ESTIMATION & COSTING - II

Write short notes on,

1. **Major work and petty work**.

Major work : The work costing more than Rs 2 lakhs is termed as major work.

petty work : The work whose cost cost doesnot exceed Rs 50,000 is known as petty work.

2) **Earnest money :**

Earnest money is an assurance or gurantee in the form of cash on the part of the contractor to keep open the offer for consideration and to conform his intention to take up the work accepted in his favour for execution as performs and conditions in the tender.

→ The earnest money given by the contractor not large it may be deposited in cash in division or sub-division office.

→ It may be 2% of estimated cost.

→ <u>Security deposite:</u>

This deposite is an amount of money which shall be deposited by the contractor whose tender has been accepted in order to render himself laible to the department.

→ This deposite may be refundable after work has been complited

3) <u>Running bill:</u>

The contractors may be paid according to the work done by them in bills i.e. partly payments the bill may be 3 types.

→ Inter mediate or running payment or running account is shortly known as R.A-1, R.A-2, R.A-3 etc.

→ This bill is prepared when a construction work is in progress.

→ <u>Final bill:</u> After giving some running payments then the contractor completes the work the last payment is known as

Final payment made in the final bill

→ Before final bill, it should be checkup the works has been done satisfactory no damage and to defects should be there.

4) **Measurement book:**

Measurement for all the works done and supplies reined in connection with the cantioned estimate are recorded in a special type note book (usually size 15x10 cm) is known as measurement book.

→ It contains besides instructions how to enter in the columns for particulars, details of ex actual measurement in terms of length, number, breadth & contact of area volume.

→ At the end of each set of measurement the officer should give a certificate measurement done by J.E. must be test checked by S.D - 50% & by the E.E. 10%.

5) **Muster roll:**

The catagories of skilled & unskilled worker employed on works are daily rated wages are drawn in muster roll whose daily attendance and outturn are recorded.

for purpose of payment.

→ They are directly under J.E. depending upon importance may be supervised by the Asst. Engineer or Executive Engineer.

6) What is drop pit?

A pit built cross-wise of the soil in an borrowing area is known as drop pit.

7) What is kerb in culvert?

The line of stone or concrete forming an edge between a pavement and a roadway.

8) What is SYPHON?

A: When the bed of irrigation channel or the drainage depressed & taken under stream or nala is known as irrigation syphone.

9) What is Minor bridge & Major bridge

Minor bridge	Major bridge
The length of linear waterway above 6m but below 30M are minor bridge.	→ The length of linear waterway is above 30m are major bridge.

10 Subsidiary cashbook :

Besides the cash book, the divisional officer has to maintain another cash account is known as subsidiary cash book to record transactions of receipts and payments relating pay, allowance etc. of his regular establishment for whom he draws money from treasury by presentation of bills.

11) Skew culvert :

The culvert which is a skew type of structure which are provided upto maximum span of 3 m.

Q Arbitration :

It is the settlement of a dispute by the decision not of a regular and ordinary court of law but of one or more persons by the parties themselves who are called arbitrators.

→ Thus, arbitration is a domestic court where the arbitrator acts as a judge.

(13) Standard Measurement book :

A Measurement book where the detailed measurements of certain items of works of a building is recorded correctly in ink on the completion of the construction & the accuracy of which is certified by an Assistant Engineer is known as Standard M.B.

→ Such books are record to facilitate the preparation of estimate for periodical repairs & their execution.

(14) Original work :

The following types of work are known as original work.

i) Entirely new construction like construction of buildings, bridge, road, dam, projects etc.

ii) Addition of rooms, conversion of verandah into room, dividing a big room into 2 rooms etc. which will increase the value of property.

iii. changing of roof, changing of floor, changing of doors & windows etc.

, which are special repair or renovations.

Repair works:

The following types of work are known as repair work.

i. Annual repairs, white washings, color washings of buildings for proper maintenance.

ii. Opening a door, providing Sunshade, providing shelves in a building which are minor modification work.

iii. Special repair, monsoon damage repair of rods etc.

(15) Tender notice:

Usually tender is called or invited for execution of work or supply of items by issuing a notice in the prescribed format known as Tender Notice. In this notice the following information are given.

i. Name of the authority inviting tender.

ii. Name of work & its location.

iii. Estimated cost.

iv. Time of completion.

v. cost of tender firm.

vi. Date, time & place of tender.

vii. Amount of earnest money & Security money.

viii. Validity of Tender etc.

