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MADRAS RECORD OFFICE.

Government of Madras.

DEPARTMENT.

G.O. No.	Press Mis.
Dated	18 .

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*Proceedings of the Madras Government, Public Works Department,
11th July 1867.*

No. 264. Read the following letter from the Superintending Engineer, 3rd Division, to the Secretary to Government, Department Public Works, dated Camp at Goontacul, Gooty Taluk, 2nd June 1867, No. 805:—

1. With reference to G. O. No. 96, of the 11th January 1867, I have the honour to submit answers to the questions proposed by the Committee for roads in Ceylon from five of the Ranges in this Division, viz., two in Bellary, two in Kurnool, and one in Juddapah.

2. I have thought it best to send replies from different Ranges, in order to show the type of work in different parts of the country.

G. O. No. 96, dated 11th January 1867.

GENERAL CHARACTER OF ROADS.

1. Describe the general character of the roads in hilly districts, and the materials of which they are composed?

1. Roads in hilly districts are kept as level as possible, are carried round, rather than over the hills, and over the lowest and most convenient saddles, occasionally in crossing valleys, embankments are necessary, but all heavy earth-work is avoided as much as possible.

In skirting the side of a hill, the road is generally one-half cutting and one-half embankment, which last, if necessary, is pitched with stone. The materials used are those most easily obtained in the neighbourhood, for, as a rule, in hilly districts good stone for metalling and good gravel are to be found.

2. Don't understand this question.

2. What is the usual type for roads of different width?

3. What system is followed in forming the road surface before laying on the metalling?

3. If the soil is hard and firm the metal is laid down at once; if of sand a depth of 6 inches is excavated and filled in with good soil—clay or gravel. This is well rammed, and the metal is then spread. If soft loamy soil, in a flat country, a small embankment from 6 inches to 1 foot in height is thrown up and this when rammed and consolidated forms a firm sub-stratum for the metal. Cuttings in hill sides generally give a hard firm surface for the metal, but in all cases the sub-stratum should be hard and firm before the metal is spread.

4. This question is answered by the foregoing, No. 3.

5. No.

6. For an ordinary road 6 yards wide with 4 yards metalling.

4. Is it usual to adopt any sub-stratum differing in character or material from the surface metalling? If so, describe it?

5. Are the roads fenced in? If so, what description of fencing is used, and what is the cost?

6. What is the total cost per mile of roads with different widths of metalling. Sub-divided under the following heads:—

a. Earth-work (including retaining walls and rocks).

b. Side drains.

c. Cross drains or culverts.

d. Bridges.

e. Metalling.

f. Miscellaneous.

7. How are estimates for roads framed?

8. What check is there for ascertaining whether the quantities actually executed agree with the estimated quantities?

a. Earth-work—impossible to say, for the cost of a road, through a flat or an undulating or a hilly country would differ so considerably.

b. Side drains about Rupees 100.

c. and d. Impossible to say. Dependent entirely upon the character of the country through which the road is carried on.

e. Metalling 4 yards about Rupees 800.

f. Miscellaneous. Unknown.

7. Already replied to by the Government of India.

8. Do. do. do.

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9. What system of drainage is adopted?

10. What is the average per-centage of rock to earth? And what are the average quantities of rock and earth per mile?

11. What is the usual width allowed beyond the metalled portion, and are there foot-paths?

12. What is the cost of earth-work per cubic yard?

13. Does this cost include carrying to embankment? Or is the cost of embankment formed from cuttings estimated as a separate item.

14. How is spoil estimated?

15. What is the cost of rock cutting per cubic yard?

16. Are there many boulders? If so, what is the cost of removing them? Are they estimated as much rock?

17. Is there much material, difficult to be removed by spade or mamooty, but the material for blasting? If so, what is the cost of such material per cubic yard?

18. Is rock defined as material which requires blasting?

19. Are retaining walls used extensively as a substitute for earth slopes?

20. If so, what is the character of masonry in such walls? What is the thickness for different heights of wall and the cost per cubic yard?

21. What is the average number of cubic yards of retaining wall per mile of road?

METALLING.

22. Describe the general character of the metalling and the materials of which it is composed?

23. What is the average thickness of metalling?

24. What is the average cost per superficial yard of metalling?

25. How is metal laid? Is it piled at the side of the road, and after being laid is it watered, stamped, rolled, or blended with gravel?

26. What is the cost of each of the following items in metalling, viz., blasting, sledging, breaking, piling, stamping, or rolling.

27. What is the average distances to which metal is conveyed from the quarry?

28. What is the cost of transport of metal for different distances?

29. Is the bushel in use as a measure? If not, what measure is used as for metal?

30. Is the measure heaped or not?

9. Catch drains are cut on the upper side of the road, and these drains are led off into larger side channels, which are led off into the nearest stream or river. It is sometimes necessary to carry this drainage across and under the road.

10. Impossible to say, for in one road there may not be rock for miles, in another rock may be found nearly every yard.

11. No foot-paths. Roads are usually metalled 2 yards less than the total width, there leaving 3 feet on each side of the metal.

EARTH-WORKS.

12. Varies from 1 Anna to 4 Annas per cubic yard, according to hardness and distance to be carried.

13. Already replied to by the Government of India.

14. Do. do. do.

15. A road in this country is very rarely carried through rock; clearing away obstructive rocks by blasting costs from Rupee 1 to Rs. 10 per cubic yard.

16. Sometimes a good many boulders are met with. They are measured as so many "cubic yards of removing rocks," and the cost varies considerably, for from 8 Annas to Rupees 5 per cubic yard, for sometimes the boulders can be dug out and rolled away, and in other places they must be burnt and blown out.

17. Small gravel or decomposed rock cost from 4 Annas to 1 Rupee per cubic yard.

18. Yes.

19. No, but earth slopes are sometimes pitched with stone.

20. Answered by No. 19.

21. Impossible to say.

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31. How many cubic yards does the measure contain?

32. How many cubic inches should be allowed on the average if the measure be heaped?

33. How many cubic yards of solid rock are required to make up a given number of measures, say 100 bushels?

CULVERTS.

34. What is the average number of culverts of different dimensions per mile?

35. What is the general description of masonry of which they are constructed?

36. Is the stone for masonry generally near at hand?

37. Is the stone blasted? If so, does it laminate with an even bed, or break up with an irregular fracture?

38. What is the cost of procuring stone per cubic yard?

39. What is the cost of lime delivered on the work?

40. What is the average quantity of lime per cubic yard of masonry?

41. What is the proportion of lime to sand used?

42. What description of lime is chiefly used? Is it of good quality?

43. Is there hydraulic lime in the district?

44. Are bricks easily obtained? What are their dimensions?

45. What is the cost of brick work per cubic yard?

46. What is the cost of masonry per cubic yard?

47. What quantity of masonry does each mason complete per diem?

48. Are elephants employed to assist in building?

49. What is the cost per lineal yard of different dimensions of culverts, and what is the cost of their faces?

50. What are the rates paid for masons?

31. 2½ cubic feet nearly; 12 parahs = 1 cubic yard nearly.

32. The measure is not heaped.

33. Don't know.

34. Impossible to say, for the number of culverts required varies according to the description of country passed over.

35. Rubble stone in mortar.

36. Sometimes it is near at hand.

37. Sometimes stone is blasted, and if it is limestone it generally breaks up evenly. The bricks of Madras are burnt and laminates off in large even beds.

38. Varies from 8 Annas to 2 Rupees per yard.

39. Varies from 4 Annas to 8 Annas per parah.

40. From 3 to 4 parahs with stone, less with brick.

41. Depends entirely upon the lime from 1 of lime to 1 of sand, to 1 of lime to 3 of sand.

42. Burnt limestone of excellent quality.

43. Never saw any.

44. Easily obtained in some places, dimensions 9" x 4½" x 3 or 9" x 4½" x 2½".

45. From Rupees 5 to Rupees 10 per cubic yard.

46. Rubble masonry from Rupees 2-8-0 to Rupees 5 per yard, coursed rubble from Rupees 3 to Rupees 6.

47. Seldom more, and sometimes less than one cubic yard.

48. Not in this district.

49. Don't know.

50. First class men range from 8 Annas to 12 Annas per diem.

BRIDGES.

51. Give a general description of different bridges with their cost?

52. What is the average number of bridges per mile?

53. What rates are paid to skilled artisans of different kinds?

51. Bridges are built with semi-circular, segmental, or elliptical arches, of stone or of bricks, sometimes of stone with brick arches. It is impossible to state cost, for the price of materials varies so much in different districts and in different parts of a district.

52. Depends entirely upon the character of the country through which the road passes.

53. Masons 8 to 12 Annas per diem, Stone cutters 6 to 10 Annas, Carpenters 8 Annas to 1 Rupee.

LABOUR.

54. Whence is labour obtained, and on what terms?

55. Is any of the labour imported? If so, at what cost?

56. Is there any system of agreement? If so, what is the character of such agreement?

54. From the neighbourhood of a work and usually on daily pay.

55. Labour is seldom imported.

56. No system of agreement for daily labour.

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57. Is the cost of importation charged to cost of the road ?
58. Is there any organized body of labourers or artisans ?
59. Is any labor on the roads performed by Pioneers or Military? If so, at what rates, and to what charged ?
60. What is the average daily rate of pay for labourers ?
61. Are there different grades? If so, how are they distinguished and paid ?
62. Are women and children employed on roads ?
63. How are the labourers and others tasked?
64. What system is adopted to enforce discipline? Or to ensure the completion of the task?
65. Are the labourers paid when on the march, changing from one place of work to another?
66. Are they paid when sick in hospital? Or when prevented from working by stress of weather?
67. Is medical aid given to the labourers? If so, how is it charged? And what is the cost of it?
68. Is rice issued at a fixed rate? If so, at what quantities?
69. Is there any loss on the rice thus issued?
70. What are the charges beyond the regular pay of the labourer included in the cost of a road?
71. How far is labour afforded by the proximity to estates?
72. Do coolies prefer working on estates to being employed on roads.
73. Are the wages paid to road coolies higher than those paid to estate coolies?
74. Are coolies enticed from the roads by crimps employed on the estates?
75. Are there many desertions?
76. What is the general system pursued with regard to labour on estates?
77. Do the highest rates prevail in those districts in which estates are most numerous?
78. What is the proportion of non-effectual labour?
79. How far is the contract system pursued in road-making?
80. What are the rates paid for contract work?
57. See No. 55.
58. No, if we except the Corps of Sappers and Miners.
59. Don't know.
60. Two Annas.
61. Three Annas per diem are sometimes paid to the better class of labourers; difference in rate of pay is distinction.
62. Yes.
63. So much work to be done per man per day.
64. Non-payment until the whole of the work is completed.
65. No.
66. Sometimes half pay when in hospital. Never paid when prevented from working from stress of weather.
67. No.
68. No.
69. See No. 68.
70. Petty superintendence only.
71. Don't know.
72. Don't know.
73. Don't know.
74. Don't know.
75. No.
76. Don't know.
77. Don't know.
78. Don't know.
79. Very little beyond the supply of materials.
80. The answers already recorded regarding rates for materials and labour apply also to this question.

SUPERVISION.

81. What is the general character of Supervision and Establishment?
82. What proportion of the Supervision is borne on the fixed or provisional Establishment, and what is charged to the road under construction?
83. Is any portion supervised by Military Engineers or other Officers? If so, to what are their pay and allowances charged?
84. To what extent is Native Supervision employed? And is such Supervision attended with satisfactory results?
81. There is the fixed Establishment and there is also a permanent Petty Establishment.
82. Already replied to by the Government of India.
83. Do. do.
84. The Subordinate grades are perhaps one half Natives. The Native Supervision is on the whole satisfactory.

TRANSPORT.

85. How is the cost of transport borne?
86. Is there a special vote for transport? Or is the cost of transport in each case charged to the construction of the road?
87. Are elephants, camels, or donkeys extensively used in transport? If so, what do they cost per mensem or per annum?
88. Are carts employed?
89. What is the cost of a pair of bullocks and a driver per diem.
90. What is the contract price of carts per diem?
91. Are barrows or hand-carts in general use?
92. Is any transport performed by men? If so, at what cost?
85. } Already replied to by the Government
86. } of India.
87. No.
88. Yes.
89. At present 12 Annas to 14 Annas per diem.
90. With bullocks and driver Rupee 1 per diem.
91. No.
92. No.

CHARACTER OF TRAFFIC.

93. What is the character of the traffic on different roads?
94. What description of carts are used?
95. What is the breadth of the wheels in ordinary use?
96. What weight is carried on a pair of wheels?
97. How many wheels pass over the roads in the course of a day.
98. What is the average duration of each road?
99. Has any relation been observed between the duration of the roads and the number of carts which have passed over them?
93. On good road the traffic is principally carts, on indifferent or bad roads by bullocks.
94. The ordinary native carts.
95. From 1½ to 2 inches.
96. From 800 to 1,500 lbs.
97. Varies of course as the traffic. On some roads 3,000 two-wheeled carts pass in one day; on other roads not more than 100 carts pass.
98. Don't know.
99. Yes, but not sufficiently so to form any reliable data.

MISCELLANEOUS.

100. How are the supplies from the workshops charged?
101. Is there a separate vote for tools? Or are the tools charged to the roads on which they are used?
102. What is the cost of lines or buildings for the accommodation of those employed on roads?
103. What is the character of such buildings? And how many are erected for a given length of time?
104. What is the system of pay? And what time is lost in paying?
105. Are there any general votes bearing upon the construction of roads, the amounts of which are not charged directly to the cost of roads?
100. Already replied to by the Government of India.
101. Do. do.
102. Lines are seldom or never built.
103. See No. 102.
104. Pay is issued every 7 or 14 days, and the people are generally paid between 12 and 2 p. m., so that very little time is lost.
105. Already replied to by the Government of India.

CAMP, GUDDACUL,
24th January 1867.

(Signed) J. GEORGE,
Assistant Engineer, D. P. W.

*Questions and Answers as called for by the Superintending Engineer, vide Circular
No. 75 B, dated 17th January 1867.*

ROADS.

