Civinnovate

Discover, Learn, and Innovate in Civil Engineering

ESTIMATING & COSTING

★ IS 1200

1) Estimating & Costing
2) Specification
3) Rate analysis
4) Conteacts
5) Tendars

★ Basic Unit conversions :

- 1 Brass = $10 \times 10 ft = 100 ft^2$
- $= 100 ft^3$

- 1 m = 3.28 ft
- 1 Gunta = $33 ft \times 33 ft = 1089$ sq.ft $= 100 m^2$
- 1 Acre = 40 Guntha
  $= 40 \times 1089 = 43560 ft^2 \cong 4000 m^2$

- 1 Hectre = 2.5 Acre
  $= 4000 \times 2.5 = 10,000 m^2$

- 1 inch = 25mm = 2.54 cm
- 1 feet = 12 inch = 30 cm

★ Estimate – An estimate is probable cost of work usually prepared before the consteuction of work. this estimate is prepared by computing oe calculating the quantities reqd & then calculating the cost at suitable rates, to get required expenditure for completion of project before actual consteuction is taken up. actual cost will be workout after completion of project.

★ purpose of estimate –

1) To workout the quantities.
2) To know appx cost of praposed work.

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3) To obtain administeative Approval & Technical Sanction.
4) To find tools & plants in advance.
5) To fixup the period of consteuction.
6) To invite the tenders.
7) To calculate the quantities of material.

* Costing –
finding the cost per item of work is known as costing.

• purpose of costing –
1) for the valuation of existing property
2) to average the finance of praposed work.

• Data reqd for Estimate
1) Drawings – plans, sectional elevations & detailed drawing to the scale fully dimensioned are reqd.

2) Specifications – Nature, quality, class of work & materials, proportions of materials, method of preparation, workmanship & execution of work is covered under the specifications.

3) Rates – rates per unit various items of work, rates of various materials to be used in construction, Rate of skilled & unskilled labours etc are reqd to prepare the estimate.

*

work
↓
preparation of Approximate Estimate
↓
Administeative approval
↓
Detailed estimate
↓
Technical sanction
↓
Draft copy of Tender
↓
Tender
↓
Work order (allotment of work)

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Types of Estimate

- Approximate / Preliminary / Rough estimate
  1) plinth Area method
  2) Cubic content method
  3) Service Unit method
  4) Typical Bay method
  5) Cost from Material & Labour
- Detailed Estimate
  1) Revised estimate
  2) supplementary estimate
  3) Revised & supplementary estimate
  4) Annual Repair & maintanance estimate

Approximate Estimate -
This is estimate is preliminary study of various aspects of work or project, it decides the financial positions & policy for administeative sanction / Approval by competant authority of respective dept. This estimate is prepared from practical knowledge & cost of similar work.
eg. appx cost of 100 bed Hospital at 50,000 per bed comes to be 50,00,000 ~~lakhs~~.

* Types of Approximate estimate -
1) plinth Area method - plinth area estimate is calculated by finding plinth area of building & multiplying ~~area~~ plinth area rate in that particular area. plinth area must not include the area of courtyard, open passages. this is Less accurate method.

Appx. cost = plinth area of praposed bldg x Rate of plinth area in Similar Location

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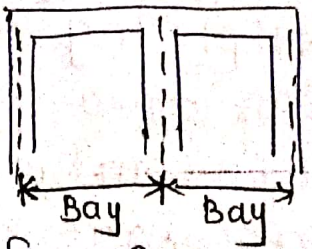
2) Cubic content Method –
In this method the volume or cubic content of praposed building is worked out & multiply by the rate per cubic volume. this is more accurate method in appx. estimate. cubic content is calculated by L x B x H. foundation, plinth & parapet above roof are not taken into account in this method.

Appx. cost = cubic content of praposed bldg x Rate per cubic volume.

3) Service unit method–
In this method the unit quantities of steucture is considered & multiplied by rate of that particular unit.

	Type of Building	Unit
i)	School Building	classroom / Bench
ii)	Hospitals	per bed.
iii)	Stadium / Theatre	seats
iv)	water tank	per litre
v)	Bridges	per span.

4) Typical Bay method –
Bay is the centre to centre distance betn the support. cost per Bay is calculated & multiplied by no. of bays.



eg– Railway platform,
factory sheds,
Industrial sheds, Building frame.

5) Cost from material & Labour –
Here in this method the appx quantity of material & Labour reqd per sq-m of the plinth area for praposed building are worked out

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arbitarily. also with the help of equations developed by central Building Reasearch Institute, Rurki (CBRI) & appx quantities are found out. (Refer Table)

Q. The most reliable estimate is
a) detailed estimate b) preliminary
c) plinth area d) None

Q. Eqn for cement requirement in tonnes for four storey RCC framed building (superstructure) recommended by CBRI is (A = plinth area in m^2)
a) 0.153A + 0.57 cement, single storey
b) 0.145A + 0.54 cement, double storey
c) 0.182A - 0.35 cement, 4 storey
d) 2.26A + 66.8 Bricks, single storey

Name of material	single storey	Double storey	superstructure RCC framed
1) Bricks (% Nos)	2.26A+66.8	2.15A+63	$-26.2+2.56A$ $-0.0096A^2$
2) Cement (tonne)	0.153A+0.57	0.145A+0.54	0.182A - 0.35
3) steel (kg)	21.3A - 314	21.97A-305	$-1491+92.0A$ $-0.36A^2$
4) Sand (m^3)	0.47A - 7	0.376A-5.6	0.361A - 0.38

* Detailed Estimate (Item Rate estimate)
1) ~~Revised Esti~~ In a detailed estimate we find all detail quantities according to drawing required for our work and also find out the detailed cost with the help of specifications.
- Detailed estimate is prepared for Technical sanction from competent authority for arranging contracts, inviting the Tender & for execution of work.

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Detailed work out quantities are arranged in a sheet known as measurement sheet.

format of measurement sheet -

Sr.No	Description	No.	L	B	H	quantity	Remark

~~form~~ The quantity work out in measurement sheet will be multiply by rates to get total amount of particular Item. this is arranged in Absteact sheet

format of Absteact sheet -

Sr. No	Description	Quantity	Rate/unit	Total Amount

Note - If in the absteact of estimate form the column of Rate & total amount are left blank (which is to be filled by contractor) is known as Bill of quantity (BOQ)

Q. Document req^d for inviting the Tender is,
a) Absteact sheet (for costing) b) specifications
c) BOQ d) measurement sheet (for estimating / for execution)

* Types of Detailed Estimate -

1) Revised Estimate - It is req^d to prepare under following condition -
a) when original sanctioned estimate is exceeded by more than 5%
b) when expenditure on a work exceeds or likely to exceed the amount of administrative sanction by more than 10%.
c) when there is material deviation from Original praposal.

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2) Supplementary Estimate:
a) It is a detailed estimate of additional work this estimate is prepared when additional work or changes in work are reqd to be supplement with original work during the execution of work.

3) Revised & supplementary estimate -
- when the work is partially abunded (stop) or when there is material deviation & change in design which may cause the additional work, this type of estimate is prepared.
- after this estimate is prepared the fresh technical sanction of competant authority is obtained.

4) Annual Repair & Maintenance estimate -
- This estimate is prepared to maintain the steucture or a work in a proper order & safe condition.
- for a building, kind of repairs include - whitewash, colourwashing, painting etc.

* Definations -

1) contigency - It is incidental expenses of miscellnous character which can not be classify in any item of work.
eg - special visits of officer, for any fatle or severe accident, nosing at the end of steps.

A provision of 3% to 5% of estimated cost should be made.

2) Work charge Establishment -
During cost^{n} of building / project a certain no. of work supervisiors, Watchman, matemunshi's etc are reqd to be employed & their salaries are paid from the amount of workcharge establishment provided in estimate.

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Provision of 1.5% to 2.5% of estimated cost is given for work charge establishment.

3) Tools & plants –
for a big project the percentage of about 1 to 1.5% of estimated cost is provided for the purpose of tools & plants.

