Lecture note

On

Estimation & Cost Evaluation-1(TH-4)

3rd Semester

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CN-1

Meaning :-

Before the undertaking the construction of a project it is necessary to know its probable cost which is worked out by estimating

→ An estimate is never the actual cost of the work.

There are different types of estimates,

1) Detailed estimate
2) Preliminary / approximate / rough estimate.
3) Quantity estimate / quantity survey.
4) Revised estimate.
5) Suplimentary estimate.
6) Complete estimate.
7) Annual maintainance or repair estimate.
8) Revised estimate & suplimentary estimates due to reduction of cost.

Detailed estimate :-

This includes the detailed particulars for the quantities, rates, & cost of all the items involved for satisfactory completion of a project.

Preliminary / Approximate / Rough estimate :-

This is an approximate estimate to find out an approximate cost in a short time. (ex: Cubic meter method / square meter method)

Quantity estimate or quantity survey :-

This is a complete estimate or list of quantities for all items of work required to complete the Concerned project

4) Revised estimate :-

A revised estimate is a detailed estimate for the revised quantities & ~~rates~~ of items of works originally provided in the estimate without material deviations of a structural nature from the design originally approved for a project.

5) Suplimentary estimate :-

While a work is in progress, some changes or additional works due to material deviation of a structural nature from the design originally approved may be thought necessary for the development of a project.

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cl12¼cill.vkifY).i_?

7) Annual maintaance or repair estimate :-

After completion of a work it is necessary to maintain the same for its proper function & for the same, an estimate is prepared for the items which requires renewal, replacements, repairs etc, in the form of a detailed estimate

8) Revised & suplimentary estimate due to reduction ~~in~~ of cost :-

In cases where a ~~substantial~~ section of a project costing not less than 5% of the total sanctioned cost of the project is abandoned or where material deviations from the original are expected.

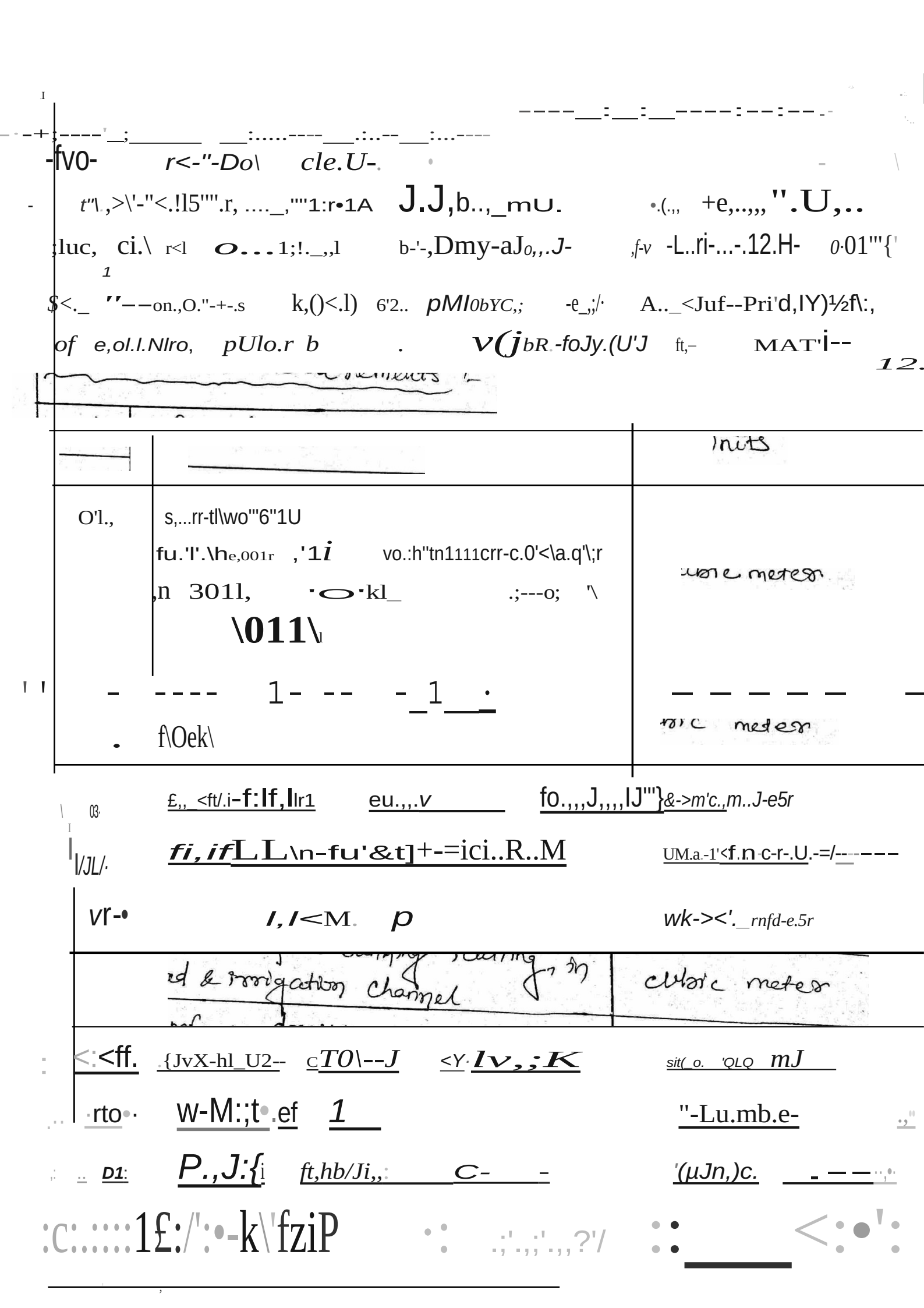
1.3 Accuracy of measurement for different types of work :-

The accuracy to be observed in preparing an estimate depends on the rate of the item & the unit of ~~parent~~ payment.

→ The higher rates the greater should be the accuracy with which the quantities are calculated.

→ Where rates are high & paid per unit, dimensions should be absolutely correct, taking dimensions to the nearest 1cm to 0.5cm (½ inch to ¼ inch) may be allowed for pratical purposes, the quantities in such cases should be worked out to atleast 2 places of decimal. But, where rates are low & paid for percentage to per-centage unit such extreame accuracy is not required.

→ In the case of wall, where masonry is paid per cubic meter a few cm. added to or substacted from the length or height would but little affect the total content. But, width the thickness of the wall where every half cm. or quater cm affects the results considerable should be taken out with great accuracy. The quantity is may be computed to nears



1.	of-,.8"-lvnL-cw **b::i.J**	cubic meter
2.	Blasting of rock (for earthwork, normal lead is 30 cm normal lift is 1.5 m	(_CUi1'7(_

Concrete -

sLno	Particulars of items	Units
01.	Lime concrete in foundation	
02.	Lime concrete in roof terracing, thickness specified	M
03.	Cement concrete	m3
	R.C.C	
05.	C.C / R.C.C chajja, sunset.	
06.	Precast C.C / R.C.C	
07.	,:),__,-c;)cV .:Ja_{+-0 0=\ / C·G o'r ku.,Qpo..Y)n,b, :cSpclt?	m2
08.	Cement concrete bed	m3
09.	D.P.C. (damp proof course) Cement concrete, rich cement mortar, asphalt etc. (thickness specified)	m2

Earthwork in excavation & earthwork in filling

usually taken out separately under different items, & quantities are calculated in m^3.

2) Earthwork in plinth filling :-

Earthwork in plinth filling is calculated by taking the internal dimension in between plinth wall (length, breath).

3) Concrete in foundation :-

The concrete is taken out in m^3 (length × breath × thickness) The length × breadth of foundation concrete are usually the same as for excavation, only the depth or thickness defers.

4) Soling :-

When the soil is soft or bathheel, one layer of dry brick or stone soling is applied below the foundation concrete. The soling layer is computed in m^2 (length × breadth) specifying the thickness.

D.P.C usually of 2.5 cm. or 25 mm. Thick rich cement concrete. 1 : 1/2 : 3 or 2 cm. 3/4 inch thick rich cement mortar → Usually D.P.C is not provided at the sills of the doors, Verandah openings, for which deductions are made.

masonry is computed in m^3 (length × breadth × height) foundation & plinth masonry is taken under 1 item & masonry in superstructure is taken under a separate item.

∴ End :-

Center line method :-

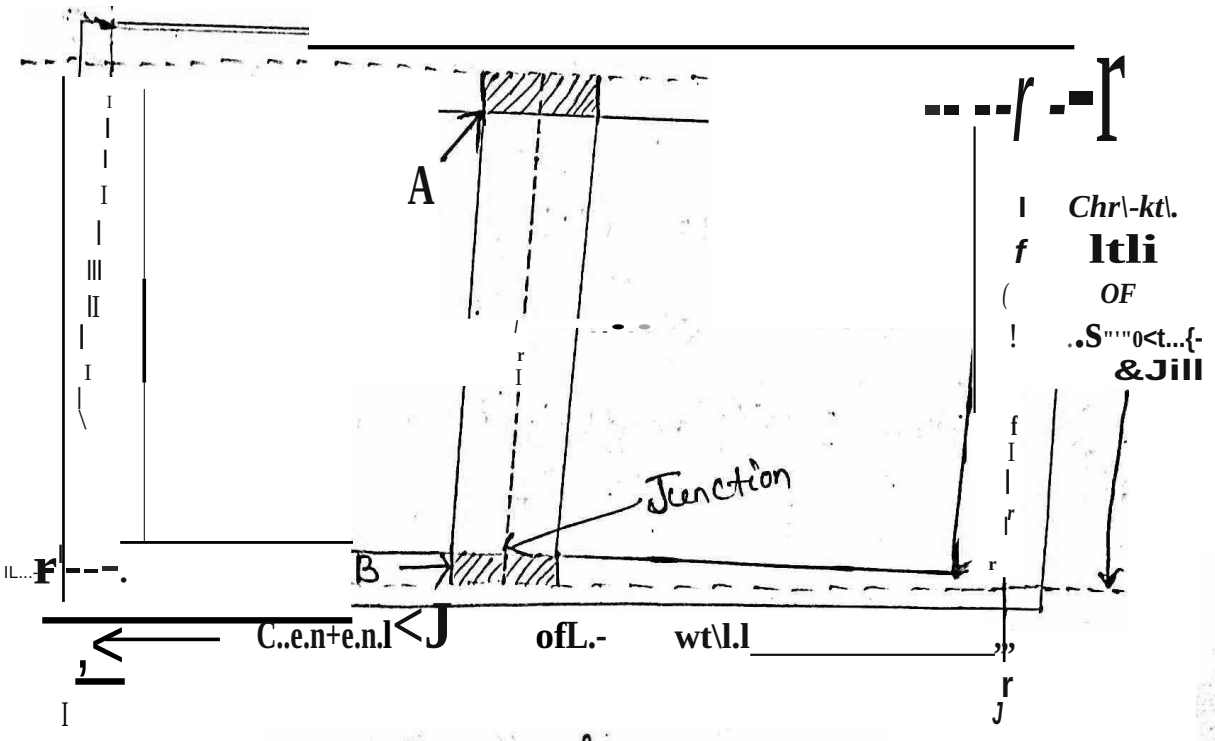


Fig :- Center line Method.

ESTIMATING,COSTING,SPECIFICATIONAN **d Shortwa llmethodof-**

2-The maindifferencesbetweencentreline method 8nd Longan **es_tn_atmg.** k orkforallwalls ofawhole

.Bythcentrelinemethodestimateforeaajlwork,concretewo_, orbncw f f
buildmghavmgthesamesectionisestimatedatatime.ButforPru:tttionll rdertosubtract-halfthewidth
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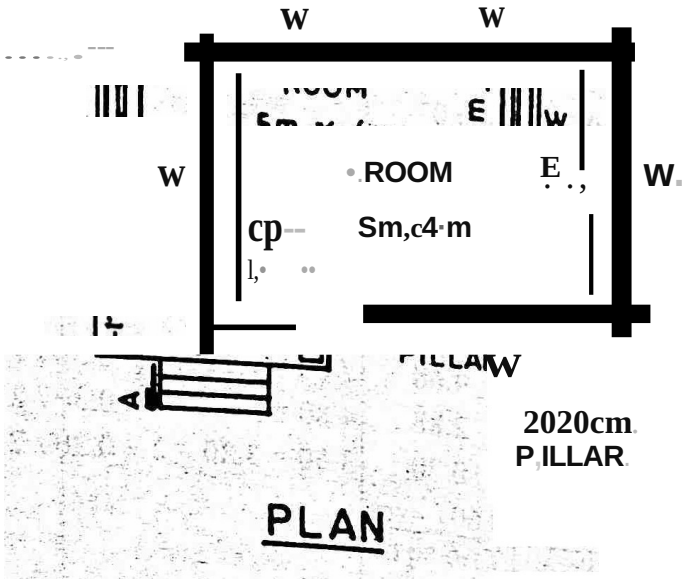
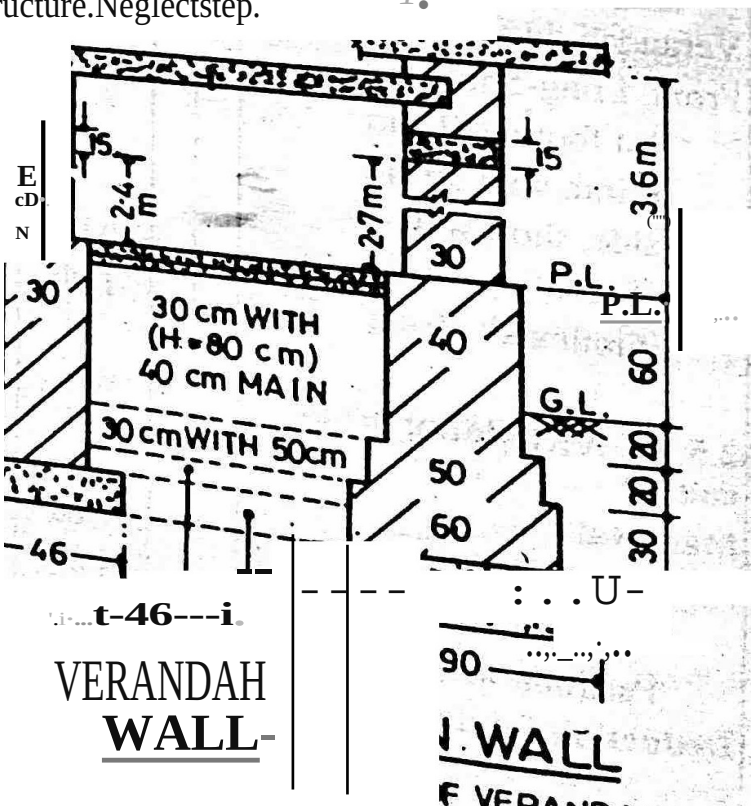
(C) Partitio norVerandahWallhavingCrossSectionDifferentfromthatofMainWall.and h
thesa_me_footingjoinsalong withSeveralFootingsoftheMainWall.

Fig. 4-20shows the planandsectionsofwallsforasingleroomedbuildingwith_Veranda
Estimate the quantities ofthefollowingitems:-(1)Earthwork inexcavationin oundation. (2 bir
concrte inJoundation.(3}Firstclassbrickworkincement mortar (1:4)in foundation.and plinth!
_Firstc.lassbrikwork.in cemntmortar(1:6)insuperstructure.Neglectstep.





