DEPARTMENT OF CIVIL ENGINEERING

LABORATORY MANUAL
FOR

**ESTIMATION PRACTICE-II,
5TH SEMESTER**

C. V. RAMAN POLYTECHNIC

(Affiliated to SCTE &VT and Approved by Govt. Odisha)
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Vision:
Civil engineering department is committed to impart knowledge and excellence in civil Engineering to the students and to produce civil engineers of high calibre, technical skills and ethical values to meet current and future challenges.

Mission:
M1: To produce civil engineers with quality technical skills aligned with industry needs to solve real life problems of the society.

M2: To create teaching learning environment for students to acquire knowledge as per need and to motivate towards entrepreneurship and to pursue higher studies.

M3: To serve construction industries, civil engineering profession and the community at large through dissemination of knowledge and technical services to improve quality of life and enhance employability.
M4: To inculcate self-learning attitude and professionalism.

Program Educational Objectives (PEOs)

PEO1- To analyze in civil engineering profession or Higher education by acquiring thorough knowledge and concepts in fundamentals of engineering.

PEO2-To Apply knowledge and skills to real life problems and there by rendering safe and economical structures against natural calamities and also environmentally sustainable and useful to society.

PEO3- To understand entrepreneurial endeavors and to develop effective communication skill and passion for learning.
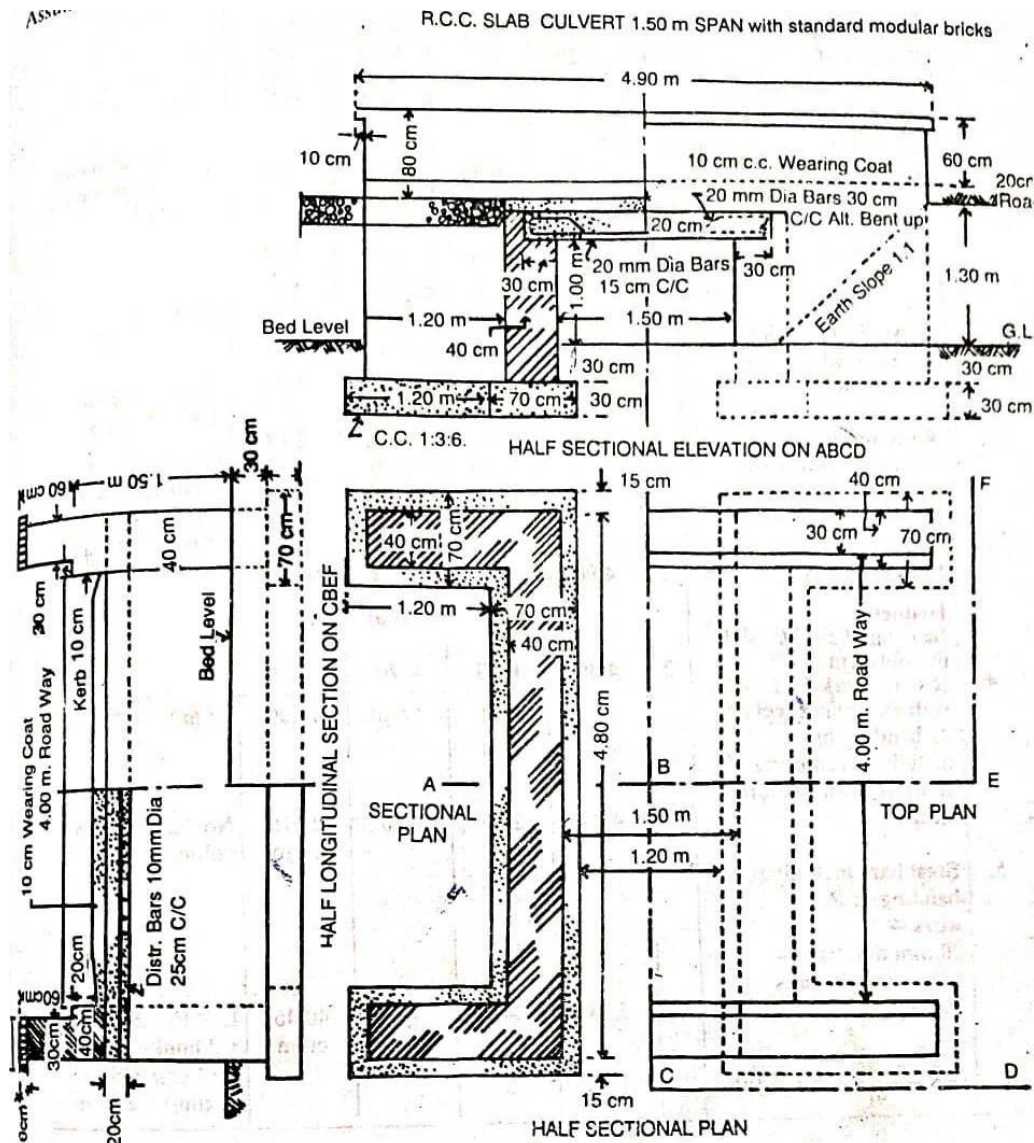
Program Specific outcomes (PSO)

PSO1- Able to meet the needs of public in the design and execution of quality construction work considering health, safety, cultural and environmental factors.

PSO2- Analyze and design regular and complex structures applying knowledge of building analysis software package.
PSO3- Able to work effectively as an individual or in a team having acquired leadership skills and manage projects in multidisciplinary environment.

Experiment No. – 1

R.C.C. SLAB CULVERT 1.50 m SPAN with standard modular bricks

HALF SECTIONAL ELEVATION ON ABCD

HALF LONGITUDINAL SECTION ON CBEF

SECTIONAL PLAN

TOP PLAN

HALF SECTIONAL PLAN

Aim of the Experiment-

Estimate of a RCC slab culvert with right angled wing walls with bar bending schedule.

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading – Details of measurements and calculation of quantities.

2. Under the table, name the columns as Item No., Description of items, No., Length in m, Breadth in m, Height in m, Quantity, Remarks.

3. Estimate earthwork in excavation by computing length, breadth and height of abutments, wing walls, curtain walls, flooring, etc from the given drawing.

4. Then calculate Cement concrete quantity of the above components by changing heights only.

5. Then calculate 1st class brick work of abutments, wing walls, parapets, coping excluding slab bearing. Put the values in respective columns and put necessary remarks of measurements.