4) Centage / Departmental charges –
When an Engineering Department takes up the work of other department % amount of 10 to 15% of estimated cost is charged to meet the expenses of establishment, designing, planing, supervision etc.

5) provisional sum –
Arbitary amount provided in estimate to carry out some special type of work, whose details can not be known at the time of preparing the estimate. (eg- Nameplate, installation of Lift)

6) prime cost – It is a net cost of purchased item or a material at the shop. this items are not included in the estimate. In order to execute such item of work, a resonable amount is provided in estimate as a prime cost.
eg- cost of fastenings & fixtures of doors & windows, sanitary fittings, plumbing items.

7) provisional Items –
This are additional quantities which are not included in estimate due to variation of site conditions. the payment for provisional items is made after completion of work.
eg- shifting of water line, installation of lift.

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* provisional sum — addition of amount for purchased material & Not mentioned.
* provisional ~~cost~~ Items — Additional quantities.
* prime cost - Net cost of purchased material.

* Administeative Approval -
it is The formal acceptance of praposal by concerned department by competant authority.
- for the adm. approval appx. estimate & preliminary plans are reqd.
- Detailed plan & estimate is prepared after getting adm. approval.

* Expenditure sanction -
The allotment of fund to meet up the expenditure to execute the work. it is done by finance department.

* Technical sanction -
- after the adm. approval & expenditure sanction a detailed estimate is further sanctioned by competant Technical authority is known as Technical sanction.
- The actual work will be start only after getting the technical sanction.

* • Adm. Approval → allocation of work • Expenditure sanction → allocation of fund • Technical Sanction → to start execution of work.

* Day Work —
During the execution of work the payments are made on the basis of actual quantity of ~~work &~~ Labour & materials, Hours requires to complete the job are denoted by Day work.
eg- cutting of trees, cleaning of site, dismantling of partition wall etc.

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★ Schedule of Rates –
The Rates of various items, Labours, material & transportation are mentioned in particular book of PWD which is known as schedule of Rates.

CSR – common schedule Rates.
SSR – state schedule Rates
DSR – distelct schedule Rates

★ To get administeative approval → Approximate Estimate

Technical sanction – Detailed estimate.

★ Degree of Accuracy – (SP27-1984)

1) Dimensions shall be measured upto 0.01m (1cm)
2) area shall be measured upto $0.01\ m^2$
3) Volume shall be measured upto $0.01\ m^3$.
4) thickness of slab portions that are projected outside then sectional dimension of beam & colm shall be measured upto 0.005m
5) mass shall be measured upto 1kg
6) wood work shall be measured upto $0.001\ m^3$
7) Reinforcement measured upto 0.005m.

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★ Units of measurement of Work:

1) mass work/ voluminous work – m^3
2) shallow & thin surface work (∵ 1 dimension is specified) – m^2
   eg – Half brick wall
3) Long & thin work (where 2 dimensions are specified B & H) → Running meter (Rmt)
   eg – skirting, fencing
4) Note – canal Lining is also measured in Rmt.
4) piece work or Job work – Number
   eg – Basin, fans, doors. (SP27-1984)
   (SP – special provisions)

★ Units of various quantities –

1) Earthwork – excavation, cutting, filling & banking.
2) surface dressing – upto 15 cm
   width of Trench, W > 1.5 m
   Depth of Trench, D < 30 cm
   then trench will be measured in m^2
3) cleaning of shrubs & bushes having girth (perimeter) less than 30 cm → m^2
4) cutting of Trees – Number
5) concrete, RCC – m^3 (steel work – Kg, quintle/ Metric quintle)
   PCC – m^3
   DPC – m^2
6) plastering – m^2
7) Brickwork – thickness > 10 cm → m^3
   < 10 cm → m^2
   eg – Half brick wall
8) pointing – m^2, skirting – Rmt, Dado – m^2
9) stone masonary – m^3
10) flooring thk ≥ 7.5 cm → m^3 & Thk < 7.5 cm → m^2
11) wood work → m^3 (window frame, door frame)
12) Door shutter, window shutter → m^2

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Grill work, collapsable gate – m^2

★ Rules of Deduction –

• for plastering :

1) No deduction for small openings upto $0.5\ m^2$ & no addition for Jambs, soffit & sill.

2) opening in between $0.5\ m^2$ to $3\ m^2$, deduction is made only for one face.

3) for opening above $3\ m^2$ deduction is made of both the faces & addition of Jambs, Soffit & sills is done.

• for Masonary work :

1) No deduction is made for openings upto $0.1\ m^2$

2) No deduction for chajja's, Lintel, offset :

3) No deduction for end of beams, soffits, Rafters, purlin upto $0.05\ m^2$.

4) when Bed plate, wall plate, bearing of chajja are upto 10cm.

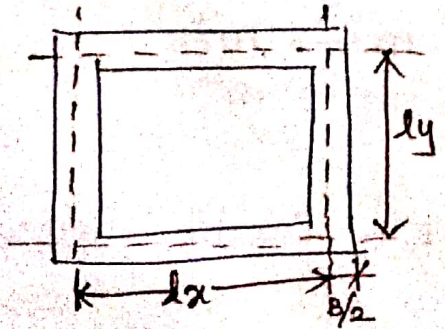
★ Long Wall-short Wall Method (PWD method) –

In this method, 1st we find c/c distance of total plan. mostly Horizontal wall is considered as long wall & vertical wall is considered as short wall.

★ Length of long wall = c/c distance + $\frac{b}{2}$ + $\frac{b}{2}$

= c/c distance + width.

★ Length of short wall = c/c distance – $\frac{b}{2}$ – $\frac{b}{2}$.



Quantity will be worked out by multiplying B & H of every item

Note – This method is genrally used in PWD.

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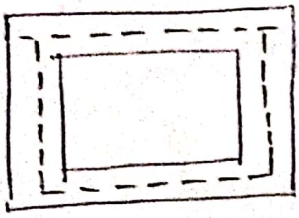
2) centeeline Method –

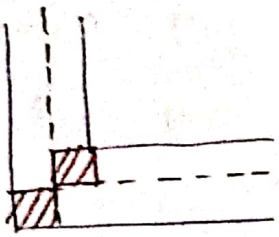
In this method, centeeline is drawn & total centre line length is found. then as beam & walls are overlapped upto centre of another wall, deduction is made on junction point.

for L-junction there will be no deduction

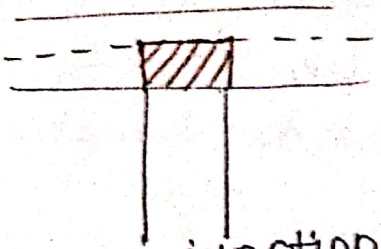
for T-junction Half of the width is deducted.



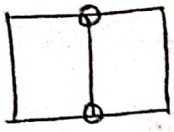
Total Length = Total centee line − $\frac{B}{2}$ × no. of junctions



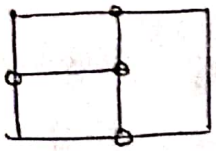
L-junction (No deduction)



T-junction (B/2 deduction)



No of junctions → 2



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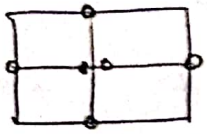

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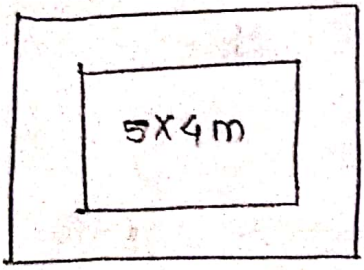
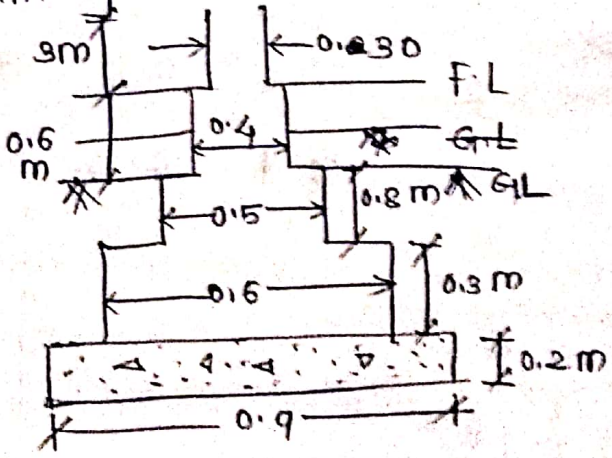
* centee line method is suitable for quantity of walls which are curved in plan.

