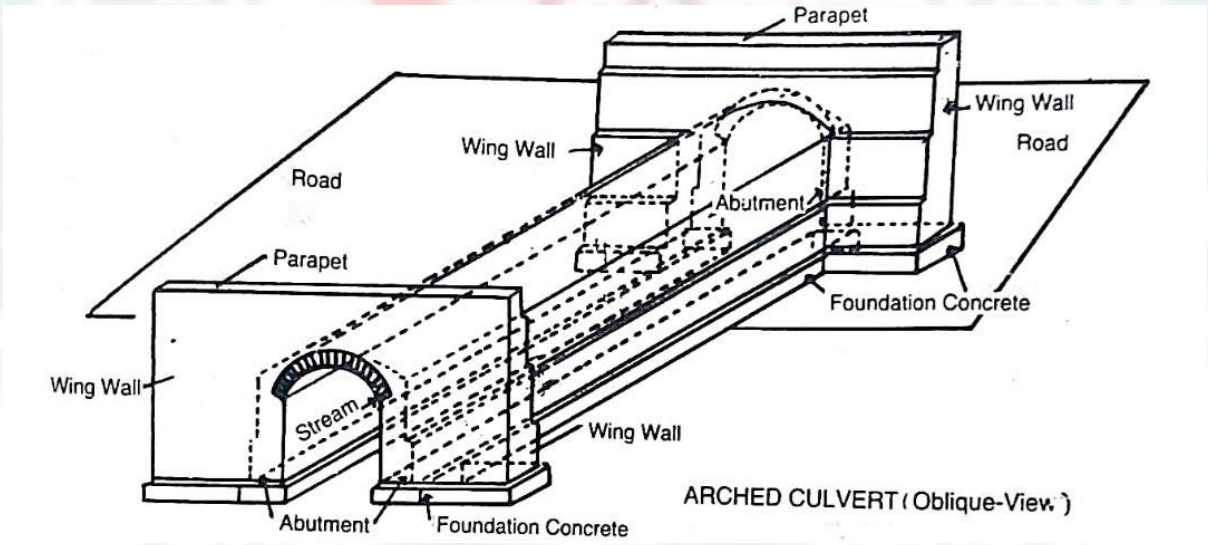
1st CHAPTER
DETAILED ESTIMATE OF CULVERTS & BRIDGES

Culvert

- Culvert is defined as a tunnel structure constructed under roadways or railways to provide cross drainage or to take electrical or other cables from one side to other.
- It is totally enclosed by soil or ground. Pipe culvert, box culvert and arch culvert are the common types used under roadways and railways.
- Generally the length between the faces of abutment is 6mt or less than 6mt of a culvert.

Parts of culvert



Types of culvert

1. Pipe Culvert (Single or Multiple) Pipe culverts are widely used culverts and rounded in shape. The culverts may be of single in number or multiple. If single pipe culvert is used then larger diameter culvert is installed.

2. Pipe Arch Culvert (Single or Multiple)

Pipe arch culverts means nothing but they looks like half circle shaped culverts. Pipe arch culverts are suitable for larger water flows but the flow should be stable. Because of arch shape fishes or sewage in the drainage easily carried to the outlet without stocking at the inlet or bottom of channel.

3. Box Culvert (Single or Multiple)

Box culverts are in rectangular shape and generally constructed by concrete. Reinforcement is also provided in the construction of box culvert. These are used to dispose rain water. So, these are not useful in the dry period.

4. Arch Culvert

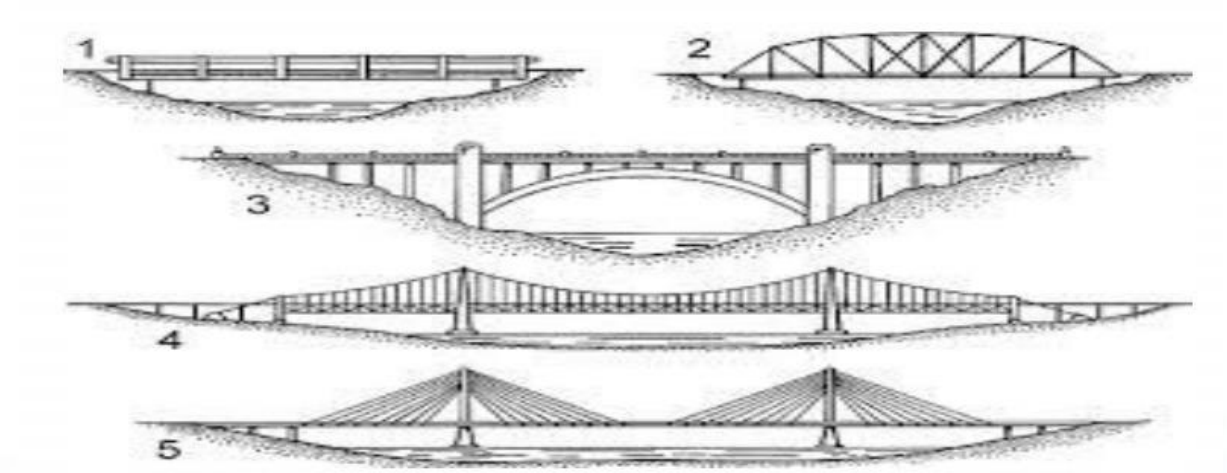
Arch culvert is similar to pipe arch culvert but in this case an artificial floor is provided below the arch. For narrow passages it is widely used.
The artificial floor is made of concrete and arch also made of concrete. Steel arch culverts are also available but very expensive.

5. Bridge Culvert

Bridge culverts are provided on canals or rivers and also used as road bridges for vehicles.
For this culverts a foundation is laid under the ground surface.
A series of culverts are laid and pavement surface is laid on top this series of culverts.
Generally these are rectangular shaped culverts these can replace the box culverts if artificial floor is not necessary.

Bridge

A bridge is a structure providing passage over an obstacle without closing the way beneath. The required passage may be for a road, a railway, pedestrians, a canal or a pipeline. The obstacle to be crossed may be a river, a road, railway or a valley.



Types of Bridges based on Span

Culvert Bridge

When the bridge span length is below 6meters then it is called as Culvert Bridge.

Minor Bridge

If the bridge span length is in between 8 to 30 meters, then it is called minor bridge.

Major Bridge

For major bridge, the span is generally about 30 to 120 meters.

Long Span Bridge

When the span of bridge is more than 120 meters then it is termed as long span bridge.

Difference between bridge and culvert

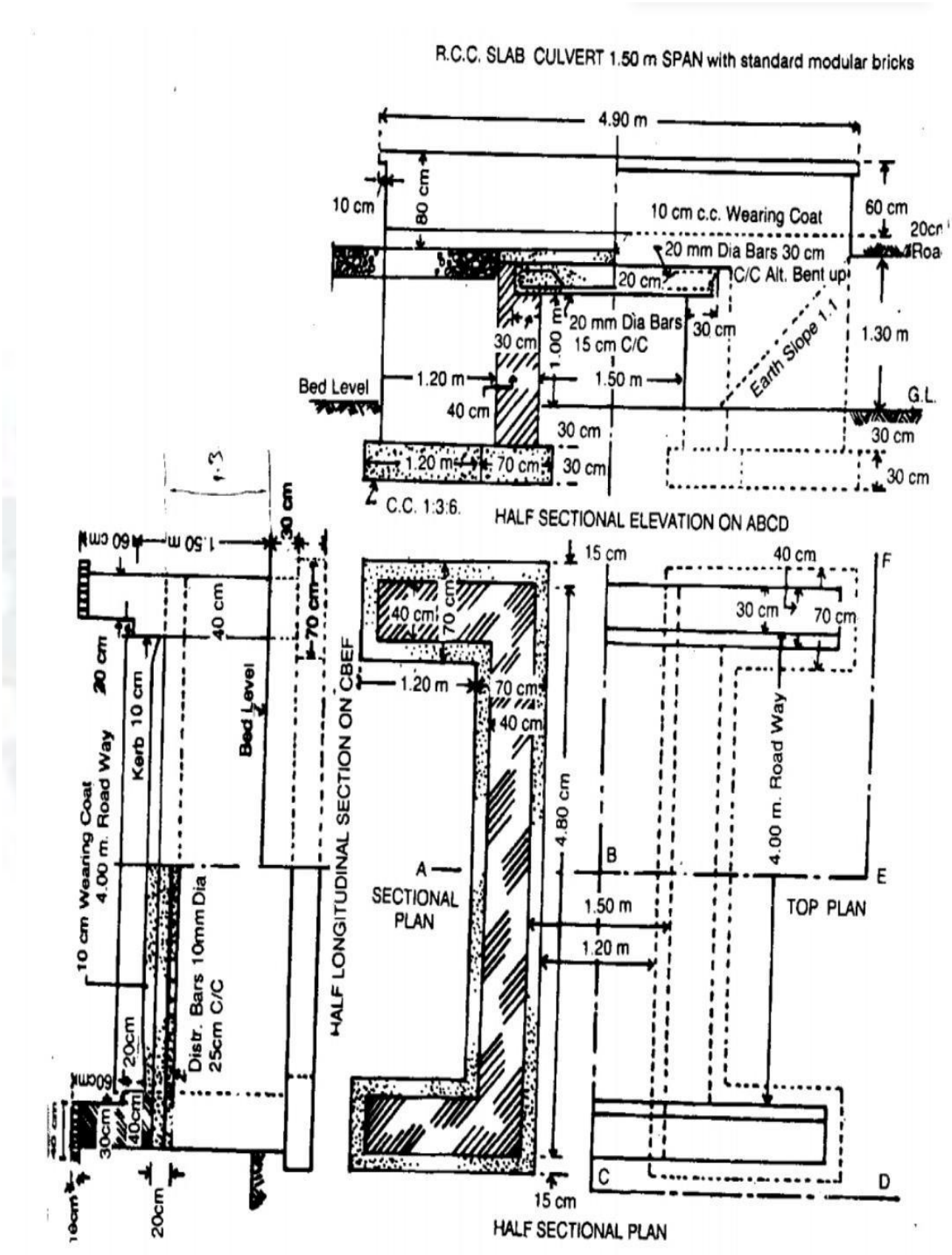
CULVERT	BRIDGE
These components of a culvert are comparatively simpler and include concrete boxes or cells, pipes, a top deck or slab, and supporting parts.	These basic components of a bridge(parts of a bridge) are superstructure, substructure, and deck (transfers surface load to other components).

The culvert is generally a tunnel-like structure that allows water to pass under a roadway or railway. These culverts are usually embedded in the soil, which bears the major portion of the culvert load. The length of culverts is typically not more than 6 meters.	The bridge is a passage of transportation over a large body of water or physical obstruction. Abutments and piers are the supporting structures of a bridge. A bridge spans from 6 meters to more than 120 meters.