1. Describe the general character of the roads in hilly districts, and the materials of which they are composed?
- There are no large lines of road running through the hilly districts in this Range, excepting a portion of the 15th and 16th miles of the Dharwar road; the general character of this road is dusty, caused by the ashy nature of the soil of which the hill is composed. The road is composed by a side cutting into the hill; slope averaging from 1 in 40 to 1 in 50, and the road surface is composed of small stones picked up from the lower slopes of the hill, which bind and form a hard surface.

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2. What is the usual type for roads of different widths?
3. What system is followed in forming the road surface, before laying on the metalling?

4. Is it usual to adopt any sub-stratum differing in character or material from the surface metalling? If so, describe it.

5. Are the roads fenced in? If so, what description of fencing is used, and what is its cost?

6. What is the total cost per mile of roads, with different widths of metalling sub-divided under the following heads, viz.:-

- a. Earth-works (including retaining walls and rocks).
b. Side drains.
c. Cross drains or culverts.

- d. Bridges.
e. Metalling.
f. Miscellaneous.

9. What system of drainage is adopted?

10. What is the average per-centage of rock to earth? And what are the average quantities of rock and earth per mile?

11. What is the usual width allowed beyond the metalled portion, and are there foot-paths?

EARTH-WORK.

12. What is the cost of earth-work per cubic yard?

15. What is the cost of rock cutting per cubic yard?

16. Are there many boulders? If so, what is the cost of removing them? Are they estimated as so much rock?

17. Is there much material difficult to be removed by spade or mamoty, but too soft for blasting? If so, what is the cost of such material per cubic yard?

18. Is rock defined as material which require blasting?

19. Are retaining walls used extensively as a substitute for earth slopes?

20. If so, what is the character of masonry in such walls? What is the thickness for different heights of wall and the cost per cubic yard?

21. What is the average number of cubic yards of retaining wall per mile of road?

The former road surface is cut up and levelled; the centre of road is raised half an inch for every 1 yard in width; a layer of good gravel is then laid on 1 yard wide and 6 inches deep on both sides of the road, between which the metal is laid.

If the surface of the road or the ground be black soil or loose earth, a coat of gravel is laid on the former, or the latter; the loose sand is removed, and a coat of black soil with coarse sand is mixed, is laid on previous to its receiving metal. If large rough stone be procurable near the spot it is used for fencing, and it costs 3 Annas a cubic yard.

The roads in this range are not fenced in, nor has there been any expenditure incurred for so doing.

For a road 6 yards of metalling in the centre, 1 yard in breadth of gravel on both sides, and raised half a yard high from the ground surface. Rupees 748.

Rupees 58.

For one culvert with one vent 3 feet x 3 feet Rupees 125.

Do do. do. according to circumstances.

Rupees 2,000 per mile, average cost.

According to circumstances. Sundries .5 per cent.

Open drains on sides of road; water-way according to circumstances.

Rock seldom if ever met within this range, soil generally composed of black earth.

One yard on either side; no foot-paths allowed in this range.

From Annas 2 to Annas 1-6.

Rupee 1 to Rupees 1-8-0.

There are boulders in some places; removing boulders Annas 4 per cubic yard. Boulders are not estimated as so much rock.

None.

Yes.

Yes.

Stones are piled one above another; the base of the stone being perpendicular to the slope. Foundation is laid 3 feet thick to about 3 feet in height, and for every yard in height it decreases half a foot till after 3 yards in height, after which it is carried up to any height half a yard in thickness, but this depends very much on the resistance the earth has to meet with. The cost per cubic yard is from Annas 4 to Annas 8.

No average can be given; this so much depends on circumstances.

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METALLING.

22. Describe the general character of the metalling and the materials of which it is composed?

In this range no road has been thoroughly metalled, but large portions have been metalled by a layer of stone or boulders picked up from the adjacent fields broken to 1½ inch in diameter, laid on 4 inches thick; good gravel is sprinkled into the crevices and then tamped if water be procurable; if not, the stone is left exposed which then gradually bind from the traffic going over it.

Four inches.

23. What is the average thickness of metalling?

Annas 3.

24. What is the average cost per superficial yard of metalling?

25. How is metalling laid? Is it piled?

Metalling is laid by the hand 4 inches thick, with a slope of half an inch to every yard in width, from the centre. Stones or boulders are collected in heaps by the side of the road and then broken; after laid it is blended with gravel and then stamped or rolled.

26. What is the cost of each of the following items in metalling, viz., blasting, sledging, breaking, piling, stamping, or rolling?

Blasting is never resorted to for metalling, boulders being procurable on the sides of the road, sledging is also very seldom resorted to. Breaking costs from 7 Annas to Rs. 1-8-0 according to the nature of the boulders, piling 8 Pies per cubic yard, stamping from 3 Pies to 1 Anna according to the distance water is procurable.

From one to three miles.

27. What is the average distance to which metal is conveyed from the quarry?

28. What is the cost of transport of metal for different distances?

Three miles Rupees 2 0 0 per cubic yard.
Two " " 1 8 0 " "
One " " 0 1 0 " "

The bushel is not used as a measure, the parah is generally in use.

The measure is not heaped.

4,000 inches.

29. Is the bushel in use as a measure? If not, what measure is used for metal?

30. Is the measure heaped or not?

31. How many cubic inches does the measure contain?

4,600 inches.

32. How many cubic inches should be allowed on the average if the measure be heaped?

33. How many cubic yards of solid rock are required to make up a given number of measures, say 100 bushels?

No trial has been made to arrive at a data.

CULVERTS.

34. What is the average number of culverts of different dimensions per mile?

Two.

35. What is the general description of masonry of which they are constructed?

Granite stone in chunam.

36. Is the stone for masonry generally near at hand?

In some instances, but not generally.

37. Is the stone blasted? If so, does it laminate with an even bed, or break up with an irregular fracture?

The stone is not blasted, but quarried, and it laminates with an even bed.

38. What is the cost of procuring stone per cubic yard?

From Rupee 1 to Rupees 1-12-0.

39. What is the cost of lime delivered on the work?

Slaked lime from Annas 6 to Rupee 1 per parah.

40. What is the average quantity of lime per cubic yard of masonry?

One and a quarter parabs.

41. What is the proportion of lime to sand used?

One of lime to three of sand.

42. What description of lime is chiefly used? Is it of good quality?

Common lime of very good quality.

43. Is there hydraulic lime in the district?

Yes.

44. Are bricks easily obtained? What are their dimensions and cost per thousand?

No. They measure 9 inches x 4½ inches x 2, and cost Rupees 4 to 7 per 1,000.

45. What is the cost of brick work per cubic yard?

From Rupees 5 to Rupees 6-12-0.

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46. What is the cost of masonry per cubic yard? Rupees 3-6-0.
47. What quantity of masonry does each Mason complete per diem? Two and a half cubic yards.
48. Are elephants employed to assist in building? No.
49. What is the average cost per lineal yard of different dimensions of culverts? And what is the cost of their faces? None constructed lately. The cost is in accordance with the number of cubic yards of masonry contained in each culvert.
50. What are the rates paid for Masons? From Annas 5 to Annas 8.

BRIDGES.

51. Give a general description of different bridges with their cost? The cost of the bridges constructed in this range cannot be arrived at by the records of this Office, there are nine bridges of spans of various lengths; the arches are generally semi-circular, and built of brick in chunam. One bridge for every 23 miles in this range, but the roads generally are incomplete in this respect. Several deep nullahs still remain unbridged.
52. What is the average number of bridges per mile? Carpenter 8 As., 7 As., and 6 As.
Blacksmith 10 " 9 " and 8 "
Bricklayer 8 " 7 " and 6 "
53. What rates are paid to skilled artisans of different kinds?

LABOUR.

54. Whence is labour obtained? and on what terms? From different villages in this range.
Men at Annas 3.
Women at " 2.
Boys at " 1 and Pies 4.
No labourers are imported.
55. Is any of the labour imported? If so, at what cost? No agreement is made, people generally to be had and are paid when only at work.
No coolies imported.
56. Is there any system of agreement? If so, what is the character of such agreement? None.
57. Is the cost of importation charged to the cost of the road? None.
58. Is there any organized body of road labourers or artisans? Annas 3, Annas 2, and Anna 1 and Pies 4.
59. Is any labour on the road performed by Pioneers or Military? If so, at what rates? And to what charged? Men, women, and boy coolies.
Men are paid Annas 3 per diem.
Women " " 2 "
Boys " " 1-4 "
Yes.
60. What is the average daily rate of pay for labourers?
61. Are there different grades? If so, how are they distinguished and paid? According to the nature of the work they are employed upon.
One man cooly will break half cubic yard of boulders, but this very much depends on its nature.
Fines.
62. Are women and children employed on the roads? Labourers are generally paid when at work, no payments are made for marching from one place to another.
No.
63. How are the labourers and others tasked? No medical aid is given, and no charges are incurred in this respect.
64. What system is adopted to enforce discipline, or to ensure the completion of the task? No rice is issued.
65. Are the labourers paid when on the march, changing from one place of work to another? No rice is issued.
66. Are they paid when sick in Hospital? or when prevented from working by stress of weather?
67. Is medical aid given to the labourers? If so, how is it charged, and what is the cost of it?
68. Is rice issued at a fixed rate? If so, in what quantities?
69. Is there any loss on the rice thus issued?

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70. What other charges beyond the regular pay of the labourer are included in the cost of a road? None.
71. How far is labour affected by the proximity to Estates? Some months in the year, generally while harvesting is in progress.
72. Do coolies prefer working on Estates to being employed on roads? Yes.
73. Are the wages paid to road coolies higher than those paid to Estate coolies? No.
74. Are coolies enticed from the roads by crimps employed on the Estates? No.
75. Are there many desertions? No.
76. What is the general system pursued with regard to labour on Estates? Paid by grain.
77. Do the highest rates prevail in those districts in which Estates are most numerous? Yes.
78. What is the proportion of non-effectual labour? One in fifty.
79. How far is the contract system pursued in road-making? Petty contracts were made for laying on metal 4 inches thick in some places.
80. What are the rates paid for contract work? At Rupee 1 to Rupees 1-2-0 per running yard of road.

SUPERVISION.

81. What is the general character of supervision and establishment? A road Goomastah on 15 Rupees per mensem is employed on 10 or 13 miles, who is to keep a list of the coolies; the coolies are worked by a leading cooly, who not only works, but is also held responsible for the quantity of work done by his gang.
84. To what extent is native supervision employed, and is such supervision attended with satisfactory results? Native superintendence want watching, and when they are watched they generally give satisfaction.

TRANSPORT.

87. Are elephants, camels, or donkeys extensively used in transport? If so, what do they cost per mensem or per annum? No such transports are used.
88. Are carts employed? Yes.
89. What is the cost of a pair of bullocks and a driver per diem? Annas 12 to Rupee 1 and Rupees 1-4-0.
90. What is the contract price of carts per diem? Rupee 1.
91. Are barrows or hand-carts in general use? No.
92. Is any transport performed by men? No transports performed by men.

TRAFFIC.

93. What is the character of the traffic on different roads? Generally cotton carts, diameter of the wheels from 3 feet to 5 feet.
94. What description of carts are used? Common hackery, which have made-wheels, also some solid wheeled carts 2½ to 3 feet in diameter.
95. What is the breadth of the wheels in ordinary use? Three inches generally, but sometimes a little less, say 2½ inches.
96. What weight is carried on a pair of wheels? 1,000 lbs.
97. How many wheels pass over the roads in the course of a day? Average 150.
98. What is the average duration of each road?
99. Has any relation been observed between the duration of the roads and the number of carts which have passed over them? No observations have been made.

MISCELLANEOUS.

102. What is the cost of lines on buildings for the accommodation of those employed on the roads? Not known.

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103. What is the character of such buildings, and how many are erected for a given length of road?

None.

104. What is the system of pay? And what time is lost in paying?

Payment is made while people are at work, and as they are generally tasked no time is lost.

BELLARY.
29th March 1867.

(Signed) S. CLARIDGE,
Supervisor.

NO. 1, OR PODATUR RANGE.

Questions and Answers as called for in G. O., dated 11th January 1867, No. 96.

1. Describe the general character of the roads in hilly districts, and the materials of which they are composed?

Roads in hilly districts are carried along the valleys, or where this is impracticable along the side of the hill, the road being half in cutting and half in embanking; the materials of which the roadway is formed are generally of broken stone, either quartz or limestone.

2. _____
3. What system is followed in forming the road surface before laying on the metalling?

In firm soils, such as gravel or rock, the road surface is generally trimmed, and is laid out according to the gradients, and after the same has consolidated, which will be after it has weathered a monsoon, the metal is then laid on; but in soft soils, such as clay and cotton, the earth thrown up is generally well rammed previous to the metal being laid on.

4. Is it usual to adopt any sub-stratum, differing in character or material from the surface metalling? If so, describe it?

It is usual in roads constructed on cotton soil to cover the surface with a layer of sand or slate rock where procurable; this acts as a sub-stratum to the metal, but where the soil is hard the metal is at once put on.

5. Are the roads fenced in? If so, what description of fencing is used, and what is its cost?

The roads in this range are not fenced in.

6. What is the total cost per mile of road with different widths of metalling sub-divided under the following heads, viz. :—

The average cost per mile of road with different widths of metalling would be as follows :—

- Earth work (including retaining walls and rocks).
- Side drains.
- Cross drains and culverts.
- Bridges.
- Metalling.
- Miscellaneous.

Six yards Metal.			
Earth-work	...	...	Rs. 600
Side drains	...	...	...
Cross drains and culverts	...	...	400
Bridges	...	...	800
Metalling	...	...	1,000
Miscellaneous	...	...	2,200
	...	...	100
Total			5,100

Five yards Metal.			
Earth-work	...	...	500
Side drains	...	...	400
Cross drains and culverts	...	...	800
Bridges	...	...	1,000
Metalling	...	...	2,000
Miscellaneous	...	...	100
Total			4,800

Four yards Metal.			
Earth-work	...	...	400
Side drains	...	...	400
Cross drains, &c.	...	...	800
Bridges	...	...	1,000
Metalling	...	...	1,760
Miscellaneous	...	...	100
Total			4,460

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7, 8. _____
9. What system of drainage is adopted?

Already replied to by the Government of India.
To convey the drainage in a level plain, ditches, termed side-drains, are excavated parallel with the road and a few yards on either side which should be led away into the natural water courses of the country. In side hill roads a drain is cut on the upper side about 8 or 10 yards from the edge of the road, and this is led across the road at intervals, under masonry culverts.

