

Estimation and Valuation

Number, length, breadth, height and quantity

What is the first stage of construction?

1. Preparation of estimate
2. Survey of the site
3. Initiation of proposal
4. Allotment of funds

Estimation

Calculation of quantities of various item of work and expenses to be incurred on a particular work.

- Probable/ tentative cost.
- Before the start of work.

Actual cost: - Real cost of project after the completion of work.

It is taken from the account book.

$$\checkmark \text{ Actual cost} = \text{Estimated cost} + \text{or} - 10\%$$

Objective: -

- If the estimated cost of a project is Rs. 1,00,000/-, what will be probable actual cost
1. Rs. 1,00,000
 2. Rs. 90,000
 3. Rs. 1,10,000
 4. All of the Above

Objectives: -

- Estimate is
 - a) calculation of quantity
 - b) calculation of cost
 - c) rough or detailed estimate
 - d) all of the above

Answer: - d

- The main objective of the estimating is
 - a) to find the probable cost of the work
 - b) to find the quantity of various materials and labor.
 - c) to find the time of completion of the work
 - d) to help the checking the work done by the contractor

Answer: - a

- Estimate is
 - a) the actual cost of construction of a structure
 - b) the probable cost arrived at before commencement of the structure
 - c) a random guess of the cost of the structure
 - d) none of the above
- Answer: - b

Actual Cost

- The actual cost of structure is obtained
 - a. After design
 - b. After estimate
 - c. After detail drawing.
 - d. Only after completion of work.

Answer: -d

- Estimation is useful for
 - a. Investor
 - b. Contractor/ government.
 - c. Engineer
 - d. All of the above

Answer: - d

- Necessary element of estimate are
 - a. Drawing
 - b. Specification
 - c. Rates
 - d. All of the above.

Answer: - d

Data required for estimating

1. Drawings: - Fully dimensioned drawing to scale.

- Plan
- Elevation & Sections.

2. Schedules of rate: - Government approved rates is essential.

3. Specifications: - General and Detail specification.

Objective: -

To make an estimate for work, the necessary requirements are

1. Drawings and specification
2. Drawings, specification and rates
3. Drawings and rate
4. Rate and specification

Answer: - 2

Work value: - estimated value of work excluding the amount for contingencies, work charge establishment, tool and equipment.

If included, called estimated cost.

	rm	80.00	5,711.82	456,945.60
	hr	15.00	1,000.00	15,000.00
Sub Total				488,345.60
	Work Value		Total	67,604,157.64
		VAT @ 13 %		8,788,540.49
		Contingencies@4 %		2,704,166.31
		Social safeguard@2.5%		1,690,103.94
		Physical contingencies@10%		6,760,415.76
			Grand Total	87,547,384.15
	Estimated Cost		Per Km. Cost	10,032,934.24

Specification

- A specification is a specific description of a particular work.
- It is very important for the execution of the work.
- The cost of the work depends upon the specifications.
- Specification should be clear and there should not be any ambiguity anywhere about the drawings of a structure arrangement of the room, various parts and the dimensions.
- Drawings do not furnish the details of different items of work, quantity of materials, proportion mortar and workmanship, which are described in specification.
- Specification don't include *dimension*.
- Part of contract document.

Objective: -

- Anu father, for her marriage, publish in a marriage magazine, "To marry with my daughter, the candidate must take coaching class in APEX". It's an example of.....
 1. Specification
 2. Tender
 3. Contract
 4. None of the above

Answer: -1

General Specification

- In general specifications, nature and class of works and names of materials that should be used in the various items of works are described.
- Only a brief description of each and every item is given.
- General specification give the general idea of whole work
- It is useful for estimating the project.
- Without going through the lengthy detailed specifications, general information for the proportion of the materials, nature and class of work can be known from the general specifications, but they do not form part of the contract document.

Example:-

1. General Specifications of a First Class Building

Foundation and plinth—Foundation and plinth shall be of I-class brickwork in lime mortar or 1 : 6 cement mortar over lime concrete or 1 : 4 : 8 cement concrete.

Damp proof course—D.P.C. shall be 2.5 cm (1") thick cement concrete 1:1½:3, mixed with one kg of Impermo per bag of cement or other standard water proofing materials as specified and painted with two coats of bitumen.

Superstructure—Superstructure shall be of I-class brickwork with lime mortar or 1 : 6 cement mortar. Lintels over doors and windows shall be of R.C.C.

Roofing—Roof shall be of R.C.C. slab with an insulation layer and lime concrete terracing above, supported over R.S. Joists or R.C.C. beams as required. Height of rooms shall not be less than 3.7 m (12 feet).

Flooring—Drawing room and dining room floors shall be of mosaic (terrazzo). Bathroom and W.C. floors and dado shall be of mosaic (terrazzo). Floors of bedrooms shall be coloured and polished of 2.5 cm (1") cement concrete over 7.5 cm (3") lime concrete. Floors of others shall be of 2.5 cm (1") cement concrete over 7.5 cm (3") lime concrete polished.

Finishing—Inside and outside walls shall be of 12 mm (½") cement lime plastered 1 : 1 : 6. Drawing, dining and bedrooms—inside shall be distempered, and others—inside white washed 3 coats. Outside shall be coloured snowcem washed two coats over one coat of white wash.

Doors and windows—Chaukhats shall be seasoned teak wood. Shutters shall be teak wood 4.3 cm (1¾") thick panelled glazed or partly panelled and partly glazed as required, with additional wire gauge shutters. All fittings shall be of brass. Doors and windows shall be varnished or painted two coats with high class enamel paint over one coat of priming. Windows shall be provided with iron gratings or grills.

Miscellaneous—Rain water pipes of cast iron or of asbestos cement shall be provided and finished painted. Building shall be provided with 1st class Sanitary and Water fittings and Electrical installations. 1 metre wide 7.5 cm thick C.C. 1 : 3 : 6 apron shall be provided all round the building.

Detail Specification

- Detail specification form a part of contract document.
- It specifies the qualities, quantities and proportion of material and the method of preparation and execution for a particular item of work.
- Detail specification of different items of work is prepared separately and they describe what the work should be and how they shall be executed and constructed.
- While writing the detailed specifications the same order of sequence as the work is to be carried out is maintained.

Objective: -

- Detail specification for an item of PCC (1:2:4) should include
 1. Quantity of material, cost of different materials and work condition.
 2. General specification, material to be used, quality and proportion, construction method and mode of measurement and payment.
 3. Work condition at site, labor requirement and site.
 4. All of the above.

Answer: - 2

Example:-

13-18. **First class Brickwork**—(a) *Materials* : (1) Brick shall be first class of standard specifications, regular in shape and size with sharp edges. They shall be of uniform deep red cherry or copper colour, free from cracks, chips, flows and lumps of any kind. Dry bricks shall not absorb more than one-sixth of their weight when immersed in water for one hour. Brick shall have a minimum crushing strength of 105 kg per sq cm. (2) For cement mortar, cement shall be fresh portland cement of standard quality. Sand shall be medium coarse, clean, sharp and free from clay, mica or other organic matter. (3) For lime mortar, lime shall be slaked and fresh stone lime screened at work site conforming its standard specification. Surkhi shall be made from first class brick having uniform colour and free from admixture of foreign matter.

(b) *Mortar* : The brickwork shall be done with the specified mortar (cement or lime) mixing the ingredients in the specified proportion. Sand shall be measured on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitable to allow for bulkage. Materials of mortar shall be first mixed dry till of uniform colour on a solid clean water tight platform and then mixed wet at least three times by adding water gradually and evenly.

(c) *Bricks before laying* : All bricks shall be thoroughly soaked in water by submerging them in clean water for at least four hours just before use. The wetted bricks shall be staked on a clean platform of wooden planks to avoid any contact with mud.

Example:-

(d) *Laying* : The brick shall be of English bond unless specially mentioned. The brickwork shall be true to line, plumb and solid through with joints not exceeding 6mm in thickness for cement mortar and 10 mm for lime mortar. Each coarse of brick shall be laid quite levelled and perfect in bond well beded with frogs upward and flushed in sound mortar. No bats shall be permitted except where absolutely required for obtaining the specified bond or dimensions of different courses. Brickwork shall be carried out together so as to maintain, as far as possible, uniform height of not more than 1 m at a time. All mortar joints on the surfaces of walls shall be raked to a depth of 12mm in case where the walls are to be plastered while the mortar is green and left clean and free from all loose or adherent mortar by brushing. Mortar of the proper consistency only shall be delivered on the work and subsequent thinning with water if required shall be provided. Very thick or thin mortar shall be remixed. Only fresh mortar within $\frac{1}{2}$ hour for cement and 24 hours for lime mortar from the time of adding water shall be used and no old or stale mortar be allowed in brick joints even remixed. During rains no brickwork shall be carried out unless special arrangements are made to protect the brickwork from rains for 24 hours according to the direction of the Engineer-in charge.

(e)* *Curing* :—The brickwork shall be protected from rain or sun while it is green. The brickwork shall be kept wet on all the faces for at least 10 days during construction. At the end of day's work troughs shall be formed on the tops of walls by weak cement mortar or by mud edging to a depth of 2·5 cm minimum and be kept flooded with water.

Example:-

(f) *Scaffolding* :—In all first class building work, double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together by horizontal pieces, over which scaffolding planks shall be fixed. For other classes of work single scaffolding may be allowed.

Objective

The information which cannot be included in drawings is conveyed to the estimator through

- a. Specifications
- b. Cover note
- c. Progress chart
- d. None of the above

Answer: - a

Specification of work is required only when the work is carried out by:

- a. Muster roll (Used for keeping record to pay the labor engaged on daily wages)
- b. User committee
- c. Contractor
- d. All of the above

Answer: - d

- The specification..... are given in detailed estimate.
 - 1. General specification.
 - 2. Detailed specification
 - 3. Approximate cost.
 - 4. None of these.

Answer : -1

Objective

- Quantity and type of material to be used in construction site is given in
 - 1. Estimated Drawings
 - 2. Specifications
 - 3. Valuation sheet
 - 4. None of the above

Answer: - 2

- For the estimation of masonry work and excavation work, accuracy required for measurement of length compared to breadth and width is
 - 1. Less
 - 2. More
 - 3. Equal
 - 4. Independent

Answer : - 1

Bill of Quantity (BOQ):-

- Statement showing item number, description of work, quantity but not units of rate.
- Prepared by quantity surveyors.
- Prepared in tabular form where rate and amount column are left blank, which is filled by contractor.
Unit rate of item is written in figure (number) and words (alphabets).

Item no.	Description of Item	Quantity	Unit	Rate (NRs.)		Amount(NRs.)
				In Figure	In Words	
1.00	<u>SITE CLEARANCE</u>					
1.01	Clearing & grubbing of site for construction as per drawings, specifications and instruction of site engineer.	285.00	Sq.m.	[REDACTED]	[REDACTED]	[REDACTED]
1.02	Building lay out for construction as per drawings, specifications and instruction of site engineer.	145.00	Sq.m.	[REDACTED]	[REDACTED]	[REDACTED]
2.00	<u>EARTHWORKS</u>					-
2.01	Earthwork in excavation in trenches, foundation etc. in all kinds of soil including timbering and pumping out water from the basement (if necessary) dressing of sides, ramming of bottom, lift upto 8m and stacking of excavated materials at least 30m lead	100.00	Cu.m.	[REDACTED]	[REDACTED]	[REDACTED]

An unpriced bill of quantities (sometimes referred to as the tender pricing document) is issued to tenderers, who will then estimate their price for each item. This priced bill of quantities constitutes the tenderer's complete offer. It is the unpriced bill of quantities, but with the tenderer's rates, costs and totals added.

Contd...

BOQ is prepared based on

- a. Actual construction quantities
- b. Estimated quantities
- c. Variation in estimated quantities
- d. None of these.

Answer: - b

- Working out the exact quantity of various item of work is known as
 - a. Estimating
 - b. Mensuration
 - c. Quantity surveying
 - d. Valuation.

Answer: - Quantity Survey

Bill of quantity:-

- BOQ contains
- a. Description of work.
- b. Quantities of work.
- c. Rate of items.
- d. All of the above

Answer: - d

- Rate column of BOQ is filled by
- a. Client
- b. Contractor
- c. Client's Engineer
- d. None of the above

Answer: - b

- BOQ is prepared by
- a. Quantity surveyor
- b. Vendor
- c. Geodetic Engineer
- d. Supplier

Answer: - a

Schedule of Rate:-

- Documents containing detailed description of all item of work together with their estimated rate but not mentioning their quantity.

