2	Squares, pointing in chunam ...	1 8 0	10 2 0	
79 1/2	Cubic feet rough stone apron ...	2 10 0	208 13 4	
15	Do. teak-wood shutters wrought and put up ...	3 0 0	45 0 0	
32	Running feet cut-stone grooves ...	0 12 0	24 0 0	
	Excavating foundation ...		20 0 0	
	Centering and baling ...		40 0 0	
6 1/2	Cubic yards metalling with brick kunker ...	1 8 0	9 12 0	
	Add for removing old materials ...		10 0 0	
	Sundries and Contingencies ...		42 15 8	780 0 0
	Grand Total...			2,970 0 0

Specification Report to accompany Plan and Estimate for proposed alterations and additions to Komatigoonta Calingulah and Ryves' Branch Head Sluice.

CALINGULAH.

1. Waterway of existing calingulah to be enlarged by 20 feet 6 inches, and a bridge of three arches 16 feet span each to be built in connection with calingulah and immediately below it.
2. The foundation of the abutment to be 5 feet 9 inches broad and 3 feet 6 inches in depth, of the piers 4 feet and 3 feet 6 inches in depth, superstructure of piers and abutment 3 feet in height.
3. The foundation of wings to be 4 feet in average breadth, 3 1/2 in depth, their superstructure to be 9 1/2 feet high.

4. The front retaining wall of the bridge to be 3 feet at bottom, 2 feet at top, and 4 feet in depth.

5. The arches of vents to have a versed sine of 4 feet 6 inches, and to be 1 1/2 thick.

6. The calingulah constructed in 1. is shown in lake in the plan. The parts colored green show the existing work to be removed.

7. The blocking course to be 1 1/2 feet wide and 6 inches high.

8. The parapet 1 1/2 feet wide and 2 feet high.

9. The foundation of body wall of calingulah is to be 4 feet in average breadth and 6 feet in depth.

10. The body wall to be 3 feet 11 1/2 inches high.

11. The foundation of the rear retaining wall to be 3 feet in average breadth and 6 feet depth. The wall itself to be 1 1/2 feet x 2 feet.

12. The flooring between pier and abutment is to be 15 feet in breadth and 2 feet in depth.

13. The rough stone apron in rear to be 20 feet wide 2 feet thick, and the revetment at sides to be 12 1/2 broad, 2 feet 6 inches thick, with slopes of 1 to 1.

HEAD SLUICE.

1. The head sluice to be increased from three to five vents, the dimensions being as follows:—

2. The foundation of the abutments to have an average width of 4 feet and the piers of 3 feet, both to be 4 feet high.

3. The abutment walls to be 3 feet on an average, and piers of 2 feet 6 inches average breadth, and 4 feet in height.

4. The foundation of wing-wall to be 3 feet 6 inches at bottom, 2 feet 6 inches at floor, 4 feet in depth, and the wall above to be 1 foot 9 inches breadth on an average, and 6 feet in height.

5. The arches of vents to have each a versed sine of 2 feet and to be 1 1/2 feet thick. The three arches constructed in 1861 are shown in lake in the plan.

6. The parts colored green show the existing work to be removed.

7. Teak-wood shutters to be worked in grooves cut in hard stone in the abutments and piers.

8. The flooring under the arches and rear to be 1 foot 6 inches thick, and the retaining wall between front and rear wings to be 2 feet thick and 6 feet deep.

9. Rough stone apron in rear to be 13 feet wide 2 feet thick, and revetment at sides to be 10 feet 3 inches broad, and 2 feet 6 inches in average thickness.

10. The foundations and superstructure to be rubble masonry or brick-in-chunam, and arch work to be of the latter.

11. All the works to be neatly pointed with chunam.

(Signed) G. V. WINSOM, Lieut.-Colonel; R. E.,
Superintending Engineer, 2nd Division.

MASULIPATAM,
10th July 1867.

DETAILED ESTIMATE.

WORK.—Enlarging and improving Gudarah branch of Ryves' Channel.

Num- ber of Sta- tions.	Distance.	Area of cutting.	Total cutting in each mil	Extra quantity required for embankment.	Total earth- work for each mile.	Total for the whole channel.
1	660	105.922	427,823.22	91,934.4	522,757.62	
2		99.981				
3		103.431				
4		70.382				
5		119.196				
6		47.522				
7		60.513				
8		41.27				
9	660	90.948	253,481.88		253,481.88	
10		18.476				
11		49.988				
12		40.002				
13		2.47				
14		66.646				
15		52.55				
16		62.988				
17	660	100.614	290,842.86	243,957.12	531,779.98	
18		59.593				
19		78.949				
20		5.522				
21		70.277				
22		43.74				
23		62.180				
24		19.796				
25	660	76.297	568,096.32		568,096.32	
26		103.666				
27		52.275				
28		49.887				
29		112.642				
30		76.691				
31		100.68				
32		288.614				
33	660	97.456	875,762.58	7,529.28	883,291.86	
34		105.675				
35		83.968				
36		99.405				
37		100.813				
38		711.623				
39		66.65				
40		61.323				
	660	1,326.913	875,762.58	7,529.28	883,291.86	

DETAILED ESTIMATE.—(Continued.)

Num- ber of Sta- tions.	Distance.	Area of cutting.	Total cutting in each mile.	Extra quantity required for embankment.	Total earth- work for each mile.	Total for the whole channel.
41	660	167.299	1,006,670.28		1,006,670.28	
42		147.007				
43		128.614				
44		217.557				
45		478.334				
46		111.781				
47		133.034				
48		141.632				
49	660	143.251	736,731.9		736,731.9	
50		275.196				
51		195.509				
52		106.309				
53		78.6				
54		135.988				
55		108.89				
56		72.522				
57	660	102.973	449,898.24		449,898.24	
58		109.361				
59		82.176				
60		37.688				
61		104.304				
62		75.666				
63		72.8				
64		96.696				
65	660	63.48	758,915.52		758,915.52	
66		216.749				
67		126.067				
68		111.692				
69		152.854				
70		152.247				
71		177.571				
72		149.212				
73	660	161.427	854,905.26		854,905.26	
74		462.549				
75		114.976				
76		110.647				
77		91.297				
78		109.145				
79		109.396				
80		132.874				
81	660	88.322				
82		43.854				

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.—(Continued.) /

Num- ber of Sta- tions	Distance.	Area of cutting.	Total cutting in each mile.	Extra quantity required for embankment.	Total earth- work for each mile.	Total for the whole channel.
83 84 85 86 87 88	660	94-96 59-741 98-697 102-867 125-501 92-528	466,270-2		466,270-2	
89 90 91 92 93 94 95 96		706-47 105-545 146-2 90-817 186-066 85-203 103-965 106-044 82-701				
97 98 99 100 101 102 103 104	660	906-544 239-641 89-998 71-801 82-301 38-858 288-53 17-592 37-21	598,319-04		598,319-04	
105 106 107 108 109 110 111 112		865-931 76-416 69-132 75-142 33-956 38-482 63-584 48-398 50-55				
113 114 115 116 117 118 119 120	660	455-66 86-626 42-072 42-027 1-456 12-626 14-277 34-667 13-899	300,735-6		300,735-6	
121 122 123 124		247-65 21-721 43-553 18-355 10-303				
	660		163,449	292,253-28	455,702-23	

*Proceedings of the Madras Government, Public Works Department.
20th August 1867.*

DETAILED ETIMATE.—(Concluded.)

Num- ber of Sta- tions.	Distance.	Area of cutting.	Total cutting in each mile.	Extra quantity required for embankment.	Total earth- work for each mile.	Total for the whole channel.
125 126 127 128	660	31-356 21-578 6-844 15-482	111,653-52	260,795-04	372,448-56	
129 130 131 132 133 134 135 136		169-172 41-869 16-424 12-691 25-069 18-655 22-564 16-4 27-878				
137 138 139 140 141 142 143 144	660	181-55 39-193 33-93 25-167 54-383 42-762 28-843 31-843 32-214	119,823-0	210,518-88	330,341-88	
145 146 147 148 149 150 151 152		288-335 65-303 32-647 33-826 47-591 23-164 35-421 36-997 36-863				
153 154 155 156 157	660	311-812 31-064 41-352 31-301 31-472 44-533	205,795-92	269,016-0	474,811-92	
Or C. yards ...		179-722	118,616-52		118,616-52	10,611,710-34
		...				393,026-3

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Enlarging and improving Gudavadah branch of Ryves' Channel.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS.
593,026	Cubic yards of earth-work, per cubic yard...	0 1 1	26,611 2 2	
	Contingencies		183 13 10	
	Total Estimate			26,800

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing an accommodation Bridge on Ryves' Branch Channel.

Particulars of Works.	No.	- MEASUREMENTS.			Cubical contents.	
		Length.	Breadth.	Depth or height.		
<i>Concrete foundations.</i>						
Under Abutments	2	Ft. In. 15 9	Ft. In. 4 9	Ft. In. 2 0	Ft. In. 299 3	
Piers	2	15 0	3 6	2 0	210 0	
Wing-walls	4	7 6	2 9	2 0	165 0	
Retaining walls... ..	6	9 0	2 0	1 0	108 0	
Floor	3	8 6	12 9	0 6	162 6½	
Cubic yards...	...				944 9½ 34½	
<i>Masonry foundations.</i>						
Abutments	2	15 9	3 9	2 0	236 3	
Piers	2	14 6	2 6	2 0	145 0	
Wing-walls	4	7 6	2 0	2 0	120 0	
Retaining walls	6	9 0	1 3	2 0	135 0	
Floor	3	8 6	12 9	6 0	1,950 9	
<i>Superstructure.</i>						
Abutments	2	15 9	2 9	3 6	303 2½	
Do.	2	15 9	1 10½	1 3	73 10	
Do. backing	2	15 9	3 0	0 3	23 7½	
Piers, including skew-backs	2	12 6	2 0	4 1	204 2	
Cut-waters	4	1 0	2 0	4 6	36 0	
Wing-walls... ..	4	7 6	2 0	6 4½	382 6	
Blocking course	2	48 0	1 6	0 9	108 0	
Parapet... ..	2	48 0	1 3	1 0	120 0	
Spandrels... ..	2	2 6	12 6	0 6	31 3	
Face walls	2	30 6	1 6	1 0	91 6	
Cubic feet	...				3,961 0½	
Cubic yards...	...				146½	
<i>Arch Work.</i>						
Arch	3	12 0	12 6	1 4½	618 9	
Gordon work, Running feet	...		...		96	
Pointing in chunam	...				87 6	
Abutments	2	12 6	3 6		231 0	
Piers, including cut-waters	4	16 6	3 6		412 6	
Soffit of arch	3	11 0	12 6		344 3	
Flooring	3	9 0	12 9		186 0	
Side or face wall	2	31 0	3 0		242 6	
Parapets	4	48 6	1 3		142 6	
Wing-walls	2	9 6	7 6		1,646 3	
Or Squares...	...				16½	
Metalling	1	10 0	46 0	0 6	230 0	
Or Cubic yards...	...				8½	
Excavating foundation and baling	...					
Centering... ..	...					
Approaches	...					
Sundries and Contingencies	...					

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing an accommodation Bridge on Ryves' Branch Channel.

Quantity.	Description of Work.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS. A. P.
35	Cubic yards of concrete ...	3 0 0	105 0 0	
146½	Do. brick masonry in chunam...	5 0 0	733 5 4	
618½	Do. feet of arch brick-in-chunam	0 4 0	131 11 0	
96	Running feet of cordon work ...	0 2 0	12 0 0	
16½	Squares pointing in chunam ...	1 8 0	21 12 0	
8½	Cubic yards of metalling with brick kunkur ...	2 0 0	17 0 0	
	Excavating foundation and baling ...		60 0 0	
	Centering ...		60 0 0	
	Approaches ...		35 0 0	
			1,201 12 4	
	Sundries and Contingencies at 5 per cent.		58 3 8	1,260 0 0
	For two other Estimates ...			2,520 0 0
	Total Estimate...			3,780 0 0

Specification Report to accompany the Plan and Estimate for constructing an accommodation Bridge of three arches of nine feet span each, to be built on Ryves' Channel.
Estimate Rupees 1,260.

- The foundation of the abutments and piers including cut-waters are to be 2½ and 3½ feet thick and 2 feet deep, and superstructure to be 3 and 2 feet thick at the floor and 2½ and 2 feet at the springing line, and 3½ feet high.
- Foundation of wing-walls to be 2 feet thick and 2 feet deep; and above 2 feet in thickness and 6½ feet in average height.
- The bridge to consist of three arches of 9 feet span each, with versed sine of 2½ feet, giving a total height of 5½ feet to the soffit of the arch; the thickness of the arch to be 1½ feet at the haunches and 1½ feet at the crown.
- Flooring between two retaining walls to be 6 inches thick, underlaid with 6 inches of concrete.
- Retaining walls connecting piers and abutments to be 1½ feet thick and 2 feet deep.
- The face walls to be 1½ feet thick and 1 foot in average height; the blocking course and parapets to be 1½ and 1½ feet thick, 1½ feet in height.
- The foundation to be of brick-in-chunam resting on concrete of 2 feet thickness, excepting for retaining walls, when the concrete will be 1 foot thick.
- All the work to be neatly pointed with chunam joints.

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

DETAILED ESTIMATE.

KISINA DISTRICT.

WORK.—Constructing two Calingulahs and Bridges on the Gudivadah branch of Ryves' Channel.

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Feet.	Feet.	Feet.	Feet.
Concrete under flooring, &c. ...	...	21	19	½	199½
Do. do. ...	...	4	4	½	8
Total concrete-in-chunam, Cubic feet...	...	...	...	...	207½
Or total do. do. Cubic yards...	...	...	...	...	7½
Foundation to abutments and side walls ...	2	21½	5½	5	1,182½
Pier including cut waters ...	1	14½	4	5	286½
Front wings and returns ...	2	11½	5½	5	632½
Rear do. do. ...	2	28	5½	5	1,540
Retaining wall between abutments and pier.	1	19	1½	3½	92½
Do. between rough stone aprons ...	1	45½	1½	3½	199½
Body wall ...	1	23	2½	5½	321½
Floorings ...	1	17	19	1½	403½
Do. ...	1	4	4	1½	20
Superstructure.					
Abutments above ...	2	12½	3½	5½	500
Side wall above ...	2	6	2½	9½	340½
Do. ...	2	2½	2½	6	86½
Pier do. ...	1	13½	3	5½	216
Front wings and returns ...	2	11	2½	6	379½
Rear do. ...	2	20	2½	8½	989½
Do. returns ...	2	7½	2½	5½	230
Skew-backs for pier ...	1	12½	3	14½	14½
Do. for abutments ...	2	12½	2½	½	32½
Backing to abutments ...	2	12½	5	½	62½
Caps ...	1	3	1	½	1½
Spandrels ...	1	12½	3	1½	56½
Face walls ...	2	13½	1½	1½	42½
Do. ...	2	13	1½	1½	56½
Blocking course ...	2	27½	1½	½	23½
Steps ...	2	2½	2½	2	22½
Parapets to do. ...	2	3½	1½	3½	32½
Do. ...	2	1½	1½	7½	24½
Total Cubic feet ...	...	...	...	...	7,789½
Deduct for steps and parapets ...	...	...	...	...	50½
Total rough stone-in-chunam, Cubic feet.	...	...	...	...	7,738½
Or total do. do. Cubic yards.	...	...	...	...	286½
Brick work.					
Arch work ...	2	12½	13	1½	406½
Parapets ...	2	70	1½	2	350
Total brick-in-chunam, Cubic feet ...	...	...	...	...	756½
Or total do. do. Cubic yards ...	...	...	...	...	23
Rough stone apron ...	1	44	13½	2	1,210
Do. ...	1	44½	5	1½	333½
Do. revetment ...	2	16½	11½	1½	556½
Total rough stone, Cubic feet...	...	...	...	...	2,100½
Or total do. Cubic yards...	...	...	...	...	77½

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.—(Concluded.)

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Feet.	Feet.	Feet.	Feet.
Pointing Squares. ...	...	...	...	...	37½
Excavating foundations ... Cubic yards. ...	...	...	...	...	339
Teak-wood shutters... .. Cubic feet. ...	...	...	...	...	12½
Iron posts	3	...	...	...	...
Groove work Running feet. ...	...	...	...	...	5
Centerings and baling	...	...	...	...	...
Sundries and Contingencies	...	...	...	...	...

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing two Calingulahs and Bridges on the Gudivadah branch of Ryves' Channel.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS. A. P.
8	Cubic yards of concrete-in-chunam, per			
	Cubic yard	2 6 0	19 0 0	
287	Do. of rough stone-in-chunam, per			
	Cubic yard	3 0 0	861 0 0	
756	Cubic feet of arch work brick-in-chunam,			
	per Cubic foot	0 4 0	189 0 0	
78	Cubic yards of rough stone work, per			
	Cubic yard	1 0 0	78 0 0	
37½	Squares of pointing ... per Square...	1 8 0	56 4 0	
12½	Cubic feet of shutters teak-wood wrought			
	and put up	3 0 0	36 12 0	
3	Iron posts, each	12 0 0	36 0 0	
5	Running feet of groove work, per			
	Running foot	0 12 0	3 12 0	
339	Cubic yards of earth-work, per Cubic yard.	0 1 3	26 7 9	
	Centerings		100 0 0	
	Baling			1,406 3 9
	Sundries and Contingencies 5 per cent.			73 12 3
	Total Estimate Rupees for one.			1,480 0 0
	Do. do. for two.			2,960 0 0

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

Specification Report to accompany Plan and Estimate for constructing two Calingulahs and Bridges on the Gudivadah Branch of Ryves' Channel.