6. Estimate RCC work of slab and put the values in respective columns.

7. Calculate Steel bar quantities in separate BBS. In BBS mention the No.s, Lengths of main and distribution bars providing additional lengths for hooks, 90 degree bends, bent up bars, etc as per IS code.

8. Put the values of no. and length of main and distribution bars in the respective columns. Compute the quantity of steel work by multiplying the total length with unit weight of individual dia bars.

9. Then compute wearing coat.

10. Then compute cement pointing work of face wall including extra 10cm depth below GL, Inner sides of parapets, Ends of parapets, copings. Then exclude rectangular openings and triangular earth slope portion.

11. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous table and put current rates as per PWD schedule of rates. Compute total amount

12. Add 3% contingencies and 2% Work charged establishment with the total amount.

Tabulation-

Table-1- Details of measurements and calculation of quantities.

Item No.	Description of items	No.	Length in m	Breadth in m	Height in m	Quantity	Remarks

Table-2- Abstract of estimated cost

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a slab culvert.

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END VIEW SHOWING DROP WALL AT UP STREAM SIDE

END VIEW SHOWING DROP WALL AT DOWN STREAM SIDE

SECTION ON 'AA'

LONGITUDINAL SECTION SHOWING DETAILS OF DROP WALLS
ALL DIMENSIONS ARE IN CENTIMETRE

Aim of the Experiment-

Estimate of a RCC Hume pipe culvert.

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading – Details of measurements and calculation of quantities.

2. Under the table, name the columns as Item No., Description of items, No., Length in m, Breadth in m, Height in m, Quantity, Remarks.

3. Estimate earthwork in excavation, filling, soling by computing length, breadth and height of components of hume pipe from the given drawing.

4. Then calculate Cement concrete quantity of the above components by changing heights only. Deduct champhering portion of hume pipe.

5. Then calculate Hume pipe length and shuttering.

6. Then calculate Excavation both U/s and D/s of drop walls Put the values in respective columns and put necessary remarks of measurements.

7. Calculate earth filing, brick flat soling in both U/s and D/s sides.

8. Compute 1st class brick work in U/s and D/s side of drop wall deducting pipe opening and conc. Under pipes.

9. Then compute cement plaster of both faces and also shuttering.

10. Then compute string course in rm.

11. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous table and put current rates as per PWD schedule of rates. Compute total amount

12. Add 3% contingencies and 2% Work charged establishment with the total amount.

Tabulation-

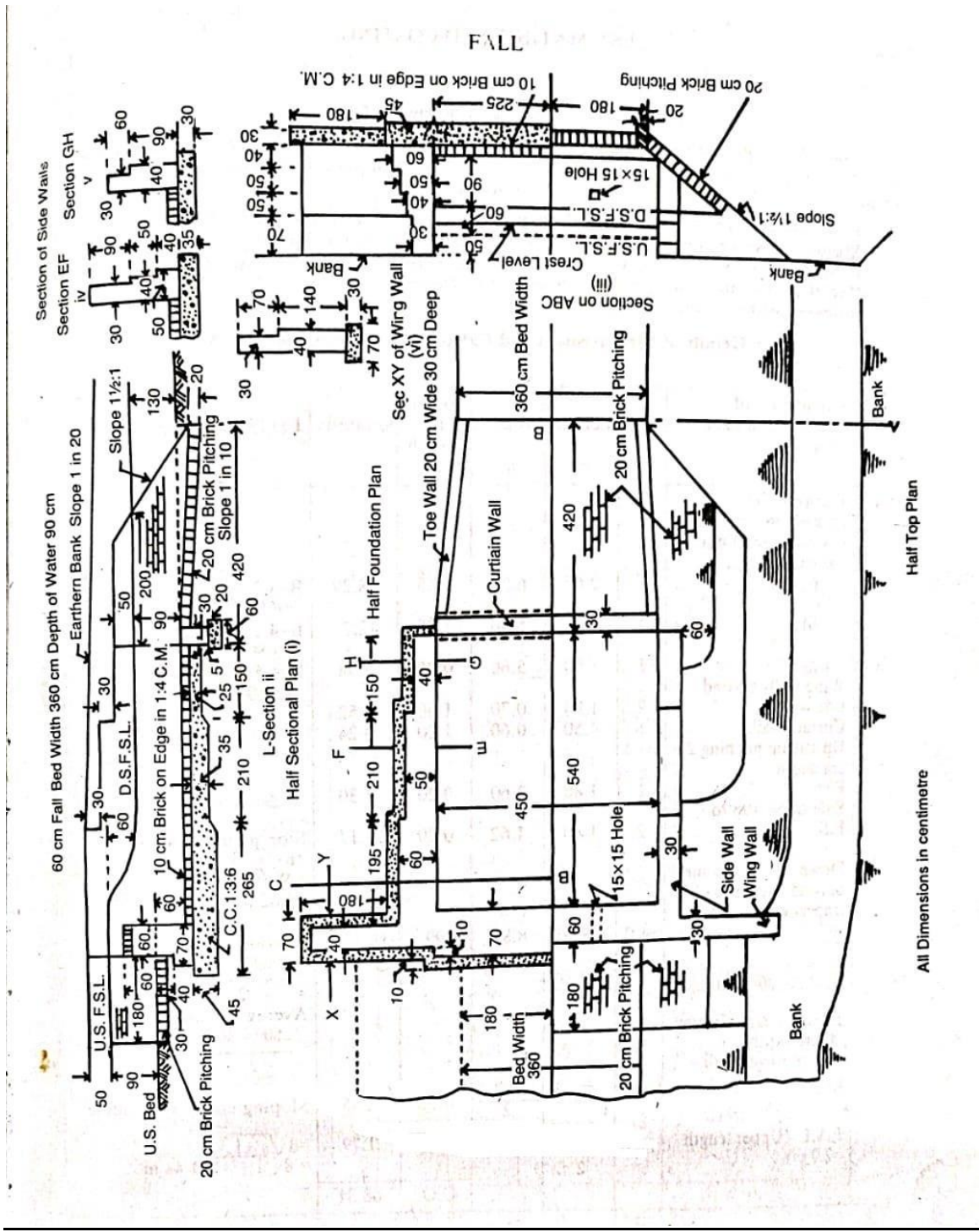Table-1- Details of measurements and calculation of quantities.