Line No.	Description	Unit	Unit Rate
17	PCC 1:2:4 FOR COPING: Providing and laying 60 mm average thickness coping in CC 1:2:4 mix using 6 to 12 mm stone aggregate with 40 mm projection on either side of wall with drip mould. Rate to include 20 mm thick plaster in CM 1:4 for fixing of glass pieces including mixing, providing necessary shuttering, compaction and curing. Thickness of coping at the ends shall be 40 mm and 80 mm at centre.	CUM	3100
18	PCC 1:2:4 FOR GROUTING ANGLE: Providing and laying PCC 1:2:4 mix using 20 mm to 12 mm stone aggregate including mixing, providing necessary shuttering, compaction and curing.	CUM	3500

- Objective

A document containing detailed description of all items of work (but their quantities are not mentioned) together with their current rates is called

1. Tender
2. Schedules of Rate or price BOQ
3. Analysis of rate
4. Valuation

Answer: - 2

Schedule of rate

1. Earthwork in excavation of foundation trenches or drains, in ordinary soil including removing the soil within a lead of 75m and including levelling dressing and ramming the bottom, bailing out water etc.	
(a) Depth of excavation not exceeding 1·5m	300·00 cu m
(b) Depth of excavation for additional depth beyond 1·5m and upto 3 0m but not requiring shoring	340·00 "
2. Earthwork in filling in foundation trenches or plinth	245·00 "
3. Sand filling in foundation trenches or plinth including cost of sand	3700·00 "
4. Cinder filling in foundation, compound or plinth (obtained a lead of 10km)	3600·00 "
5. Hire and labour charges for shoring work (a) depth upto 2·0m (b) depth beyond 2m & upto 3m	13·00 " 16·50 "

Schedule of Quantity:-

- List of quantity of various item of work required for construction.
- **Also called quantity survey.**

Sl No.	Description of Item	Qty.	Unit	Rate	Amount
1.	Providing & laying cement concrete of specified grade excluding cost of centering and shuttering – all work upto plinth level in 1:4:8 (1 cement : 4 coarse sand : 8 graded stone agg. 40 mm nominal size)	74.00	Cum.		
2.	Providing & laying cement concrete of specified grade excluding cost of centering and shuttering – all work upto plinth level in 1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone agg. 20 mm nominal size)	110.00	Cum.		
3.	Centering and shuttering including strutting, propping etc. and removal of form for Foundations, footings, bases of columns etc. for mass concrete.	96.00	Sq. m.		

Method of calculating Quantities

Out to out and in to in method or long wall or short wall method:-

- In this method, the longer walls in a building are considered as long walls and measured from out to out: and shorter or partition walls , in a perpendicular direction of the long walls, are considered as short walls and measured from in to in for a particular layer of work. These length of long and short walls are multiplies separately by the breadth and height of the corresponding layer and are added to get quantity.
- Length of long wall= center to center length+ half breadth at each end.
- Length of short wall= center to center length- half breadth at each end.
- Suitable to unsymmetrical building.
- Less chance of mistake and suitable for complicated building.
- Accurate Method

Method of calculating Quantities

Center Line method:-

- In this method, calculate the total center line length of walls in a building and multiply the same by the breadth and depth of the respective item to get the total quantity.
- Quick method and easiest method as compared to other method.
- Suitable to calculate quantity of circular, hexagonal, octagonal shaped building.
- Only in the case of an unsymmetrical wall which is generally rare, no advantages may be claimed by this method.
- More chance of mistake.
- Suitable for walls having same width.

Objective: -

- Which method is easiest for the estimation of the quantity of material?
 1. Center line method
 2. Long and short wall method
 3. Both a and b
 4. none

Method of calculating Quantities

Crossing Method: -

- In this method calculate the overall perimeter of the building and subtract from this *four times* the thickness of wall to obtain the center line length.
- This method is now rarely use.

Objective: -

- Centerline method for estimation is suitable for
 1. Building having large number of cross wall.
 2. Building having large number of junctions.
 3. Walls having different width.
 4. Walls having same width.

Answer: - 4

Method of calculating quantities (Objectives)

- In the long and short wall method, the length of long wall is the c/c distance between the walls and
 - a. Breadth of wall
 - b. Half breadth of wall in each side
 - c. One forth breadth of wall in each side.
 - d. None of these

Answer: - b

- Deduction at T-junction of the wall for total length of center line is
 - a. Half the wall thickness
 - b. No deduction
 - c. Thickness of wall
 - d. Twice the thickness of wall

Answer: - a

Method of calculating quantities (Objectives)

- In center line method of working out volumes, for cross walls, what deductions must be made from center line at each junction?
 - a. Twice of wall thickness
 - b. Breadth
 - c. 1.5 breadth
 - d. Half of the width

Answer: - d

- Which of following method is more accurate in preparing quantity estimate of building
 - a. Center line method
 - b. Plinth area method
 - c. Long wall and short wall method
 - d. Crossing method

Answer: - c

Method of calculating quantities (Objectives)

- Deduction for total length of the center line at the corner where two walls meets is
 - 1. Half of the thickness of wall
 - 2. No deduction
 - 3. Thickness of wall
 - 4. Twice of the thickness of wall

Answer: -2

- Centerline method is used for calculating
 - 1. Building
 - 2. Culvert
 - 3. Well
 - 4. All o the above

Answer: - 4

- Centerline method of estimation is mostly used for
 - 1. Culvert works
 - 2. Building works
 - 3. Bridge works
 - 4. All of the above

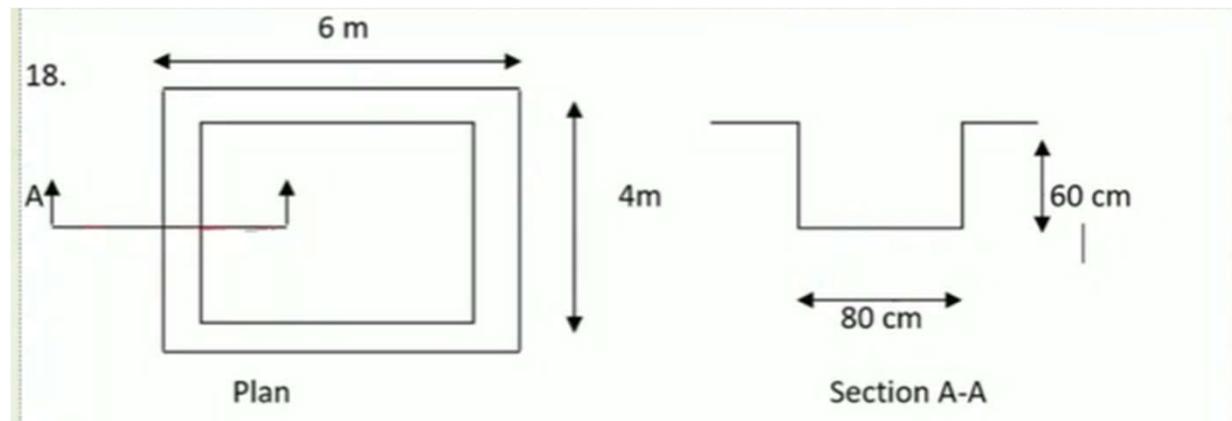
Answer: - 2.

Method of calculating quantities (Objectives)

- Quantity of excavation of foundation trench

- 6.528
- 8.064
- 8.832
- 9.600.

Answer :- 5



- Centerline method is suitable for
- Building having large number of cross wall.
 - Building having large number of junctions.
 - Walls having different widths.
 - Walls having same width.

Answer: - 4

(Objectives)

- A wall of width 300 mm contains two T junctions. The height of wall is 3m and total length of the center line is 150m. Calculate the quantity of the B/W using centerline method.

1. 134.46
2. 134.73
3. 134.86
4. 135

Hint: - (Centerline length – 2*half of wall thickness)*breadth* height

Answer: - $(150 - (2 * 0.15)) * 0.3 * 3 = 134.73$

- Which of the following is the correct statement for length of the long wall as one move from E/W to B/W in superstructure in long wall and short wall method.

1. It decreases.
2. Its value depend upon the length of wall.
3. Its value increases
4. Its value remain same.

Answer: - 1

Hint: - length of long wall = C/L length + wall thickness (as it move fro E/W to superstructure, length decreases)

Note: - length of short wall as move from E/W to B/W IN SUPERSTRUCTURE its value increases.

Objectives on Plinth area.

- The plan area of building is in the form of rect. With centerline dimension of outer wall as 9.7 m X 14.7m. The thickness of wall is 0.30m. The PA is

1. 150 sq. m
2. 145 sq. m
3. 145.5 sq. m
4. 135.36 sq. m

Answer: - 1.

- The plan area of building is in the form of rect. With centerline dimension of outer wall as 9.7 m X 14.7m. The thickness of wall is 0.30m. The CA is

1. 150 sq. m
2. 145 sq. m
3. 145.5 sq. m
4. 135.36 sq. m

Answer: - 4

Principle unit of measurement

1. Mass, voluminous and thick works shall be measured in m^3
2. Thin, shallow and surface work shall be taken in m^2 .
3. Long and thin works shall be taken in running meter (rm).
4. Piece work or job work shall be taken in number.

Objective: -

- Same type of work under different conditions and nature shall be measured
1. Under same item.
 2. Separately under the same item.
 3. Separately under separate item.
 4. None of the above.

Answer: - 3

Take example of plaster in outside and inside.

For E/W excavation under water, the rate is increased by 20%.

Item no	Description of work	Unit of measurement	Unit of payment
1	Earthwork a. E/W in excavation. b. E/W in filling and cutting. c. Surface excavation (30cm) and surface dressing (15cm), leveling, cleaning etc. d. Hire and labor charge for shoring. e. <u>Puddling</u> . f. Rock excavation. g. Sand filling h. Earthwork in plinth. i. Preparation and repair of side <u>berm</u>	m^3 m^3 m^2 m^2 m^3 m^3 m^3 m^3 m^3 Per km	

- Side Sloping Surface

Objective: -

- Brickwork is measured in
1. Cu.m
 2. Sq.m
 3. Rm
 4. 10 sq.m



$$\text{Area of Sloping on One Side} = L \times d \sqrt{S^2 + 1}$$

$$\text{Area of Sloping on Both Side} = 2 L \times d \sqrt{S^2 + 1}$$

	<p>Brickwork</p> <ul style="list-style-type: none"> a. Brickwork (with lime and mortar) of one or more than one brick wall b. Brickwork in arches.(work turn is least) c. Reinforced B/W. d. Honey comb B/W e. 10cm or half brick walls with lime or cement mortar f. Flat brick soling (one or two layer) g. B/W in foundation h. B/W in superstructure. i. Brick arch work j. Fair faced B/W. k. First class B/W in mud mortar in foundation and plinth. l. Moulding, Cornices, string courses, drip course (pani patti). m. B/W in coping. n. Broken Glass Coping o. Beading in door and window frame. p. Brick edging. q. Brick on edging r. Cutting holes through existing B/W. s. Sundried B/W. t. Jack arch roofing including top finishing. u. B/W in jack arches, if measured separately v. B/W in well steining 	m^3 m^3 m^3 m^2 m^2 m^2 m^3 m^3 m^3 m^3 m^3 rm rm rm rm rm rm $Per\ cm$ m^3 m^2 m^3 m^3
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3.	Concrete works a. Lime or cement concrete in foundation. b. RCC work (beam, slab, lintel etc.) c. DPC (thickness is 2 to 4cm, provided at plinth) d. R.C <u>chajja</u> . e. Precast C.C or R.C.C blocks - Block construction exceeding 10cm on bed - Not exceeding 10cm f. Hollow concrete block wall g. Expansion and contraction joint. h. Concrete <u>jaffries</u> and sunshade. i. Concrete fencing posts j. PCC in foundation. k. 50mm thick PCC. l. Cement concrete bed.	m^3 m^3 m^2 m^3 m^3 m^2 rm m^2 m^3 m^3 m^2 m^3
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5.	<p>Wood works</p> <ul style="list-style-type: none"> a. Door and window shutter b. Door and window frame c. Form work d. Scantlings, <u>batterns</u>, trusses etc. e. Handrail f. Wooden false ceiling g. Lintel over opening h. Striking i. <u>Ballies</u> (Stick) j. Wooden pile k. Wooden partition l. Beadings. m. Balusters. n. Newel post <p>Note: - Conceal face of <u>chaukhat</u> shall be painted with two coat of coal tar or <u>solignum</u> and other face is painted with prime coat. (Dutta, P#584)</p>	m^2 m^3 m^2 m^3 <u>rm</u> m^2 m^3 m^2 <u>rm</u> <u>rm</u> m^2 <u>Rm</u> <u>Rm</u>
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Unit of measurement for payment of door and window

1. Cu.m
2. Meter
3. Sq.m
4. None of these

Answer: - 3

Contd...

4.	Steel and iron works. <ul style="list-style-type: none"> a. Steel reinforcement on RCC works b. Steel truss and purlins c. Welding and soldering of plates & sheet <i>(Welding of rails, steel, trusses and rod in per no).</i> d. Steeling reinforcement including binding wire. e. M.S grill f. Rolling, collapsible & main gate shutter g. Wire fencing h. Expanded metal, wire netting etc. i. Lightening conductors. j. Bending, Binding of steel reinforcement k. Hoop iron l. Boring hole in iron. m. Cutting of Iron joist and channels n. Cutting angles, tees and plate o. Threading in iron. p. Measurement of AC sheet q. Measurement of GI sheet r. Rivets, bolts and nuts, anchor bolts, <u>lewis</u> bolts, holding down bolts. s. Fabric reinforcement. t. Cast iron <u>balsuters</u> and <u>newals</u> post 	MT Quintal Per cm Quintal Kg m^2 rm m^2 Rm Quintal Rm No. Cm Sq.cm Cm m^2 m^2 Quintal m^2 No.
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6.	Finishing		
	a. Plastering	m^2	
	b. Pointing	m^2	
	c. Painting works in door, grill, roof, grating etc.	m^2	
	d. Painting on eaves, gutters, rainwater and ventilation pipe	rm	
	e. Painting letter and figures	No.	
	f. Lime concrete roof terracing	m^2	
	g. Plastering band up to 30cm	Rm	
	h. White washing, color washing, cement washing, distempering, snow cement washing, varnishing.	m^2	
	i. Oiling and cleaning of door and window.	m^2	
	j. Coal tarring.	m^2	
	k. Removing of paint and varnish.	m^2	

Objective

- Calculate the cost of plastering for a wall of 4m long, 3.5 m high and 12.5mm thick, if the rate of plastering is Rs. 12 per sq. m.
 1. Rs. 100
 2. Rs. 168
 3. Rs. 336
 4. Rs. 423

Objectives

- The plastering is done on compound wall at the rate of Rs. 50 per sq.m and the length, breadth and height of compound wall are 5m,0.3 and 2m. The total cost of plastering.

