SRI VIDYA COLLEGE OF ENGINEERING & TECHNOLOGY

VIRUDHUNAGAR

CE6704 ESTIMATION & QUANTITY SURVEYING

UNIT-II

ESTIMATE OF OTHER STRUCTURES

QUESTIONS & ANSWERS

PART – A

1. ***Workout the quality of stone metal required for 2Km. Length for wearing coat of a 4m wide road. The thickness of the metal road required is 12cm loose.***

   Solution

   Quality of metal = 1 X 2 X 1000 X 4 X 0.12 = 960.00cu.m

2. ***An approach road 2Km.long is to be constructed. Work out the quantity of materials required i.e. stone metal and bricks. Data is given below.***

   Length = 2 Km

   Metalled width = 3.60m

   Soiling of bricks = 10cm

   Wearing coat of stone metal = 12 cm

   Solution

   Quantity of bricks = 1 x 2 x 1000 x 3.60 x 0.10 = 720 cu.m

   No of bricks = 720.0 x 3.60 x 0.12 = 3, 60,000

   Stone metal = 1 x 2000 x 3.60 x 0.12 = 864 cu.m

   Bricks = 3, 60,000 Nos

3. ***A cement concrete road (1:2:3) is to be constructed over the existing water bound macadam road .The thickness of slab =10cm.The length*** **of the road is one km and the width 3.60m.Calculate the quality of cement concrete and the material required,**

   Solution

   Quality of cement concrete = 1 x 1000 x 3.60 x 0.10 = 360 cu.m

4. Calculate the quality of earthwork for the construction of an approach road

Length = 1Km

Width of formation = 10 m

Height of embankment = 60 cm

Side slope = 1:2 (Apr./May 2011)

Solution

Quantity of earth work = L ($Bd+Sd^2$)

B=10cm; d =0.60m; S = 2

Quantity of earth work = 1000 x (10 x 0.60) +2 x 0.60 x 0.60 = 6720 cu.m

5. How to estimate bituminous and cement concrete road in general? (Apr./May 2008)

A metalled road (Water Bound Macadam) consists of 2 layers of coats, the **soling coat** which is generally of bricks, kankar or stone and **wearing coat** which is generally of stone metal, kankar etc. But in case of **concrete roads**, top layer is of concrete slabs (1:2:4). The surface painted roads will have two coats of **tar or bitumen** over the wearing coat of stone metal.

6. How to estimate water supply pipe line and sewer line in general? (Apr./May 2008)

Water supply works mainly consist of pipe lines. The connections with water mains should be enumerated stating size and length of pipes from the water main up to the boundary of the properly together with the charges of water and local authorities. Where it is not possible to ascertain these charges provisional sums shall be included. The lines are estimated on running metre (or ft) basis for different diameters for the complete work with fittings supplying and fixing in position. Including digging, laying, refilling, jointing, etc. The Principles for preparation of Sewer line is same as water pipe line.

7. What are the types of culvert?

- Arch culvert
- Slab culvert
- Pipe culvert
- Box culvert

8. What are the main components of culvert? (Apr./May 2008) (Nov./Dec.2016)

1. Abutments 2. Wing walls 3. Arch

9. What are factors to be considered in design of septic tank?

The following factors should be taken into consideration:

- Material should be water proof and corrosion resistant.
- Natural ventilation provided should be adequate
- A manhole should be provided to permit inspection and cleaning.
- Baffles should be limited to one at the inlet and one at the outlet.
- The escape of gas and sludge to effluent pipe should be avoided.

10. Define lead.

Lead is the crow flying horizontal distance from the centre of borrow pit to the centre of the earthwork at site, i.e. centre of the area of excavation to the centre of placed earth.

11. Define lift.

Lift is the distance through which the excavated soil is lifted beyond a certain specified depth.

12. What are the methods of measurements of earthwork?

The work shall be measured as given below

- Each dimension shall measured nearest to 0.01
- Area shall be worked out nearest to 0.01 m^2
- Volume shall be worked out nearest to 0.01 m^3

13. What are methods to be adopted for volume calculating?

- From cross-section
- From spot level
- From contours

14. The actual expenditure incurred in the construction of a school building which has a total length of main walls 140m is Rs.4.97lakhs.Estimate the approximate cost of a similar school building which will have 180m length of main walls.