10. _____
11. What is the usual width allowed beyond the metalled portion, and are there foot-paths?

The usual width allowed beyond the metalling is one yard on either side; there are no regular paved foot-paths constructed.

12. What is the cost of earth-work per cubic yard?

The cost of earth-work usually varies from 1½ to 4 Annas a cubic yard, depending upon the nature of the soil.

13—14. _____
15. What is the cost of rock cutting per cubic yard?

Already replied to by the Government of India.
Rock cutting would cost from 4 Annas to 1 Rupee per cubic yard.

16. Are there many boulders? If so, what is the cost of removing them? Are they estimated as so much rock?

The removal of large boulders should be estimated as clearing so much rock.

17. Is there much material difficult to be removed by spade or mamooty but too soft for blasting? If so, what is the cost of such material per cubic yard.

The cost of such material per yard would be about 3 to 6 Annas.

18. Is rock defined as material which requires blasting?

Rock is not defined as material which requires blasting, the term would also refer to such as would be removed by a crowbar or pickaxe.

19. Are retaining walls used extensively as a substitute for earth slopes?

Retaining walls are generally used in side hill roads, when the natural surface inclination is very great, to sustain the earth-work of the road.

20. If so, what is the character of masonry in such walls, what is the thickness for different heights of wall, and the cost per cubic yard.

Retaining walls are generally built of rubble masonry; the thickness at base for a wall two or three yards high being about 3 feet at bottom and battering to 1½ at top, cost about 3½ to 5 Rupees per cubic yard.

21. _____
22. Describe the general character of the metalling, and the materials of which it is composed?

The metalling generally consists of broken stone, either quartz or limestone, which should not be larger than 1½ inch cubes.

23. What is the average thickness of metalling?

The average thickness should be ten inches.

24. What is the average cost per superficial yard of metalling?

Cost per superficial yard of metalling would be from 4 to 8 Annas.

25. How is metalling laid? Is it piled at the side of the road, and after being laid is it watered, stamped, rolled, or blended with gravel.

Metal is first carted from the quarries and piled in heaps on the side of the road, it is then broken to the proper size and laid on, over this a course of 3 inches of screened gravel is put on, well watered, and rolled, so as to form one compact mass.

26. What is the cost of each of the following items in metalling, viz. :—

Metal broken into 1½ inch cubes would cost about 8 Annas per cubic yard, it is usually quarried in this district, and then broken with hammers.

- Blasting.
- Sledging.
- Breaking.
- Piling.
- Stamping or rolling.

27. What is the average distance to which metal is conveyed from the quarry.

In some cases it has to be carted from 3 and 4 miles, but the average distance is ½ to 1 mile.

28. What is the cost of transport of metal for different distances?

A cubic yard of metal would cost as follows :—
Lead from quarry ½ mile 4 Annas.

Do. do. 1 do. 6 do.
Do. do. 2 do. 9 do.

29. Is the bushel in use as a measure? If not, what measure is used for metal?

The bushel is not used as a measure, but parah.

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30. Is the measure heaped or not.
The parah measure is not heaped, but struck level on the top.
The parah measure contains 4,000 cubic inches.
31. How many cubic inches does the measure contain?
The average number of culverts from 3 feet to 4 feet would be about 4 per mile.
The masonry is generally regularly coursed rubble masonry with ashlar quoins.
The stone for masonry is more or less obtainable from a distance of 3 to 5 miles.
The stone obtainable in this range is laminated and breaks up with an even bed, comes off from 6" to 9", are easily procurable.
The cost of stone per cubic yard varies from Rupee 1 to Rupees 2-8-0.
Average 8 Annas per parah.
32. ———
Two parabs per cubic yard.
33. ———
Two of sand to one of lime.
The lime used is procured by burning limestone nodules, which is plentiful in this district.
Not answered.
Bricks are made in places where fuel is to be procured; the size being after burnt 9" x 4½" x 3", and cost about 6 Rupees per 1,000.
About Rupees 6 per cubic yard.
Rupees 4 to 5 per cubic yard.
34. What is the average number of culverts of different dimensions per mile?
In pier and abutments and such like a mason completes about ½ of a yard per day, but in walling half a yard is generally considered fair.
Elephants are never used.
35. What is the general description of masonry of which they are constructed?
The dimensions of culverts are usually calculated and reduced to cubic yards, and the rates then struck accordingly.
Masons are paid at the rate of 8 Annas each, 2nd class 7 Annas.
36. Is the stone for masonry generally near at hand?
The cost of brick work per cubic yard?
The cost of masonry per cubic yard?
What quantity of masonry does each mason complete per diem?
37. Is the stone blasted? If so, does it laminate with an even bed or break up with an irregular fracture?
What is the cost of procuring stone per cubic yard?
38. What is the cost of lime delivered on the work?
What is the average quantity of lime per cubic yard of masonry?
What proportion of lime to sand used?
What description of lime is chiefly used?
Is it of good quality?
Is there hydraulic lime in the district.
Are bricks easily obtained? What are their dimensions and cost per 1,000.
39. What is the cost of brick work per cubic yard?
What is the cost of masonry per cubic yard?
What quantity of masonry does each mason complete per diem?
40. Are elephants employed to assist in building?
What is the average cost of lineal yard of different dimensions of culverts, and what is the cost of their faces.
What are the rates paid for masons?
41. ———
42. ———
43. ———
44. ———
45. ———
46. ———
47. ———
48. ———
49. ———
50. ———
51. ———
52. ———
53. What rates are paid to skilled artisans of different kinds?
Bricklayers, 1st class ... 8 Annas.
Do. 2nd " ... 7 "
Carpenters, 1st " ... 12 "
Do. 2nd " ... 8 "
Smiths, 1st " ... 12 "
Do. 2nd " ... 8 "
Stone Masons, 1st " ... 8 "
Do. 2nd " ... 7 "
Sawyers, 1st " ... 8 "
Do. 2nd " ... 7 "
Labour is obtained from the villages about, but skilled workmen are usually met with in towns and large stations. No regular agreement is entered into with workmen.
No labour is imported.
There is no agreement entered into when a workman is paid by the day, but if work is executed and paid for at so much a cubic yard, or foot, then a formal agreement is drawn up.
54. Whence is labour obtained, and on what terms?
Is any of the labour imported? If so, at what cost?
Is there any system of agreement? If so, what is the character of such agreement?
57. ———

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58. Is there any organized body of road labourers or artisans?
There is no organized body of labourers in the district, but almost in every village Wudders (or navvies) could be procured, who are accustomed to execute earth-work and pitch a bank or quarry stone.
No labour is performed by Pioneers.
59. Is any labour on the roads performed by Pioneers or Military? If so, at what rates to what charge?
A cooly is paid at the rate of 2½ Annas per diem.
There are no grades, all male coolies receive 2½ Annas per diem.
Women and children are employed, the former receive 1½ Annas and the latter 1 Anna per diem.
A certain number of men, women, and boys form a gang, and to this a certain portion of work is given out, which is expected to be completed by the evening.
A Pygust or Maistry is generally put over the gang to ensure the task being worked out, and the coolies are fined should the same be incomplete.
60. What is the average daily rate of pay for labourers?
No.
61. Are there different grades? If so, how are they distinguished and paid?
No.
62. Are women and children employed on roads?
No.
63. How are the labourers and others tasked?
No.
64. What system is adopted to enforce discipline or to ensure the completion of the task.
No.
65. Are the labourers paid when on the march, changing from one place of work to another?
No.
66. Are they paid when sick in Hospital, or when prevented from working by stress of weather?
No.
67. Is medical aid given to the labourers? If so, how is it charged, and what is the cost of it?
No.
68. Is rice issued at a fixed rate? If so, at what quantities?
No.
69. ———
Besides the pay of the regular labourer a head cooly or foreman is employed over every gang, and over two or three a Maistry or Time-keeper.
70. What other charges beyond the regular pay of the labourer are included in the cost of a road?
There are no estates in the proximity of this range.
71. How is labour affected by the proximity to estates?
Road work could entirely be given out on contract, the quantity of earth-work performed being measured and paid for by the cubic yard, and metalling by so much the running yard of roadway completed; masonry of culverts, &c., should also be given out, paying the contractor for the number of yard of masonry executed by him.
- 72 to 78. ———
The rates paid for contract work are as follows:—
Earth-work 1½ Annas to 4 Annas per cubic yard.
Metalling running yard 1½ to Rupees 2½ Rs. per running yard of road, 5 yards wide 10 inches deep.
Masonry 4 to 6 Rupees per cubic yard, Pointing 2½ Rupees per 100 square feet.
79. How far is the contract system pursued in road-making?
A line of road of about 20 miles under construction is superintended by a Talook Overseer, who is under the immediate orders of a Sub-Assistant Engineer. Under the Talook Overseer again are Maistries who are directly in charge of the working parties.
Already replied to by the Government of India.
80. What are the rates paid for contract work?
All the Maistries employed are natives, and require very much looking after, the greater portion being untrustworthy and deceitful, and must not be depended upon.
81. What is the general character of supervision and establishment?
82 and 83.
84. To what extent is native supervision employed, and is such supervision attended with satisfactory results?

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85. _____
86. _____
87. Are elephants, camels, or donkeys extensively used in transport? If so, what do they cost per mensem or per annum.
88. Are carts employed.
89. What is the cost of a pair of bullocks and a driver per diem?
90. What is the contract price of carts per diem?
91. Are barrows or hand-carts in general use?
92. Is any transport performed by men? If so, at what cost?
93. What is the character of the traffic on different roads.
94. What description of carts are used?
95. What is the breadth of the wheels in ordinary use?
96. What weight is carried on a pair of wheels?
97. How many wheels pass over the roads in the course of a day?
98. What is the average duration of a road?
99, 100, and 101.
102. What is the cost of lines or buildings for the accommodation of those employed on the roads?
103. What is the character of such buildings, and how many are erected for a given length of road?
104. What is the system of pay, and what time is lost in paying?
105. _____
CAMP, POTLADOORTY,
1st May 1867.

These are not used in this range.

Carts are employed.
12 Annas to 1 Rupee

The same as above.

Barrows or hand-carts are not used extensively, but in repairing roads they are useful.
No.

The traffic is principally carried through on common two-wheeled carts, pack-bullocks, and asses are also extensively used, about 800 to 1,500 carts per diem pass over first class communications, and about 200 to 300 daily over a minor road.

The common country carts consist of a wooden frame placed over the axle, to which are attached a pair of wheels 5 feet in diameter.
Two inches invariably.

From 1,000 to 1,500 lbs.

On first class roads about 800 to 1,500 carts pass over the road daily, but in minor lines the traffic varies from 100 to 500 daily.
A road once well constructed with minor repairs now and again, will not deteriorate for at least ten years.

Already replied to by the Government of India.

When large working parties are engaged on mountain passes far away from villages, lines are constructed there; it costs about 200 Rupees to hut a party of about 1,000 men.

These buildings are generally long sheds built with mud wall and thatch roofs, sometimes, however, the coolies hut themselves with bamboo mats.

Once every week and fortnight the Overseer in charge of the work pays his gangs generally between 12 to 2 during the recess; but in very extensive works, a half day is lost once a week in disbursing each man's wages.

(Signed) GEORGE LEWIS.

Supervisor, D. P. W., Poddatur Range.

Questions and Answers regarding Ceylon Roads, as called for in G. O. No. 96 of 11th January 1867.

1. Describe the general character of the roads in hilly districts, and the materials of which they are composed?
2. What is the usual type for roads of different widths?
3. What system is followed in forming the road surface before laying on the metalling?

No roads of the kind in the Range.

4. Is it usual to adopt any sub-stratum, differing in character or material from the surface metalling? If so, describe it.

First, levelling; second, a layer of gravel; third, a layer of selected but unbroken pebble; fourth, gravel; fifth, metal. Layers 2 and 3 will vary in thickness with the absorbing power of the soil.
Answered in a former question.

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5. Are the roads fenced in? If so, what description of fencing is used, and what is its cost? No.
6. What is the total cost per mile of roads, with different widths of metalling, sub-divided under the following heads, viz.:—
a. Earth-works (including retaining walls and rocks).
b. Side drains.
c. Cross drains or culverts.
d. Bridges.
e. Metalling.
f. Miscellaneous.
7. How are the estimates for roads framed?
8. What check is there for ascertaining whether the quantities actually executed agree with the estimated quantities?
9. What system of drainage is adopted?
10. What is the average per-centage of rock to earth, and what are the average quantities of rock and earth per mile?
11. What is the usual width allowed beyond the metalled portion, and are there foot-paths?
12. What is the cost of earth-work per cubic yard?
13. Does this cost include carrying to embankment? Or is the cost of embankment formed from cuttings, estimated as a separate item?
14. How is spoil estimated?
15. What is the cost of rock cutting per cubic yard?
16. Are there many boulders? If so, what is the cost of removing them? Are they estimated as so much rock?
17. Is there much material difficult to be removed by spade or mamoty, but too soft for blasting? If so, what is the cost of such material per cubic yard?
18. Is rock defined as material which requires blasting?
19. Are retaining walls used extensively as a substitute for earth slopes?
20. If so, what is the character of masonry in such walls? What is the thickness for different heights of wall, and the cost per cubic yard?
21. What is the average number of cubic yards of retaining wall per mile of road?

The cost of the road from Kurnool to Nundicootoor was—

a. Rupees 660.
b. „ 165.
c. „ 1,890.
d. „ 7,280.
e. „ 3,960.
f. „ 650.

Already replied to by the Government of India.

In levels, side channels run down to the lowest level where the drainage crosses the road; in hill roads, a catch water channel is put above the road, the road is barrelled in levels, and surface drainage runs off on each side; in hill traces, it is generally sloped to the out, and water tables put across at short intervals.

Varies on every road.

Six feet width is usually allowed beyond the metalling portion.

EARTH-WORK.

Rupees 0-2-8.

Already replied to by the Government of India.

Rupee 1.

On hill slopes they are generally rolled down the face of the hill with a lever. There has been no work of the kind in the range.

Yes. 12 Annas per cubic yard.

Yes.

Only on hill traces, none in this range.

Not used.

Not used.

METALLING.