1. Rs. 500
2. Rs.1000
3. Rs. 1500
4. Rs. 2000

Answer: - Rs. 1000

Hint: - $(l \times h \times \text{no.of sides} \times \text{rate}) = 5 \times 2 \times 2 \times 50 = \text{Rs. } 1000$

- Calculate the area of form work required for a beam of 2m span and cross section of 0.4m*0.2m.

1. 0.8
2. 1.2
3. 0.16
4. 2

Answer: - 2

Hint: - $(2 \times 0.4) + (2 \times 0.4) + (2 \times 0.2) = 2$

Contd...

6.	Finishing a. Plastering b. Pointing c. Painting works in door, grill, roof, grating etc. d. Painting on eaves, gutters, rainwater and ventilation pipe e. Painting letter and figures f. Lime concrete roof terracing g. Plastering band up to 30cm h. White washing, color washing, cement washing, distempering, snow cement washing, varnishing. i. Oiling and cleaning of door and window. j. Coal tarring. k. Removing of paint and varnish.	m^2 m^2 m^2 rm No. m^2 Rm m^2 m^2 m^2	
----	---	--	--

Objectives: -

- The total cost of painting the inner curve surface of a cylindrical tank having internal radius equal to 3.0 m & height 10m at the rate of Rs. 10 per sq.m.

1. Rs. 4400
2. Rs. 2000
3. Rs. 2200
4. Rs. 4000

Answer: - 3

Hint:- $2\pi r h \times \text{rate}$

Contd...

7.	<p>Flooring works</p> <ul style="list-style-type: none">a. Brick on edge or brick flat flooringb. Lime or cement concrete floors or paving. (note:- if thickness exceed 20cm, it shall be measured as work on foundation)c. Terrazzo or mosaic flooringd. Tile flooringe. Skirting<ul style="list-style-type: none">o Less than 30 cmo Greater than 30cmf. Interlocking block flooringg. Artificial stone to floor, dado, staircase etch. Stone slab flooringi. Tile flooring	<p>m^2</p> <p>m^2</p> <p>m^2</p> <p>m^2</p> <p>rm</p> <p>m^2</p> <p>m^2</p> <p>m^2</p> <p>m^2</p>	
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Contd...

8. Miscellaneous works <ul style="list-style-type: none"> a. Rain water pipe gutter, vent waste pipe etc b. Iron bracket for gutter c. Surface drain small d. Surface drain large (item wise) <ul style="list-style-type: none"> ✓ Masonry ✓ Plastering e. Sanitary fittings f. Glass panes (supply) g. Fixing glass panel or cleaning h. Door handle i. Door and window Bolts j. Cutting of tree 	Rm quintal rm cu.m sq.m No. m^2 No. No. No. No.
--	---

Objective:-

- The quantity of stone grit required for tar and bitumen road should be measured in
 1. Cum per sq.m
 2. Kg per sq.m
 3. Kg per cum
 4. Quintal per sq.m

Answer: -1

Contd...

o. Scaffolding	m^2
p. Blasting	Kg
q. Silt clearance in irrigation canal (for thin layer up to 5cm, may be on <i>area basis</i>)	m^3
r. Grouting (Bituminous grouting of road metal, cement grouting of concrete)	m^2
s. Grouting of crack, joints etc.	Rm
t. Bituminous road surfacing.	m^2
u. Dismantling of B/W.	m^3
v. Pargetting chimney.	Rm
w. Holdfast.	Quintal
x. Barbed wire fencing.	Rm
y. Glazing.	m^2
z. Insulated cable	Rm
aa. Bare cable	Kg or Quintal
bb. Sheet piles	m^2
cc. Electric wiring or electrification light, fan, plug points	Point
dd. Pitching of stone, <u>kankar</u> etc.	m^3
ee. Cribbing.	m^2
ff. Jail work.	m^2
gg. Preparation of subgrade or formation.	m^2
hh. Sub- base.	m^2
ii. Surface painting	m^2
jj. Tar and bitumen road.	m^2
kk. Premix carpet.	m^2
ll. Grouting (full or semi)	m^2
mm. <u>Sacrificing</u>	m^2
nn. Cement concrete road	m^3

Contd...

9.	<p>Supply of works</p> <ul style="list-style-type: none">a. Supply of brickb. Supply of sanitary fittingsc. Supply of ordinary cementd. Supply of sand, aggregatee. Supply of paintsf. Supply of electric wireg. Supply of glass panelh. Supply of GI sheeti. Supply of AC sheetj. Supply of bitumen, coal and Tark. Supply of Timberl. Supply of stiff paint.m. Supply of slaked and un-slaked lime.	<p>No. No. <u>bags.</u> <u>m³</u> <u>Ltr.</u> Per m <u>m²</u> Quintal <u>m²</u> Ton <u>m³</u> Kg Quintal.</p>
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Contd...

10.	Stone masonry works a. Stone work in Wall facing, wall lining etc. b. Dressed stone in <u>chujja</u> , shelves, stone sunshade and stone slab. c. Stone masonry. d. Cut stone work in jail e. Dressed stone work in sills, steps, column, coping lintel f. Cut stone in lintel, beam. g. Blasting of rock (<i>Blasted stone stacked and then measured</i>) h. Boulder work or stone soling. i. Dressing of stone	m^2 m^2 m^3 m^2 m^3 m^3 m^3 m^3 m^2
-----	--	---

- Estimate for electrical wiring is prepared on the basis of
 1. Voltage
 2. Number of point
 3. Number of appliances
 4. Power

Contd...

Method of measurement

1. Dimensions shall be measured to the nearest **0.01** meter.
2. Area shall be measured to the nearest **0.01** sq. meter.
3. Volume shall be measured to the nearest **0.01** cu. meter.
4. Wt. shall be measured to the nearest about **1kg**.
5. Each pane of glass is measure nearest to **0.5 cm**.
6. Length of wooden frame for window and door is measure nearest to 2 cm and width and thickness to the nearest **2 mm**.
7. Sectional dimension of different R.C.C member shall be taken nearest to **0.5 cm**.
8. Steel work = 1mm.
9. Reinforcement = 5mm.

Objective

- Reinforcement shall be measured nearest to
- | | |
|-----------|-----------|
| 1. 0.01m | 2. 0.001m |
| 3. 0.001m | 4. 0.005m |

Answer:- 4

Objectives

- In the detail estimate, the volume is worked out to the nearest
 - a. 0.001 m^3
 - b. 0.005 m^3
 - c. 0.01 m^3
 - d. 0.05 m^3

Answer: - c

AMERICAN WIRE GAUGE TO SQUARE MM CROSS SECTIONAL AREA CHART			
AWG	DIAMETER (IN)	DIAMETER (MM)	CROSS SECTIONAL AREA (MM ²)
0000	0.46	11.68	107.16
000	0.4096	10.40	84.97
00	0.3648	9.27	67.4
0	0.3249	8.25	53.46
1	0.2893	7.35	42.39
2	0.2576	6.54	33.61
3	0.2294	5.83	26.65
-	- - - - -	- - - - -	- - - - -

Rule for deductions:-

1. Plastering: - no deduction is made for opening less than 0.5 m^2 areas.
 - a. For area $0.5-3\text{ m}^2$, deduction is made for only one face. Usually outer face.
 - b. For area $> 3\text{ m}^2$, deduction shall be made for openings, jambs, soffits and sill are measured.
 - c. End of beam and rafters .

Objective :-

- What is the net quantity of plastering required for wall measuring 10.5 m length, 12m width and 12mm thick with an opening of $1.2\text{m} \times 1.0\text{m}$?

1. 126.00 sq.m
2. 124.80 sq.m
3. 132.43 sq.m
4. 155.50 sq.m

Answer: - 2.

Masonry work :-

- a. Opening of less than 0.1 m^2 areas.
 - b. Bearing of floor and roof slab.
 - c. Horn of door or window frame.
3. No deduction is made for volume occupied by reinforcement in concrete.
 4. In case of expanded metal, wire netting etc. opening less than 0.2 m^2 are not deducted.
 5. Ceiling: - opening less than 0.4 m^2 are not deducted.
 6. Form work: - opening less than 0.4 m^2 are not deducted.
 7. Hollow concrete block: - No deduction is made on hole of concrete block.

Rule for deductions:-

Objective: -

- What is the net quantity of B/W OF THICKNESS 0.23 for a 10m³, having two openings of 1.2*2.1m and 0.9m*0.9m?
 1. 9.81 cu.m
 2. 0.63 cu.m
 3. 9.42 cu.m
 4. 9.23 cu.m

Hint: - $10 - (1.2 * 2.1 * 0.23) - (0.9 * 0.9 * 0.23) = 9.23$

Answer: - 4.

- In estimation of quality of plastering work, quantity of deduction for openings allowed for 0.5 m² is?
 1. No deduction is made for end of beams.
 2. Deduction is allowed for both faces of opening.
 3. Deduction is allowed for one face of the wall
 4. Deduction is allowed for both face of the wall.

Answer: - 3

Rule for deductions:-

Objective: -

- The covered area of a proposed building is 150 m² and it include a rear courtyard of 5m*4m. If the prevailing plinth area rate for similar building is Rs. 1250/m². what is its cost?
 1. 1,87,500/-
 2. 1,62,500/-
 3. 2,12,500/-
 4. 3,75,000/-

Answer: -2

Hint: - $(150 - (5 * 4)) * 1250 = 1,62,500/-$

Contingencies : -Incidental expenses of miscellaneous characteristics which cannot be classified under any distinct item sub-head. Physical contingencies=10% and price adjustment contingencies=10% Uncertain	3-5% of the estimated cost of project. 4% Adopted																
Work Charged Establishments: - Additional supervising staff engaged at work site.	1.5 to 2% of estimated cost.																
Overhead: - indirect cost of unproductive nature.	7.5 -10%																
<table border="1"> <thead> <tr> <th>General Overhead</th> <th>Job Overhead</th> </tr> </thead> <tbody> <tr> <td>Establishments (Office staff)</td> <td>Salary of engineer, supervisors Handling of materials</td> </tr> <tr> <td>Stationary, Printing</td> <td>Repair and depreciation of Tools and plants</td> </tr> <tr> <td>Travelling expenses</td> <td>Workman's compensation, insurances.</td> </tr> <tr> <td>Telephone</td> <td>Interest on investments</td> </tr> <tr> <td>Taxes</td> <td>Lighting at sites</td> </tr> <tr> <td>Postage</td> <td>Losses on advance</td> </tr> <tr> <td>Electric bills etc.</td> <td>Amenities to labor</td> </tr> </tbody> </table>	General Overhead	Job Overhead	Establishments (Office staff)	Salary of engineer, supervisors Handling of materials	Stationary, Printing	Repair and depreciation of Tools and plants	Travelling expenses	Workman's compensation, insurances.	Telephone	Interest on investments	Taxes	Lighting at sites	Postage	Losses on advance	Electric bills etc.	Amenities to labor	
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Water Charges: - For drinking purpose of the workers and for the work, arrangement of water either by sinking tube-well or by taking temporary water connection from the corporation or municipality becomes necessary.	1.5% of total cost of material and labor.																
Value Added Tax (VAT)	13% of total cost of project																
Contractor Tax	1.5% of paid bill																
Centage charge : -charged levied to department for planning, designing and monitoring and supervision of work.	10-15% of estimated cost																

Scrap value and salvage value Note: Scrap value < Salvage value	8-10% of cost of construction Generally 10%
Approximate cost of electrification	8% of estimated cost
Cost of sanitary and water supply For electric fan	8% of estimated cost 4% of estimated cost
Un-sewered area, additional cost for septic tank	3-4% of bldg. cost
Provision of supervision	5 to 10%
Profit to contractor (Analysis of rates)	10% of total cost.
Labor charge	25% of total cost

Valuation (70% fair market value + 30% governmental value)

Gross income of building	5-10% of building
Annual repair and maintenance	10% of gross income Or, 1% to 1.5% of total cost of construction Or, 1 to 1.5 months' rent.
Annual rent	5-10% value of building
Penalty	0.05% of contract amount per day does not exceed 10%

- Physical contingencies – to cover physical uncertainties beyond the base case to complete the project.
- Price contingencies – to cover inflation and price uncertainties.

Some typical levels of Physical Contingencies:

- ✓ Standard equipment designs/definable civil works, e.g., road surfacing, canal lining.
- ✓ General civil works with routine and predictable uncertainties e.g., roads, buildings, pipelines, transmission lines
- ✓ Plant and civil works in difficult terrain.

Rate analysis: -

Art of determining the rate of item of work considering the

- Total cost of material.(50%)
- Total cost of labor.(30%)
- Hire tools and equipment's (Generally, 3% of unskilled labor).
- Contractor's profit (10%) and overheads (5%) = Total 15%.

Purpose

- To revise the schedule of rate.
- To work out economical use of material.