PROBLEM: 01

Detail estimate of R.C.C slab culvert Estimate the quantities of the following items of work from the drawing of a RCC slab culvert as shown in fig. 1

- **Earthwork in excavation**
- **Cement concrete in foundation (1:3:6)**
- **First class brickwork in CC(1:6)**
- **RCC in deck slab**
- **Cement pointing 1:2**
- **Cement plastering.**


R.C.C. SLAB CULVERT 1.50 m SPAN with standard modular bricks
4.90 m
10 cm
80 cm
10 cm c.c. Wearing Coat
60 cm
20 mm Dia Bars 30 cm C/C Alt. Bent up
20 cm
20 mm Dia Bars 15 cm C/C
30 cm
1.00 m
1.30 m
Earth Slope 1:1
Bed Level
1.20 m
1.50 m
40 cm
G.L.
30 cm
70 cm
C.C. 1:3:6.
HALF SECTIONAL ELEVATION ON ABCD
1.50 m
60 cm
40 cm
20 cm
Kerb 10 cm
Bed Level
10 cm Wearing Coat
4.00 m. Road Way
Distr. Bars 10mm Dia
25cm C/C
HALF LONGITUDINAL SECTION ON CBEF
15 cm
4.80 cm
A
SECTIONAL PLAN
B
E
TOP PLAN
4.00 m. Road Way
F
C
D
15 cm
HALF SECTIONAL PLAN

Details of Measurement and Calculation of Quantities (Ex. 1)

Item No.	Particulars of items of works	No.	Length m	Breadth m	Height or Depth m	Quantity	Explanatory notes
1.	**Earthwork in excavation** in foundation —						
	Abutments ...	2	5.10	0.70	0.60	4.28	
	Wings walls ...	4	1.20	0.70	0.60	2.02	
					Total	6.30	cu m
2.	**Cement concrete** 1:3:6 in foundation with stone ballast— Abutments ...	2	5.10	0.70	0.30	2.14	½ of earthwork in excavation in item 1.
	Wings walls ...	4	1.20	0.70	0.30	1.01	
					Total	3.15	cu m
3.	**I-class brickwork in 1 : 4** cement mortar—						
	Abutments ...	2	4.80	0.40	1.50	5.76	Up to top of R.C.C. slab.
	Wing walls ...	4	1.20	0.40	1.50	2.88	
	Parapets up to kerb ...	2	4.70	0.40	0.30	1.13	Above R.C.C. slab up to kerb.
	Parapets above kerb ..	2	4.70	0.30	0.50	1.41	Above kerb excluding coping.
	Parapet coping ...	2	4.90	0.40	0.10	0.39	
	Deduct—						
	Bearing of R.C.C. slab in abutment				Total	11.57	
4.	**R.C.C. work 1 : 2 : 4 in** slab excluding steel and its bending but including centering shuttering and binding steel	2	4.80	0.30	0.20	0.57	
				Net	Total	11.00	cu m
		1	4.80	2.10	0.20	2.016 cu m	
5.	**Steel bars including bending in R.C.C. work—**						No deduction for volume of steel.
	20 mm dia. bars— Main straight bars 30 cm c/c ...	17	2.38	—	—	40.46 cu m	L=2.10—2 side covers + 2 hooks = 2.10—(2×4 cm)+(18×20 mm) = 2.38 m
	(No. = $\frac{4.80}{.30}$ + 1 = 17)						

	Particulars of items of works	No.	Length m	Breadth m	Height or Depth m	Quantity	Explanatory notes
	Main bent up bars 30 cm c/c ... (No. = $\frac{4.80}{.30}$ = 16)	16	2.54	—	—	40.64 m	Adding one depth, 16 cm for two bent ups L=2.38+.16 = 2.54 m
			Total	81.10 m	@ 2.47	kg m= 200.32kg	
	10 mm Dia. bars— Distributing bottom bars 25 cm c/c ...	9	4.90	—	—	44.10 m	L=4.80—2 end covers +3 hooks =4.80— (2×4 cm) + (18× 10mm)= 4.90 m
	Distributing top bars	4	4.90	—	—	19.60 m	
	To	tal	63.70 m	@ .62 kg	=	39.49 kg	
			Total	of	steel	239.81 kg	2.398 quintal
6.	**Cement concrete 1:2:4 wearing coat** ...	1	4.00	2.30	0.10	0.92 cu m	In between parapets
7.	**Cement pointing 1:2 in walls—**						
	Face wall from 10 cm below G.L. up to bottom of coping	2	4.70	—	2.10	19.74	
	Inner side of parapet excluding coping	2	4.70	—	0.80	7.52	Ht.=(20+10+50) =0.80 mm
	Coping (inner edge, top, outer edge and outer and side) ...	2	4.90	0.70	—	6.86	B=(10+40+10+10) cm = 0.70 m
	Ends of parapet ...	4	—	0.40	0.20	0.32	Up to kerb.
	Ends of parapet ...	4	—	0.30	0.50	0.60	Above kerb.
	Ends of coping ...	4	—	0.40	0.20	0.32	Edge and under side.
					Total	35.36	
	Deduct— Rectangular opening	2	1.50		1.30	3.90	Including 10 cm below G.L. and edge of R.C.C. slab.
	Triangular portion below earth slope	2	(½×1.30	×1.30)		1.69	
				Total of	deductio	n 5.59	

PIPE CULVERT

Pipe culverts are provided when discharge of Nala stream is small or when sufficient headway or height is not available. Number and size of pipes depend on the discharge and height of bend. Diameter of pipe for pipe culvert should not be less than 30 cm as smaller diameter pipe is likely to be chocked. The wing walls may be straight with face walls but it is better to make wing walls spalyed for easy approach of water

Example:2

Prepare a detailed estimate of Hume pipe Culvert of three pipes each of 60 cm diameter from the given plan and elevations Fig. 8-14. Foundation concrete shall be of 1:4:8 cement concrete and brickwork shall be of first class in 1:6 cement sand mortar. Exposed surfaces shall be pointed with 1 : 2 cement sand mortar.

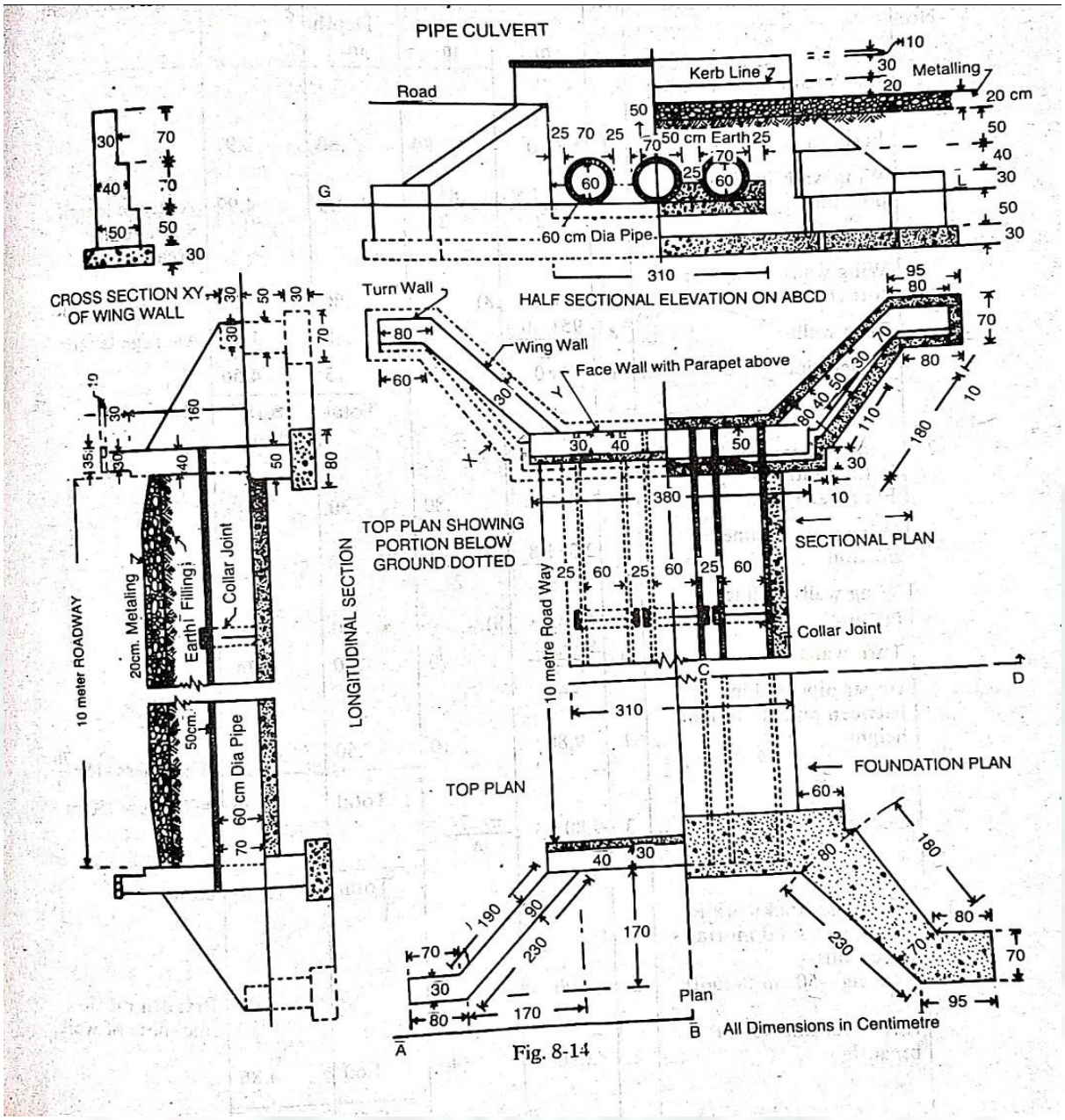

PIPE CULVERT
Road
Kerb Line
Metalling
20 cm
50 cm Earth
60 cm Dia Pipe
310
HALF SECTIONAL ELEVATION ON ABCD
Turn Wall
Wing Wall
Face Wall with Parapet above
CROSS SECTION XY OF WING WALL
LONGITUDINAL SECTION
TOP PLAN SHOWING PORTION BELOW GROUND DOTTED
SECTIONAL PLAN
10 meter ROADWAY
20cm. Metaling
Earth Filling
Collar Joint
10 metre Road Way
TOP PLAN
FOUNDATION PLAN
Plan
All Dimensions in Centimetre

Fig. 8-14

Details of Measurement and Calculation of Quantities (Ex. 7)

Item No.	Particulars of items	No.	Length m	Breadth m	Height or Depth m	Quantity	Explanatory notes
1	Earthwork in excavation in foundation—						
	Face walls ...	2	3.10	.80	.80	3.97	
	Wing walls inclined portion ...	4	$\frac{2.3+1.8}{2}$	$\frac{.8+.7}{2}$	.80	4.92	Average length and average breadth.
	Wing walls triangular corner ...	4	(½×.6×.8)		.80	0.77	Area of triangle.
	Turn walls ...	4	$\frac{.95+.80}{2}$	.70	.80	1.96	Average length.
	Under pipe ...	1	9.80	3.10	.15	4.56	
					Total	16.18 cu m	
2	Cement concrete 1 : 4 : 8 in foundation—						
	Face walls ...	2	3.10	.80	.30	1.49	
	Wing walls inclined portion ...	4	$\frac{2.3+1.8}{2}$	$\frac{.80+.70}{2}$	.30	1.85	
	Wing walls inclined portion ...	4	(½×.6×.8)		.30	0.29	
	Turn walls ...	4	$\frac{.95+.80}{2}$	.70	.30	0.74	
	Upper pipe and in between pipe up to half height ...	1	9.80	3.10	.50	15.19	Thickness=$15+\frac{70}{2}$
					Total	19.56	=50 cm = .50 m
	Deduct half of pipes ...	3	9.80×½	$\frac{\pi\times.7^2}{4}$		5.66	
					Total	13.90	cu m
3	First class brickwork in 1:6 cement sand mortar—						
	Face walls—						
	Footing—50 cm breadth	2	4.00	.50	.50	2.00	Breadth means thickness of wall.
	Above footing 40 cm breadth ...	2	3.80	.40	1.60	4.86	
					C.O.	6.86	