→ This tender Notice is posted in the notice board of the department and also published in the newspaper for quarness of contractors.

(16) Debit :

The debit comprises of loan raised by govt. and the remiftances division consists of all merely adjusting heads I.e, remittances of each bet^{n} treasuries & transfer transaction bet^{n} different accounting circles.

Credit :

Credit is a note on the basis of which the book adjustment through the accountant general concerned. Some times private commercial firms purchase the credit

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notes. The divisional officers are usually authorised to sign credit notes.

(17) Tools & Plants :

The tools & plants of a division are of two categories.

Ordinary T & P I.e. those required for the general use of the division & the cost of which is charged to minor head tools & plant.

→ Special T & P I.e. those required for a specific work, the cost of which is borned by the work concerned.

(18) What is valuation :

valuation is the art of assessing the present fair value of a property at a stated time.

→ valuation of anything is an estimate of the value of that thing in terms of money.

→ It only attempts at suggesting the fair prices. Yet, valuation is not an arbitrary process.

→ It is based on certain facts & indication and only after a judicious processing of such facts.

19) **Value :**

value means the present market value or fair sale value which may not be the same to the cost of construction.

→ value depends upon supply & demand. where as cost is a

Cost :

Cost means the actual cost of construction. where

→ cost is a constant amount requires for the construction.

Market value	Book value
→ The value is fixed by purchaser	→ The value is fixed by the rate of depreciation.
→ The value may be higher during the subsequent years due to increase of price index.	→ The value can't be higher during the subsequent years even due to increase of price index.
→ This is applicable for any type of property.	→ The value can't be constant but there is a gradual fall.
→ It considered for valuation.	→ It is considered for Accounts book of a company.

Comparative Study of Stock and T. & P. Accounts :

STOCK	T. & P.
1. Both Quantity and value accounts are maintained.	1. Only Quantity accounts are kept.
2. Value of Stock materials is charged to *suspense head*—Stock.	2. Value of T. & P. articles is charged to *final head* "T. & P." or work.
3. Value of Stock found deficient is shown issued and charged to Misc. P. W. Advance immediately.	3. T. & P. articles found short continue to be shown in the account until written off.
4. Value of stock found surplus is credited to revenue.	4. No such value adjustment is made for article found surplus.
5. The stock account is closed annually in March.	5. The T. & P. Account is closed annually in September.

Road Metal :—

For construction of new roads or for maintaining existing roads, road metal is collected at the road side before being laid. A quantity account showing km by km, the receipt, disposal & balance of each kind *viz.* stone, kankar etc. is maintained in the Sub-Division in (Form-16)—*viz.* "Statement of Receipts, Issues and Balance of road metal". This Account is rendered monthly to Divisional office. Physical verification is conducted at least once a year. Metal found surplus is atonce taken as receipt. But deficit is bought to account only on receipt of sanction to write off etc.

What is Contract ? – The Contractors and their qualification – Authorities competent to enter into contracts for Public Works.

(A) **What is Contract ?** An agreement enforceable by law is Contract. The contract invariably follows a proposal from one party and its acceptance by the other. In absence of any of the above elements of a contract it becomes void, i.e. without a legal effect or voidable, i.e., which can be avoided by any of the parties to it.

The term contract, so far as Public Works Department is concerned, means a written undertaking for execution of works or supply of materials or for the performance of any service connected therewith duly accepted and registered by the competent authority on behalf of the Union or State Govt.

(B) **Contractors and their Qualifications** – In the above context, the term Contractors mean Private individuals Partnership firm, Public or Private Limited concerns who have made such an undertaking for the execution of works, supply of materials or for services concerned therewith with the respective Govt.

In relation to Public Works the following Categories of contractors are generally enlisted – (a) For Building and Roads (B & R), (b) For Sanitary installations and Water Supply, (c) For Electrical and Airconditioning, (d) For Furniture.

Each of these categories of contractors should have an engineering organisation competent to deal with works entrusted to them. Contractors at (b) and (c), must possess valid Plumbing and Electrical Licences respectively. Each of them is expected to have the machinery and equipment required for the job. Their qualifications are further adjudged from (i) their professional ability to understand and implement the contractual obligations and subsidiary instructions given by the Engineer-in-charge of the Department, (ii) their financial resources, (iii) their capacity to control labour, particularly by way of regular payment of fair wages and observance of Labour Regulations, (iv) and their zeal for maintaining reputation and integrity.