Que – calculate the quantity of various items as per PWD method.





→ Long wall = $5 + \frac{0.3}{2} + \frac{0.3}{2} = 5.3$

short wall = $4 + \frac{0.3}{2} + \frac{0.3}{2} = 4.3$

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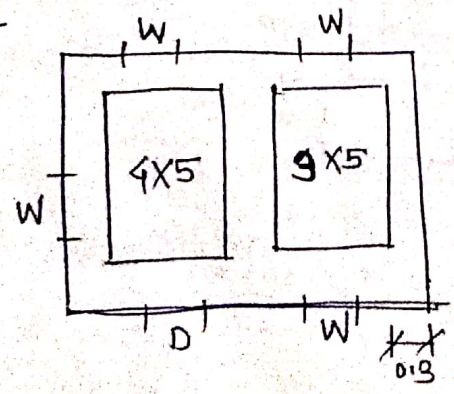
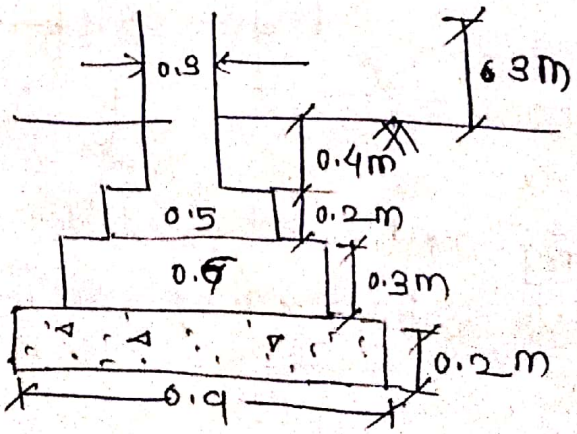
Se. No	Description	No.	L	B	H	Quantity	Remark
1.	Excavation						
	L·W = 5.3+0.9 = 6.2	2	6.2	0.9	1.3		
	S·W = 5.3-0.9 = 4.4	2	3.4	0.9	1.3		
2.	PCC						
	L·W	2	~~6.2~~	0.9	0.2		
	S·W	2	~~3.4~~	0.9	1.3		
3.	Step 1						
	L·W	2	~~5.9~~	0.6	0.3	2.12	
	S·W	2	4.7	0.6	0.3	1.692	
4.	Step 2						
	LW	2	5.8	0.5	0.8	4.64	
	SW	2	3.6	0.5	0.8	3.84	
5.	Step 3						
	LW	2	5.7	0.4	0.6	2.736	
	S.W	2	4.9	0.4	0.6	2.352	
6.	Superstruct						
	LW	2	5.6	0.3	3	10.08	
	SW	2	5.1	0.3	3	9	

Que -





D = 1.2 X 2.1

W = 1 X 1.2

By centeeline method

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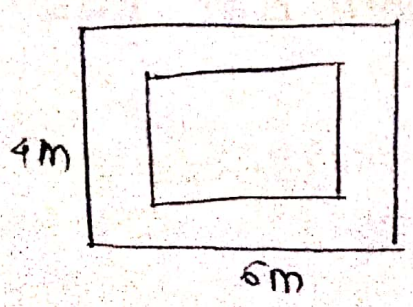
Centre line Length = $(0.15+4+0.3+3+0.15)\times 2 + 3(0.15+5+0.15)$

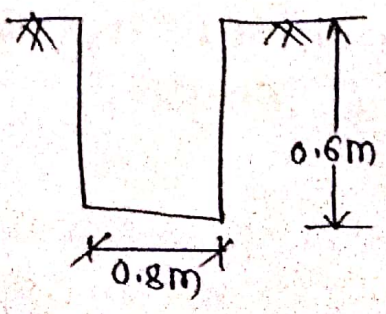
$= 31.1\ m$.

No. of junctions = 2

Sr. No	Description	No.	L	B	H	Quantity (m^3)	Remark
1.	Excavation $L = 31.1 - \frac{0.9}{2}\times 2$ $= 30.2\ m$	1	30.2	0.9	1.2	32.61	
2.	PCC $L = 31.1 - \frac{0.9}{2}\times 2$ $= 30.2\ m$	1	30.2	0.9	0.2	5.436	
3.	Step 1 $L = 31.1 - \frac{0.5}{2}\times 2$	1	30.5	0.6	0.3	6.3840	
4.	Step 2 $L = 31.1 - \frac{0.5}{2}\times 2$	1	30.6	0.5	0.2	3.06	
5.	wall $L = 31.1 - \frac{0.3}{2}\times 2$	1	30.8	0.3	3.4	31.9	
	Deductions – $D = 1.2\times 2.1$	1	1.2	0.3	2.1	0.756	
	$W = 1\times 1.2$	5	1	0.3	1.2	1.8	
						28.86 m^3	

Que Find the volume of in excavation for following foundation teench.





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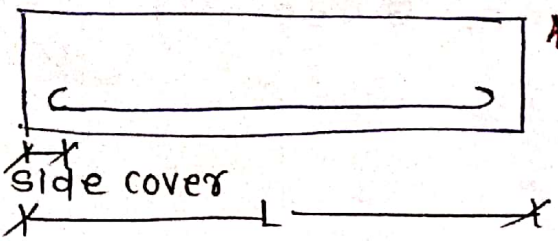
→ Total length = $6 \times 2 - (4 - 0.8 - 0.8) \times 2$

$= 16.8$ m

Quantity = $16.8 \times 0.8 \times 0.5 = 8.064$ m³

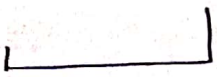
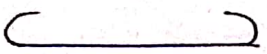
★ Bar Bending schedule –

It is the List of R/f bars in tabular form giving the particulars of bars, shape of bending with sketches, the Length of every bar, total length & total weight.

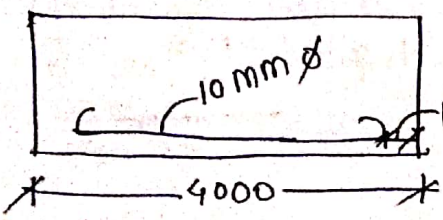


★ Total Length of Bar =

L – 2× side cover + 2× Hook Length

Angle of Bending	Hook length
 90°	6ϕ or 8ϕ
 180°	9ϕ
 45° or 135°	12ϕ

Que – find cutting length of bar in a given beam.



Total Length =

$4000 - 2 \times 15 + 2 \times 9 \times 10$

$= 4150$ mm

- sometimes we have to provide a bentup bars for the continuous slab. Bentup bar has some extra length.

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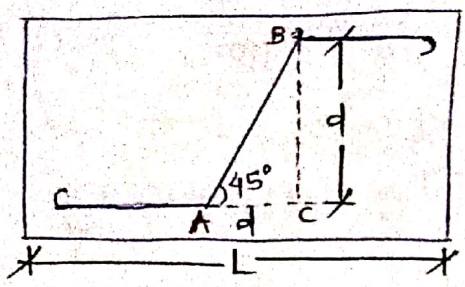

In $\triangle ABC$, $\cos 45 = \frac{AC}{AB}$

$\therefore AB = \frac{d}{\cos 45}$

$= \frac{d}{1/\sqrt{2}}$

$AB = 1.414d \cong 1.42d$

External length for 45° = $AB - AC$

$= 1.42d - d = 0.42d$

∴ Total Length of Bentup bar = L − 2x side cover + 2x Hook Length + Extra length.

Angle of Bentup	Extra Length
30°	0.27d
45°	0.42d
60°	0.57d

★ weight per meter of steel.