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LongandShortwallmethod:-Centretocentrelengths for Room:-Longwalls= 5+2x 2.1= 5.30m,Shortwalls4+2x =4.30m

verandah:-Front,Longwall=3+2 x'lfl=3.20m.Sides,Shonwalls=1.5 +2f1,.:+-=1.75rn

Jte	oescriptionofitem	No.	Dimensionsinmetre Length	Breadth.	Height	Quantity	Explanatorynotes.
t.	Earthworkin**excavation**						
	Room-:-Longwalls•...	2	6.20	0.90	1.00	11.16	6.20=5.30+0.90"
	ShortWalls...	2	3.40	0.90	1.00	6.12	3.40=4.30-0.90
	Verandah-Front,Longwall	1	3.66	0.46	0.70	1.18	3.66=3.20+0.46
	Sides,Shonwalls	2	1.07	'o.46	.0_.10.... ,..0-=-.6-=-9_	1.01= 1.1s--	
					Total=	19.15cu	
2.	Lime**concreteinfoundatio**						
	Room-Longwalls...	2	6.20	0.90	0.30	3.35	
	Shortwalls...	2	3.40	0.90	0.30	1.83	
	Verandah-Front,Longwal	1	3.66	0.46	0.20	0.34	Q&Q
	Sides,Shortwalls	2	1.22	0.46	0.20	0.22	1.22=l.75- 2-2
					--,;T-ota---1_-t--5,=-74cu-,		
3.	Firstclassbrickwork **(1:4)in** foundationandplinth						Lime concrete joins with 60cm bricklayer room
	Room- Long walls						
	60cm layer,	2	5.90	0.60	0.30	2.12	5.90 s.3o+o.60
	50cmlayer	2	5.80	0.50	0.20	1.16	5.80=5.30+0.50'
	40cmlayer	2	5.70	0.40	0.80	3.65	
	Shortwalls60cmlayer	2	3.70	0.60	0.30	1.33	3.70=4.30-0.60
	50cm layer	2	3.80	0.50	0.20	0.76	
	40cmlayer	2	3.90	0.40	0.80	2.50	
	Verandah-Longwall. 30cm layer ...	1	3.50	0.30	1.10	1.16	3.50-=,3.20+0.3,0
	Short walls 30cmlayer		1.30	0.30	0.10	0.08	{.30-.75_oto...:oio
	(i) thatwith60cmlayer	2					
	(ii) " " 50cm "	2	1.35	0.30	0.20	0.16	_ 0.50 0.30
	(iii) " " 40cm "	2	1.40-.	0.30	0.80	0.67	1.35=1.7)----
					Total=	13.59cu	2 2
4.	FirstclassbrickworkO:6) insuperstructure						
	'Room- Longwalls •··	2	5.60	0.30	•3.60	12.10	5.60=5.30'+0.30'
	Shortwalls •••	2	4.00	0.30	3.60	8.64	4.00=4.30-0.30
	Verandah-Longwall (considersolid first)	1	3.40	0.20	2.80	1.90	3.40 = 3.20+0.20 0'>00.30
	Shortwalls •••	2	1.50	0.20	2.80	1.68	1.50=1.1s-T--r.
	Deductionsforopenings, Lintelandveran oppnmgs... ...					= 6.86(-v	

Sa easC.Lme^th od T o ta l

Centre line method :-

(a) Length of centre line for mainwalls = $2\{(5.0 + 2 \times \frac{0.30}{2}) + (4.0 + 2 \times \frac{0.30}{2})\}$ = 19.20m

(b) Length of centre line for verandah walls, sides = $2(1.5 + \frac{0.30}{2} + \frac{0.20}{2})$ = 3.50m

Front = $3 + 2 \times \frac{0.20}{2}$ = 3.20m

Total = 6.70m

Numbrofjoints=2no.r. *Isoin.*

Notethatajointoccursat aplacewherethreewalj NTffJBS

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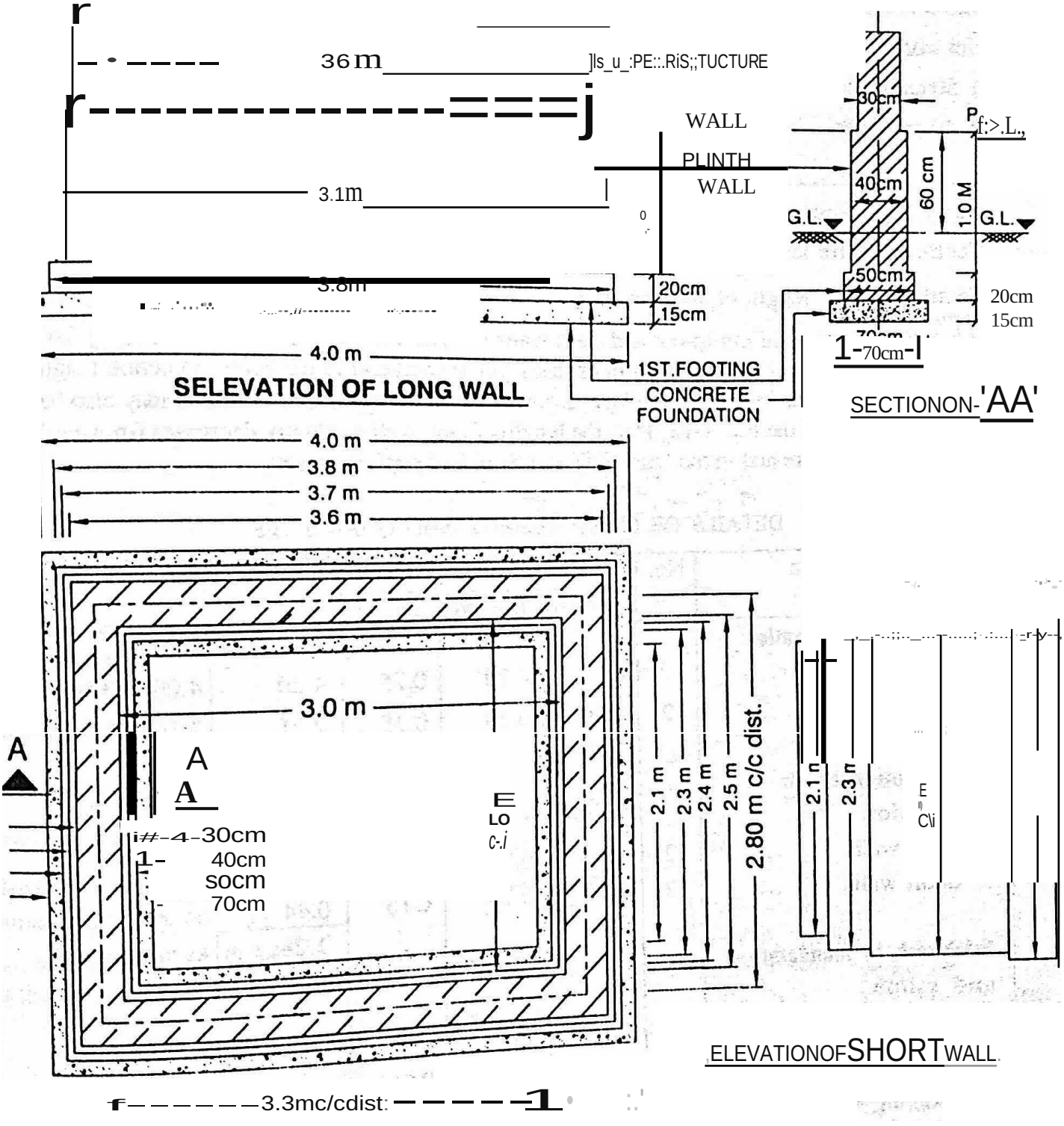
DETAILSOFMEASUREME

I no.	Descriptionof item	N c	.Dimensionsinmctr Lenth	Brcalth	Hetht	Quantity	Explanatorynotes
L	**Earthwork**inexcavation					17.28	Lengthofverandahis reducedbyhalfof
	(a)Mainwalls	1	19.20	0.90	1.00		trenchwidth
	(b)Verandah wall	1	5.80	0.46	0.70	1.87	5.80=.6.70_: 7x__!W.
					Total-	19.15 cum	2
2.	Limeconcreteinrounciatlo						
	(a)Mairi walls	1	19.20	0.90	0.30	5.18	
	(b),Verandah	1	6.10	0.46	0.20	0.56	
					Total=	5.74cu	
3.	**Firstclassbrick workin** foundationandplinth(l:4)						Limeconcretejoin with60cmbricklayer ofmainwall
	(a)Mairiwalls						
	60cmiayer ...	1	19.20	0.60	0.30	3.46	
	50cmlayer ...	1	19.20	0.50	0.20	1.92	6.10=6!70;..2x
	40cmlayer ...	1	19.20	0.40	0.80	**6.14**	
	(b)Verandahwall,portionjoins With-						
	(i)60cmlayerofmailiwaii	1	6.10	0.30	0.10	0.18	6.10=6.7().-2xAff.
	(ii) s0cm....	1	6.20	0.30	0.20	0.37	=20 6.70;..2x
	(iii)40cni,	1	6.30	0.30	0.80		-:-:-+-_;l;.:.:.5:.:.1.6.30=6;70-2x:.L2
					Total	13.58cum	
4.	Firstclassbrickworkin superstnicturewalls						**6.40-6.70-2x** .Q1lQ 2
	(a) Main walls...	1	19.20	0.30	3.60	20.74	
	(b) Verandah walls...	1	6.40	0.20	2.80	3.58	
	i>eciuctionsfor-						
	Dooropenings,D..	I	LIO	0.30	2.10	0.69(–ve)	
	Wid-Wopenings;W..	'5	,Loo	0.30	1.50	2.25 "	
	Verandahopenings,sides	.-	1.50	0.20	2.40	1.44 "	
	" " front	1	-3.00	0.20	2.40	1.44 "	
	Lintelat main wall ..	I	19.20	0.30	0.15	0.86 "	No deduction for ends of verandah lintel
	-do- V_eraftdah	1	6.40	6.20	0.15	0.18 "	
					Total =	17.46 cu m	

Example-2.Sin,1R ge oomb·, ,oun atonwall(afterremovalofu,ding:-F"•g.4-11re quant1t1esof(l) Earthw. . earth)ofabu'l• •presentsthelan, • Brickwork in foundation:nelcavationinfm,•n:ginternallymea!iring•!':-of:the A Pnth. ion,(2)Limeconcrete in foundation, (3) st1 1n at cthe



PLANOFFOUNDATION&FOOTINGAFTERREMOVINGEARTH

PLANAFTERREMOVIN9EARTHFIG-4-11

Centreliemethod:-Toestim;tethe_Q,ia_ntities,calculatefirstthetotal10ngih 0rcentre1ine hich_rem8insconstantforverying"Withsofwo_rks,and.multiply(hisconstantiength Oflhiicenyre hnewiththerespectivebreadthandheight.Thusquanutesofallitemsmaybecalculatedeasily.

Totallengthofcentre Jine=2[(3m+2 x30cm)+(2.5m+2 x JOcm-))= 12.2m

Item no.	DescriptionofItem	No.	Length	Breadth	Height	Quantity
1.	**Earthwork**inexcavation	1	12.2m	0.70m	0.75m	6.4lcuoi
2.	Limeconcreteinfoundation ...	1	12.2m	0.70m	0.15m	l.28cuoi
3.	**rickwork**infoundation&plinth					
	(a)50cmlayer ...	1	12.2m	0.50m	0.20m	1.22
	(b)40cmlayer ...	1	12.2m	0.40m	1.00m	4.88
						6.10curn

LongandShortwallmethod:-

.Centretocentrelengthoflongwalls=3+2x =3.30m

C. entocentrelengthofshortwalls=2.5+2x$2fl-=$2.80m

Thelengthsoflongwallsout-toutshortwallsin-to-invaryinevery layeroffooting.Tocalculat theengths of long walls addhalf thebreadth of that layerat eachendto tlk!centreto cent lengtha1¥1fo shortwallssubtracthalfthebreadthofthelayerfromeachend.Lengthsthusobtail'W!dmayalsobeverified fromtheplan_asshowntheFig.4-12;'[bustheleoflongwallgraduallydec.rcascsfromearthwork10 brickwork·insuperstructureandinthecaseofashortwI,itslengthirK:reases.

DETAILSOFMEASUREMENTANDQUAN11TIES

Item no.	DescriptionofItem	No.	Dimensionsinmetre			Quantity	Explanatorynotes
			Lep	Breadth	Heiht		
1.	**Earthworkinexcavation**						
	Longwalls	2	4.00	0.70	0.75	4.20	4.00=3.30+2x$^{OJ..0}$
	Shortwalls	2	2.10	0.70	0.75	2.21	2.10=2.80-2x$^{0}f^{2}$
						6.41cu	
2.	**Limeconcretein foundation**						Width of
	Longwalls	2	4.00	0.70	0.15	0.84	concreteis same
	Shortwalls	'.2	2.10	0.70	0:15	0.44	asearthwork
						l.28cum	solengthsaresame
3.	**Brickworkinfoundation andplinth**						asexcavation.
	Longwalls						
	1st. footing 50 cm	2	3.80	0.50	0.20	0.76	
	2nd.footing40cm...	2	3.70	0.40	1.00	2.96	3.80=3.3o+2x*0.SOf},*
	Shortwalls·						3.70=3.30+2XQ,40f},
	lsLfooting50cm	2	2.30	0.50	0.20	0.46	
	2nd.footing40m	2	2AQ	0.40	1.00	1.92	2.3Q=2.80-2X*0.5{},*
						6.10cu	2.42.80-2X0.40f},

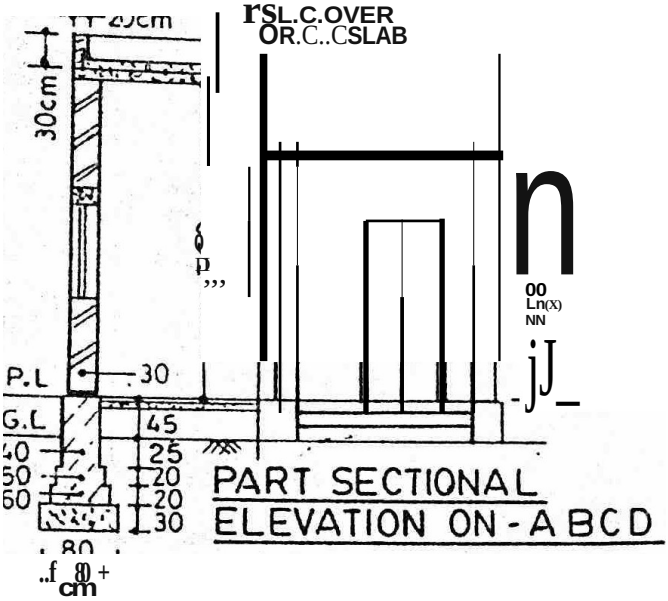
Bu i d' ESTIMATI NG,COSTING,SPECIFICATJONAND.VALUATION

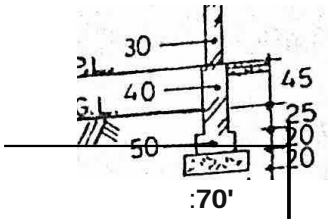
esfmg IA.The rt e followin • cuonsofanoneroomedbuildingisshownin Fg 5-1A. Preparequantity h

(1)E imatef o Pan and se• • •

(4) a rthw o rk in e g Im s o fw o rk ; (2)Earthworkin plinthfil lin•,(3). imecon crete•mf ound at io n

course- s l das s. rx k w a k • n In o u n da u . o n ,(and(6)p· irst c l as sbr ic k m ent mortar (1:6)forfoundationandplinth,(5)? 5cm l t lC kd amp proo f workmsuperstructure.