(C) **Authorities competent to enter into contracts for Public Works :—**

(i) Articles 229 (1) of the Constitution authorises officers of the Public Works Department to execute a contract for on behalf of "The President of India" or "The Governor of the State" as the case may be. The Divisional or Sub-Divisional Officers (i.e., Executive Engineer or Assistant Engineer-in-charge) derives delegated powers to enter into contracts for the Govt. within their financial limits.

Suspense Account and Subhead account.

Ans. Suspense Accounts : These accounts are meant for the temporary transition of all such transactions and must at once be taken into the account of the works of grant concerned but cannot be cleared finally because the relevant payment, recovery or adjustment is awaited. These are sub-divided into four heads viz, (i) Purchases, (ii) Stock, (ii) Misc. P.W. Advance, (iv) Workshop suspense.

(i) **Purchases :** Materials purchased for specific work are credit to purchases immediately on their receipt by per contra debit to the work. Materials received for stock are similarly credited to purchases by debit to stock to secure agreement between the quantity and value accounts.

(ii) **Stock :** This account head is debited will the expenditure connected with acquisition of stock materials and manufacture operations and credited with value of materials issued to works, sold or transferred.

(b) Explain the step by step procudure with the related documents for awarding a construction of NH (National Highway) Road to a contractor by NH (Govt.) Authority.

Ans. Contract Document : Before the work is given out on constract an agreement or bond is prepared. The following documents shall be attached to the contrast agreement of bond which should be duly endorsed and sealed. Each page shall bear the signature of the contractor and the accepting authority and all corrections shall be similarly initialled :

1. *Title page* – having the name of work, contract bond number, etc.
2. *Index page* – having the contents of the agreement with page references.
3. *Tender notice* – giving brief descriptions of the work, estimated cost of work, data and time of the tender, amount of earnest money and security money, time of completion, etc. Earnest money, usually 2% of the estimated cost, is deposited along with tender.
4. *Tender form* – giving the bill of quantities, contractor's rates, and total cost of works, and time for completion, progress of works, security money, penalty clause, etc.
5. *Bill of quantities or schedule of quantities* – giving quantities and rates of each item of work and cost of each item of work and the total cost of the whole work.
6. *Schedule of issue of materials* – giving list of materials to be issued to the contractor with rates and place of issue.
7. *General specification* – specifying the class and type of works in general.
8. *Detailed specification* – of each item of work, and of each material to be used in the work.
9. *Drawings* – complete set of drawings including plans, elevations, sections, detailed drawing, etc. and site plan, all fully dimensioned.
10. *Condition of contract* – containing the terms and conditions of contract in detail. The conditions specify the following :

    (i) Rates inclusive of materials, transport, labour, T, and P. all other agreements necessary for completion of work, (ii) Amount of the security money, (iii) Time for completion of the work, (iv) Progress to be maintained, (v) Penalty for unsatisfactory and bad work, for failure in maintaining progress, for delay in completion, (vi) Mode of payment, running account payment, final payment, security money refunt, (vii) Extension of time limit of contract, (viii) Rules for employment of debitable agency, terminationof contract, (ix) Minimum wages to labour, compensation to labour, (x) Authority deciding extra items and contractors claims, etc.
11. *Special condition* : depending on the nature of works, regarding taxes, royalties, which are included in rates, labour camp, labour amenities, compensation to labour in case of accident, etc.

Assessed value :—Assessed value is the value of a property recorded in the register of a municipality in order to determine the amount of municipal taxes to be collected from the owner of the property. Generally the assessed value is determined from the gross annual rent at which the land or building might at the time of assessment be reasonable expected to let from year to year, less in the case of building, an allowance of ten percent for the cost of repairs and for all other expenses necessary to maintain the building. In case if the gross annual rent of a property can not be easily estimated then an amount of 5 percent of the estimated cost of the property shall be considered.

Sinking fund :—Sinking fund is an amount which has to be set aside at fixed intervals of time (say annually) out of the gross income so that at the end of the useful life of the building or property the fund should accumulate to the initial cost of the property. A building a machine, a vehicle etc., becomes useless after certain years i.e. at the end of its life. Hence it is necessary to make some provision whereby the owner can accumulate to a sum required for rebuilding the premises or can replace the article. For the above purpose sinking fund is periodically collected and deposited to a bank to get highest compound interest or sinking fund insurance policy is made to the insurance company throughout the life of a building or article. In case when a building is built up or a vehicle is purchased by taking loan, a small portion of rent or income is set aside every year or at regular intervals and may be paid directly to the lender by way of instalments.