Item No.	Particulars of items	No.	Length m	Breadth m	Ht. or Depth m	Quantity	Explanatory notes
	Parapet—30 cm breadth	2	3.80	.30	B.F.	6.86	
	Coping—35 cm breadth	2	4.00	.35	.30 .10	0.68 0.28	
	Wing walls—						
	1st step—50 cm breadth	4	1.10	$\frac{.5+0}{2}$	.50	0.55	
	2nd step—40 cm breadth—						
	(*i*) Straight portion ...	4	1.80	.40	.30	0.86	
	(*ii*) Sloping portion ...	4	1.80	.40	$\frac{.40+.0}{2}$	0.58	Average height.
	3rd step—30 cm breadth	4	1.90	.30	$\frac{.70+0}{2}$	0.80	Average height.
	Turn wall—40 cm breadth	4	$\frac{.8+.7}{2}$	.40	.50	0.60	
	Turn wall—30 cm breadth ...	4	$\frac{.80+.75}{2}$	.30	.30	0.28	
					Total	11.49	cu m
4	Cement pointing 1 : 2 in exposed surfaces above G.L.—						
	Face walls outer sides ...	2	3.10	—	1.40	8.68	Up to road level
	Face wall parapet outer side	2	3.80	—	.65	4.94	Above road level including coping. Ht.=20+30+10 +5=65 cm =.65 m
	Parapet inner faces ...	2	3.80	—	.70	5.32	Including kerb offset of 10 cm
	Wing walls vertical face	4	2.30	—	$\frac{1.40+.50}{2}$	8.74	Average height.
	Wing walls top ...	4	2.30	.30	—	2.76	
	Turn walls vertical face three sides ...	4	1.80	—	.30	2.16	L = Perimeter = 80 + 30 + 70 = 180 cu m = 1.80 m
	Turn walls top ...	4	$\frac{.8+.7}{2}$	.30	—	0.90	
					Total	33.50	sq m
5	Hume pipe heavy type 60 cm dia. including collar joint ...	3	10.80	—	—	32.40	L = 10 + .4 + .4 = 10.8 m

2ND CHAPTER
ESTIMATE OF IRRIGATION STRUCTURES

Definition:
A cross drainage work is a structure carrying the discharge from a natural stream across a canal intercepting the stream. Canal comes across obstructions like rivers, natural drains and other canals. The various types of structures that are built to carry the canal water across the above mentioned obstructions or vice versa are called cross drainage works.

Cross drainage works carrying canal across the drainage:
The structures that fall under this type are:
An aqueduct
Syphon aqueduct

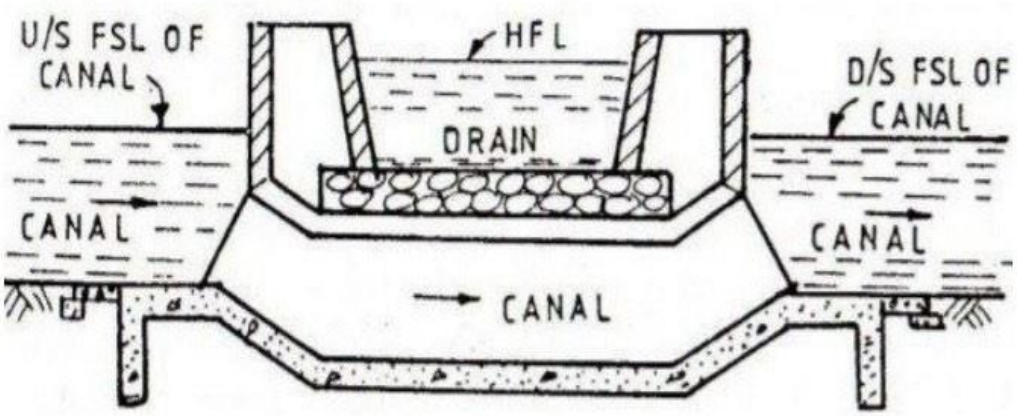
Aqueduct:
When the HFL of the drain is sufficiently below the bottom of the canal such that the drainage water flows freely under gravity, the structure is known as aqueduct.

Siphon Aqueduct
In case of the siphon aqueduct, the HFL of the drain is much higher above the canal bed, and water runs under siphonic action through the aqueduct barrels.

Cross drainage works carrying drainage over canal
The structures that fall under this type are:
Super passage
Canal syphon or called syphon only

Super passage
Super passage is a hydraulic structure in which the drainage passes over the irrigation canal. The structure is suitable when the bed level of drainage is above the flood surface level of the canal.

Canal Syphon:
If two canals cross each other and one of the canals is siphoned under the other, then the hydraulic structure at crossing is called canal syphon.



DRAINAGE SYPHON ACROSS A MINOR

Example:-

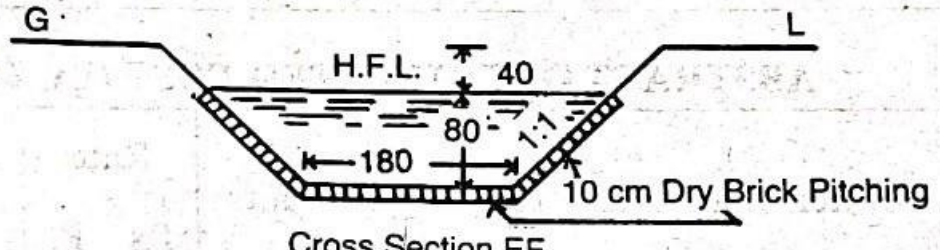
Prepare a detailed estimate of a Drainage Syphon across a minor from the given drawing. Foundation concrete shall be of 1:4:8 cement concrete with brick ballast. All brickwork shall be of 1:4 cement mortar.

Exposed surfaces of brickwork shall be struck pointed with 1:2 cement mortar.

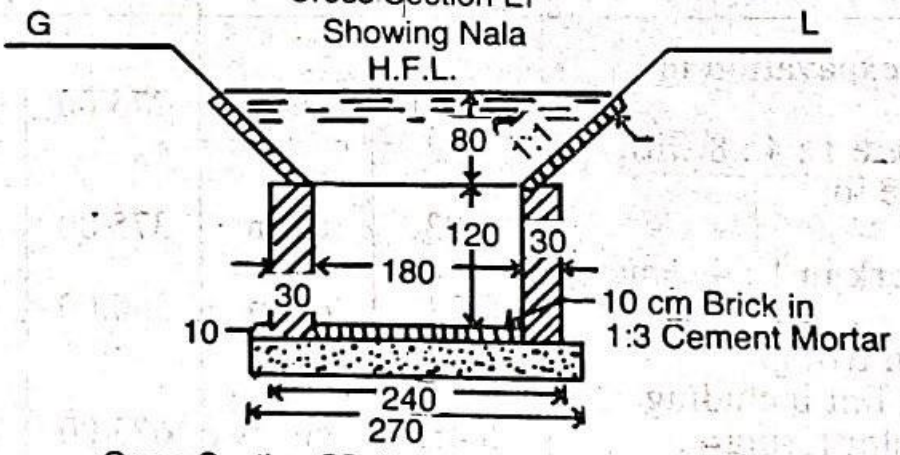
Brick pitching shall be of dry brick with straight over burnt bricks.