Total expenditure = Rs.4, 97,000 Total length of main walls = 140m

Rate per m length of main wall = 4, 96,000/140 = Rs.3550/-

Length of main walls in the proposed building = 180m

Approximate cost = 180 x 3550 = Rs.6, 39,000/-

15. Write the formula for mid ordinate rule and Prismoidal formula Rule.

Mid sectional area method:

$Q = (Bd_m + sd_m^2) \times L$

Where, B – Formation width

S – Side slopes

d_m – Mean depth

L – Length of the section

Prismoidal formula rule:

$Q = L/6(A_1 + A_2 + 4A_m)$

$A1 = Bd_1 + sd_1^2$

$A2 = Bd_2 + Sd_2^2$

$A_m = Bd_m + sd_m^2$

$d_m = (d_1 + d_2)/2$

16. What are the Different types of traps used as sanitary fittings? (Nov./ Dec. 2011)

The traps are used for preventing foul gas from sewers to back flow in the house. This is done by providing water seal in the trap. The depth of water seal varies from 45 mm 75 mm. The traps can be classified in two ways:-

A) As per their shape	B) As per their use
1) P – trap	1) Floor Traps
2) Q – trap	2) Gully Traps
3) S - Trap	3) Intercepting Traps

17. Write down the expression for calculation of volume by Prismoidal formula. (Nov./ Dec. 2011)

A more accurate formula would the prismoidal formula, which takes out most of the error accrued by the average end area method.

$$V_p = \frac{L(A_1 + 4A_m + A_2)}{6}$$

Where: A_1= Cross section area of first side A_2= Cross section area of second side L= Length between the two areas V_p= Volume given by the prismoidal formula A_m= Area of a plane surface midway between the two cross sections.

18. What is the importance of soak pit? (May/June 2013, Nov./Dec. 2014)

A soak pit, also known as a soak away or leach pit is a covered, porous-walled chamber that allows water to slowly soak into the ground.

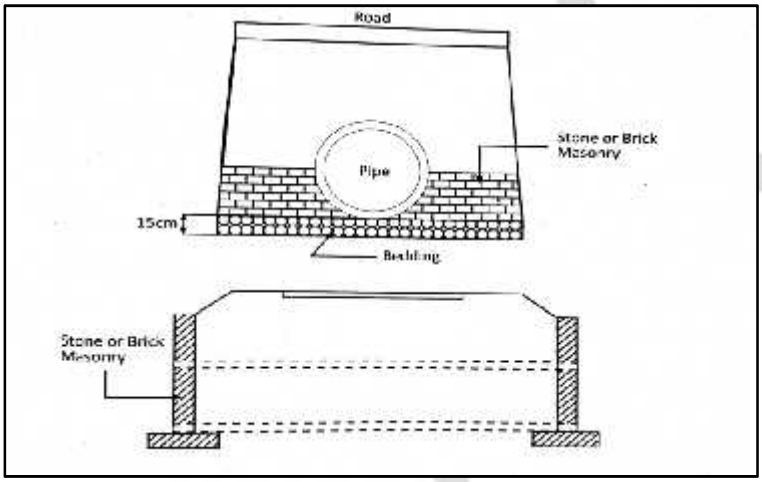
The water in the septic tank is not pure; it is called grey water because it still contains organic materials that need to be filtered out. A Soak Pit is a covered, porous-walled chamber that allows water to slowly soak into the ground. Pre-settled effluent from septic tank is discharged to the underground chamber from where it infiltrates into the surrounding soil.