Determination of sinking fund :—

The calculation of sinking fund depends upon the life of a building and also upon the rate of interest. When the life of a building is over the owner can get back a certain amount on the sale of old building materials which is known as *scrap value*. This amount is considered as 10% of the building cost. Therefore, the calculation of sinking fund is made on 90% cost of the building.

Let S = Total amount of the sinking fund ; I = Annual instalment required ;

i = Rate of interest expressed in decimal ; n = number of years and

I_o = Co-efficient of annual sinking fund, so that $I = I_o \times S$.

The first annual instalment would accumulate interest for $(n-1)$ years, the second for $(n-2)$ years and so on. Also the annual sinking fund for redemption of Rs. 1·00 would be I_o (as $I = I_o \times S$ and $S = 1$).

Consequently, the first instalment would accumulate to $I_o (1+i)^{n-1}$, the second to $I_o (1+i)^{n-2}$ etc. Whence $I_o [(1+i)^{n-1}+(1+i)^{n-2}+\cdots\cdots+(1+i)^2+(1+i)+1]=1$

$$\text{or,} \quad I_o\frac{[(1+i)^n-1]}{(1+i)-1}=1.$$

$$\text{or,} \quad I_c=\frac{i}{(1+i)^n-1} \quad\quad\cdots\quad\quad\cdots\quad (1)$$

$$\text{consequently,} \quad I=I_o \times S=\frac{Si}{(1+i)^n-1} \quad\quad\cdots\quad (2)$$

Example—1. An owner has installed an air cooler in a building at a cost of Rs. 8,000/-. If the life of the air cooler is 18 years calculate the amount which he should set aside annually as sinking fund to accumulate the above cost at 5% compound interest.

Annual sinking fund require, $I=\dfrac{Si}{(1+i)^n-1}=\dfrac{8000\times0\cdot05}{(1+0\cdot05)^{18}-1}=8000\times0\cdot0355=\text{Rs. }284/-$

Therefore, the owner should set aside an amount of Rs. 284/- annually and invest the same @5% compound interest for a period of 18 years in order to accumulate the total cost of Rs. 8,000/-

Example—2. A person has purchased an old building at a cost Rs. 90,000/- on the basis that the cost of land be Rs. 50,000/- and the cost of building structure be Rs. 40,000/-. Considering the future life of the building structure be 20 years workout the amount of annual sinking fund at 4% interest when scrap value be 10% to the cost of building structure.

Scrap value = 10% cost of building structure = $0\cdot10\times40,000=$ Rs. 4000/-

$\therefore$ The total amount of sinking fund to be accumulated = $40,000-4,000=$ Rs. 36,000/-

Annual sinking fund for re-equipment of Rs. 36,000 in 20 years.

$$I=\frac{Si}{(1+i)^n-1}=\frac{36,000\times0\cdot04}{(1+0\cdot04)^{20}-1}=36,000\times0\cdot0336=\text{Rs. }1,209\cdot60$$

$\therefore$ Annual instalment for sinking fund for a period of 20 years = Rs. 1,209·60.

Q-1 The dimensions of a RCC slab is 4.00 m × 5.00 m × 12 cm deep. Reinforcement of 12 mm dia rods are placed in short span @ 15 cm c/c of the total number of rods, 16 numbers have been cranked and hooked at the ends. Other rods are straight and hooked at the ends. The 12 mm dia rod weigh 0.89 kg per meter. To hold the cranked portion 4 numbers 10 mm dia straight and hooked rods have been used. The 10 mm dia rods are placed in a direction of long span @ 20 cm c/c and all are straight and hooked at ends. The 10 mm dia rods weigh 0.62 kg/m. The covers are 1.8 cm at the bottom and 2.5 cm on all sides. Assume any other dimension not given. Estimate the total weight of steel required for reinforcement of the slab.

Ans. Total length of bent-up bar = 15 × 5.411 = 81.165 m

Total length of main bar = straight bar + bentup bar

= 85.056 + 81.165

= 166.221 m

Weight of steel required = 166.221 × 0.89

= 147.93 kg

For distributory bar

Length of central position = Total length of bent-ip bar – 2 × bent up section

$$= 4.1 - 2 \times \left(\frac{4.1}{4}\right) = 2.05 \text{ m}$$

No. of bar = 4 nos for covering the actual direction.