DRAINAGE SYPHON

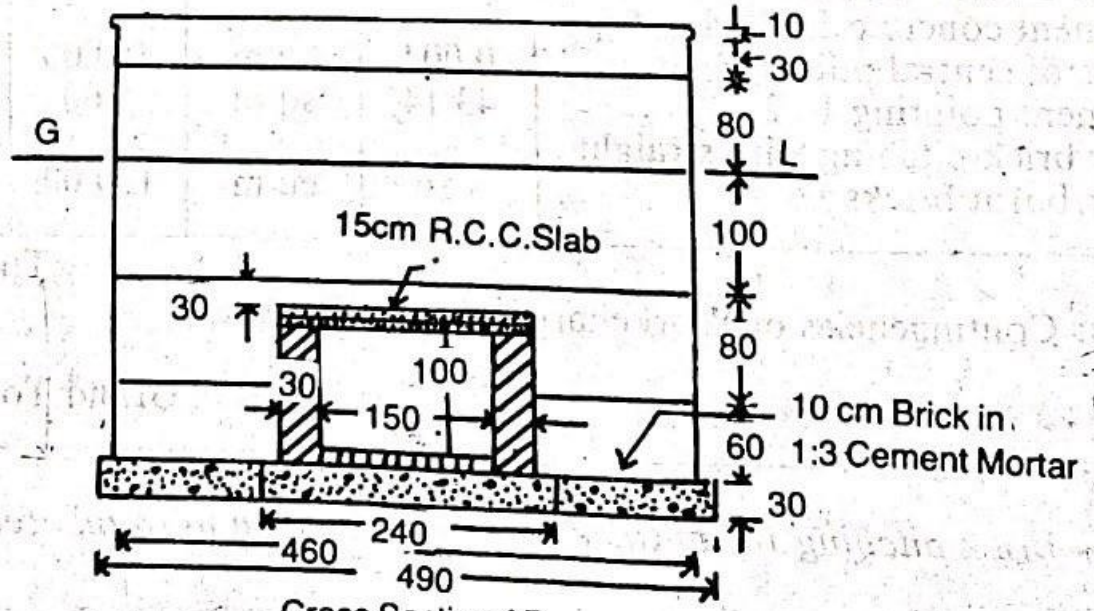
Cross Sections



Cross Section EF
Showing Nala



Cross Section CD Showing Drop Pit and Nala



Cross Section AB
Showing Duct and Wing Walls

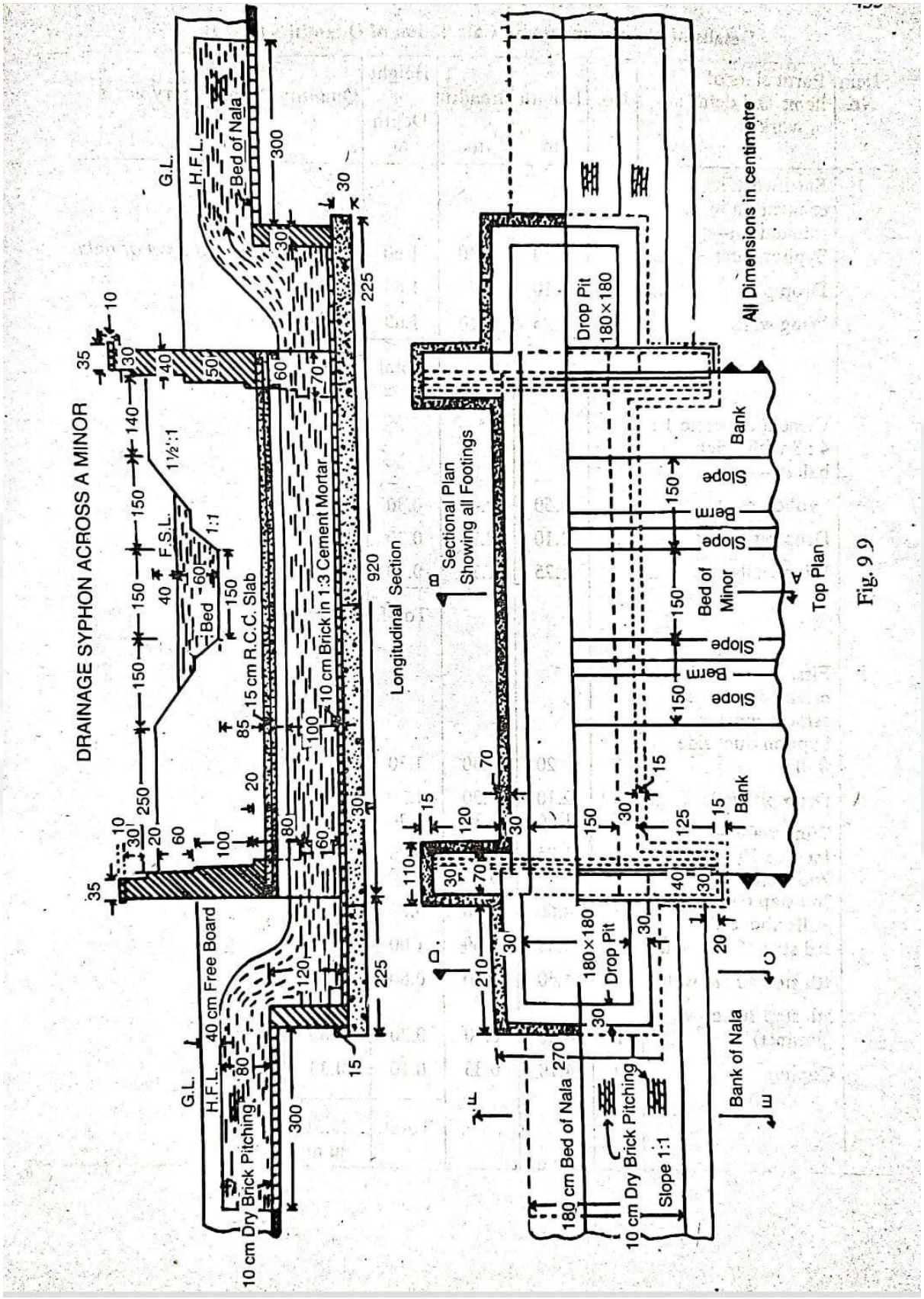

DRAINAGE SYPHON ACROSS A MINOR
G.L.
H.F.L.
Bed of Nala
F.S.L.
Bed
1½:1
1:1
15 cm R.C.C. Slab
10 cm Brick in 1:3 Cement Mortar
40 cm Free Board
10 cm Dry Brick Pitching
Longitudinal Section
Sectional Plan Showing all Footings
Drop Pit 180×180
Bank
Slope
Berm
Bed of Minor
Top Plan
180 cm Bed of Nala
Slope 1:1
Bank of Nala
All Dimensions in centimetre

Fig. 9.9

Details of Measurement and Calculation of Quantities (Ex. 7)

Item No.	Particulars of items and details of works	No.	Length m	Breadth m	Height or Depth m	Quantity	Explanatory notes
1	Earthwork in excavation in foundation—						
	Syphon duct ...	1	9.50	2.40	1.60	36.48	*For bed level of nala.*
	Drop pit ...	2	2.10	2.70	1.60	18.14	
	Wing walls ...	4	1.25	1.10	1.60	8.80	
					Total	63.42 cu m	
2	Cement concrete 1 : 4 : 8 with brick ballast—						
	Syphon duct ...	1	9.50	2.40	0.30	6.84	
	Drop pit ...	2	2.10	2.70	0.30	3.40	
	Wing walls ...	4	1.25	1.10	0.30	1.65	
					Total	11.89 cu m	
3	First class brickwork in 1 : 4 cement mortar—						
	Syphon duct side walls	2	9.20	0.30	1.30	7.18	
	Drop pit walls ...	2×2	2.10	0.30	1.30	3.28	
	Wing walls—	2	1.80	.30	1.30	1.40	
	1st step 70 cm walls	4	1.25	0.70	0.70	2.45	
	2nd step 60 cm walls	4	1.25	0.60	0.60	1.80	Upto top of slab.
	2nd step 60 cm walls above slab	2	4.60	0.60	0.20	1.10	
	3rd step 50 cm wall	2	4.60	0.50	1.00	4.60	
	4th step 40 cm wall	2	4.60	0.40	0.80	2.94	
	5th step 30 cm wall (parapet)	2	4.60	0.30	0.30	0.83	
	Coping	2	4.70	0.35	0.10	0.33	
					Total	25.91 cu m	

Item No.	Particulars of items and details of works	No.	Length m	Breadth m	Height or Depth m	Quantity	Explanatory notes
4	R.C.C. slab of syphon duct including steel reinforcement complete work	1	9.20	2.10	0.15	2.90 cu m	
5	10 cm thick brick floor in 1 : 3 cement mortar including 1 : 2 cement pointing —						
	Floor of syphon duct	1	9.20	1.50	—	13.80	
	Floor of drop pit ...	2	1.80	1.80	—	6.48	
					Total	20.28 sq m	
6	Cement struck pointing 1 : 2—						
	Syphon duct inner faces	2	9.20	—	1.00	18.40	
	Drop pit 3 vertical faces	2×3	1.80	—	1.20	12.96	
	Drop pit 3 top faces	2	5.70	—	0.30	3.42	L=2×180+210 =570 cm
	Parapet wall inner face top and outer face up to G.L.	2	4.60	—	2.30	21.16	Ht.=20+10+30+10 +35+10+5+110 =230 cm
	Outer face of wing wall above slab ...	2	1.80	—	1.20	4.32	
	Triangular portion of outer face of wing wall	2×2	(½×.8	×.8)	=	1.28	
					Total	61.54 sq m	
7	10 cm dry brick pitching with straight over burnt bricks—						*Thin piching, unit in area basis.*
	Bed of nala	2	3.00	1.80	—	10.80	*Up and down streams.*
	Side slopes of nala	2×2	3.00	1.13	—	13.56	*Sloping breadth=* $\sqrt{.8^2+.8^2}$=1.13 m
					Total	24.36 sq m	

3RD CHAPTER
DETAILED ESTIMATE OF ROADS

Introduction:

The Cutting & Filling of the Earthwork is carried out with reference to the formation line.

Formation line:

It is the imaginary line to draw to level the ground. Volume of earthwork shall be calculated by multiplying the length, breadth, Height or Depth. It is measure from the ground from which soil has been taken out.

Lead:

It is the horizontal distance through which earth is carried out from one place to another place for spreading. In this case the earth work is estimated to a normal lead of 30cm. For the greater lead will be higher for every unit of 30cm lead.

Lift:

It is the vertical straight depth through which the excavation is done along the formation line & it is measure from ground level. The earthwork is estimated to a normal lift of 1.5m.

Method of computation of earthwork

The method of computation of earthwork is classified according to form of the solid as defined by

1. Cross-section Method
2. Spot level Method
3. Contour line Method

Normally measurement from Cross-section method is an universally applicable method. Cross-section of earthwork of road in banking or in cutting is usually in the form of trapezium, and the quantity of earthwork may be calculated by the following methods.

Quantity or volume= Sectional area* Length

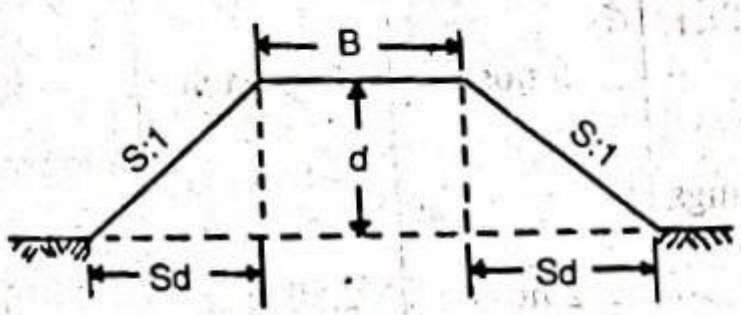


Fig. 7-1
Banking

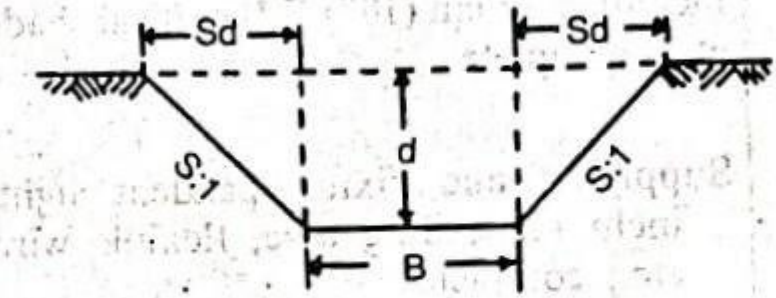


Fig. 7-2
Cutting

Sectional area= Area of central rectangular portion + Area of two-side triangular portions.

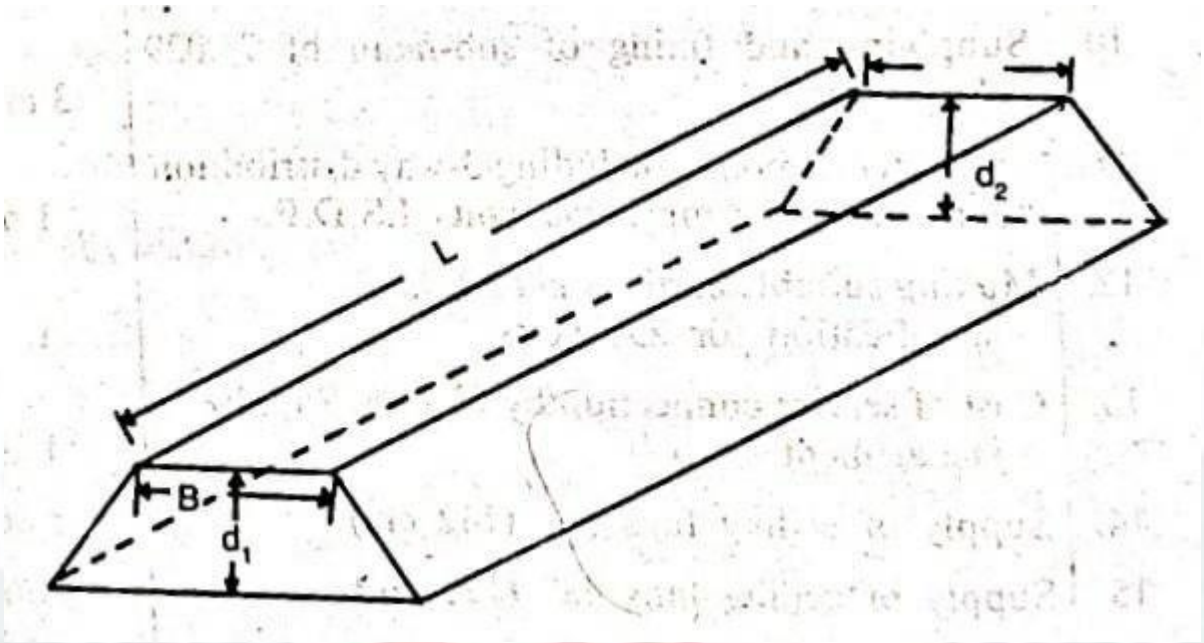
= Bd+2(½ sd*d) = Bd+sd

S:1 is the ratio of side slopes as horizontal: vertical. For I vertical, horizontal is s, for d vertical, horizontal is sd.