Item No.	Description of items	No.	Length in m	Breadth in m	Height in m	Quantity	Remarks

Table-2- Abstract of estimated cost

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a hume pipe culvert.

FALL

All Dimensions in centimetre

Aim of the Experiment-

Detailed estimate of simple type of vertical fall to given specification

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading – Details of measurements and calculation of quantities.

2. Under the table, name the columns as Item No., Description of items, No., Length in m, Breadth in m, Height in m, Quantity, Remarks.

3. Estimate earthwork in excavation of crest wall, side wal and floor taken together, wing wall, curtain wall, upstream pitching, side slope, d/s channel and pitching. Deduct set back of wing wall, by computing length, breadth and height of components from the given drawing.

4. Then calculate Cement concrete quantity of the above components by changing heights only. Deduct Deduct set back of wing wall.

5. Then calculate 1^{st}class brick work for crest wall- 1 stand 2 ndstep, side walls step wise and wing wall beyond side wall, curtain wall and toe wall.

6. Then calculate brick on edge flooring including pointing.

7. Calculate cement pointing for all exposed surface of crest wall, side wall, vertical faces of stepping and end, curtain wall wing wall, toe wall, etc.

8. Compute brick pitching for u/s and d/s bed and side slopes, side curved portions.

9. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous table and put current rates as per PWD schedule of rates. Compute total amount

10. Add 3% contingencies and 2% Work charged establishment with the total amount.

Tabulation-

Table-1- Details of measurements and calculation of quantities.

Item No.	Description of items	No.	Length in m	Breadth in m	Height in m	Quantity	Remarks

Table-2- Abstract of estimated cost

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a vertical fall.

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DRAINAGE SYPHON

Cross Sections

G   L

H.F.L.   40
80   1:1
|←— 180 —→|
10 cm Dry Brick Pitching
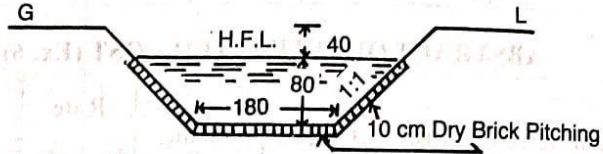
Cross Section EF
Showing Nala

G   L

H.F.L.
80   1:1
120   30
|←— 180 —→|
30
10
10 cm Brick in
1:3 Cement Mortar
|←——— 240 ———→|
|←———— 270 ————→|
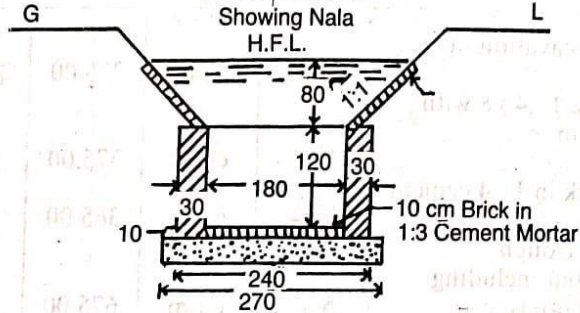
Cross Section CD Showing Drop Pit and Nala

10
30
80
G   L
100

15cm R.C.C.Slab
30
30   100
|← 150 →|
10 cm Brick in
60   1:3 Cement Mortar
30
|←——— 240 ———→|
|←——— 460 ———→|
|←———— 490 ————→|
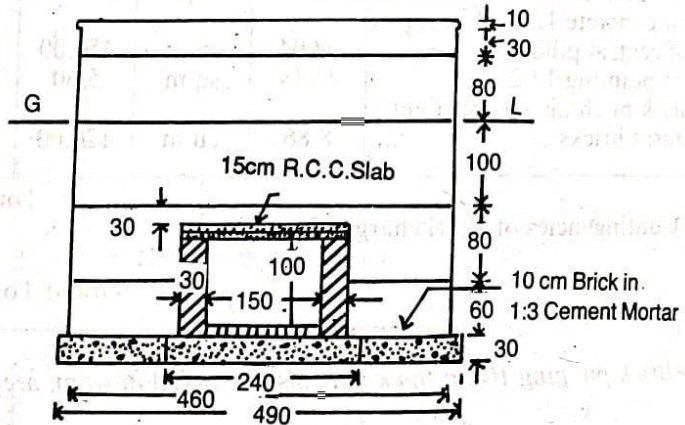
Cross Section AB
Showing Duct and Wing Walls

DRAINAGE SYPHON ACROSS A MINOR

Longitudinal Section

Sectional Plan
Showing all Footings
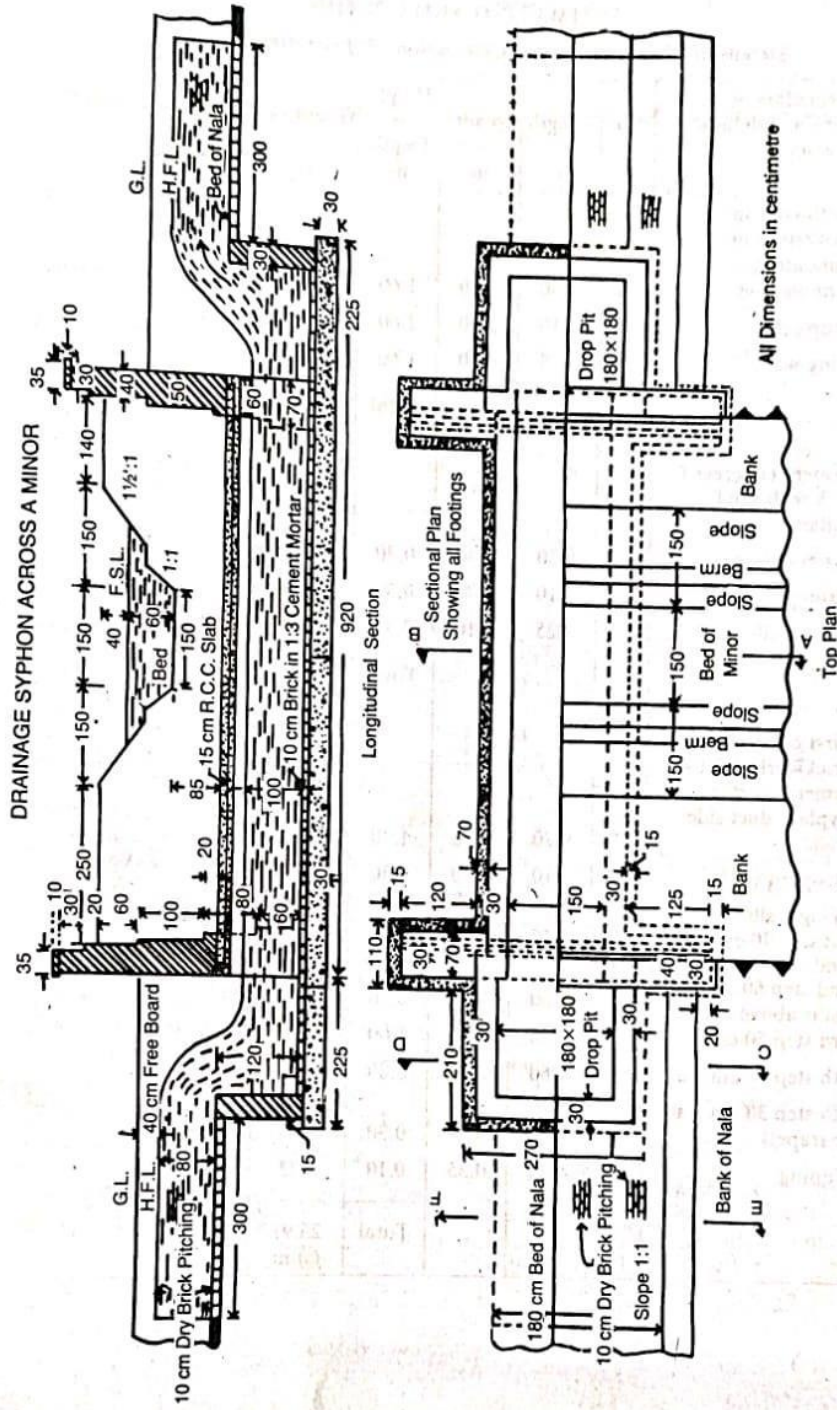
Top Plan