Objective: -

Unit rate is only for

- | | |
|------------------------|-----------------------|
| a. Preparing Documents | b. finding cost |
| c. Contractor | d. none of the above. |

Answer: - b.

Which is not considered while calculating rate analysis

1. Inflation on material and wages
2. Unit of material
3. Wage of labor
4. Charge of equipment and tools.

Answer : -1

28. Which of the following contributes major cost of a work item?

A. Material cost

B. Labour cost

C. Over heads or establishment charges

D. Special tools and plants

Rate analysis: -

Objective: -

- In the rate analysis norms of Nepal, the provision of contractor profit is
 - 1. 5%
 - 2. 10%
 - 3. 15%
 - 4. 20%
- In the rate analysis norms of Nepal, the provision of contractor's overhead and profit is
 - 1. 5%
 - 2. 10%
 - 3. 15%
 - 4. 20%

Rate analysis: -

- Calculate the estimate including contractor's profit for the building having a plinth area of 1500 sq.m and a rate is Rs. 2000 per sq.m .

1. 30,00,000
2. 31,35,000
3. 33,00,000
4. 35,00,000

Answer: - 3

Hint = $1500 * 2000 * 1.1 = \text{Rs. } 33,00,000$ (Take profit as 10%).

- The approximate volume %, the thickness of steel in RCC work is taken as

1. 0.5%
2. 1%
3. 2%
4. 4%

Answer: - 2.

- When not specified, the thickness of steel in RCC work is taken as

1. 1% to 1.6% of RCC volume
2. 2% to 4%
3. 4% to 6%
4. 0.6% to 1%

Answer: - 4

Contd...

- Method of rate analysis.
 - Total Cost of a material = Rs. X
 - Total cost of laborers:- Rs. Y
 - Hire of tools and equipment (3% of unskilled labors cost) = Rs. Z
 - so, Sub-total (A) = Rs. (X+Y+Z)
- Note:- VAT is not included in Rate Analysis and TRANSPORTATION COST for more than 8km is considered.
 - Contractor overhead (5%) and profit(10%) = 15% of A = Rs. 0.15*A
 - so, Total (B) = Rs. $(A + 0.15 * A)$ = Rs. 1.15*A (unit rate of item).

Contd...

These may be taken as the approximate quantity of work or out-turn or task for an average artisan per day.

Particulars of items	Quantity	Per day
1. Brickwork in lime or cement mortar in foundation and plinth	... 1.25 cu m	(45 cu ft) per mason
2. —Do— in superstructure	... 1.00 cu m	(35 cu ft) per mason
3. Brickwork in mud mortar in foundation and plinth...	1.50 cu m	(55 cu ft) per mason
4. —Do— in superstructure	... 1.25 cu m	(45 cu ft) per mason
5. Brick in cement or lime mortar in arches	... 0.55 cu m	(20 cu ft) per mason
6. —Do— in jack arches	... 0.55 cu m	(20 cu ft) per mason
7. Half brick wall in partition	... 5.00 sq m	(50 sq ft) per mason
8. Coursed rubble stone masonry in lime or cement mortar including dressing	... 0.80 cu m	(30 cu ft) per mason

Particulars of items	Quantity	Per day
9. Random rubble stone masonry in lime or cement mortar	... 1.00 cu m	(35 cu ft) per mason.
10. Ashlar masonry in lime or cement mortar	... 0.40 cu m	(15 cu ft) per mason.
11. Stone arch work	... 0.40 cu m	(15 cu ft) per mason.
12. Lime concrete in foundation or floor.	... 8.50 cu m	(300 cu ft) per mason.
13. Lime concrete in roof terracing	... 6.00 cu m	(200 cu ft) per mason.
14. Cement concrete 1 : 2 : 4	... 5.00 cu m	(175 cu ft) per mason.
15. R.B. work	... 1.00 cu m	(35 cu ft) per mason.
16. R.C.C. work	... 3.00 cu m	(125 cu ft) per mason.
17. 12 mm (½") plastering with cement or lime mortar	... 8.00 sq m	(80 sq ft) per mason.
18. Pointing with cement or lime mortar	... 10.00 sq m	(100 sq ft) per mason.
19. White washing or colour washing three coats	... 70.00 sq m	(700 sq ft) per white washer.
20. White washing or colour washing one coat	... 200.00 sq m	(2000 sq ft) per white washer.
21. Painting or varnishing doors or windows one coat	... 25 sq m	(250 sq ft) per painter.
22. Coal tarring or solignum painting one coat	... 35.00 sq m	(350 sq ft) per painter.
23. Painting large surface one coat	... 35.00 sq m	(350 sq ft) per painter.
24. Distempering one coat	... 35.00 sq m	(350 sq ft) per painter.
25. 2.5 cm (1") C.C. floor	... 7.50 sq m	(75 sq ft) per painter.
26. Flag stone floor laying with lime or cement mortar excluding L.C.	... 10.00 sq m	(100 sq ft) per mason.
27. Terrazo floor 6 mm thick mosaic work over 2 cm thick cement concrete (1 : 2 : 4)	... 5.00 sq m	(50 sq ft) per mason.
28. Brick-on-edge in floor lime or cement mortar excluding L.C.	... 7.00 sq m	(70 sq ft) per mason.
29. Brick flat floor as in above	... 8.00 sq m	(80 sq ft) per mason.
30. Timber framing sal or teak wood	... 0.07 cu m	(2.5 cu ft) per carpenter
31. —Do—country wood	... 0.15 cu m	(5 cu ft) per carpenter
32. Door and window shutters panelled or glazed	... 0.15 sq m	(1.5 sq ft) per carpenter
33. —Do—battened	... 0.80 sq m	(8 sq ft) per carpenter
34. Sawing hard wood	... 4.00 sq m	(40 sq ft) per pair of sawers.
35. Sawing of soft wood	... 6.00 sq m	(60 sq ft) per pair of sawers.
36. Single Allahabad tiling or Mangalore tiling	... 6.00 sq m	(60 sq ft) per tile layer
37. Double Allahabad tiling	... 4.00 sq m	(40 sq ft) per tile layer
38. Breaking of brick ballast 40 mm (1½") gauge	... 0.75 cu m	(30 cu ft) per labourer or breaker.
39. Breaking of brick-ballast 25 mm (1") gauge	... 0.55 cu m	(20 cu ft) per labourer or breaker.
40. Breaking of stone ballast 40 mm (1½") gauge	... 0.40 cu m	(15 cu ft) per labourer or breaker.

Contd...

Particulars of items	Quantity	Per day
41. Breaking of stone ballast 25 mm (1") gauge	... 0.25 cu m	(10 cu ft) per labourer or breaker
42. Ashlar stone dressing	... 0.70 cu m	(25 cu ft) per stone cutter.
43. Flag stone dressing	... 1.50 sq m	(15 sq ft) per stone cutter.
44. Earthwork in excavation in ordinary soil	... 3.00 cu m	(100 cu ft) per beldar mazdoor.
45. Earthwork in excavation in hard soil	... 2.00 cu m	(75 cu ft) per beldar mazdoor.
46. Excavation in rock	... 1.00 cu m	(35 cu ft) per beldar mazdoor.
47. Sand filling in plinth	... 4.00 cu m	(140 cu ft) per beldar mazdoor.
48. Number of bricks laid by a mason in brickwork upto a height of 3 m (10')	... 600 bricks	per mason.
49. Amount of work done by a mazdoor (helper) per day—		
(i) Mix	... 3 cu m	(100 cu ft) mortar per mazdoor
(ii) Deliver brick	... 4000 nos. to a distance of 15 m (50	per mazdoor
(iii) Deliver mortar	... 5.5 cu m	(200 cu ft) per mazdoor.
50. Scaffolding cost for single storey building	... Re. 0.50 per cu m (Rs. 1.5% cu ft)	of brickwork.

Contd...

- **Notes:-**
- In concrete mix: - To get dry mix, increase **50% to 55% (1.54)** of wet mix.
- In mortar mix: - To get dry mix, increase **30% to 35%** of wet mix.
- In plastering works: -First increase **25%** for **filling in between joints and irregular surface**.
- ✓ In case of ceiling of concrete surface only **10% to 15%** increase in wet mix.
- ✓ Then to get dry mix, increase **30% to 35%** of wet mix.
- Dry mortar for pointing = ***0.6 m³*** for 100 m²
- In case of stone works
- ✓ **15% to 20%** Due to wastage and dressing to get the required stone.
- ✓ Volume of dry mix = **42%** of stone masonry.
- In R.C.C works
- To get reinforcement= (0.6 to 1%) volume of R.C.C.
- Binding wires = 1kg per quintal.
- For column = 1 to 5%.
- Chajja= 0.5%.
- Volume of void for back filling = 20%.

Objectives on rate analysis

1. The quantity of cement required for 1 m³ plaster (1:5) is

- a. 110 kg
- b. 210 kg
- c. 310 kg
- d. 410 kg.

Hint:- Increase by 30%

2. The volume of cement required for 100 m³ 1:2:4 concrete is = $150/7 * 1 = 21$.

- a. 16 m³
- b. 32 m³
- c. 25 m³
- d. 21 m³

Hint: - Increase by 50%

3. Quantity of stone required for 10m³ of stone masonry is (1:4)

- a. 10 m³
- b. 8 m³
- c. 13.5 m³
- d. 12.5 m³

Hint: - Increase by 15%.

Objectives on rate analysis

- Calculate the total quantity of coarse aggregate required for isolated rectangular footing of size 3mX2m and depth 600m with (1:2:4) is

1. 2.05
2. 2.46
3. 3.16
4. 3.82

Answer: - 3

- Quantity of stone required for 10 m³ of rubble stone masonry

1. 10 m³
2. 8 m³
3. 13.5 m³
4. 12.5 m³

Answer: - 4

Hint: - 120%.

- Rate analysis is carried out on the basis of
 - a. Length, breadth and height
 - b. Procurement documents
 - c. Approved norms
 - d. All of the above

Answer : - c

Objectives on rate analysis

- Contractor profit is added in
 - a. Detail estimate
 - b. Rate analysis
 - c. Valuation
 - d. Salvage
- The rate analysis include
 - a. Material, labor, VAT, all taxes.
 - b. Material, labor, contractor profit, and overhead.
 - c. Material, labor, contractor all taxes.
 - d. Material and labor.
- The overhead and profit claimed by the contractor to client is
 - a. A separate item.
 - b. Include in materials only
 - c. Include in labor only
 - d. Include in rate analysis

Objectives on rate analysis

- For 100 sq.m cement concrete (1:2:4) 4cm thick floor, the quantity of cement required (Agor book)

- a. 0.90 m³.
- b. 0.94 m³
- c. 0.98 m³
- d. 1.00 m³

Answer: - b

- Hint: - increase by 10% to fill undulation and then increase by 50% to get dry volume.
- For 12mm thick cement plaster 1:6 on 100 sq. m new brick work, the quantity of cement required

- a. 0.200 m3.
- b. 0.247 m3.
- c. 0.274 m3
- d. 0.295 m3

Answer: - c

- (Hint:- add 1st 25% to fill joint and then 30-35% to get dry volume)

Objectives on rate analysis

The volume of cement required for 10m³ of B/W in 1:6 cement mortar is approximately equal to

- a. $\frac{3}{7} m^3$ (19*9*9) cm (India bix)
- b. $\frac{3}{6} m^3$
- c. $\frac{3}{5} m^3$
- d. $\frac{3}{4} m^3$

Hint: - No. of Brick for 1 m^3 = 560 nos

And, Mortar = 0.26 m^3

Modular Brick = (19*9*9)cm = 500 nos

Machine made brick = 530 nos

Local Brick = (240*115*57) mm = 560 nos

Objectives on rate analysis

Objectives

- The volume of **CA** required to make 100 m³ of 1:2:4 concrete is (d prasad)
 1. 84 m³
 2. **87 m³**
 3. 90 m³
 4. 93 m³
- The volume of **course aggregate** required to make 100 m³ of 1:2:4 concrete is (Ram Kr. Shrestha)
 1. **84 m³**
 2. **88 m³.**
 3. 92 m³.
 4. 96 m³.
 5. Answer of this question is **88 m³**

Type of estimate

1. Approximate or rough or preliminary estimate

- Prepared for administrative approval.
- Rough estimate.
- Done in preliminary state of work.
- Carried out for *feasibility study, tax, valuation, insurance etc.*
- This estimate is accompanied by a report duly explaining necessity and utility of project *with a site or layout plan.*

Objective

- The drawings necessary to be enclosed with the preliminary estimate
1. No drawings is required.
 2. Service plan and detail plan of building.
 3. Site plan and location (line) plan of building.
 4. Detail drawings of the buildings.

Sanctions of following sequences

1. **Administrative sanction:** - Formal acceptance of proposal by concern authority.
2. **Expenditure sanction:** -Allotment of fund by finance department.
3. **Technical sanction:** - Sanction of detail estimate, design, calculation, quantities and cost of work by competent authority of Engineering department.

Type of estimate

Objective: -

- For the approval of any project a number of sanction is followed out. Which is done initially?
 1. Administrative
 2. Expenditure
 3. Technical
 4. All of the above.

Answer: - 1.

- The sanction of detail estimate, design, calculation, quantities and cost of work by competent authority of Engineering department is called as
 1. Administrative
 2. Expenditure
 3. Technical
 4. All of the above

Answer: -3

Type of estimate

Objectives: -

- Calculate the approximate estimate of the building with total plinth area of the building is 500 sq.m. the rate of the plinth area is Rs. 300. The costs of the water and contingencies are 7% and 5% of the construction cost.