22. Describe the general character of the metalling, and the materials of which it is composed?

Granite and trap are generally to be found on the sides of all our roads. Trap makes the best metal, but is very hard to break; metal broken into dice of an inch and a half cubic, enough gravel added to make it bend, then tamped or rolled.

4 to 6 inches.

12 Annas to 1 Rupee.

23. What is the average thickness of metalling.
24. What is the average cost per superficial yard of metalling?

By hand. Yes.

25. How is metalling laid? Is it piled at the side of the road, and after being laid, is it watered, stamped, rolled, or blended with gravel?

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26. What is the cost of each of the following items in metalling, viz., blasting, sledging, breaking, piling, stamping, or rolling?

	RS.	A.	P.	
Sledging ...	0	3	0	per cubic yard.
Breaking ...	0	8	0	do.
Piling... ..	0	0	6	do.
Laying... ..	0	1	6	do.
Tamping ...	0	0	8	do.
Half a mile.				

27. What is the average distance to which metal is conveyed from the quarry?

28. What is the cost of transport of metal for different distances?

	RS.	A.	P.	
For a distance of one mile	0	0	5	per parah.
For a .. of two miles	0	0	6	do.
For a .. of three ..	0	0	8	do.
For a .. of four ..	0	1	4	do.
No. Parah.				

29. Is the bushel in use as a measure? If not, what measure is used for metal?

30. Is the measure heaped or not?

31. How many cubic inches does the measure contain?

32. How many cubic inches should be allowed on the average, if the measure be heaped?

33. How many cubic yards of solid rock are required to make up a given number of measures, say 100 bushels?

No.

4,000.

It is not heaped.

$\frac{1}{17}$ th cubic yard makes a parah.

CULVERTS.

34. What is the average number of culverts of different dimensions per mile?

Three.

35. What is the general description of masonry, of which they are constructed?

Stone in chunam.

36. Is the stone for masonry generally near at hand?

Yes.

CULVERTS.

37. Is the stone blasted? If so, does it laminate with an even bed, or break up with an irregular fracture?

No slate and shale laminated works easily.

38. What is the cost of procuring stone per cubic yard?

One Rupee.

39. What is the cost of lime delivered on the work?

Six Annas per parah.

40. What is the average quantity of lime per cubic yard of masonry?

Two parahs.

41. What is the proportion of lime to sand used?

One to two.

42. What description of lime is chiefly used? Is it of good quality?

Grey lime stone or marble of the district. Very good lime.

43. Is there hydraulic lime in the district?

Yes. All the lime may be made so.

44. Are bricks easily obtained? What are their dimensions, and cost per thousand?

Only in one talook; 9 inches $\times$ 4 $\frac{1}{2}$ inches $\times$ 2 $\frac{1}{2}$ inches; 7 Rupees per 1,000.

45. What is the cost of brick-work per cubic yard?

Rupees 5-12-0 per cubic yard.

46. What is the cost of masonry per cubic yard?

Rupees 3-8-0.

47. What quantity of masonry does each mason complete per diem?

Average $\frac{1}{2}$ cubic yard.

48. Are elephants employed to assist in building?

No.

49. What is the average cost per lineal yard of different dimensions of culverts? And what is the cost of their faces?

Rupees 66.

50. What are the rates paid for masons?

Face with cut stone in chunam; 1 Rupee per R. foot.

Annas 6, 8, 10, and 12.

BRIDGES.

51. Give a general description of different bridges with their cost?

Impossible to give an average—no two are alike. Cost varies with every variation of bed fall, facility of procuring materials, &c.
One.

52. What is the average number of bridges per mile?

Carpenters, Annas 12; Blacksmiths, Rupee 1; and Masons, Annas 12.

53. What rates are paid to skilled artisans of different kinds?

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LABOUR.

54. Whence is labour obtained? And on what terms?

From the neighbourhood. Daily pay.

55. Is any of the labour imported? If so, at what cost?

No.

56. Is there any system of agreement? If so, what is the character of such agreements?

Yes. Written Contracts and job-work.

57. Is the cost of importation charged to the cost of the road?

Practice does not obtain.

58. Is there any organized body of road labourers or artisans?

A yearly staff of a certain number of coolies per mile is kept up on some roads.
No.

59. Is any labour on the roads performed by prisoners or Military? If so, at what rate, and to what charged?

No.

60. What is the average daily rate of pay for labourers?

Annas 3 $\frac{1}{2}$

61. Are there different grades? If so, how are they distinguished and paid?

Yes. Men coolies, Annas 3, 4, and 5; Women coolies, Annas 2; and Boys, Annas 1 $\frac{1}{2}$
Yes.

62. Are women and children employed on the roads?

Yes.

63. How are the labourers and others tasked?

The daily out-turn is inspected by the Road Maistry.

64. What system is adopted to enforce discipline, or to ensure the completion of the task?

Refractory or incompetent coolies are dismissed.

65. Are the labourers paid when on the march, changing from one place of work to another?

Yes. But the practice is not encouraged; local labour preferred.

66. Are they paid when sick in hospital, or when prevented from working by stress of weather?

Yes.

67. Is medical aid given to the labourers? If so, how is it charged, and what is the cost of it?

No work employs a mass of coolies sufficient to require medical aid.

68. Is price issued at a fixed rate? If so, in what quantities?

No.

LABOUR.

69. Is there any loss on the rice thus issued?

Unknown.

70. What other charges beyond the regular pay of the labourer are included in the cost of a road?

Cost of materials and contingencies and a proportion of supervision.

71. How far is labour affected by the proximity to Estates?

No Estates employ labour; but private Companies engage a large number of people.
Yes, for they are better paid.

72. Do coolies prefer working on Estates to being employed on roads?

No.

73. Are the wages paid to road coolies higher than those paid to Estate coolies?

The labour market is free.

74. Are coolies enticed from the roads by crimps employed on the Estates?

High prices will always attract labour. We must pay what the Railway and Canal Company pay, or lose our coolies.

75. Are there many desertions?

No Estates in the Range.

76. What is the general system pursued with regard to labour on Estates?

Yes.

77. Do the highest rates prevail in those districts in which Estates are most numerous?

Ten per cent.

78. What is the proportion of non-effective labour?

The system is rather one of job-work, for earth-work paid by the cubic yard.

79. How far is the contract system pursued in road making?

Six cubic yards for 1 Rupee for earth-work.

80. What are the rates paid for contract work?

SUPERVISION.

81. What is the general character of supervision and establishment?

There is a fixed establishment in each district besides minor and temporary supervision.

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82. What proportion of the supervision is borne on the fixed or provisional establishment, and what is charged to the road under construction?

Already replied to by the Government of India.

83. Is any portion supervised by Military Engineers or other Officers? If so, to what are their pay and allowances charged?

84. To what extent is native supervision employed, and is such supervision attended with satisfactory results?

For the greater part of the subordinate supervision is by natives who make excellent Overseers, &c.

TRANSPORT.

85. How is the cost of transport borne?

86. Is there a special vote for transport, or is the cost of transport in each case charged to the construction of the road?

Already replied to by the Government of India.

87. Are elephants, camels, or donkeys extensively used in transport? If so, what do they cost per mensem or per annum?

No.

88. Are carts employed?

Yes.

89. What is the cost of a pair of bullocks and a driver per diem?

14 Annas.

90. What is the contract price of carts per diem?

30 Rupees per mensem.

91. Are barrows or hand-carts in general use?

Yes. For short distances, carrying spoil to an embankment.

92. Is any transport performed by men? If so, at what cost?

The hire of a transport cooly averages 6 Pies per mile.

CHARACTER OF TRAFFIC.

93. What is the character of the traffic on different roads?

Nearly all heavy carts.

94. What description of carts are used?

Two wheels—pair of bullocks.

95. What is the breadth of the wheels in ordinary use?

The diameter is 5 feet and the breadth of the tire $2\frac{1}{2}$ inches.

96. What weight is carried on a pair of wheels?

$\frac{3}{4}$ ths of a ton.

97. How many wheels pass over the roads in the course of a day.

228.

98. What is the average duration of each road?

Roads are maintained by an annual allowance.

99. Has any relation been observed between the duration of the roads and the number of carts which have passed over them.

No.

MISCELLANEOUS.

100. How are the supplies from the work-shops charged?

101. Is there a separate rate for tools, or are the tools charged to the roads on which they are used?

Already replied to by the Government of India.

102. What is the cost of lines or buildings for the accommodation of those employed on the roads?

None in the district.

103. What is the character of such buildings, and how many are erected for a given length of road?

None.

104. What is the system of pay? And what time is lost in paying?

Coolies are paid by the Overseer or Officer every week or ten days. As the payments to the gangs are generally made after working hours, the time lost is inappreciable.

105. Are there any general notes bearing upon the construction of roads, the amounts of which are not charged directly to the cost of roads?

Already replied to by the Government of India.

KURNOOR,

9th May 1867.

(Signed) J. N. HUNTER, Captain, R. E.,
Executive Engineer in charge of Kurnoor Range.

*Proceedings of the Madras Government, Public Works Department,
11th July 1867.*

The following Questions refer more particularly to metalled Roads constructed about the years 1864, 1865, and 1866 in hilly Districts, or sidelong ground.

1. Describe the general character of the roads in hilly districts, and the materials of which they are composed?

Roads in hilly districts are generally formed along the side of a hill, half in cutting and half in forming embankments. The materials used for the surface is broken stone and gravel laid on 9 inches in thickness; well watered and tamped, drains and culverts are constructed in places where most required.

2. What is the usual type for roads of different widths?

3. What system is followed in forming the road surface before laying on the metalling?

The surface is first made level and sectioned from excavations of side channels, &c., well tamped, in which the metalling is then spread.

4. Is it usual to adopt any sub-stratum differing in character or material from the surface metalling? If so, describe it?

In some instances where the soil is loose, sand or morum is laid on in courses, watered and tamped before the metalling is spread.

5. Are the roads fenced in? If so, what description of fencing is used, and what is the cost?

Roads are only fenced in ghauts and in steep places to prevent accidents. Parapets of rough stone or pillars with wooden railings, are erected.

6. What is the total cost per mile of road with different widths of metalling sub-divided under the following heads, viz. :—

A. Earth-work including retaining walls and wells.

220 Rupees.

B. Side drains.

C. Cross drains or culverts.

D. Bridges.

E. Metalling.

2,200 Rupees.

F. Miscellaneous.

7. How are estimates for roads formed?

8. What check is there for ascertaining whether the quantities actually executed agree with the estimated quantities?

Already replied to by the Government of India.

9. What system of drainage is adopted?

Side channels, culverts, road dams, and bridges, &c., where it is necessary, or as the case may be.

10. What is the average per-centage of rock to earth? And what are the average quantities of rock and earth per mile?

The width allowed beyond the metalling is one yard on either side; these are generally used as foot-paths.

11. What is the usual width allowed beyond the metalled portion; and are there foot-paths?

EARTH-WORK.

12. What is the cost of earth-work per cubic yard?

2 or 4 Annas according to soil.

13. Does this cost include carrying to embankment? Or is the cost of embankment formed from cuttings estimated as a separate item?

Already replied to by the Government of India.

14. How is spoil estimated?

15. What is the cost of rock cutting per cubic yard?

Removing boulders cannot be estimated as rock. The cost will depend on circumstances.

16. Are there many boulders? If so, what is the cost of moving them? Are they estimated as so much rock?

Very little blasting is necessary. The material is generally removed with the ordinary tools in use, pickaxes, crowbars, mamoties, &c.

17. Is there much material difficult to be removed by spade or mamoty, but too soft for blasting? If so, what is the cost of such material per cubic yard?

Rock is defined as material which requires blasting.

18. Is rock defined as material, which requires blasting?

Not extensively, but where ghauts and high banks, and in places absolutely necessary.

19. Are retaining walls used extensively as a substitute for earth slopes?

The walls are generally built of rough stone well packed; about the thickness of a yard or more, according to height; average cost 1 Rupee.

20. If so, what is the character of masonry of such walls; what is the thickness for different heights of wall; and the cost per cubic yard?

21. What is the average number of cubic yards of retaining wall per mile of road?

Proceedings of the Madras Government, Public Works Department.
11th July 1867.

22. Describe the general character of the metalling, and the materials of which it is composed?

METALLING.

Metalling is composed principally of broken stone laid on the surface 7 inches in thickness, in which gravel well sifted is spread of 2 inches in thickness; it is then watered and tamped. 9 inches.

4 to 6 Annas.

The materials are carted to the road side, after which it is laid on the road surface watered, tamped, rolled, &c.

From 1½ to 2 miles distances, and in many cases it is to be had by the road side.

Six trips per mile, 15 cubic feet or ½ cubic yard per load, the rates of hire will vary according to locality from 2 to 2-8 Pies per trip of 1 mile distance.

The bushel is not known here; the parah measure, ¼th of a candy, is used.

It is heaped.
4,000 cubic inches.

750 cubic inches on an average.

23. What is the average thickness of metalling?

24. What is the average cost per superficial yard of metalling?

25. How is metalling laid; is it piled at the side of road; and after being laid is it watered, tamped, rolled, or blinded with gravel.

26. What is the cost of each of the following items in metalling, blasting, sledging, breaking, piling, tamping or rolling?

27. What is the average distance to which metal is conveyed from the quarry?

28. What is the cost of the transport of metal for different distances?

29. Is the bushel in use as a measure? If not, what measure is used for metal?

30. Is the measure heaped or not?

31. How many cubic inches does the measure contain?

32. How many cubic inches should be allowed on the average if the measure be heaped?

33. How many cubic yards of solid rock are required to make up a given number of measures, say 100 bushels.

34. What is the average number of culverts of different dimensions per mile?

CULVERTS.

35. What is the general description of masonry of which they are constructed?

36. Is the stone for masonry generally near at hand?

37. Is the stone blasted? If so, does it laminate with an even bed, or break up with an irregular fracture?

38. What is the cost of procuring stone per cubic yard?

39. What is the cost of lime delivered on the work?

40. What is the average quantity of lime per cubic yard of masonry?

41. What is the proportion of lime to sand used?

42. What description of lime is chiefly used, is it of good quality?

43. Is there hydraulic lime in the district?

44. Are bricks easily obtained; what are their dimensions and cost per 1,000?

45. What is the cost of brick-work per cubic yard?

46. What is the cost of masonry per cubic yard?

47. What quantity of masonry does each mason complete per diem?

48. Are elephants employed to assist in buildings?

49. What is the average cost per lineal yards of different dimensions of culverts, and what is the cost of their prices?

Culverts are generally constructed of stone in chunam, sometimes of brick where stone is scarce.