1. The foundation of abutments of bridges, including side walls of calingulahs, to be 21½ feet long, 5½ feet thick, and 5 feet deep.
2. Foundation of pier including cut water to be 14½ feet long, 4 feet thick, and 5 feet deep.
3. Foundation of front and rear wing-walls with returns to be 5½ feet thick and 5 feet deep, and above 2½ in average thickness, and the former 6 feet high and the latter 8 feet 7½ inches.
4. Body wall to be 2½ feet wide, and 5 feet 7 inches in height, or 4 feet 4 inches above the floor, on which three cast-iron posts of 2½ feet high will be placed, thus dividing the water-way into four bays of 5½ feet each to be closed, when water is required, with two planks each, with iron rings. The side walls to be furnished with grooves cut in hard stone in which the planks can be worked.
5. Five steps to be built on each side of the side walls, as shown in plan, to facilitate the Lascars in working the planks. Side walls above 8½ feet × 2½ av. × 8 feet av.
6. Abutments above 12½ feet long 4½ feet wide at bottom, and 3 feet at the springing line, and 5 feet 4 inches high.
7. Pier above, including cut water, to be 13½ feet × 3 feet × 5 feet 4 inches. Bridge consisting of two arches of 10½ feet span each, with a versed sine of 3 feet and 1½ feet thick to be constructed.
8. Flooring between abutments and pier to be 1½ feet thick, resting on a concrete of 6 inches thick.
9. Retaining walls between abutments and rear wings to be 1½ and 1½ feet thick, and 3½ and 3½ feet high respectively.
10. The face walls and backing to be 5 and 1½ feet thick, and 1½ and ½ foot in average height.
11. The blocking course over the arch to be 1½ feet thick and 3½ inches in height.
12. The parapet walls to be 1½ feet thick and 2 feet high.
13. The rough stone aprons and revetments as shown in plan to be 13½ and 5 feet wide, 2 and 1½ feet thick to the former and 10 feet wide, 1½ feet thick to the latter.
14. Foundation and superstructure to be of rubble masonry.
15. Arch work and parapets to be of brick-in-chunam, and the whole to be pointed neatly.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Masulipatam,
10th July 1867.
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

GENERAL ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Enlarging and improving the Ellore Canal, Ryves' Canal, and its branch, and erecting the necessary masonry works.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
	Constructing two additional arches to the bridge at the head of Ellore Canal ...	...	RS. 10,340	RS.
	Enlargement of the Ellore Canal from the head near Bezoarah to the head of Ryves' channel, between the 7th and 8th mile ...	...	1,88,440	
	Enlarging the head sluice of Ryves' channel ...	...	5,400	
	Enlarging and improving Ryves' channel from head sluice to Pullairu near Murrevada ...	...	60,580	
	Constructing a bridge of five arches of 23 feet span on Ryves' channel at crossing the Ellore road ...	...	4,170	
	Constructing two accommodation bridges with elevating platforms on Ryves' channel ...	...	5,660	
	Constructing accommodation bridge across Pullairu at Murrevada, below junction of Ryves' channel ...	...	3,710	
	Alterations and additions to Komatigoonta calingulah and Ryves' branch head sluice as now proposed ...	...	2,970	
	Enlarging and improving Gudevadah branch of Ryves' channel ...	...	26,800	
	Constructing three accommodation bridges on Ryves' branch channel ...	...	3,780	
	Constructing two calingulahs and bridges on the Gudevadah branch of Ryves' channel ...	...	2,960	
	Sluices and minor channels ...	...	5,000	
				3,25,810

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.

ALTERNATIVE LINE.—KISTNA DISTRICT.

WORK.—Constructing Sluice and Bridge at head of proposed new line for Ryves' Channel at Bezoarah. The Bridge will answer for both the Ellore and Masulipatam roads.

Particulars of Work.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
<i>Foundation.</i>					
Abutments	2	Ft. In. 21 0	Ft. In. 11 6	Ft. In. 6 0	Ft. In. 2,898 0
Piers including rear cut waters	2	28 1½	8 9	6 0	2,953 0
Front cut waters of piers	2	6 10½	2 10½	6 0	237 2
Front do. of abutments including projections for sluices	2	7 6	6 0	6 0	540 0
Rear do. of abutments	2	7 6	1 9	6 0	157 6
Piers for sluices	12	8 0	3 6	6 0	2,016 0
Wing walls	4	14 0	6 4½	6 0	2,142 0
Pedestals at termination of wings	4	4 0	3 10½	6 0	372 0
Side walls to masonry path	2	10 0	5 0	2 0	200 0
Do. above floor	2	10 0	3 7½	4 0	290 0
Rear retaining wall	...	115 6	3 0	6 0	2,079 0
Front retaining walls between piers	9	6 6	3 0	5 6	965 3
Do. do. piers and abutments	6	5 9	3 0	5 6	569 3
<i>Superstructure.</i>					
Abutments	2	21 0	8 0	14 0	4,704 0
Backing to abutments... ..	2	21 0	5 6	0 4½	86 7
Piers, large, including skew-backs	2	21 0	6 6	5 9	1,569 9
Rear cut waters of large piers including caps.	4	6 6	1 8	6 6	281 8
Projection of large piers for sluices	4	6 6	5 0	10 0	1,300 0
Front cut waters of do. do.	4	5 3	2 0	10 0	420 0
Wing walls	4	14 0	4 2½	15 9	3,693 3
Do. at abutments... ..	4	6 4	3 0	14 0	1,064 0
Do. do.	4	11 0	3 1½	6 9	923 1
Pedestals at termination of wings	4	4 0	3 2½	10 9	548 3
Piers for sluices including cut waters	12	7 0	2 6	5 6	1,155 0
Cut waters of small piers above springing	12	2 0	1 0	5 6	132 0
Rear do. do.	12	2 0	1 0	3 9	90 0
Side walls to masonry path	2	10 0	2 3	10 0	450 0
Face walls for large arches	12	20 0	2 6	2 6	1,500 0
Filling spandrels do. do.	2	21 0	6 0	2 0	504 0
Face walls over piers do. do.	4	6 6	2 3	6 9	394 10
Do. of small arches	15	3 0	1 3	3 6	196 10
Flooring	3	39 0	21 3	1 0	2,486 3
Pedestals at termination of masonry path	2	2 0	0 3	10 0	10 0
Pilasters	4	4 0	0 6	10 9	86 0
Total Cubic feet... ..	...	...	...	...	37,019 0
Deduct for piers included in flooring... ..	12	7 0	2 6	1 0	210 0
Arches	2	21 0	4 0	4 3	714 0
Ashlar work	...	...	...	...	5,526 0
Vertical ashlar work	...	...	...	...	1,197 0
Total deductions... ..	...	...	...	...	7,617 0
Net Cubic feet... ..	...	...	...	...	29,372 0
Cubic yards of rough stone in chunam... ..	...	...	...	...	1,087½
Rear parapets excluding pedestals	...	183 0	1 6	2 9	754 10
Do. pedestals at termination of parapets	...	8 0	2 3	2 9	49 6
Front parapet wall excluding pedestals and pilasters	...	167 0	1 6	2 9	688 10

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.—(Continued.)

Particulars of Work.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Ft. In.	Ft. In.	Ft. In.	
Front parapet wall of sluice excluding cut waters and pedestals	...	167 0	1 0	1 6	250 6
Cubic feet...	...	...	...	...	1,743 8
Or Cubic yards of brick-in-chunam...	...	...	...	...	64 1/4
<i>Arch work.</i>					
Arches for bridge excluding ashlar work ...	3	55 6	18 0	3 1 1/2	9,365 7
Do. small, for sluices do.	15	12 0	3 6	1 6	945 0
Arches for spandrels	2	16 6	11 9	1 3	484 8
Cubic feet...	...	...	...	...	10,795 3
Or Cubic yards of arch work brick-in-chunam.	...	...	...	...	399 1/4
<i>Plastering.</i>					
Intrados of bridge arches excluding ashlar work	3	51 3	18 0	...	2,767 6
Do. sluice do. do. do.	15	10 0	3 6	...	525 0
Square feet of plastering two coats of chunam.	...	...	...	...	3,292 6
Pointing to front parapets in and out ...	...	350 0	2 9	...	962 6
Do. rear parapet	...	368 0	2 9	...	1,006 6
Do. to parapet of sluice inside	...	163 0	1 6	...	244 6
Do. do. outside	...	90 0	1 6	...	135 0
Square feet of pointing to parapet...	...	...	...	...	2,348 6
Cornice work	2	191 0	...	...	382 0
Running feet of cut-stone cornice work...	...	...	...	...	382 0
Cut-stone coping work including inside of parapet	2	202 0	...	...	404 0
Running feet of cut-stone coping work...	...	...	...	...	404 0
<i>Vertical Ashlar work.</i>					
Abutments including rear cut waters...	2	33 0	1 3	5 6	453 9
Piers including rear cut waters	2	59 0	1 3	5 6	811 3
Rear wing walls including pilasters up to cornice	2	22 0	1 3	10 6	577 6
Front wing walls	2	19 6	1 3	10 9	524 0
Masonry path	2	8 0	1 3	6 0	120 0
Front face walls over large arches	12	21 3	1 3	2 6	796 10
Rear do. over do. arches	12	20 0	1 3	2 6	750 0
Do. do. over piers and abutments	4	6 6	1 3	9 0	292 6
Caps to rear cut waters of piers and abutments.	4	6 6	1 3	3 0	97 6
Piers for sluice... ..	12	6 0	2 6	5 6	990 0
Cut waters of piers for do. above springing ...	12	2 6	1 0	3 9	112 6
Cubic feet...	...	...	...	...	5,526 0
Or Cubic yards of vertical ashlar work...	...	...	...	...	204 1/4
<i>Ashlar work.</i>					
Faces of arches for bridge both sides...	6	55 6	1 6	3 1 1/2	1,500 11
Do. for sluices front	15	12 0	1 6	1 6	405 0
Front cut waters of piers and abutments ...	4	7 0	1 6	13 0	546 0
Pilasters up to cornice	4	4 0	1 6	10 9	258 0

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.—(Concluded.)

Particulars of Work.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Ft. In.	Ft. In.	Ft. In.	
Pilasters at termination of wings	2	4 0	1 6	3 0	36 0
Do. do. of masonry path	2	2 0	1 6	2 0	12 0
Cut waters of piers for sluices... ..	12	2 6	1 0	11 6	345 0
Pilasters in parapet	6	4 0	2 9	2 9	181 6
Caps to pedestals	6	4 0	2 0	0 3	12 0
Caps to sluice cut waters including coping ...	14	3 0	2 0	0 6	42 0
Stringing course to cut waters of piers ...	2	7 0	0 4	0 6	2 4
Flat coping over sluice parapet	15	6 0	1 3	0 3	28 1
Cubic feet...	...	...	...	...	3,429 0
Or Cubic yards of ashlar work...	...	...	...	...	127
<i>Concrete work.</i>					
Concrete under floor	3	39 0	21 0	1 0	2,457 0
Filling up masonry path	2	10 0	2 4 1/2	14 0	665 0
Filling up spandrels of small arches	15	4 0	3 6	3 0	630 0
Cubic feet...	...	...	...	...	3,752 0
Deduct for piers ..	...	...	...	...	210 0
Net cubic feet...	...	...	...	...	3,542 0
Or Cubic yards of concrete work...	...	...	...	...	131 1/4
Planks for shutters	15	6 6	0 2 1/2	11 6	233 7
Cubic feet of teak-wood works...	...	...	...	...	233 7
Iron bars	15	6 9	0 2	0 2	2 9 1/4
...	15	6 9	0 3	0 3	6 3 1/4
Cubic feet...	...	...	...	...	9 1 1/2
Or lbs. of Iron bar...	...	...	...	...	4,434 1/4
Groove work	15	21 0	...	...	315 0
Running feet of groove work...	...	...	...	...	315 0
Metalling road-way	...	191 0	17 0	1 0	3,247 0
Cubic feet...	...	...	...	...	3,247 0
Or Cubic yards of metalling with brick kunkur.	...	...	...	...	120 1/4
Rough stone apron	...	133 0	18 0	1 6	3,591 0
Cubic feet...	...	...	...	...	3,591 0
Or Cubic yards of rough stone apron...	...	...	...	...	133
Guard stones	4	...	...	...	
Excavating foundation and raising approaches.	...	...	...	...	
Centerings	...	...	...	...	
Baling water	...	...	...	...	
Sundries and Contingencies	...	...	...	...	

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

**ABSTRACT ESTIMATE.
ALTERNATIVE LINE.—KISTNA DISTRICT.**

WORK.—Constructing Sluice and Bridge at head of proposed new line for Ryves' Channel at Bezoarah. The Bridge will answer for both the Ellore and Masulipatam roads.

Quantity.	Description of Work.	Rate.			Amount.			Total.		
		RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
1,087 $\frac{3}{4}$	Cubicyards of rough stone in chunam	2	10	2	2,866	15	1			
64 $\frac{1}{4}$	Do. of brick-in-chunam ...	5	0	0	321	7	4			
399 $\frac{3}{4}$	Do. of arch work do. ...	5	13	9	2,342	10	7			
3,292	Square feet of plastering with two coats of chunam... ..	2	12	0	90	8	5			
2,348	Do. of pointing to parapet very neatly	1	4	0	29	5	7			
382	Running feet of cut-stone cornice work	0	8	0	191	0	0			
404	Do. of do. coping work	0	12	0	303	0	0			
204 $\frac{3}{4}$	Cubic yards of vertical ashlar work.	7	8	0	1,535	0	0			
127	Do. of fine wrought ashlar work ...	12	0	0	1,524	0	0			
131 $\frac{5}{8}$	Do. of concrete work	1	8	0	196	12	5			
233-7	Cubic feet of teak-wood wrought and put up for shutters ...	3	12	0	875	15	0			
4,454 $\frac{1}{2}$	lbs. of iron	0	1	6	415	12	0			
315	Running feet of groove work	0	12	0	236	4	0			
120 $\frac{1}{4}$	Cubic yards metalling road-way with brick kunkur	1	8	0	180	6	2			
133	Cubic yards of rough stone apron	1	0	0	133	0	0			
4	Guard stones	3	0	0	12	0	0			
	Excavating foundations and raising approaches, &c.				200	0	0			
	Centerings				500	0	0			
	Baling water				300	0	0			
	Sundries and Contingencies							12,254	0	7
	Total Estimate... ..							745	15	5
								13,000	0	0

Specification Report to accompany Estimate for constructing Bridge and Sluice at the head of proposed new line for Ryves' Channel—Rupees 13,000.

1. The foundations of the abutments, piers of bridge, and sluices to be of rough stone in chunam 6 feet deep, resting on natural soil.

2. Piers and abutments are to be connected by retaining walls in front and rear 2 feet 6 inches thick at top and 3 feet 6 inches at bottom, the latter 6 feet deep, and the former 5 $\frac{1}{2}$ feet only.

3. Abutments and piers of bridge are to be 21 feet long, the thickness of the former to be 11 feet at the floor, and 8 feet 7 $\frac{1}{2}$ inches at the springing, and that of the latter to be of uniform thickness of 6 feet 6 inches; both to be raised to a height of 5 $\frac{1}{2}$ feet above floor. The versed sine of the arches to be 12 $\frac{1}{2}$ feet, giving a total height of 18 feet to the soffit.

4. Length of the projection of the piers and abutments for sluices (excepting cut waters) to be 5 feet, the breadth will be 6 feet 6 inches, and height 10 feet. Rear cut waters of the piers and abutments are to be 2 feet 9 inches from the face of the arch with semi-circular caps of 1 foot 6 inches high, stringing course under 4 inches by 6 inches.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

5. Piers for sluices to be 5 feet in length, excluding cut waters 2 $\frac{1}{2}$ feet thick and 5 $\frac{1}{2}$ feet high. Front and rear cut waters to be 2 feet long with two plain faces.

6. Wing walls to vary from 20 $\frac{1}{4}$ feet in height close to abutment, to 10 feet 9 inches at the extremities; depth of the foundations to be reduced by steps of 2 feet up and 2 feet 9 $\frac{1}{4}$ inches on, for a length of 18 feet including 4 feet for pedestals.

7. Flooring will be 1 foot thick with a substratum of 1 foot of concrete; masonry path 4 feet wide, (for the Lascars to go over the sluice to work the shutters,) it will be built of rubble in chunam, the interior space between outside and wing-walls and the spandrels of the small arches will be filled up with concrete.

8. The bridge is to consist of three elliptical arches of 40 feet span each and 21 feet long, thickness at crown 2 feet 3 inches, and gradually increases to 4 feet thick at the haunches. The thickness of the semicircular arches of sluices to be 1 $\frac{1}{2}$ feet and spandrel arches 1 foot, all built of brick-in-chunam, excepting the front and rear faces of the large arches and the front faces of the small arches which are to be of ashlar work, to a depth of 1 $\frac{1}{2}$ feet. The intrados of arches of bridge and sluices to be plastered with two coats of chunam.

9. The superstructure of the wing-walls, small and large, piers, abutments, rear cut waters of the large and small piers, masonry path, and face walls are to be rubble stone in chunam, and faced with vertical ashlar masonry.

10. Front cut waters of the large and small piers and abutments, pedestals at the termination of the wing walls and masonry path, pilasters of piers and of parapets, caps of the pedestals and pilasters are to be cut-stone ashlar work.

11. Parapets of the bridge to be 1 foot 6 inches thick and 2 feet 9 inches high, excluding coping of 6 inches, and the sluice parapet to be 1 foot thick and 1 $\frac{1}{2}$ feet high excluding coping, all built of brick-in-chunam pointed very neatly; cut-stone cornice work at the foot of the parapet will be projected 6 inches and 9 inches high. Road-way over the arches in clear width 18 feet all along.

12. Length of the rough stone apron in rear of bridge to be 133 feet and 18 feet wide and 1 $\frac{1}{2}$ feet thick. Teak-wood shutters which will be worked in grooves in hard stones in the abutments and piers. Iron bars, 2 inches and 3 inches square, will be placed across the vents in rear of shutters as shown in the plan.

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

**ESTIMATE.
ALTERNATIVE LINE.**

Estimate of the probable expense of excavating a new Channel as a head to Ryves' Channel from adjacent to the Bridge at Bezoarah across the Ellore Canal.

Miles.	Depth of cutting.	Area ($w+2d$) d .		
1	19.2	(90+38.4) 19.2	2,465.28	
2	14.7	(90+29.4) 14.7	1,755.18	
3	11.8	(90+23.6) 11.8	1,340.48	
4	13.	(90+26.) 13.	1,508.0	
5	13.6	(90+27.2) 13.6	1,593.92	
6	10.4	(90+20.8) 10.4	1,152.32	
7	9.0	(90+18.) 9.0	972.0	
		Square feet	10,787.18	
		Or Square yards	1,198.6 $\times$ 1,760 =	2,109,536 Cubic yards.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE.—(Continued.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.	
73	660	69-2 $\frac{1}{2}$	580,140		
74		71-8 $\frac{1}{2}$			
75		62-4 $\frac{1}{2}$			
76		67-7 $\frac{1}{2}$			
77		102-1 $\frac{1}{2}$			
78		116-11 $\frac{1}{2}$			
79		177-2 $\frac{1}{2}$			
80		211-10 $\frac{1}{2}$			
		879-1 $\frac{7}{8}$			
81		126-9 $\frac{5}{8}$			665,940
82	78-6 $\frac{1}{2}$				
83	81-7 $\frac{1}{2}$				
84	77-6 $\frac{1}{2}$				
85	125-8 $\frac{5}{8}$				
86	136-11 $\frac{5}{8}$				
87	152-6 $\frac{5}{8}$				
88	232-3 $\frac{1}{2}$				
		1,008-10 $\frac{7}{8}$			
89	207-1 $\frac{3}{4}$	6,18,090			
90	150-2 $\frac{3}{4}$				
91	156-2 $\frac{1}{2}$				
92	144-5 $\frac{7}{8}$				
93	89-1 $\frac{1}{2}$				
94	81-0 $\frac{1}{2}$				
95	81-8 $\frac{7}{8}$				
96	26-5 $\frac{3}{4}$				
			936-4 $\frac{1}{2}$		
97	67-9 $\frac{1}{2}$		254,330		
98	152-6 $\frac{1}{2}$				
99	91-1 $\frac{5}{8}$				
100	18-7				
101	21-5 $\frac{7}{8}$				
102	21-11 $\frac{3}{4}$				
103	10-4 $\frac{5}{8}$				
104	13-9 $\frac{1}{2}$				
		400-6 $\frac{7}{8}$			
105	13-11 $\frac{5}{8}$	65,340			
106	11-2 $\frac{5}{8}$				
107	15-3 $\frac{1}{2}$				
108	16-11 $\frac{1}{2}$				
109	13-1 $\frac{3}{4}$				
110	10-4 $\frac{5}{8}$				
111	10-8 $\frac{7}{8}$				
112	7-4 $\frac{1}{2}$				
			99-0 $\frac{1}{2}$		
113	8-3 $\frac{5}{8}$				
114	19-10 $\frac{7}{8}$				
115	37-10 $\frac{1}{2}$				

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE.—(Concluded.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
116	660	71-0 $\frac{7}{16}$	286,110	
117		104-2 $\frac{1}{2}$		
118		92-9 $\frac{1}{4}$		
119		59-6 $\frac{7}{32}$		
120		39-9 $\frac{1}{2}$ $\frac{5}{8}$		
	433-5 $\frac{1}{2}$ $\frac{1}{4}$			
121	660	83-3 $\frac{7}{32}$	603,900	
122		116-10 $\frac{2}{3}$ $\frac{2}{3}$		
123		159-7 $\frac{7}{32}$		
124		271-0 $\frac{2}{3}$ $\frac{5}{8}$		
125		284-3 $\frac{1}{2}$		
		915-1 $\frac{1}{8}$		
		19,135,215	Or 708,711 $\frac{1}{2}$ Cubic yards.	