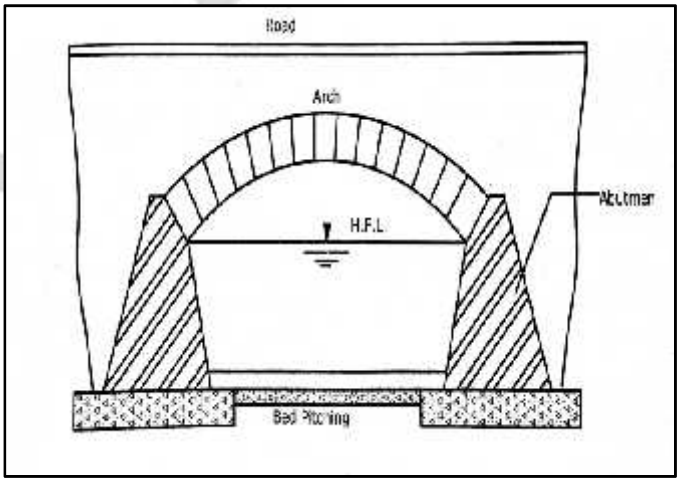
19. List the various sanitary fittings. (Nov./Dec.2012)

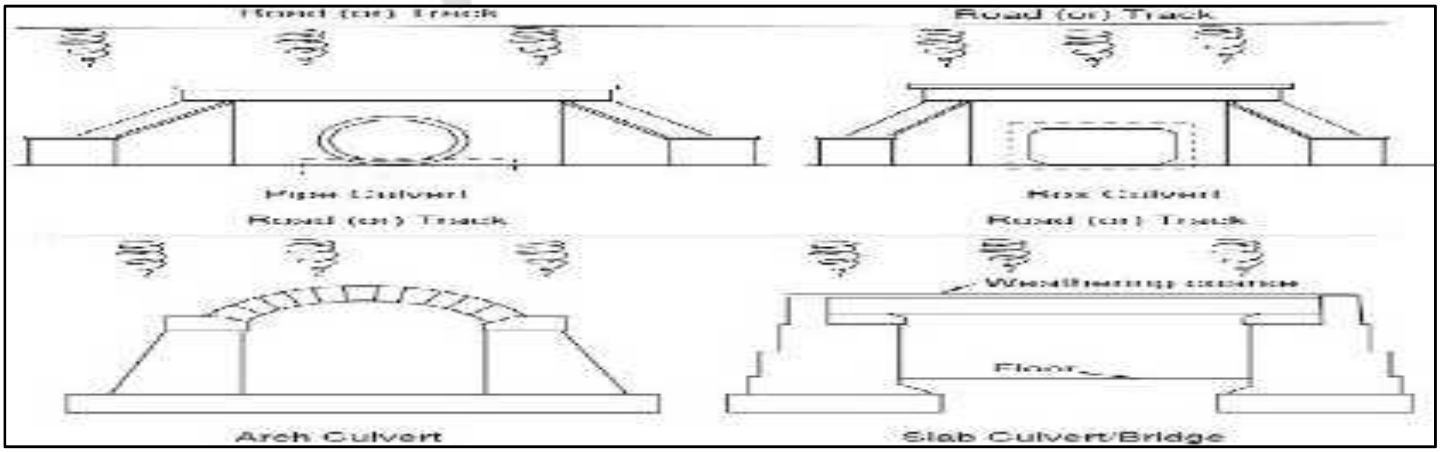
The sanitary fittings comprise of :

- Traps
- Water closets
- Flushing cistern
- Wash basin
- Sink
- Urinals

20. Draw different parts of culverts. (Nov./Dec.2012)







21. List the main components of sewer line. (Apr./May 2015)

The main components of sewer line are:

- Man hole
- Gaskets
- Drop connection
- Clean out
- Service branches.