Quantity $(Bd+sd^3)$ L

When the ground is in a longitudinal slope, the height of bank or the depth of cutting will be different at the two ends of the section, and mean height or depth may be taken for "d" and sectional area at mid-section is taken out for mean height. Alternatively, sectional area at the two ends may be calculated and the

mean of two sectional area is taken out. Sectional area at the mid-section or the mean sectional area, multiplied by the length gives the quantity.



Mean Height= (d1+d2)/2

Different kinds of soil as sandy, clayey, rocky, etc., estimated separately as the rates vary.

For the calculation of earthwork in a road longitudinal section and cross-section of the ground are taken and the formation line is fixed. The formation line is fixed in consideration of flood level, gradient, height of bank, depth of cutting, etc. In plain countries road is usually in banking, but if the road is in cutting for some length and in banking for some other length, the excavated earth from the cutting portion should be utilised for the banking portion within economical limits, during the execution of the work. But for estimating of earthwork this point of utilising excavated earth from cutting in certain length in banking of the adjacent length may not be taken into account to avoid complicacy. In hilly countries road is usually both in banking and in cutting and the excavated earth from cutting is utilised for banking within economical limits.

From the L-section and formation line, the height of bank and depth of cutting are calculated the difference of R.L. of ground and R.L. of formation gives the height of bank or depth of cutting. For plain country the ground is considered as level accross, that is there is no cross-slope. The earthwork is calculated by parts of the

length in between two consecutive stations of L-lection and continued until the whole length is covered.

For longitudinal section R.L. of ground is usually taken by levelling instrument at every 30 metre apart along the centre line of road. When the ground is fairly even the levels may taken at 40 or 50 metre apart or even up to 100 metre apart. In uneven ground or hilly areas the R.L. of ground may be taken at 20 metre or more or less depending on the nature of the ground. Estimate of road is prepared kilometre wise. It is better if the distance apart of L-section is such that it is multiple to make the kilometre.

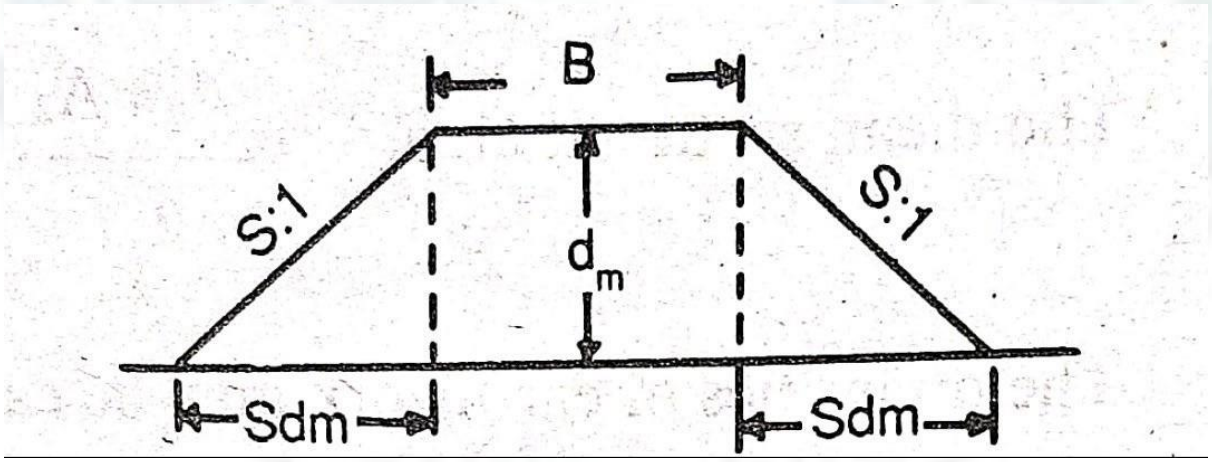
Method I:

Mid-Sectional Area Method:

Quantity=Area of mid-section length.

Let.d, and d, be the height of bank at two ends portion of embankment, L the length of the section, B the formation width and S: 1 (horizontal vertical) the side slope then,

Area of mid-section= Area of mid section Area of rectangular portion+ area of two triangular portion.



Area of mid section = Area of rectangular portion + area of two triangular portion

$= Bd_m + \frac{1}{2}sd_m^2 + \frac{1}{2}sd_m^2 = Bd_m + sd_m^2$

$\therefore$ Quantity of earthwork $= (Bd_m + sd_m^2) \times L$

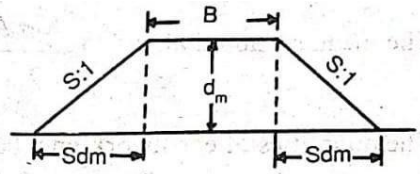


Fig. 7-4

General, $Q = (Bd + sd^2) \times L$, where d stands for mean height or depth.

The quantities of earthwork may be calculated in a tabular form as below :—

Stations or Chain-age	Depth or Height	Mean Depth or Height "d"	Area of central portion Bd	Area of sides Sd^2	Total Sectional Area $Bd+sd^2$	Length between stations L	Quantity $(Bd + sd^2) \times L$	
							Embank-ment	Cutting

Area of side sloping surface - The area of sides which may require turfing or pitching, may be found by multiplying the mean sloping breadth by the length.

The mean sloping breadth = $\sqrt{(sd^2+d^2)} = \sqrt{s^2+1}$, where d stands for mean d.

Area of both side slopes = 2 L, $\times d\sqrt{s^2+1}$

This also may be calculated in a tabular form —

Station or Chain-age	Depth or Height	Mean depth or Height	Breadth of side slopes $d\sqrt{s^2+1}$ *Sloping breadth*	Length between stations L	Total Area of both side slopes $2 L d\sqrt{s^2+1}$

This table may be added to the previous table or may be worked out separately, d being mean depth or height.

Method II:

Mean Sectional Area Method:

Method II. Mean Sectional Area Method — Quantity = Mean Sectional area × length, Sectional area at one end $A_1 = Bd_1+sd_1^2$, sectional area at the other end $A_2=Bd_2+sd^2_2$, d_1 and d_2 are the heights or depth at the two ends.

The mean sectional area $A = \frac{A_1+A_2}{2}$, Quantity $Q = \frac{A_1+A_2}{2} \times$ Length.

The quantities of earthwork may be calculated in a tabular form as given below :—

Stations or Chainage	Height or Depth "d"	Area of central portion Bd	Area of sides Sd^2	Total Sectional Area $Bd+Sd^2$	Mean Sectional Area	Length between station L	Quantity $(Bd+sd^2) \times L$	
							Emba-nkment	Cutting

Method III. Prismoidal Formula Method. — Quantity or volume $= \frac{L}{6}(A_1+A_2+4A_m)$

Where A_1 and A_2 are the cross-sectional areas at the two ends of a portion of embankment of a road of length L, and A_m is the mid-sanctional area.

Let d_1 and d_2 be the heights of banks at the two ends, and d_m be the mean height at the mid-section, B be the formation width and S:1 be the side slope.

Cross-sectional area at one end —

$A_1 = Bd_1 + Sd_1^2$

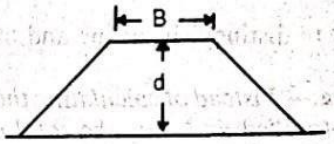


Fig. 7-5

Cross-sectional area at other end —

$A_2 = Bd_2 + Sd_2^2$

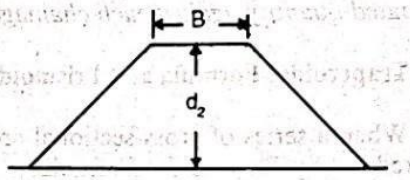


Fig. 7-6

Cross-section at middle —

$d_m = \frac{d_1 + d_2}{2}$

$A_m = Bd_m + Sd_m^2$

$= B\left(\frac{d_1+d_2}{2}\right) + S\left(\frac{d_1+d_2}{2}\right)^2$

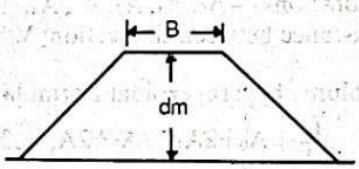


Fig. 7-7

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

$= \frac{L}{6}\left[(Bd_1+sd_1^2) + (Bd_2+sd_2^2) + 4\left\{B\left(\frac{d_1+d_2}{2}\right) + s\left(\frac{d_1+d_2}{2}\right)^2\right\}\right]$

$= \frac{L}{6}\left[(Bd_1+Bd_2+4\frac{Bd_1}{2}+4\frac{Bd_2}{2}) + sd_1^2+sd_2^2+4s\frac{d_1^2+d_2^2+2d_1d_2}{4}\right]$

$= \frac{L}{6}\left[(3\,Bd_1+3\,Bd_2) + 2sd_1^2 + 2sd_2^2 + 2sd_1d_2\right]$

$= \frac{3BL}{6}(d_1+d_2) + \frac{2Ls}{6}(d_1^2 + d_2^2 + d_1d_2)$

$= \frac{BL}{2}(d_1+d_2) + \frac{Ls}{3}(d_1^2+d_2^2+d_1d_2)$

$= \left\{B\left(\frac{d_1+d_2}{2}\right) + s\left(\frac{d_1^2+d_2^2+2d_1d_2}{3}\right)\right\} \times L$

= [Sec. Area of central portion + Sec. Area of side slope portions] × Length.

The same is also applicable for cutting.