ABSTRACT.

708,712 $\frac{1}{2}$ Cubic yards of earth-work at 1 Anna 3 Pies	RS.	A.	P.
per cubic yard	55,368	1	7
Sundries at about 5 per cent	2,811	14	5
Total...	58,180	0	0

MASULIPATAM,
17th August 1867.

(Signed) G. V. WINSKOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

The estimate for sluices and minor channels, amounting to Rupees 5,000, cannot at present be framed with any degree of accuracy. It is impossible at present to say where they will be necessary, but I have assumed that they may cost on an average about 166 Rupees per mile, or for 30 miles 5,000 Rupees.

(Signed) G. V. WINSKOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—First alternative line of Ryves' Channel, referred to in paragraph 7 of Superintending Engineer's letter to Government, No. 47 of 10th July 1867.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
	Constructing a sluice and bridge at head of the alternative line		RS. 13,000	RS.
	Excavating a new channel from do., including compensation... ..		2,79,880	
	Enlarging and improving Ryves' channel from the 2nd mile of Ryves' channel to Pullairu, near Murrevada		58,180	
	Constructing a bridge of five arches of 20 feet span each on Ryves' channel, at crossing the Ellore road		4,170	
	Constructing two accommodation bridges, with elevating platforms, on Ryves' channel.		5,660	
	Constructing accommodation bridge across Pullairu, at Murrevada, below junction of Ryves' channel		3,710	
	Alterations and additions to Komatigoonta calingulah and Ryves' branch head sluice, as now proposed		2,970	
	Enlarging and improving Gudevadah branch of Ryves' channel		26,800	
	Constructing three accommodation bridges on Ryves' branch channel		3,780	
	Constructing two calingulahs and bridges on the Gudevadah branch of Ryves' channel		2,960	
	Sluices and minor channels		5,000	
				4,06,110

No. 468. ORDER THEREON, 20th August 1867, No. 2,543.

IRRIGATION, No. 7.

1. With the letter above recorded, the Superintending Engineer of the 2nd Division submits plans and estimates for certain works connected with the general scheme of irrigation from the Kistna Anicut, as proposed by Colonel Anderson, the late Superintending Engineer, and approved of by this Government and by the Secretary of State for India.

2. The works which are now brought forward by Colonel Winscom provide for the extension of irrigation in the eastern, or the Masulipatam side of the Kistna Delta, and with this object in view he has submitted two alternative projects; the first including the enlargement of the Ellore Canal, and of its main branch, known as "Ryves' Channel," which at present is led from it, in a south-easterly direction, at a point seven miles east of Bezwarrah; while the second provides for the excavation of an entirely new head to "Ryves' Channel," giving it an independent source at Bezwarrah, at the point where the Ellore and Masulipatam Canals now bifurcate.

3. The estimates submitted by the Superintending Engineer show the cost of the two projects to be respectively Rupees 3,25,810 and Rupees 4,06,110.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

4. Colonel Winscom enters in his letter into the advantages and disadvantages of each scheme; and after a full consideration of the papers upon the subject, the Government agree with him that the large additional sum of Rupees 80,300 will be well spent in securing an independent head to a channel which will play so important a part in the irrigation of the Delta.

5. The larger estimate of Rupees 4,06,110 will accordingly be recommended to the Government of India for sanction.

Ordered that the following letter be sent:—

(Here enter No. 2,544, dated 20th August 1867.)

(True Extract.)

(Signed) J. H. M. SHAW STEWART, Major, R. E.,
Under Secretary to Government.

- To the Superintending Engineer, 2nd Division.
,, Accountant General.
,, Controller of Public Works Accounts.
,, Revenue Department.

Exd. S. T. Augustin.

PUBLIC WORKS DEPARTMENT,
FORT SAINT GEORGE,
20th August 1867.

No. 2,544.

No. 469.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,
PUBLIC WORKS DEPARTMENT.

SIR,

IRRIGATION, No. 8.

1. I am directed to forward for the consideration of the Government of India the accompanying plans and estimates for works connected with the general scheme of irrigation from the Kistna Anicut, as proposed* by Colonel Anderson, the late Superintending Engineer of the 2nd Division, and approved of by this Government and by the Secretary of State for India.

2. The works which are included in these estimates provide for the extension of irrigation in the eastern, or the Masulipatam side of the Kistna Delta, and with this object in view two alternative projects have been submitted by the Superintending Engineer; the first including the enlargement of the Ellore Canal, and of its main branch, known as "Ryves' Channel," which at present is led from it, in a south-easterly direction, at a point seven miles east of Bezwarrah, while the second provides for the excavation of an entirely new head to "Ryves' Channel," giving it an independent source at Bezwarrah, at the point where the Ellore and Masulipatam Canals now bifurcate. The cost of the two projects is estimated at Rupees 3,25,810 and 4,06,110 respectively.

3. Colonel Winscom enters in his letter into the advantages and disadvantages of each scheme; and after a full consideration of the papers upon the subject, I am to state that this Government agree with that Officer that the additional sum of Rupees 80,300 will be well spent in securing an independent head to a channel which will play so important a part in the irrigation of the Delta.

4. Seeing that large returns are being realized from the Kistna works in their present incomplete state, and that the development which it is now proposed to give to those works will unquestionably add to their remunerative character by affording better supplies of water to rapidly extending cultivation, I am to request that the estimate of Rupees 4,06,110 may receive the sanction of the Right Honorable the Governor General in Council.

I have the honor to be,

Sir,

Your most obedient servant,

(Signed) J. H. M. SHAW STEWART, Major, R. E.,
Under Secretary to Government.

Ed. S. T. Augustin.

*I have the honor to be
Sir, your most obedt servant
J. H. M. Shaw Stewart
August 20th 1867*

No 62

From

Lee

To

Colonel C. F. Orr R.E.

Sir,

Engineers Office
Camp Multhapur
3rd August 1867

Colonel G. V. Winscom R.E.
Super Engineer 2nd Divn

Secretary to Government
D. P. W.
Madras

In reply to your Official Memo No. 24 dated 24th July, I have the honor to forward an Abstract Estimate for the Alternative line referred to in para 7 of the letter of 10th July 1867.

2. It will be seen that the sum of Rs 406,111 includes compensation for land.

3. There will be no destruction of Trunk Road No VI, nor will any masonry works be needed, excepting those entered in the Abstract Estimate. The Bridge combined with Road Sluice which I have proposed, will pass both the Ellon & the Masulipatam roads across the Channel close to Bezawada; & as will be observed by the map, the Trunk Road for Ellon Road will not again cross it, till the existing Ryers Channel is reached, where a bridge has been duly allowed - Estimate Rs 1,170.

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

Lee
Super Engineer 2nd Divn

Work - Constructing 2 additional arches to the
Bridge at the head of Ellore Canal.

Particulars of Works.	Number.	Measurements			Cubical Contents
		Length	Breadth	Depth.	
Foundation to					
Abutments	2	38-0	9-6	5-0	3610
Wing walls	4	34-0	11-0	5-0	7480
Lowring path	"	61-6	5-6	5-0	1691-3
Retaining walls	2	29-0	1-3	2-6	181-3
Do.	2	23-6	1-3	2-6	146-10
Pedestals	4	4-6	0-3	5-0	22-6
Superstructure					
Abutments	2	37-0	7-6	8-0	4440-0
Do.	2	37-0	2-9	2-0	407-0
Backing to Do.	2	37-0	9-0	1-0	333-0
Wing walls	4	34-0	6-1/2	24-6	20408-6
Do.	4	1-3	8-4 1/4	10-0	418-9
Do.	4	2-6	4-6 3/4	14-6	595-5
Do.	4	7-6	4-6 3/4	11-0	1505-7
Piers including cutwaters	2	33-6	2-0	8-0	536-0
Pedestals	4	4-6	0-3	24-6	110-3
Lowring path	"	64-0	2-9	9-0	1584-0
Parapet of Do.	"	69-6	1-0	0-6	34-9
Face walls at abutments	4	15-0	2-0	3-6	420-0
Filling up spandrels	2	26-0	10-0	3-0	1560-0
Spandril walls	4	24-0	2-0	4-9	912-0
					Cubic feet - 46397-0
Result for ashlar work					5012-0
Net Cubic feet -					41395-0
or Cubic yards of Rubble stone in channel					1533- 4/27

Abstract Estimate No 20 of 1867-68.

For constructing 2 additional arches to the Bridge at the head of Ellore Canal.

Pl. 274 6/67

Quantity	Description of Charges.	Rate	Amount	Estab
1533 $\frac{4}{27}$	Cubic yards of Rubble stone in chunam	2 10 2	4040 7 9	
231 $\frac{1}{9}$	do of arch work brick in do	5 13 9	1354 2 3	
2314-0	Sqre ft of Plastering with 2 coats of chunam	2 12 -	63 10 2	
44 $\frac{8}{27}$	Cubic yards of brick in chunam	5 - -	221 7 8	
1080-0	Sqre ft of pointing with chunam to brick work neatly -----	1 4 -	43 8 -	
353-0	Running ft of cut stone cordon work	- 8 -	176 8 -	
353-0	do do coping work	- 12 -	264 12 -	
185 $\frac{7}{27}$	Cy of Vertical ashlar stone work	7 8 -	1389 7 1	
78 $\frac{4}{9}$	do Ashlar work	12 - -	941 5 4	
62 $\frac{5}{6}$	do of Concrete work	1 8 -	94 4 -	
183 $\frac{13}{18}$	do of metalling with old brick Kuntha	- 5 6	63 2 3	
803 $\frac{22}{27}$	do of Rough stone revetment for slopes	1 - -	803 13 -	
1291 $\frac{2}{3}$	Sqre yards of Turfing	- - 3	20 2 9	
4	Quard stones	3 - -	12 - -	
	Centrings	- - -	250 - -	
	Baling water	- - -	150 - -	
	Removing old work	- - -	130 - -	
	Excavating foundations & Raising approaches	- - -	65 - -	
	Temporary bunds	- - -	50 - -	
	Linchies & Contingencies	- - -	256 5 9	
			Total Rupees	10390 - -
			Deduct value of old materials	50 - -
			Total Estimate Rupees	10340 - -

Supd. Engr's Office 2nd Bn
Maulipatam
10th July 1867

Responsible Lint. Col. M.
Superintending Engineer

In a letter from the
Superintending Engineer to
the Secretary to Government
D. P. W. No 47 dated 1st July, 1867

No 2746/67

Estimate for constructing
2 additional arches to the
Bridge at the head of Illone
Canal amounting to Rs 10340

Specification report to accompany Estimate
No of 1867-68.

Estimate No 10340 --- for Constructing
2 additional arches to the Bridge at the head
of Illone Canal.

1. The foundations of the new wing walls
abutments and towing path are to be of
Rough stone in chunam, 5 feet deep, resting on
natural soil.
2. Piers and abutments are to be connected
by retaining walls in front & Rear 1'-3" thick
and 2'-6" deep, and to be of Rough stone in chunam.
3. The abutments are to be 8'-6" thick at the
level of the bed of the channel & 6'-6" at the
springing of the arch, raised to a uniform
height of 8 feet; the versed sine of the arch to
be 13 1/2 feet giving a total height of 21 1/2 feet to the
soffit. The thickness of the two additional
arches to be 3'-6", 3'-0", & 2'-6" at haunches (from
the springing measured on the intrados of
arch, 3'-9" each distance) and the remainder
to be 2 feet thick, built of brick in chunam
and pointed neatly.
4. The old abutments of the Bridge will be
used as piers of the new arches by adding
masonry to the proper breadth of 11 feet and
taking away superfluous work.

5. The wing walls 2' 3" thick at top and 10 feet at bottom with a batter of 7'-9" at the back.
6. The superstructure of the wing walls, spandrels, face walls of arches, Piers, cutwaters, and abutments are to be of rubble in chunam, faced with ashlar masonry.
7. The parapets are to be 1'-6" thick and 3 feet high built of brick in chunam pointed neatly with a cut stone cordon work of 7" high and 4 inches coping; the intrados of arches will be plastered with 2 coats of chunam.
8. Pillars over the cutwaters are to be of ashlar work, with a capping of cut stone over parapet. The diameter of the pillars at base 2'-6", and at top 2'-4" feet.
9. Road way over the Bridge will be metalled with old brick bunker at centre 1'-6" and at sides 1'-3" thick. The road way over the arches to be 23' wide and at wings 34 feet.
10. A towing path 9' above bed of channel having parapet 6" high will pass under the western arch. It will be built of rubble stone and chunam and the interior space between outside and abutment of Bridge

of Bridge will be filled with concrete.

Supd. Engr's Office
Masulipatam
10th July 1867

Geo. Morrison. Lieut. Col. R.E.
Superintending Engineer

Engr. P.E.

In a letter from the
 Sup^d Dyke 2^d Dec to the
 Secretary to Government
 P. P. No 47 dated 10th July 1867

No 2746/67

Specification Report
 for Constructing 2 additional
 arches to the Bridge at the
 head of Elhar canal
 Amounting to Rs 10340-0-0

71

Alternative line Abstract Estimate Road of 1867-68

Madras District

Work Constructing sluice and Bridge at head of pro-
 posed new line for Ryne's Channel at Nagaroh. The bridge
 will answer for both the Ellore & Masulipatam Roads.

Quantity	Description of Charges	Rate	Amount	Total
1087 $\frac{23}{27}$	Cyds of rough stone in Chunar	2 10 2	2866 15 1	
64 $\frac{7}{4}$	— do of Brick in Chunar	5 ..	321 7 4	
399 $\frac{22}{27}$	— do of Arch work — do	5 13 9	2342 10 7	
3292	Sq ^{ft} of plastering with 2 Coats of ^{Chunah}	2 12 ..	90 8 5	
2348	do of pointing to parapet & gully	1 4 ..	29 5 7	
382	R ^{ft} of cut stone cornice work	" 8 ..	191 ..	
1104	— do of — do coping work	" 12 ..	303 ..	
204 $\frac{2}{3}$	Cyds of vertical ashlar work	7 8 ..	1535 ..	
127	— do of ^{new masonry} ashlar work	12 ..	1524 ..	
131 $\frac{5}{27}$	Cyds of Concrete work	1 8 ..	196 12 5	
233-7	C ^{ft} of Teak wood wrought for up for shutter	3 12 ..	875 15 ..	
4454 $\frac{3}{4}$	lb of Iron	" 1 6	415 12 ..	
315	R ^{ft} of frame work	" 12 ..	236 4 ..	
120 $\frac{7}{27}$	Instal ^g roadway with bricks ^{Kumhar}	1 8 ..	180 6 2	
133	Cyds of rough stone apron	1 ..	133 ..	
4	Guard stone	3 ..	12 ..	
	Excavating foundations & raising approaches & fill	" ..	200 ..	
	Centings		500 ..	
	Baling water		300 ..	
	Surveys & Contingencies	" ..	745 15 5	
	Total Estimate Rupees		13000 ..	

Superintendent of Works Office 2^d Divⁿ
 Masulipatam
 10th July 1867
 Compt. P. P.

Commissioner District Colonel R. B.
 Superintending Engineer 2^d Division

13.

In a letter from the
 Supy. Engrs 2nd Div to the
 Secretary to Government
 G.P.W. No 47 dated
 10th July 1867

Rs. 2746/67

Estimate for Constructing
 Dams and Bridges at head
 of proposed sluice line for Pynes
 channel at Bogganalo - The
 Bridges will answer for both
 the Ellore and Masulipatam
 Roads amounting to Rs 13,000.

Work

- Enlarging and improving the Ellore Canal
 Pynes Canal, and its branch and erecting
 the necessary masonry work.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
✓	Constructing 2 additional Arches & the Bridges at the head of Ellore Canal.		10340	
✓	Enlargement of the Ellore Canal from the head near Bogganalo to the head of Pynes Channel between the 7 th and 8 th mile.		188440	
✓	Enlarging the Head Sluice of Pynes Channel.		5400	
✓	Enlarging and improving Pynes Channel from Head Sluice to Pillains near Mirrissa -		66500	
✓	Constructing a Bridge of 5 Arches 20' span on Pynes Channel at crossing the Ellore Road.		4170	
✓	Constructing two accommo- dation bridges with elevating flat forms on Pynes Channel		5660	✓
			280590	

Quantity.	Description of Charges.	Rate.	Amount.	Total.
	Brought Over -		280590 . .	
	Constructing Accommo- dation Bridge across Pullair at Munroa below junction of Ryves Channel.		2710 . .	✓
	Alterations and Additions to Komatigonta Calujals and Ryves Branch Head Sluice as now proposed.		2970 . .	✓
	Enlarging and improving Guaduaal Branch of Ryves Channel.		26800 . .	✓
	Constructing Accommo- dation Bridge on Ryves Branch Channel.		3720 . .	✓
	Constructing 2 Calujals and Bridges on the Guaduaal Branch of Ryves Channel.		2960 . .	✓
	Sluice and Minor Channels.		5000 . .	✓
			325810 . .	
			325810 . .	

Capt. J. G. S. P. & Co.
 Messrs. J. G. S. P. & Co.
 10th July 1867.