1) for circular bars $\frac{w}{m}$ = Vol^m × γ of Steel

$= \frac{\pi}{4} \times d^2 \times 1 \times 7850$

$= 0.00617\, d^2$

$\therefore \frac{w}{m} = \frac{d^2}{162}$

Bar dia	w/m
6 mm	0.222
8 mm	0.395
10 mm	0.617
12 mm	0.888
16 mm	1.580
20 mm	2.469
25 mm	3.858
30 mm	5.55
32 mm	6.92

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for square bar of side 'a' $\frac{w}{m} = \frac{a^2}{127} = 0.00787 d^2$

Que- what is wt of bar of 16mm dia for 10m length

a) 16.90 kg (b) 15.80 kg c) 16.10 kg d) 15.40 kg

for 16 mm w/m = 1.58

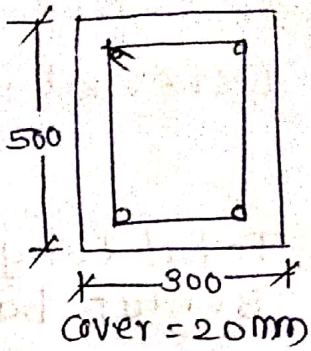
Total wt = 1.58 × 10 = 15.80

Que - find the length of stirrup, ϕ = 8mm

→ L = (300 − 2×20) × 2 + (500 − 2×20) × 2

+ 2 × 12 × 8

= 1632 mm



Que - workout the quantity of mild steel R/f in a detail sheet for the following Lintel.

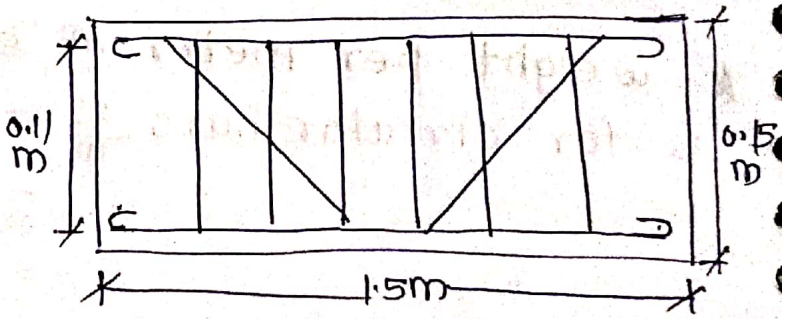
main bars - 12 mm dia, 3 nos.

2 stealght & 1 bentupbar

Anchor bars - 6mm ϕ, 2 nos.

Stirrups 6mm at 150 mm c/c.

→ cover = 20mm



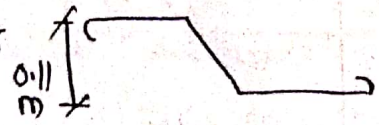
Main Bars

a) Stealght bars

L = 1500 − (2×20) + 9×12×2

= 1676

b) Bentup bar



L = 1500 − 2×20 + 9×12×2 + 0.42×2 + 110

= ~~1722.2~~ ~~1681.04~~ mm

c) Anchor bars

L = 1500 − 2×20 + 2×9×6

= 1568 mm

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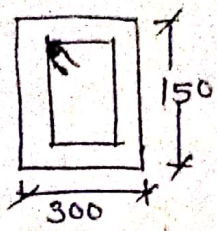
d) stirrup size (Lintel size = 1.5 X 0.3 X 0.15)

$L = [(300 - 2\times20)\times2 + (150 - 2\times20)\times2 + 2\times12\times6]$

$= 884$ mm



Sr. No	Description	shape of bar	dia of bar	Nos.	Length	Total Length
1.	Bottom st. bar	⟶	12 mm	2	1.676	3.352
2.	Bottom Bent up	⟶	12 mm	1	1.722	1.722
3.	Anchor	⟶	6 mm	2	1.568	3.136
4.	Stirrups	□	6 mm	11	0.884	9.72

$$\text{No of stirrups} = \frac{\text{Length} - 2\times\text{cover}}{\text{spacing}} + 1$$

Quantity of steel,

- for 12 mm ϕ = 3.352 + 1.722 = 5.07 m

wt of bar = $5.07 \times \frac{(12)^2}{162}$ = 4.52 kg

- for 6 mm ϕ = 3.136 + 9.72 = 12.856 m

wt of bar = 12.856 X 0.22 = 2.82 kg

Q. The usual practice of bending of bars near the support is at an angle of

a) 30° ~~b) 45°~~ c) 60° d) 15°

at support – 90°

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Q. while computing the masonary work, no deductions are made upto

a) opening upto $0.1 m^2$ b) end of beam upto $0.05 m^2$

c) bed plate & wall plate upto 10cm

d) All of the above.

★ SPECIFICATIONS

1) Specification is very important document for execution of work.
2) specification is a contract document specifying the quantity of materials to be used.
3) specification should be clear & it should not create any ambiguity.
4) specification always contain the word like 'shall be' & 'should be'
5) specification for particular project is depends on nature of work, purpose of work, SOM, availability & quality of material.
6) cost of work is depends on specifications.

★ purpose of specifications—

1) to give the reqd information for an item of work which can not be shown on drawings.
2) for execution of work, for supervising purpose.

★ Types of specifications—

1) General / Brief specification—

- It is the short description of different parts of work specifying materials, proportions, qualities etc.
- The general sp. gives genral idea of work & useful in preparing a estimate.

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2) Detailed specification —

- Detailed sp. of different items of work are prepared seprately & describe the what work should be & how they shall be executed & constructed.
- The detailed sp. are arranged as far as possible in the same sequence of order as the work is carried out.
- detailed specification mainly used for execution of work.

* some specifications are as follows —

1) conc in foundation of M20 grade should be laid in the layer of thickness not exceeding 20cm
2) after completion of conc it should kept wet atleast foe 7 days & no masonary work should be done over it for these days.

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RATE ANALYSIS

Deteemination of Rate per unit of particular item ~~of~~ feom the quantities & cost of material, Labours, tools & plants etc are reqd for work is defined as Rate Analysis.

★ purpose of Rate Analysis –

1) To find actual cost per unit of items
2) To calculate the exact quantity of material reqd for an item.
3) To check the rates offered by the conteactor.
4) To fix up the Labour conteact rate

★ Taskwork / outturn –

It is the capacity of skilled Labour to do the work in a day of 8th working hours is called Taskwork.

$$\therefore \text{no. of Labours} = \frac{\text{Total Quantity}}{\text{Task work}}$$

MES-13

	Items	Quantity Per day / Labour or mason
1)	earthwork in ordinary soil	3 m^3
2)	Earthwork in Hard soil	2 m^3
3.	excavation in rock	1 m^3
4.	Brickwork in foundn & plinth in cement mortar	1.25 m^3
5.	Brickwork in superstruct.	1 m^3
6.	Half brickwall in partition	5 m^2
7.	Random rubble masonary in foundn & plinth	1 m^3
8.	Random rubble masonary in superstruct above plinth	0.9 m^3

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9.	Ashlar masonry in super structure	$0.4 m^3$
10.	Coarse rubble masonry in super structure	$0.67 m^3$
11.	PCC	$5 m^3$
12.	RCC	$3 m^3$
13.	25 mm thick DPC	$12.5 m^2$
14.	12 mm thick plaster	$8 m^2$
15.	Painting	$10 m^2$
16.	Timber framing in thick wood	$0.07 m^3$/day/carpenter
17.	White washing in 3 coats	$70 m^3$/day/white washer
18.	2.5 cm cement flooring	$7.5 m^2$/day/carpenter
19.	Mangalore Tile roofing	$6 m^2$/ tile layer

Quantity Estimation

1) RCC

Dry volume = Add 52% of wet volume

= 1.52 x wet volume

2) P.C.C

Dry volume = 1.52 x wet of volume

3) Brickwork

Dry volume of Mortar = 35% of Masonary

No. of Bricks = $\frac{\text{volume of masonary}}{\text{volume of standard Brick}}$

Standar brick size = 20 x 10 x 10 cm

For frog Add 10% of Dry volume

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4) Plastering

i) To find volume of plastering

ii) Add 30% of volume for joints and uneven surface

wet volume = 1.3 × volume of plastering

iii) Add 25% of wet volume to get Dry volume

Dry volume = 1.25 × wet volume

5) UCR (uncoorde Rubble) Masonary

Volume of Mortar = 40% of UCR Masonary

volume of stone = Add 25%

= 1.25 of masonary

6) Painting

Volume of mortar = 0.7 m^3 per 100 m^2.