1. Rs. 150000
2. Rs. 165000
3. Rs. 168000
4. Rs. 187000

Answer: - 3.

Solution,

Construction cost= $500 * 300 = \text{Rs. } 150000$

Water charges = 7% of 150000 = Rs. 10500

Contingencies = 5% of 150000= Rs. 7500

Total = Rs. 168000

Contd...

Types

1. Unit rate estimate: - Per bed of hospital, per km of road, per span of bridge.

Objective:-

16. A hospital building of 150 beds is constructed in Haryana in the cost of construction of Rs. 25 lacs. Find the approximate estimate of a small hospital of 35 beds in similar locality by using service unit method?

1. Plinth area estimate:-

- Called square rate method.
- Mostly adopted in building.
- Calculate by multiplying plinth area rate of similar building to plinth area of building.
- Method of valuation of a building as used by commercial banks.
- Least accurate method.

Contd...

Objective:-

- Find the value of building if the plinth area 350m² and the cost of construction of a similar building in a similar locality is Rs. 1700/m².
1. 595003
2. 592002
3. 595001
4. 595000

Answer: -4

Contd...

Cubic rate estimate:-

- Most accurate than plinth area estimate.
- Cubic rate of similar building is obtained and multiplied by cubic area to get cubic cost of building.
- Parapet wall is not included while calculating height.
- The height should be measured from the top of the flat roof (or half way of the sloped roof) to above the plinth. (Foundation and plinth are excluded).
- Suitable for multistoried building.

Objective: -

- Which of the following is correct statement for the cubical content methods?
 1. Cost of building is estimated by multiplying the total area with area rate.
 2. It is based on the total area of the building.
 3. It is less accurate as compared to plinth area estimate.
 4. It is best suitable for the estimate of multi- story building.

Answer: - 4

Objectives on Plinth area.

- The plan area of building is in the form of rect. With centerline dimension of outer wall as 9.7 m X 14.7m. The thickness of wall is 0.30m. The PA is

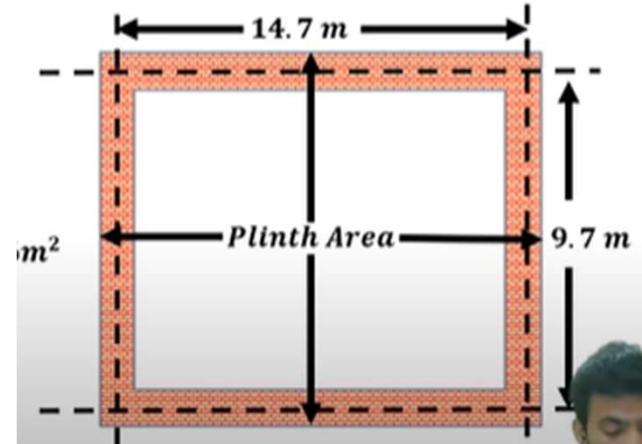
- 150 sq. m
- 145 sq. m
- 145.5 sq. m
- 135.36 sq. m

Answer: - 1.

- The plan area of building is in the form of rect. With centerline dimension of outer wall as 9.7 m X 14.7m. The thickness of wall is 0.30m. The CA is

- 150 sq. m
- 145 sq. m
- 145.5 sq. m
- 135.36 sq. m

Answer: - 4



Numerical...

- The covered area of a proposed building is 150 sq.m and it include a rear courtyard of 5m*4m. If the prevailing plinth area rate for similar building is Rs. 1250/ sq.m. What is its cost?
 - a. Rs. 1,87,500
 - b. Rs. 2,12,500
 - c. Rs. 1,62,500
 - d. Rs. 3,75,500

Answer: - c

- What is not included in floor area?
 1. Clear coverage area
 2. Area of walls
 3. Sills of window
 4. Sill of door

Options

- a. 1 and 3
- b. 2 and 3
- c. 2,3 and 4
- d. 2 and 4

Contd...

Detailed or item rate estimate or elemental bill method:-

- **Most accurate and reliable estimate.**
- Done after administrative sanction.
- Detailed Estimate is conducted to get the approval of Technical Sanction of the related project.
- First rate per unit work are considered and total cost for the item is found by multiplying the cost per unit rate of the rate by the number of item.
- Then, 3% to 5% is added as contingencies and amount of about 1.5% to 2% is provided for work charged establishments.

It is done in two stage

1. Details of measurements and calculation of quantity.
2. Abstraction of estimated cost.

It is accomplished with

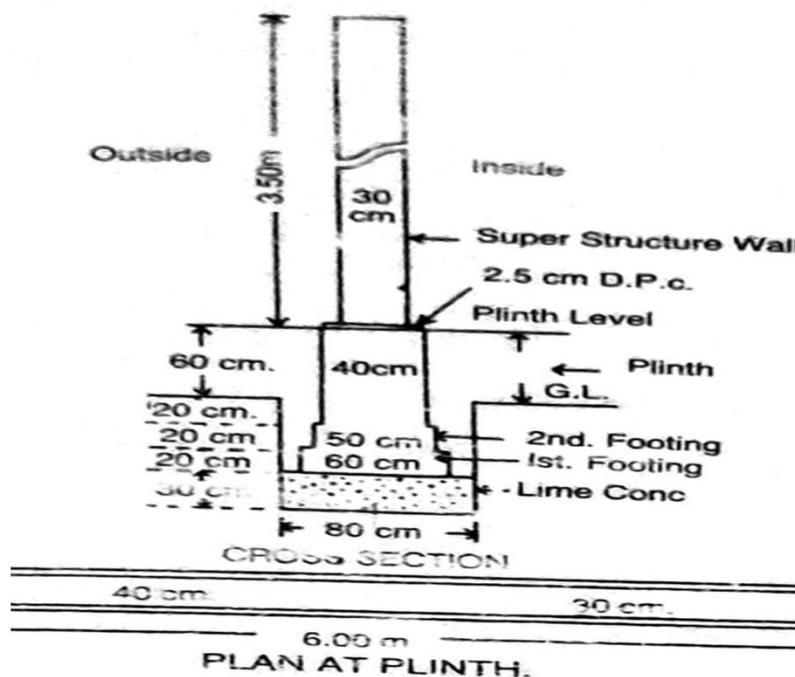
- i) Report
- ii) General specification.
- iii) Drawing
- iv) Calculation
- v) Design
- vi) Analysis of rate.

Example

Hand Section

Fig. 2-1

WALL WITH STANDARD MODULAR BRICKS.



b Standard Bricks, Fig. 2-1 — DETAILS OF MEASUREMENT AND C

Description of items of work	No.
Earthwork in excavation in foundation	1
Lime concrete in foundation	1
1st class brickwork in lime mortar in foundation and plinth	1
1st footing	1
2nd footing	1
Plinth wall up to G.L.	1
Plinth wall above G.L.	1

Fig. 2-2

Item No.	Description of items of work	No.	Dimensions			Quantities or Contents	Total quantities
			Length	Breadth	Ht. or Depth		
4.	2.5 cm Damp proof course (D.P.C.) c.c. 1 : 1½ : 3 ...	1	6.00 m	.40 m	—	2.4	2.4 sq.m
5.	First class Brickwork in lime mortar for superstructure ...	1	6.00 m	.30 m	3.50 m	6.3	6.3 cu m
6.	12 mm plaster of Cement sand 1:6 —						
	Inside	1	6.00 m	—	3.50 m	21.0	46.2 sq m
	Outside including 10 cm below G.L. ...	1	6.00 m	—	4.20 m	25.2	
7.	White washing 3 coats (inside) ...	1	6.00 m	—	3.50 m	21.0	21.0 sq m
8.	Colour washing 2 coats over one coat of white washing (outside above G.L.) ...	1	6.00 m	—	4.10 m	24.6	24.6 sq m

ABSTRACT OF ESTIMATED COST (Ex. 2)

Item No.	Description of Items of Work	Quantity	Unit	Rate	Per		Amount
					Rs.	Rs.	
1.	Earthwork in excavation in Foundation	4.32	cu m	350.00	% cu m	15.12	
2.	Lime concrete in foundation with white lime, surkhi and brick ballast	1.44	cu m	220.00	per cu m	316.80	
3.	1st class brickwork with white lime and surkhi mortar 1 : 2 in foundation and plinth	3.24	cu m	300.00	per cu m	972.00	
4.	2.5 cm thick c.c. 1 : 1½ : 3 Damp proof course with water proofing compound	2.4	sq m	20.00	per sq m	48.00	
5.	1st class Brickwork with white lime and surkhi 1 : 2 mortar in super-structure 12 mm cement and local sand plaster 1 : 6	6.3	cu m	320.00	per cu m	2016.00	
	White washing 3 coats	46.2	sq m	8.50	per sq m	392.70	
	Colour washing 2 coats over one coat of white washing	21.0	sq m	0.75	per sq m	15.75	
		24.6	sq m	0.82	per sq m	20.17	
		Total ...		3796.54			
		Add for Contingencies 3% ...		113.90			
		Add for Workcharged Establishment 2% ...		75.93			
		Grand Total ...		3986.37			
		6.00 m	.40 m	.20 m	.60		
		6.00 m	.40 m	.60 m	.48		
		3.24 cu m		1.44			

Supplementary Estimate:-

- While a work in progress, some additional works may be thought necessary for development of a project which was not foreseen when the original estimate was framed and the expenditure for such supplementary work cannot be met up, an estimate is prepared to cover up all such work are called supplementary estimate.
- Same as detailed estimate but it should be accompanied by a full report of the circumstances which render it necessary.
- The abstract must show the amount of original estimate and the total of the sanction required including supplementary amount.

Revised Estimate:-

- Type of detail estimate
- Prepared when original sanctioned detail estimate exceed by 5% or
- Expenditure exceed by 10% due to rate being found insufficient or other reason.

Objective

- Which of the following statement is correct?

 1. Revise estimate is an approximate estimate
 2. Supplementary estimate is a detailed estimate
 3. Cube rate estimate is detailed estimate
 4. All of the above.

4. Revised estimate is required due to

- 1) changes of quantity of materials, rates, etc.
- 2) addition of new work
- 3) deduction of existing work
- 4) changes of design

Difference between Supplementary Estimate and Revise estimate-

Difference between Revised and Supplementary Estimate

	Revised estimate	Supplementary estimate
i)	When sanctioned amount is exceed due to change in rates or addition of work from first sanctioned, revised estimate is required. So, it is due to the material deviation from original proposal.	When there is a deviation of work which is structural in nature from design originally approve supplementary estimate is required.
ii)	Comparative statement, abstract from showing the probable variation for quantity, rate and amount against each item of work is required.	No comparative abstract form is required. This is the estimate for additional works only.
iii)	Revised estimate is required due to change of rate or quantity of materials. So, no additional or revisions of drawings is necessary.	Supplementary estimate is required due to some new works or due to change of design so additions or revisions of the drawings may be necessary.

Contd...

Supplementary and revised estimate: - This estimate is prepared when a particular work is abandoned and the cost of the work remaining is less than 95% of the original sanctioned amount of work

or

- Where there are material deviations from the original proposed work which may result in substantial saving in the estimate.

Objective: -

- The actual cost of supplementary and revised estimate is
 1. Less than estimated cost
 2. More than estimated cost
 3. Equal to estimated cost
 4. All of the above

Answer: -1

Annual repair and maintenance estimate-

- After completion of a work, it is necessary to maintain the same for proper function and for the same, estimate is prepared for the items which require renewal, replacement, repair etc. in the form of a detailed estimate.
- The estimated amount should not more than *1.5% of the capital cost of the work.*

Objective

Total expenditure on annual repair and special repair to a building should not be more than % of the capital cost

- | | |
|----------|-------|
| a. 1.5 % | b. 2% |
| c. 2.5% | d. 5% |

Answer: - c

Special repair work carried out every fourth year is known as

1. Quarter repair
2. Quadrennial repair
3. Fourth cum repair
4. Special repair

Answer:- 2

Conceptual Estimate: -

An estimate of construction costs made from designer's preliminary sketches and outline specification.

Extension and Improvement of Estimate:-

- When some changes and extensions are required to be made in old works, the cost of which cannot meet out annual maintenance estimate, a detail estimate of the additional works prepared, called extension and improvement of estimate.

This estimate includes

- Report explaining the necessity of the additional work.
- Existing drawings.
- Drawing of changed work.
- Calculation sheet as per design.
- Rates followed for preparing the abstract of cost.

Contd...

Plinth area:-

- Plinth area= Floor area+ area of walls
- Floor area= Circulation area+ carpet area
- So, PA= Carpet area+ circulation area+ area of walls.

Conclusion:- Plinth Area> Floor Area

- *For framed multistoried building, area occupied by wall is 5% to 10% of Plinth Area (3% for external wall and 2% internal wall)*
 - *For ordinary building without frame, 10% to 15% of Plinth Area.*
-
- **Objective:** -

What area of a building is the total area of floors in between walls

Or

Area between walls

1. Floor area
2. Plinth area
3. Carpet area
4. Circulation area.

Answer :- 1

Contd...

Points to remember:-

- Plinth Area: - built up covered area of a building measured at floor level of any stored is called plinth area.

Include

- All floors excluding plinth offsets.
- Area of barsati/ mumti at terrace level.
- Internal shaft for sanitary less than $2m^2$.
- Area of porches but not cantilever.
- Machine room, lift, duct etc.