22. Differentiate tube wells and open wells. (Nov./Dec.2014)

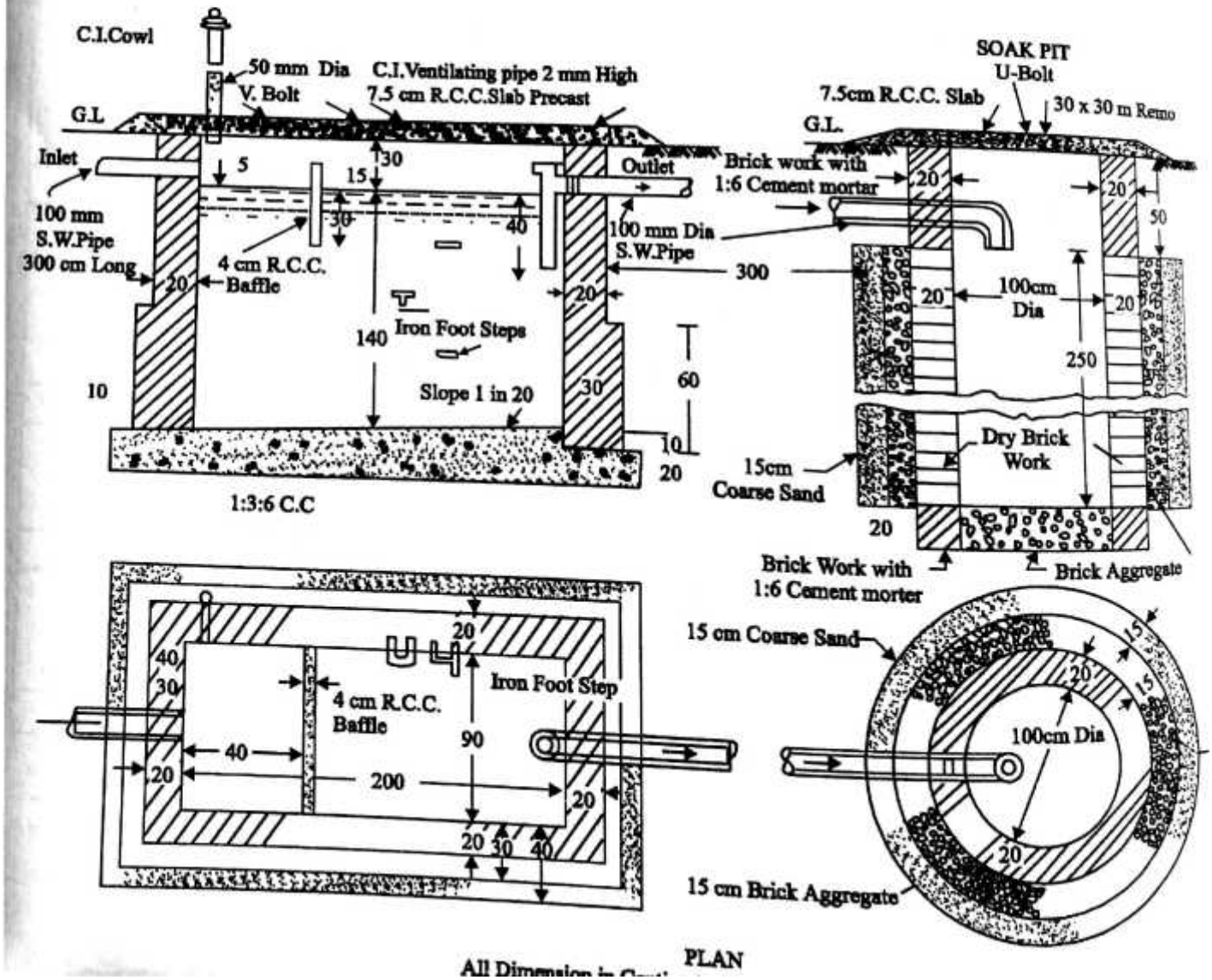
Tube wells	Open wells
A well consisting of an iron pipe with a solid steel point and lateral perforations near the end, which is driven into the earth until a water-bearing stratum is reached, when a suction pump is applied to the upper end.	To tap the groundwater storage vertical hole of bigger diameter (2 to 10 metres generally) is some time dug or sunk in the rock or soil mass. The hole is sunk till it penetrates saturated underground material. The hole is further taken down to reach a depth quite below ground water-table. The depth of well or hole below the ground water-table should be such that even during a dry year there will be sufficient depth 3 to 4 metres) of water to cope up with the requirements then. The water surface in the well and free surface of water in the soil are at atmospheric pressure.