Not generally, but is to be had within 2 miles distance.

The stone is not blasted; it is generally quarried and taken up in slabs or in layers of different thickness, with an even bed; seldom breaks up with an irregular fracture.

8 to 12 Annas per cubic yard rough at the quarries.

6 to 8 Rupees per candy of 12 parahs.

One parah of chunam, ¼th of a candy.

Lime one part to two of sand.

Stone; of very good quality.

Bricks are not easily obtained, has to be manufactured when required; dimensions 9" x 4½" x 2½" or 3"; the cost will be 6 Rupees per 1,000.

Rupees 4-8-0 per cubic yard.

Rupees 3 to 3½ per cubic yard.

¼ths of a cubic yard.

No elephants are employed.

Proceedings of the Madras Government, Public Works Department.
11th July 1867.

50. What are the rates paid for masons?

8 Annas for ordinary workmen.

BRIDGES.

51. Give a general description of different bridges with their cost?

52. What is the average number of bridges per mile?

53. What rates are paid to skilled artisans of different kinds?

Skilled artisans are not known here.

LABOUR.

54. Whence is labour obtained, and on what terms?

Local labour, coolies, &c., from the nearest villages where the work is in progress; on daily wages.

55. Is any of the labour imported? If so, at what cost?

No import labour.

56. Is there any system of agreement? If so, what is the character of such agreement?

There is no agreement for daily labourers; they are paid for the days of actual work.

57. Is the cost of importation charged to the cost of the road?

No organized body.

58. Is there any organized body of road labourers or artisans?

Pioneers or Military are not employed.

59. Is any labour on the roads performed by Pioneers or Military? If so, at what rates and to what charged?

3 Annas per diem.

60. What is the average daily rate of pay for labourers?

61. Are there different grades? If so, how are they distinguished and paid?

There are different grades, and are distinguished as adults and children, and paid accordingly.

62. Are women and children employed on the road?

They are employed.

63. How are labourers and others tasked?

The quantity of work required to be done by them is marked out daily.

64. What system is adopted to enforce discipline as to ensure the completion of the task?

The labourers are under the charge of a Maistry, whose duty it is to see that the task is performed; the pay is withheld in case of the task not being completed.

65. Are the labourers paid when on the march, changing from one place to another?

Labourers do not march from place to place, unless to proceed on any work of emergency, when batta or a day's hire is allowed them.

66. Are they paid when sick in Hospital, or when prevented from working by stress of weather?

Labourers are not sent to hospitals, and are not paid when prevented by stress of weather.

67. Is medical aid given to the labourers? If so, how is it charged, and what is the cost of it?

No medical aid is given to the labourers.

68. Is rice issued at a fixed rate? If so, in what quantities?

Rice is not issued.

69. Is there any loss on the rice thus issued?

Superintendence and sundry items are included in the cost of road.

70. What other charges, beyond the regular pay of the labourers are included in the cost of the road?

Does not affect, there being no Estates.

71. How far is labour affected by the proximity to Estate?

72. How far do coolies prefer working on Estates to being employed on roads?

73. Are wages paid to road coolies higher than those paid to Estate coolies?

74. Are coolies enticed from the roads by crimps employed on Estates?

75. Are there many desertions?

76. What is the general system pursued with regard to labour on Estates?

77. What is the highest rates that prevail in those districts in which Estates are most numerous?

78. What is the proportion of non-effectual labour?

*Proceedings of the Madras Government, Public Works Department,
11th July 1867.*

79. How far is the contract system pursued in road-making?

The contract system has not been much pursued.

80. What are the rates paid for contract work?

The rates will differ greatly; it will depend on the distances the materials have to be brought; the average cost is estimated at Rupees 1½ per running yard of road complete.

SUPERVISION.

81. What is the general character of supervision and establishment?

In general, an Overseer has charge of the work, who has a few Maistries, &c., employed under him, whose duty it is to supervise all works under his charge.

82. What proportion of the supervision is borne on the fixed or provisional establishment, and what is charged to the road under construction?

Already replied to by the Government of India.

83. Is any portion supervised by Military Engineers or other Officers? If so, to what are their pay and allowances charged?

84. To what extent is native supervision employed, and is such supervision attended with satisfactory results?

Native supervision does not prove satisfactory in every instance.

TRANSFERS.

85. How is the cost of transport borne?

86. Is there a special note for transport, or is the cost of transport in such case charged to the construction of the road?

Already replied to by the Government of India.

87. Are elephants, camels, or donkeys extensively used in transports, if so, what do they cost per mensem or per annum?

Elephants, camels, and donkeys are not used in transports.

88. Are carts employed?

Carts are employed for conveying materials. 12 Annas to one Rupee per diem.

89. What is the cost of a pair of bullocks and a driver per diem?

90. What is the contract price of carts per diem?

The contract price is one Rupee per diem.

91. Are barrows or hand-carts in general use?

Barrows are not used.

92. Is any transport performed by men, if so, at what cost?

Men are not employed in transport.

CHARACTER OF TRAFFIC.

93. What is the character of traffic on different roads?

Carts laden, bullocks, donkeys, and horses.

94. What description of carts are used?

laden camels, and elephants, &c.

95. What is the breadth of the wheels in ordinary use?

Two-wheeled carts drawn by a pair of bullocks 4½ feet is the ordinary width.

96. What weight is carried on a pair of wheels?

40 maunds or 1,000 lbs. ordinary weight.

97. How many wheels pass over the roads in the course of a day?

Average 50 carts per diem.

98. What is the average duration of each road?

The duration of roads will depend on the repairs made on it, where there is a maintenance grant, a road may always be kept in good repair.

99. Has any relation been observed between the duration of the roads, and the number of carts which have passed over them?

MISCELLANEOUS.

100. How are the supplies from the work-shops charged?

101. Is there a separate rate for tools; are the tools charged to the roads on which they are used?

Already replied to by the Government of India.

102. What is the cost of lines or buildings for the accommodation of those employed on the roads?

Lines or buildings are not erected.

103. What is the character of such buildings, and how many are erected for a given length of road?

*Proceedings of the Madras Government, Public Works Department.
11th July 1867.*

104. What is the system of pay, and what time is lost in paying?

Labourers, &c., are paid once a week and at hours of intervals allowed them as rest hours during the day.

105. Are there any general notes bearing upon the construction of roads, the amounts of which are not charged directly to the cost of roads?

NALLAGUTLA,
20th May 1867.

(Signed) S. HOWELL,
Supervisor, D. P. W.

No. 265.

ORDER THEREON, 11th July 1867, No. 2,070.

CIVIL WORKS, No. 34.

Ordered that these papers be communicated to the Government of Ceylon:—

(Here enter No. 2,071 dated 11th July 1867.)

(True Extract.)

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

Exd. S. T. Augustin.

PUBLIC WORKS DEPARTMENT,
FORT SAINT GEORGE,
11th July 1867.

No. 2,071.

No. 266.

To

THE COLONIAL SECRETARY, COLOMBO.

SIR,

CIVIL WORKS, No. 35.

In continuation of my letter
No. 1,743 of the 11th June 1867, I am
directed to forward for the informa-

tion of the Government of Ceylon, a further collection of papers relating to the
construction of roads in some of the districts in this Presidency.

I have the honour to be,

Sir,

Your most obedient servant,

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

N:805

36

The Secretary to Government.
Dept. Pub. Works
Madras.

Sir,

With reference to G. O. No 96 of
the 11th January 1867 I have the honor to
submit answers to the questions proposed
by the Committee for Roads in Ceylon
from five of the Ranges in this Division
viz. two in Bellary two in Kurnool and
one in Cuddapah
2. I have thought it best to send
replies from different Ranges, in order to show
the type of work in those parts of the
country.

Superintending Engineer's Office
Camp. Gontaul. 22nd June
Taluk
Bellary District 1867

I have the honor to be
Sir
Your obedient servant

A. Albert Mayor C.E.
Super. Engineer 30th

drawn
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e. 29th June 1867 R. 10th

26th

20th 2070 62071-113 20th 1/6
Toward's Commission from
different ranges to Govt.
how proposed by Committee
for roads and bridges.
Ca. 500.
20th 2070 62071-113 20th 1/6
The Deputy Government
Engineer
3rd Div.

The following Questions refer more particularly to Metalled Roads
instructed about the year 1864/65/66 in Hill Districts or side lanes, gravel

1. Describe the general character of the
roads in Hill Districts and the ma-
terials of which they are composed?

Roads in Hill^{districts} are generally formed
along the side of a hill, half in cutting
and half in forming Embankments.
The materials used for the surface is
broken stone and gravel, laid in 9 inch
in thickness, well watered and tamped
down and culverts are constructed
in places where most required.

2. What is the usual type for roads
of different widths?

3. What system is followed in forming
the road surface before laying on
the Metalling?

The surface is first made level
and sectioned from excavations of side
channels & well tamped, in which the
Metalling is then spread.

4. Is it usual to adopt any substra-
tum differing in character or Ma-
terial from the surface Metalling, if
so describe it?

In some instances, where the soil is
loose, sand or morum is laid on in
courses, watered and tamped before
the Metalling is spread.

Are the roads fenced in open, what
description of fencing is used, and
what is the cost?

Roads are only fenced in ghats,
and steep places to prevent acci-
dents. parapets of rough stone or pillars
with wooden railings are erected.

6. What is the total cost per mile of
road with different widths of
Metalling?

Sub divided under the following heads viz:

- | | |
|---|-------------|
| A. Earthwork including retaining walls
and wells | 220 Rupees |
| B. Side drains | |
| C. Cross drains or culverts | |
| D. Bridges | 2200 Rupees |
| E. Metalling | |
| F. Miscellaneous | |

7. How are Estimates for roads prepared?
8. What check is there for ascertaining whether the quantities actually executed agree with the estimated quantities.

9. What system of drainage is adopted? Side channels, Culverts, Road ditches and Bridges etc. where it is necessary or as the case may be.

10. What is the average percentage of rock to Earth? And what are the average quantities of rock and Earth per mile.

11. What is the usual width allowed beyond the metalled portion, and are there foot paths. The width allowed beyond the metalled portion is one yard on either side, these are generally used as foot paths.

12. What is the cost of Earthwork per C. Yd. 2 or 4 Ans. according to soil.

13. Does this cost include carrying to Embankment? or is the cost of Embankment formed from cuttings estimated as a separate item.

14. How is Spoil estimated?

15. What is the cost of rock cutting per Cubic yard?

16. Are there many boulders if so what is the cost of removing them, are they estimated as so much rock? Removing boulders cannot be estimated as rock, the cost will be dependent on circumstances.

17. Is there much material difficult to be removed by spades or tools. Very little blasting is necessary, material is generally removed with tools, but too soft for blasting if so, the ordinary tools in use, Pickaxes, etc. What is the cost of such material per Cubic yard? but material is 1/2.

18. Is rock defined as material which requires blasting? Rock is defined as material which requires blasting.

19. Are retaining walls used extensively as a substitute for Earth slopes? Not extensively, but where ghats, and high banks, and in places absolutely necessary.

20. If so what is the character of masonry of such walls, what is the thickness for different heights of wall, and the cost per Cubic Yard? The walls are generally built of rough stone well packed, about the thickness of a yard or more, according to height average cost 1 Rupee.

21. What is the average number of Cubic yards of retaining wall per mile of road.

Metalling

22. Describe the general character of the metalling, and the materials of which it is composed.

Metalling is composed principally of broken stone, laid on the surface yard in thickness, in which gravel well sifted is spread of 2 inches in thickness, it is then watered, and tamped.

23. What is the average thickness of metalling.

9 inches.

24. What is the average cost per superficial yard of metalling?

4 to 6 Ans.

25. How is metalling laid, is it piled at the side of road, and after being laid is it watered, tamped, rolled, or bladed with gravel?

The materials are carried to the road side after which it is laid on the road surface watered, tamped, rolled etc.

26. What is the cost of each of the following items in metalling. Blasting, Piling, breaking, piling, tamping or rolling.

27. What is the average distance to which material is conveyed from the quarry?

From 1 1/2 to 2 miles distance, and in heavy cases it is to be had by the road side.

28. What is the cost of the transport of material for different distances?

6 trips per mile, 15 Cft or 1/2 Cpd per load the rates of hire will vary according to locality, from 2 to 2 1/2 pice per trip of 1 mile distance.

29. Is the brushel in use as a measure of not what measure is used for metalling?

The brushel is not known here, the Piche measure 1/2 of a Candy is used. It is heaped.

30. Is the measure heaped or not?

4000. Cubic inches

31. How many Cubic inches does the measure contain?

750 Cubic inches on an average.

32. How many Cubic inches should be allowed on the average if the measure be heaped?

33. How many Cubic yards of solid rock are required to make up a given number of measures say 100 brushels.

Culverts

34. What is the average number of Cubic yards of different dimensions for roads?

Culverts are generally constructed of stone in masonry, sometimes of brick where stone is scarce.

35. What is the general description of masonry of which they are constructed.

36. Is the stone for masonry generally quarried or blasted? quarried generally, but is to be found within 2 miles distance.
37. Is the stone blasted if so does it. The stone is not blasted it is generally quarried and taken up in slabs or in layers of different thickness, with an even bed, seldom breaks up with an irregular fracture.
38. What is the cost of procuring stone per Cubic Yard? 8 to 12 Annas per Cubic Yard rough at the quarries.
39. What is the cost of lime delivered on the work? 6 to 8 Rupees per Candy of 12 pails.
40. What is average quantity of lime per Cubic Yard of masonry? 1 Pail of Chunnar $\frac{1}{12}$ of a Candy.
41. What is the proportion of lime to sand used? Lime one part to two of sand.
42. What description of lime is chiefly used, is it of good quality? Stone of very good quality.
43. Is there hydraulic lime in the district? No.
44. Are bricks easily obtained, what are their dimensions, and cost per 1000? Bricks are not easily obtained, have to be manufactured where required dimensions $9 \times 4\frac{1}{2} \times 2\frac{1}{4}$ or 3 inches the cost will be 6 Rs per 1000.
45. What is the cost of brick work per Cubic Yard? Rupees $4\frac{1}{8}$ per Cubic Yard.
46. What is the cost of masonry per Cubic Yard? Rupees 3 to $3\frac{1}{2}$ per Cubic Yard.
47. What quantity of masonry does each mason complete per diem? $\frac{3}{4}$ Cubic Yards.
48. Are Elephants employed to assist in building? No Elephants are employed.
49. What is the average cost per lineal yards of different dimensions of Culverts, and what is the cost of their piers? 8 Annas for ordinary workmen.
50. What are the rates paid for masons? 8 Annas for ordinary workmen.