7) DPC

Wet volume = Thickness × surface Area

Dry volume = 1.52 × wet vol^m

If DPC is done in cement mortar then dry volume

= 1.33 × wet volume

The Add 1 kg of admixture per bag of cement in DPC

* 1 $Bag_{of\ cement}$ = 0.035 m^3
* 1 m^3 = $\frac{1}{0.035}$ = 28.57 ≈ 29 bags

* 1 bag = 50 kg
* 1 Brass = 2.83 m^3
* 1 m^3 = $\frac{1}{2.83}$ = 0.35 Brass

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Q find the quantity of ingredients of $10 m^3$ RCC work in a proportion of 1:2:4

→ wet volume = $10 m^3$

Dry volume = 1.52 × wet volume

= 1.52 × 10 = 15.2

proportion = 1:2:4

1) volume of cement = $\frac{1}{1+2+4} \times 15.2 = \frac{15.2}{7} = 2.17 m^3$

No. of bags = $\frac{2.17}{0.035} = 62$

Cement in kg = 62 × 50 = $62 \times \frac{100}{2}$

= 3100 kg

2) Sand = $\frac{2}{1+2+4} \times 15.4 \ m^3$

= $4.34 m^3$ = $\frac{4.34}{2.87}$

= 4.34 × 0.35 = 1.52 Brass

4) Aggregate = $\frac{4}{1+2+4} \times 15.2 = 8.68 m^3$

* For calculation for no. of bags

As 1 ~~bag~~ m^3 = 29 bags

$x m^3 = 29x$ (

$30x - x \rightarrow (30x - 1.5x)$

Q For $1 m^3$ of cement concrete of proportion 1:2:4 with stone chips required no. of cement bags are

1) 6.34 2) 8.00 3) 5.5 4) 4.5

→ Dry volume = 1.52 × 1 = 1.52

Volume of cement = $\frac{1.52}{1+2+4} \times 1 = \frac{1.52}{7} = 0.217$

No. of cement bag = $\frac{0.217}{0.035} = \frac{30 \times 0.217 - 0.217}{3 \times 2.17 - 0.217} = \frac{6.51 - 0.217}{6.293}$

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Topic Q3 2012

Q3. For above problem work out the cement in kg

cement in kg = 6.34 × 50

= 317.00

= 317

a) 3.05 b) 3.30 c) 2.85 d) 2.55

Q The approximate volume of cement required for 100 m^3 of 1:2:4 is

→ wet volume = 100 m^3

Dry volume = 1.52 × 100

= 152

Volume of cement = $\frac{1}{1+2+4}$ × 152

= 21.7

No. of bags = $\frac{21.7}{0.035}$ = 30 × 21.7 − 21.7 − 0.5 × 21.7

= ~~651 − 21.7~~ 618.45

= ~~629.3~~ 629.3 − 10.89 = 618.41

= 6200 No. of bags

cement in kg = $\frac{629.3}{314.7}$ × 50 = 620 × 50

= 629.3 × $\frac{100}{2}$ = 620 × $\frac{100}{2}$

= ~~314.65~~ 31465 = ~~12400~~ 31000

For 1 m^3 brick work in cement mortar find the quantity of ingredients (1:6)

→ wet volume = 1 m^3

1) Dry volume = 35% of brick masonary

= 0.35 × 1 = 0.35 m^3

2) Volume of cement = $\frac{1 \times 0.35}{1+6}$ = $\frac{0.35}{7}$ = 0.05

3) No. of bags = $\frac{0.05}{0.035}$ = 30 × 0.05 − 1.5 × 0.05

= 1.5 − 0.75 = ~~1.25~~ 1.425

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No. of bags = $\frac{0.57}{0.035}$

$= \frac{57}{100} \times \frac{1000}{35}$

$= \left(57 \times \frac{2}{7}\right)$

4) Cement in kg $= 1.425 \times 50$

$= 1.425 \times \frac{100}{2}$

$= 0.7125 \times 100$

$= ~~712.5~~\ 71.25$

5) Sand $= \frac{6 \times 0.35}{1+6} = \frac{2.10}{7} = 0.3$

$= \frac{0.3}{2.83} = 0.3 \times 0.35$

$= 0.105$

6) No. of bricks $= \frac{1}{0.2 \times 0.1 \times 0.1} = \frac{1}{2 \times 1 \times 1 \times 10^{-3}}$

$= \frac{1000}{2} = 500$ No. of bricks

wrong ~~x~~ $= 500 \times 0.105$

$= 5 \times 10.5$

$= 52.5$

7) Quantity of mortar only $= 1 - (0.19 \times 0.09 \times 0.09) \times 500$

$= 1 - 0.769$

$= 0.23\ m^3$

For frog filling = Add 10%

Total mortar $= 0.23 \times 1.1$

$= 0.253\ m^3$

If proportion is not given then quantity of mortar can be found by step no. 6

Q) Find the quantity of plaster ingredients of plaster in cement mortar 1:4 for $100\ m^2$ and 12 mm thick

→ ~~Wet volume~~ Area $= 100\ m^2$

~~Dry volume~~ Thickness $= 12\ mm = 12 \times 10^{-3}$

volume of plaster $= 100 \times 12 \times 10^{-3}$

$= 1.2\ m^3$

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Wet volume = 1.3 × volume of plaster

= 1.3 × 1.2

= 1.56 m^3

Dry volume = 1.25 × wet volume

= 1.25 × 1.56

= $\frac{5}{4}$ × 1.56

= 1.95

Volume of cement = $\frac{1}{1+4}$ × 1.95 = $\frac{1.95}{5}$ = 0.39

No. of bags = $\frac{0.39}{0.035}$ = 30 × 0.39 − 1.5 × 0.39

= 11.7 − 0.585

= 11.115 ≈ 12 bags

cement in kg = 11.115 × 50

= $\frac{11.115 \times 100}{2}$ = 5.55 × 100

= 555 kg

Volume of sand = $\frac{4}{1+4}$ × 1.95

= 1.56 m^3

in brass = 1.56 × 0.35

= 0.55 Brass

Q Find the quantities for UCR in 1:6 CM for 10 m^3 masonary

→ UCR = 10 m^3

Volume of mortar = 40% of UCR

= 0.4 × 10 = 4 m^3

cement = $\frac{1}{1+6}$ × 4 = $\frac{4}{7}$ = 0.57 m^3

No. of bags = 30 × 0.57 − 0.57 × 1.5 = 17.1 − 0.855

= 16.145

cement in kg = 16.145 × 50 = $\frac{1614.5}{2}$ = 807.25 kg

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Sand = $\frac{6}{1+6} \times 4 = 0.57 \times 4$