23. Define: Aqueduct. (Nov./Dec.2014)

A conduit for water; especially: one for carrying a large quantity of flowing water. A structure for conveying a canal over a river or hollow. A canal or passage in a part or organ

PART – B

Prepare a detailed estimate of a septic tank with soak pit for 25 users from the given drawings. Septic tank shall be of first class brickwork in 1:4 cement mortar the foundation and floor shall be of 1:3:6 cement concrete. Inside of septic tank shall be finished with 12 mm cement plaster and floor shall be finished with 20 mm cement plaster with 1:3 mortar mixed with standard water proofing compound. Upper and lower portion of soak pit shall be of second class brickwork in 1:6 cement mortar and middle portion shall be of dry brickwork. Roof covering slabs and baffle shall be of precast RCC. The length of the connecting pipe from latrine seat may be taken as 3 metres.

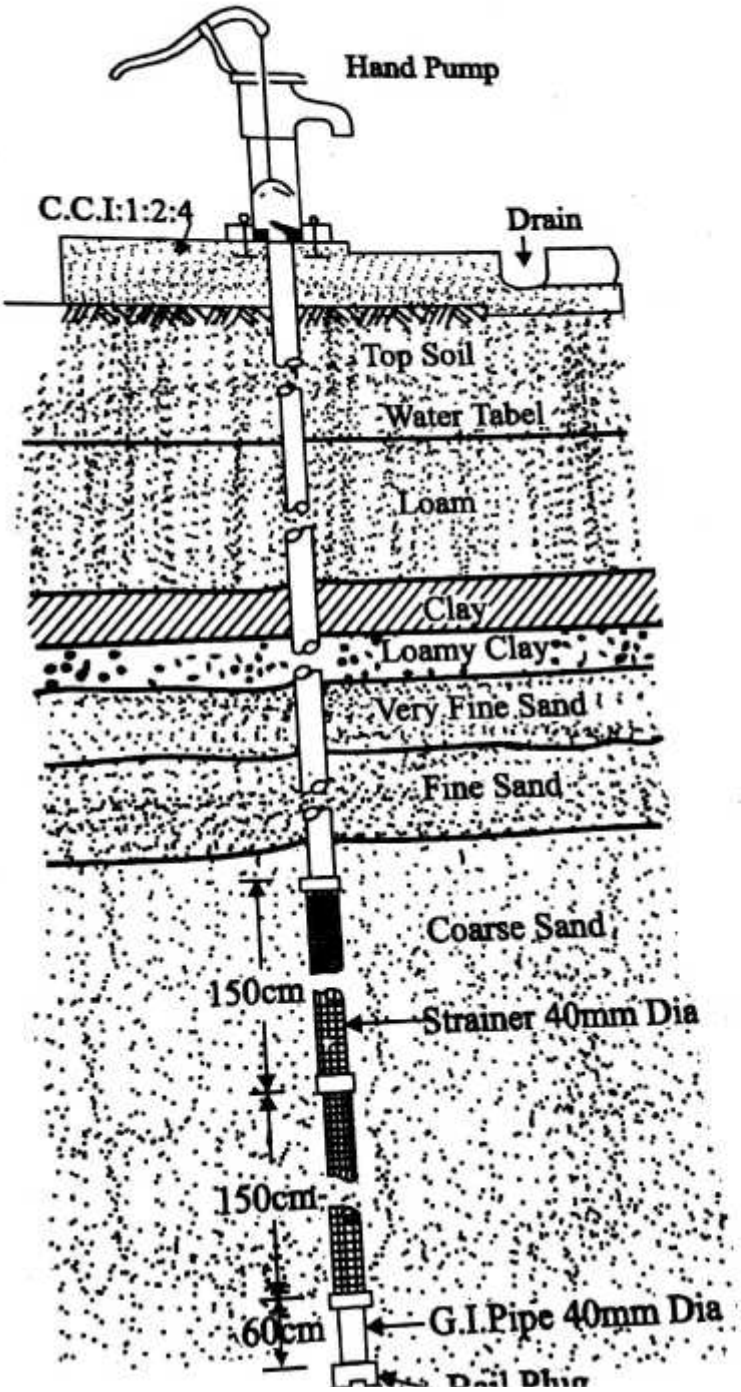


Solution:

S.No.	Details of work	No	Measurements			Quantities
			Length (m)	Breadth (m)	Height or Depth (m)	
1.	Earthwork in Excavation					
	Septic tank	1	2.80	1.70	1.95	9.28
	Soak pit up to depth 3.00 m	1	$\frac{\pi \times 2^2}{4}$	×	3.00	9.42
	Height = 140 + 30 + 20 + 5 = 1.95 m					
	Soak pit lower portion	1	$\frac{\pi \times 1.4^2}{4}$	×	0.20	0.30
	(Below dry brick work)					
					Total	= 19.00 cub.m
2.	Cement concrete 1:3:6					
	Floor and foundation	1	2.80	1.70	0.20	0.95
	Sloping floor	1	2.00	0.90	0.05	0.09
	Average thickness				Total	1.04 cub.m
	$\frac{10+0}{2} = 5$ cm					
3.	First class brick work in 1:4 cement mortar in septic tank					
	Long walls					
	1st step	2	2.60	0.30	0.60	0.94
	2nd step	2	2.40	0.20	1.15	1.10
	Short walls					
	1st step	2	0.90	0.30	0.60	0.32
	2nd step	2	0.90	0.20	1.15	0.42
					Total	2.78 cub.m
	2nd class brickwork in 1:6 cement mortar in soak pit.					
	Upper portion	1	(π × 1.20)	× 0.20	0.50	0.38
	Lower portion	1	(π × 1.20)	× 0.20	0.20	0.15
	(L = mean circumference)				Total	0.53 cub.m
	2nd class dry brickwork in soak pit.	1	π × 1.20	× 0.20	2.50	1.88 cub.m
	Precast RC work finished smooth including steel reinforcement complete laid in position					
	Roof cover slab of	1	2.40	1.30	0.075	0.234

S.No.	Details of work	No	Measurements			Quantities
			Length (m)	Breadth (m)	Height or Depth (m)	
	Septic tank 7.5 cm thickness Roof cover slab of	1	$\frac{\pi \times 1.40^2}{4}$	×	0.075	0.115
	Soak pit Baffle wall in	1	1.00	0.04	0.45	0.018
	Septic tank				Total	0.367 cub.m
7.	12 mm cement plaster 1:3 with standard water proofing compound in septic tank					
	Long walls	2	2.00	–	1.70	6.80
	Short walls	2	0.90	–	1.70	3.06
	(Innerface)				Total	9.86 sq.m
8.	20 mm cement plaster 1:3 with standard water proofing compound in floor of septic tank	1	2.00	0.90	–	1.80 sq.m
9.	50 mm size brick aggregate					
	Outer side of soak pit	1	$\pi \times 1.55$	×0.15	2.50	1.84
	At bottom of soak	1	$\frac{\pi \times 1.01^2}{4}$	×	0.20	0.16
	L = mean circumference				Total	2.00 cub.m
10.	Coarse sand outer side of soak pit					
	L = mean circumference	1	$(\pi \times 1.85)$	×0.15	2.50	2.18 cub.m
11.	Iron foot steps of 16 mm dia bar	4	–	–	–	4 no's
12.	100 mm dia s.w. pipe laying and jointing with 1:3 cement mortar complete					
	Inlet end from latrine to septic tank	1	3.00	–	–	3.00
	Outer end from Septic tank to soak pit	1	3.30	–	–	3.30
					Total	6.30 m
13.	S.W. Tee 100 mm dia with one leg of 40 cm	1	–	–	–	1 Number
14.	S.W. Bend 100 mm dia	1	–	–	–	1 Number
15.	50 mm dia C.I Ventilating pipe	1	2.00	–	–	2.00 m
16.	50 mm dia C.I (0W) at top of ventilating pipe.	1	–	–	–	1 Number

Prepare an estimate of a 40 mm dia. tube well 40 metre deep from the given drawings. The length of the strainer is 3 metre. Assume suitable rates.