All Dimensions in centimetre

Fig. 9.9

Aim of the Experiment-

Detailed estimate of drainage siphon to given specification.

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading – Details of measurements and calculation of quantities.
2. Under the table, name the columns as Item No., Description of items, No., Length in m, Breadth in m, Height in m, Quantity, Remarks.
3. Estimate earthwork in excavation in foundation for siphon duct, drop pit and wing walls by computing length, breadth and height of components from the given drawing.
4. Then calculate Cement concrete quantity of the above components by changing heights only.
5. Then calculate 1st class brick work for syphon duct wall, drop pit wall, wing wall (1 st to 5th steps) and coping.
6. Calculate RCC slab quantity.
7. Then calculate brick floor in siphon duct and drop pit.
8. Calculate cement struck pointing for all exposed surface of siphon duct, drop pits, parapet wall and wing wall.
9. Compute brick pitching for bed and side slope of nala.
10. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous table and put current rates as per PWD schedule of rates. Compute total amount
11. Add 3% contingencies and 2% Work charged establishment with the total amount.

Tabulation-

Table-1- Details of measurements and calculation of quantities.

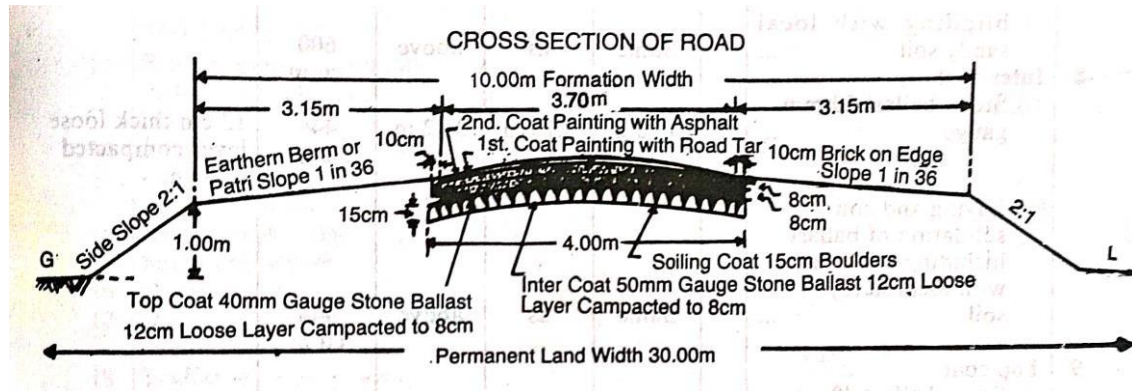| Item No.	Description of items	No.	Length in m	Breadth in m	Height in m	Quantity	Remarks

Table-2- Abstract of estimated cost

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a drainage siphon.

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CROSS SECTION OF ROAD

Aim of the Experiment-

Detailed estimate of a water bound macadam road.

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading – Details of measurements and calculation of quantities.
2. Under the table, name the columns as Item No., Description of items, No., Length in m, Breadth in m, Height in m, Quantity, Remarks.
3. Estimate earthwork in embankment by computing length, breadth and height of components from the given drawing.
4. Then calculate quantity of grass work on the side slope.
5. Compute preparation of subgrade in sqm.
6. Find soling coat quantity.
7. Find inter coat and top coat quantity for 1 km length. Take loose thickness as 12 cm.

8. Find painting first coat with 20mm gauge @ 1.35 cum per 100 sqm and binding road tar @ 220 kg per 100sqm. Also include laying quantity.

9. Find painting second coat with 12mm gauge @ .75 cum per 100 sqm and binding road tar @ 120 kg per 100sqm. Also include laying quantity.

10. Then compute brick edging on both sides in km unit.

11. Take any other miscellaneous items like road signs, km stones, arboriculture, etc.

12. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous table and put current rates as per PWD schedule of rates. Compute total amount

13. Add 3% contingencies and 2% Work charged establishment with the total amount.

Tabulation-

Table-1- Details of measurements and calculation of quantities.

Item No.	Description of items	No.	Length in m	Breadth in m	Height in m	Quantity	Remarks

Table-2- Abstract of estimated cost

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a water bound macadam road.

Estimate the cost of earthwork for a portion of road for 400 metre length from the following data :—

Formation width of the road is 10 metre. Side slopes are 2 : 1 in banking 1½ : 1 in cutting.