Exclude:-

- Area of cantilever porch.
- Area of cantilever projections.
- Courtyard area.
- Area of architecture band, cornice etc.
- Loft
- Internal shaft for sanitary more than $2m^2$.
- Tower, sunshade, external staircase etc.

Objective: -

- Which of the following area is included in the plinth area of the building?
 1. Area of loft
 2. Area of barsati at terrace level
 3. Cornices
 4. Tower projecting above terrace level

Q : The plinth projection for the wall is calculated as:

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A : Half the difference between breadth of plinth and breadth of wall

B : Difference between breadth of plinth and breadth of wall

C : Difference between plinth area and carpet area

D : Difference of breadth of damp proof course and breadth of plinth wall

Contd...

- **Floor Area**:- Total area of floor in between walls, i:e area of floor of all rooms, verandahs, corridors, passages, entrance halls, staircase room, kitchen, bath and latrines etc. is called floor area. *Sill of door is not included in floor area.*
- **50% of area of balcony is included in floor area.**
- **Circulation area**:- The area of verandahs, corridors, passages, entrance halls, staircase, balconies, and shafts of lifts is called circulations area. These areas are used for movements in building.
- **Vertical circulation area**:- area occupied by staircase, lifts and entrance hall
4% to 5% of the plinth area.
- **Horizontal circulation area**:- verandah, passage, corridor, balconies, porches etc.
10% to 15% of the plinth area.
- **Carpet area**:- Livable area of building is called carpet area. It is the total floor area minus the circulation area and minus the other un- useable areas such as of bathroom, water closets, air conditioning rooms etc. It should also exclude the kitchen areas, stores and similar other rooms which are not use for living purposes

Carpet area of the building for any story shall be the *floor area excluding* the following

- Sanitary accommodation b) Verandah c) Corridor and passage d) Kitchen and pantries e) Entrance hall and porches f) staircase and mumties g) Barsaties h) Garages i) Shaft for lifts j) Canteen.

For Residential Building:- Livable area.

- Carpet area: - 50% to 60% of the plinth area.

For Office Building:- Usable or lettable area

- Carpet Area: - 60% to 75% of the plinth area.

Contd...

Main factor while preparing detail estimate is

- a. Quantity of material
- b. Availability of material
- c. Location of site and local labor charges
- d. All of the above.

Answer: - d

The preliminary estimate is prepared based on

- a. Plinth area rate
- b. Detail rate analysis
- c. Cost of similar work
- d. Labor rate.

Answer: - a

Most reliable estimate is

- a. Plinth area estimate
- b. Detail estimate
- c. Preliminary estimate
- d. All of the above

Answer: - b



Contd...

Carpet area does not include

- a. Verandah, corridor and passage
- b. Bath room and lavatory
- c. Kitchen
- d. All of the above

Answer:- d

Which is not considered in plinth area

- a. Cantilever beam projection
- b. Inside room
- c. Below the staircase
- d. Passage

Answer: - a



19. Multiplying factors for different surfaces to get equivalent plan area

S.N	Name of surface Painted	Multiplying factor for each sides
1	Panelled, framed and braced, ledged and battened or ledged battened and braced.	$\frac{9}{8}$ times
2	Fully glazed or gauzed	$\frac{1}{2}$ times
3	Part panelled and part glazed or gauzed	1 times
4	Fully venetioned or louvered	$\frac{3}{2}$ times
5	Flush door	1 times
6	Corrugated iron sheeting in roof	1.14
7	A.C corrugated sheeting in roof	1.2
8	A.C. Semi corrugated sheeting in roof	1.1
9	Steel rolling shutter	$\frac{5}{4}$ times
10	Guard bars, balustrades, grating, railing, grills, expanded metal	1




Objective

- The multiplying factor for painting in flush door for both sides is

1. 2
2. 1
3. 3
4. 2.25

In painting of doors the multiplying factor for each side of panelled door is

- 1.25
2. **1.125**
3. 1
4. 0.5

Objectives

1. Whenever the whitewashing or distempering is done on corrugated iron sheet, in the estimation the plan area is increased by (Ram kr. Shrestha)
 - a. 5%
 - b. 7%
 - c. 10%
 - d. **14%**
2. Whenever the color washing A.C corrugated sheet is done , in the estimation the plan area is increased by (D parsad)
 - a. 5%
 - b. 10%
 - c. 15%
 - d. **20%**
3. To account for the corrugation, the plan area of the semi-corrugated A.C. sheet is increased by (D Parsad)
 - a. 1%
 - b. **10%**
 - c. 20%
 - d. 30%



Sheet Specification

For A.C sheet

- Standard length = 1.50m, 1.75m, 2.00m, 2.25m, 2.75m and 3.00m
 - Standard width = 1.05m
 - No. of corrugation= 7
 - End lap= 15cm.
 - Side lap= 4cm.

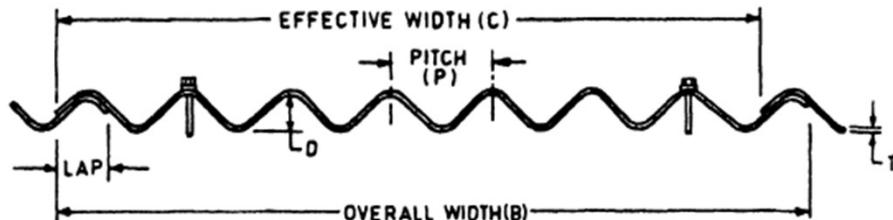


FIG. 1A CORRUGATED SHEET WITH FULL OVERLAP

Table 1 Dimensions and Tolerances of Corrugated and Semi-Corrugated Sheets

(*Clauses 5.1, 5.1.1, 5.1.2 and 5.1.3*)

All dimensions in millimetres.

Sheet Specification

G.I. Sheet (6', 7', 8', 9', 10', 12' 18') **1 bundle = 72'** **72/6 = 12** **7' & 10' = 70'**

- Standard length = 1.8m, 2.20m, 2.50m, 2.80m, 3.00 and 3.050m.
- Standard width = **80cm (32")**
- No. of corrugation = **10**
- Pitch (Center to center distance) of corrugation= **7.5cm**
- Depth of corrugation= **18mm**
- End lap= **15cm**
- Side lap = 7.5cm.
- Each bundle= 72 ft./ 70 ft

Objective

- Besides standard length and width of corrugated sheet, one important dimension usually considered

1. Pitch
2. Depth
3. Shape
4. Gauge of corrugation (Note, higher the gauge number, smaller the diameter & thinner the wire)

Table 6 Tolerance on Dimension of Corrugated Sheets
(Clause 14.2.1)

Sl No. (1)	Dimensions (2)	Tolerance ^b (3)
i)	Depth of corrugation	± 2.5 mm
ii)	Pitch of corrugation	± 5 mm
iii)	Overall width after corrugation	± 25 mm

^b Average of 4 measurements

Septic Tank

Septic tank

- Minimum width and detention time = 75 cm and 30 minutes.
- Minimum size of pipe connecting septic tank = 100mm
- Capacity of septic tank for 100 users = $7-8 m^3$ (Study site).
- Sludge is removed = 1- 2 years.
- Domestic sewer pipe laid in 1:100 = 150 mm.

Life of different material

S. No.	Life	Items
1.	100 years or more	Masonry in lime or cement. Stone work in lime or cement
2.	100 years	Arches of brick work in lime or cement. Brickwork in C.M.
3.	80 years	Iron works in roof.
4.	75 years	Sun-dried brickwork in clay. R.C.C. and R.B. roofing, R.S. Joints.
5.	60 years	Salwood work in roofing
6.	50 years	Cement concrete flooring. Stone flooring. G.I. sheet roofing.
7.	40 years	Brick flooring over lime concrete. Teakwood. Salwood.
8.	30 years	Deodar wood joinery.
9.	20 years	Lime concrete terraced floor. Sal ballies roofing.
10.	15 years	Country wood work in roof.

Rolling shutter Specification

IS : 6248 - 1979

For rolling shutter, minimum depth of guide channel for

3.5 m width	65 mm
3.5 m to 8 m	75 mm
>8m	100mm

Objective: -

For rolling shutter, the minimum depth of guide channel for and up to 3.5 m wide is

1. 25 mm
2. 40 mm
3. 60 mm
4. 75 mm

Answer: - 3.



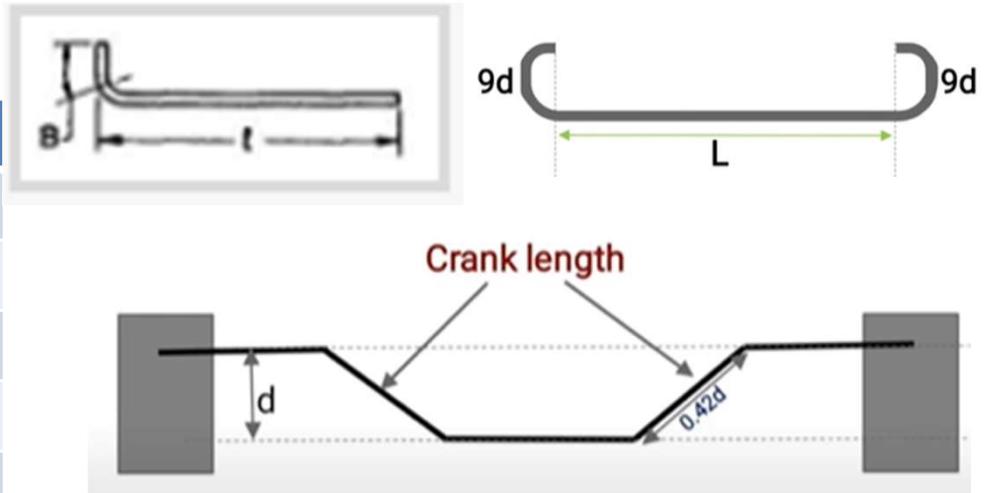
- Minimum number of hold fasts (*if not mentioned*).
 - Door= 6.
 - Window =4.
- Minimum number of hinges in window and door shutter= 2 & 3.

Rebar hook Specification

If tensile stress of steel of rod of diameter D is 400 kg/cm^2 and bond stress is 6kg/cm^2 , then required bond length of rod = $59*D$.

- Extra length of required

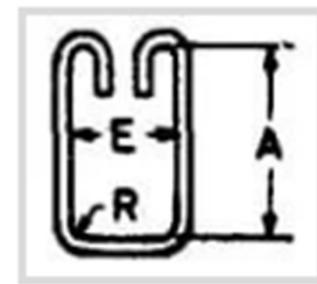
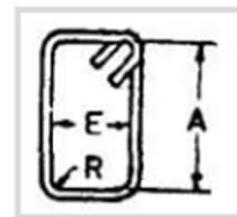
Bend- up bar (45 degree)	$2*0.414*d$
Bend- up bar (30 degree)	$2*0.270*d$
Hook	$2*9*\text{diameter}$
90 degree bend	$2*6* \text{diameter}$
Two leg stirrups	$12*2* \text{diameter}$
Open stirrups	$2*14*\text{diameter}$



- Normal Lead and lift is 30m and 1.5m

But if

Lift	Lead
$\leq 3.6 \text{ m}$	<u>Lift *10</u>
$3.6 \text{ m} - 6 \text{ m}$	$(lift)^2 * 8.3$
$> 6 \text{ m}$	<u>Lift *20</u>



8. Which one is the CORRECT statement for conversion of the lift into lead?

- 1) Lift up to 3.6 m is converted into the horizontal lead by multiplying with 10.
- 2) Lift up to 3.6 m is converted into horizontal lead by multiplying with 15
- 3) Lift up to 3.6 m is converted into horizontal lead by multiplying with 20
- 4) Lift above 6 m is converted into horizontal lead by multiplying with 10

Specification

Reinforcement Bar:-

Rolling margin: - Difference in **theoretical weight** and **actual weight** of reinforcement bar.

Allowable rolling margin as per [IS 1786:2008](#)

- Up to 10mm = +/-7%
- 10 mm to 16 mm =+/-5%
- Over 16mm = +/- 3%

- Density= 7850kg/m³.