$= 2.28$

in brass = 2.28×0.35

$= 0.798$

Volume of stone = $1.25 \times$ vol m of masonary

$= 1.25 \times 10$

$= 12.5$

Q. Find the quantity of ingredient for PCC of proportion 1:4:8 of $10\ m^3$

→ Volume of wet = 10

Dry volume = 1.52×10

$= 15.2$

Volume of cement = $\frac{1}{1+4+8} \times 15.2 = \frac{15.2}{13} = 1.169\ m^3$

No. of bags = $\frac{1.169}{0.035} = \frac{1.169 \times 1000}{35} = \frac{1169}{35} = 33.4$

cement in kg = $33.4 \times 50 = \frac{3340}{2} = 1670$

Sand = $1.169 \times 4 = 4.676$

In brass = 4.676×0.35

$= 1.6366$

Aggregate = 1.16×8

$= 9.28\ m^3$

Q. Find the quantity of DPC 1:2:4 of 25 mm thick for $100\ m^2$

→ Area = $100\ m^2$

Thickness = 25 m

Volume of DPC = $100 \times 25 \times 10^{-3}$

$= 2.5\ m^3$

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Dry volume = 1.52 × 2.5

= 3.8

Volume of cement = $\frac{1}{1+2+4} \times 3.8$

= $\frac{3.8}{7}$ = 0.54 m^3

No. of bags = $\frac{0.54}{0.035}$ = $54 \times \frac{2}{7}$

= 7.8 × 2 = 15.4

Cement in kg = 15.4 × 50

= $\frac{1540}{2}$ = 770 kg

Volume of sand = 0.54 × 2

= 1.08 m^3

in brass = 1.08 × 0.35 $\quad 1.08 \times \frac{1}{3}$

= 0.378 brass

Aggregate = 0.54 × 4 = $\frac{4}{1+2+4} \times 3.8$

= 2.16 m^3

1 kg of cement = 1

We add 15.4 kg of admixture as 1 kg is added for 1 cement bag

Q. Quantities of DPC for 1:4 cement mortar of 25 mm thick of area 100 m^2

→ Volume of DPC = 100 × 25 × 10^3 = 2.5 m^3

Dry volume = 1.33 × 2.5 = 3.32

Volume of cement = $\frac{1}{1+4} \times 3.32 = \frac{3.32}{5}$ = 0.66 m^3

No. of bags = $\frac{0.66}{0.035} = \frac{66}{3.5} \times 2 = 9.4 \times 2 = 18.8$

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Cement in kg = 18.8 × 50

= 1880 / 2 = 940

Sand = 4/(1+4) × 3.32 = 2.64

In brass = 2.64 × 0.35

= ~~0.924~~ 0.924

2.64 × 0.35 = 0.924

Q Find the quantity of painting of 100 m^2 in 1:3 cement mortar

→

Dry vol^m = 0.7 m^3 for 100 m^2

∴ vol^m of cement = 1/(1+3) × 0.7 = 0.7/4 = 0.175

No. of bags = 0.175 / 0.035 = 17.5 × 2/7

= 2.5 × 2

= 5.0

Cement in kg = 5 × 50 = 250 kg

Sand = 0.175 × 3 = 0.425

In brass = 0.425 × 0.35

= 0.148

0.425 × 0.35 = 0.14875

Note: As the grade changes the proportion of sand and aggregate remains constant for the particular volume but the quantity / vol^m of cement is variable which is increases with the increase in grade of concrete.

M10 → 1:3:6 → 0.16 m^3 → 1/6 : 1/2 : 1 → (1/6 : 3/6 : 6/6)

M15 → 1:2:4 → 0.25 m^3 → 1/4 : 1/2 : 1 → (1/4 : 2/4 : 4/4)

M20 → 1:1.5:3 → 0.33 m^3 → 1/3 : 1/2 : 1 → (1/3 : 1.5/3 : 3/3)

M25 → 1:1:2 → 0.5 m^3 → 1/2 : 1/2 : 1 → (1/2 : 1/2 : 2/2)

M5 → 1:5:10 → 0.1 m^3 → 1/10 : 1/2 : 1 → (1/10 : 5/10 : 10/10)

M17.5 → 1:4:8 → 0.125 m^3 → 1/8 : 1/2 : 1 → (1/8 : 4/8 : 8/8)

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Q1. The rate of particular item of work is depends on
a) Specifications of work and materials
b) Quantities of material and their rates
c) Location of site of work
d) Profit and overhead expenses of contractor
a) A and B b) only D
c) A, C and D ~~d)~~ A, B, C, D

Q2 The unit of measurement for earthwork in surface excavation exceeding 1.5 m in a width as well as 10 m^2 on plan but not exceeding in 30 cm is in
a) m^3 ~~b)~~ m^2 c) 10 m^2 d) Rmt

Q3 If the length of 20mm diameter bar is 20 m then its weight is

→ Bar = 20 mm
length = 20 m
$\frac{w}{m}$ = 2.46 kg/m
= 2.46 × 20 = 49.2 kg

Q4. The work output of mason for a brick work in cement mortar for the foundation work is roughly expected to be
a) 0.5 m^3/day ~~b)~~ 1.25 m^3/day c) 2 m^3/day d) 5 m^3/day

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UNIT NO: 4

Contracts

Contracts:

- The contract is an agreement which is imforcable by court of law.
- It is the undertaking by a person or formed to do any work under certain terms and conditions

Objects

- To execute the work as per agreement and according to specification
- To execute the work by using latest machinary. techniques and experienced person.

- Requirement of valid contract
- The both the parties to formed the contract must be competent. (Liable)
- Their must be free consent by both parties.
- During signing of contract it must be attested by witness.
- Contract must be in a writing only
- The subject matter of contract must be simple and understandable.
- It can be enforced in court of law

contract document:

1) Title page - Having a name of work, contract bond no. etc.
2) Index page - Having the content of agreement with page references.
3) Tender Notice - Giving the brief description of work.

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estimated cost of work, date and time of tender, amount of EMD and SD, and type of time of completion etc.

4) Tender form - Giving the bill of quantities, contractor rates, total cost etc.

5) Bill of quantities -

6) Schedule of issued of materials

7) General specification

8) Detailed specification

9) Drawings

10) Condition of contract

11) Special conditions - The labour can, labour amenities, any compensation in case of accident

Condition of contracts:

- The rates for complete project including materials, transport, labour, T and P etc.
- Contractor shall deposit 10% estimated cost as security Deposit.
- The work to be completed in a given time
- For any delay in completion of project the contractor is liable for compensation and the part or whole security money may be forfeited.
- The work shall have to be done strictly in accordance with specifications and drawings.
- For bad work, that work may dismantled.
- The work shall be open for inspection, it should not sub-late.
- The compensation to the work man shall be paid by the contractor form any accident or damage.

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Types of contract

1. Item Rate contract / Unit Rate contract / Schedule contract
- In this type the contractor is required to quote the rates for individual item of work.
- The rates are including labour, materials, tools and plant etc.
- It is suitable for PWD and Railway Department.

2. Percentage Rate contract
- It is modified formed of item rate contract
- Contractor is asked to quote only percentage above or below as per rate shown in schedule

a) Cost + fixed ~~fee~~% contract
The owner is agreed to pay the actually cost of work + some percentage of contract as per contractor's profit

b) Cost + fixed fee contract
A certain amount of fixed fee provided to the contractor for particular things (Architectural fees) is known as cost + fixed fee contract.

c) Cost + Variable fee
In this method the contractor will be paid on variable fees link with the cost of construction

3) Lumpsum contract
In this contract the contractor undertakes the execution of specific work to complete in all aspects that work within specific time for a fixed amount.

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- It is suitable for small work.
- The cost of project is known before the completion of work, so the contractor can get more profit by proper planning.

4) Labour contract
- The contractor is required to quote for all items of work only for labours and not for materials.

5) Negotiated contract
- When the work is avoided to a contractor by mutual negotiation between two parties without call of tender.
- In such a contract their is no open competition.

6) Target contract
- Target contract is used for execution of large work finance by public bodies or government
- It is the combination of cost + fixed percentage and cost + variable fees.

7) Turn key contract
- The owner is desired to deal with only one party (contractor) for all aspect of work (planning, designing and execution).

8) B.O.T (Built operate and transfer)
It is a constructed and operated by a contractor and transferred that project after end of contract time to the concerned department.

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9 Departmental contract

- When the no contractor is willing to except a work due to small margin of profit then the work is to be executed by department

The material is supplied by the department in schedule A form

10) Void contract

The contract is done with a minor person (below 18 years) without free consent or with insane person is known as a void contract.

Forms of contract:

A_1 → % Rate contract

A_2 → Item Rate contract

B_1 → % Rate contract } Regular and experiance contractor

B_2 → Item Rate contract

C → Lumpsum contract

D → Material supply contract

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UNIT NO: 5

Tenders

It is a written offered submitted by the contractor for notification given to execute a certain works under certain conditions.

Types of Tender

Local Tender

This tender is invited for any type of work in local area or surrounding region.

Global Tender

For a big project the specialized job and designed are required so we have to call the tender globally this tender is known as global tender.

Open Tender

It is suitable for public works, any contractor filled the tender.