Geo. W. M. S. L. & Co.
 Capt. J. G. S. P. & Co.

12

In a letter from the
Superintending Engineer
to the Secretary to Government
D. P. H. No 47 dated 10th July 1867

No 2746/67

General Abstract
Estimate for enlarging
and improving the Allah
Canal Ryres Canal, and
its Branch and erecting
the necessary masonry work
Amounting to Rupees 325810

Detailed Estimate No 20 of 1867-68 71
Kistna District

Work. Constructing 2 Calingulaks and Bridges on the Gudwadah
Branch of Ryres Channel.

Particulars of work	Number	Measurement			Cubic Contents
		Length L	Breadth B	Height H	
Concrete under flooring &c	3	21	19	$\frac{1}{2}$	$199\frac{1}{2}$
Do		4	4	$\frac{1}{2}$	8
Total concrete in channel					$207\frac{1}{2}$
Do	Do	Do	Do	Do	$\frac{37}{54}$
Foundations to abutments & side walls	2	$21\frac{1}{2}$	$5\frac{1}{2}$	5	$1182\frac{1}{2}$
Do to Pier including cutwaters	1	$14\frac{1}{3}$	4	5	$286\frac{2}{3}$
Do to front wings and returns	2	$11\frac{1}{2}$	$5\frac{1}{2}$	5	$632\frac{1}{2}$
Do to Pier Do Do	2	28	$5\frac{1}{2}$	5	1540
Retaining wall between abutments & Pier	1	19	$1\frac{1}{2}$	$3\frac{1}{4}$	$92\frac{5}{8}$
Do between rough stone aprons	1	$45\frac{1}{2}$	$1\frac{1}{4}$	$3\frac{1}{2}$	$199\frac{1}{16}$
Body wall	1	23	$2\frac{1}{2}$	$5\frac{7}{12}$	$321\frac{1}{24}$
Floors	1	17	19	$1\frac{1}{4}$	$403\frac{3}{4}$
Do	1	4	4	$1\frac{1}{4}$	20
<u>Superstructure</u>					
Abutments above	2	$12\frac{1}{2}$	$3\frac{3}{4}$	$5\frac{1}{3}$	500
Side wall above	2	6	$2\frac{7}{8}$	$9\frac{7}{8}$	$340\frac{11}{16}$
Do	2	$2\frac{1}{2}$	$2\frac{7}{8}$	8	$86\frac{1}{4}$
Pier Do	1	$13\frac{1}{2}$	3	$5\frac{1}{3}$	216
Front wings and returns	2	11	$2\frac{7}{8}$	6	$319\frac{1}{2}$
Rear Do	2	20	$2\frac{7}{8}$	$8\frac{29}{48}$	$989\frac{23}{48}$
Do returns	2	$7\frac{1}{2}$	$2\frac{7}{8}$	$5\frac{1}{3}$	230
Skewbacks for Pier	1	$12\frac{1}{2}$	3	$\frac{3}{8}$	$14\frac{1}{16}$
Do for abutments	2	$12\frac{1}{2}$	$2\frac{5}{8}$	$\frac{1}{2}$	$32\frac{13}{16}$
Backing to abutments	2	$12\frac{1}{2}$	5	$\frac{1}{2}$	$62\frac{1}{2}$
Caps	1	3	1	$\frac{1}{2}$	$1\frac{1}{2}$
Spandrels	1	$12\frac{1}{2}$	3	$1\frac{1}{2}$	$56\frac{1}{4}$

Face walls	2	13 $\frac{1}{2}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	42 $\frac{3}{16}$
Do	2	13	1 $\frac{1}{4}$	1 $\frac{3}{4}$	56 $\frac{7}{8}$
Bloching Course	2	27 $\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{7}{24}$	23 $\frac{12}{96}$
Steps	2	2 $\frac{1}{2}$	2 $\frac{1}{4}$	2	22 $\frac{1}{2}$
Parapets to Do	2	3 $\frac{3}{4}$	1 $\frac{1}{4}$	3 $\frac{5}{12}$	32 $\frac{1}{32}$
Do	2	1 $\frac{1}{3}$	1 $\frac{1}{2}$	7 $\frac{3}{8}$	24 $\frac{7}{12}$

Total Cft 77 $\frac{59}{16}$
30 $\frac{15}{48}$

Deduct for steps and Parapets

Total rough stone in channel Cft 77 $\frac{58\frac{3}{4}}{16}$
Do Do C yards 281 $\frac{27}{4}$

Brick work

Arch work	2	12 $\frac{1}{2}$	13	1 $\frac{1}{4}$	46 $\frac{1}{4}$
Parapets	2	70	1 $\frac{1}{4}$	2	350

Total Brick in channel Cft 751 $\frac{1}{4}$
Do Do C yards 28

Rough stone apron	1	44	13 $\frac{3}{4}$	2	1210
Do	1	44 $\frac{1}{2}$	5	1 $\frac{1}{2}$	323 $\frac{3}{4}$

Do Reinforcement	2	16 $\frac{1}{2}$	11 $\frac{1}{4}$	1 $\frac{1}{2}$	556 $\frac{1}{8}$
------------------	---	------------------	------------------	-----------------	-------------------

Total Rough stone Cft 2100 $\frac{5}{8}$
Do Do C yards 77 $\frac{21}{7}$

Painting Sqr 37 $\frac{1}{2}$

Excavating Foundation Cys 339

Shutters Cft 12 $\frac{1}{4}$

Iron posts 3

Grove work Rg ft 5

Contingents and Balug

Indies and Contingences

Supr Eng's Office 20 De
Masulipatan
10th July 1867

Commissioner Masulipatan
Supr Engineer 20 De

Abstract Estimate No 20 of 1867-68.

Histia District

Work. Constructing 2 Calingulaks and Bridges on the Gudivarah Branch of Pynes Channel.

Quantity	Description of Charges	Rate	Amount	Total
8	Cy ² of concrete in channel per Cy ²	2	6	19
287	Do of Rough stones in channel per Do	3		861
756	Cft of arch work in channel per Cft	4		189
78	Cy ² of Rough stonework per Cy ²	1		78
37 $\frac{1}{2}$	Sqr of Painting per Sqr	1	8	56 4
12 $\frac{1}{4}$	Cft of Shutter with wood wrought & put up	3		36 12
3	Iron posts each	12		36
5	Rg ft of Grove work per Rg ft	12		3 12
339	Cy ² of Earthwork per Cy ²	1	3	26 7 9
	Contingents			
	Balug			100
	Indies and Contingences 5 per cent			1406 3 9

Total Estimate Rupees for one 1480
Do Do for two 2960

Superintending Engineers
Office 20 De Masulipatan
10th July 1867

Commissioner Masulipatan
Supr Engineer 20 De

Specification Report to accompany Plan & Estimate for Constructing 2 Calingulaks and Bridges on the Gudivada Branch of Pynes Channel

1 The foundations of abutments of Bridges including side walls of Calingulaks to be $21\frac{1}{2}$ ft long, $5\frac{1}{2}$ ft thick, and 5 ft deep.

2 Foundation of pier including cut-water to be $14\frac{1}{3}$ ft long 4 ft thick, and 5 ft deep.

3 Foundation of front and rear wing walls with returns to be $5\frac{1}{2}$ ft thick & 5 ft deep, and above $2\frac{7}{8}$ in average thickness and the former 6 ft high and the latter 8, $7\frac{1}{4}$ "

4 Body wall to be $2\frac{1}{2}$ ft wide, & 5'-7" in height, or 4'-4" above the floor, on which 3 Cast Iron Posts of $2\frac{1}{2}$ ft high will be placed thus dividing the water way into 4 bays of $5\frac{5}{8}$ ft each to be closed, when water is required, with 2 planks each, with Iron rings. The side walls to be furnished with grooves cut in hard stone in which the planks can be worked.

5 5 steps to be built on each side of the side walls, as shown in plan, to facilitate the lascar in working the planks. Side walls above, $8\frac{1}{2} \times 2\frac{7}{8} \times 0'$

6 Abutments above $12\frac{1}{2}$ ft long $4\frac{1}{2}$ ft wide at bottom, & 3 ft at the springing line & 5'-4" high.

7 Pier above, including cut-water, to be $13\frac{1}{2}$ ft $\times 3 \times 5-4$ - Bridge consisting of 2 arches of $10\frac{1}{2}$ ft span each with a mersed sine of $3 \times 1\frac{1}{4}$ ft thick, to be constructed.

8 Flooring between abutments & pier to be $1\frac{1}{4}$ thick resting on a concrete of 6" thick.

9 Retaining walls between abutments & pier wings to be $1\frac{1}{2}$ & $1\frac{1}{4}$ ft thick, & $3\frac{1}{4}$ & $3\frac{1}{2}$ ft high respectively.

10 The face walls & backing to be $5 \times 1\frac{1}{4}$ ft thick & $1\frac{1}{2}$ & $\frac{1}{2}$ ft in average height.

In a letter from the
Supt Engrs 22 Dec 1886
Secretary to Government
8 PM to 4 PM dated
10 July 1887

No 2746/67

Estimate for Constructing 2
Calingulaks & Bridges
on the Gudivada Branch
of Pynes Channel
Amounting to Rs 2960

11 The blocking course over the arch to be 12 ft thick & 3 1/2 ft high.

12 The parapet walls to be 1 1/2 ft thick & 2 ft high.

13 The rough stone aprons and buttresses as shown in plan to be 10 1/2 ft wide & 1 1/2 ft thick to the former & 10 ft wide & 1 1/2 ft thick to the latter.

14 Foundation and superstructure to be of rubble

masonry.

15 Arch work and parapets to be of brick in Chumam, and the whole to be pointed neatly.

Superintending Eng^r's office
3rd Division of the Department
10th July 1867

Commissioner. Can^l of R.E.
Super Engineer & Co.
No 27 of 1867

Approved by R.E.

In a letter from the
 Sup^r Engr^s 2^d to the
 Secretary to Government
 D.P.N. No 47 dated
 10th July 1867

Specification Report
 for Constructing 2 Galangaleh
 & Bridges on the lower part
 Branch of Rye Branch Channel

Detailed Estimate No 20 of 1867-68. By
 Hinton District.

Constructing an accommodation Bridge on
 Rye Branch Channel.

Particulars of Works

	Number	Length	Breadth	Depth or Height	Cubic Feet
<u>Concrete foundations.</u>					
Under Abutments	2	15' 9" 4'	9' 2'	0'	299' 3"
" Piers	2	15' 0' 3' 6"	2' 0"	0'	210' 0"
" Wing walls	4	7' 6" 2' 9'	2' 0"	0'	165' 0"
" Retaining walls	6	9' 0' 2' 0' 1'	0"	0'	108' 0"
" Floor	3	8' 6" 12' 9' 0'	6'	0'	162' 6"
					944' 9"
					Cy. 24' 2"
<u>Masonry foundations</u>					
Abutments	2	15' 9' 3'	9' 2'	0'	236' 3"
Piers	2	14' 6' 2'	6' 2'	0'	145' 0"
Wing walls	4	7' 6' 2' 0' 2'	0'	0'	120' 0"
Retaining walls	6	9' 0' 1' 3' 2'	0'	0'	133' 0"
Floor	3	8' 6" 12' 9' 6'	0'	0'	195' 0' 9"
<u>Superstructure</u>					
Abutments	2	15' 9' 2'	9' 3'	6'	303' 2"
Do.	2	15' 9' 1'	10' 1' 3'	7' 3' 10"	
Do Barking	2	15' 9' 3'	0' 6' 3'	23' 7' 2"	
Piers including square backs	2	12' 6' 2'	0' 1' 1"	20' 1' 2"	
Wing walls	4	1' 0' 2' 6' 1'	6' 3' 6'	0"	
Wing walls	4	7' 6" 2' 0' 6'	4' 2' 3' 5' 2'	6"	
Barking Course	2	48' 0' 1'	6' 0' 9'	108' 0' 0"	
Drainage	2	48' 0' 1' 3' 1'	0' 12' 0'	0"	
Splendils	2	2' 6" 12' 6' 0'	6'	3' 3"	
Face walls	2	30' 6' 1'	6' 1'	0'	91' 6"
					2961' 0"
					46' 2"

Arch	12' 0" 12' 6" 1' 4" 6" 8" 9"	96
Garden work		
Painting in Chumam		
Skutunaks	2' 12' 6" 3' 6" "	57' 6"
Pier including cutwaters	1' 16' 6" 3' 6" "	251' 0"
Efforts of Arch	3' 11' 0" 12' 6" "	1112' 6"
Floring	3' 9' 0" 12' 9" "	344' 3"
Side or Tace wall	2' 31' 0" 3' 6" "	156' 0"
Parapet	1' 18' 6" 1' 3" "	242' 6"
Wing walls	2' 9' 6" 7' 6" "	142' 6"
		1646' 3"
Metalling	1' 10' 0" 46' 0" 6" 6"	230' 6"
		Cy 5'
Excavating foundation & Baling		
Centering		
Approaches		
Sundries & Contingencies		

Superintendent
Municipal
10th July 1867

Genl. Insp. Com. L. & C. D.
Superintendent

P. 24 2746/67

Abstract Estimate to 20/10/67
Krishna District
Work. Constructing an Accommodated Bridge on
Upper Branch Channel.

Quantity	Description of work.	Rate	Amount	Total
35	Cubic yards of Concrete	3	105	
146- ² / ₃	Do Brick Masonry in Chumam	5	733.54	
618- ³ / ₄	Do Efforts Brick in Chumam	4	154	
96	Floring part of Garden work	2	12	
16- ² / ₃	Painting in Chumam	1.5	24.12	
8- ¹ / ₂	Cubic yards of Metalling with Brick kind	2	17	
	Excavating foundation & Baling		60	
	Centering		60	
	Approaches		35	
			1201	12 4
	Sundries and Contingencies at 5 percent		53	3.8
				1260

For other Estimates 2520

Total Estimate Rs. 3780

Superintendent's Office
Maulapattam
10th July 1867

Responsible Officer
Superintendent

10
3
Small letter from the
Supr Engr 2nd Gen to
the Secretary to Government
G.P.N. No 47 dated
10th July 1867

No 2746/67

Estimate for constructing
an Accommodation Bridge
on Ryres Branch Channel
Amounting to Rupees 3780.
for three

Specification report to accompany the
Plan and Estimate for constructing an accom-
modation Bridge of 3 arches of 9 feet span
each to be built on Ryres Channel Estimate
No 1260.

- 1 The foundation of the abutments & Piers
including cut waters are to be $2\frac{1}{2}$ and $3\frac{3}{4}$ ft thick
and 2 ft deep and Superstructure to be 3 and 2
ft thick at the floor and $2\frac{1}{2}$ and 2 ft at the
springing line and $3\frac{1}{2}$ feet high.
- 2 Foundation of Wing walls to be 2 ft thick
and 2 ft deep and above 2 ft in thick & $6\frac{3}{4}$ ft
in average height.
- 3 The Bridge to consist of 3 arches of
9 ft span each, with raised sine of $2\frac{1}{4}$ ft giving
a total height of $5\frac{3}{4}$ ft to the soffit of the Arch,
the thickness of the Arch to be $\frac{1}{2}$ ft at the
haunches and $\frac{1}{4}$ ft at the Crown.
- 4 Flooring between two retaining walls to be
6" thick under laid with 6" of concrete.
- 5 Retaining walls connecting piers and
abutments to be $1\frac{1}{4}$ ft thick and 2 ft deep.
- 6 The face walls to be $1\frac{1}{2}$ ft thick and 1' in average
height, the blocking course and parapets to
be $1\frac{1}{2}$ and $1\frac{1}{4}$ ft thick, 1 and $3\frac{1}{4}$ ft in height.
- 7 The foundation to be of brick in
Chunam resting on concrete of 2' thickness
excepting for retaining walls when the concrete
will

will be one foot thick.

8 All the work to be neatly pointed
with Chumant joints.

Superintendent
Manuel Palam
10th July 1867.

Continued
Superintendent

Pl. 2746/67

85
Detailed Estimate No. 20 of 1867/68.
Work. Enlarging and improving Gadenasa branch
of River Channel.

Number of stations	Distances	Area of cutting	Total cutting in each mile	Up to a quantity required for embankment	Total Earth work for each mile	Total for the whole channel.
1		108.922				
2		99.981				
3		103.451				
4		70.352				
5		119.196				
6		117.522				
7		10.513				
8		41.27				
	110	118.217	427823.22	94936.4	523757.12	
9		90.948				
10		18.176				
11		49.988				
12		40.002				
13		2.47				
14		16.146				
15		52.56				
16		12.958				
	110	384.068	252454.88		253484.88	
17		100.614				
18		59.593				
19		78.949				
20		5.522				
21		70.277				
22		43.74				
23		62.180				
24		19.796				
	110	440.671	290842.86	24397.12	524779.98	

25 76.277
 26 103.166
 27 52.275
 28 49.557
 29 112.112
 30 76.691
 31 100.65
 32 255.14

110 516.752 515091.32 515091.32

33 97.456
 34 105.675
 35 83.915
 36 99.405
 37 100.513
 38 711.623
 39 66.15
 40 61.322

110 1326.913 875712.55 7529.281 883291.51

41 167.299
 42 147.007
 43 128.114
 44 217.537
 45 475.334
 46 111.751
 47 133.034
 48 141.632

110 1525.255 107670.28 " 107670.28

49 142.251
 50 275.196
 51 195.509
 52 106.309
 53 78.6
 54 125.988
 55 108.59

56 72.522
 110 111.215 736734.9 " 736734.9

57 102.973
 58 109.361
 59 82.176
 60 37.638
 61 104.304
 62 75.666
 63 72.8
 64 91.646

110 181.664 449598.24 " 449598.24

65 63.487
 66 216.749
 67 126.667
 68 111.692
 69 152.854
 70 152.247
 71 177.571
 72 149.212

110 1149.870 758915.52 " 758915.52

73 114.427
 74 462.549
 75 114.976
 76 110.147
 77 91.297
 78 109.145
 79 109.396
 80 132.574

110 1245.311 884905.26 " 884905.26

81 88.322
 82 43.854
 83 94.96
 84 159.741
 85 98.647
 86 102.867
 87 125.501
 88 92.528

110 706.47 466270.2 " 466270.2

89 165.545
 90 146.2
 91 90.817
 92 186.111
 93 85.203
 94 103.965
 95 106.544
 96 82.704

660 961.544 59831904. " 598319.04

97 239.141
 98 89.998
 99 71.501
 100 82.301
 101 38.858
 102 285.53
 103 17.592
 104 37.21

660 565.921 571514.46 94212.84 115775.2

105 76.416
 106 69.132
 107 75.142
 108 33.956
 109 38.432
 110 63.554
 111 45.398
 112 50.55

660 450.66 300725.6 " 300725.6

113 86.626
 114 42.072
 115 42.037
 116 1.456
 117 12.626

118 14.277
 119 34.667
 120 13.599

660 217.65 163449 292253.28 455702.28

121 21.721
 122 43.533
 123 15.335
 124 10.303
 125 31.356
 126 21.578
 127 6.546
 128 15.182

660 169.172 11153.52 260795.04 372448.56

129 41.869
 130 11.426
 131 12.691
 132 25.069
 133 18.655
 134 22.564
 135 16.4
 136 27.878

660 181.55 119823.0 210515.88 320341.88

137 39.193
 138 33.93
 139 25.167
 140 54.383
 141 42.762
 142 28.843
 143 31.843
 144 32.214

660 288.335 190311.1 68830.05 259131.15

145	65.303				
146	32.647				
147	33.826				
148	47.591				
149	22.116				
150	35.421				
151	36.997				
152	36.863				
160	311.812	205798.92	264516.0	474511.92	
153	31.064				
154	21.352				
155	31.301				
156	31.472				
157	44.533				
160	179.722	118616.52	"	118616.52	1061710.34
					or
					393026.3 Cubic yards.