- Wt. per meter= $\frac{d^2}{162.2}$

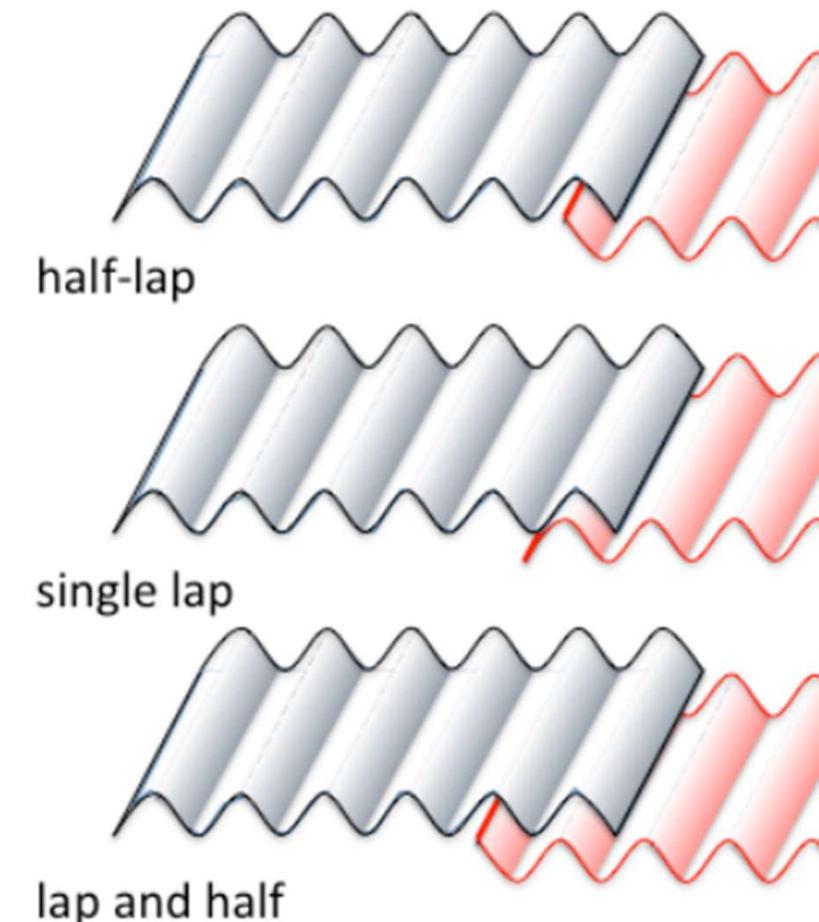
Description	Percentage
Beam	2% of total volume of concrete
Column	5% of total volume of concrete
Slab	1% of total volume of concrete
Footing	0.8% of total volume of concrete

Bar diameter= 10mm	Wt. per meter= $\frac{10*10}{162.2}$	0.62 kg per meter.
Bar diameter= 12mm	Wt. per meter= $\frac{12*12}{162.2}$	0.88 kg per meter.
Bar diameter= 16mm	Wt. per meter= $\frac{16*16}{162.2}$	1.57 kg per meter and so on...

- Rebar Size= 8mm, 10mm, 12mm, 16mm, 20mm, 25mm, 28mm, 32mm, 36mm, 40mm.
- Rebar length= 12m.
- For raft footing : - 0.5% to 0.8%

Manhole Specification

- i. Shallow : - up to 2.1 m in depth.
- ii. Deep: - above 2.1m & up to 4.2m in depth.
- iii. Extra deep: - above 4.2m and up to 6.0 m in depth.



Some definitions

Provisional quantity: -

- When the quantity of a particular item is not known, certain provisional quantities are provided separately for such item. For this purpose the quantities are calculated from measurement of the drawing with certain assumption of the probable increase.
- Kept separately in BOQ and marked as provisional.
- Payment is done on actual work.

Liquidated damage: -

- Fixed stipulated sum of penalty by contractor.
- Have no relation with real damage.
- Depend up-on term of condition.

Un-liquidated damage: -

- Ordinary damages are having relations with real damage.

Muster roll

- Basic record of payments made to daily labor is kept.

Valuation:-

Valuation:-

- Technique of determining the fair price.
- Present price of property is known.
- Value of property depends upon structure, [life](#), [maintenance](#), location, bank interest etc.

Purpose of valuation:-

- Buying and selling of property.
- Taxation.
- Rent fixation (5-10% of valuation amount)
- Security of loan.
- Compulsory acquisition.

Objective

- Which of the following is the purpose valuation
1. Approximate estimation of cost
 2. Analysis of rate
 3. Detailed estimation of cost
 4. Taxation.

i. For Land Located within the boundaries of Municipalities, Sub-Metropolitan City and Metropolitan City:

Classification	Fair Market Value Derivation	
	Commercial / Market Rate	Government Rate
Residential	70%	30%
Commercial	70%	30%
Industrial	60%	40%
Agricultural	50%	50%

Some definitions

Book Value: -

- ✓ Original cost - Total depreciation up to previous .
- ✓ Amount shown in account book after allowing necessary depreciation.
- ✓ At the end of utility period, the book value will be the scrap value only.

Market Value:-

- ✓ Value of property which is obtained at any time from open market.
- ✓ Differ from time to time according to demand and supply.

Distress Value or Forced Sale Value: -

When a property is sold at a lower price than the market value of that time, it is said to have a distress value. Such distress value may be due to any of the following reason;

- a) Financial difficulties of the seller.
- b) Insufficient knowledge about the market value.
- c) Quarrel among partners.
- d) Panic due to war or riots or civil commotion.

Scrap Value: -Scrap value is the dismantled materials value of a property at the end of its utility period. Also called junk or demolition value.

Salvage Value: - It is the value of any property at the end of its utility period without being dismantled. Generally 10%.

Note:-

- Scrap value of property may be positive or negative.
- Scrap value of RCC is always negative.
- Salvage > Scrap

Dis-mental: - Breaking up the structure with care.

Demolition: - Breaking up the structure.

Prime cost(maximum probable cost): - actual cost of article at shop. Example sanitary, water supply fitting etc.

1. **Capital cost:** - *Total cost of construction including land.*

$$\text{Capital recovery factor} = \frac{i(1+i)^n}{(1+i)^n - 1}$$

1. **Annuity:** - It is defined as the annual periodic payments for repayment of the capital amount invested.
2. **Perpetual Annuity:** - If the payments of annuity continue for indefinite period, it is known as perpetual annuity.
3. **Differed Annuity:** - If the payment of annuity begins at some future date after years, this is known as differed annuity.
4. **Annuity due:** - if the amount of annuity is paid at the beginning of each period year and payment continue for definite period of time.
6. **Annuity Certain:** - Annuity paid for definite number of period of year.

1. **Value and Cost**

Value indicates the present market value of any property which may be higher or lower than the cost of construction, whereas the cost means actual cost of construction.

The value is fluctuating in nature whereas cost is a constant which required for the construction.

7. **Ratable value:-** Net annual value of property obtained after deducting
 $\text{gross income} - \text{Amount of yearly repair}$

8. **Sentimental value:** - When the property is sold at the higher value than market value by use of sentiments.

Some definitions

- ✓ **Gross Income**: - It is the total revenue relished from a property either as rent or lease money during a year.
- ✓ **Outgoing**: - These are the expenses incurred to maintain the property by undertaking periodic repairs.
- ✓ **Net Income**: - $\text{Net income} = \text{Gross income} - \text{Outgoings}$
- ✓ **Capitalized Value**: - It is defined as that amount of money whose interest at the highest prevailing rate of interest will be equal to the net income from the property in perpetuity (for an indefinite period or for a specified period).

$$\text{Capitalized value} = \text{Net income} \times \text{Year purchase (Y.P.)}$$

- ✓ **Year's Purchase (Y.P.)**: - It is defined as the capital sum (i.e. capitalized value) required to be invested in order to receive an annuity of Rs. 1.00 at the prevailing rate of interest.
- $\text{Year's Purchase (Y.P.)} = \frac{100}{\text{Rate of interest}}$
- ✓ **Sinking Fund**: - Fund which is accumulated by way of periodic annual deposit for replacement of any structure at its utility life.

OR

Periodic deposit for replacement of Buildings at end of useful life.

$$S_n = \frac{R}{(1+R)^n - 1} * S$$

Objective

Numerical

An old building has been purchased by a person at the cost of Rs. 30,000/- excluding the cost of land . Calculate the amount of annual sinking fund at 4% interest assuming the future life of building as 20 years and the scrap value of building as 10% of the cost of purchase.

Solution,

Total amount of sinking fund accumulated at the utility life of 20 years

$$\begin{aligned} &= \text{Rs. } 30,000 * 0.9 \text{ (Taking 10% as scrap value)} \\ &= \text{Rs. } 27,000/- \end{aligned}$$

$$\begin{aligned} \text{Annual installment of sinking fund} &= \frac{R}{(1+R)^n - 1} * S = \frac{0.04}{(1+0.04)^{20} - 1} * \text{Rs. } 27,000/- \\ &= \text{Rs. } 907.20 \end{aligned}$$

Hence,

Annual instalment of sinking fund required for 20 years = **Rs. 907.20**

Objective

- A building is fetches an annual rent of Rs. 2,00,000/-. The purchaser desire to get 5% return on capital. The capitalized value of building is

1. 10,00,000
2. 40,00,000
3. 10,000
4. 1,00,000/-

Answer: - 2

Hint

$$\text{Capitalized value} = \text{net income} * YP = 2,00,000 * \frac{100}{5} = \text{Rs. } 40,00,000.$$

- The objective of sinking fund is
1. Meet cost of construction & replacement after of its utility period.
 2. Pay taxes
 3. Recover the cost of construction.
 4. Save money for future.

Answer: -1

- Which value of asset will fetch more money from market
1. Distress value
 2. Sentimental value
 3. Potential value
 4. Monopoly value

Answer: -2

Valuation:-

Budget:- Annual financial statement of anticipated receipts or expenditure.

Or,

Amount allocated for execution of work.

Bill: - Account of work done or supply of materials made which includes the particulars & quantity of work done or material supplied.

Voucher: - written document with detail which is kept in record as proof as payment.

Objective: -

- Which of the following tax generally not applicable to residential building is
1. Municipal tax
 2. Property tax
 3. Sales tax
 4. Wealth tax

Valuation:-

Freehold property: -

- ✓ Owner in absolute possession of property and owner can utilize in any manner.
- ✓ He may grant lease for any period.

Leasehold property

- ✓ Physical possession of property for definite period.

Lessee of lease Holder: - person who take lease.

Lessor:- owner who grant lease

Note:

- **Rent** =
 - ✓ *Temporary Use of Property by Tenant which is Owned By Landlord*
 - ✓ *Owner has to do Repairs and Maintenance Charges*
- **Lease** =
 - ✓ *It is an Agreement in which Owner allows Leaseholder to Use his property for Some Definite Period*
 - ✓ *Leaseholder has to Repair and Maintenance Charges*

Type of lease

1. Building lease: -

- ✓ Owner of freehold land lease the land to someone to construct a building, on payment of a yearly ground rent by the lease holder.
- ✓ The lease holder construct the building and maintain it at his own expenses and earn some rent from the building.
- ✓ As the lease holder invest large money, the lease period is large (99 or 999 years).

2. Occupation lease: -

- ✓ Owner construct building and give lease for the certain period on payment of certain amount of annual rent.
- ✓ If for the factory, the lease period is 10 to 30 years, for other case it may be less.
- ✓ The maintenance is done by lease holder.

Legal right of mortgagor by which he can free his property from the mortgage after repaying the full amount of loan together with interest?

1. Mortgage deed
2. Right of mortgagee (those who give loan)
3. Equity of redemption
4. All of the above

Contd...

Depreciation:-

- Loss of value of property due to structural deterioration, use, wear and tear, decay and obsolescence.

Objective:-

- Total depreciation during 1st five years of a cement concrete structure is

1. 0 %
2. 0.5 %
3. 1 %
4. 2 %

Answer: - 1

	<u>Depreciation per year</u>	<u>Total depreciation</u>
0-5 years	Zero	Zero
5- 10 years	0.50%	2.50%
10- 20 years	0.75%	7.50%
20-40 years	1%	20%
40-80 years	1.50%	60%
	Total	90%

Types:-

- a. **Physical depreciation:** - Due to wear and tear.
- b. **Locational Depreciation:** -Due to technological advancement.
- c. **Functional Depreciation:** -Caused by factors other than the property itself.

Obsolescence: -

Value of property become less by its becoming out of date in style.

Objectives: -

- Which of the following is factor for obsolescence of the structure
1. New invention.
 2. Improvement in design.
 3. Outdated design and structure.
 4. All

Contd...

Method of calculating Depreciation: -

- a. Straight line method: - lost its value at same amount every year and only scrap value remains at last.

- Annual Depreciation= $\frac{\text{Original cost} - \text{Scrap value}}{\text{life in years}}$

- b. Constant percentage method.

- Also called declining percentage method.
- Property will lose its value by a constant value.

- $D = 1 - \left(\frac{V}{C}\right)^{\frac{1}{n}}$ Where,

- D= percentage rate of annual depreciation.
- V= scrap value
- C= original cost.

Objective: -

A machine costs R. 16000 by constant rate of declining balance method of depreciation, its salvage value after an expected life of 3 years is 2000. the rate of depreciation is

1. 0.25
2. 0.30
3. 0.40
4. 0.5

Answer: - 4

Contd...

Method of calculating Depreciation: -

c. Sinking fund method.

- Depreciation is assumed to be equal to the annual sinking fund plus the interest on the sinking fund for that year.

- *Sinking fund coefficient (S_c) = $\frac{R}{(1+R)^n - 1}$* (i)

- Product of equation (i) & (ii) give rate of depreciation.
 - Suitable for finding depreciation of a building having a life of 100 years.

d. Quantity survey method: -

- only experienced valuator workout.

Objective

- Find the YP to get RS. 1 per year at interest rate of 4%.
 - a. Rs. 15
 - b. Rs. 25
 - c. Rs. 35
 - d. Rs. 45.

Hint: - Year's Purchase (Y.P.) = $\frac{100}{\text{Rate of interest}}$
= $100/4 = \text{Rs. } 25$

- Which of the following is the purpose of valuation?
 1. Approximate estimate of cost.
 2. Analysis of rate.
 3. Detail estimation of cost.
 4. Taxation.