Important points of Tender Notice

1. Scaled item take tender in B2 form
2. The name of work and location
3. Estimated cost
4. EMD and SD
5. Time of completion
6. Tender form price
7. Submission date and opening date with time

Important terms in Tender

Earnest money Deposit

- Earnest money is a guarantee from a contractor

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★ Security Deposit
After acceptance of Tender a particular contractor has to deposit a certain amount to the department this is known as security deposit It is 5 to 10 % of cost of work.
SD may be deducted from running bills.
SD genrally takes to complete the work. It is refunded after Defect Liability period. which is 6 month or 1 monsoon whichever is later.

★ Time Limit – It is specified Time for the Tender

Validity period – It is the period in which rates quoted by contractor are valid. usually it is 30 to 90 days.

★ Extra Items – The items for which the rates are not covered under the Contract agreement but they have to be carried out by contractor for satisfactory completion of work.

★ Arbitration – It is a process of settlement of disputes betn owner & contractor or Department & contractor is called as Arbitration. The person who settles the dispute is known as Arbitrator.
The outcome or result of arbitration is known as Award.

★ Defect Liability period –
according to this condition, the contractor is supposed to maintain all the defects due to faulty material & bad workmanship. contractor is responcible to take care of the work during this period. (One monsoon or 6 month whichever is Later)

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* Liquidity Damage – It is the amount of compensation payable to the owner or Department by conteactor due to delay in the woek, it has no relation with actual damage.

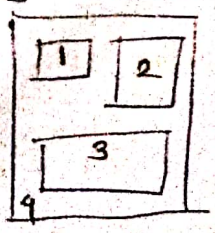
* Corrigendum – The tender notice is extended in following three conditions –
  1) Time period to prepare a Tender for conteactor is short.
  2) when there is a major change in design, drawings or specifications.
  3) when sufficient no. of Tender forms are not sold.

* Escalation cost – The completion period for the Big project is usually long hence the cost of material & Labour is increases day by day therefor the Escalation cost provides the conteactor to work in better way without hampering the quality of work.

* Act of God – All the Natural calamities are comes under the Act of God in such a cases Neither party of conteact is liable to compensate any loss or damage

* work order – after the acceptance of Tender the work order is issued & time limit is given in which SD must be paid.

* Procedure of submitting Tender (4 Envelope system)
  1) Envelope 1 - It contains EMD
  2) Envelope 2 – It contains conteactor's Technical details like registeation certificate, experience certificate, tools & machinary, IT certificates, all kind of Taxation certificate is enclosed in this envelope
  3) Envelope 3 – commercial Envelope
     It contains Tender form.



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* Procedure of opening Tender →
Envelope 4 → Envelope 1 → Envelope 2 → Envelope 3

* Mobilisation Advance –
The amount of money given to the contractor for establishment purpose
eg - Approach Road, site offices.

* Retention Money –
The some amount to be hold from the security Deposit for contractor by the Engineer Incharge This amount is hold up till the finalisation or adjustment of any claim is settled.

* Rejection to particular Tender –
1) EMD is not enclosed in the Tender
2) Tender is not signed by contractor.
3) The contractor having inadequate experiences & he is not reputed contractor (Blacklisted)

* Rejection of All Tenders –
1) when the Fraud is detected in the submission of Tender by contractor.
2) When There is a ring or group formation is detected bet^n the contractors.
3) when there is a fight or collosion bet^n contractors.

* Types of Bills →
1) First & final Bill – for small work
2) Running Account Bill (RA Bill) – for large work
3) final Bill – Addition of all R.A Bill of work.

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★ Various Account forms to be used—

1) Measurement Book — form no 23
2) Nominal Muster Roll — form no. 21
3) Cash book — form no. 7
4) 1st & final bill — form no. 24
5) Running Account bill — form no. 25, white
6) Final Bill — form no. 26

★ Schedules —
Schedule A - list of materials to be borrow from Dept.
Schedule B - Bill of Quantity
Schedule C - Itemwise specification & drawing.

★ VALUATION

★ Valuation - is the art of finding the present fair value of property at that particular time.

purpose of valuation —

1) Taxation
2) Rent fixation
3) for sale & purchase
4) Mortgage
5) for insurance premium
6) for Assessment of stamp duty. (To pay Tax to Gov at the time of purchasing)

★ cost — Amount req'd for manufacturing the particular comodity.

★ price — It is the cost of commodity plus profit of manufacturer. (price = cost + profit)

★ Value — The present value of property in open market means its utility. It varies from time to time & place to place

★ Gross Income — The total income of all sources without deducting the outgoings.

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* Net Income – It is the income after the substeaction of total outgoings.
  Net Income = Gross income – outgoings.

* perpetual Income – The income receivable for Indefinite period (eg – pension)

* Differed Income – The income receivable after the certain period (Insurance policy)

* outgoings – The expenses made for maintenance of properties such as Repairs, any kind of Tax etc.

* scrap value – The value of dismantled material of property at the end of its utility. normally 10% of estimated cost or present value is considered as scrap value.

* Salvage value – It is the value of property at the end of its useful life without being dismantled. It indicates further utility of property.

* Distressed value – when the property is sold or purchased at lower value than the market value is known as disteessed value. The basic reason to lowered the value is fear of war, Riots, earthquakes, financial difficulties of seller.

* sentimental value – when property is sold or purchased at higher value than the market value due to sentimental attachment with the property is known as sentimental value.

* Book value – The value of property shown in account book in that particular year is known as Book value.
  Book value = original cost – depreciation

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* Market value – The value of property at which it can be sold in open market.

* speculative value – purchasing the property at lower price & selling it at higher price for gain of profit is known as speculative value.

* potential value – property is capable of fetching the more income due to its alternative use is known as potential value.

* Depreciation – It is the loss of value due to wear & tear, use etc.

* obsolence – It is the loss of value of property because of the property becoming out of date in style, structure & design.

* Mortgage – The owner of property can raise the Loan against the property

* Free hold property – It is in absolute possesion of its owner for a perlod of Indefinite duration.

* Lease hold property – It holds only physical possesion of property for a definite period under certain conditions, known as Lease hold property.

* Monopoly value – when the property possess a special advantage w.r.t adjoining property due to its Location, Frontage, size & shape. The owner may demand any fancy price such a value of property is known as Monopoly value. (eg – Highway touch Land.)

* Accomodation value – The value of surrounding agricultural land of a city which is expanding considerably will be more if the Land is converted into accomodation Land. In this case sometime owner of adjoining Land may offer more price for accomodation purpose, such a price will be more than market value & it is known as accomodation value.

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★ Easement / Right of Easement -
It is an non possesionary right to use the real property of another owner without possessing it

★ sinking fund - It is the amount which has to be kept aside at the fixed Interval of time out of the gross income so that at the end of useful life of property the fund should be accumulate ~~the ini~~ equal to intial cost of property.

$$I = \frac{S \times i}{(1+i)^n - 1}$$

∵ I = Annual Installment
S = amount of sinking fund
i = Rate of Interest
n = lifespan

★ Capital cost - The total amount req^d to possess the property (cost of Land & Cost of const^n)

Que - Calculate sinking fund to be deposited for an equipment which was purchased for Rs. 80000, life is 8 yrs, assume salvage value = 10% & Rate of Interest is 8% find installment also

→ $I = \frac{10}{100} \times 80000 = 8000$

$n = 8$ yrs. $i = \frac{8}{100} = 0.08$

$$\therefore I = \frac{S \times i}{(1+i)^n - 1}$$

$$S = \frac{I\,(1+i)^n - 1}{i}$$

$$= \frac{8000\,(1+0.8)^{0.08} - 1}{0.08}$$

$$= 8000 \times$$

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sinking fund = cost − salvage value
= 80000 − 8000
= 72000

$$I = \frac{S \times i}{(1+i)^n - 1}$$

$$= \frac{72000 \times 0.08}{(1+0.08)^8 - 1} = \frac{5760.00}{(1.08)^8 - 1}$$

$$I = \frac{5760}{0.8509} = 6769.80$$

Que- An old building has been purchased by a person at the cost of 30,000 excluding cost of Land. Calculate the amount of sinking fund at 4% interest assuming future life of building as 20yrs & scrap value of bldg as 10% of cost

→ $i = 4\%$, $n = 20$ yrs, Cost $= 30000 \times \frac{10}{100} = 3000$

$S = 30000 - 3000$
$= 27000$

$$\therefore S = \frac{I \times (1+i)^n - 1}{i}$$

$$I = \frac{3000 \times (1+0.04)^{20} - 1}{0.04} \quad \frac{27000 \times 0.04}{(1+0.04)^{20} - 1}$$

S.F = 30 89 · I = 907

★ Years purchase (Y.P) —
Capital sum reqd to be invested in order to receive the net annual income of Rs. 1 at Certain Rate of interest.