Bridges

51. Give a general description of different bridges with their cost.

52. What is the average number of bridges per mile? None.
53. What rates are paid to skilled artisans of different kinds? Skilled artisans are not known here.
- Labour.
54. Whence is labour obtained and on what terms? local labour comes from the nearest villages where the work is in progress, on daily wages.
55. Is any of the labour imported if so, at what cost? No import labour.
56. Is there any system of agreement if so, what is the character of such agreement? There is no agreement for daily labourers, they are paid for the days of actual work.
57. Is the cost of transportation charged to the cost of the road? No.
58. Is there any organized body of road labourers or artisans? No organized body.
59. Is any labour on the roads performed by pioneers or military if so at what rates and to what charged? Pioneers or Military are not employed.
60. What is the average daily rate of pay for labourers? 3 Annas per diem.
61. Are there different grades of labourers, and how are they distinguished and paid? There are different grades, and are distinguished as adults and children, and paid accordingly.
62. Are women and children employed on the road? They are employed.
63. How are labourers and others tasked? The quantity of work required to be done by them is worked out daily.
64. What system is adopted to enforce discipline as to ensure the completion of the task? The labourers are under the charge of a headman, whose duty it is to see that the task is performed. The pay is withheld in case of the task not being completed.
65. Are the labourers paid when on the march, changing from one place to another? Labourers do not march from place to place, unless to proceed on a work of emergency, when a batta or a days line is allowed them.
66. Are they paid when sick in Hospital or when prevented from working by stoppage of weather? Labourers are not sent to hospital and are not paid when prevented by stoppage of weather.

67. Is medical aid given to the labourers, if so how is it charged and what is the cost of it? — he medical aid is given to the labourers.
68. Is rice issued at a fixed rate if so, in what quantities? — Rice is not issued.
69. Is there any loss on the rice thus issued? —
70. What other charges beyond the regular pay of the labourers are included in the cost of the road? — Superintendence and Sunday rates are included in the cost of road.
71. How far is labour affected by the proximity to Estate? — Does not affect, there being no Estate.
72. How far do Coolies prefer working on Estates to being employed on roads? —
73. Are wages paid to road Coolies higher than those paid to Estate Coolies? —
74. Are Coolies retained from the roads by Circars employed on Estates? —
75. Are there many desertions? —
76. What is the general system pursued with regard to labour on Estates? —
77. What is the highest rates that prevail in those districts in which Estates are most numerous? —
78. What is the proportion of non-effective labour? —
79. How far is the Contract system pursued in road making? — The contract system has not been much pursued.
80. What are the rates paid for contract work? — The rates will differ greatly, it will depend on the distance the materials have to be brought, the average cost is estimated at Rs. 1 1/4 per running yard of road complete.

Supervision

81. What is the general character of supervision and Establishment? — In general an overseer has charge of the work who has a few assistants & employed under him, whose duty it is to supervise all work under his charge.
82. What portions of the supervision is borne on the fixed or provisional Establishment and what is charged to the road under construction? —
83. Is any portion supervised by Military Engineers or other officers if so, to what are their pay and allowances charged? —
84. To what extent is native supervision employed, and is such supervision attended with satisfactory results? — Native supervision does not prove satisfactory in every instance.

Transfers

85. What is the cost of Transport borne? —
86. Is there a special rate for Transport, or is the cost of Transport in such case charged to the construction of the road? —
87. Are Elephants, Camels, or donkeys extensively used in transport, if so what do they cost per mensem or per annum? — Elephants, camels and donkeys are not used in transport.
88. Are Carts employed? — Carts are employed for carrying materials.
89. What is the cost of a pair of bullocks and a driver per diem? — 12 Annas to one rupee per diem.
90. What is the contract price of carts per diem? — The contract price is one rupee per diem.
91. Are bullocks or hired carts in general use? — Bullocks are not used.
92. Is any transport performed by men if so at what cost? — Men are not employed in transport.

Character of Traffic

93. What is the character of traffic on different roads. — Carts laden. Bullocks, donkeys and horses laden. Camels and Elephants &c.
94. What description of carts are used. — Two wheeled carts drawn by a pair of bullocks.
95. What is the breadth of the wheels in ordinary use? — $4\frac{1}{2}$ feet is the ordinary width.
96. What weight is carried on a pair of wheels. — 40 Maunds or 1000 lbs ordinary weight.
97. How many wheels pass over the roads in the course of a day. — average 50 carts per diem.
98. What is the average duration of each road. — The duration of roads will depend on the repairs made on it. Where there is a maintenance grant, the road may always be kept in good repair.
99. Has any relation been observed between the duration of the roads and the number of carts which have passed over them. —

Miscellaneous

100. How are the supplies from the work shops charged? —
101. Is there a separate rate for tools, are the tools charged to the roads on which they are used? — } When repaired by the Govt. Khirki
102. What is the cost of houses or buildings for the accommodation of those employed on the roads? — Houses or buildings are not erected.
103. What is the character of such buildings and how many are erected for a given length of road. —
104. What is the system of pay and what time is lost in paying? — Labourers &c. are paid once a week and at hours of intervals allowed them as rest hours during the day.

105. Are there any general notes bearing upon the construction of roads, the amounts of which are not charged directly to the cost of roads? —

Camp Valleyatta }
20th May 1867 — }

Howell
Sapin D. D.

22

Survey July 1894

Pr 2298/54

Section regarding the
construction of suitable
roads in the District

Dec 1894

Internal District
Technical Charge

1894/105/67

No 1 or Poddatur Range

Questions & answers as called for in G.O. dated 11 January 1894
No 46.

Describe the general character of Roads in Hill Districts are
of the Roads in Hill Districts carried along the valleys or
over the materials of which they where this is impracticable
are composed of ——— along the side of the hill, the
road being half in cutting and
half in embanking; the materials
of which the roadway is formed
are generally of broken stones
either quartz or limestone

What system is followed in forming the road surface before gravel or rock the road surface
laying on the metalling? — is generally trimmed, and is laid
out according to the gradients &
after the same has consolidated
which will be after it has weathered
down some, the metal is then laid
on but in soft soils such as
clay and cotton the earth thrown
up is generally well rammed
previous to the metal being laid
on

Is it usual to adopt any substratum, differing in character or material from the surface metalling, if so describe? — It is usual in roads constructed on cotton soil to cover the surface with a layer of sand or slate rock where procurable, this acts as a substratum to the metal but where the soil is hard the metal is at once put on

Are the roads generally in, if so what description of fencing is used and what is its cost? — The roads in this Range are not fenced in

What is the total cost per mile of road with different widths of metalling subdivided under the following heads as follows:-

a. Earthwork (including pe- tany walls & rocks.)	Earthwork	600
b. Side drains	Side drains	100
c. Cross drains & Culverts	Cross drains & Culverts	800
d. Bridges	Bridges	1000
e. Metalling	Metalling	2200
f. Miscellaneous	Miscellaneous	100
		<u>Total 5100</u>

5 yards Metalling	Earthwork	600
	Side drains	100
	Cross drains & Culverts	800
	Bridges	1000
	Metalling	2000
	Miscellaneous	100
		<u>Total 4800</u>

4 yards Metalling	Earthwork	400
	Side drains	100
	Cross drains & Culverts	800
	Bridges	1000
	Metalling	1760
	Miscellaneous	100
		<u>Total 4460</u>

What system of drainage is adopted?

Is convey the drainage in a level plain, ditches termed side drains are ex-
posed parallel with the road and a few yards on either side which should be

23

led away into the natural water courses of the country. Inside hill road a drain is cut on the upper side about 8 or 10 yards from the edge of the road, and this is led across the road at intervals under masonry culverts.

What is the usual width allowed beyond the metalled portion, and are there footpaths constructed? The usual width allowed beyond the metalling is 2 feet on either side; there are no regular paved footpaths constructed.

What is cost of earthwork per cubic yard? The cost of Earthwork usually varies from 1 1/2 to 4 Annas a Cub. yard depending upon the nature of the Soil.

What is cost of rock cutting per Cub. yard? Rock cutting would cost from 4 Annas to 1 Rupee per Cub. yard.

Are there many boulders? The removal of large boulders should be estimated as clearing so much rock to be estimated as so much rock.

Is there much material difficult to be removed by spade or manually but too soft for blasting, if so what is the cost of such material per yard would be about 3 to 4 Annas.

The cost of such materials per cub. yard.

18. Is rock defined as material which requires blasting? Rock is not, defined as material which requires blasting; the term would also, refer to such as would be removed by a crow bar or Pickaxe.

19. Are retaining walls used extensively, as a substitute for earth slopes? Retaining walls are generally used on side hills where the natural surface inclination is very great; to sustain the earthwork of the road.

20. If so, what is the character of masonry in such walls, generally built of rubble. What is the thickness for different heights of wall base for a wall 2 or 3 yards high being about 3 feet at bottom and battering to 1 1/2 at top. Cost about 3 1/2 to 5 Rs per cub. yards.

21. Describe the general character of the Metalling and the materials of which it is composed? The Metalling generally consists of broken stone either granite or lime stone which should not be larger than 1 1/2 inch cubes.

22. What is the average thickness of Metalling? The average thickness should be 10 inches.

24. What is the average cost per superficial yard of Metalling? Cost per superficial yard of Metalling would be from 4 to 8 annas.

25. How is Metalling laid? Metal is first casted from the quarry and piled in the road, and after being laid heaps on the side of the road so it is watered, stamped, rolled, it is then broken to the proper size and laid on, over this a course of 3 inches of screened gravel is put on, well watered and rolled so as to form one compact mass.

26. What is the cost of each of the following items in Metal? Metal broken into 1 1/2 inch cubes would cost about 8 annas per yard, it is usually quarried in this District and then broken with hammer.

Blasting _____
 Sledging _____
 Breaking _____
 Piling _____
 Stamping or rolling _____

27. What is the average distance to which Metal is conveyed from the Quarry? On some cases it has the distance from 3 or 4 miles but the average distance is 1/4 to 1/2 mile.

28. What is cost of transport of Metal for different distances? A cub. yard of Metal would cost as follows:-

Lead from Quarry 1/2 mile 4 as
 do do 1 do 6 as
 do do 2 do 9 as

29. Is the bushel in use as a measure of Metal? The bushel is not used as a measure of Metal but a pawan is used for Metal.

30. Is the measure heaped or not? The parak measure is not heaped but struck level on the top.

31. How many cub. inches does the measure contain? The Parak measure contains 4000 Cub. inches.

32. 33.

34. What is the average number of culverts of different dimensions per mile? The average number of Culverts from 8' to 4' would be about 4 per mile.

35. What is the general description of masonry of which they are constructed? The masonry is generally regularly coursed rubble masonry with Jashlar quoins.

36. Is the stone for masonry generally near at hand? The stone for masonry is more or less obtainable from a distance of 8 to 5 miles.

37. Is the stone blistered? does it laminate with an even bed or break up with an irregular fracture? The stone obtainable in this district is laminated & breaks up with an even bed comes of from 6" to 9" are easily procurable.

38. What is the cost of procuring stone per cub. yard? The cost of stone per cub. yard varies from Rs. 1 to 2 1/2.

39. What is cost of lime delivered on the works? Average 8 rs per parak.

40. What is the average quantity of lime per cub. yard of masonry? 2 paraks per cub. yard.

41. What proportion of lime & sand used? 2 of sand to one of lime.

42. Which description of lime is chiefly used, & is it of good quality? The lime used is procured by burning limestone nodules which is plentiful in this District.

43. Is there hydraulic lime in the District? Not answered.

44. Are bricks easily obtained? Bricks are made in places where fuel is to be procured. What are their dimensions & cost per 1000. The size being after burnt 9" x 4 1/2" x 3" and cost about 6 Rs. per 1000.

45. What is the cost of brickwork per (yard? About Rs. 6 per (yard.

46. What is cost of masonry per cub. yard? Rs. 4 to 5 per cub. yard.

47. What quantity of masonry does each mason complete per diem? In pier and abutments and such like a mason can plate about 1/4 of a yard per day but walling 1/2 a yard is generally considered fair.

48. Are elephants employed to assist in building? Elephants are never used.

49. What is the average cost of 1 (yard of different dimensions of culverts and the dimensions of culverts are usually calculated and reduced to cub. yards &

What is cost of their faces the rates then struck accordingly.

What are the rates paid for masons? Masons are paid at the rate of 8 annas each; 2nd class 7 as.

What rates are paid to skilled, artisans of different kinds? Bricklayers 1st class 8 as do 2nd class 7 as Carpenters 1st class 12 as 2nd class 8 as Smiths 1st class 12 as 2nd class 8 as Stonemasons 1st class 8 as 2nd class 7 as Sawyers 1st class 8 as 2nd class 7 as

Whence is labor obtained and on what terms? Labor is obtained from the villages about, but skilled workmen are usually met with in towns and large stations, no regular agreement is entered into with workmen.

Is any of the labor imported if so at what cost? No labor is imported.

Is there any system of agreement; if so what is the character of such agreement? There is no agreement entered into when a workman is paid by the day, but if work is expected and paid for at a fixed rate, a formal agreement is drawn up.

Is there any organized body of coolies or artisans? There is no organized body of coolies or artisans in the District but about every village Waddans (or Waddans) could be procured who are accustomed to execute earthwork and pitch about or quarry stone.

Is any labor on the roads performed by pioneers or building pioneers if so at what rates to what charge? No labor is performed by pioneers.

What is the average daily rate of pay for labourers? A coolie is paid at the rate of 2 1/2 annas per diem.

Are there different grades if so how are they distinguished and paid? There are no grades, all males receive 2 1/2 as per diem.