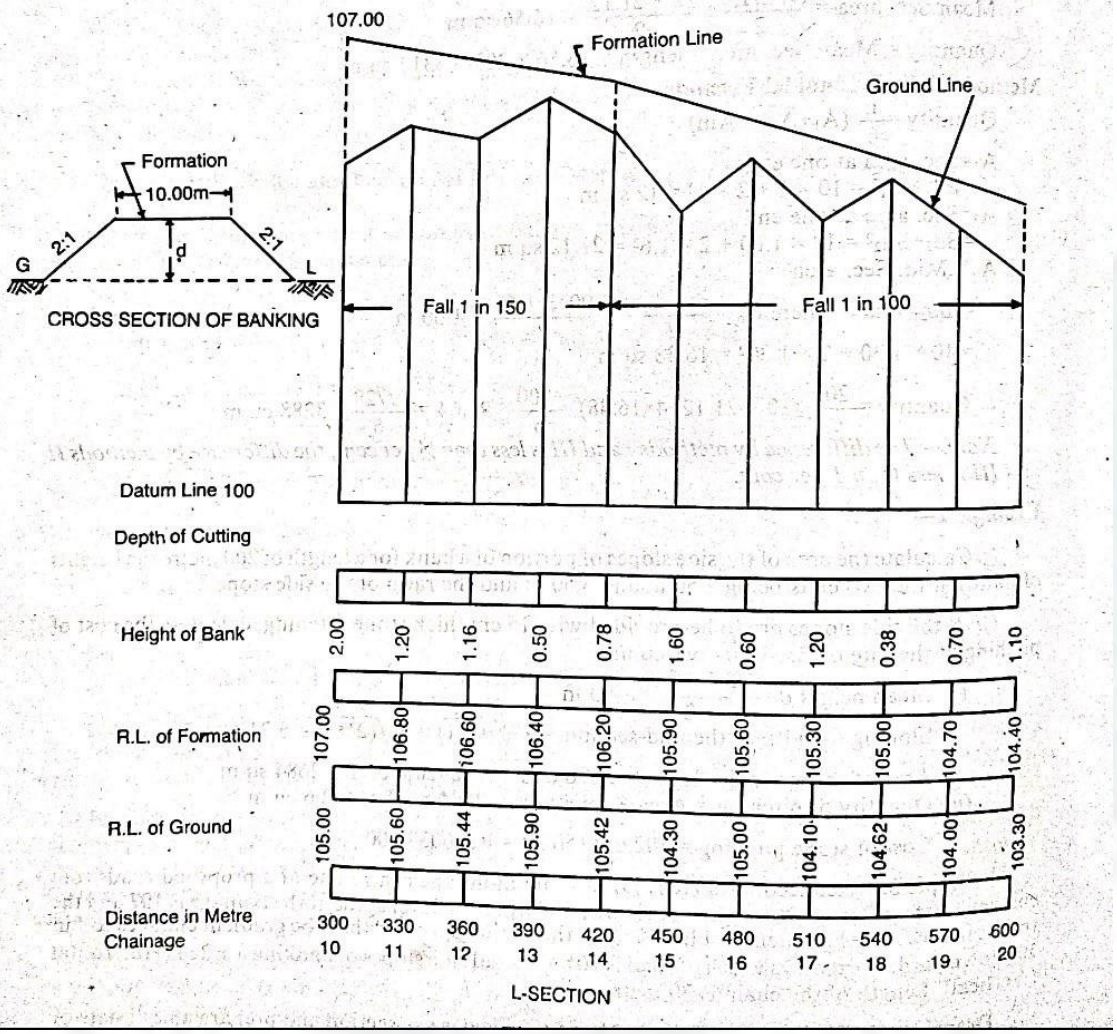
(*i*) Find also the area of the side slopes and the cost of turfing the side slopes at the rate of Rs. 60.00% sq. m.

Chainage	10	11	12	13	14	15	16	17	18	19	20
R.L. of ground	105.00	105.60	105.44	105.90	105.42	104.30	105.00	104.10	104.62	104.00	103.3

R.L. of Formation 107.00.

Gradient Down gradient 1 in 150 ⟶ ⟵ Down gradient 1 in 100

L=Section and Typical cross-section of the road are as given in Fig. 7-8.



B=10 m, s=2

Stations or Chain-age m	Length m	Height or Depth *Diff. of G.L. and F.L.* m	Mean height or depth d m	Central area Bd m^2	Side area sd^2 m^2	Total sec. area $Bd+sd^2$ m^2	Length in betw. stations L m^2	Quantity $(Bd+sd^2)\times L$ Banking m^3	Cutting m^3
10	300	2.00	—	—	—	—	—	—	—
11	330	1.20	1.60	16.00	5.12	21.12	30	633.6	—
12	360	1.16	1.18	11.80	2.78	14.58	30	437.4	—
13	390	0.50	0.83	8.30	1.38	9.68	30	290.4	
14	420	0.78	0.64	6.40	0.82	7.22	30	216.6	
15	450	1.60	1.19	11.90	2.83	14.73	30	441.9	—
16	480	0.60	1.10	11.00	2.42	13.42	30	402.6	—
17	510	1.20	0.90	9.00	1.62	10.62	30	318.6	—
18	540	0.38	0.79	7.90	1.25	9.15	30	274.5	—
19	570	0.70	0.54	5.40	0.58	5.98	30	179.4	—
20	600	1.10	0.90	9.00	1.62	10.62	30	318.6	—

Total 3513.6 cu m

ABSTRACT OF ESTIMATED COST (Ex. 3)

Item No.	Particulars of items	Quantity	Unit	Rate Rs. P.	Per	Cost Rs. P.
1	Earthwork in banking ...	3513.6	cu m	275.00	% cu m	9662.40
					Total ...	9662.40
	Add 5% (3% for Contingencies and 2% for Workcharged Establishment) ...					483.12
					Grand Total ...	Rs. 10145.52

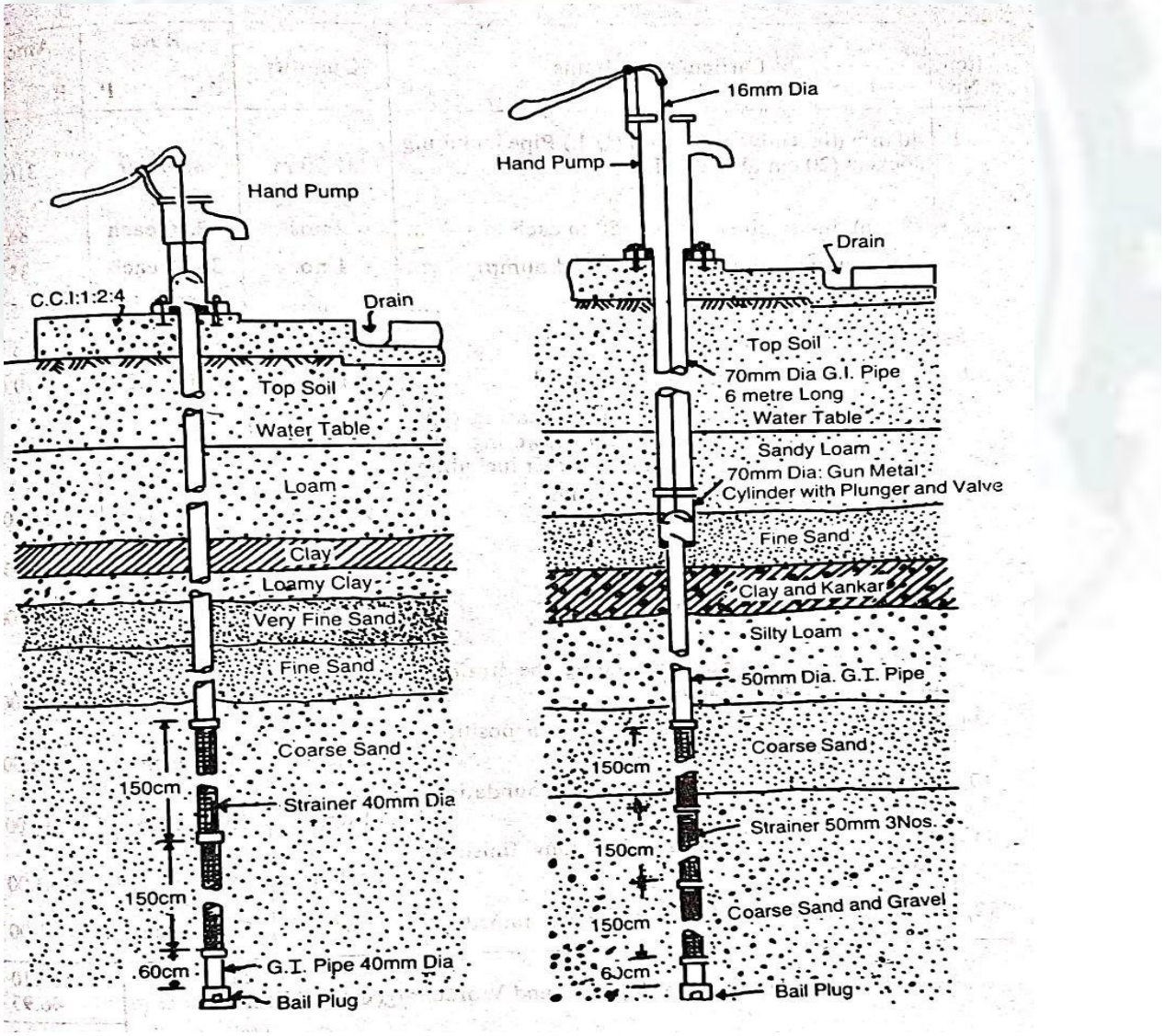
4TH CHPTER
MISCELLANEOUS ESTIMATES

Tube well:

A tubewell is a type of Water wall in which a long 100-200 millimeter (3.9 to 7.9 -inch) wide Stainless steel tube or pipe is bored in to an underground aquifer. The Lowers end is fitted with a strainer & a pump lift's water for Irrigation.

Use of Tube well:

Tube wells. the terms generally used to describe water well in the subcontinent including Bangladesh which are termed as bore holes or water well in other parts of the world. They use number 16 pumps for abstracting water for drinking & domestic use.



Function of Piles Foundation:

To transmit a foundation lead to a Solid ground.

To resist vertical, lateral & uplift load.

Materials of pile foundation:

Pile can be of: Timber is concrete & steel.

General fact (concrete piles):

Usual length = 10m - 20m

Usual Load = 300KN-3000K N

Advantages:

It is Corrosion resistance.

It can be easily combined with a concrete superstructure.

Disadvantages:

Difficult to transport .

Difficult to achieve proper cut off.

Difficult to placing & more labour required.

Pile foundation

Pile can be divided in to two major categories.

i) End bearing Pile

ii) Friction Pile

End bearing Pile:

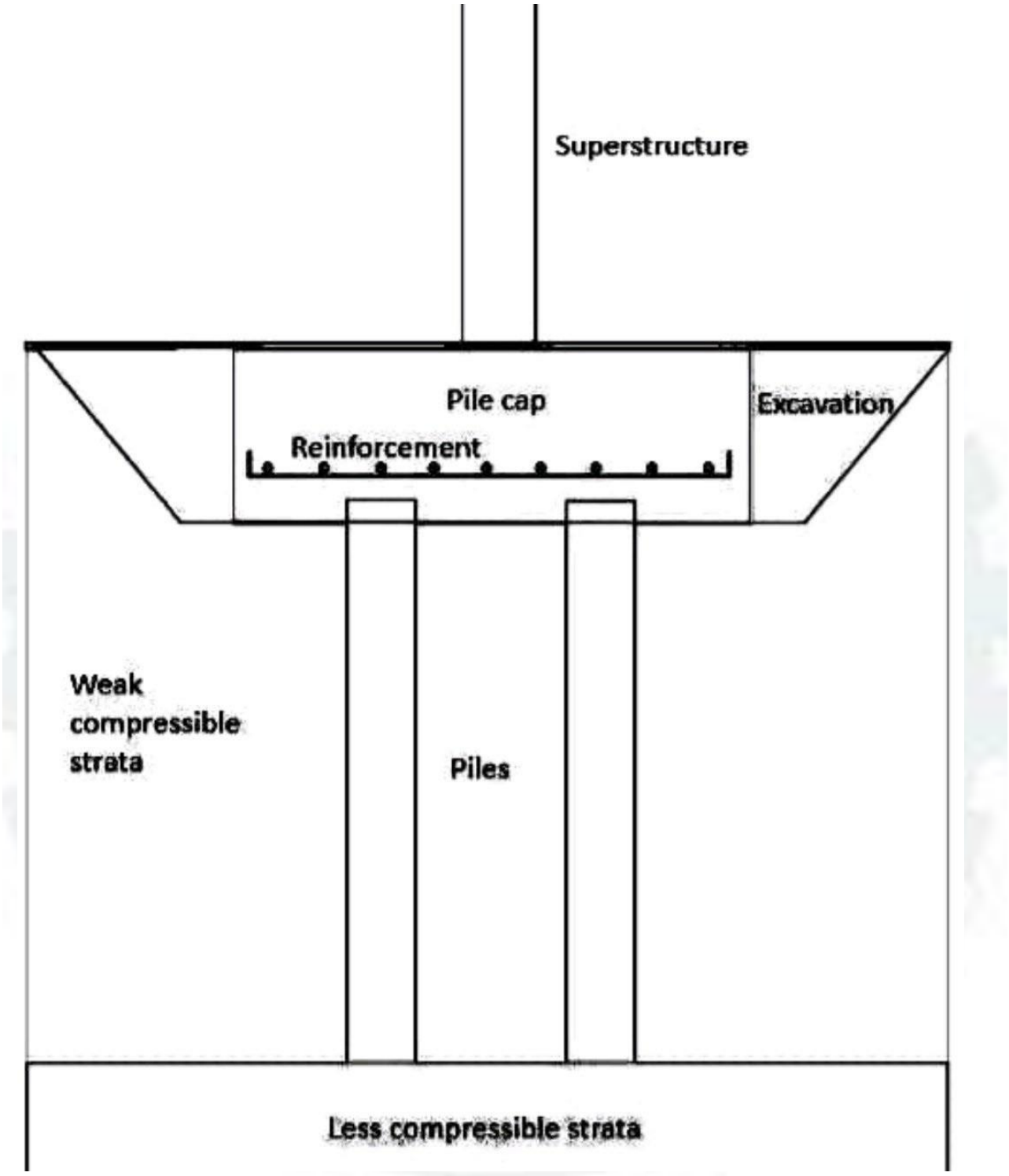
If the soil bearing records pricience об bed rock at the site within a reasonable depth piles can be extended to the rock surface.