Abstract Estimate ~~20~~ of 1867/68 91
 Kistna District,
 Work. Enlarging and improving Guenasa branch
 of Pykes Channel.

Quantity	Description of Charges.	Rate	Amount	Total
293026	Cubic yards of earth work per Cubic yds.	11	3211	22
	Contingencies		188	13.10
				26800 ..
				26800 ..
				26800 ..

Sup^r Engineer's Office & Co.
 Masulipatam
 10th July 1864
 Commr. N. S. S. S.
 Sup^r Engineer & Co.

Sup^r Engineer's Office & Co.
 Masulipatam
 10th July 1864
 Commr. N. S. S. S.
 Sup^r Engineer & Co.

24 2446/67

9

In a letter from the
 Sup^r Engr^r 2nd Gen to
 the Secretary to Government
 D.P.N. No 47 dated
 10th July 1867

No 2746

Estimate for enlarging
 and improving Rudowale
 Branch of Ryes channel
 amounting to Rupees 26800

Madras District

Detail Estimate No 20 of 1867-68

Alterations and additions to Komaty Gonta Calingulah
 and Ryes Branch Head sluice now proposed

Particulars of Work	No	Measurements			Cubic Content
		Length	Breadth	Depth	
Calingulash					
Foundation Rubble masonry or Brick in Churn					
Body wall	1	21-9	4-0	6-0	522-0
Wing do	1	8-0	5-0	6-0	240-0
Abutments	1	11-3	5-9	3-6	226-5 $\frac{1}{4}$
do	1	8-0	2-0	3-6	56-2
Wing	1	7-6	4-0	3-6	106-0
Piers including cut waters	2	12-6	4-0	3-6	350-0
Rear retaining wall	1	4-6	3-0	6-0	81-0
Front do to the Bridge	1	49-2	2-6	4-0	490-0
Flooring	1	21-0	15-3	2-0	640-6"
Superstructure.					
Body wall new work	1	8-6	2-9	2-6	58-5 $\frac{1}{4}$
Wing do - - - - -	1	45-6	1-12	1-5	125-3 $\frac{1}{4}$
Abutments	1	20-3	3-3	10-8	650-0
do	1	11-3	4-9	3-0	160-3 $\frac{3}{4}$
do	1	8-0	1-6	3-0	36-0
do Backing	2	11-3	3-6	1-6	118-1 $\frac{1}{2}$
Wing	1	7-6	2-6	9-9	182-9 $\frac{3}{4}$
Piers including cut waters	2	12-6	3-0	3-9	281-3
Rear retaining wall	1	54-0	2-0	1-2	108-0
Span rails	2	11-3	3-6	1-9	137-9 $\frac{2}{5}$
Side or Face walls	2	52-0	2-0	1-8	346-8

Blocking Course	2	52-0	1-6	0-6	78-0
Parapet	1	145-0	1-3	2-0	362-6
Total rubble masonry Cfl.					441 1/2
Cgo					493 1/2
					200 1/2

Arch work brick in Chumam	3	11-3	21-0	1-6	1063 1/2
Pointing in Chumam					
Body wall	1	8-6	7-6	"	63-9
Wing	1	15-6	15-6	"	250 1/8
Abutments	1	11-0	14-0	"	154-0
Piers including cutwaters	2	11-3	3-0	"	67-6
Wing	4	14-6	3-3	"	188-6
Introds of the Arch	1	12-0	9-0	"	108-0
Side or Face walls	3	11-3	22-0	"	742-6
Parapets	2	71-0	2-9	"	390-6
Side retaining wall above	2	71-0	2-7 1/2	"	372-9
Flooring	1	54-0	3-6	"	159-9
	1	21-0	15-3	"	326-3

Total pointing Sq ft 240 1/2
Squares 24 1/2

Rough stone apron in rear of Bridge	2	23-0	2-6	12-6	1437-6
Do Packing in front of Calinguloh	1	64-6	20--	2-0	2570-0
	1	13-0	2-7 1/2	12-6	426-6 3/4

Total rough stone Cfl 4434-0 3/4
Cgo 164-2 1/4

Excavating foundation					
Centering and Dairling					
Metalling					
Add for removing old materials					
Surveys and Contingencies					
Head office					

Foundation rubble masonry for Brick in Chumam					
Abutment	1	11-3	4-0	4-0	180-0
Wing	1	15-0	3-0	4-0	180-0
Do	1	6-0	4-0	4-0	96-0

Front retaining wall	1	11-0	2-0	6-0	132-0
Rear	1	4-0	2-0	6-0	48-0
Flooring	1	13-0	9-6	1-6	188-3
Do	2	17-0	4-0	1-6	204-0
Superstructure					
Abutments	1	11-3	3-0	4-0	135-0
Do Packing	1	11-3	1-0	4-0	45-0
Wing	1	15-0	1-9	6-0	157-6
Do	1	6-0	1-9	3-0	84-0
Side or Face walls including binding wall	2	14-0	1-1 1/2	1-0	31-6

Total rubble stone or brick in Chumam 1478-3 3/4
Cgo 54-7 1/2

Arch work Brick in Chumam Cfl	2	11-3	8-0	1-6	270
Pointing in Chumam Squares					63 1/4
Rough Stone Apron in rear	2	26-0	2-6	10-3	1332-6
	1	31-0	13-0	2-0	806-0

Total rough stone Cfl 2138-6
Cgo 79 5/9

Teak wood shutter	Cfl	2	4-6	8-0	2 1/2	15-
Cut stone gornes	Cfl					32
Excavating foundation						
Centering & Dairling						
Metalling						6 1/2
Add for removing old materials						
Surveys and Contingencies						

Supr Engineer's Office add
Masaipetam
10th July 1867.
Commissioner
Supr Engineer
add

Abstract Estimate for 20 of 1867-68
Alterations and additions to Komaty Gounta
Calingula & Ryves Branch Head sluice now proposed.

Quantity Particulars of Works Rate Amount Total.

Calingulah

200 $\frac{11}{2}$ 795 $\frac{7}{9}$	Cybs of Rubble masonry or Brick in Chumam	5 8	1102 3 10 1066 12 6
1663 $\frac{4}{2}$	Cybs of Arch Work brick in Chumam	" 4	265 12 6
28 $\frac{1}{2}$ 24 $\frac{1}{8}$	Squares Pointing Chumam	1 8	42 12 " 36 8 "
164 $\frac{2}{9}$	Rough Stone Revetment for Cybs	2 10	431 1 4
	Excavating foundation		50 "
	Centering and Paving	" "	150 "
18 $\frac{1}{2}$	Cybs Metalling with Brick Runker	1 8	27 12 "
	Add for removing old materials		10 "
	Sundries and Contingencies at 5 p.c.		110 6 4 43 1 8 2150 "
			2190 "

Head sluice

54 $\frac{7}{9}$	Cybs of Rubble masonry or Brick in Chumam	5 8	301 13 "
270	Cybs of Arch Work Brick in Chumam	" 4	67 8 "
6 $\frac{3}{4}$	Squares pointing in Chumam	1 8	10 2 "
79 $\frac{5}{9}$	Cybs Rough stone apron	2 10	208 13 4
15	8 Teak wood shutters wrought by hand	3 "	45 "
32	R fl cut stone grooves	" 12	24 "
	Excavating foundation		20 "
	Centering and Paving		40 "
6 $\frac{1}{2}$	Cybs Metalling with Brick Runker	1 8	9 12 "
	Add for removing old materials		10 "
	Sundries and Contingencies		42 15 8 780 "

Grand Total Rupees 2940 ..

Supd by Mr. C. J. J. J. J. J.
in a meeting at
10th July 1867.

Commissioner
Superintendent

Pl 274 6/67

In a letter from the
Superintending Engineer
to the Secretary to Government
D.P.W. No 47 dated 10th July 1881

Pl. 2746/67

Estimate for Alterations
& additions to Komaty Gootah
Calingulah and Ryne
Branch Head Sluice as now
proposed amounting to Rs 2971

299
Specification Report to accompany
Plan and Estimate for proposed
alterations and additions to Komaty
Gootah Calingulah and Ryne branch
Head Sluice.

Calingulah
Waterway of existing Calingulah
to be enlarged by 20'-6" and a Bridge
of 3 Arches 16' span each to be built
in connection with Calingulah and
immediately below it.

The foundation of the abutment
to be 5'-9" broad and 3'-6" in depth of the
Piers 4' & 3'-6" in depth. Superstructure
of Piers and abutment 3' in height.

The foundation of Wings to be
4' in average breadth, 3½ in depth,
their Superstructure to be 9¾ high.

The front retaining wall of the
Bridge to be 3' at bottom 2' at top & 4'
in depth.

The Arches of Vents to have a
verged sine of 4'-6" and to be ½ thick.

The Calingulah Constructed in 1861.
is shown in Lake in the Plan. The parts

Colored green when the existing works
to be removed.

The blocking course to be $1\frac{1}{2}'$
wide and 6" high.

The parapet $1\frac{1}{2}'$ wide and 2' high.

The foundation of body wall
of Culinglah is to be 4' in average
breadth and 6' in depth.

The body wall to be $3\frac{1}{2}'$ high.

The foundation of the rear retaining
wall to be 3' in average breadth &
6' depth. The wall itself to be $1\frac{1}{2}' \times 2'$.

The flooring between Pier and
abutment is to be 15' in breadth and
2' in depth.

The rough stone apron in rear to be
20' wide, 2' thick and the pavement at
sides to be $12\frac{1}{2}'$ broad, 2' 6" thick
with slopes of 1 to 1.

Head sluice

The Head sluice to be increased
from 3 to 5 Vents, the dimensions being
as follows.

The foundation of the abutments
to have an average width of 4' and the

piers of 3' both to be 4' high.

The abutment walls to be 3' on an
average & Piers of 2' 6" average
breadth and 4' in height.

The foundation of wing wall
to be 3' 6" at bottom, 2' 6" at floor 4' in
depth, and the wall above to be 1' 9"
breadth on an average & 6' in height.

The Arches of Vents to have each
a rounded sine of 2' and to be $1\frac{1}{2}'$ thick.
The 3 Arches constructed in 1861 are shown
in Lake in the Plan.

The parts colored green when existing
work to be removed.

Cast iron buttons to be worked
in grooves cut in hard stone in the
abutments and Piers.

The flooring under the Arches
and rear to be 1' 6" thick and the re-
taining wall between front and
rear wings to be 2' thick and 6' deep.

Rough stone apron in rear to be
13' wide, 2' thick, and pavement at
sides to be 10' 3" broad and 2' 6" in
average thickness.

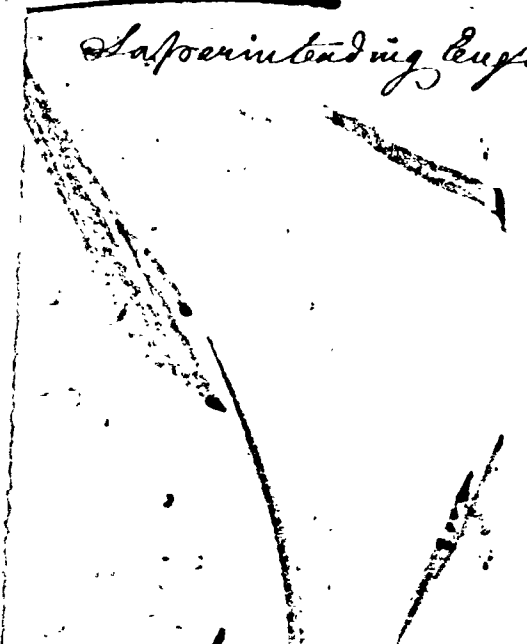
The foundation & Superstructure
to be Rubble masonry or Brick in Chumam.

and arch work to be of the latter.
 All the work to be neatly finished
 with Chunan.

Superintending Engineer's Office
 2nd Division Calcutta
 10th July 1867

Grouped pgs.

Robert M. L. Lieut. Colonel R.E.
 Superintending Engineer 2nd Division



P 62746/67

Detailed Estimate No. 20 of 1867/68
 Kutch District

Work Constructing the accommodation Bridge across Pullaro
 at Marrywadda below junction of Rynes channel

Particulars	Number	Measurements			Cubical Contents
		L.	B.	H.	
Foundations to abutments counted Square	3	18 1/2	14 3/4	4	1054 1/2
Do to Piers Do	3	18 1/2	3 1/4	4	721 1/2
Do to Wings	4	11 1/2	3 1/2	4	644
Retaining wall	1	94 1/8	1 3/4	2	329 7/8
Superstructure					
Abutments counted Square	1	17	3 1/2	3	178 1/2
Do Do	2	17	4	11 7/8	1518 2/3
Piers Do	3	17	2 1/2	3	382 1/2
Wings	4	11 1/2	3 1/2	11 7/8	1284 1/6
Do	2	2	2 7/8	4 1/2	17 1/4
Do	2	1 1/3	1 7/8	6	30
Caps	6	2 1/2	1 1/2	1 1/2	33 3/4
Backing to abutments	1	12 1/2	1 1/2	1 1/2	28 15/48
Do to arch	1	12 1/2	3 1/2	5/12	18 11/48
Span rails	3	12 1/2	9	3/4	253 1/8
Do	1	12 1/2	4	2/3	33 1/3
Pace walls	2	67 1/2	1 1/2	11/12	185 5/8
Do	2	12 1/2	12 1/2	2	625
Do	2	10	12 1/2	5/12	104 1/6
Blocking course	2	91	1 1/2	2/3	182
Parapets	2	118	1 1/4	2	590
Total Brick in Chunan Cubic Feet					8206.0
or Do Do Cubic Yards					303 25/27
Arch work	4	27 1/2	12 1/2	1 1/2	2177
Total arch work in Chunan					80 17/27

Cutstone Cordon work Running feet 2 114 . . 228
 Total Rq. feet 228
 Cutstone Coping work 2 114 . . 228
 Total Rq. feet 228

Wood work

Posts 4 16 $\frac{5}{8}$ $\frac{5}{8}$ 45
 Cross beams over posts 2 13 $\frac{1}{8}$ 1 $\frac{2}{3}$ 17 $\frac{1}{12}$
 Beams of plat form 3 17 $\frac{1}{2}$ $\frac{19}{24}$ $\frac{1}{2}$ 20 $\frac{3}{4}$
 Tie struts 2 14 $\frac{1}{2}$ $\frac{19}{24}$ $\frac{7}{12}$ 13 $\frac{1}{3}$
 Planks 17 $\frac{1}{2}$ 10 $\frac{1}{8}$ 29 $\frac{1}{6}$
 Projection of Planks for Railing 6 1 $\frac{1}{2}$ $\frac{1}{6}$ $\frac{1}{2}$
 Top & side rails including projections 2 19 $\frac{5}{24}$ $\frac{1}{4}$ 2
 Railing posts do do 6 2 $\frac{1}{2}$ $\frac{5}{24}$ $\frac{1}{4}$ $\frac{3}{4}$
 Struts 6 2 $\frac{3}{4}$ $\frac{5}{24}$ $\frac{1}{4}$ $\frac{11}{12}$
 Total Teak wood wrought put up Cft. 130.

Pointing Sgs 49
 Chain iron 4 16 64
 Total Rq. feet of Iron chain 64
 Iron weights, nails & shaps etc 3,600
 Total lbs of Iron 3,600

Iron rings with screw and nuts 4 . . .
 Iron Pulleys with do 4 . . .
 Metalling 108 9 $\frac{1}{2}$ $\frac{3}{4}$ 769 $\frac{1}{2}$
 Total Metalling Cys. 28 $\frac{1}{2}$

Centrings
 Baling water
 Fitting up elevating plat form
 Excavating foundations & raising approaches
 Sundries and Contingencies

Sup. & Engineer's Office 22/8/67
 M. S. S. S. S. S.
 10th July 1867
 2746/67

Commissioner Lieut. Col. R. S.
 Superintending Engineer

Abstract Estimate No. 20 of 1867/68. 105
 Kistna District

Work Constructing the accommodation bridge across Pullaros at
 Murrywood a below junction of Ryves channel

Quantity	Description of Charges	Rate	Amount	Total
304	Cys. of Brick in chunam	5 8	1672	
81	do of arch work in do	6 12	546 12	
49	Sgs of Pointing	1 8	73 8	
228	Rq. ft. of cutstone Cordon work	5 6	78 6	
228	do do of Coping work	6	85 8	
130	Cft. Teak wood wrought put up	2 8	325	
64	Rq. feet of Iron chain	1	64	
3,600	Lbs of Iron for weights, nails & shaps etc	16	337 8	
4	Iron rings with screw & nuts	2 8	10	
4	Iron pulleys with do	13	52	
28 $\frac{1}{2}$	Cys of Metalling	1 8	42 12	
	Centrings		120	
	Baling water		100	
	Fitting up elevating plat form		25	
	Excavating foundation & raising approaches	50	3582 6	
	Sundries & Contingencies		127 10	
	Total Estimate Rs.		3710	

Sup. & Engineer's Office 22/8/67
 M. S. S. S. S.
 10th July 1867
 Comptroller

Commissioner Lieut. Col. R. S.
 Superintending Engineer

In a letter from the
 Supy. Engr. 2nd Div. to the
 Secretary to Government D.S.
 No. 47 dated 10th July 1867

No 2746/67

Estimate for constructing
 the accommodation Bridge
 across Pullarai at Murry^{ad}
 below junction of Ryner
 Channel amounting to Rs 37¹¹

Specification for accommodation Bridges on
 Ryner channel—

1. These Bridges ~~is~~ for the accommodation
 of the neighbouring Villagers who would
 otherwise be cut off by the water of Canal
 from the adjacent country—

2. They will consist of 4 arches of 20 feet
 span ^{each} and one bay with an elevating plat-
 form, which will be balanced by counterpoise
 weights—so that ~~they~~ ^{it} can be raised or lowered
 by the strength of one man—