Station	Distance in metre	R.L. of Ground	R.L. of formation
25	1000	51.00	52.00
26	1040	50.90		
27	1080	50.50		
28	1120	50.80		
29	1160	50.60	Downward gradient
30	1200	50.70	of 1 in 200
31	1240	51.20		
32	1280	51.40		
33	1320	51.30		
34	1360	51.00		
35	1400	50.60		

Longitudinal section of the road and type cross-section are as given in Fig.

Aim of the Experiment-

Detailed estimate of a flexible pavement in cutting / filling.

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading –Calculation of quantities.
2. Under the table, name the columns as station, distance, height or depth (Diff. of G.L and F.L), Mean height or depth(d), central area (Bd), Area of sides (sd ^{2}), total sectional area (Bd+sd^2), Distance in between stations (L), Quantity in benking and cutting.
3. Write the stations and chainages. Find difference between GL and Fl and write in respective column.
4. Find mean height. Multiply ht. with breadth of road. Find sd^2.

5. Add Bd and sd²and write the value in respective column. Write the distance L.

6. Write the mid sectional area formula formula and calculate volume in banking or cutting. Find the ht. of benking or cutting by similar triangle principle when the FL passes from filling to cutting or vice versa.

7. –ve sign indicates cutting and +ve sign indicates filling for the height.

8. Draw the L- section showing formation and ground level with gradients.

9. Show the chainages in metres in next row.

10. Also show the cross sections of filling and cutting in separate diagram.

11. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous table and put current rates as per PWD schedule of rates. Compute total amount

12. Add 3% contingencies and 2% Work charged establishment with the total amount.
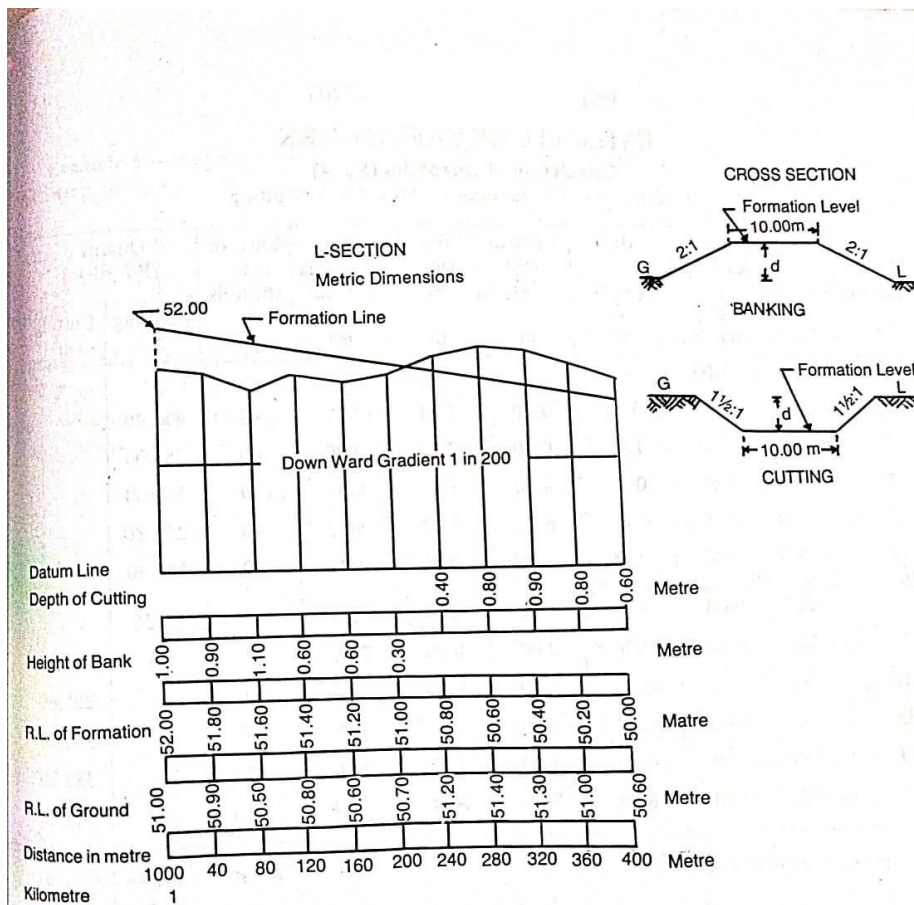
Tabulation-

Table-1

ESTIMATE OF EARTHWORK
Calculation of Quantities (Ex. 4)
B=10 m,   s=2 for banking,   and s=1½ for cutting

| Station	Distance Km m	Height or Depth Diff. of G.L. and F.L.	Mean ht.or Depth d m	Central area Bd m	Area of sides sd² m²	Total sec. area Bd+sd² m²	Dist. in betw. stations L m	Quantity (Bd+sd²)×L	
								Banking m³	Cutting m³

Table-2- Abstract of estimated cost

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a water flexible pavement in cutting / filling.