Years purchase $Y.P = \frac{100}{i}$

i will be substituted as direct value

★ Capital value = Net income × Y.P

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Que- The annual income of property is 25000, the capitalised value of this property for prevailing the rate of 12.5 % is

a) 500000 b) 2,00,000 c) 250000 d) 3 12 000

→ Net income = 25000, i = 12.5%

$$YP = \frac{100}{i} = \frac{100}{12.5} = 8$$

∴ Capitalised value = Net income x YP

= 25000 x 8

= 2,00,000

Que - what is the capitalised value of a property fetching an annual Rent of Rs. 1000 at the highest rate of Interest 5%.

→ Capitalised value = $1000 \times \frac{20}{5}$

= 20,000

★ Annuity - It is annual periodic payments for repayments of capital ~~va~~ amount invested by the party (it is annual installment of sinking fund)

1) Annuity certain - paid at end of each year
2) Annuity Due - paid at begining of year
3) Differed Annuity - it begins at some date in future
4) perpetuity - It continues for indefinite period.

★ Method of Depreciation -

1) Steaight Line method - In this method, it is assume that the property uses its value by the same amount every year & at the end of useful life only scrap value is left.

$$D = \frac{\text{Cost} - \text{scrap value}}{n} = \frac{C-S}{n} \quad \text{(for 1 year)}$$

(n = lifespan)

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★ Book value for 'm' years = cost − m × Depreciation.

Que – The total cost of new building is 1,50,000. Calculate the depreciated cost after 20 yrs by steaight line method if the scrap value is 15,000 & life of bdg is assumed to be 80 yrs.

→ $C = 150000$, $n = 80$, $S = 15,000$

$$D = \frac{C-S}{n} = \frac{1,50,000 - 15000}{80} = 1687.5/- \text{ (for 1 yr)}$$

Total Depn ~~cost~~ = $1687.5 \times 20 = 33750/-$

~~Book value = 33750~~

Total depreciated cost = $150000 - 33750 = 1,16,250/-$

2) constant percentage Method (Decline balance method)
– In this method it is assumed that the value of the property is loose by constant % of its total cost at the begining of every year.

$$P(\%) = 1 - \left(\frac{S}{C}\right)^{1/n}$$

value at 'x' yrs of property $= C(1-P)^x$

∵ p = % of annual depreciation
S = Scrap / Salvage value
C = Total cost
n = life of property

Que – The present value of machine is 20,000. Work-out the depreciation cost at the end of 5 yrs if the salvage value is 2000. assume life of machine is 16 yrs.

→ $C = 20,000$, $n = 16$, $S = 2,000$

$$P = 1 - \left(\frac{2000}{20000}\right)^{16}$$

$$= 1 - (0.1)^{16} = 0.135$$

at the end of 5 yrs, $= C(1-P)^x$

$= 20000(1-0.135)^5$

$= 9741.35$

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V = cost − deprⁿ

$96852 = 20000 - D$

$\therefore D = 10314.8$

3) sinking fund method –
In this method of Depreciation of property is assume to be equal to the annual sinking fund plus the interest on fund for that year which is supposed to be invested.

$$I = \frac{S \times i}{(1+i)^n - 1}$$

eg- suppose 'A' is sinking fund & b, c, d are resp Rate of Interest

Year	Deprⁿ per yr	Total deprⁿ
1	A	A
2	A+b	2A+b
3.	A+b+c	3A+b+c
4.	A+b+c+d	4A+b+c+d

4) Quantity survey Method –
This method is widely used. properties are studied in a detail & Lost of value due to physical deterioration is worked out.

* Earthwork –

Lead – It is the Horizontal distance betⁿ the Trench pit & place where excavated earth is deposited. std. Lead value is 30m

Lift – It is the depth of Excavation or vertica movement of material is known as Lift.
Std. Lift value is 1.5m

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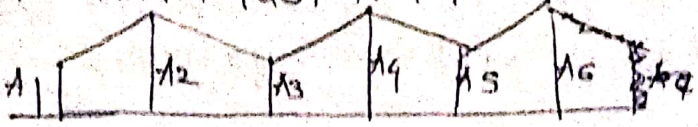
★ Measurement of Earthwork quantity –

1) Trapezoidal formula

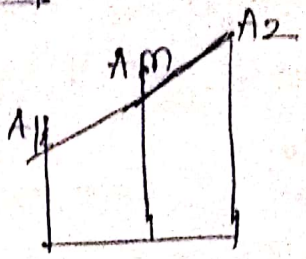
$Q = \frac{L}{2}$ [1st area + last area + 2 × Σ Remaining area]



2) Prismoidal formula

$Q = \frac{L}{6}[A_1 + 4A_m + A_2]$

A_m = mean area = $\frac{A_1 + A_2}{2}$



★ Simpson's 1/3rd formula –

$Q = \frac{L}{3}$ (1st area + Last area + 4 × odd area + 2 × even area)

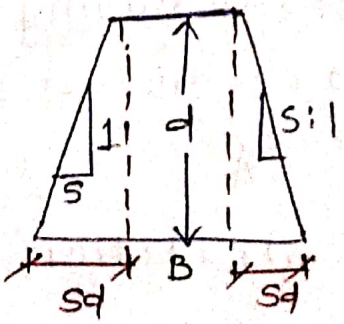
★ Simpson's 3/8th formula –

$Q = \frac{3L}{8}$ (1st area + Last area + 2 × multiple of 3 + 3 × remaining areas)

3) Mid Sectional formula

$A = Bd + sd^2$

$Q = (Bd + sd^2)l$



★ Specific Gravity of Cement = 3.14
Density of Cement = 1440

★ Cement → 33 grade → IS 269
→ 43 → IS 8112
→ 53 → IS 12269

★ Sand → IS 383
→ IS 515

★ Aggregates – IS 383

★ R/f → MS → IS 432
→ HYSD → IS 1786

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1) The machine purchased for 10 Lakhs & has estimated value of life 10yrs. the salvage value at the end of 10yrs is 150000, the Book value of machine at the end of 5yr using genral steight line method is,

a) 650000 b) 575000 c) 850000 d) 475000

$$D = \frac{C-S}{n} = \frac{10,00,000 - 1,50,000}{10}$$

$$D = \frac{850000}{10} = 85000$$

Book value = $10,00,000 - 85000 \times 5$

$= 475000$

2) Calculate total quantity of plastering of 12mm thick in cement mortar in 1:6 for 1 brick thick wall on both face. dimension of wall is 6x3m having opening of 1mx2m

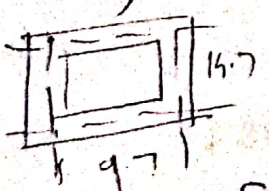
a) 33 m^2 b) 36 m^2 c) 32 m^2 d) 34 m^2

$A = 2(6 \times 3) = 36 m^2$

deduction $1 \times 2 = 2 m^2 \Rightarrow 36 - 2 = 34 m^2$

3) The plan of building is in the form of Rectangle with centeeline dimensions of outer walls as 9.7 x 14.7 m. thickness of wall in super steuct is 0.30m then its plinth area is—

a) 150 m^2 b) 147 m^2 c) 145.5 m^2 d) 135.36 m^2



$(9.7 + 0.3) \times (14.7 + 0.3) = 150 m^2$

4) The following document contains detail description of all items of work excluding their quantities along with current rates.

a) Analysis of Rate b) Tender document

c) Abstract estimate d) Schedule of Rate.

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