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SCHEDULE

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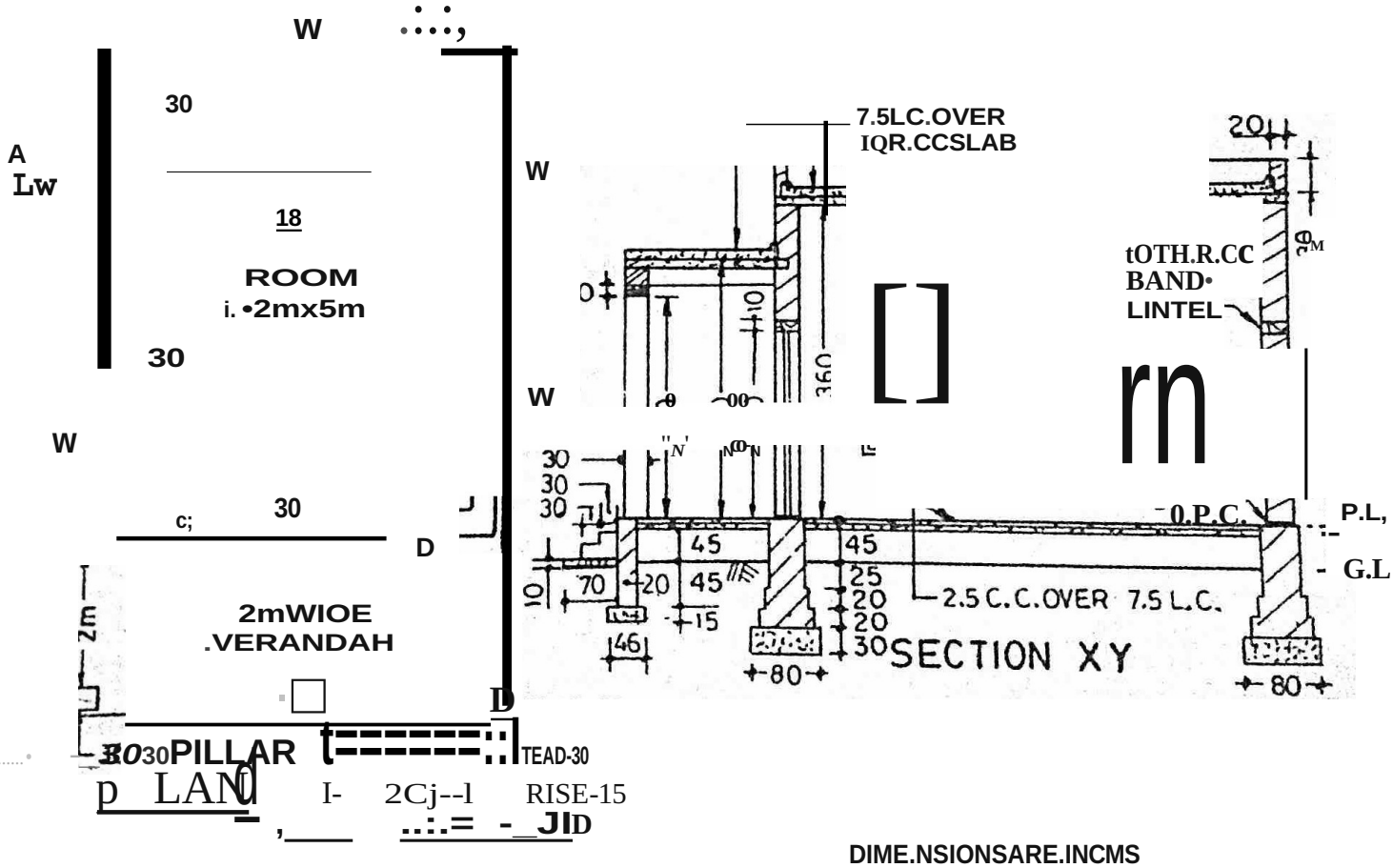


DIME.NSIONSARE.INCMS

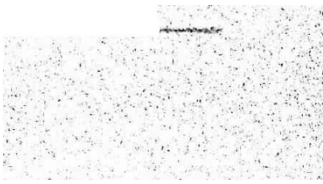
FIG.5-IA

Long-Shortwallmethod. - Centretocentlengthfo
Room-Longwall=5.00+0.30=5.30m
Shortwall==4.20+0.30=4.50*m*
Verandahfront=4.20+0.30=4.50rn(constantduetopresenceofpillars}
Verandah,.sidesShortwalls=2.00+0.30=2.30m.
(Note:The accounta1"/ityuptothecentreof20cmplinthdwarfwallisnotrequiredduetopresenceof isolatedcornerpillarshavinghighersectionthanthatofthedwarfwall.)

DETAILS OF MEASUREMENT AND CALCULATION OF QUANTITIES

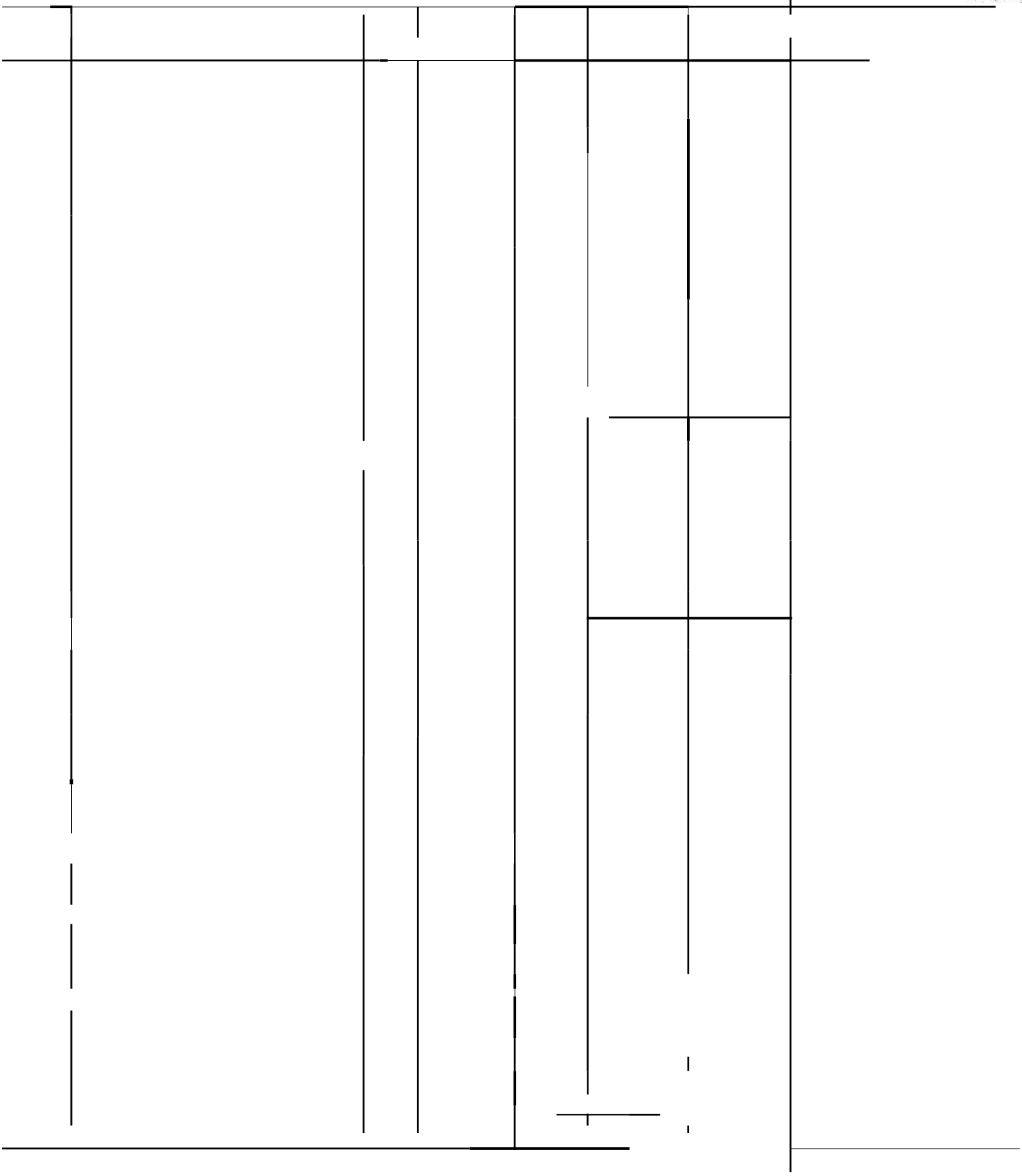
Item No.	Description of item	No.	Length m	Breadth m	Height m	Quantity	Explanatory notes
L	**Earthwork in excavation in foundation** -Room -						
	Longwalls	2	6.10	0.8-0	0.95	9.27	6.10==5.30+0.80
	Shortwalls	2	3.70	0.80	0.95	5.62	3.70=4.50-0.80
	Verandah pillars	3	0.70	0.70	0.65	0.96	
	Plinth dwarfwall-						
	Front	I	3.IO	0.46	0.60	0.86	).JQ"'4.50-2x0.70
	Sides, Short	2	1.55	0.46	0.60	0.86	{forcornerpillars}-0.70 (middle)
	Step	I	2.20	0.57	0.10	0.13	i.55"'2.30-0.80/2-0.701:?
					Total	17.70cum	
2.	**Earthwork in filling in plinth**		0				
	Room		4.9b	4.10	0.375	7-53	
	Verandah		4.50	2.10	0.375	3.54	
	De<luct pillar projc.ctions						
	Central	I	.0.40'	0.20	0.375	0.03(-\IC)	
	Sicks	2	0.20	0.20	0.375	0.03(-vc)	
					Total	1L04cum	
3. .	**Lime concrete in foundation** Room-						
	Longwalls	2	6.10	080	0.30	2.93	
	Shortwalls	2	3.70	U.80	0.30	1.7$	
	Verandah pillars	3	0,70	0.70	0.20	0.29	
	Plinth dwarfwalls-						
	Front	I	3.10	0.46	0.15	0.21	3.10,,.,4.50-1:id).70!2
	Sides,Short	2	1.65	*OA6*	0.15	0.23	0.70.L.C.joinsLCofver.
	S1ep	I	2.20	0.70	0.10	0.15	pillars1.65=2.30-0.6-0/2
					i-,--o-ta-1-+--5-5_9_cu_m--i_0.70/2L.C.jOm:i.v:ith.		0.60LC,ofmainand0.70 L.C.ofver.piflar•
4.	First class brkkwork in foundnrion **and plinth io** ctment monar (I:6) Room-						
	Longwans-						
	I*st* footing60 cm	2	5.90	0.6-0	0.:2.0	l.41.	S.90"'·5.30+0,60
	2ndfoorinr,50cm	2	.80-	0.50	0.20	Ll6	.5.80 '5.30+0-.50•
	Plinth wall 40 cm	2	*.S.10*	0.40	0.70	3.19	5;70"':530-+·OAO
	Shortwalls-						
	1stfooting60cm	2	3,90	0.60	-020	0.94	.3.9'0"'45-0"."" .0.60
	.2ndfooting50cm	2.	4,00	.050	10.20	0..80	4-.00."-"·L5-0--050

J._ _ _P1_;...;.11,\w.a 11 _0;._7 _ .-..-.,,.···-_·,_,,_;....2__._4_J--0---'----00-·;.....;·==1=:·:=t-J·:·--·;·:::: _ - :_ ·.-·.·:.J....4_;·.·_m_;-:·:;·;· ---.s-0;.....:-.;;... _ ·---·-0:·...·.=.·.·:·.;,,,,,,·.·



Item No	Description of item		No.	Length m	Breadth m	Height m	Quantity	Explantory Notes
	B.F.	...		...	...	...	9.80	
	Verandah pillars			0.50	0.50	0.20	0.15	
	1st footing 50cm	...	3	0.40	0.40	0.10	0.34	
	Plinth wall 40cm	...	3					
	Dwarf wall front -					0.20	0.14	3.50=4.502x0.50/2 - 0.60
	(i) Lower part upto 30cm	...	1 1	3.50 3.70	0.20 0.20	0.70	0.52	3.10=4.so-2x0Ao
	(ii) Upper part							
	Dwru-t: wall side-				0.20	0.20	0.14	1.80=2.30-2X0.5012
	(i) Lo,yer pa.rt upto 20cm	...	2 2	1.80 1.96	0.20	0.70	0.53	1.90=2.30-2x 0.40/2
	(ii) Upper part				0.45(av)	0.30	0.27	0.45=)/2(0.30+0.60)
	Steps		t	2.00		Total	11.89cum	
5.	**2.5cm thick damp proof coune**				0.30	-	3.36	5.60=5.30+0.30Dp
	Longwalls	...	2	5.60				under superstruture wai'is
	Shortwalls	...	2	4.20	0.30	-	2.52	
	Verandah pillars	...	3	0.30	0.30	-	0.27	
	Deduct door opening	...	1	1.10	0.30	-	0.33(-ve)	
						Total	5.82sqm	
6.	**1st class brickwork in superstructure** incement mortar(1:6)							
	Longwalls	...	2	5.60	0.30	3.60	12.10	
	Shortwalls	...	2	4.20	0.30	3.60	9.07	
	Verandah pillars	...	3	0.30	0.30	2.50	0.68	
	Above ver. lintel -							
	Front long wall	...	1	4.80	0.30	0.20	0.29	
	Sides shortwalls	...	2	2.00	0.30	0.20	0.24	
	Parapet-							
	Longwalls	...	2	5.60	0.20	0.30	0.67	
	Shortwalls	...	2	4.40	0.20	0.30	0.53	
	Deduct							
	Doropening	...						
	Wmdowopenings	...	1	1.10	0.30	2.10	0.69(-ve)	
	Shelve	...	5	0.90	0.30	1.50	2.03(-ve)	
	Band lintel in main walls-		1	0.90	0.20	1.5()	0.27(-ve)	
	Long walls.	...						
	Shortwalls	...						

2	5.60	0.30	0.10	0.34(-ve)
2	4.20	0.30	0.10	0.25<-ve)
			Total	20.00cum



Centrlinemethod.-

Totallengthofcentrelineforroom=2[(5+0.30)+(4.2+O.JO)J 19.60m
Totallengthofcentrelineforverandahdwarfwall'"'4'.5+2x2.30""9.10lll

.Total len th of ce tre line for parapet wall= 2(5.60 + 4.80) -4 x 0.20

2Qtn(i.e.HJL'iidc pcrine_ter4:"' .times the thickness ofwall).

. **(Note**:Forverandahdwarfwallaccountabilityuptothectntrcof20cmwallisnotncccssnryd_uc10 presenceofisolatedcomerpillars).