Estimate of 40 mm Diameter Tube well with Ordinary Hand Pump

S.No.	Details of particulars	Quantity	Rate Rs. P.	Amount Rs. P.
1.	40 mm dia. Galvanised Iron (GI) pipe including sockets (20 cm above GL)	37.20 m	8.5 per rm	316.10
2.	40 mm dia strainer 2 nos 1.50 m each	2 nos	42.00 each	84.00
3.	Hand pump ordinary (No 4 hand pump)	1 no	35.00 each	35.00
4.	Bail plug	1 no	5.50 each	2.50
5.	Sockets 4 Nos extra	4 No	2.00 each	8.00
6.	Transport of materials to site of work	L.S	10.00 L.S	10.00
7.	**Sinking**			
	Boring with 60 mm dia casing type including water arrangements lowering the 40 mm dia tube well pipe and strainer including jointing and with drawing casing pipe			
	1. 0 to 20 m	20.00 m	7.00 per rm	140.00
	Below 20 m to 30 m	10.00 m	11.00 per rm	110.00
	3. Below 30 m to 40 m	10.00 m	15.50 per rm	155.00
8.	Inserting coarse sand surrounding the strainer including supply of sand	1 no	11.00 each	11.00
9.	Fixing and erecting of hand pump in position including holding down bolts	1 no	5.50 each	5.50
10.	Cement concrete platform and foundation surface finished smooth	1 no	35.00 each	35.00
11.	Cement concrete drain 2 metre long finished smooth	2.00 m	6.50 per m	13.00
12.	pumping out water till clear water is obtained	1 no	11.0 each	11.00
			Total	939.10
	Add 5% for contingencies and work charged Establishment			46.95
			Grand total	986.05

Prepare a detailed estimate of a road from the given data in Fig. 2.24 m Length = 1609 m. Height of embankment = 0.60 metre; side slope = 1 in 4; Formation width = 11.58 Metalled width = 6.7 cm; soling coat = Bricks 10 cm thick; wearing coat = stone metal 10 cm thick. Surface to be finished off with 2 coats of bitumen using 264 kg of bitumen and 1.98 m^3 of bajri per % square metres of road area.

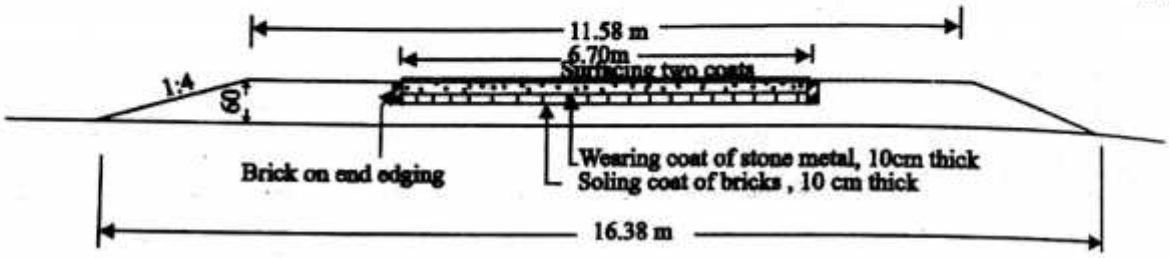


Fig. 2.24 Cross section of road

Solution:

Formation

1. Earthwork in embankment including dressing

$$1 \times 1609 \times \frac{11.58 + 16.38}{2} \times 0.60 = 13496$$

Total cub m = 13496

2. Compensation of earth to be brought from private land same as per item (1) above

Total cub m = 13496

Soling coat

3. Preparation of bed for soling coat including rolling the bed with a roller $1 \times 1609 = 1609$ — Total = 1609 m

4. Collection of bricks for soling coat soling $1 \times 1609 \times 6.70 \times 0.10 = 1078$

   Brick on end edging — Total cub m = 1142.36

   $2 \times 1609 \times 0.20 \times 0.10 = \frac{64.36}{1142.36}$

5. Consolidation of bricks for soling coat same as per item (4) = 1142.36 — Total cub m = 1142.36

Wearing Coat

6. Collection of stone metal 10 cm thick (4 cm to 5 cm gauge) from an approved quarry $1 \times 1609 \times 6.70 \times 0.10 = 1078$ — Total cub m = 1078