SEPTIC TANK FOR 50 USERS
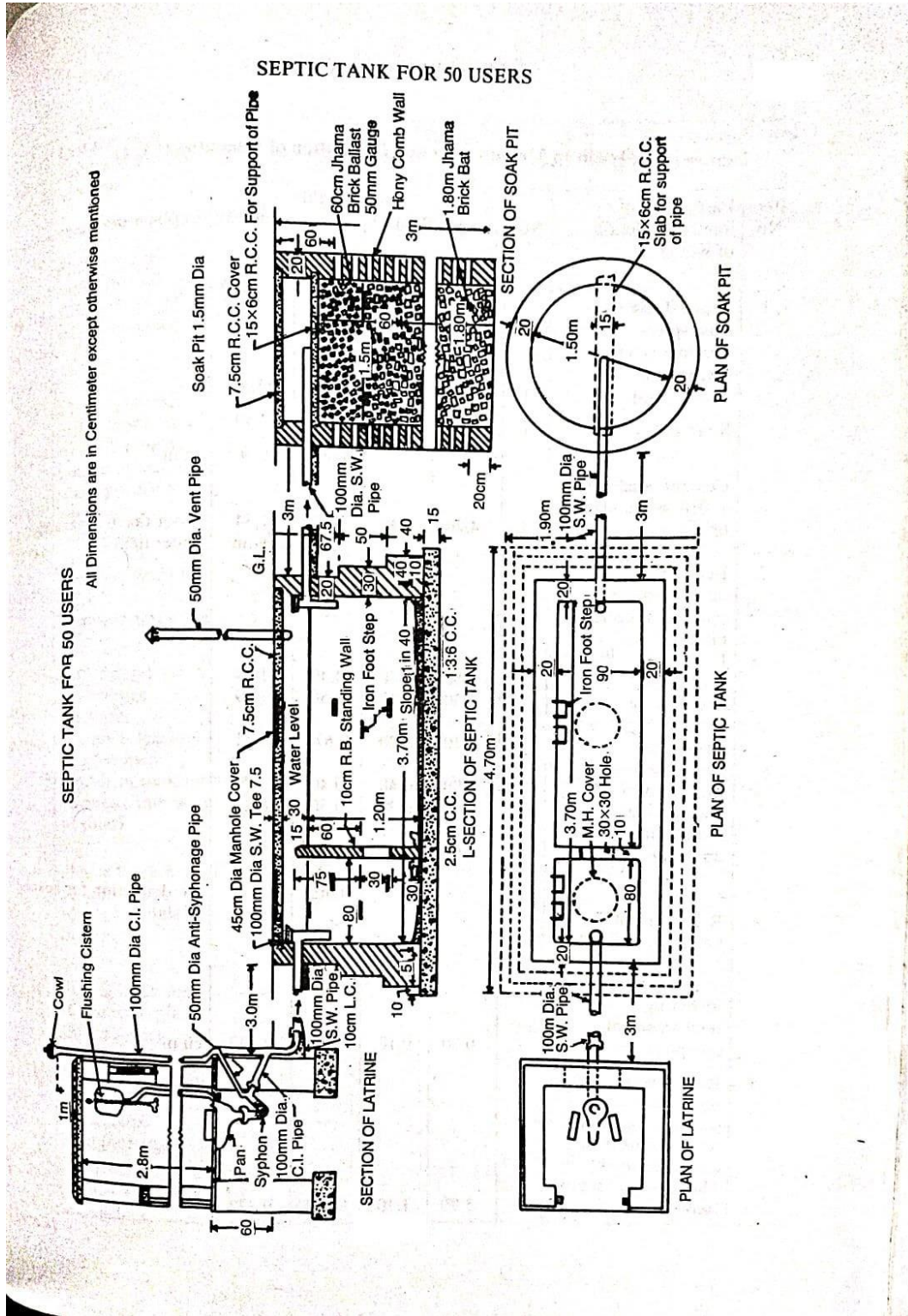
Aim of the Experiment-

Detailed estimate of septic tank and soak pit for 50 users

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading – Details of measurements and calculation of quantities.
2. Under the table, name the columns as Item No., Description of items, No., Length in m, Breadth in m, Height in m, Quantity, Remarks.
3. First of all estimate for Septic tank and soak pit.
4. Estimate earthwork in excavation for septic tank and soak pit. Then calculate c.c.
5. Then estimate first class brick work using long wall and short wall method for first , 2ndand 3 rdfooting as per drawing.
6. Then estimate R.B. work for partition wall.
7. Estimate RCC work for slab cover of septic tank, soak pit, RCC support of pipe in soak pit.
8. Estimate plastering work mixed with water proofing compound for inside and partition wall of septic tank.Calculate for CC floor.
9. Estimate IInd class brick work in Honey comb wall for soak pit.
10. Estimate for Jhama brick ballast in upper and lower layer.
11. Estimate for C.I. Manhole cover and iron steps in nos.
12. Estimate for sanitary works as follows-
    a. W.C. Indian pattern 1 set.
    b. S.W. pipe 100mm dia. Connecting latrine to septic tank and septic tank to soak pit. In m.
    c. S.W. Tee at inlet and outlet of septic tank in nos.

d. C.I. heavy soil pipe100mm dia connecting latrine seat, vent pipe with lead jointing in m.

e. C.I. heavy soil pipe 50mm dia connecting latrine with vent pipe and sepic tank vent pipe in m.

f. Cowl for latrine and septic tank taken in nos.

g. 250 litre G.I. Tank supplying and fixing in position in no.

h. G.I. pipe with fittings including digging, laying connected with water main in m.

i. Flushing cistern connection with G.I. tank.

j. Connecting tank with water main, connecting water tap from GI tank in m.

k. 15mm dia brass stop cock and bib cock in no.

l. Brass ferrule 6mm dia fixing in no.

13. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous table and put current rates as per PWD schedule of rates. Compute total amount

14. Add 3% contingencies and 2% Work charged establishment with the total amount.

Tabulation-

Table-1- Details of measurements and calculation of quantities.

Item No.	Description of items	No.	Length in m	Breadth in m	Height in m	Quantity	Remarks