Answer: - 4

Earthwork

- Method of measurement

Method I: Mid sectional area method

Quantity = Area of mid section \times Length

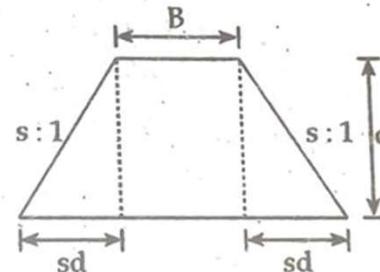
Area of mid section = Area of rectangular portion

+ Area of two triangular portions

$$= Bd + \frac{1}{2} sd^2 + \frac{1}{2} sd^2$$

$$= Bd + sd^2$$

∴ Quantity of earthwork = $(Bd + sd^2) \times L$
 where, d is the mean depth or height.



B is the formation width.

s is the side slope.

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

Earthwork Numerical

Prepare an estimate for the portion of a road from chainage 14 to 22 from the data given below. Draw typical cross sections for cutting and banking.

The formation width of the proposed road is 12 m, side slopes $1\frac{1}{2}: 1$ in cutting and 2 : 1 in banking.

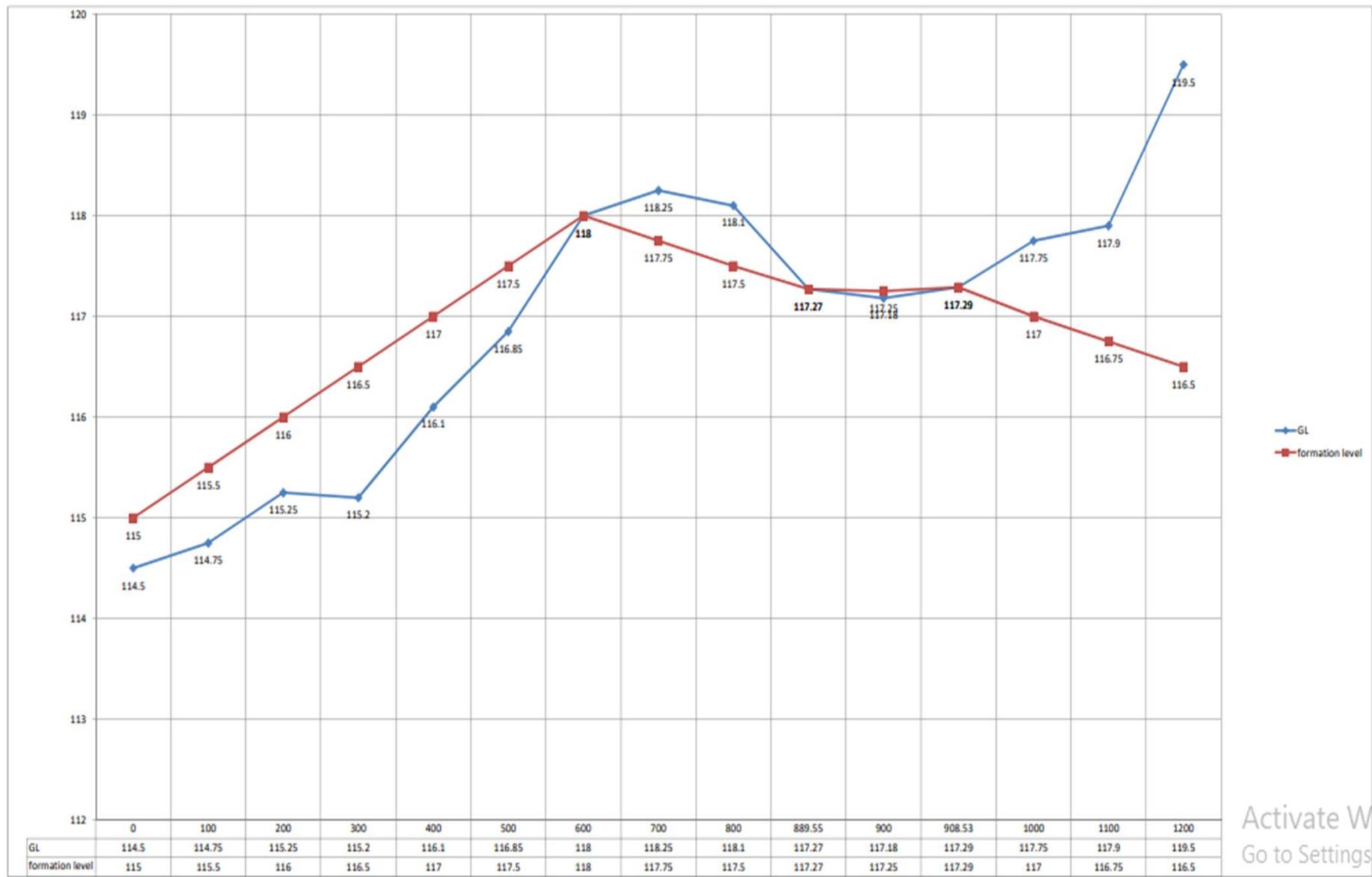
Chainage	14	15	16	17	18	19	20	21	22
R.L. of ground	108.6	109.25	109.40	108.85	1085.5	107.25	106.8	107.15	107.20

The road formation is proposed as uniform falling gradient 1 in 200 passing through G.L. at chainage 14 length of one chain = 30 m

Earthwork Numerical

Distance(m)	Ground level(m)	Formation level(m)	Depth(m)		average(d)(m)	side slope(s)		formation width(B)	Area(sq.m)=Bd+sd*d		Length(m)	Volume (Cu.m)	
			cut	Fill		cut	fill		cut	fill		cut	fill
0	114.5	115		0.5	0		2	10					
100	114.75	115.5		0.75	0.625		2	10		7.03	100		703.13
200	115.25	116		0.75	0.75		2	10		8.63	100		862.50
300	115.2	116.5		1.3	1.025		2	10		12.35	100		1235.13
400	116.1	117		0.9	1.1		2	10		13.42	100		1342.00
500	116.85	117.5		0.65	0.775		2	10		8.95	100		895.13
600	118	118	0	0	0.325		2	10		3.46	100		346.13
700	118.25	117.75	0.5		0.25	1.5		10	2.59		100	259.38	
800	118.1	117.5	0.6		0.55	1.5		10	5.95		100	595.37	
889.55	117.27	117.27	0	0	0.3	1.5		10	3.13		89.55	280.74	
900	117.18	117.25		0.07	0.035		2	10		0.35	10.45		3.68
908.53	117.29	117.29	0	0	0.035		2	10		0.35	8.53		3.01
1000	117.75	117	0.75		0.375	1.5		10	3.96		91.47	362.31	
1100	117.9	116.75	1.15		0.95	1.5		10	10.85		100	1085.38	
1200	119.5	116.5	3		2.075	1.5		10	27.21		100	2720.84	
Grand Total											5304.01	5390.69	

Earthwork Numerical



Earthwork

- Method of measurement

Method II: Mean Sectional area method

$$\text{Quantity} = \text{Mean sectional area} \times \text{Length}$$

In this method, it is not necessary to calculate mean depth but we should calculate the mean area after calculating the area of each station.

The quantity of earthwork may be calculated in tabular form as given below:

Stations or Chainag e	Height or depth 'd' (m)	Area of central portion 'Bd' (m ²)	Area of sides sd ² (m ²)	Total sectional area (Bd + sd ²) (m ²)	Mean sectional area A_m (m ²)	Length between stations 'L' (m)	Quantity ($A_m \times L$)	
							Embankmen t (m ³)	Cutting (m ³)

where, A_m is the mean sectional area.

d is the height or depth.

B is the formation width.

s is the side slope.

Earthwork

- Method of measurement

Method III: Prismoidal formula method

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

where, A_1 is the cross sectional area at one end.

A_2 is the cross sectional area of other end.

A_m is the mean sectional area.

$$A_1 = Bd_1 + sd_1^2$$

$$A_2 = Bd_2 + sd_2^2$$

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

$$A_m = Bd_m + sd_m^2$$

- ✓ Method I and II are generally used because it is simple and entails less labor, but where rates are high and greater accuracy is required, Prismoidal formula is used.
- ✓ The difference between method I and II is less than 0.5% and that II and III is less than 1%.

Road Specification

- Volume by prismoidal formula = $\frac{D}{3} (First\ area + Last\ area + 4 * \sum even\ area + 2 * \sum odd\ areas)$.
- In case of Prismoidal formula, it should have odd number of sections.
- E/W calculated by prismoidal Formula is more accurate.(1%)

Case I: Wholly in banking or wholly in cutting

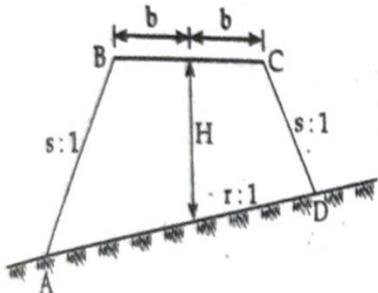


Figure: Fully banking

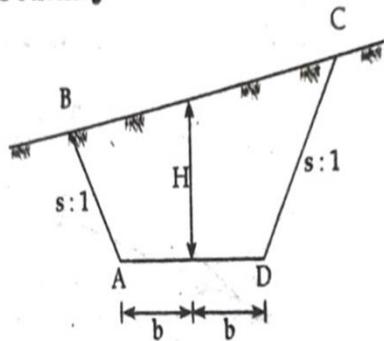


Figure: Fully cutting

Thus, from geometry; we have,

$$\text{Area of } ABCD \text{ (Area of fully cutting or banking)} = \frac{sb^2 + r^2(2bH + sH^2)}{r^2 - s^2}$$

where, $s : 1$ is the side slope.

$r : 1$ is the transverse slope.

H is the height of banking or depth of cutting.

b is the half of formation width.

Case II

- a) When centre line (FG) is in cutting portion (figure a)

Partly in banking and partly in cutting;

Area of ABE = Area of banking

$$= \frac{1}{2} \frac{(b - rH)^2}{r - s}$$

Area of EDC = Area of cutting

$$= \frac{1}{2} \frac{(b + rH)^2}{r - p}$$

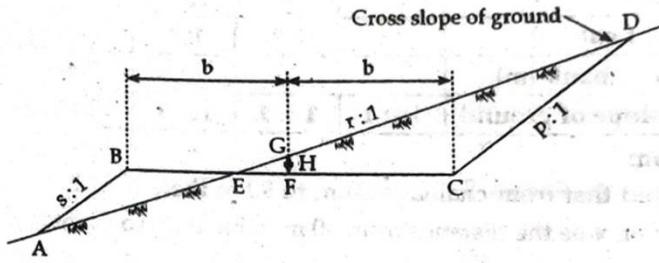


Figure: (a)

- b) When centre line (FG) is in banking portion (figure b)

$$\text{Area of ABE} = \text{Area of banking} = \frac{1}{2} \frac{(b + rH)^2}{r - s}$$

$$\text{Area of EDC} = \text{Area of cutting} = \frac{1}{2} \frac{(b - rH)^2}{r - p}$$

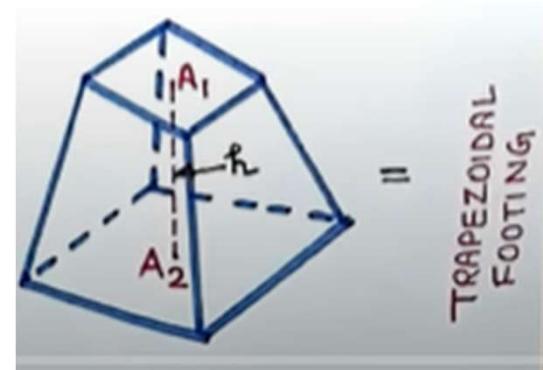
where, H is the centre depth of cutting or banking.

$s : 1$ is the side slope of banking.

$P : 1$ is the side slope of cutting.

Contd...

- Mean harmonic slope at Zero point (r) = $\frac{2 \cdot r_1 \cdot r_2}{r_1 + r_2}$
- Crest width at Zero point (Balance point) (b) = $\frac{1}{2} \left(\frac{B_1}{2} + \frac{B_2}{2} \right)$.
- Area of trapezoidal section = $B \cdot d + s \cdot d^2$.
- Area of truncated pyramid = $\frac{1}{3} * (A_1 + A_2 + \sqrt{A_1 \cdot A_2}) * h$



- When the contractor fails to complete the work, an agency is employed to execute a part or whole of work at the cost of contractor. Such agency called **debitable** agency.



Building Works

1. Cost of labor and materials

- i) Cost on account of labor 30- 35% of whole cost
- ii) Cost on account of materials. 70-65% of whole cost

2. Direct and Overhead Cost

- i) Direct cost on actual work 85% of whole cost
 - ii) overhead cost due to establishment, supervision etc. 15% of whole cost
3. i) Cost of foundation and plinth 10-15% of whole cost
 ii) Cost of superstructure 90-85% of whole cost
4. **Cost of second stored** 85-90% of first stored

5. Cost of materials and labor required for building

- i) Cost of Brick 22% of whole cost
- ii) Cost of Cement 12%
- iii) Cost of steel bar 10%
- iv) cost of timber 10%
- v) Cost of other materials 14%
- vi) wages of labor 30%
- vii) Work charged Establishments 2%

Cost of different parts of building (excluding sanitary and electrical works)

i) E/W in excavation and filling	0.5% of whole work
ii) Concrete in foundation	5% " " "
iii) DPC	1%
iv) B/W	34%
v) Roofing	20%
vi) Flooring	6%
vii) Doors and windows	16%
viii) Plastering and pointing	10%
ix) White washing, color washing, painting etc.	2%
x) Miscellaneous	5.5%