Friction pile (sandy soil):

When no layers of rock is present depth at a site Point bearing piles became Very Long & uneconomical. In this type of Subsoil Piles are driven through the softer material to specified depth.

Pile Cap Reinforcement:

Pile Caps carrying very heavy point Loads tend. to produce high tensile Stresses at the pile cap. Reinforcement provided the pile cap to resist tensile bending forces in the bottom of the cap & also resist the vertical shear.



Footing:

Footing are Structural members used to support column's and Walls and to transmit & distribute their loads to the soil in such a way that the load bearing capacity of the soil is

not exceeded, excessive settlement, differential or rotation are prevented & adequate safety against overturning of sliding is maintained.

Isolated Footing:

Isolated or single footings are used to support single columns.

This is one of the most economical types of footing and is used when columns are: spaced at relatively long distances.

Ex- Verandah

Combined Footing:

Combined footing usually support two columns or three columns not in a row Combined footings are used when two columns are so close that single footings can not be used or when one column is located at or near a property line.

5TH CHAPTER
PWD ACCOUNT WORKS

Organization of Engineering Department.The Engg department of govt deal with the construction and maintenance of public work as building roads bridge, Culveret Canals Connecting work. like -dams, Sanitary & Water supply Work R Electrification work etc. We is know known. the as Engg work. department public Work department (PWD) There are dealing with as followes:

- PWD :- It is the branch which deal with the building roads, bridges and culver ts and Connecting wo Health rks.
- IRRIGATION DEPARTMENT:- It's deal with canal and river and the Work connecting with irrigation & for the development of crops.
- PUBLIC ENGG. DEPADEPARTMT:- 1 + 6 deal with the Sanitary work etc. water supply work,different Engg departmen 1 the differentbranch of work etc.
- ELECTRICITY DEPARTMENT:- It's deal with electrification installation power lines and connecting.

WORK :-

For any original work, the Engineering Department prepares. proposal on the a basis of preliminary estimate, brom the requirements and informations supplied by the BOULINIANA concerned department. The deportment at tere due consideration approves the proposal with respect the Work & fund, and convey their approval to the engineering department. Classification of work according to their nature.The work according to the nature are classified under thetwo main classes

- Original work.
- Repair Or Maintenance Work

ORIGINAL WORK :-

Entirely new construction of bridge, road, damp etc.
Addition the existing of the property Additions and alternations to the work will increase the value Conversion of verandah into room dividing a big room in to two room etc.

Special repair for renovation damage work as Changing of etc. changing of Floor changing of doors &windows.

(ii)REPAIR OR MAINTENANCE WORK:-

The repair work required to maintain the Work in proper condition as annual repairs to buildings, roadse to as Annual repair 2 white washing colout Washing etc.

Minor additions and alternations, within. Certain monetary limits (say Rs 200.00) which will not increasethe value of the property -ex- opening of doors, providing sunshades, providing shelves etc.

Special repair, Monsoon Damage Repair etc.

Classification of work. work according to their cost.

COST:-

With respect to the cost, the original work ig classified as Major work , Minor work,Petty Work..

i) MAJOR WORK:-

The work costing more than Rs 2 lakh! is termed as estimate Major work, and the for such work isknown Major Estimate.

ii) MINOR WORK:-

The work costing more but not as Minor Such work. than exceeding Rs 2 lakh Work & the estimate isknown as Minor Estimate.

iii) PETTY WORK:-

The work whose cost doesn't exceed Rs 50,000 is known as petty work and the estimate is known asPetty Estimate

DIFFERENT TYPES OF REPAINS WORK:-

ANNUAL REPAIR OR MAINTENANCE WORK:-

All work & structures are repair maintained. in proper conditions. the normal repair work is known asdone annually. It is known as annual repair work.

For annual repair & maintenance of building.1-1.5% of the original construction, 1. cost of the wholebuilding is provided.

Annual Repair work is usually done by contract by inviting tender or quotation.

QUADRENNIAL REPAIR:-

Besides annual repair work of White Washing and Colour washing, every. fourth year special repair works are done for repair as repainting of doors & Windows and patch repair of Plastering etc. in Specialrepair work every fourth year is known as Quadrennial repair.

SPECIAL REPAIR:-

Special repair work or renewals Works Consist of structures renovations or damaged.

It generally consist of renewal of bloor, root and other item of work involving replacement at at longintervals.
Repair of Monsoon damage or blood damage work also come under special repair work.
Contract Contract is an under taking. by a person or firm to do any work under certain term andcondition..
Contreac tor: The term con treac for means a person or firm who under takes any. time type of contract
- Usally. this. engaged for the Construction. or execution. of worke 5. of repairs.
Tender: Tender is offer in writing or to execute. some specibied work to Supply some Specified articlesat certain rates within a bixed time. under Certain. conditions. of contract aggremen + between the contractor & the department or Owner or pparty

DIFFERENT METHOD OF CARRIED OUT:-

The following are the different method of carrying out work

i) Employment of daily labour ii) piece on Muster work agreement. (iii) Work order (iv) lump sum contract (v) lump Sum and Schedule Contract (v_1) scheduled. contract or item rate contract. (vii) Labour Contract (viii) cost plus percentage contrac

DAILY LABOURE EMPLOYMENT BY MASTER ROLL:-

ii) Work may. ·be executed departmentally. by employing daily labout as. mason 3/ Coolies bis
+ ies, carpenters etc. The work of the particular employed is followed by. masterc reollesystem and payment should be provided to the emloyee weekly, (2 week) for tnightly monthly or *at the Completion of the work according to the Work.

PIECE WORK AGGREMENT:-

iii) Piece Work Aggrement. only rate is. that where are. agreed of ses upon. Without reberenceto the total quantity of work or time.

iv) That Involves. the -payment of work done at stipulated rate. Sosem The piece fork aggrement contain only the description of different item of work to be done and. the rate.to. be paid for that..

WORK ORDER:-

Small work upto Rs 2000 may be. by Work order.
This is a Contract and appropriate quantities. of Specitied the different item. Daily laboure Employmentby Master Roll.
Work may be executed departmentally. by employing daily labout as. mason 3 Coolies bis + ies, carpenters etc. The work of the particular employed is followed by. masterc reolle system and paymentshould be provided to the emloyee weekly, (2 week) for tnightly monthly or *at the Completion of the work according to the Work detailed specification of each L item of work, time. for the whole work penalty. im posed Por completion that will be not fulfilling term and conditions etc..

payment is made measurement of the work done.

CONTRACT SYSTEM:-

Contracts are inviting tenders. usually arranga by. and its devided as follows

1) Lump Sump contract.

2) lump sump and schedule contract

3) Schedule Contract or item rate Contract. 1)Lump Sump Sump CONTRACT:-

In lump sum Contract the contractor -- Under takes the execution or construction of a specific work with all its contingencies to complete it in all respects within Specified time for a fixed amount.

The quantity or schedule of different item of Work are not provided. In this case the Contractor shallhave to complete the Work as per plan & specification, within the contreact fixed term.

In this case for complexion of the work no detailed. measurement. ob different item. of work isrequired. but the whole work is compared checked. with plan & drawing.

2) SUMP & SCHEDULE CONTRACT:-

This is Similar to Lump Sump. contract but in this case the schedule of rate is. also provided in thecontract agreement.

In this system the contractor under takes the execution of a particular work at a fixed time 8 Sum.

General Specification & description on different part of building with dimension. is mention. whenrequired

The quantity of different Item work are not provided so the contractor shall have to comple te the workas per plan.

3) SCHEDULE CONTRACT. OR ITEM RATE :-

In this case the contractor under take the execution or construction of a work on the Item rate basis.

The amount receives by the depend U pon contractor the quantity of various. of work actually done... 1tem

The payment to the contractor is made by Considering the detailed. de tailed measurement of ditteren+item of work actually done by the Contractor.

CONTRACT DOCUMENT:-

Before the work is given out on contract & agreement or bond. is prepared. The following documen tshall b.c. attached to the contract agreement.

1- Title page: having the name of work, contract bond number etc.

2- Index paget having the content of the agreemen + with page references.

3- Tender Notice: giving brief descriptions at the work, estimated cost of work data and time of the.tender amount ob earnest money & security money, time of completion etc.
4- Tender form: giving the bill of quantities, contractor's. ra tes & total cost of works a time. forcompletion, progress of works, security money, penalty clacsse etc.
5- Bill of Quantitles or Schedule of quali 110g giving quantities & rates of each item a b work. 3 cost ofeach item of work & the total cost of the whole work.
6- Schedule or issue of Materials i- giving list. of materials to be issued to the contractors with rate &place of issue.
7- General Specification: @specitying the class & type of works in general.
8- Detailed specitrication of each item of work and of each material. work. to be used in the work.
9- Drawings; Complete the set of drawings... including plans, elevations, sections detailed drawing etc.
10- Condition of contract: containing the terms & Conditions of contract in detalle Condit lon specity thefollowing: The condition
i) The Rate including of materials, transport Lebour, T & P all other agreement necessary for completionof Work..
ii) Amount of the security money:
iii) Time for completion of the work.
iv) progress to be main tained.
v) Penalty for unsatisfactory & bad work.
vi) Mode of payment, running account -payment, final payment, security money refund.vii)Extension of time limit of contract.
viii) Rules for employment of de bitable agency. termination of contractix)Minimum wages to. to laboure. the labour compensation.
x) deciding extra Items & contractors claims etc.
xi) Depending on the nature of works, regarding taxes, royal ties, which are labour requirements.included in rates,

LABOURE CONTRACT:-

Labour contrast Contract bor the the contrag for Labour postion materia Is for the Construct lop &supplied at the size of work department or owner.
the work done according All labour ge 1 to specifications.
This system of contract is not generally. -adopted in the government department by provides building atby labour now ever constructed contract system..