Are Women and children employed on roads? Women and children are employed, the former receive 1 1/2 annas and the latter 1 as per diem.

How are the labourers and coolies treated? A certain number of men, women and boys form a gang and a certain portion of work is given out which is expected to be completed by the evening.

What system is adopted to enforce discipline or ensure the completion of the task? A Pygmy or Maistry is generally put over the gang to ensure the work being worked out and the coolies being worked out.

82 } *Presently, left*
83 } *to be*
84 } *to be*
To what extent is native supervision employed? All the Masters employed are natives and require very much looking after attended with satisfaction the greater portion being trustworthy and deceitful and must not be depended upon.

85
86
87
Are Elephants, Camels or Donkeys extensively used in transport, if so what do they cost per mensem or per annum? Horses are not used in this Range.

88
89
Are Carts employed? Carts are employed —
What is the cost of a pair of bullocks and a driver per diem? 12 annas to 1 Rupee

90
What is the contract price of Carts per diem? The same as above.

91
Are barrows or hand carts in general use? — Barrows or hand carts are not used extensively but in repairing roads they are useful.

92
Is any transport performed by men, if so at what cost? — No.

93
94
What is the character of the traffic is principally carried traffic on, different types, though on common 2 wheeled carts, pack bullocks and asses are also extensively used, about 800 to 1500 carts per day pass over 1st class communication and about 200 to 300 daily over a ~~minor~~ road.

95
What description of carts are used? The common country carts consists of a wooden frame placed over the axle to which are attached a pair of wheels 5 feet in diameter.

96
What is the breadth of the wheels in ordinary use? 2 1/2 inches invariably.

97
What weight is carried on a pair of bullocks? From 1000 to 2500 lbs.

98
How many wheels pass over the roads in the course of a day? On 1st class roads about 800 to 1500 carts pass over the road daily but in minor lines the traffic varies from 100 to 500 daily.

99
What is the average duration of a road? A road well constructed with minor repairs now and again will not deteriorate for at least 10 years.

100 } *at least 10 years*
101 } *at least 10 years*

102
What is cost of lines for the accommodation of those employed on the roads? When large working parties are engaged on mountain passes far away from villages lines are constructed here; it costs about 200 Rs. to build a party of about 1000 men.

103
 What is the character of these buildings? These buildings are generally
 such buildings and how many long, shed, built with mud
 are erected of a given length. walls and thatch roofs, some
 of them are covered with bamboo mats
 themselves with bamboo mats

104
 What is the system of hiring? Once every week and
 and what time is lost? at night. The mason in
 paying? charge of the work pays his
 gangs generally between 12
 to 2 during the recess, but
 in very extensive works a
 half day is lost once a
 week in disbanding such
 men's wages

105
 Poddatur Rang Office
 Camp Poddatur
 1st May 1867
 Col. Crook
 Poddatur Rang

2
 30
 Recd from Supr mgt Office
 75 B - 17 May 1867

Recd from
 Poddatur Rang
 To the Super Engineer
 3^d Division

Dated 1st May 1867
 No 6

P. N 2390/67
 Questions and
 answers as called for
 in G. O. No 96
 Dated 11th January
 1867

Proc. 11th July 1867 L 264

Lucifer from Supr. Inq. Office

75 B - 17 May 1967

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G. O. No. 96 dated 11th January 1867.

General Character of Roads.

1 Describe the general character of the roads in Hilly Districts, and the materials of which they are composed?

2 What is the usual type for roads of different widths?

3 What System is followed in forming the Road Surface before laying on the metalling?

4 Is it usual to adopt any Substratum differing in character or material from the surface metalling - If so describe it?

5 Are the roads fenced in? If so what description of fencing is used, and what is the cost?

6 What is the total cost per mile of roads with different widths of metalling - Sub divided under the following heads?

a - Earthwork (including retaining walls and rocks)

b - Side drains.

c - Cross drains or Culverts

d - Bridges.

e - Metalling

f - Miscellaneous.

7 How are Estimates for Roads framed?

8 What check is there for ascertaining, whether the quantities actually executed, agree with the Estimated quantities?

9 What System of drainage is adopted?

G. O. No. 96 dated 11th January 1867.

33

General Character of Roads.

1 Roads in Hilly Districts are kept as level as possible, are carried round, rather than over the Hills, and over the lowest and most convenient saddles; occasionally in crossing valleys Embankments are necessary, but all heavy Earthworks is avoided as much as possible.

In striking the Side of a hill, the road is generally one half Cutting and one half Embankment, which last if necessary is finished with Stone. The materials used are those most easily obtained in the neighbourhood; for as a rule in Hilly Districts good Stone for metalling and good gravel are to be found.

2 Don't understand this question

3 If the Soil is hard and firm the metal is laid down at once; if of Sand a depth of 6 inches is excavated and filled in with good Soil - clay or gravel. This is well rammed and the metal is then spread. If soft lumpy soil in a flat country, a small Embankment 2 or 6 inches to 1 foot in height is thrown up and this when rammed and consolidated forms a firm Substratum for the metal. Cuttings in hill sides generally give a hard firm surface for the metal, but in all cases, the Substratum should be hard and firm before the metal is spread.

4 This question is answered by the foregoing Q. No. III.

5 Q. No.

6 For an ordinary Road 16 yards wide with 4 yards metalling

a. Earthwork - impossible to say, for the cost of a Road, whether in a flat or an undulating or a hilly country would differ considerably.

b - Side drains - about 1 Rupee 100.

c - } Impossible to say - Dependent entirely upon the character of the country through which the road is carried on.

d - Metalling 16 yards about 1 Rupee 800.

f - Miscellaneous. Unknown.

7 A regular form is adopted in this country, or Survey of the line is drawn on the paper, the terms of work required on that portion of road is shown in Survey.

8 The measurements of the road are done, by the Officer in charge of the road.

9 Catch drains are cut on the upper Side of the Road, and these drains are led off into lower side channels which are led off into the nearest Stream or River. It is sometimes necessary to carry this drainage across and under the road.

G.O. No. 96 dated 11th January 1867.

10. What is the average per Centage of rock to earth? and what are the average quantities of rock and earth per mile?
11. What is the usual width allowed beyond the metalled portion, and are there footpaths?

Earthworks.

12. What is the cost of earthworks per Cubic Yard?
13. Does this cost include Carrying to Embankment? or is the cost of Embankment formed from Cuttings, estimated as a separate item?
14. How is Spoil Estimated?
15. What is the cost of rock Cutting per Cubic Yard?
16. Are there many boulders? if so, what is the cost of removing them? are they Estimated as much rock?

17. Is there much material, difficult to be removed by Spade or Hammer, but too soft for blasting? if so, what is the cost of such material per Cubic Yard?

18. Is rock defined as material, which requires blasting?

19. Are retaining walls used extensively as a substitute for Earth Slopes?

20. If so, what is the character of Masonry in such walls? what is the thickness for different heights of wall and the cost per Cubic Yard?

21. What is the average number of Cubic Yards of retaining wall per mile of road?

Metalling. 22. Recount the General character of the Metalling and the materials of which it is composed?

23. What is the average thickness of Metalling?

24. What is the average cost per superficial yard of metalling?

25. How is Metal laid? is it piled at the side of the Road, and after being laid is it watered, stamped, rolled or blinded with gravel?

26. What is the cost of each of the following Items in Metalling. Viz. blasting, Sledgeing, Breaking, piling, Stamping, or Rolling.

G.O. No. 96 dated 11th January 1867.

10. Impossible to say, for in one road there may not be rock for miles - in another rock may be found nearly every yard.

11. 2 to 3 footpaths. Roads are usually metalled 2 yards left than the total width - thus leaving 3 feet on each side of the metal.

12. Varies from 1 anna to 4 annas per Cubic Yard, according to hardness, and distance to be carried.

13. ~~Cost includes carrying to Embankment~~
Already used by the Govt. -

14. ~~See all~~

15. A Road in this country is very rarely carried through rocks. Clearing away obstructive rocks by blasting, costs from Rupees 1 to Rupees 10 per Cubic Yard.

16. Sometimes a good many boulders are met with. They are measured as so many "Cubic Yards of removing rocks" and the cost varies considerably, for from 8 annas to Rupees 5 per Cubic Yard for sometimes, the boulders can be dug out and rolled away, and in other places, they must be burnt and blown away.

17. Hard gravel or decomposed rock - cost from 4 annas to one Rupee per Cubic Yard.

18. Yes.

19. No, but Earth Slopes are sometimes pitched with Stone.

20. Answered by Q No. 19.

21. Impossible to say.

Metalling. 22. Stone broken to pieces of $1\frac{1}{2}$ to 2 inches - trap, granite, and limestone are the best materials.

23. 18 to 24 inches wide - 6 inches in middle and 4 inches at sides.

24. From 1 to 2 annas.

25. The Metal is first piled at the side of the road, then laid to the thickness required, then blinded with gravel and afterwards watered and rammed.

26. Blasting and Sledgeing - seldom or never required. Beating and piling 2 to 3 annas per Cubic Yard, Stamping 2 to 4 annas a square yard.

C.O. No 96 dated 11th January 1867.

27. What is the average distances to which metal is conveyed from the quarry?
28. What is the cost of transport of Metal for different distances?
29. Is the bushel in use as a measure? if not what measure is used as a metal?
30. Is the measure heaped or not?
31. How many Cubic Yards does the measure contain?
32. How many Cubic Inches should be allowed on the surface of the measure be heaped?
33. How many Cubic Yards of solid rock are required to make up a given number of measures, say 100 bushels?
- Culverts. 34. What is the average number of Culverts of different dimensions per mile?
35. What is the General description of masonry of which they are constructed?
36. Is the Stone for masonry generally near at hand?
37. Is the Stone blasted? if so does it laminate with an even bed, or break up with an angular fracture?
38. What is the cost of procuring Stone per Cubic yard?
39. What is the cost of lime delivered on the works?
40. What is the average quantity of lime per Cubic yard of Masonry?
41. What is the proportion of lime to sand used?
42. What description of lime is chiefly used? is it of good quality?
43. Is there Hydraulic lime in the District?
44. Are bricks easily obtained? What are their dimensions?
45. What is the cost of brick work per Cubic yard?
46. What is the cost of Masonry per Cubic yard?
47. What quantity of masonry does each mason complete per diem?
48. Are Elephants employed to assist in Building?
49. What is the cost per lineal yard of different dimensions of Culverts and what is the cost of their Jacks?
50. What are the rates paid for Masons?

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27. Generally in this Country the metal is close at hand - but in some soil it has sometimes to be carried from 3 to 5 miles.
28. For one mile one anna a yard, for two miles $2\frac{1}{2}$ annas for 3 miles from 4 to 5 annas.
29. The bushel is not used. The parish measure $20" \times 20" \times 10"$ is used.
30. Not heaped.
31. $2\frac{1}{3}$ Cubic feet nearly = 12 parabs = 1 Cubic yard nearly.
32. The measure is not heaped.
33. Went know.
- Culverts. 34. Impossible to say, for the number of Culverts required, varies according to the description of Country passed over.
35. Rubble Stone in Mortar.
36. Sometimes it is near at hand.
37. Sometimes stone is blasted and if it is limestone it generally breaks up evenly. The bricks of Madras are burnt and laminated off in large even beds.
38. Varies from 8 annas to 2 Rupees per yard.
39. Varies from 4 annas to 8 annas per parish.
40. from 3 to 4 parabs with stone, less with brick.
41. Depends entirely upon the line from 1 of lime to 1 of sand to 1 of lime to 3 of sand.
42. Burnt Limestone of excellent quality.
43. I never saw any.
44. Easily obtained in some places. dimensions $9" \times 4\frac{1}{2}" \times 3"$ $9" \times 4\frac{1}{2}" \times 2\frac{1}{4}"$
45. from 1 Rupee 5 to 1 Rupee 10 per Cubic yard.
46. Rubble masonry from 1 Rupee $2\frac{1}{2}$ to 1 Rupee 5 per yard. carried rubble from 18th 3 to 18th 6
47. seldom more and sometimes less than one Cubic yard.
48. Not in this District.
49. Went know.
50. Street clasp new range from 8 annas to 12 annas per diem.

Q. Q. No. 96 dated 11th January 1867.

- Bridges. 51. Give a General description of different Bridges with their cost?
52. What is the average number of Bridges per mile?
53. What rates are paid to skilled artisans of different kinds?
- Laborer. 54. Whence is labor obtained and on what terms?
55. Is any of the labor imported? If so at what cost?
56. Is there any system of agreement? if so what is the character of such agreement?
57. Is the cost of importation charged to cost of the road?
58. Is there any organized body of laborers or artisans?
59. Is any labor on the Roads performed by joiners or millers? if so, at what rates, and to what charged?
60. What is the average daily rate of pay for laborers?
61. Are there different grades? if so how are they distinguished and paid?
62. Are women and children employed on Roads?
63. How are the laborers and others treated?
64. What system is adopted to enforce discipline? or to ensure the completion of the task?
65. Are the laborers paid when on the march, changing from one place of work to another?
66. Are they paid when sick in Hospital? or when prevented from working by Sickness or weather?
67. Is medical aid given to the laborers? if so how is it charged? and what is the cost of it?
68. Is rice issued at a fixed rate? if so at what quantities?
69. Is there any loss on the rice thus issued?
70. What are the charges beyond the regular pay of the laborer are included in the cost of a Road?

Q. Q. No. 96 dated 11th January 1867. 63

- Bridges. 51. Bridges are built with Semi-Circular, segmental or Elliptical arches. of Stone or of bricks, sometimes of both with brick arches. It is impossible to state cost, the price of materials varies so much in different districts and in different part of a district.
52. Depends entirely upon the character of the Country through which the road passes. Impossible to mention an amount that would be a guide.
53. Masons 8 to 12 annas per diem, Stone Cutters 6 to 10 annas, Carpenters 8 annas to 1 Rupee.
- Labor. 54. From the neighbourhood of a work and usually on daily pay.
55. Labour is seldom imported.
56. No system of agreement for daily labor.
57. See No. 55.
58. No; if so except the Corps of Sappers and miners.
59. Don't know.
60. 2 annas.
61. 3 annas per diem, and sometimes paid to the better class of laborers. difference in rate of pay is distinction.
62. Yes.
63. So much work to be done per man per day.
64. No payment until the whole of the work is completed.
65. No.
66. Sometimes half pay when in Hospital. Never paid when prevented from working from Sickness or weather.
67. No.
68. No.
69. See No. 68.
70. Petty superintendence only.