Item No	Descriptionofitem	No.	-Length m	Breadth tn	Height m	Quantity	Explntl.'llo!)'nt>lt:$
I.	**Earthworkinexcavationin foundationtrenches**						
	Room ...		19.60	0.80	**0.95**	**14.90**	
	Pillars ...	!	0.70	0.70	0.65	**0.96**	
	Verandahdwarfwall ...	I	6.20	**0.46**	0.60	**1.71**	6.20 9.10-090-3x0.70
	Stl!p ...	I	2.20	0.57	0.10	**0.13**	0.57•0.70-I/2(0.4(,-0.20,)
					Totul	17.70cum	
2.	**Earthworkinfillininplinth**		Sa:ncasL.S.Metlu•d			11.04cum	
3.	**Limeconcreteinfoundation**						
	Room ...	1	.19.60	0.80	0.30	4.70	
	Pillars ...	3	0.70	0.70	0.20	0.29	
	Verandah dwarfwnll ...	I	**6.40**	**0.46**	0.15	**0.44**	6.40c-9.10-2x0.60/ 2-)
	Sti.:p ...	I	2.20	0.70	0.10	0.15	x0.70 Ver.L.C._joins wilf1 60 cmwallnl2 junctions- 3 nos. cone.for pillnrs
			.,		Total	5.58cum	
4.	**1st**classbrickworkin **foundationandplinth**						
	1stfootinr!60cm ...	I	19.60	0.60	0.20	2.35	
	2ndfooti,;g50cm ...	I	19.60	0.50	0.20	1.96	
	Plinthwall40cm ...	I	19.60	0.40	0.70	5.49	
	Vcron<lahpillars -						
	Istfooting50cm ...						
	Plinthw:ill40cm ...	3	0.50	0.50	0.20	(l.15	
	Verandahdwarfwall	*3*	0.40	0.40	0.70	**0.34**	
	(i)Lowerpart50((I.)"...	I	7.10	0.20	0.20	0.28	Lowerpartcoincides with 2
	(ii)Upperpart '-li>JrV-\"'·.	I	7.50	0.20	0.70	1.05	
	Step ...	I	2.00	0.45(nv.)	0.30	0.27	nos50cmwallundjp'illursut 50 cm 7.IO ""9.lo-2 x 0.50/2-)x050
					Total		
	2.5cmthickD.P.C.						
	Room ...	I	19.60	0.30	—	11.89 cum 5.88	
	Pillars ...	*3.*	0.30	0.30	—	0.27	
	Qcductdoo ropening ...	I	1.10	0.30	—	0.33t-vc)	
					Total	5.82sqm	
6.	**Islclassbrickworkin superstructure**						
	Room	I	19.60	0.30	3.60	21.17	
	Pillars. ...	3	0.30	0.30	2.50	0.68	
	Abovepillars	I	**8.80**	0.30	0.20	0.53	8.80""9.JO--U.30
	Parapet_ ...	I	.20.00	0.20	0.30	1.20	
	?edt!ttfonfo_r.opcnings.		SameasLIS. Meth		)d	3:58(-ve)	
					Total	20.00cum	

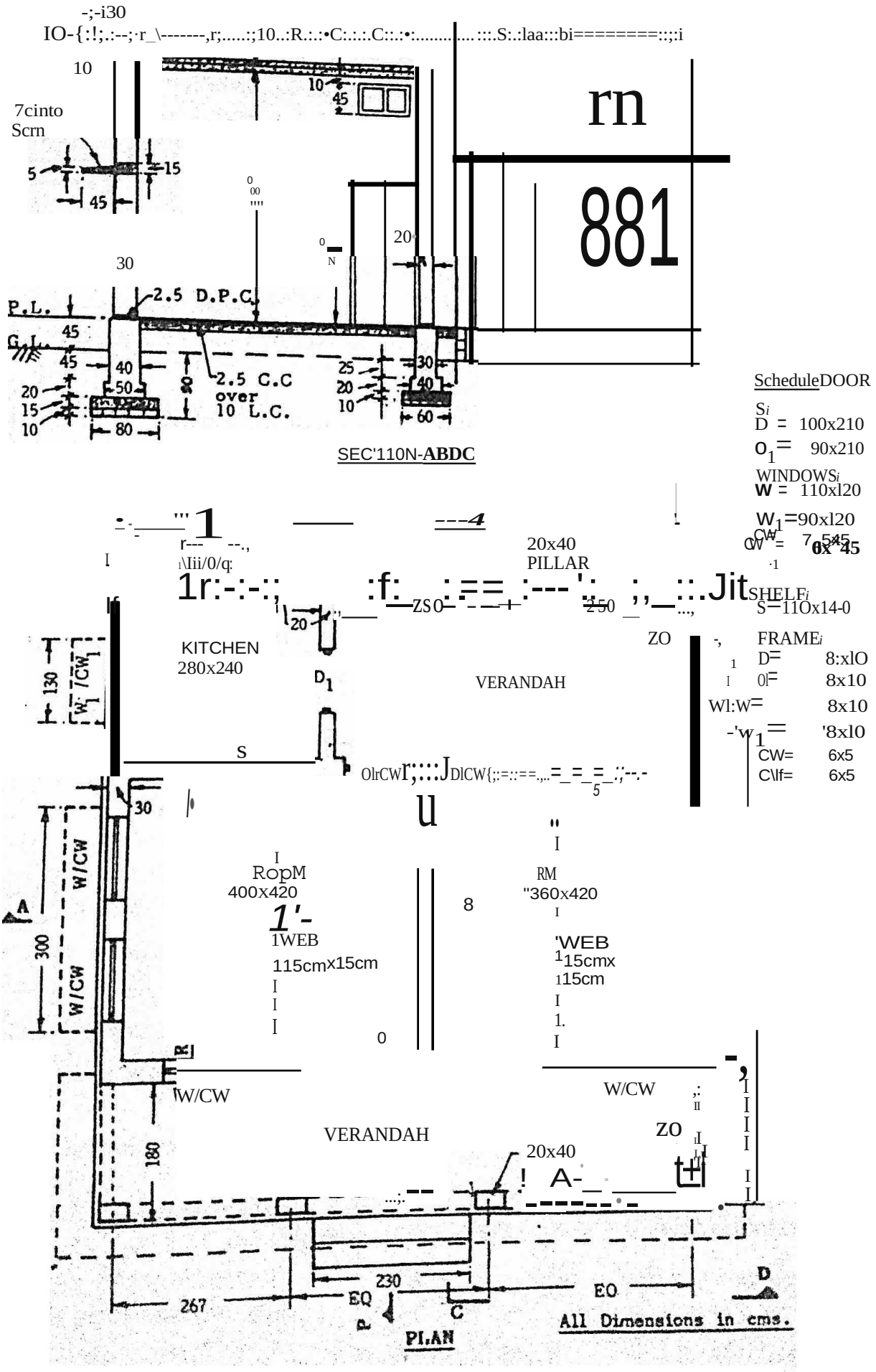
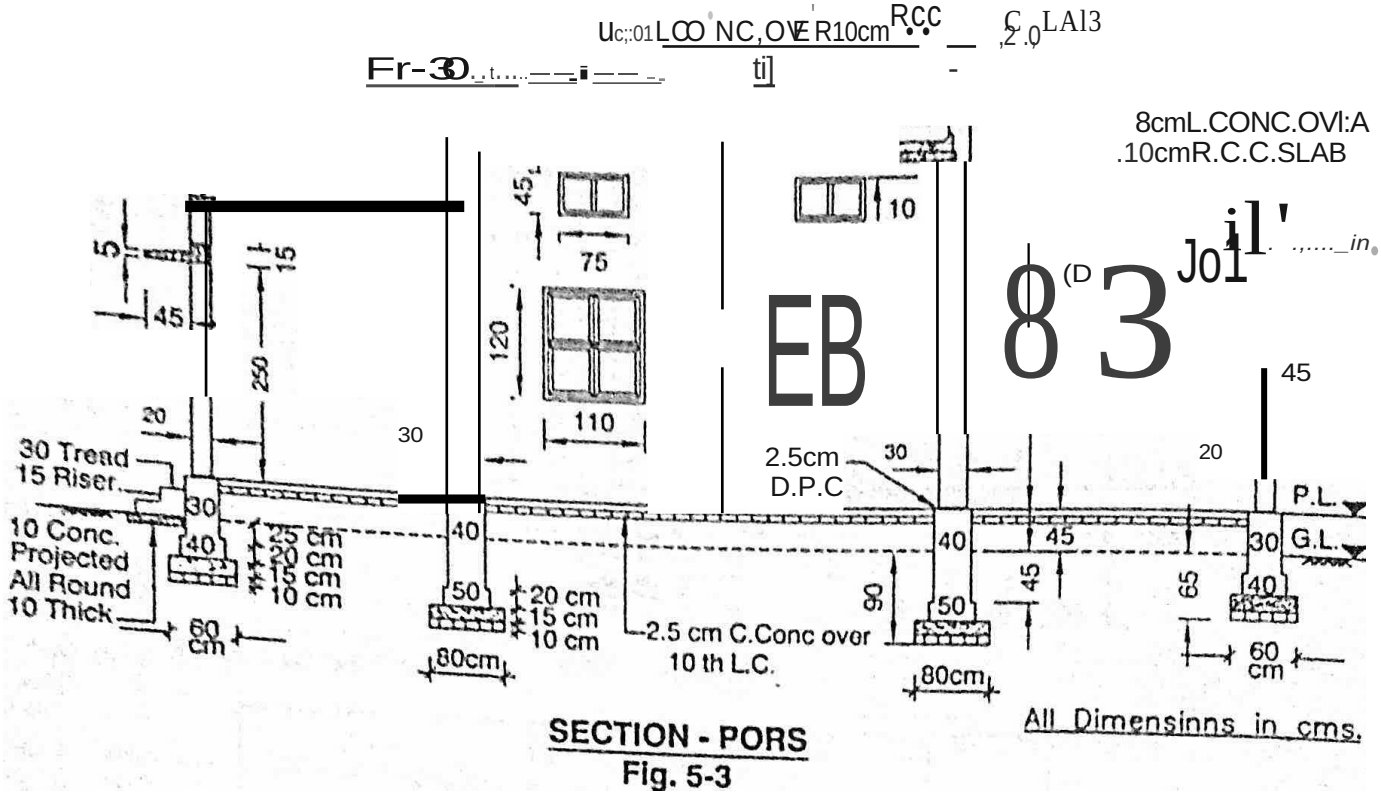

10
7cinto
Scrn
rn
881
30
2.5 D.P.C.
P.L.
G.L.
2.5 C.C over 10 L.C.
SEC'110N-ABDC
ScheduleDOOR
D = 100x210
O1 = 90x210
WINDOWS
W = 110xl20
W1 =90xl20
CW = 7 5x45
6x 45
SHELF
S=11Ox14-0
FRAME
D= 8:xlO
Ol= 8x10
Wl:W= 8x10
W1 = 8xl0
CW= 6x5
C\lf= 6x5
20x40
PILLAR
KITCHEN
280x240
VERANDAH
RopM
400x420
1WEB
115cmx15cm
"360x420
'WEB
115cmx
115cm
W/CW
VERANDAH
20x40
ZO
267
EQ
EO
PI.AN
All Dimensions in cms.

FIG. 5-3



SECTION - PORS
Fig. 5-3

A)LongandShortwanmethod-

Centretocentredistance-

Rooms-

Backandfront.Longwalls(2nos.)

=4+3.6+0.20+2xO.O =8.1m

Sides.Shortwatls(2nos.)4.2+2x-y- =4.5m

Partition (having different sec.)

=4.2+0.30 =4.5m

Verandat,s-

Entireback andfront,Longwalls(2nos.)

==(2.8+0.20+2x2.5)2x0220 =8.2m

Frontverandah.Shortwalls(2nos.)

020 0.20

:;::1.8- -y- =1.85m

Back verandah sides and kitchen front,Short walls (3nos.)=2.4+0.30/2+0.20/2 =2.65m

(B) **CentreLinemethod.-**

LQngthofcentrelinefor-

Mainwalls30cm

Outer walls of room =2[(4+0.20+3.6+ 0.30)+(4.2++0.30)] ==25.20m

20cmwalls

Partion of rooms =4.2+0.30 ==4.50m

Front and bbck ofbuildi'ng-

2[(2.8+0.20+2X2.5)+2xo.2g] ==16.40m
2

Frontverandahsides-

=2(1.0- 020 +.Q2gQ_) =3.70m
-2

Brickverandahsidesandwallsand

Kitchenfrom=3(2.4+Qio+0 2.Q:) ==7.95m
2

Total=32.55rn

Notethatthenumberofjoints=7ns.with mainWall and 1No.with 20cm wall

Ex_ludingpartitionwall_totaliengh o_f centreline:::32.55-4.50 :::28.0Sm

*NumberofJoints*Soos.Withmaihwat i rind_1no.wlth20cm wall:

DetailsofMeasurmentandQuantities(Building-3)

,-TD)eesc;rTrip;tio;n:0Jfit:em--,_N70.'L.7B;_H.:Q:ty.--E-x-pl-ana-tor--yN-ele-s-

No.			m	m	m		
-1.	**Earthworkinexcavation**						
	(a) Forfoundationtrenches						
	Long-Short wall method-Rooms-						
	Longwalls	2	8.90	0.80	0.90		8.90=8.1+0.80
	Shortwalls	2	3.70.	0.80	0.90		3.70=4.50-0.80
		T.L.	25.20	0.80	0.90	18.14	
	Partition,Shortwall	1	3.70	0.S>	0.65		3.70=4.50-0.80
	Verandahs-						
	Longwalls	2,	8.80	0.60	0.65		8.80=8.2+0.60
	FrontShortwalls	2	1.15	0.60	0.65		1.15=1.85-0.60/2-0.80/2
	BackShortwalls	3	1.95	0.60	0.65		1.95=2.65-0.60/2-0.80/2
		T.L	29.45	0.60	0.65	11.49	
				Total	(a)	29.63	
	,Centre lihe method-Outerwalls--	1	25.2	0.80	0.90	18.14	
	ofrooms 20cm walls	1	29.45	0.60	0.65	11.49	29.45=32.55-7x
				Total	(a)	29.63	0.80/2-0.60/2
	(b) Steps,frontandback...	2	2.50	0.55	0.10	0.28	0.55=2x0.30 + 0.10
			Total		(al+(b)	29.91	+0.30/2-0.30
						cum	
2	**•EarthworkinOIiing**						
	•(a)Forfoundationtrenches	-1S	thofexcavalion(apx.,=5.97				
	(b)Plinthfilling-						
	Room bigger	1	4.10	3.90	0.35	5.60	4.1=4.2-2:x0.05
	Room smaller	1	3.50	4.10	0.35	5.0	(offsets)
	.Verandah front	1	8.00	1.50	0.35	4.20	0.35=0.45.:0.10(L.C.)
	Verandahback	1	**4.90**	2.30	O.'?,S	**".!,.94**	
	Kitchen	1	2.70	2.30	0.35	2.17	
				Total	-	26.90	cum'
-3.	***Brick*ffatsoling**						Concreteof-20cmwatl
	Forfoundationtrenches						joinswith50cmbrick•
	Long-Shortwallmethodor Centre linemethod-						layer ofmainwall.
	Rooms-	1	25.20	0.80	-	20.16	30-llo 31tt'J
	Verandah	1	30.50	0.60	-	18.30	7×2-T
				Total	=	38.46	sqm
4.	**Cementconcrete 1:3:6** in foundation-						
	(a) Walls-:-						
	- *Lo11g-Shqrtwallm_ethod*-						
	Rooms						
	LongWalls	2	8.90	0.80	0.15		The cortcreteof
	Shortwalls	2	3.70	0.80	0.15		partitionwaIjoins/

c.o.

* Accurately the volume is earthwork in excavation less volume of structure up to G.L.