7. Consolidation of wearing coat with road roller same as per item (6) = 1078 — Total cub m = 1078

8. Water allowance where water is not available — Total km = 1.6

Surface Treatment

9. Collection of bajri 6 mm to 20 mm gauge @ 1.98 m^3 per% square metre of road area — Total cub.m = 214

   Total tonnes = 28.50

10. Collection of bitumen $\frac{80}{100}$ penetration

    $1 \times 1609 \times 6.70 = 10780$ square metre

    @ 264 kg per% square metre = 28.5 k

    Total sq m = 10780

11. Labour for surface painting $1 \times 1609 \times 6.70 = 10780$

Road Structure

12. Bridges and culverts — = Job

13. Kilometer stones of RCC — = 1 No

14. Metre stones of RCC — = 9 Nos

15. Boundary pillars of RCC — = 18 Nos

16. Direction posts including fixing in position = Job

Arboriculture

17. Plantation of trees and nurseries along road 1.6 km = Job

18. Land acquisition including cost of compulsory acquisition and crops (1 hectare = 100000 sq.m)

$1 \times 1609 \times 30.0 = 48270$ sq.m

or $\frac{48270}{10000} = 4.827$ hectares

Miscellaneous

19. Making and maintaining of service road 1.6 km Total = 1.6 km

20. Jungle clearance = Job

21. Turfling and watering for 30 day along side slopes = Job

22. Surveying of Road alignment 1.6 Total km = 1.6

PROBLEM

Prepare an estimate for one kilometer length of cement concrete trackway with 60 cm wide tracks 1.50 m centre to centre over 15 cm rammed kankar. The cross-section of the track is as given in Fig. 2.25

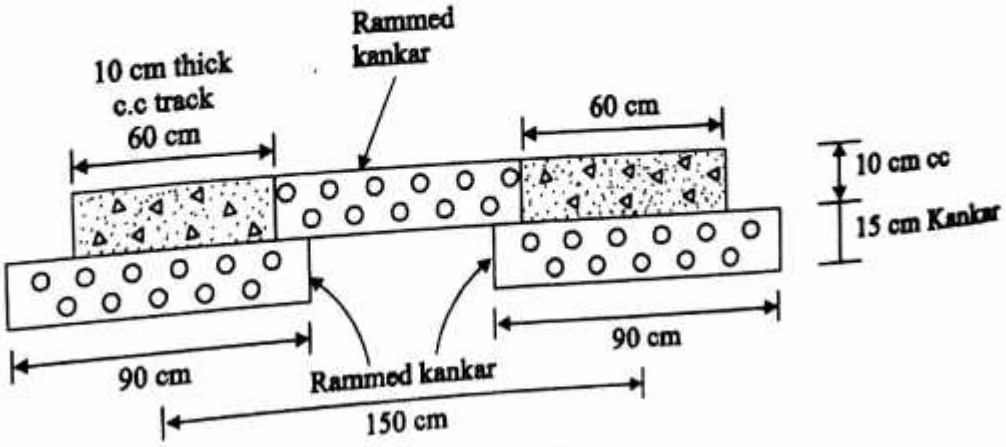


Fig. 2.25

Detail of Measurement and Calculation of Quantities

S.No.	Details of work	No	Length m	Breadth m	Thickness m	Quantity m^3
1.	Cement concrete 1:2:4 in tracks including laying	2	1000 m	0.60 m	0.10 m	120 cum
2.	Kankar metal loose (with 1/2 allowance for compaction) under cc tracks	2	1000 m	0.90 m	0.20 m	360 cum
	In between cc tracks	1	1000 m	0.90 m	0.133 m	120 cum
					Total	480 cu.m
3.	Laying and consolidation of Kankar metal	–	–	–	same as above 480 cu.m	

ABSTRACT OF COST

1. Cement concrete 1:2:4 in track including laying – 120 cu m @ Rs.225.00 per cum = Rs. 27000.00
2. Kankar metal (supply) – 480 cum @ Rs. 40.00 per cum = Rs. 19200.00
3. Laying and consolidation of Kankar metal = 480 cum @ Rs. 650 per cum = Rs. 3120.00

Total = Rs. 49320.00

Add 5% for contingencies and work charged Establishment = Rs. 2466.00

Grand total = Rs. 51786.00 per km