3. The arches will have a rise of 6' & be oval
 in form as shown on plan—

4. Each pier will be 3' in height & 2' 6" in
 thickness—

5. The width of Roadway will be 10' and the
 parapets will be 1'-3" thick & 2'-3" height includ-
 ing coping—

6. The whole will be built of Brick in common
 pointed very neatly—

7. The elevating Bridge will be of teak wood
 of the scantlings shown in estimate. The counter-
 poises will be formed of old iron. The pulleys
 chain &c. will be obtained from the stores at
 Madras—

Supy. Engr. Office 2nd Div. 7
 Madras
 10th July 1867

C. S. M. M. S. L. S. Col. R. S.
 Superintending Engineer 2nd Div.

In a letter from the
 Sup^t Engr 2nd Dec to
 the Secretary to Government
 G.P.W. No 47 dated
 10th July 1867

No 2746/67

Specification Report
 for constructing the Accommo-
 dation Bridge across Pullara
 at Murumadala below Jun-
 ction of Regar channel
 Amounting to Rs 3710 - - -

Histua District

Detailed Estimate No 20 of 1867/68

107

Work for constructing accommodation bridge with elevating platform
 on Regar Channel for the use of the villagers and the maintenance of
 District Navigation

Particulars of work	Number	Measurements			Cubical Content
		Length	Breadth	Depth	
<u>Foundations</u>					
Abutments	1	16' 0"	4' 0"	4' 0"	336' 0"
Do to elevating platform	1	17' 9"	4' 0"	4' 0"	337' 3"
Do Do	1	17' 9"	4 1/2'	4' 0"	310' 7 1/2"
Piers	2	17' 9"	3' 3"	4' 0"	441' 6"
Wing walls	11	11' 6"	3' 6"	4' 11"	644' 0"
Retaining walls	1	62' 8 1/2'	1' 9"	2' 0"	219' 5"
<u>Superstructure</u>					
Abutment	1	16' 0"	3' 6"	3' 9"	210' 0"
Abutments including cut waters & Caps	2	11' 9"	4' 0"	9' 9"	1150' 6"
Piers including show baskets	2	15' 2"	4' 0"	3' 10"	1465' 1"
Caps to Piers	11	1' 11"	2' 6"	1' 11"	17' 9"
Wing walls	2	11' 6"	2' 6"	9' 3"	531' 10 1/2"
Do	2	0' 8"	2' 10 1/2"	5' 6"	21' 1"
Do	2	1' 4"	1' 10 1/2"	3' 9"	18' 9"
Wing walls at elevating platform side	2	11' 6"	2' 6"	9" 3"	531' 10 1/2"
Face walls at abutment	2	10' 8"	1' 10 1/2"	1' 4 1/2"	55' 10"
Filling up spandrels	2	12' 6"	1' 6"	2' 10"	106' 8"
Do Do	2	12' 6"	2' 9"	1' 0"	68' 9"
Face walls	11	15' 6"	1' 9"	0' 10 1/2"	113' 4"
Do at Elevating platform	2	5' 0"	1' 7 1/2"	0' 7 1/2"	16' 3"
Parapet walls excluding Cordons & coping	2	82' 6"	1' 3"	2' 0"	412' 6"
Grand total					5942' 7"

Brought over	5948	
educt for arches	1	12' 6" 2' 2' 1' 6" 48'
or cubic yards of brickwork in chimney		5908
Arches	3	22' 6" 12' 6" 1' 6" 1237'
or cubic yards of arch work brickwork		45'
Painting with chunam		
Side walls & Introdes of arches	3	26' 9" 12' 6" 1003'
Cutwaters of Piers including Caps	4	5' 0" 6' 9" 135'
Wing walls including faces & cutwaters	11	15' 6" 9' 3" 573'
Structures of Elevating platform	2	12' 6" 9' 9" 2113'
Cutwaters including Caps of Do	2	6' 0" 11' 9" 111'
Face walls over cutwaters	12	8' 0" 2' 5" 232'
Spandril walls over cutwaters	4	2' 6" 4' 0" 40'
Parapets in and out Do	2	16' 9" 2' 0" 679'
Square feet of painting chunam		3047'
Butts low garden work	2	32' 6" 165' 0"
Butts lime coping work	2	82' 6" 165' 0"
Wood work		
Posts	4	16' 2" 0' 10' 0' 10 1/5'
Cross beams over posts	2	13' 2" 1' 0' 0' 8' 17'
Beams to platform	3	17' 6" 0' 9' 2' 0' 6' 20' 9'
Side struts	2	14' 6" 0' 9' 2' 0' 7' 13' 1/2'
Planks	"	17' 6" 10' 0' 0' 2' 29' 2'
Projections of planks for railing	6	1' 0' 0' 6' 0' 2' 0' 6"
Top and side rails including projections	2	19' 0' 0' 2' 2' 0' 3' 2' 0"
Painting posts Do Do	6	2' 6' 0' 2' 2' 0' 3' 0' 9"
Planks	6	2' 9' 0' 2' 2' 0' 3' 0' 10"
Cubic feet of Sunk wood		130' 0"
Chains & Iron	4	16' 0' 64
Remaining feet of Iron chains		64
Iron weights, nails, and traps &c		3600
Ch of Iron		3600

Iron rings with screw anchors	4	"	"	"	"
Iron Pulleys with Do Do	4	"	"	"	"
Metalling New way	"	73' 0"	10' 0' 0"	7' 45 6 1/4	
or cubic yards of metalling with links				45 6 1/4	
Centerings	"	"	"	"	"
Bracing water	"	"	"	"	"
Fitting up elevating platform	"	"	"	"	"
Elevating platform and raising	"	"	"	"	"
Approaches &c	"	"	"	"	"
Structures and elevating frame	"	"	"	"	"

Superintending Engineer's office
 2nd Division Madras Presidency
 10th July 1867-

Commissioner Port Co. P. & C.
 Superintending Engineer 2nd Div.

Hoona District.

Work for constructing accommodation bridge with Elevating platform on Ryus Channel for the use of the villagers and the maintenance of District Navigation

P. 62746/67

Quantity	Description of Charges	Rate	Amount	Total
218 22/27	Cubic yards of brick in channel	5 8 "	1203 7 8	
145 5/6	Do of archwork brick in channel	6 12 "	309 6 "	
3047	Square feet of Painting	1 8 "	45 11 3	
145.0	Running feet of Cuts low cordons	" 4 "	41 4 "	
145.0	Do of Do Copingwork	" 6 "	61 14 "	
140.0	Cubic feet of Teak wood wrought ^{and} put up	2 8 "	325 " "	
14.0	Running feet of Iron chain	1 " "	64 " "	
3600.	Lbs of Iron for weight mails & Straps &c	" 1 6	337 5 "	
1	Iron rings with screw nuts	2 8 "	10 " "	
1	Iron pulleys with do do	13 " "	52 " "	
16 7/8	Cubic yards of Mettalling road way with brick Runties	1 8 "	25 5 7	
	Centerings	" " "	125 " "	
	Baling water	" " "	60 " "	
	Fitting Elevating platform	" " "	25 " "	
	Excavating foundations and raising approaches &c	" " "	75 " "	
	Sundries and Contingencies	2 8 "	69 7 6	2830 " "
	For another similar Bridges			2830 " "
	Total Rupees			5660 " "

Superintending Engineer office
2nd Division Manipal
10th July 1867.

Respectfully Submitted
Lieut. Colonel R. E.
Superintending Engineer 2nd Division

In a letter from the
 Supg Engr 2nd Div to the
 Secretary to Government D.P.
 No 47 dated 10th July, 1867

No 2746/67

Estimate for Constructing
 accommodation bridges with
 elevating platform on Ryus
 channel for the use of the
 villagers and the maintenance
 of District navigation
 amounting to Rupees 5660-
for two.

Specification for accommodation Bridges in
 Ryus channel.

- 1 These bridges are for the accommodation of the
 neighbouring Villagers who would otherwise be cut off
 by the water of Canal, from the adjacent Country.
- 2 They will consist of arches of 16 feet span & one bay
 with an elevating platform, which will be balanced
 by Counterpoise weights. so that they can be raised or
 lowered by the strength of one man
- 3 The arches will have a rise of 4' & the arch infirmas
 shown on plan.
- 4 Each pier will be 3' 9" in height & 2' 6" in thickness.
- 5 The width of Roadway will be 10' & the parapets will
 be 1' 3" thick, & 2' 3" ⁱⁿ height including cornice work.
- 6 The whole will be built of Brick & Chumam,
 pointed very neatly.
- 7 The elevating bridge will be of Teak wood
 of the scantlings shown in estimate. The Counter
 poises will be made of old iron. The pulleys chains &c.
 will be obtained from the stores at Madras.

Superintending Engineer office
 2nd Division Madras
 10th July 1867
 Supg Engineer 2nd Division

Comd. P. 22.

In a letter from the
Superintending Engr 2nd to
the Secretary to Government
G.O. No. 47 dated 10th July 1867

No 2746/67

Specification Report
for constructing accommodation
bridge with elevating slab
form on Ryur channel for
the use of the villagers and
the maintenance of District
navigation amounting to
Rupees 5660-- for two--

Detailed Estimate No 20 of 1867/68
Ryur District

Work
Constructing a Bridge of 5 Arches 20 feet span
on Ryur Channel at crossing of the Elan Road--

Particulars	Number	Measurements			Cubic Contents
		Length	Breadth	Height	
Foundations to Abutments (Canted Square)	3	21 1/2	6	5	1290
Do to Piers including Cut waters Do	4	21 3/4	4 3/4	5	2066 1/4
Do to Wings	4	21 1/2	6 1/2	5	2615 1/2
Do Piers to the end	4	2	1/4	5	10
Retaining Walls	2	98 3/4	1 1/2	1	296 1/4
Do Do	2	92 3/4	2 1/2	1	185 5
Flanking	5	19 3/4	1 1/2	1	1135 3/8
<u>Superstructure</u>					
Abutments (Canted Square)	2	20 1/2	1 3/4	7 1/4	1509 1/4
Piers including Cut waters Do	4	20 1/2	3 1/2	7 1/2	2152 1/2
Wings	4	21 1/2	3 1/4	10 3/4	2942 3/8
Do	4	1/4	1 1/2	1 1/4	61 3/4
Piers	4	2	1/4	7	11
Shutters for Piers	4	14 1/2	3 1/2	5 1/2	169 1/2
Do Do Abutments	2	14 1/2	3 3/8	1 1/2	140 3/4
Spandrels	4	14 1/2	5	3/4	217 1/2
Parting to Arches	2	14 1/2	7 1/2	1 1/2	180 3/4
Flow Walls	2	94	1 1/2	1 1/2	422
Do	2	35	1 1/2	2	210
Blocking Course	2	167	1 1/2	1	601
Do Do for Piers	4	2	2	1	16
Total Cubic ft. of Materials in Quantity					17813
Cubits of Do					657 20/27

Bricks in Churnam					
Arch Work	5	24.6	14.6	1-10	3256.7
Parapet	2	167	1-3	1-9	730.7 1/2
Pilasters	4	2--	2--	1-9	28.
Total Cubic ft. Bricks in Churnam 1465.1					
or Cubic Yds of Bricks 112.14					

Cut Stone Work					
Strengthening Course for Abutments	2	21--	2--	--6	42--
Do Do for Piers	4	21--	4--	--6	168--
Cap	10	3-6	2--	1-8	16-8
Loaden Work for Parapets	2	167	1-8	--6	278-4
Pilaster	4	2-5	2-5	--6	11-8
Coping for Parapets	2	167	1-6	--9	375-9
Do for Pilaster	4	2-3	2-3	--9	15-2 1/2
Total Cubic ft. of Cut Stone Work 937 7/8					
or Cubic Yds of Stone 34.97					

Painting Scaffolds					99
Excavating Foundations Culiv Yds					540
Guard Stones					
Centring	4				
Baling water					
Sundries and Contingencies					

Superintending Engineer's office
2nd Division Masulipatam
10th July 1867

Leo Mmoom
Superintending Engineer

2746/67

Abstract Estimate No 20 of 1867/68
Kistnath District
Work
Constructing a Bridge of 5 Arches of 20 feet span
over Puzos Churnam at crossing of the Chow Road.

Quantity	Description of Charges	Rate	Amount	Total
160	Culiv Yards Rough Stone in flow	3 2	2062 8	
149	Do of Bricks in Churnam	6 "	894 "	
35	Do of Cut Stone in Churnam	11 15 1	417 15 11	
99	Squares of Peinting	1 "	99 "	
540	Culiv Yds of Earth Work for Excavating foundations	" 1 "	33 12 "	
11	Guard Stones	3 "	12 "	
	Centring		200 "	
	Baling water		250 "	
				3979 3 11
	Sundries and Contingencies			190 12 1
				Total Estimate No 4170 . .

Supdy. Engrs Office
Masulipatam
10th July 1867

Leo Mmoom
Superintending Engineer

23	$477.6\frac{5}{32}$	
24	$530.3\frac{5}{8}$	
bb0	$3678.11\frac{25}{32}$	2428140
25	$476.3\frac{5}{32}$	
26	$419.4\frac{13}{16}$	
27	$354.0\frac{47}{64}$	
28	$331.6\frac{15}{64}$	
29	$340.6\frac{25}{64}$	
30	270.3	
31	$255.10\frac{5}{64}$	
32	$363.6\frac{53}{64}$	
bb0	$2811.5\frac{5}{64}$	1855590
33	$377.2\frac{27}{32}$	
34	$336.10\frac{15}{32}$	
35	$328.0\frac{5}{8}$	
36	$297.0\frac{15}{16}$	
37	$318.1\frac{3}{8}$	
38	$279.7\frac{3}{8}$	
39	$213.11\frac{1}{32}$	
40	$233.7\frac{17}{32}$	
bb0	2384.6	1573770
41	$260.8\frac{1}{16}$	
42	$237.0\frac{5}{8}$	
43	$244.6\frac{13}{16}$	
44	$258.0\frac{1}{16}$	
45	$295.6\frac{21}{32}$	
46	$227.3\frac{7}{32}$	
47	$140.6\frac{3}{32}$	
48	$239.8\frac{15}{32}$	
bb0	$1902.9\frac{14}{16}$	1255980
49	$282.4\frac{11}{64}$	
50	$277.4\frac{5}{64}$	
51	$257.6\frac{3}{64}$	
52	$223.6\frac{63}{64}$	

53	$275.1\frac{1}{4}$	
54	$304.7\frac{5}{8}$	
55	382.1	
56	$422.11\frac{1}{4}$	
bb0	$2425.7\frac{5}{16}$	1600830
57	$358.5\frac{21}{32}$	
58	360.5	
59	$340.9\frac{9}{32}$	
60	$302.2\frac{3}{16}$	
61	$333.3\frac{1}{4}$	
62	371.4	
63	$420.7\frac{1}{16}$	
64	$276.2\frac{5}{64}$	
bb0	$2763.3\frac{1}{64}$	1823745
65	$249.5\frac{31}{32}$	
66	$233.3\frac{15}{32}$	
67	$255.3\frac{23}{32}$	
68	$282.9\frac{15}{32}$	
69	$342.5\frac{3}{4}$	
70	$356.8\frac{1}{8}$	
71	$257.4\frac{3}{8}$	
72	$248.1\frac{1}{8}$	
bb0	$2225.5\frac{23}{32}$	1468830
73	$252.2\frac{19}{32}$	
74	$161.6\frac{7}{16}$	
75	$160.1\frac{15}{16}$	
76	$150.3\frac{3}{8}$	
77	$127.3\frac{31}{64}$	
78	$131.1\frac{3}{64}$	
79	$125.4\frac{25}{32}$	
80	$104.0\frac{3}{16}$	
bb0	$1212.0\frac{1}{32}$	799920
81	$69.2\frac{1}{4}$	
82	$71.8\frac{3}{4}$	

Nuxta District.

Work Enlarging & improving Ryres Canal
from Head Sluice to Pallairu near Murrenada.

In a letter from the
Superintending Engineer Esq
to the Secretary to Government
G. O. No 47 dated 10th July 1867

No 2746/67

Specification Report
for constructing a Bridge of 5
arches 20 feet span on Ryres
Channel at crossing of the Alluvial
Road
Amounting to Rs 4.170-0-0

Number of Stations	Distance	Area of Cutting	Total Cutting in cubic yards
1		622.0 $\frac{1}{2}$	
2		580.0 $\frac{5}{16}$	
3		466.11 $\frac{23}{64}$	
4		390.9 $\frac{3}{4}$	
5		455.1 $\frac{13}{16}$	
6		498.7 $\frac{3}{16}$	
7		574.5 $\frac{3}{32}$	
8		620.11 $\frac{9}{32}$	
660		4209.0 $\frac{2}{32}$	2777940
9		604.9 $\frac{1}{16}$	
10		608.0 $\frac{1}{16}$	
11		559.11 $\frac{21}{32}$	
12		616.0 $\frac{17}{32}$	
13		655.0 $\frac{1}{8}$	
14		620.10 $\frac{5}{8}$	
15		624.11 $\frac{5}{16}$	
16		631.7 $\frac{3}{16}$	
660		4916.2 $\frac{4}{16}$	3244560
17		600.0 $\frac{5}{8}$	
18		415.4 $\frac{9}{32}$	
19		287.8 $\frac{53}{64}$	
20		432.3 $\frac{37}{64}$	
21		502.1 $\frac{29}{32}$	
22		433.7 $\frac{9}{16}$	

83	$62.11\frac{5}{8}$	
84	$67.7\frac{1}{8}$	
85	$102.1\frac{25}{32}$	
86	$116.11\frac{3}{32}$	
87	$177.2\frac{63}{64}$	
88	$211.10\frac{43}{64}$	
660	$879.1\frac{17}{32}$	580140
89	$126.9\frac{5}{16}$	
90	$75.4\frac{3}{8}$	
91	$81.7\frac{31}{32}$	
92	$77.6\frac{21}{32}$	
93	$125.8\frac{5}{16}$	
94	$136.11\frac{57}{64}$	
95	$152.6\frac{55}{64}$	
96	$232.3\frac{19}{64}$	
660	$1008.10\frac{7}{16}$	665940
97	$207.1\frac{23}{32}$	
98	$150.2\frac{25}{32}$	
99	$156.2\frac{1}{4}$	
100	$144.5\frac{7}{16}$	
101	$89.1\frac{1}{2}$	
102	$81.0\frac{13}{16}$	
103	$81.8\frac{17}{32}$	
104	$26.5\frac{25}{32}$	
660	$936.4\frac{13}{16}$	618090
105	$67.9\frac{1}{2}$	
106	$152.6\frac{1}{2}$	
107	$91.1\frac{5}{32}$	
108	18.7	
109	$24.5\frac{7}{16}$	
110	$21.11\frac{29}{64}$	
111	$10.4\frac{5}{32}$	
112	$13.9\frac{31}{32}$	
660	$400.6\frac{7}{32}$	264330

113	$13.11\frac{5}{16}$	
114	$11.2\frac{15}{16}$	
115	$15.3\frac{13}{16}$	
116	$16.11\frac{13}{64}$	
117	$13.1\frac{59}{64}$	
118	$10.4\frac{35}{64}$	
119	$10.8\frac{7}{32}$	
120	$7.4\frac{9}{16}$	
660	$99.0\frac{1}{32}$	65340
121	$8.3\frac{25}{32}$	
122	$19.10\frac{7}{8}$	
123	$37.10\frac{1}{2}$	
124	$71.0\frac{7}{8}$	
125	$104.2\frac{1}{2}$	
126	$92.9\frac{1}{4}$	
127	$59.6\frac{7}{32}$	
128	$39.9\frac{25}{32}$	
660	$433.5\frac{13}{32}$	286110
129	$83.3\frac{7}{32}$	
130	$116.10\frac{29}{32}$	
131	$159.7\frac{7}{32}$	
132	$271.0\frac{25}{32}$	
133	$284.3\frac{1}{4}$	
660	$915.1\frac{1}{16}$	603900

Total Culin $\frac{1}{2}$ 21913155

or
Culin $\frac{1}{2}$ 811598

Abstract

811598 Cubic Yards of Earth Work	}	63406-1-
at 1-8 per C. Yard		
Sundries at 5 per Cent		3173-15-

Total Estimate Rs 66580-1-

Superintending Engineer's Office	}	Certificat. <i>Leut. Min. Com. Supt. Engrs. Div.</i>
2 nd Division Masulipatam		
10 th July 1867.		