Table-2- Abstract of estimated cost

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a septic tank.
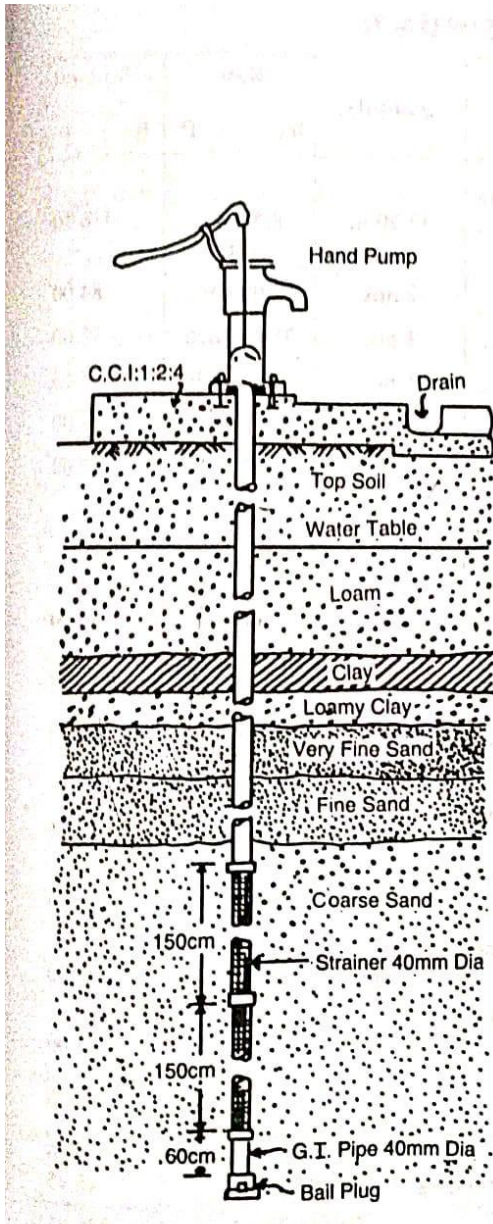
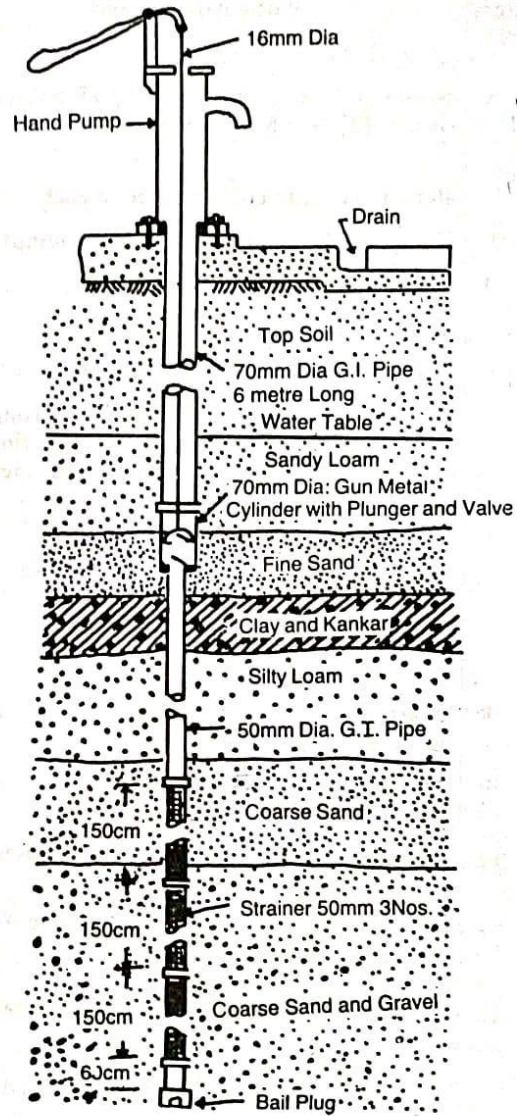Fig. 6-18   Fig. 6-19

ESTIMATE OF 40 MM DIA. TUBE WELL WITH ORDINARY HAND PUMP

Aim of the Experiment-

Detailed estimate of a tube well.

Software required-

MS Excel Software

Procedure-

1. First of all prepare a table with heading – Bill of quantities and cost
2. Under the table, name the columns as Item No., Description of items, quantity, rate, amount.
3. 40mm dia galvanized Iron (G.I.) pipe including sockets above GL in m.
4. 40mm dia strainer 2nos 1.5m each in nos.
5. Hand pump no. 4 in ordinary in no.
6. 4 nos socket taken.
7. Transport of material to site of work in LS.
8. Sinking- Boring with 60mm dia casing with all arrangements for different depths.
9. Inserting coarse sand surrounding strainer in no.
10. Fixing and erecting hand pump in no.
11. CC platform and foundation with drain pipe in m.
12. Water pumping to get clear water.
13. Add 3% contingencies and 2% Work charged establishment with the total amount.
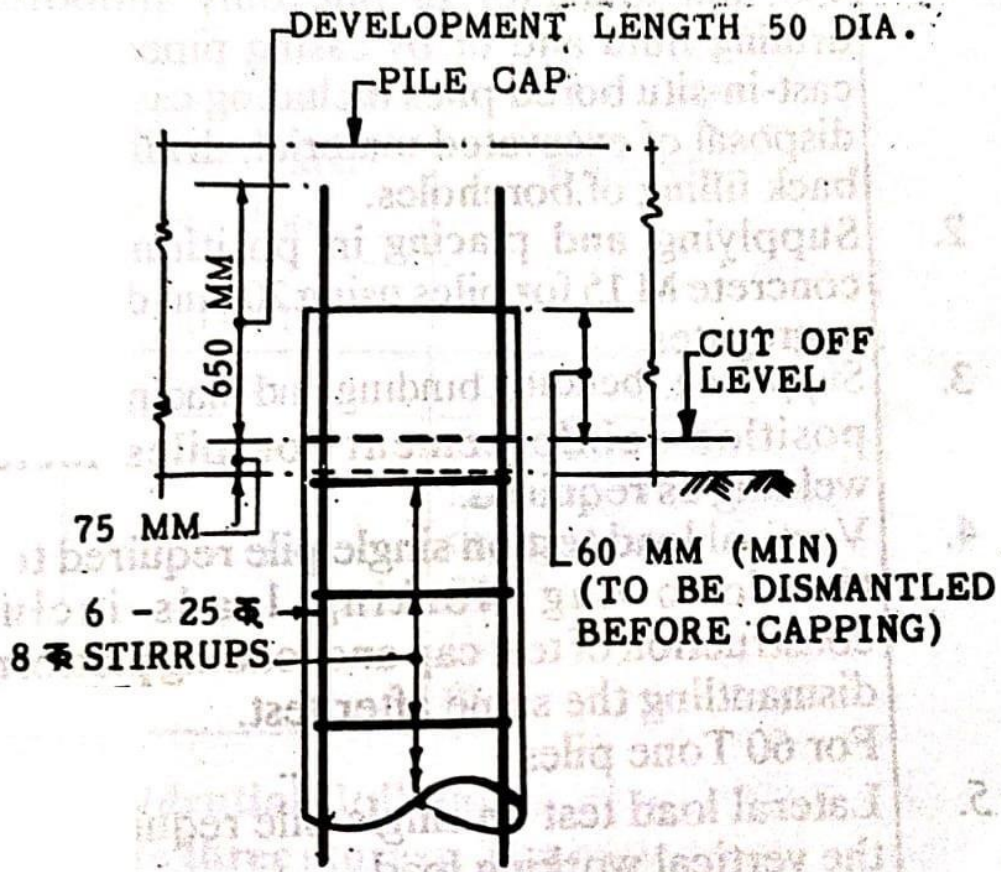
Tabulation-

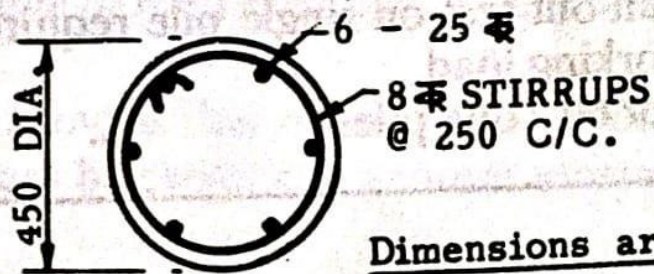| Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a Tube well.