Here basis the contract is for labour contractors. item rate person only & the paid per quantity of work
done measurement Lof the different item. об work on the basis of contract agreement.

SHORT NOTES:-

COST PLUS PERCENTAGE:-

In this type of p given in. cost is actual probit. LENNON system Contractor certain percentage over the ofConstruction. as bis profit.
Contractor arrange material and labour at bis. cost and keep proper account. and he is paid by thedepartment or Owner the whole certain cost together with percentage.
An aggreemen + is prepared with all condition of contract in advance.
In this case propere Control in the purchase of materials & labour shall have +40 be checked by theowner.

ADMINISTREATIC APPROVAL:-

for any work or Project required by a department an approval ·& sanctION Of the Competant authorityto cost' and work is First stage. with necessary respect at the first stage.
The approval of authorities. of department to take off the work respect to prepare approxiplete engg with estimate and preliminary plans submitted to the for department to concerne d administrative approval.

TECHNICAL SANCTION:-

It means estimate the sanction of detail 8, calculation, quantity a b Work rates & cost of work anddesign or plan by the authority of the engg. de partment.
After the estimate technical sanction of is given then only. is taken off for construction the the work.

CONTINGENCY BUDGET:-

The term contingency. contingency indicates accidental the espreme expenses of miscelleniousCharacter which cannot. be consider under the whole estimate budget& work.
An estimate a certain amount in the Form of con ting ency of 3%-5% of the total estimate cost isprovided to allow for the expenses for miscellenlous pitty item.

MODE OF PAYMENT:-

The payment. of the contractor for Work or Supply metal, tools and. made on the of material or road.plants etc. at basis of measurement recorded inmeasurement book.
When the work. or supply is completed that the detailed. or subbiciently that enti taken. usually by recorded overseen in measurement book and obstracle and measurement of quantities is prepared. & the is calculated at the rate of the cost contract aggreement Usually payment are made of the completion of the work.

RUNNING BILL:-

form 26 is use d in this form all to prepare running the bills. & final payment including cash & where.advance are made are also mention. Payment.
for second advance form 26-'A' is used & its attached to
the bill.

SECURED ADVANCE PAYMENT:-

It means the advanced payment made on Security of material brought by. the Contractor for the Sitework.
When the Contractor made advance. payment for the completed. item of work Secure advance paymentmay be allow by Case the the divisional. Engg - In this. amount of payment not exceed. 75% ob the valueof materials.

ESTABLISHMENT:-

Establishment Fur ther divided into 2 types.
i) Regutar Establishment
ii) Temporary
Establishment I)Regular

ESTABLISHMENT:-

Both permanent& temporary employees OF the department are included at the regular establishment.There salaries & allowances regular are drawn pay bills from the treasury.
The Payment made. to taking receipt on the each employee pay bill.
The Salary grant an is made. from the budget the head of establishment.
There Services rule ob the are governed by state of the union Civil Service gavernment..Regular establishment is of 2 types.
1) Peremanent Establishment
2) Temptypes
Establishment.
1)PERMANENT

ESTABLISHMENT:-

In this Permanent case the employees appointed. post & the against -payment made regularly.These posts are Sanction to Fun a department.
The the employees can be payment Sanction post only
against.
2)Temporary Establishment:-
When new projects are sanction. by govt this includes temporary post with considering that the extraWork load cannot be carried by the existing permanent employees.
The post are. Sanctioned usually fore @G or 12 months. or the completion of -particular project.

allownees Salarytoriances & leave condition are same as that of ent.. permanent establishm. Atter completion of of post are closed. are transtered. to project & the the sanction employees. o therproject.

Work charge Establishment:-

The Work charge establishment as employees who are employeed direct O.D the work for the Specibic. work. of the Store execution ob for the super vission departmental work, labour, & machinary etc.. the usually Work Super vision chauhida mates, Labour there payment is changed direct to the work. in the for which Provisions is made estimate of the work by adding. 2% 3% over the estimate amount of work..

Account:-

Goverment account are maintained in. the following 3 parts,

1) Consolidated Fund of India on the State concerned2)Contigency Concerned fund of India on state.

On public account of India and state.Cash:-

The term cash include Legal tender coins notes, checks, diposite at call received Soshestacte sceduled. bank demand draft Revenue stamp but do es p't covere govt. Security deposit of Receipt of bank o therthan. those maximum and.. below

Mode of cash payment:-

i) Reciept of Money
ii) Treasury challan
iii)Payment
iv) Cash book.
v) Interest
vi)Temporary, Advance

Cash book or Subsidiary cash book:-

The paymen + and allowancesou . the regular establishment by the division the divisional officer aredrawn from the treasurCash book or Subsidiary cash book by Preparation of bills. The account of this are in a separate Subsidary amount and payment cash book known as cash book. The is Cash ballance of this. kep + separate. the main. from. accoun + the cash. cash am account.

Measurement book:-

In this book the measurement of all works and Supplies are. recorded. book.. in measurement. Payment of all works & supplies are made the basis of measurement record.

The measurement books for maintain the are very important account record.The Columns off a measurement book is Shown below.

procedure of making entries of Measuremen + or work & supply of material:

The measurement are recorded by the executive Enggor sectional officer to Whom the measurementbook have been. issue for the purpose

The measurement of the works. are taken. accurately & recorded neatly. item of work for respective forthe different unit..

The Supply of Materials and its quantities. recorded in the measurement book properly.

The all measurement should be recorded in ink directly in the the measurement book & no where else.

The measurement should be taken in presence. of contractor & bis signature should be taken at thebottom of the measurement.

Set of measurement should With the each entry following Can be entries identity, commence so thatcase-1

in case of bill. measurement the following for should Work done the commence with entries.

a) Full name of work as given to estimate
b) situation of work:
c) agency by which executed
d) Name of the contractor.
e) Date of written order. work or commence
f) Date of actual it completed. complition of work.

Case-Bill for Supply of Materia

a) Name of the Supplyer or Contractor
b) No. & date of aggrement
c) Purpose of supply
d) Date of Written order
e) Date of actual complition of work it completedF)Depth of Measurement

Standard Measurement Book (SMB):-

A measurement book Where the detailed measurements of Certalo Items of work of a buildind is recorded Correctly by using ink the complition ob the Construction is clarritied & the. accuracy of whichby an Assistant Executive Engg is known as standard Measurement book.
The book is prepare record to Facila ted. for maintained as the preparation of Estimate. for repair &their execution..
However, in case of annual repair & maintainance fat work. (White washing, Colour washing) is mentioned no detalled measurement is need to be taken The SMB checked every 5 year alternation itany. and the and. it any entry is required.

Muster Roll:-

The Muster Roll provides columns For recording attendance for a month. but the roll may be closed. forpayment earlier.
In this Officer. case Payment is made by. The unplayed items are recorded Wages register, for subsiquen
+ to hand received. in the unpay payment The Muster Roll consists of 2 parts.
a) Nominal Roll
b) Detail of Quantity of workdone by the labour 8 the progress
of worka)Nominal Roll:-
Here daily attendance recorded. In this part there are columns and space for the name of the laboure designation, fathers name, date of attendance dave rate per person, to tal amount, to tal amount done for whole, signature of the Person, signature of the officers making Payment etc and these.. Columns are adequately billed up to make the payment regular basis...
The muster Roll should never dubli cate. The entry be made should be made in Such manner with ink. The name of the labourer are grouped according to classes. such as masons, mazdook, carpenter etc Details of quantity of workdone! Labourer & progress of work :-
Detail of measurment are taken and entered in the measurement book & an abstrut of quantity isprepared.
unpaid wages are recorded. register help of of which is maintained. In the divisional & subdivisionalofficer...
The Subsiquent payment is made on hand receipt. of unpaid
wagesRules Preparation of Muster Ralle:-
One or more for each work be muster Roll may be kept but muster roll should not prepared in duplicate.
The labourers may be paid more than one in a be mon th but prepare for Separate muster roll musteach period of payment.
The daily attendance and a bsence of labour & fines if any imposed on them Should be recorded in inkdaily in Muster Roll.

So that the calculations may be done correctly after take Mustes Roll has been. passed payment shouldbe as possible. made as quickly.
The the Each payment is initiated & dated by paying officer.
If any item is remain unpaid the detail of Such item should be recorded in the register wages.The amount of unpaid wages deposited on Cash & the amount is kept us deposit.

Store:-

The Stores are procedure by inviting. tenders. for the supply of Store of. material con the Sameprinciples as for works.

Classification of store:-

The store are divided into following types
a) stock of general store
b) Material charge directed Work
c) Road Metal
d) Tools & Plants Stock Account:-

FOR ALL transaction of receipt & Issue of material are recorded day to day in the register of stock receips& issue.
The account is maintained separately for every month and closed once in a month, Usually 25th of everymonth.
Except in the month of march when it is closed. on the March..
for a big stock when there. are large number of transaction of receipt and issue & Separate. register ofstock receipt issue. may be maintain
On closing of the -monthly. Stock receipt is. prepare abstract of stock issue is Submitted by account at in a single Prepare and S.D.O or A.E incharge of the store to the divisional atbicer inclusioD in the monthly A P = Assistant for divisional. account.

Stock taking and Shortage and surpluses:-

Stack is checked, Vertified physically by Counting, measuring once. in a year, period ending 31st Marchby the S.D.O incharge of Store.
For the verification of stare the account for First checked. for any mistake, it there is no mistakes, sure plus. or it any Should be taken. as govt, and the Cost Credit to revenue the shortage it any taken in Suspense head as should be miscellaneous..
If the Shortage are minor or no body is found responsible, then. of on Survey report.

Building Bylaws:-

The covering requirements of building, ensuring Safe ty of the butEdis public through open Spaceminimum size of rooms & height & area limitation are. known as building bye-laws.
Rules and regulations which largely regulate the building activity should be Pormulated. to get disciplined growth of building and the better planned development of towns & sites.

Necessity of Building Bye-laws:-

A bye-law is the local law Framed by a competent authority.
Every locality has it own Pecularities with respect to the climatic conditions, geological conditions ieavailability of materials.For construction la boure etc. building is built in a definite planned
If a way the Cans +reuc tion. becames economically sound and safe..
AS Such there must be law or regulation on the part of the owner. while building his own house...
If not the house - Owner undere his Ownership right will construc+ the bouse Which may affect Othersin the interests of respect of health & convenience.

2- Objects of Bye-laws:-

pre- planning of building activity.
Allow orderly growth and prevent haphazard development.
proovisions of by-laws usually afford safety against fire, noise health hazard and structure Failure.provide. proper utilization of space to achieved maximum etticiency in planning.
They provide health, safety and comfort people who live in building.
Due to these. bye-laws, each building will have proper approaches light, aire and ventilation.RERA (Real Estate Regulation And Developmen+) Acty2016:-
This act is applicable from 2016 for the regulation and Sector and to -promotion of the ensure real-ES to te sale of plot, apartment of building, as the case may be or Sale of -real - Esstate project. In an ebbisientand trans P arent manners and to protect the interest of consumers in real-estate sector 2 to establish 09 mechanism. for Speedy dispute of real-estate business.