Comptrol. *Off.*

In a letter from the
Superintending Engineer
2nd Gen to the Secretary to
Government D. P. H. No. 47
dated 10th July 1864

No. 2746/64

Estimate for Enlarging
& Improving Regus Canal
from Head Sluice to Pullari
near Kurrinwala
Amounting to Rs 66580

Detailed Estimate No. 20 of 1867-68
Kistna District.
Enlargement of the Head Sluice of Regus Channel

Particulars of work.	Number	Measurements			Contents
		Length	Breadth	Depth or Height	
Foundation Rubble Masonry in channels					
Abutments	1	42'-0"	6'-0"	6'-0"	1512'-0"
Do	1	10'-0"	6'-0"	6'-0"	360'-0"
Wing	1	2'-6"	4'-10"	6'-0"	72'-6"
Do	1	7'-6"	4'-10"	6'-0"	217'-6"
Piers	9	17'-6"	4'-0"	6'-0"	3780'-0"
Front retaining wall	1	54'-0"	3'-0"	5'-6"	891'-0"
Rear Do	1	79'-9"	2'-3"	4'-6"	807'-6"
Do Do	1	22'-0"	2'-3"	4'-6"	222'-9"
Do apron Do	1	130'-8"	3'-0"	6'-0"	2349'-0"
Superstructure					
Abutments	1	15'-0"	3'-9"	6'-0"	337'-6"
Do Backing	1	15'-0"	2'-3"	4'-6"	151'-10"
Do	1	26'-0"	3'-1 1/2"	10'-6"	853'-1 1/2"
Do	1	10'-0"	3'-1 1/2"	10'-6"	328'-1 1/2"
Piers	9	13'-9"	3'-0"	6'-0"	2227'-6"
Wing	1	7'-6"	2'-7"	11'-0"	213'-1 1/2"
Do	1	2'-6"	2'-7"	11'-0"	71'-2 1/2"
Closing	1	106'-0"	10'-0"	2'-0"	2120'-0"
Do	1	55'-0"	16'-0"	2'-0"	1760'-0"
Blocking course	1	174'-0"	1'-3"	0'-9"	163'-1 1/2"
Do	1	54'-0"	1'-3"	0'-9"	50'-7 1/2"
					18488-324

Deduct
Roughly chisel dressed stone
Cut-stone and cut stone grooves

2350'-6"

700'-6"

3051'-0"

Total Rubble Masonry in chunam $\text{cft. } 1549\frac{3}{4}$

Cubic yards $571\frac{7}{8}$

Arch work Brick in chunam $10-8\ 13-0\ 11-0\ 1-6\ 2145$

Cut stone work

Grooves $20-0\ 1-0\ 0-9\ 11-0\ 165-0$

Caps of cutwaters $12-0\ 3-0\ 1-6\ 0-9\ 40-0$

Face of arch $24-0\ 1-3\ 11-0\ 1-6\ 495-0$

Cubic feet $700-60$

Cubic yards 26

Roughly chisel dressed stone

Side or Face walls $1\ 15\frac{1}{2}\ 0\ 1\ 3\ 2\ 0\ 46\frac{1}{2}\ 0$

Cutwaters $12\ 2\ 0\ 2\ 6\ 6\ 0\ 360\ 0$

Rear faces of Piers $12\ 1\ 3\ 3\ 0\ 6\ 0\ 270\ 0$

Parapet $1\ 44\ 0\ 1\ 0\ 1\ 9\ 812\ 0$

Abutment and wings $2\ 39\ 0\ 1\ 3\ 6\ 0\ 585\ 0$

Cubic feet $2494\ 0$

Cubic yards $92\frac{10}{27}$

Pointing in chunam squares $"\ " " " 78\frac{1}{4}$

Concrete to fill spandrels $1\ 60\ 0\ 13\ 0\ 2\ 6\ 1950\ \text{cft.}$

C. yds. $72\frac{2}{9}$

Rough stone Apron $1\ 63\ 0\ 15\ 6\ 2\ 3\ 2197\ \frac{1}{2}$

$1\ 61\ 6\ 12\ 0\ 2\ 0\ 1476\ 0$

$1\ 62\ 6\ 20\ 0\ 2\ 0\ 2500\ 0$

Total Rough stone Cubic feet $6173\frac{1}{8}$

Cubic yards $228\frac{2}{3}$

Teakwood shutters $10\ 6\ 6\ 12\ 6\ 0\ 2\frac{1}{2}\ 169\ 3\frac{1}{4}$

Iron bar $20\ 6\ 9\ 0\ 2\ 0\ 2\ 9\frac{3}{4}$

Iron bar $20\ 6\ 9\ 0\ 3\ 0\ 3\ 8\frac{7}{16}$

Cubic ft. $12\frac{3}{16}$

lbs 5923

Excavating foundations cubic yards $"\ " " " 1320$

Centering $"\ " " " "$

Add for removing old abutment &c $"\ " " " "$

Metalling $1\ 130\ 0\ 8\ 6\ 0\ 6\ \text{cft. } 552\frac{1}{2}$

C. yds. $20\frac{1}{2}$

and Contingencies

Sum of all Rs.

Abstract Estimate No. 20 of 1867-68

Hisra District

Enlargement of the N. Side of Pyres Channel

Work

Quantity Description of Work Rate Amount Total

$571\frac{7}{8}$ c. yds. of Rubble Masonry in chunam 3 . . 1715 54

2145 c. ft. of Arch work Brick in chunam 4 . . 536 4 .

26 cubic yds of cut stone work 12 . . 312 . .

$92\frac{10}{27}$ - Do - Roughly chisel dressed

stone in chunam 8 . . 738 155

$78\frac{1}{4}$ Sqrs. of Pointing in chunam 1 8 . . 117 6 .

$72\frac{2}{9}$ Cubic yards of Concrete 2 6 . . 171 8 6

$228\frac{2}{3}$ Rough stone Apron 1 . . 228 10 8

$169\ 3\frac{1}{4}$ Cubic feet Teakwood shutters

wrought and put up 3 . . 507 13 .

5923 lbs of Iron bar . . 14 493 9 4

1320 c. yds. Excavating foundation . . 1 . . 82 8 .

Centering 16 . . 160 . .

Add for removing old abutment &c . . 20 . .

$20\frac{1}{2}$ c. yds. of Metalling with Brick Hammer 1 8 . . 30 12 .

5114 87

Sundries and Contingencies at 5 percent 285 7 5 5,400 . .

Total Estimate Rupees 5,400 . .

Superintendent of Works

W. S. P. S. S. S.

10th Dec 1867.

Commissioner of Works

Superintendent of Works

In a letter from the
Superintending Engineer 2nd to
the Secretary to Government
P. O. No. 122 dated July 1867

Plc 2746/67

Estimates No 20. of 1867-68.
Enlargement of the
Head Sluice of Ryres Channel
Amounting to Rs 5400

Specification Report to accompany Plan
and Estimate for enlarging the Head sluice of
Ryres channel from 3 to 13 Vults. —

The bed of the channel is alluvial soil.
The Head Sluice to consist of 13 Vults having
dimensions as follows.

1 The foundation of the piers and
abutments to be 5 and $7\frac{1}{2}$ ft at bottom $3\frac{1}{2}$
 $4\frac{1}{2}$ ft at the floor, and 6 ft deep resting
on natural soil.

2 The abutments above, to be $4\frac{1}{2}$ ft
at the floor and 3 ft at top in thickness, $8\frac{1}{2}$
ft high and the piers to be 3 ft wide and
6 ft high.

3 The foundation of wings to be 6 ft
at bottom, $3\frac{1}{2}$ ft at the floor, and 6 ft deep,
and above, $3\frac{1}{2}$ ft at the floor, $1\frac{1}{2}$ ft at top
and 11 ft high.

4 The arches of Vults to have each a
curved line of 3 ft $\&$ to be $1\frac{1}{2}$ ft thick.

5 The three vults constructed in 1861/62, are
shown in lake in the plan. The parts coloured
green show the existing work to be removed.

6 Iron bars 2" sq. will be placed
across the Vults in front as shown in the
plan and support the Laskwood shutters
which will be worked in grooves cut in hard
stones in the abutments and piers.

7. Four steps to be built on each side of the abutments as shown in the plan to facilitate the lascar to work the planks.

8. The flooring under the arches and in rear, to be 2 ft thick, and the retaining walls between front and rear wings to be 1 and 2 1/2 ft at bottom, 2 ft at top, and 5 1/2 and 4 1/2 ft deep respectively.

9. Retaining wall between aprons & connecting revetments to be 1 & 2 ft thick and 5 1/2 ft deep.

10. Rough stone apron in front to be 14 ft wide and in rear 20 & 12 ft wide all 2 ft thick. Revetments to be 2 1/4 ft in average thick 6 ft high, slope 1 3/10 to 1.

11. The foundation and superstructure to be of rubble masonry, and arch work to be of brick in Chumau.

12. Grooves, Caps of cutwaters, & face of arch to be of cut stone, & face walls. Cutwaters - rear face of piers - parapets - abutment and wings, to be of roughly chiseled dressed stone and the whole work to be pointed neatly.

Supr Engr Office of the
Maulapa tam
10th July 1867 } Lt Col M. J. Lamb
Supr Engr of the

Compared
by P. L.

In a letter from the
Superintending Engineer to
the Secretary to Government
D. P. W. No 47 dated 10th July 1868

No 2746/67

Specification report of the Engr
near the Head of River
Channel
Amounting to Rs. 5,400-00

Estimate of the probable expense of the enlarging of the
More Canal from the head near Bezoara to the head
of Ryne's Channel between the 7th & 8th mile.
Width of bed 120-150 ft. side slopes 2 to 1. fall $2\frac{1}{2}$
inches per mile.

	Average Depth of cutting	Width of cutting	Area	Length	Cubical Contents
Section 1	$\frac{107.8}{10}$	90	970.2		
side slopes	$\frac{20.7 \times 41.4}{2}$		428.49		
	$\frac{20.3}{2}$	40.6	412.09		
			1810.78	3420	6192867.6
Section 2	$\frac{94.5}{11}$	95	816.15		
slopes	$2 \times \frac{15.8}{2}$	31.6	249.64		
			1065.77	4000	4263030.0
Section 3	$\frac{112.1}{10}$	85	952.85		
slopes	$\frac{13.9}{2}$	27.8	193.21		
	$\frac{15.3}{2}$	30.6	234.09		
			1380.15	4100	5658615.0
Section 4	$\frac{87.6}{11}$	100	796.36		
slopes	$\frac{12.6}{2}$	25.2	158.76		
	$\frac{9.9}{2}$	19.8	98.01		
			1053.13	4100	4317833.0
Section 5	$\frac{32}{11}$	95	708.18		
	$\frac{8.3}{2}$	16.6	68.89		
	$\frac{4.1}{2}$	18.2	82.81		
			859.88	4000	3439520.0

Carried over 23871915.6

2

In a letter from the
Superintending Engineer
2^d Dec to the Secretary to
Government D. P. W. - 1867
dated 10th July 1867

No 2746/67

Estimate of the probable
expense of the enlarging
the Elbow canal from the
head near Beyoarah to the
head of Ryres channel below
the 4th & 8th mile - Width
bed 120-150 ft deep Slope
2 to 1 - fall 2 1/2 inches per
foot Amounting to Rs. 1,88,440-

DETAILED ESTIMATE No. 2 of 1867-68

District Kistnah

Alternative Series

Work Constructing sluice and Bridge at head of proposed
New line for Ryres Channel at Beyoarah - The
Bridge will answer for both the Elbow Mesulipetam
Roads

Particulars.	Number.	Measurement.			Cubical Contents.
		Length.	Breadth.	Height.	
Foundation to					
Abutments	2	21-0	11-6	6-0	2898-0
Piers including rear cut waters	2	28-1 1/2	8-9	6-0	2953-0
Front cut waters of Piers	2	6-10 1/2	2-10 1/2	6-0	237-2
Ends of abutments including projections for sluices	2	7-6	6-0	6-0	540-0
Rear do of abutments	2	7-6	1-9	6-0	137-6
Piers for sluices	12	8-0	3-6	6-0	2016-0
Wing walls	11	14-0	6-4 1/2	6-0	2142-0
Piers at termination of Wings	4	4-0	3-10 1/2	6-0	372-0
Side walls to masonry path	2	10-0	5-0	2-0	200-0
do above floor	2	10-0	3 1/2	4-0	290-0
Rear Retaining wall	1	15-6	3-0	6-0	2079-0
Front Retaining walls between piers	9	6-6	3-0	5-6	965-3
do do piers and abutments	6	5-9	3-0	5-6	569-3
<u>Superstructure</u>					
Abutments	2	21-0	8-0	14-0	4704-0
Passing to abutments	2	21-0	5-6	0-4 1/2	86-7
Piers large including stem backs	2	21-0	6-6	5-9	1569-9
Rear cut waters of large piers including Caps.	4	6-6	1-8	6-6	281-8
Projection of large piers for sluices	4	6-6	5-0	10-0	1300-0
Front cut waters of do	4	5-3	2-0	10-0	420-0
Wing walls	4	14-0	4-2 1/4	15-9	3693-3
do at abutments	4	6-4	3-0	14-0	1064-0
do do	4	11-0	3-1 1/2	6-9	928-1

Particulars	Number	Measurement			Cubical Contents
		Length	Breadth	Height	
Piercings at termination of wings	4	4-03-2/10-9			548-3
Piers for chimneys including cutwaters	12	7-02-65-6			1155-0
Cutwaters of small piers above springing	12	2-01-05-6			132-0
Rear do do do do	12	2-01-03-9			90-0
Side walls to masonry path	2	10-2-310-11			450-0
Face walls for large arches	12	20-2-62-6			1500-0
Filling of piers	2	21-6-2-2			504-0
Face walls over piers	4	6-62-36-9			394-10
Face walls of small arches	15	3-1-33-6			196-10
Flooring	3	39-21-51-11			2486-3
Piercings at termination of masonry path	3	2-00-310-11			10-0
Pilasters	4	4-00-610-9			86-0
		Total cu. ft.			37019-
Quant. for piers included in flooring	12	7-2-61-11			210-0
Arches	2	21-4-4-3			714-0
Ashlar work					5526-0
Vertical ashlar work					1197-0
		Total deductions			7647-0
		Net cubic feet			29372-0
		Cp. of Rough stone incl. in			1087 22/27
Rear parapets excluding pedestals		183-1-62-9			754-10
do pedestals at termination of parapets		8-2-32-9			49-6
Front parapet wall excluding pedestals & pilasters		167-1-62-9			688-10
do do of chimneys excluding cutwaters and pedestals		167-1-1-6			250-6
		Cubic feet			1743-8
		Cp. of brick in Chuan			64 2/12
Arch work					
Arches for bridge excluding ashlar work	3	55-618-03-1 1/2			9365-7
do small for chimneys do	15	12-3-61-6			945-0

Particulars	Number	Measurement			Cubical Contents
		Length	Breadth	Depth	
Arches for piers	2	16-6	11-9	1-3	484-8
		Cp. of			10795-3
		Cp. of brick work in Chuan			399 22/27
Plastering					
Interiors of bridge arches excluding ashlar work	3	51-3	18-11		2767-6
do chimneys do do do	15	10-11	3-6		525-0
		Sq. ft. of plastering			2 Cts 7 Chuan
Pointing to front parapets in and out		350-11	2-9		962-16
do rear parapet		366-11	2-9		1006-6
do to parapet of chimneys inside		163-11	1-6		244-6
do do outside		90-11	1-6		135-0
		Sq. ft. of pointing to parapet			2348-6
Cornice work	2	191-11			382-0
		Rt. ft. of cut stone Cornice work			382-0
Cut stone coping work including insides of parapets	2	202-11			404-0
		Rt. ft. of cut stone coping work			404-0
Vertical ashlar work					
Abutments including rear cutwaters	2	33-0	1-3	5-6	453-9
Piers including rear cutwaters	2	59-11	1-3	5-6	811-3
Rear wing walls including pilasters & up to cornice	2	22-0	1-3	10-6	577-6
Front wing walls	2	19-6	1-3	10-9	524-0
Masonry path	2	8-0	1-3	6-0	120-0
Front face wall over large arches	12	21-3	1-3	2-6	796-10
Rear do over do arches	12	20-11	1-3	2-6	750-0
do do over piers and abutments	4	6-6	1-3	9-0	292-6
Caps to rear cutwaters of piers & abutments	4	6-6	1-3	3-0	97-6
Piers for chimneys	12	6-11	2-6	5-6	990-0
Cutwaters of piers for do above springing	12	2-6	1-0	3-9	112-6
		Cp. of			5526-0
		Cp. of vertical ashlar work			204 2/3

Ashland Dock					
Fans of Arches for bridge both sides	6	55-6	1-6	3-1/2	1560-11
do for sluice fronts	15	12-0	1-6	1-6	405-0
Front cutwaters of Piers & Abutments	4	7-0	1-6	13-0	546-0
Pilasters up to Cornice	4	4-0	1-6	10-9	258-0
do at termination of Wings	2	4-0	1-6	3-0	36-0
do do of masonry path	2	2-0	1-6	2-0	12-0
Cutwaters of piers for sluice	12	2-6	1-0	11-6	345-0
Pilasters in parapet	6	4-0	2-9	2-9	181-6
Caps to pedestals	6	4-0	2-0	0-3	12-0
Caps to sluice cutwaters including coping	14	3-0	2-0	0-6	42-0
Stringing course to cutwaters of Piers	2	7-0	0-4	0-6	2-4
Flat coping over sluice parapet	15	6-0	1-3	0-3	28-1-0
				Cpl	3429-0
				Yds of ashland dock	127
Concrete Works					
Concrete under floor	3	39-0	21-0	1-0	2457-0
Filling up masonry path	2	10-0	2-4 1/2	14-0	665-0
Filling up spaces of small arches	15	4-0	3-6	3-0	630-0
				Cpl	3752-0
					210-0
Desert for piers				Net cube feet	3542-0
				Yds of concrete work	131 5/27
Planks for shutters	15	6-6	0-2 1/2	11-6	233-7
				Cpl of Teakwood work	233-7
Iron bars	15	6-9	0-2	0-2	2-9 3/4
	15	6-9	0-3	0-3	6-3 3/4
				Cpl	9-1 1/2
				Wts of Iron bar	4434 3/4
Frame work	15	21-0			315-0
				Ref of frame work	315-0

Installing Roadway					
	191-0	17-0	1-0		3247-0
				Cpl	3247-0
				Yds of installing met brick	120 2/27
Rough stone apron					
	133-0	18-0	1-6		3591-0
				Cpl	3591-0
				Yds of Rough stone apron	133-0
Guard Stones	4	"	"	"	
Excavating foundation & raising approaches	"	"	"	"	
Centerings	"	"	"	"	
Boaling water	"	"	"	"	
Lumbers and Contingencies	"	"	"	"	

Supd by Officer 2d Div
 In accordance
 10th July 1867.