DEVELOPMENT LENGTH 50 DIA.

PILE CAP

650 MM

CUT OFF LEVEL

75 MM

60 MM (MIN)
(TO BE DISMANTLED
BEFORE CAPPING)

6 - 25 無

8 無 STIRRUPS

DETAIL OF PILE

6 - 25 無

8 無 STIRRUPS
@ 250 C/C.

450 DIA

Dimensions are in MM

SECTION OF PILE

Aim of the Experiment-

Detailed estimate of a Pile.

Software required-

MS Excel Software

Procedure-

1. First of all find the total length of the pile.
2. Then find the quantity of concrete from height and dia of pile.
3. Then quantity of steel is found from the BBS prepared.
4. Consider suitable lap length and cover for pile.
5. Then make another table with name – Abstract of estimated cost with columns-
   Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the
   quantities from previous table and put current rates as per PWD schedule of rates.
   Compute total amount.
6. Add 5% for contingencies and 2½% as Work charged establishment with the total
   amount.

Tabulation-

1. Bar bending Schedule:

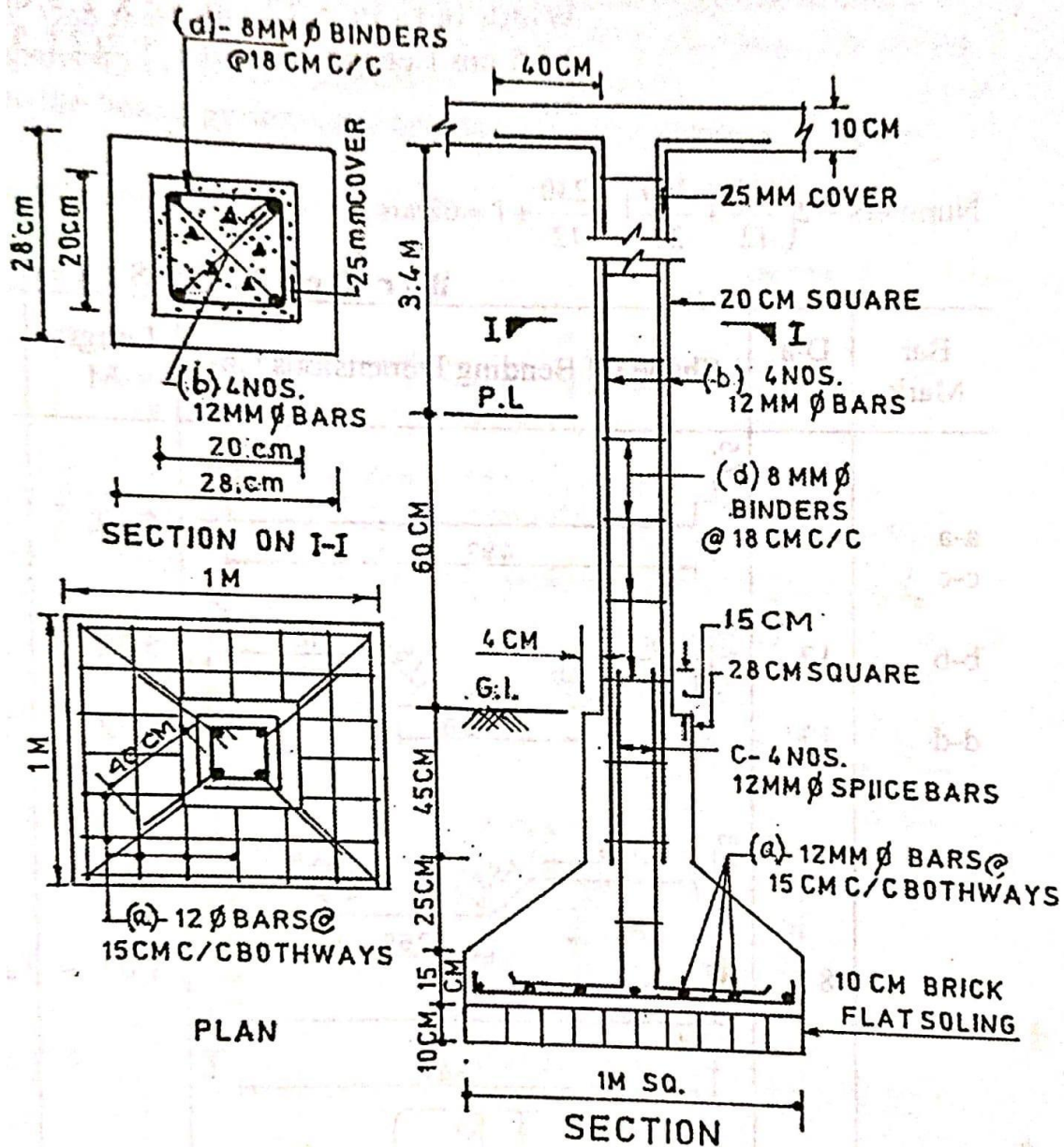| Dia. Of bar	Position of bar	Nos.	Length of each bar in m	Total length in m	Weight

2. Abstract of estimated cost:

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of a Pile.

SECTION ON I-I

PLAN

SECTION

Aim of the Experiment-

Detailed estimate of a isolated footing.

Software required-

MS Excel Software

Procedure-

1. First of all find the lengths of different dia. Bars and prepare BBS accordingly.
2. Then find the quantity of concrete of slab- bottom and trapezoidal portion separately.
3. Then find quantity of cc for pedestal and column.
4. Compute shuttering quantity as per drawing.
5. Then make another table with name – Abstract of estimated cost with columns- Item no., Description of item, Quantity, unit, Rate, Per unit, Amount. Put the quantities from previous calculations and put current rates as per PWD schedule of rates. Compute the total amount.
6. Add 5% for contingencies and 2½% as Work charged establishment with the total amount.

Tabulation-

1. Bar bending Schedule:

Dia. Of bar	Position of bar	Nos.	Length of each bar in m	Total length in m	Weight

2. Abstract of estimated cost:

Item no.	Description of item	Quantity	unit	Rate	Per unit	Amount

Conclusion-

In this way we can compute total quantities and cost of an isolated footing.

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