Q. O. No 96 dated 11th January 1867.

- 71 How far is labor offended by the proximity to Estates?
72 Do Coolies prefer working on Estates to being employed on Roads?
73 Are the wages paid to Road Coolies higher than those paid to Estate Coolies?
74 Are Coolies Enticed from the Roads by crimps employed on the Estates?
75 Are there many desertions?
76 What is the General System pursued with regards labor on Estates?
77 Do the highest rates prevail in those districts in which Estates are most numerous?
78 What is the proportion of Non-effective labor?
79 How far is the Contract System pursued in Road making?
80 What are the rates paid for Contract work?

Supervision 81 What is the General Character of Supervision & Establishment?

- 82 What proportion of the Supervision is borne on the fixed or provisional Establishment and what is charged to the Road under Construction?
83 Is any portion Supervised by Military Engineers or other officers? if so to what are their pay and allowances charged?
84 To what extent is native Supervision employed? and is such Supervision attended with satisfactory results?

Transport 85 How is the cost of transport borne?

- 86 Is there a special vote for transport? or is the cost of transport in each case charged to the construction of the Road?
87 Are Elephants, Camels, or Donkeys extensively used in Transport? if so what do they cost per mensem or per Annum?
88 Are Carts employed?
89 What is the cost of a pair of Bullocks and a driver per diem?
90 What is the contract price of Carts per diem?

Q. O. No 96 dated 11th January 1867.

- 71 Don't know.
72 Don't know.

73 Don't know.

74 Don't know.

75 No.

76 Don't know.

77 Don't know.

78 Don't know. ~~Very proportion to what?~~

79 Very little beyond the supply of materials
80 The answers already recorded, regarding rates for materials and labour, apply also to this question

Supervision 81 There is the fixed Establishment and there is also a permanent Petty Establishment.

82 Don't know what the proportion is in this respect.

83 Military and Civil Engineers supervise work; pay and allowances are charged to "Establishment"

84 The Subordinate grades are perhaps one half natives. The Native Supervision is on the whole satisfactory.

Transport 85 A part of the cost of materials
86 If by transport is meant Carriage for materials it is charged to the construction of Road

87 No.

88 Yes.

89 At present 12 annas to 14 annas per diem.

90 With Bullocks and driver 1 Rupee per diem

Q. O. No 96 dated 11th January 1867.

- 91 Are Burrows or Hand Lamps in general use?
92 Is any transport performed by mules? if so at what cost?

Character of Traffic

93 What is the character of the traffic on different Roads?

94 What description of carts are used?

95 What is the breadth of the wheels in ordinary use?

96 What weight is carried on a pair of wheels?

97 How many wheels pass over the roads in the course of a day?

98 What is the average duration of each road?

99 Has any relation been observed, between the duration of the Roads and the number of Carts which have passed over them?

Miscellaneous

100 How are the supplies from the workshops charged?

101 Is there a separate vote for tools? or are the tools charged to the roads on which they are used?

102 What is the cost of lines or buildings for the accommodation of those employed on Roads?

103 What is the character of such buildings? and how many are erected for a given length of time.

104 What is the system of pay? and what time is lost in paying?

105 Are there any General votes, bearing upon the construction of Roads, the amounts of which are not charged directly to the cost of Roads?

Range Office 5th 5
Camp Giddacul
24 January 1867

Q. O. No 96 dated 11th January 1867.

91 No.

92 No.

Character of Traffic

93 on good Road the traffic is principally Carts, on undrained or bad roads by bullocks.

94 The ordinary native Carts.

95 From 1 1/2 to 2 inches

96 From 800 to 1500 lbs.

97 Varies of course as the traffic. on some roads 3000 two wheel Carts pass in one day: on other roads not more than 10 Carts pass.

98 Don't know.

99 Yes, but not sufficiently so, to form any reliable data.

Miscellaneous

100 Not to Tools Account and then to the work.

101 There is a separate vote for tools.

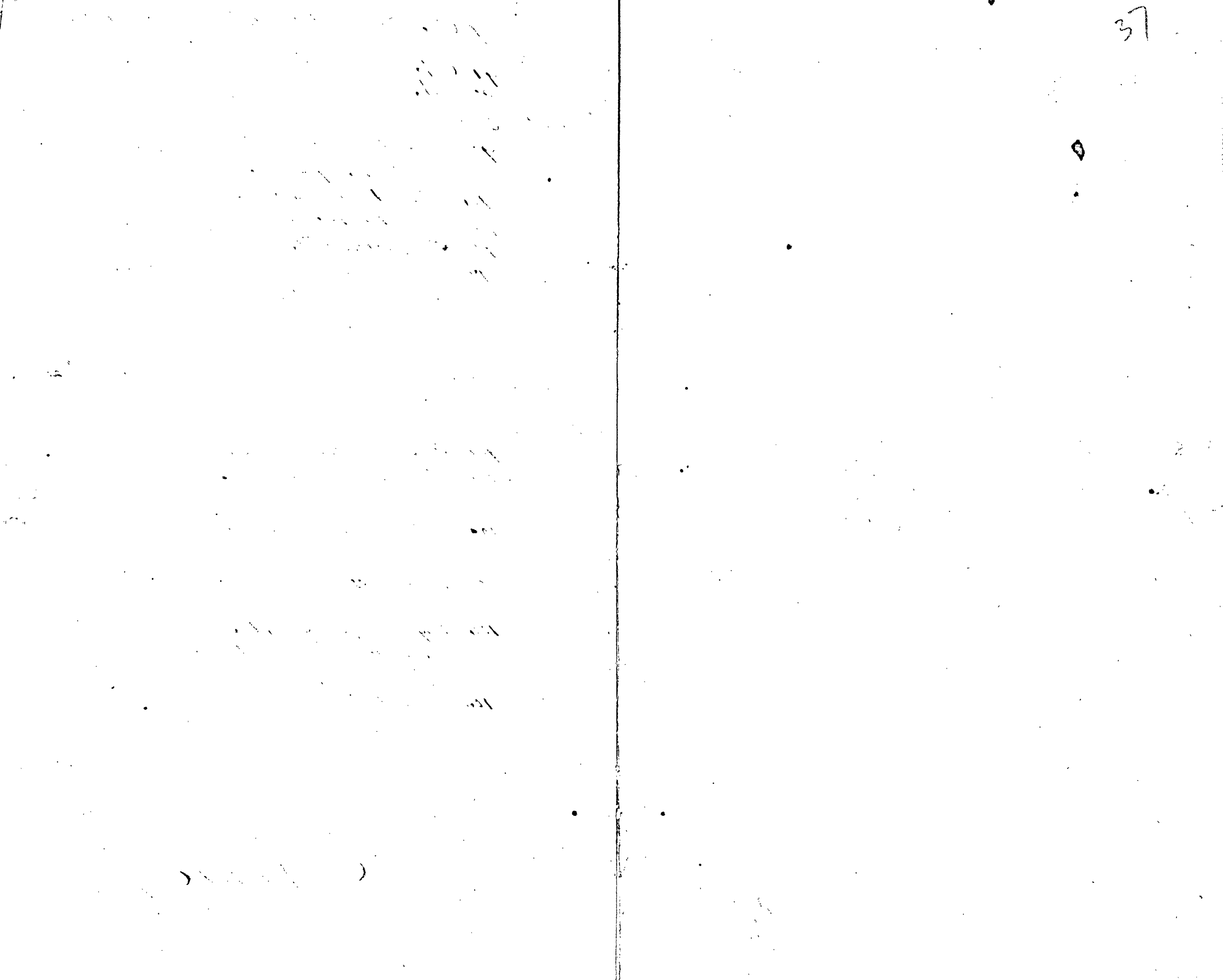
102 Lines are seldom or never built.

103 See 102.

104 Pay is issued every 7 or 14 days and the people are generally paid between 12 & 2 P. M. so that very little time is lost.

105 Not known. Already copied to by Mr. [unclear] of India.

Wm. Glavin
Assistant Engineer 10. P. 7.



of the Government of
Ceylon

From Messrs J. B.
in charge of
Mauritius Naval

Public Supply Department
and Provision

Added 24 Decr 1867
Recd.

22/23/67

Ref. to Supply Dept. Dis-
cuss Memo: no 75 B of
17 Jan 1867

Answer to questions
regarding the formation
of a - submitted
by the Capt. J. B.

22nd July 1867

97 How many wheels pass over the roads in the

year?

98 What is the average duration of each Road?

How are maintained by our annual allow-

99 How many wagons are there in the State?

How many are engaged in the business of carrying

100 How many are engaged in the business of carrying

How many are engaged in the business of carrying

How many are engaged in the business of carrying

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How many are engaged in the business of carrying

How many are engaged in the business of carrying

How many are engaged in the business of carrying

How many are engaged in the business of carrying

103 What is the character of each building, & how

How

104 What is the system of pay? and what time

Costs are paid by the Owners or Officers every

105 What are the general notes bearing upon

of Roads?

J. L. Steele

Sept. 28.

Document & Range Office
Summit 9th May 1873

Executive Engineer
Summit Range

Let us see how the

How many are engaged in the business of carrying

How many are engaged in the business of carrying

25

The daily and turn is inspected by the local authority

of one Government of Ceylon

63 When are the labourers and others looked at? The daily and turn is inspected by the local authority

64 What system is adopted to enforce discipline? Reproaches, or imperfect control are dismissed

65 How the labourer is paid? either on the month or by the day. The practice is not encouraged. Local

66 When they find it when sick in hospital? They are sent to the hospital. The practice is not encouraged. Local

67 What is the system of punishment? The labourer is sent to the hospital. The practice is not encouraged. Local

68 What is the system of punishment? The labourer is sent to the hospital. The practice is not encouraged. Local

69 What is the system of punishment? The labourer is sent to the hospital. The practice is not encouraged. Local

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77 What is the system of punishment? The labourer is sent to the hospital. The practice is not encouraged. Local

78 What is the system of punishment? The labourer is sent to the hospital. The practice is not encouraged. Local

There is a piece of establishment in each district

Average $\frac{1}{4}$ *Cookie yard*
 27 25 26 27

1891

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

66-66

Handwritten signature: *Handwritten signature*

Diems 6-8-10-12

impossible to find an average no two are alike.
Each ~~series~~ with every variation, of heat, fall & facility
of forming materials etc

One
of

Confrater	Amos 12
Adelantado	Amos 1
Alonso	Amos 12

from the neighborhood - daily pay

[illegible]

My dear friends with confidence and God with
God of mercy & comfort and a joyful heart

Practise does not obtain

of a ready staff of a certain number of copies for
it is kept up on some roads.

1. *Chamaecyparis*
 2. *Juniperus*
 3. *Thuja*
 4. *Podocarpus*
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28

For a distance of one mile 20-0-0-5 ① park
 from a 20-0-0-6 ② 20-
 from a 20-0-0-8 ③ 20-
 from a 20-0-1-4 ④ 20-
 from a 20-0-1-4 ⑤ 20-

back

It is not heated

14

$\frac{1}{2}$ lbs. malleable iron

10/10/10

Handwritten notes in cursive script, likely bleed-through from the reverse side of the page.

Monte in Chiamara

2

22

note No. 10 - alk and shale laminated with easily
fractured - some of the sandstone - some of the

[illegible]

6 Annas & Sarah

Handwritten musical notation on a single staff, featuring various note values and rests.

162

Graves 8-10-15

They lived free or marble of the disturbance very good time

yes. All the time may be made so.

Only in one lot - 9" x 4 1/2" x 2 1/4" y Surface 20000

No 5-12 - Cuthrie yard

2 1/2 quarts
of milk
1/2 cup
of sugar

The Government

25

12. What is the cost of rock cutting per cubic yard?
 13. Does the cost include carrying to embankment?
 14. How is the cost estimated?

15. What is the cost of rock cutting per cubic yard?
 16. Does the cost include carrying to embankment?
 17. How is the cost estimated?
 18. What is the cost of rock cutting per cubic yard?
 19. Does the cost include carrying to embankment?
 20. How is the cost estimated?

21. What is the average number of cubic yards of retaining wall per mile of road?
 22. Describe the general character of the retaining wall.
 23. What is the average height of retaining wall?
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ment of
Ceylon

- [illegible]

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2	22	660	-
4	22	165	-
6	22	1890	-
2	22	7280	-
8	22	3960	-
10	22	8550	-

The running and long extended system shows the nature of the ground and general location suitable for both north & vice channels is that made by the running wind - for getting or cutting into the side of a hill in glacial raising the incoming water abundantly indicated as then embayed in the general channel.

Wm. H. Webb July 1894

Wm. H. Webb July 1894

Wm. H. Webb July 1894

When directly raised & equals run down to the lowest level where the drainage surface the road runs with grass, a surface water channel is just above the road. The top of the channel is level with the drainage runs upon each side in full flow it is usually 1 foot to the out. and water table just accepts of about 1 inch.

James on my head.

I find out it is usually allowed beyond the mitalling position.

Original District

From The Engineer

May 2, 1867

General Engineer

Division

Barley

Order of the

Barley

Barley

Barley

Barley

Barley

Barley

UPA

From

The Major Engineer

3 1/2 D^{ns} - (H. E. of 22nd June 1867 No 8)

Ordered that these papers be communicated to the Government of Ceylon -

To the Colonial Secretary Colombo -

For the continuation of my letter No 1743 of the 11th June 1867, I am directed to forward for the information of the Government of Ceylon

Proceedings of the Madras Government Under date the 11th July 1867 Reads the following

2070

Ceylon, a further
 collection of papers
 relating to the Customs
 & Roads in some
 of the districts in the
 Presidency—

1867

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Port St George
 11th July 1867

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Recd 12/7/67 with six
 Copies of G.O. 2070 of 1867

Pro. of Govt. for July

No 2070 & 2071

Pro. of the Madras Govt.

Of 11th July 1867

Passing orders on
certain papers submitted
by the Supt. Engineer of Sd
Division containing
information regard by the
Ceylon Road Committee.

Transmitting the
Govt. of Ceylon with the
above papers in continuation
of former correspondence
regarding road-making.

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