Commissioner of Public Works
 Supd Engineer 2d Div

Pl. 2746/67

Specification Report to accompany
Estimate for constructing Bridge and sluice
at the head of proposed new line for Pyner
Channel - Amounting to Rs 13000.

1. The foundations of the abutments, piers
of bridge and sluice to be of rough stone in
Chunam 6 ft deep resting on natural soil.

2. Piers and abutments are to be connected
by retaining walls in front and rear 2.6 thick
at top and 3.6 at bottom, the latter 6 ft deep,
and the former $5\frac{1}{2}$ ft only.

3. Abutments and Piers of bridge are to be
21 ft long, the thickness of the former to be 11 ft
at the floor and $8\frac{3}{4}$ at the springing, and that
of the latter to be of uniform thickness of
6.6, both to be raised to a height of $5\frac{1}{2}$ ft
above floor. The curved side of the Arch is
to be $12\frac{1}{2}$ ft giving a total height of 18 ft to the
soffit.

4. Length of the projection of the piers and
abutments for sluice (excepting cut waters)
to be 5 ft, the breadth well be 6.6 height 10 ft.
Rear cut waters of the piers and abutments
are to be 2.9 from the face of the Arch with
semicircular Caps of 1.6 high, stringing course
under 4" x 6".

5. Piers for sluice to be 5 ft in length

6. Closing End walls $2\frac{1}{2}$ feet thick and $5\frac{1}{2}$ feet high
Front and rear walls to be 2 ft. long with 2

plain faces.

6. Wing walls to vary from 20 ft. in height
close to abutment to 10 ft. 9" at the extremities,
depth of the foundations to be reduced by
steps of 2 ft. up and 2 ft. 9" on, for a length of 18 ft.
including 4 ft. for pedestals.

7. Flooring will be 1 ft. thick with a sub-
stratum of 1 ft. of concrete. Masonry path
4 ft. wide for the lancers to go over the sluice
to work the shutters. It will be built of
rubble in Chumam the interior space between
outside and wing walls and the panels
of the small arches will be filled up with
concrete.

8. The Bridge is to consist of three
elliptical arches of 40 ft. span and
21 ft. long. thickness at crown 2 ft. 3" and
gradually increases to 4 ft. thick at the
haunches. The thickness of the semicircular
arches of sluices to be 1 ft. 6" and span 16 ft.
Arches 1 ft. all built of brick in Chumam,
excepting the front and rear faces of the large
arches and the front faces of the small arches
which are to be of ashlar work to a depth
of 1 ft. 6". The interiors of arches of bridge
and sluices to be plastered with 2 coats
of Chumam.

9. The Superstructure of the wing walls,
small and large piers, abutments, rear
end walls of the large and small piers,
masonry path and face walls are to be
rubble stone in Chumam and faced with
vertical ashlar masonry.

10. Front end walls of the large & small
piers and abutments, pedestals at the
termination of the wing walls and masonry
path, Pilasters of piers and of parapets,
Caps of the pedestals and Pilasters are to be
cut stone ashlar work.

11. Parapets of the Bridge to be 1 ft. 6" thick
and 2 ft. 9" high excluding coping of 6" and
the sluice parapet to be 1 ft. 6" thick and 1 ft. 6"
high excluding coping, all built of brick
in Chumam pointed very neatly. Cut stone cornice
work at the foot of the parapet will be
projected 6" and 9" high. Roadway over the
arches is clear width 18 ft. all along.

12. Length of the rough stone apron in rear
of bridge to be 130 ft. and 18 ft. wide and
1 ft. 6" thick. Teak wood shutters which
will be worked in grooves in hard stone
in the abutments & piers. Iron bars 2" x 3"
square will be placed across the vents
in rear

in rear of shutters as shown in the Plans

Supr Engineer's Office D.D.
 Manipalpetam
 10th July 1867.

Westminster New York N.Y.
 Supr Engineer's Office D.D.

[Faint, mostly illegible handwritten notes and sketches, possibly showing cross-sections or plan views of a canal or bridge structure.]

No 2746/67

Estimate No 290 of 1867-68. Alternative Line.

Estimate of the probable expense of excavating a new Channel as a Head to Ryer's Channel from the point of the Bridge at Beggarab across the Ellore Canal,

Miles	Depth of cutting	Area (W+2d) d	
1	19.2	(90+38.4) 19.2	2465.28
2	14.7	(90+29.4) 14.7	1755.18
3	11.8	(90+23.6) 11.8	1340.48
4	13	(90+26.) 13.	1508.0
5	13.6	(90+27.2) 13.6	1593.92
6	10.4	(90+20.8) 10.4	1152.32
7	9.0	(90+18.) 9.0	972.0

10707.18 $\frac{1}{2}$

Cubic fms
 $10707.18 \times 1760 = 2109536.$

Abstract.

2109536. $\frac{1}{2}$ at 2 Annas per $\frac{1}{2}$ = Rs 263692.
 Contingencies at 5 per cent. 13188
 Compensation. 3000.
Total Rs 279080.

Supr Engineer's Office D.D.
 Manipalpetam
 10th July 1867

Westminster New York N.Y.
 Supr Engineer's Office D.D.

16
List of Plans &c. to accompany Superintending Engineer's letter to the Secretary to Govt No 47- dated 10th July 1867-

- 1 Plan of Bridge showing proposed additions at head of Ellore Canal.-
- 1 Plan of Head sluice of Pyner Channel showing proposed enlargement.
- 1 Plan of Bridge of 5 Arches to be built over Pyner Channel at crossing of the Ellore Road.-
- 1 Plan showing alterations and additions to Komatigunta Calingalab and Pyner Branch Head sluice now proposed.-
- 1 Plan of 2 Calingalabs and Bridges on the Guduvada Branch of Pyner Channel.
- 1 Plan of Accommodation Bridges on Pyner Branch Channel.-
- 1 Plan of Accommodation bridge with levelling platform on Pyner Channel.
- 1 Plan of D^o with D^o across Pullains at Murruada below junction of Pyner Channel.-
- 1 Plan of Head sluice and bridge for the proposed alternative line of Pyner Channel at Bezgarah.-
- 1 Sections showing proposed enlargement of the Ellore Canal from its head to Pyner Channel.-

In a letter from the
Supt Engr to the
Secretary to Government
G. S. No 47 dated
10th July 1867

Pro 2746/67

Confirmation of the probable
expenditure of Rs 29,880-
for the proposed alterations
to the Pyner Channel from
adjacent to the bridge
at Bezgarah and
the Ellore Canal
amounting to Rs 29,880-

27/2/4/6/67
Proc. 20th Aug^r 1867 No. 466.

List of plans &c. to accompany
Superintending Engineer's letter
to the Secretary to Government
D. P. No. 1247 dated 10th July 1867.

14 E 11

1. Survey and plans
as per list attached.
2. Detailed and Abstract
Estimates.
3. Specifications
reports.
4. General Abstract
Estimate.

x by hand

D No 135
January
1868.

Superintending Engineer's Office
Madras
10th July 1867.

To
Lieut. Colonel G. V. Winscom R.E.
Superintending Engineer
Colonel C. A. Orr R.E.
Secretary to Government
D. P. No.

I have the honor to submit for the
Sanction of Government, Estimates and Plans
as per margin for works connected with the
irrigation from the Krishna amounting in value
to Rs. 325810.-

These form part of the general scheme
proposed by Colonel Anderson in his letter
No 143, embodied in Proceedings of Government
No 250 dated 12th February 1864, which received
the approval of the Secretary of State in his
letter No 33 dated 9th December 1864 to the Governor
in Council Fort Saint George.

The Estimates now forwarded are for the
enlargement of the Ellore Canal and of the Central
Draught, (commonly known as Ryne's Canal)
of the Madras side of the Krishna Delta.
The Ellore Canal is designed to

discharge 274,000 Cys. per hour, with a depth varying from 6 1/2 to 8 fms of which Ryne's Canal will take off 192,000 Cys. leaving 71,000 Cys. for irrigation under the Ellora Canal between Ryne's Head and Ellora, and 11,000 Cys. for surplus into the Poomair, whence it will be utilized by the Mofussil Channel which takes off from the Calingulahs of that name already constructed and so forth.

5. Of the 192,000 Cys. available for Ryne's Channel 51,000 Cys. will be taken off by the Guivada Branch, and 141,000 will pass down the Channel watering the lands adjacent, the surplus being discharged into the Poolairoo at Mungwada whence it will pass into the various irrigation ducts branching from that stream.

6. It will be observed by the sections forwarded that the present scheme makes the Channels flow on a considerably higher level than at present, whereby a large area of Country for which water is not now available, will become susceptible of Cultivation.

7. I forward for the decision of Government plans and Estimates as per margin for an alternative line of Ryne's Channel proposed by Captain Ryne's. If it be adopted the total sum required will be Rs. 40,6110, being Rs. 20,300 in excess of the one proposed by Colonel Shiroon, & specially alluded to in his report in para 13. There are, no doubt, great advantages obtainable by adopting this line.

14. In having the head of the Chief irrigation Channel at Bazoroh, instead of 7 miles distant. This would ensure greater control of the distribution and regulation of the water.

25. The ability that would be possessed for carrying on the execution of the work with vigor all the year round, instead of only during the time that the Ellora Canal is dry - and when most of the available labour of the District is employed in clearing the Channels from their silt deposits.

35. The diminishing of the current to a slight extent on the Ellora Canal, rendering it more easy for navigation.

4th. A permanent retention of Conservancy.

Establishment.

8. The disadvantages are

1st The increased expense in Construction.

Exp. Rupees 80300. -

2nd The necessity of maintaining 7 more miles of Channel during all future years.

9. In the hope of getting a more economical line, I took levels in 2 other directions which appeared favorable, as shown in the sketch map accompanying. But the expense of these projects, if they were adopted, would be Rs 430000 and Rs 434600. - respectively and they cannot therefore be recommended.

10. My own opinion is that the advantages of being able to control the water close to the Head Works and of carrying on the work throughout the year are so great, that the extra money would be well expended in adopting the 1st alternative line. and I may mention that lately Colonel Anderson has expressed himself of the same opinion.

11. The various masonry works are designed to meet the objects desired. They are all of a substantial nature and

I think that the rates allowed will be found sufficient.

12. The probable increase of irrigated land is alluded to in Mr. Ford's letter attached to the Proceedings of Government above quoted. It is impossible to say what the special works now submitted for sanction will return, nor does it appear to be necessary as they form a portion of the great scheme, which in its incomplete state last year, returned 21 per Cent.

I have the honor to be

Sir

Yours most Obedt. Servant

Geo. F. Nicolson Esq. R.E.
Superintending Engineer D. D.

12th July 1865 No. 430
 12th Aug 1865 No. 133

1st of Govt for August
 No. 47

A. 2746

From the Super Engineer
 22nd Dec

To the Secretary
 to Govt. P.W.

Dated 10th July 1867
 Recd 22nd

Enclosures 49.
 19-6-1867

Submitting for the
 sanction of Government
 Plans and Estimates
 for enlarging and
 improving the Ellore
 Canal, Ryres Canal,
 and its branch and
 erecting necessary
 masonry works
 in the Masulipatam
 portion of the Nistua
 Delta amounting to
 Rupees 3,25,810 -

2543 - 2544 - 20th Aug 1867

ABSTRACT ESTIMATE No. 13 of 1867
 Nistua District.

Work

1st Alternative line of Ryres channel
 referred to in para of Supr Engr's letter to Govt
 No. 47 of 10th July 1867.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
	Constructing a Sluice and Bridge at head of the alternative line.		13000	✓
	Excavating a new ch ^l from No. 1 including compensation.		279800	✓
	Enlarging & improving Ryres Ch ^l from the 2 nd mile of Ryres Channel to Pullaim near Murruwa.		58180	✓
	Constructing a bridge of 5 Arches of 20' span each, on Ryres channel at crossing the Ellore Road.		470	✓
	Constructing two accommodation bridges with elevating platform on Ryres Ch ^l .		5860	✓
	Constructing accommodation bridge across Pullaim at Murruwa below junction of Ryres Ch ^l .		3710	✓
	Alterations & additions to Nomaigoria Caligala & Ryres Branch & sluice as now proposed -		2970	✓
			367570	

Amended

Quantity.	Description of Charges.	Rate.	Amount.	Total.
	Brought Over.		367570	
	Salaries & improving Guzenada branch of Pyroes Ch ^l .		26800 . . ✓	
	Constructing 3 Accommo- dation bridges on Pyroes branch Ch ^l .		3780 . . ✓	
	Constructing two Caluyden and bridges on the Guzenada branch of Pyroes Ch ^l .		2960 . . ✓	
	Sluices & Minor Ch ^l .		5000 . . ✓	
	Total Rupees.			406110

Supd. Engr. Office at D^r
Camp Mulkapooram
13th August 1867.

Commissary of Works
Supd. Engr. D^r.

Abstract Estimate
of
1st Alternative
of
Seyna Channel
No 1406110

P. N. 3017/67

In letter No 62 dated
3rd August 1867 to
the Secretary to
Government of Madras

Mysore

Public Works Department.

25/3
No. 2543

PROCEEDINGS of the MADRAS GOVERNMENT.

Under date the 20th August 1867

From the Superintending
to — to —

Read the following

10 July 1867 No. 47

(Here enter No. 62 dated 3rd Aug 1867)

With the letter above recorded, the Superintending Engineer of the 2nd Division submits plans and estimates for certain works connected with the general scheme of irrigation from the Krishna Aicut, as proposed by Col. Anderson, the late Superintending Engineer, and approved of by this Govt. and by the Secretary of State for India.

W. W.

2. The works which are now brought forward by Col. Pinson provide for the extension of irrigation in the eastern, or the Masulipatam side of the Krishna Delta.

and with this object in view he has submitted two alternative projects; — the first including the enlargement of the Ellore Canal, and of its main branch, known as "Pyves' Channel", which at present is led from it, in a south easterly direction, at a point 7 miles east of Bezwarrah, while the second provides for the excavation of an entirely new head to "Pyves' Channel", giving it an independent source at Bezwarrah, at the point where the Ellore and Masulipatam Canals now bifurcate.

The estimates submitted by the Supg. Engineer show the cost of the

two

two projects to be respectively Rs: 3,25,810 and Rs: 4,06,110.

Colonel Wincom in his letter sets out the advantages and disadvantages of each scheme; and after a full consideration of the papers upon the subject, the Govt. agree with him that the large additional sum of Rs: 80,300 will be well spent in securing an independent head to a channel which will play so important a part in the irrigation of the Delta.

The larger estimate of Rs: 4,06,110 will accordingly be recommended to the Govt. of India for sanction.

To the Supg. Engr. 2^d Div.
3^d Sect. General.
4th Controller.
21 Rev. Dept.

Dec 28/67
L.S.
J.

Ordered

Ordered that the
following letter be sent:—

2544
No. 2544
The Secretary to the Govt.
of India. P. W. D.

Sir,
I am directed to forward for the consideration of the Government of India the accompanying plans and estimates for works connected with the general scheme of irrigation from the Kistnah Aicut, as proposed by Colonel Anderson, the late Supg. Engineer of the 2^d Division, and approved of by this Govt. and by the Secretary of State for India.

2. The works which are included in these estimates

+ In letter No. 143 of 5th Jan'y/13

177
estimates provide for the extension of irrigation in the eastern, or the Masulipatam side of the Krishna Delta, and with this object in view two alternative projects have been submitted by the Supg. Engineer:— the first including the enlargement of the Ellore Canal, and of its main branch, known as "Rynes' Channel," which at present is led from it, in a south easterly direction, at a point 7 miles east of Bezwarrah, while the second provides for the excavation of an entirely new head to "Rynes' Channel," giving it an independent source at Bezwarrah, at the point where the Ellore and Masulipatam Canals now bifurcate. The cost of the

the two projects is estimated at Rs: 3,25,810 and 4,06,110 respectively.

Colonel Haiescom enters in his letter into the advantages and disadvantages of each scheme; and after a full consideration of the papers upon the subject, I am to state that this Govt. agree with that Officer that the additional sum of Rupees 80,300 will be well spent in securing an independent head to a channel which will play so important a part in the irrigation of the Delta.

Seeing that large returns are being realized from the Ristrah works in their present incomplete state, and that the development which

177
which it is now proposed to give to those works will unquestionably add to their remunerative character by affording better supplies of water to rapidly extending cultivation, I am to request that the estimate of Rupees 4,06,110 may receive the sanction of the Right Honorable the Governor General in Council.

M.

Fort St George
20th Aug 1867

50

Recd with six copies of G.O. No 2543 of 67 and one copy of G.O. No 430 of 64

Plans - 2
Details of Rs 58180 in general
Abstract Estimate of alternative
line
of Rs 5000 provided in the
two general Abstract Estimates
for sluices & minor channels

Will follow

No 2 forwarded to Govt of India on the 28th Aug 67 with a note that the details of Rs 5000 cannot at present be furnished.
127 (15 Plans) forwarded to the Govt of India on the 2nd Sept 1867

+ 11 Plans Recd

27/5/1861

Mr. Secretary to Govt.

Govt. of Madras

No. 25437 2544

Secy of the Madras Govt.

Of 20th August 1861

Passing orders on
Plans, Estimate &c.
connected with the
scheme of Irrigation
from the Pichayana River

Furnishing the
Govt. of India with
above Plans &c. and
requesting a sanction
the estimate of Rs. 5,00,000
for the works

No. 466 (468-469)