SL No.	Description ofitem	No,	L. m	B. ff. m	n	Qty.	explanatoryNotes
						3.02	4.00::::4.5-0.50
	I/. B.F.	1	4.00	0.0	0.10		
	vPartitionShortwallV						
	erandahs-	2	8.80	0'.60	0.10		_180-0.50_0.60
	Long.walls	2	t.30	0.60	0.10		1.25-
	FrontShortwalls	3	2.10	0.60	0.10	18.3	
	BackShort walls	T.L.	30.50	o.60	0.10	4.85	2.10==2.65-
				Total	(a)	3.02	
	Centre line method-Outer	1	25.20	0.80	0.15		
	walls of rooms ...	1	30.50	0.60	0.10	1.83	
	Verandah&20cmwalls...			Total	(a)	4.85	
	b)Steps,backandfronl...	2	2.50	0.70	0.10	0.35	
			Total	(a)	+(b)	5.20	cum
5.	**1st.classbrickworkin foundationandplinth**						
	a) Walls-						
	Long-Shortwallmethod--						
	Rooms-						
	Longwalls	2	8.60	0.50	0.20	1.72	
	1st.footing	2	8.50	0.40	0.90	6.12	
	2na Htg-pl2t1+h--						
	Shortwalls -	2	4.00	0.50	0.20	0.80	4:00=4.50-0.50
	1st.footing	2	4.10	0.40	0.90	2.95	
	t-ing*plin1h*wolf...						
	PartitionShortwall-					0.33	4.10=4.50-0.40
	1st.footing •••	1	4.10	0.40	0.20	0.86	1st.and2nd. footJig
	2JKl-footing*p1.,-vd'Y*\r.,v0-1,f•••	1	4.10	0.30	0.70"		of partition wall meet with 40 cm brick
	Verandahs-Back						
	Longwalls-	2	8.60	0.40	0.20	1.38	)ayerofmainwall
	1st.footing •••	2	8.50	0.30	0.70	3.57	
	2nd.-footing*plivi*i-h --.						
	FrontverandahShortwalls-	2	1.45	0.40	0.20	**0.23**	**1.45=1.85-2x0.40/2**
	1st.footing •••	2	1.50	0.30	*0:10*	0.63	1.50=1.85-0.40/2-0.30/2
	2nd.-fuoting*fl.Jr'Ar,JnJI* •••						
	BackShortwalls-	3	2.25	0.40	0.20	0.54	2.25=2.6>-2x0.40/2
	1st.footing	3	2.30	0.30	0.70	1.45	2.30=2.65
	2nd.--footing*ruv'*_,..,/ •••			Total	(a)	20.58	-0.40/2-
	Centrelinemethod-						40cmand-30cm
	Outerwallsofr oo ms	1	25;20	0.50	0.20	2.52	ofver.andahmee t
	1st.footing50cm	1	25.20	0.40	0.90	9.07	with40cmofmain.
	2nd.footing40cm						30.95=3i.55
	Verandah&20cmwalls	1	30:95	0.40	0.20	2.48	-7.xQ.40/(J.4{)/2 ,
	(b) Steps, front and back ...	1	31.00	0.30	0,70	&51	31.00=32,55
	2nd; footing 30cm	2	230	Totalof(a)		20.58	-7x04 '0/2-4)0'Z
			;	o.45	0.30	0.62	230isav
			Total (a) (b)=		21;20	cm	

Sl. No.	Description of item	No.	L. m	B. m	H.	Qty. m	Explanatory Notes
6.	*2.5*cm thick D.P.C. of cement concrete (1:2:4) *Long-Short wall method*						
	Rooms-						
	Long walls ...	2	8.40	0.30	-		8.40=jo+o.30
	Short walls ...	2	4.20	0.30	-		
		T.L.	25.20	0.30	-	'7.56	
	Partition Short waU ...	1	4.20	0.20	-		
	Verandahs..,						
	Long walls ...	2	8.40	0.20	-		
	Front Short wall ...	2	1.60	0.20	-		1.60=1.85-¥ :- $^{02}_{0.30}$ r $^{0}_{0.20}$
	Back Short walls ...	3	2.40	0.20	-		
		T.L.	31.40	0.20		6.28	2.40=2.65--r- .,-
		Total before deduction				13.84	
	Centre line method-						
	Main walls ...	1	25.20	0.30	-	7.56	
	Verandah &20cm walls...	1	31.40	0.20	-	6.28	31.40=32.55
		Total before deduction				13.84	$-7x\frac{0.30}{r}-\frac{0.20}{,-}$
	Deductfons for-						
	Doors ills D ...	4	1.00	0.30	-	**1.20(-ve)**	For front verandah
	Door sills D1 ...	2	0.90	0.20	-	**0.36(-ve)**	**D.P**.C. is for openings also.
	Bck veran. openings ...	2	2.30	0.20	-	**0.92{-vc)**	
		Net total by anyme::thod				11.36	sqm
7.	**1st. class brickwork in superstructure** with cement mortar (1:6)						
	(a) Walls-						
	Long-Short wa/1. metlwd-						
	Rooms-						
	Long walls ...	2	8.40	0.30	3.80		
	Short walls ...	2	4.20	0.30	3.80		
		T.L.	25.20	0.30	3.80	28.73	
	Partition Short Wall ...	1	4.20	0.20	3.80	3.19	
	Verandahs-						
	Long walls. ...	2	8.40	0.20	3.00		
	Fron. Short walls ...	2	1.60	0.20	3.00		
	Back Short walls ...	3	2.40	0.20	3.00		
		T.L.	27.20	0.20	3.0()	16.32	4.20 is the clear di tance
				Total	pf(a)	.24	27.20=28.05 $-5\times\frac{0.30}{T}-\frac{0.20}{T}$
	Centre lineme1/Jod						
	Outer walls of frooms ...	1	25.20	0.30	3.80	28.73	
	Partition wall ...	1	4.20	0.20	3.80	3.19	
	Verandahs and kitchen wall onl_y	1	27.20	0.20	3.00	16.32	
	C.O.			Total	K>f-(a)	48.24	

I,	l).cfl11ilot1ofltttm	No,	;,·	!;	QtY'	Explanatoryn<i1ct
N...1.;				4824		
	1JJi,					
	tl;1t;c:<;,lf:1:'$_1$:;(,i}UJd.	2	8.40	0.20	0.63	**2.12** :copet
	idc/1IHMt10inner	2	4.40	0.20	0.63	l.1l height.
	f•tojtetit111t1					4.40=4.2+2'.x0.to
	lHidm1dfr()t1tt>u(toout	2	8.60	0.JO	0.10	o.1^7 (offsets)
	W1ilf!t(r	2	4.80	0.IO	0.10	0.10 p $_1$-
	,HC; 111		L----J..---f--t-:-:"""::"".roJccions may			
			Total of(a) +(b)			51.74 aJternatively
						bemeasuredas
	UtducHon for-					
	OJ!Joor0f1<:r1ingg())withlintel	4	].00	0.30	2.25	2.70(-ve)JrgC C.0
	Vlimlow					(for1:tei)+ .IS
	W(comb)"	2		0.30	J.35	2.18 2.70=3.00-2x0.IS
	W	3	0.90	0.20	1.35	1.09 i.e.0.15less
	ClcM,.wrywir,dowft.!CW	JO	0.75	0.30	0.55	1.24 bearing
	CW	2	0.(,0	0.20	0.35	1.13 Considershelf
	She•l•opc11it11:n ..S^I	2	1.10	0.20	I.55	0.68 depth=20cm
	1'rumvcrn;"fohopcoi11gs,Front	3	2.27	0.20	2.65	3.61 5Pillers40cm
	Sfdc.,	2	1.60	0.20	2.65	1.70 lengthwise
	Buckvcrwtd£lhopc11inw.;	2	2.30	2.20	2.65	2.44 15cmbearing
	UntcJ(Werpillcr'		....1..... ._2_.o_o+-o._20--+-_o_.1_5_.,_0_.0_6_-tconsidered.			
			Net total	of(a)	+(b)	32.32 cum 1.95=1.80+0.15
H,	U,C.C:.Work(l!2:4)C.llcluding					2.75=2.4+0.20
	rcfnfcm:cmcntbutincluding					+0.15
	ccntcduftandf.lflullcriug					
	(a) Hoolfab,,1bovcroorrIn	l	8.10	4.50	0.10	3.65 For doorsand
	" "P'rontvcrnrtdah	I	8.40	1.95	0.10	1.6S windows15cm
	·Back vcrnn<fah	1	8.40	2.75	0.10	2.31 bearing
	(bLimcloverdoomD	4	1.30	0.30	0.15	0.23 For'SandCW
	W J " 1J$_1$	2	J.20	0.20	0.15	0.07 CW110embearing
	Jn(owsWnx,rtrnfront "	2	1.40	0.30	0.15	0.13
	W tdcles(corTl(J.)	2	3-.CX)	0.30	0.15	0.27
	" w,	3	1.20	0.20	0.15	0.11 l.75=1.8O-0.20+
	OverheirS	2	1.30	0.30	0.15	0.12 0.15
	Clearntorcywiud<,:1wCW	10	0.95	0.30	0.10	0.29 (bearing).Forback
	CW,	2	0.80	0.20	0.10	0.03 o:1o_bcaring.
	,Promvl:wr1dahfront	1	8.40	0.20	0.15	0.25
	" icJC/{	2	1.75	0.20	0.15	0.11
	H,k:'.hvcrn.ncJnt1back	I	5.20	0.20	0.15	0.16
	(C)H·rmw.(Wcbonly)	2	4.70	0.15	0.15	0.21
	{d)Son•foHfo11fm·-					9.30isout.erto
	11mmv,rutHJaJ1front	t	9.J0	0.45	0.06	(av.) o·utcr=·8:4+2x.0.45•
	ti H kfcr.	2	.2.00	0.45	0.06	
	ovcirwfnd-0ws-W (pafr)	2	3.00	0.45	0.06	
	ti W,	3	.J.20	0.45	0.06	
			T.L 22.90	0.45	0.06	Ohl
					Total	10.14 cu m

1.20 same as lintel

SI. No.	Description of item	No.	L. m	B. m	H. m	Qty:	Explanatory Notes
9.	Mild steel bars for R.C.C. work including bci1ding binding etc.	@ 1% vol of item 10,14		x...Lx 100	(8)= 78.5= Total	"8.18. 8.10 Qtl	Wt. of ild steel per cum=78.5 quintals
10.	8cm thk klime concrete in roof terracing.						Considered the clear surface area between
	Roof overrooms ...	1	8.00	4.40	-	3520	parapets as the item _ includes rounding edges.
	Roof over front verandah	1	8.40	1:80	-	15:12	
	Roof over back verandah	1	8.40	2.60	-	21.84	The inserted portion _ has been accounted as brickwork for parapet.
					Total	72.16. sqm	
11.	**Salw, oodwork** indoor & window frames						
	(a) Do ors D ...	4	5.20	0.10	0.08	0.166	Door frames
	D1 ...	2	5.10	0.10	0.08	0.082	2 verts. and 1 hors.
	(b) Windows W ...	6	5.70	0.10	0.08	0.274	5.20=2x**2.10**+**1.00**
	" W1 ...	3	5.10	0.10	0:08	0.122	
	(c) Clearstorey Window						
	" CW ...	10	2.40	0.%	OO	0.072	Window frames 2
	CW1 ...	2	2.10	0.06	0.05	0.013	verts. and 3 hors.
					Total	0.729 cum	5.70=2xl.10+3x 1.10 CW frames 2 vcrts and 2 hors
•12.	35mm thick **panelled** Shutters of Indian teak wood indoors and windows with fillings						
	(a) Doors D ...	4	0.87	-	2.03	7.06	**0.87**=**1.00-2x**
	" D1 ...	2	0.n	-	2.03	3.13	0.08(frame)+2
	(b) Windows W ...	6	0.97	-	l.02	5.94	x0.015(rebate)
	" W1 ...	3	0.n	-	1.02	2.36	2.03=2.1-0.08+0.015
					Total	18.49 sqm	-0.005(bottom gap) 1.20-3x0.08+4 xo.015
p.25	mm thick glazed Shutters of Indian teak wood for C.W. Shutters						
		10	0.68	-	0.38	2.58	
	C\-Vt	:	0.53	.	0.38	0.40	
					Total	2.98	sqm

• Fittigs for doors and windows may be mated separately counting lhe dffet,e (fittin ...

Sl. No.	Description of item	No.	L. m	B. m	H. m	Qty.	Explanatory Notes
14.	**16mm dia. window grating bars including fitting fixing**						
			1.40	=	—	67.2	Bars are @ 10 cm
			1.20	=	—	21.6	c/c vertically
			0.76			3.6	
			0.60	=	—	114.9m	@1.58kg/m
					=	181.5 kg	
				Total	=	1.82	Qtl.
15.	**M.S.eta.mp**250mmlongend bifurcatedwith40x6mmflatiron						
	(a) Fordoorframes ...	6x6	-	-	-	36	Maybemasurcd
	(b) Windowframes ...	9x4	-	-	-	36	byweightalso.
	(c) Clearstoreywindows ...	12x2	-	-	-	24	nos.
				Total	=	%	
16.	**10cmthicklime**concretefloor						
	Roombig,ger ...	1	4.10	3.90	-	15.99	4.10=4.2-
	Roomsmaller ...	1	4.10	3.50	-	14.35	2x*0.05* **(offsets)**
	Vcrandahfront	1	.7-.90	1.50	-	11.85	
	Kitchen ...	1-	2.30	2.70	-	6.21	
	Vcrandahback ...	1	4.9 0	·2.70	-	13.23	
17.	***2S*mm thickce1J1ent**concrete (1:2:4) floor finishcd:smooth with neat cement			lotal	=	61.63	sqm
	Room bigger	1	4.20	**4.00**	-	16.80	
	Roomsmaller	1	4.20	3.60	-	15.12	
	Verandahfront	1	8.40	1.80	-	15.12	
	Kitchen	1	2.40	2.80	-	6.72	
	Verandah back	1	5.00	2.60	-	13.00	
	DoorsillsD	4	1.00	0.30	-	1.20	
	" " D1 ...	2	0.90	0.20	-	0.36	
	Deductionforpillars ...	*5*	0.400.20		-	0.40{-vc)	
18.	**.20mmthickcementplastering** (1:4)finishedwithneatcement			Total	=	67.92	sqm
	(a) PlinthwallfromG.L.-						
	Backandfront ...	2	8.50		0.50	8.50	0.50=0.45+0.05
	Sides ...	2	9.25		0.50	9.25	(offset)
	(b) Stpsbackandfront						
	Treads	2x2	2.30		0.30	2.76	Risesofstepshas
	Sides	2x2	0.30+ 0.60/2		0.30	0.54	beenconsideredin plinth
19.	12mmthickcementplaster(1:6)			Total	=	**21.U:>**	sqm
	(a) Inside--						
	(i)Rooms -	2	4.				
		2	4.				
	Biggr ro,om,Longwalls ...		4.20	- ...	4.80	38L92	
	" " Shortwalls		4.	-	380	30.40	
				...		62.32	

ESTIMATEOPBlJILDJNOS_:.;_--r:,._-:---:---7:-:;::··

Sl.	occ-ripuono	,rem	N o,	J ;';;	D	ff	OlY• Explanai_toryN<>tc.$_
£No:.L.		8.P.					.62.32
	nl'c,a_..rwornCcifin,,	1	4,20	4;(.wl	-	16.8<1	
	Sm^a^ll^er'room,Long^r^wall"	2	4,20		3.80	31,92	
	• " Shortwalb...	2	:J,(j()	-	3,80	27,¾	
	• .. Ceiling	1	4.20	3.(J)	-	l5;12	
	Web!{ofR.C.beam"	2x2	4.20	-	0.15	2.52	
	Jamb11illsandsoffitsofshelv e	2	5.00	0,20	-	2.00	0 = 2(1.1 + 1.4)
	(ii)Kitchen-						
	Long walls	2	2.00		3.0	16$0	
	Short wal	2	2.40		3,0	14.40	
	Ceiling	1	2.80	2.40	-	6.72	
	{iii)Frontverandah-						
	Fronrofrooms	1	8.40		3.d	25.20	
	front above openings ...	1	8.00		0.50	4.00	8,0=**8.4-2x**0.20
	Sidc5aboveopening.s ...	2	lhO		0.50	1.60	
	Ceiling	1	8.40	1.80		15.70	0.50=3.0-25
	(iv)Backverandah-						
	Back portion of rooms ...	l	5.00		3.00	15.00	
	Long side abe.openings	1	5.00		0.50	2.50	
	Side andkitchen front ...	2	2.40		3.00	14.-40	
	Ceiling ...	1	5.00	2.60		13.00	2.6=2.4+0.20.
	(v)Pillarsthreesides						**0..80= 0:40+2x0..20**
	Frontpillars	4	0.80		2.50	8.00	FollowingLS.I.
	BackpiJJar	l	0.80		2.50	2.00	forbothfaces
	DeductJoofor-						deductoneside.
	Dooropenings,D ...	4	LOO	-	2.10	8.40(--.·e)	Deductionfor
	" " D1 ...	2	0.90	-	2.10	3.73(-vc)	otherwindow
	Windowopenings_W...	2	1.10	-	1.29	2.64{-ve}	opening.shasbeen
	Clea.r•storcywindowCW...	6	0.75	-	0.45	2.02{-veJ	madeinoutside
	Endsoffrontverahdah...	2	0.20	-	0-.50	0.20(..ve)	pltering
	Areaofpillars ...	5	0.40	0.20	-	0.40(-vc)	0.50=3.0-25
	(b) **Outslde-**						
			T o tal o f ins i[de = 2T187 s.qm				
	(i) Roomswithoutsideparapet						
	Sides of rooms	2	4.80		4.53	43.49	453=3.8+0.10
	Front & back of rooms						+0.80+0.45+0.0 '{-·S.3
	(above low roof) ...	2	8.40		135	2268	(projection)l.35= 8
	(ii) Verandah(as solidfirst)						(as above)-3.0-
	Front&backverandahlong	2	8.40		3.18	53.42	0.10-0.08
	Front verandah sides ...	2	1.80		3.18	11.45	2.6=2.4+0.20
	Back verandah sides ...	2	2.<50		3.18	16.54	
	(iii) Parapet inside over-						8.00=8.40--:-2x0.20
	Backandfrontof.rooms	2	8.00		0.45	7.20	(parapetthickness)
	Sidesof rooms ...	2	4.40		0,45	3.96	8.6=8.4+20.10
	(iv)Parapettop-						(projections)
	Back&front(outtoout)	2	8.60	.030		'5,16	4.4 4.20+2x03()
	Sides(intoin)	2	4.40	0.30		2.64	2xo.io
	C.O. ...					.166.22	