Length of each bar = h + 18n

= 4.1 + 18 × 0.01

= 4.28 m

Total length of central portion = 8 × 4.28 = 34.24m

For bentup portion

	No	length of inch	total length
bottom	(2 × 2)	4.28	17.12
Top	(2 × 2)	4.28	12.12

Total weight of distributor bar

= 34.24 × 0.62 = 21.23 kg

2. Calculate the quantity of earthwork for a portion of the proposed road from the following data:

Chainage	15	16	18	19	200	21	22	23
RI of ground	100.5	101.0	101.2	102.9 100.8	101.4	100.8	101.0	101.0
RL of formation	100.0		UPWARD GRADIENT 1 : 200 $\longrightarrow$					

Distance between two consecutive chainages = 40 m
Formation width = 10 m
Side slope (Bank) = 1 : 2
Side slope (Cut) = 1 : 1.5.

Ans.

Chainage	15	16	13	18	20	21	22	23
R.L of ground level	100.5	101.0	101.2	102.9 100.8	101.4	100.8	101.0	101.0
R.h of formation	100	100.2	100.4	100.6	100.8	101.0	101.2	101.4
Depth	0.5	0.3	0.8	0.2	0.6	0.2	0.2	0.4

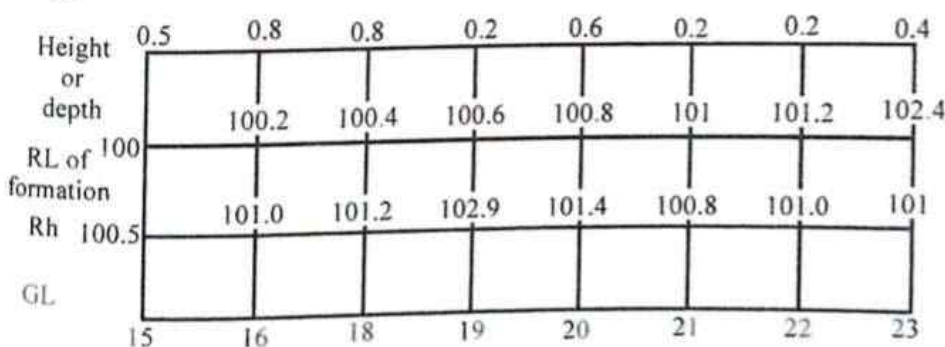| Chainage	Length	d	d_m	Area of control point	Area of side	Length between consucutive chainage	Volume of fitting or cutting	Total area
15	40	−0.5	−0	0	0	40	0	0
16	80	−0.8	0.65	6.5	71.55	40	3122	78.05
18	120	−0.8	0.8	8.0	71.55	40	3182	79.55
19	160	−0.2	0.5	5.0	17.88	40	9182	22.88
20	200	−0.6	0.4	4.0	53.66	40	2306	57.66
21	240	0.2	0.4	4.0	17.88	40	875.2	21.88
22	280	0.2	0.2	2.0	17.88	40	795.2	19.88
23	320	0.4	0.3	3.0	35.77	40	1550.8	38.77

O/P of filling

Area of central portion = B × d_m
Area of side slope = $21 \times d_m \times \sqrt{5^2 \times 1^2}$

$S = \dfrac{1}{2} = 0.5$ for cutting

$S = \dfrac{1}{1.5} = 0.67$ for filling

Height or depth	0.5	0.8	0.8	0.2	0.6	0.2	0.2	0.4
		100.2	100.4	100.6	100.8	101	101.2	102.4
RL of formation	100							
Rh	100.5	101.0	101.2	102.9	101.4	100.8	101.0	101
GL	15	16	18	19	20	21	22	23

3. Estimation the items involved for construction of a WBM road from the following data :

Length of road = 150 m.

Formation width = 10 m.

Metalled width = 8 m.

Thickness of grade-I metal soaling = 90 mm

Wearing coat of grade-II metal

= 12 cm thick loose and 8 cm thick compacted

Surface to be finished with 2 coats of bitumen as given below :

First finishing coat = 12 mm chips @ 0.020 m^3 and bitumen @ 1.24 kg per m^2 of road surface.

Second finishing coat = 6 mm chips @ 0.02 m^3 and bitumen @ 1.24 kg per m^2 of road surface.