,9

escription of item	No.	L. m	B. m	H. m	Qty.	Explanatory Notes
					166.22	
B-F ...					8.37	Dimensions are ame as in item o. (8d)
(\.:)Sunshadesbothfaces-	lx2	9.30	o.45		3.60	
Frontverandahfront	2x2	2.00	o.45		5.40	
" sides	2x2	3.00	o.45.		3.24	
Over windows, W (pair)	3x2	1.20	o.45		**1.14**	2.90 is total length
" W1	1	22.90	0.05			
Frontedges	1.2	0.45	0.06	(av.)	0.32	
Sideedges						
Deductionsfor-				**1.20**	**5.28(-ve)**	
Windowopening_s,W	4	1.10		**1.20**	**3.24(-ve)**	
" " W1	3	0.90		**0.45**	**1.35(-ve)**	
dear-storeyopenings,CW	4	0.75		**0.45**	**0.54(-ve)**	
" CW1	2	0.60				
Frontverandahopenings_ Front	1	6.80			2.5017.00(-ve)6.80=8.40-4x0,40 00	
Sides	2	1.60			22 io811.;e)	
Backverandahopenings.,.	2	L 230	+--=--:-+d::T:fi411137			sqm
		TotaJO oulsl e=				
		TotaIinside +outside				
		=!..227.87+141-=:_38=:173690.7'25nsqm				
20. **Whitewashing**threecoats		I				
Insidewallsandceiling ...		Sameasitem(19a)=277.87				sqm
21. **Colourwashing**twocoats overacoatofwhitewash						
Outside·		Sameasitem(19b)=141.38				sqm
22. Paintingtowoodworktwo coatsoveracoatlopriming						Multiplyingfactor for bothfacesis2x1.30=
(a)Panelleddoors D	4x2.6	1.00		2.10	21.84	2.6imes theareof
" " D1	2x2.6	0.90		2.10	9.83	openingforpanell_ed
(b) Panelledwindows W	6x2.6	1.10		1.20	20.59	shutter.
" Wt	3x2.6	0.90		1.20	8.42	Multiplyingfactoris
(c)Glaz.dwinows-: ...	Oxl.6	0.75		0.45	5.40	2x0.80=1.6timas a
23. **Creosotingofsolignum** 1	ixl.6	0.60	Total	0.45 =	60.94 0.86	ofopening forbothfa m_
treatmentatbackofframes						ofglazeds.hutter
g;!:g	4	5.20	0.10		5io	
1						
:: ::,	i	::g:i		:	4.60	2(1.20+1.io)
Clear-storeywindovsC:V/	lO	4.20	0.10		1.26	middlepieceisnot
" " CW1	2	2.40	0.06		1.44	tobeconsidered.
Pajti_ngtoironworkstocoats	,	2•10l°T:0.06r--+_;0:;25.:..... _ J4;2=2(0.90+L2f				
Fprwm,?owgratigs,W ...	6xl	0. 94	Total	-	881	sq m
Clearoleywindowgratings CW10 1	3xl	0-74		1.04	2.31	s'.s1 Multiplyingfactor for painting_arro,vcr
ZS; loori,diil.C.;';rai;i10)w	2x;	:1 –		:;;	::	measufedflatV!f1';
with_paint:in!g-						sq m

Deductionsforopeningsbearinginmasonry

Nodirectionismadeforthefollowing:-

1. Openingeach upto1000cm^{2}or0.1m^2.
2. Endsofbeams,pores,reaction,purlinsetc.upto500cm^{2}or0.05m^2,72inch^2.
3. Bedplate,wallplate,bearingofchajjas&theylikeupto10cm,4inchdepth.

:, Forrectangularopeningsfulldeductionismadedededuct=Lxhxthicknessofwall

:, Doorsandwindowswithsmallsegmentalarches;

Deduction ismade for rectangular portions onlyupto the springingline.Thesegmental portion isconsidered as solidto allow for the extra expense in constructingthe arch& the filling of with thin wall.

Thenthe deductionisLxhxthicknessofwall

:, Segmentalearthopenings;

Deductionismadeforthewholeopening,therectangularportionaswellasthe segmentalportion.Theareaofsegmentalportion=-rl+-$^{2}_{3}$ $^{Rq}_{12}$

Thenthetotaldeductionwillbe,[*(lxh)*+(;*xlxr)*]xthicknessofwall

:, Semicirculararchopenings;

Theareaofsemicircularportionis$^{nr2}_{2}$-, but for the deductionthe areaofthe semicircularisobtainedapproximately¾ofspanxrise(¾*xlx*r)

Thetotaldeductionwillbe[*(lxh)*+(¾*lr)*]xthickness ofwall

:,Archmasonrywork;

Masonry workin archesiscalculated in cubic meter separated bymultiplyingthe mean lengthofthe archbythe thickness of thearch& thequantityofarchmasonry=lmxt x thickness of wall

:,Linteloveropening;

LintelsareeitherofR.C.C.orR.B.quantitiesarecalculatedinm^3

Length of lintels= lx t x thickness of wall

Deduction=lxtxthicknessofwall

Plastering:

Plasteringusually12mmthickiscalculatedinmm^2

:, Forwalls the measurementsaretaken fromthewholefaceof thewallfor bothsides of solid & deductions for openings are made in the following manner;

I. Nodeductionismadeforendsofbeams,posts,rafters,etc.
II. Forsmallopeningupto0.5m^{2}nodeductionismade.
III. Foropeningexceeding0.5m^{2}but not excludingSm^2,Deductionismadeforoneface only.
IV. Foropeningabove3m^{2}deductionismadeforbothfacesoftheopenings.

Whitewashings:

Thequantitiesarecomputedinm^2&areusuallysameasplastering.

:>Theinsideisusually white washedor distempered andthisitemwillbesameasfoeinside plaster.Theoutsideiscolour washed& thequantitiesofcolour washingwillbesameasfor outside plaster.

Painting:

Paintingorvarnishingofdoors&windowsarecomputedinm^2.

:>Thedimension shouldbetakenfor outerdimensions of thechow khati.e.,outer dimension of doors &windows. The area is measured flat (not greater).

:>Noseparatemeasurementistakenforthechowkhat,theareaissameasthe areaof wallopening.

:>Foriron bars,grillsetc.theareaoftheclearopeninginsidethechow khatistaken.

:>Forbothfacesofdoors&windows,thesimpleareaasmeasuredaboveismultipliedby appropriate nos. as below.

i. Paneled,framed,braced,ledged&battenendorledge battened&braced-2 1/4 times onesurfacearea,foebothsides.
ii. Fullyglazedorgauged-onetimeonesurfaceareaforbothsides.
iii. Partlypaneled&partlygauged-Twotimesonesurfaceareaforbothsides.
iv. Flushdoor-Sametwotimesonesurfaceareaforbothsides.
v. Venetian-Threetimesonesurfaceareaforbothsides.
vi. Ironbars,grills,in windows-Onetimethearea of clear openingin between chow khat for overall.

Thiscoversalsoforchowkhat orthreefaces,paintingisdonein 2or3coats,usuallyovera coat & priming.

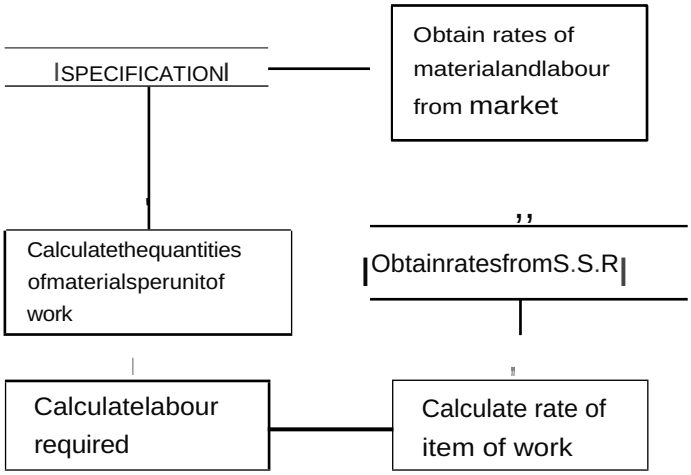
CH-3 Analysisofrate

Theprocessofdeterminingtheunitrateoffinisheditemofworkisknownas*AnalysisofrateorRateof analysis.*
Theunitofafinisheditemofworkdependsonthefollowing;

:>Thequantitiesofmaterialsrequiredofdesiredquality&theircost.
:>Thequantitiesofrequiredproportionsofmortarswiththeircost.
:>Thelabour chargesforrequirednumber,forconstruction.
:>Miscellaneous pettyexpenditure. Purpose
of rate analysis;

- Toworkouttheactualcostofitemperunitquantity.
- Toworkouttheeconomicaluseofmaterialsandlabour.
- Toworkoutthecostofextraitemswhichwerenot providedintheagreement,but aretobedoneasperdirectionsof the department.
- Torevisethescheduleofratesduetoincreaseinthecostofmaterialandlabour.

Flowchartofrateanalysis;



StandardScheduleRates(S.S.R.):

Theratesof materialsat sourceandwagesof labour of various categories andconveyance charges of materials including loading, unloading andspecial allowance such asarea allowance, ghat roadallowance etc.needed fortheconstruction of works at variousdepartmentsisfixed by theconcernedboard ofchief engineers atstate level withtheir construction knowledgeduring every financial year and communicatedtaall the governmentdepartmentsforadoption in their construction activities.

:>Theratesfixedbytheconcernedengineeringauthorityforthematerialsandwagesoflabourforthefinancialyearare knownasS.S.R.andtheyareadopted.

Costofmaterial:

Costofmaterialatsource,

- Costofmaterialwhere itisavailable.
- Costofmaterialofferedbyacompanyorbydistributor.
- Itdoesnotincludethecostoftransportation.
- Itisabasicrateperunitofmaterialattheplaceofmanufactureorproduction.
- It isfixedinstandard schedule of rate.

Cost of material at site,

- Itincludesofcostofmaterialandcostoftransportation.
- Itincludes,Costofmaterialatsource, Costofloading &unloading,Road tax, Costofstackingandstoring,Toll gatefee.

LabourCost:

- Thecostofwagespaidtoworkersduringanaccountingperiodon daily,weeklyormonthlybasis.
- Inorder toobtaincosts,thenumberof various categoriesoflabourrequired per unit item isknown from the standard data book and daily wages ofeach labour is fixed in standard schedule ofrate ofcurrent year.
- Thenumbermultipliedbytherespectivewage perdaygivesthelabourcost.

StanderddataBook:

- The quantities ofmaterial and labour required per unit of various finished item of work have been standardizedand given in the data book by thebritish engineers.
- Itisbeingfollowedinallthegovernmentdepartmentsofstates&alsoingovernmentofIndia.

Typesoflabourinconstruction:

- Mulia(MenandWomen)
- CasualLabour
- Watchman
- Electrician
- Plumber
- Painter
- Carpenter
- Welder
- BarBender
- Mason
- Mechanic
- Blaster
- Driver
- MachineOperator

Classificationbasedonskilloflabour:

- istclass-Skilled labour
- 2ndclass-Semiskilledlabour
- 3rdclass-Unskilledlabour

Variation in labour rates:

:>Labourratesvariesfromplacetoplace.

:>Labourratesaremoreinurbanareas.

:>Labourratesaremoreinplaceslikeforestsandhillyareas.

:>The rategivenS.S.R arebased onaverage rates.

Area allowances :

:, Thelabour ratesgiveninS.S.Rshallbeadoptedafter addingsuitable areasallowance giveninS.S.R.for,Municipal corporation, Hills, Jail premises, Industrial area, Agency/Tribal areas etc.

:, 25%extraovertheratesonlabourcomponentofworksisallowedin allMunicipalCorporation ofstates.

:, 40%extraovertheratesonlabourcomponentofworksforgreatertownarea.

:, Allow 20% extra over basic rates onlabourcomponentof works in all district headquarters andtheremainingmunicipal limits (upto a belt of 12 km from municipallimits)

:, 15%extra isallowed over labourratesfortheworksin the jail compounds. Only equivalentnumber of men muliashallbe provided in the Jail premises and no women milia are allowed inside.

Rateofanalysisofearthworkexcavation:

Example1

Earthworkexcavationanddepositingonbankwithinitialleadof30.00mandinitialliftof1.5minloamyandclayey soilslikeblackcotton,redearthandordinarygravellysoilsforfoundations unit10.00cum.

Descriptionofwork	Quantity	Rate	Per	Amount
RateasperS.S.R.for loamyandclaysoils like blackcotton,redearth andordinarygravelly soils.	10.00 cum	200	1cum	2000.00
50%extraforfoundationtrenches		200x 50%	1cum	100.00
				Rs2100.00

Rateofanalysisoflimeconcrete:

Example2

Limeconcreteinfoundationwith40mmgaugebrickballastunit1cum.&Quantity10cum.Withwhitelimeandsurkhi 1 : 2 (proportion 1:2:6)

Particulars	Quantityor Nos.	Rate Rs. P.	Cost Rs. P.
Materials-			
Brickballast I st Class 40mmgauge-	10cum	1000.00/cum	10000.00
Whitelimeslaked -	1.6cum	1000.00/cum	1600.00
Surkhi --	3.2cum	800.00/cum	2560.00
		Total=	14160.00
Labour-			
Mistri(HeadMason) --	½nos.	450.00perday	212.50
Mason --	1nos.	400.00perday	400.00
Blender --	12nos.	250.00perday	3000.00
Menorwomencoolie --	12nos.	230.00perday	2760.00
Waterman --	2nos.	230.00perday	460.00
SundriesT&Petc.(Misc.pettythings)-	Lumpsum	150.00L.S.	150.00
Totalofmaterialsandlabour			21142.5
Add1½%watercharges -			317.14
Add10%Contractor'sprofit-			2114.25
Grandtotal=			23573.85 for10cum
Ratepercum $\frac{23573.85}{10}$ =Rs2357.00			

Rateanalysistor cementconcrete:

:>Thetotalquantityofmaterialsfor10cumconcrete&the drymaterialwillbe(lettake52%oftotalvolume)15.2, the proportion of cement concrete 1:4:8

:>Quantityofcementwillbe,Cement=$\frac{1}{1+4+8}$x15.2x1440=1683.7kg=34bag

:>Thereforesand =$\frac{4}{13}$xIS.2=4.67cum&Aggregate=$\frac{8}{13}$xIS.2=9.35cum

Particulars	Quantityornumber	Rate Rs.P.	Cost Rs. P.
Materials-			
Aggregate40mmgauge-	9.35cum	1000.00/cum	9350.00
Sand(local) -	4.67cum	1500.00/cum	7005.00
Cement (34 bags) -	1.17cum	9700.00/cum	11349.00
Labour-		Total=	27704.00
Headmason -	½	425.00perday	212.5
Mason -	no1½n	400.00perday	600.00
Blender -	o	250.00perday	3000.00
Menorwomencoolie-	12no	230.00perday	4140.00
	18no		920.00
Bhishti(includingcuring)-	4 no	230.00perday	150.00
Sundries T&P etc.	Lumpsum	150.00L.S.	
		Total=	9022.50
		Totalofmaterialandlabour	36726.50
		Add1½%ofwatercharge -	550.90
		Add10%contractor'sprofit -	3672.65
		Grandtotal=	40950.05
Ratepercum=40950.05/10=Rs4095.00			

Rateanalysisofl-classbrickworkwithmortar:

Example3

I-classbrickworkinsuperstructurewith20x10x10cmbrickwith1:6cementmortarunit1cum.Totalquantity 10cum.

Particulars	Quantity or number	Rate	Cost
		Rs. P.	Rs. P.
Materials-			
BrickI-class(500brickpercum)-	5000nos.	8000.00/cum	40000.00
Cement(13.5bags) --	0.45cum	9700.00/cum	4365.00
Sand(Local) --	2.7 cum	1500.00/cum	4050.00
Labour-		Total=	48415.00
Headmason --	½no.	425.00/day	212.50
Mason --	10no.	400.00/day	4000.00
Blender --	7 no.	250.00/day	1750.00
Coolie --	10no.	230.00/day	2300.00
Bhishti --	2no.	230.00/day	460.00
Scaffolding --	Lumpsump	350.00L.S.	350.00
SundriesT&Petc. --	Lumpsump	120.00L.S.	120.00
		Total=	9192.50
		Total of materials and labour -	57607.50
		Add1½%watercharges --	864.00
		Add 10% Contractor's profit --	5760.75
		Grandtotal=	64232.25
Ratepercum=64232.25/10=Rs6423.00			for10cum

Rateofanalysisofplastering:

Example4

12mmPlastering 1:6unit,1sq.m.Quantity100sq.m.

Particulars	Quantityor numbers	Rate	Cost
		Rs. P.	Rs. P.
Materials-			
Cement (9bags) --	0.30 cum	9700.00/cum	2910.00
Sand(local) --	1.80cum	1500.00/cum	2700.00
Labour-		Total=	5610.00
Headmason --	1/3no.	425.00/day	141.70
Mason --	10no.	400.00/day	4000.00
Blenderincludingranking ofjoints ---	15no.	250.00/day	3750.00
Bhishti(curing) --	¾no.	230.00/day	172.50

Scaffolding --			
SundriesT&Petc. --	LumpSump	300.00L.S.	300.00
		Total=	8364.20
	Totalofmaterial&labour-		13974.20
	Add1½%ofwatercharges --		210.00
	Add10%ofContractor'sprofit --		1397.42
	Grandtotal=		15581.62
Ratepercum=15581.62/10=Rs155.00			for10cum

Rateanalysisofscaffolding;

Scaffolding charges forbrickwork based on S.S.R.

As per SSR-2014 OPWD

Particular	Per	Rate(Rs)
Forsuperstructureinfirstfloor	1cum	63.32
ForIIfloor	1cum	86.00
ForIIIfloor	1cum	108.67
ForeachadditionalflooroverIIIfloor	1cum	22.68

ScaffoldingchargesforplasteringbasedonS.S.R.

Particular	Per	Rate(Rs)
Forfirstfloor	lOcum	63.30
ForIIfloor	10cum	86.00
ForIIIfloor	lOcum	108.70
ForeachadditionalflooroverIIIfloor	10cum	22.70

Rateofanalysisofpainting,whitewashing:

:>Paintingwithbestsyntheticenamelpainttwocoatstonewwoodworkoverprimarycoatofwhitelead includingcostandconveyanceofallmaterialsandalllabourchargesetc.completeforfinisheditemofwork in wood.(Quantity 10 cum)

Slno.	Description	Quantity	Rate	per	Amount
1	Woodprimer	1.60lit	135.00	1lit	216.00
2	Syntheticenamelpaint	1.20kg	238.00	1kg	285.00
3	PainterIclass	0.57no.	400.00	1no.	228.00
4	PainterIIclass	1.33no.	320.00	1no.	425.60
				Total=	1155.20

:>Oilbounddistempertwocoatsoveronecoatofprimarytointeriorfacesincludingcostandconveyanceofall materials andalllabour charges etc.completefor finisheditemofwork(Quantity10cum)

Slno.	Description	Quantity	Rate	per	Amount
1	Primarycoatdistemper	0.97 kg	81.00	1kg	78.57
2	PainterIclass	0.21no	400.00	1no.	84.00
3	PainterIIclass	0.49no.	320.00	1no.	156.80
4	Distemer	1.343kg	81.00	1kg.	108.783
5	PainterIclass	0.15no.	400.00	1no.	60.00
6	PainterIIclass	0.35no.	320.00	1no.	112.00
7	ManMulia	0.5no.	280.00	1no.	140.00
8	Womanmulia	0.8nos	280.00	1no.	224.00
				Total=	964.153

:>Paintingwithwhitecementtwocoatsoverprimarycoatincludingcostandconveyance ofallmaterialsand labourchargesetcforexterior wallscompletefor finisheditemofwork(Quantity 10cum)

Slno.	Description	Quantity	Rate	per	Amount
1	Costofwaterproofcement	3.75kg	47.00	1kg.	176.25
2	PainterIclass	0.57no.	400.00	1no.	228.00
3	PainterIIclass	1.33no.	320.00	1no.	425.00
4	ManMulia	0.50no.	280.00	1no.	140.00
5	Womenmulia	1.00no.	280.00	1no.	280.00
				Total=	1249.85

Rateofanalysisofreinforcingsteel&R,c,c.Works:

R.C.C. (1:2:4) using20mm size H.B.G.metalincluding costand conveyanceof allmaterials andalllabour charges excludingcost ofsteel etc.Complete forfinished itemof theworkin R.C.C. works(Quantity1cum).

Sl no.	Description	Quantity	Rate	per	Amount
1	Costof20mmH.B.Gmetal	0.92cum	1150.00	1cum	1058.00
2	Costofsand	0.46cum	540.00	1cum	248.40
3	Costofcement(331kg)	0.23cum	4100.00	1000kg	1357.10
4	Mason-I	0.12 no.	350.00	1no.	42.00
S	Mason-II	0.28no.	320.00	1no.	89.60
6	ManMulia	2.10no.	280.00	1no.	588.00
7	Womanmulia	3.50no.	280.00	1no.	980.00
8	Vibratingcharges		50.00	1cum	50.00
9	Machinemixigcharges		50.00	1cum	50.00
			Total=		4463.10

R.C.C.(1:2:4)using20mm size H.B.G.metal includingcost andconveyanceofallmaterials andall labour charges excludingcost ofsteel etc.Complete forfinished itemof the workin sunshades 600mm, wide 75 mmandSO mmthick at ends in thefirst floor.(Quantity 1 rm)

Slno.	Description	Quantity	Rate	per	Amount
1	CostofR.C.C.inG.F.	0.0375 cum/rm	3843.00	1cum	144.11
2	Centeringcharges	lrm	38.00	lrm	38.00
3	Liftingcharges	0.0375 cum	111.00	1cum	4.16
				Total=	187.00

Materialcalculationofreinforcingsteel,

For calculation of reinforcement in slab,

BBS ofslab,

Dia.Ofmainbar=l00

Dia. Of distribution bar=80

Spacing=lSOmm=.150metre

Mainbarquantity=1+ =101Nos.
.150

Distributionbarquantity=1+-6 -=41Nos.
.150

Weightofmainbar=--d2L XNumberofbars=--10.6 x101=373kg
162.2 162.2

Weightofdistributionbar=--d2L XNumberofbars=--8.15 x101=243kg
162.2 162.2

Total weight= 373+243 =616 kg

Price of TATA steel= Rs 46/kg

=616x46**=Rs28336**

Bindingwire=lOkg/ton(Thumbrule)

=616/100=6.1kg

Perkgrate=Rs65

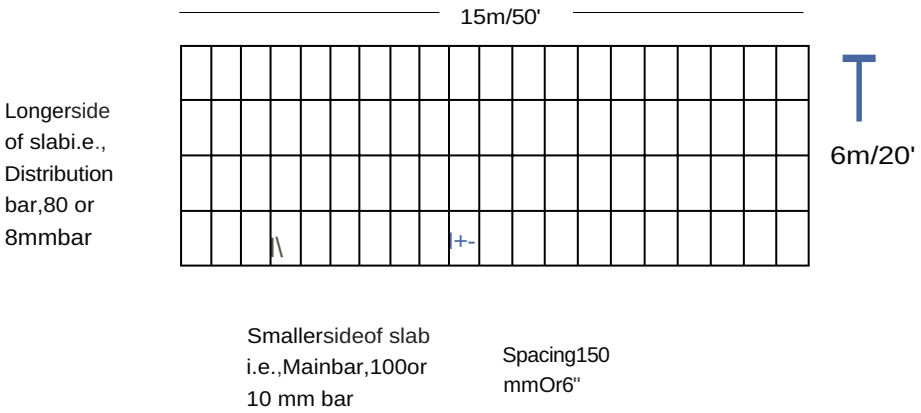
=6.1x65**=Rs396.5**

Labourrate=Rs6.5/kg

=616x6.5**=Rs4004**

Totalcost=28336+397+4004

=Rs32,737.00



Rateanalysisofflooring:

:,FlooringwithpolishedShahabadstone15mmthicklaidincementmortar(1:2)andpointingwithCementmortar (1:2)includingcostandconveyanceofallmaterialsandalllabour chargesetc.completeforfinisheditemofwork in ground floor.

SI. No.	Description	Quantity	Rate	Per	Amount
1	Polishedshadedstone15mmthick	10.10sq.m.	1544.00	lOsqm	15594.40
2	Cementmortar(l:2)	0.12 cum	322.30	1cum	38.676
3	Pointing charges	10 sq.m.	1200.00	lOsqm	1200.00

4	MasonI	0.96no.	350.00	1no.	336.00
5	MasonII	2.24No.	320.00	1no.	716.00
6	ManMulia	2.20No.	280.00	1no.	627.00
7	WomenMulia	1.10No.	280.00	1no.	616.00
				Total=	19129.076

:, Measurementsforplastershallbepaidonareabasisforthe areaactuallyplastered.

:, Flooringwithpolishedcuddapahstone15mmthicklaidincementmortar{1:2)andpointedwithcementmortar (1:2)includingcostandconveyanceofallmaterialsandalllabourchargesetc.completeforfinisheditemofwork in first floor (Quantity 10 sqm)

Sl. No.	Description	Quantity	Rate	Per	Amount
1	Polishedshadedstone15mmthick	10.10sq.m.	1287.00	10sqm	1299.90
2	Cementmortar(l:2)	0.12cum	322.30	1cum	30.68
3	Pointing charges	10sq.m.	1200.00	10sqm	1200.00
4	MasonI	0.96no.	350.00	1no.	336.00
5	Mason II	2.24No.	320.00	1no.	716.00
6	ManMulia	2.20No.	280.00	1no.	616.00
7	WomenMulia	1.10No.	280.00	1no.	308.00
8	Liftingcharges		45.00	10sqm.	45.00
				Total=	4552.38

Leadandlift:

Lead isthehorizontal distancebetweenthecenterofpitandthecenterofthebackofdepositofsand.

Liftistheverticaldistancebetween thecenterofthedepthofcuttingandcenterofthebankofdepositofsand.

:, Theinitialleadandliftare10.00mand2.00mrespectively.
:, Forgreaterleadorlifttherateswillbedifferentforeveryunitof10mleadandforeveryunitof2mlift.

Additionalleadandlift:

:, Foreveryadditionalleadof10morpartthereof, oneextraleadistobeadded.
:, For example, whenearthwork iscarriedover a distance of 18 m, oneinitial leadandadditional leadisadded (l0m+8m).
:, Foreveryadditionalliftof2morpartofit,oneextraliftistobeadded.
:, Forexample,whenearthworkiscarriedoveraheightof2.5m,oneinitialliftandadditionalliftisadded(2m +0.5m)

Le.ad.;_

- The material istransported from theproduction place (source or quarry) to thework site (place where the constructionis goingon),The distance is known as lead.

Leadcharges;

- Thecostofconveyanceofthematerialfromthesourcetoworkspotisknownasleadcharges.
- Itvarieswithreferencetotypesofthematerial,typesofroadsurface,thematerialis conveyed.
- Ingeneral,the chargesonCarTrackare1.1timestheMetalRoadandonSandTrackis1.4timesthe metal road.

Blastingcharges;

- Materialslikeroughstone,40mm sizeH.B.G.,thestonesareextractedbyblastingatquarry.
- If the materialactually extracted byquarrybyblasting, the blastingcharges per unitasfixedinS.S.R.areto be added toinitial rate.

Ceasecharges;

- Generally,thesechargesarealsofixedbygovernmentfromtimetotime.
- Thesearenormally37%overseniorage charges.

Stackingcharges;

- Ifthe materiallife40mm sizeH.B.G.conveyedto theroadsidehastobestackedtothedepartmental gauge forpremeasurements.
- Thechargesallowedperunitasfixed S.S.R.isknownasstackingcharges.

Crushingcharges;

- If themetallife20mm size H.B.Gmetalareactuallycrushedfromthecrushingmachines toensureto correct size.

Conveyanceratesofmaterial:

Sl. No	Lead	Per	S.S.R. 2007-2008
1	Upto250m	cum	44.80
2	250to500m	cum	66.10
3	1km	cum	86.70
4	2km	cum	96.80
5	3km	cum	96.00

6	4km	cum	100.30
7	5km	cum	104.50
8	6km	cum	113.50
9	7km	cum	
10	8km	cum	
11	9km	cum	
12	10km	cum	
13	Beyond 20andupto 30km (rate/km)	cum	4.10
14	Beyond30anduptoSOkm (rate/km)	cum	4.00
15	BeyondSOandupto80km (rate/km)	cum	3.90
16	Beyond80andupto100km (rate/km)	cum	3.60
17	Beyond100km(rate/km)	cum	3.40
18	loading	cum	8.70
19	Unloading	cum	7.20
20	Stacking	cum	4.60

Typesoflead:

Therearevaroustypesoftrack,

1. Cartrack
2. Sandtrack
3. Metalroad
4. Ghatroad

Conversionofleadtometaltrack,

- One unit ofcartrackisequalto1.1unitofmetalroad.
- Oneunitofsandtrackisequalto1.4unitofmetalroad.
- Ghat road steeper than1.20aretakenequalto 1.5 to2.5times the actual length depending on circumstances.

Example,

lead forsand has3 km of sand track,6km ofcart track andmetal roadof15 km.What isthetotallead in terms of metal road?

Total lead=(3x1.4)+(6xl.1)+15

=25.8kms

ABSTRACTOFCOSTOF£STIMATE:.

:>The cost ofanitem of work isestimated from the amounts already calculatedin tabularform andthecumulative cost is calculated in the abstract form of the calculation.

:>Thepricesofvariouswork itemsaretakenforcompletedwork itemsaccordingtothesequenceofratesor actualworkableratesoranalysedrates.

:>Tomake contingencies for miscellaneousminor itemsthat donot fallunder any classified headofwork items,a percentageof 3%ofthetotal expense istypically applied anda percentageof around 2%isgiven forwork charged institutions.The approximatecost ofwork isgiven by the total so collected.

Valuation:

Valuationistheartofassessingthepresentfairvalueofapropertyataspecifiedtime.

:>Itistheestimateofthevalueofaparticularitemintermsof money.Itisbasedoncertainfactsandfactors.
:>Costmeansthe actualcost of construction orpurchase,whilevaluemeansthepresentmarketvaluewhich may not be same asthecost.
:>Valuedependsuponthe supplyanddemandwhereascostistheamountrequiredforconstruction.
:>Thetermpriceisusedtoindicatethecost oftheconstructionplustheprofitofthecontractor.
:>Abuildingwholecostof construction isRs.4,50,000.00, whenput forsaleitmayfetchRs.5,00,000.00.This sale price is the value of the building.