Consumption of fuel @ 0.45 kg per kg of bitumen.

Ans. Length of the road = 150m

Formation width = 10 m

Metalled width = 8m

$\Rightarrow$ area of road surface – 8 × 100 = 800 square meter.

Thickness of grade-1 metal soaling = 90mm = 0.09 m.

$\Rightarrow$ Quantity required = 8 × 0.09 × 100 = 72 cum

Thickness of grade-II metal 12 cm loose consolidated to 8cm thick compacted.

$\Rightarrow$ Quantity required = 8 × 0.12 = 0.96 cum

1st coat of finishing = 12 mm size

chip @ 0.020 m^3 per square meter.

$\Rightarrow$ For 800 square meter, chips required

= 800 × 0.020 = 16 cum

Bitumen required = @ 1.24 kj/m^2 are of road surface = 800 × 1.24 kg = 992 kg.

2nd coat finishing 6mm chips @ 0.02m^3 / square meter of road suface quantity required

= 800 × 0.02 = 16 cum.

Bitumen required = @ 1.24 kg/m^2 of road surface = 800 × 1.24 = 992 kg.

For 1st coat and 2nd coat bitumen required

= 992 + 992 = 1894 kg.

$\therefore$ Consumption of bitumen @ 0.45 kg

= 1984 × 0.45 = 892.8 kg. (Ans)

4. Prepare a quantity esimate for the following items of work of the slab culver (Fig.-1)

(a) Earthwork in excavation.

(b) Cement concrete in foundation.

(c) 1st class brickwork in cement mortal (1:4).

(d) Cement plastering over brickwork in cement mortar (1 : 3).

Ans.

Sl. No.	Particulras of Items	No.	Length in m.	Breadth in m.	Depth/Height in m.	Qty.	Explanatory Notes
(a)	Earthwork in Excavation						
	Syphon duct walls	1	8.3	2.7	2.8	62.75 m³	L = 8.0 + 2 × 0.15 = 8.3m
	Wing walls	4	1.3	1.0	2.8	14.56 m³	D = 103.30 – 100.80
							+ 0.3 = 2.8 m.
	Drop pits	2	3.0	2.25	2.8	37.80 m³	
						Total = 115.11 m³	
(b)	Cement Concrete in Foundation						
	Syphon duct walls	1	8.3	2.7	0.3	6.72 m³	
	Wing walls	4	1.3	1.0	0.3	1.56 m³	
	Drop pits	2	3.0	2.25	0.3	4.05 m³	
						Total = 12.33 m³	
(c)	1st class B.W. in C.M.(1:4)						
	Syphon duct walls	2	8.0	0.3	0.90	4.32 m³	
	Wing walls	4	1.3	0.7	0.60	2.18 m³	
		4	1.3	0.6	0.30	0.94 m³	
	Parappet walls	2	5.0	0.6	0.50	3.00 m³	
		2	5.0	0.5	0.60	3.00 m³	
		2	5.0	0.4	0.40	1.60 m³	
		2	5.0	0.3	0.20	0.60 m³	
	Parappet coping	2	5.1	0.4	0.10	0.41 m³	
	Drop pit walls	2 × 1	2.4	0.3	1.30	1.87 m³	L = 1.8 + 2 × 0.3 = 2.4 m
		2 5 2	1.8	0.3	1.30	2.18 m³	H=102.10 – 100.80=1.30
						Total = 20.73 m³	
(d)	Cement Plastering over Brick work in C.M.(1:3)						
	Duct wall inside	1	8.0	–	0.90	14.4 m²	
	Parappet wall inside top and outside	2	5.0	–	2.80	28.0 m²	H = 0.5 + 0.4 + 0.1
							+ 0.1 + 0.2 + 0.4 + 0.6
							+ 0.5 = 2.8 m.
	Deduction u/s side	2×2 $\frac{1}{2}$ × 0.6 × 0.6			–	(–)0.72 m²	
	earth slope						
	Drop pit inside wall	2	5.4	–	1.3	14.04 m²	L = 3 × 1.8 = 5.4 m.
	Drop pit top	2	6.0	0.3		– 3.60 m²	H = 102.1 – 100.8 = 1.3m.
	Ends of parappet	2 × 2	–	0.4	0.2	0.32 m²	
		2 × 2	–	0.3	0.3	0.36 m²	
						Total = 60.00 m²	