Necessityofvaluation;

- The subject valuation wasfirst restricted to landacquisition. When some property required to be acquired by the government for public purpose was appropriatedand compensation paid totheowner.
- Since almost allthe banks areadvancing loans against property onregular loanbasis, thevaluation of property isessentially needed foradvancing loanson property. Atpresent valuation of property ismostly needed to give valuation of immovable properties, forthe following purposes;

  i. Forsecurity ofloansandmortgages.
  ii. Forsaleandpurchasepurposes.
  iii. Fortaxationpurpose.
  iv. ForVISApurpose.
  v. Forrentfixation.
  vi. Forinsurancepurposes.
  vii. Forfixingcourtfeestamp.
  viii. Forpayingcompensationincaseofcompulsoryacquisition.
  ix. Forrehabilitationthepeople.
  x. Forreleaseofloaninstallmentsasandwhentheconstructionofbuildingisgoingon.
  xi. Forhighlightingthevariousassetsandliabilities.

Factors governingvaluation;

:>Valuationofabuildingdependsonvariousfactorssuchas;

- Typesofbuilding,
- Locationofbuilding,
- Demandofpeople,
- Buildingstructureanddurability,
- Size,Shape,Frontageofthebuilding,
- Widthofroadways,
- Qualityofmaterialsusedinconstruction.

Terminologyofvaluation:

Scrapvalue:

- Scrapvalueisthevalueofdismantledmaterials.
- Fora building when the life is overat the end ofits utility period the dismantledmaterialsassteel, bricks, timber, etc. will fetch a certain amount which is the scrap value ofbuilding.
- Incaseofmachinethescrapvalueisthevalueofmetalonly.
- Thescrapvalueofabuildingmaybeabout10%ofitscostofconstruction.
- The cost ofdismantling and removalof the rubbish material isdeductedfrom the total receipt fromthe saleof the useable materials toget the scrap value.

Salvagevalue:

- Itisthevalueattheendoftheutilityperiodwithoutbeingdismantled.
- A machine afterthecompletionofitsusual spanoflife orwhenitbecome uneconomic, maybe soldand one may purchase thesame for usefor some other purpose, the sale value of themachine isthe salvage value.
- Itdoesnotincludethecostofremoval,sale,etc.
- Normally, thescrap value orthesalvage value of aproperty oranasset hasgotsomepositive figure, butit may also be zero or negative.
- ForexamplethescrapvalueofaR.C.Cstructurebenegative,asdismantlingandremovalwillbecostly.

Marketvalue:

- The market value ofaproperty istheamountwhich can be obtained at particulartime from the open market if the property it put for sale.
- Themarketvaluewilldifferfromtimetotimeaccordingtodemandandsupply.
- The market valuealsochanges fromtimeto time forvariousmiscellaneous reason such asindustry,changeson fashions, means transport, cost of materials and labour etc.

Book value:

- Bookvalueistheamountshownintheaccountbookafterallowingnecessarydepreciation.
- The bookvalue ofa property ata particular year isthe original cost minus amountofdepreciationupto the previous year.
- The book value depends onthe amount of depression allowed peryear and willbegradually reduced yearto yearandat the end of the utility period oftheproperty the bookvaluewill be only scrapvalue.
- The book valuegradually reduces bya particularamounteveryyear from the original value tillit reaches the scrap value.

Rateablevalue:

- Rateablevalueisthenetannuallettingvalueofproperty,whichisobtainedafterdeductingtheamountof yearly repairs fromthegross income.
- Municipalandothertaxesarechargedatacertainpercentageontherateablevalueoftheproperty.

Obsolescence and annuity : Obsolescence:

- Thevalueofpropertyorstructurebecomelessby itsbecoming outofdateinstyle, instructureindesign, etc. and this is termed as Obsolescence.
- Anold datedbuildingwithmassive walls, arrangements of rooms not suitedin present daysandfor similar reasons,becomes obsoleteevenif itismaintained ina verygoodconditionanditsvaluebecomes lessdue to obsolescence.
- TheObsolescencemaybeduetothereasonsuchasprogressinarts,changesinfashions,changesin planning ideas, new inventions, improvements in design technique etc.
- A machine of old designmaybecome obsolete, thoughit maybein goodrunningcondition andits value will be less.

Annuity:

- Annuityistheannualperiodicpaymentsforrepaymentsofthe capitalamountinvestedbyaparty.
- These annual payments areeither paid attheendof theyear or atthe beginning ofthe year,usually for a specified number of years.

- Typesof annuity,
  - Iftheamount of annuity ispaidfor a definite number of periodsor years,itisknownas**Annuitycertain.**In such cases theamount of annuity will be higher,the lesser thenumber of the years thehigher will be the amount and vice versa toclear up tothewhole amount of capital.
  - Iftheamountofannuityispaidatthebeginningofeachyear,thisisknownas**Deferredannuity.**
  - Ifthepaymentsofannuitycontinueforindefiniteperiod,itisknownas**perpetualannuity.**
  - Thoughannuitymeansannualpayments,theamountofannuitymaybepaidbymonthly installmentsor quarterly of half yearly installments.

Grossincomeandnetincome,

- Grossincomeis thetotalincomeandincludesallreceiptsfromvarioussourcesofoutgoingsandthe operational andcollection chargesarenotdeducted.
- Netincomeisthesavingortheamountleftafterdeductingalloutgoings,operationalandcollection expenses fromthegross income or totalreceipt.
- Netincome-Grossincome-outgoings
- Outgoings or theexpenses which arerequired tobeincurred tomaintain the revenue of thebuilding.The various types of outgoings are taxes, repairs, sinking fund, loss of rent.

Capital cost,

- Capitalcostisthetotalcostofconstructionincludinglandortheoriginaltotalamountrequiredtopossessa property.
- It istheoriginalcost anddoes notchange,whilevalue of aproperty isthepresent cost whichmaybe calculated by methods of valuation.

Capitalizedvalue,

- The capitalized value of property istheamount of amoney whose annual interest at the highest prevailing rate ofinterestwill be equal tothenetincomefrom the property.
- Todeterminethecapitalizedvalueof apropertyit isrequiredtoknowthenetincomefromtheproperty and highest prevailing rateof interest.

Year'spurchase(Y.P.),

- YearspurchaseisdefinedasthecapitalsumrequiredtobeinvestedinordertoreceiveanannuityofRs. 1.00atcertainrateofinterest.
- For4%interest perannum,togetRs4.00itrequires Rs100.00tobedepositedinabank.
- TogetRs.1.00peryearitwillberequiredtodeposit¼ofRs.100.00

i.e.,100/4=2s.oo

Thusyear'spurchase=100/Rateofinterest=1/i

Where,i=Rateof interest in decimal

Sinkingfund:

The fundwhich isgradually accumulatedby way ofperiodic on annual deposit forthereplacement of the buildingor structure at the end of its useful life, is termed as sinking fund.

- Theobjectofcreatingsinkingfundistoaccumulatesufficientmoneytomeetthecostofconstructionor replacement of the buildingor structure after its utility period.
- Thesinkingfundiscreatedbyregularannualorperiodicdepositsincompoundinterestbearinginvestment, which willformthe amount of replacement at the endof the utilityperiodof the property.
- The sinking fundmay becreated bytakinga sinking fund policy with aninsurance company orby depositing in bank to collect higher compound interest.

- Thecalculation of sinkingfunddepends onthelifeofthebuildingandscrapvalue of thebuildingforthecostof old materials.
- The costoflandisnottakenintoaccountincalculatingsinkingfundaslandremainsintact.
- The sinkingfundmayalsoberequiredforpaymentofloan.
- If a property isowned or constructed by takingloan a sinkingfundmay becreated by setting aside a sum of money annually, toaccumulatewith compound interest in order to repay the debt at the end ofthe term of loan.
- Theamountthussetasideisalsoknownas**Annuitypayment.**
- Theamountwhichwillbesetasidemayalsobepaiddirectlytolenderbywayofannualinstallment.
- Thetotalamountofsinkingfundtobeaccumulated(S)=Costofbuilding-scrapvalue
- Theamountofannualinstallment ofthesinkingfundmaybefoundoutbytheformula.

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

Where,S=Totalamountofsinkingfundtobeaccumulated.
n=Number of years required to accumulate thesinkingfund i=
Rate of interest in decimal (e.g., 5%=0.05)
I=Annualinstallmentrequired

Anoldbuildinghasbeenpurchased byapersonatacost of Rs.30000/-excluding thecostof land.Calculate the amountof annual sinking fund at 4%interest assuming the future lifeof the building as 20years and scrap value of the building as10% ofthe cost of purchase.

Ans.

Givendata,

S=30,000-scrapvalue

=30,000-10/100x30000

=Rs27,000.00/-

i=4%=0.04

n=20years

Annualinstallmentofsinkingfund,I= $\frac{Si}{(1+i)^n - 1} = \frac{27000 \times 0.04}{(1+0.04)^{20} - 1} = Rs.907.201-$

Annualinstallmentforsinkingfundrequiredfor20years isRs.907.20/-

Depreciation:

Depreciationmayalsodefineasthedecreaseorlossinthevalueofapropertydue tostructuraldeteriorationuse, life wearand tear, decay and obsolescence.

- Depreciationisdependentonoriginalcondition,qualityofmaintenanceandusage.
- Thegeneralannualdecreaseinthevalueofapropertyisknownasannualdepreciation.
- Usually,thepercentagerateofdepreciationislessatthebeginningandgraduallyincreaseduringlateryears.
- The amount of depreciation isknown,the present value of a property canbecalculated after deductingthe total amount of depreciationfrom the original cost.
- Depreciationisthegradualexhaustionoftheusefulnessofaproperty.

Typesof depreciation,

:>Physicaldepreciation

- Wearandtearfromoperation
- Actionoftimeandnaturalforces.

:>Functionaldepreciation

- Inadequacyorsuppression
- Obsolescence

Methodofsolvingdepreciation:

Thevariousmethodsofcalculatingdepreciationare;

1. Straightlinemethod
2. Constantpercentagemethod
3. Sinkingfundmethod
4. Qualitysurveymethod

1. Straightlinemethod:

:>Inthismethoditisassumed thatpropertylosesitsvaluebythesameamounteveryyear.

:>A fixedamountof theoriginal cost isdeducted everyyear,sothatattheendoftheutilityperiod onlythe scrap value is left.

$$\text{Annual depreciation} = \frac{\text{Original cost - Scrap value}}{\text{Life in year}}$$

$$D = \frac{c - s}{n}$$

Where,C=originalcost

n=Lifeofproperty

D=Annualdepreciation

S= Scrap value

2. Constantpercentagemethod:

:>Thismethodalsocalleddeclinedbalancemethod.

:>Usually,thevalueofpropertydecreasesyearafter yeartillexpiryofitslifeperiod.

:>Hereitisassumedthatpropertylossesits valuebyaconstant percentage of itsvalueatthe beginning of every year.

=C-PC

=C(l-P)

Valueofpropertyattheendofsecondyear,

=C(l-P)-C(l-P)P

$=C(1-P)^2$

Thevalue of property at the endof nyear,

S=C(l-P)"

Or(1-P)=()2;

:>Theaboveformuladoesnothold good,whenthescrapvaluebecomeszero.

3. Sinkingfundmethod:

:>Herethedepreciation of the property isassumedtobeequaltoannual sinkingfund plusthe interest on the fund for the year.

:>IfRbetheannualsinkingfundandp,q,retc.betheinterestonthesinking fundsucceedingyearandC betheoriginal cost.

:>Whereastheamountofannualinstallmentsinkingfundmaybefoundas,

$$R=(1+W^{-1}$$

Where,

R=Annualinstallmentrequired

S=Totalamountofsinkingfundtobeaccumulated

n=No of years required for accumulating totalsinkingfund

i=Rate ofinterest in decimal (e.g. 8%=0.08)

4. Quantitysurveymethod:

:, Inthismethod the property isstudied in detail andlossinvalue duetolife,wear and tear, decay, obsolescence, etc. worked out.

:, Eachandeverystepisbasedonsomelogicalgroundwithoutanyfixedpercentage of thecostof the property.

Problem-1:

Aconcretemixer waspurchased for1,00,000 /-in theyear1992.Thesalvagevalveof themachineafter6 years is 30,000/- . Calculate thedepreciation and book value each year by;

i. Straightlinemethod

ii. Constantpercentagemethod

iii. Sinkingfundmethod

Given data,

Capital cost, C= 1,00,000/-

Salvage value, S= 30,000/-

i. Straight line method;

Annualdeprec1·at1·on, $D = \frac{C-S}{n}$

$$\frac{100000-30000}{6}$$

=11,667/-

ii. Constantpercentage method;

Rate of depreciation,

$$P=(1-\sqrt[n]{\frac{S}{C}})$$

$$=(1-(\frac{30,000}{1,00,000})\%)$$

=0.1818

Annualdepreciation,

$$Dn=C[(I-pr)^{-1}-(1-Pr]$$

$$D1=1,00,000[(1-0.1818)^{1-1}-(1-0.1818)^{1}]$$

=18,180 /-

02=,1,00,000[(1-0.1818)^{2}-^{1}-(1-0.1818)2]
=,14,875/-

03=,1,00,000[(1-0.1818)^{3}-^{1}-(1-0.1818)^{3}]
=,12,171/-

04,=1,00,000[(1-0.1818)^{4}-^{1}-(1-0.1818)4]
=,9,958/-

0s=,1,00,000[(1-0.1818)^{5}-^{1}-(1- 0.1818)^{5}]
=,8,148/-

06=,1,00,000[(1-0.1818)^{6}-^{1}-(1-0.1818)^{6}]
=,6,667/-

Totaldepreciation,
Ot=01+02+03+04+Os+06
=,18,180+,14,875+,12,171+,9,958+,8,148+,6,667
=,69,999=,70,000

iii. Sinkingfundmethod;
Totalamountofsinkingfund,S=Capitalsalvagevalve S=
100000- 30000
=,70,000/-
Rate of interest, i= 5%= 0.005
Annual installment of sinkingfund,

$$\frac{Ci+ir-1}{\frac{70,000x0.05}{(1+0.05)6-1}}$$

=,10,291/-
Annualdepreciation,
01=,10,291/-
02=,10,291(1+0.005)1=,10,291
03=,10,291(1+0.005)2=,11,346
04=,10,291(1+0.005)^{3}=,11,913
Os=,10,291(1+0.005)^{4}=,12,509
06=,10,291(1+0.005}5=,13,135
Totaldepreciation,
Ot=01+02+03+04+Os+06
=,10,291H10,291+,11,346+,11,913+,12,509+,13,135
=,70,000/-

Methodofvaluation:

Buildingvaluationisdonefollowingdifferentmethods;

1. RentalMethodofValuation
2. Directcomparisonwithcapitalvalue
3. Valuationbasedonprofit
4. Valuationbasedoncost

5. Developmentmethodofvaluation
6. Depreciationmethodofvaluation

1. RentalMethodofvaluation

In this method, net income from thebuilding iscalculatedbydeducting all theoutgoings from gross rent Year'spurchase (Y.P.) value is calculated byassumingasuitable rateof interest prevailinginthe marketFor example,considera rate of interest as 5%, theYear's Purchase= 100/5 =20 years.

:, Thenet income multiplied bythe year'spurchase givesthe capitalized value or the valuation of the property. Thismethodisusedonlywhentherentisknownorprobablerent isdeterminedbyenquiries.

2. DirectComparisonwithCapitalValue

When the rental value isnot known, this method of directcomparisonwith the capital value of a similar property of thelocalityisused.Inthiscase,the valuation oftheproperty isfixed bydirectcomparison with the valuation or capitalized value of similar property in the locality.

3. ValuationbasedonProfit

This method of valuation is suitable for commercialproperties such as hotels, restaurants, shops, offices, malls, cinemas, theatres etc. for which thevaluationdepends on theprofitInsuchcases, the net annual income is used from the valuation afterdeducting all theoutgoingsand expenses from the grossincome.The valuation of buildingor propertyisfound bymultiplying thenet income byyear'spurchase.Thevaluation,in this case, can be too high in comparisonwith the actual cost of construction.

4. Valuationbasedon Cost

Inthiscase,theactualcostof construction of thebuildingor the costincurred inpossessingthe building is considered as the basis to determine the valuation of theproperty. In thiscase, necessary depreciation isallowed and points of obsolescence areconsidered.

5. Developmentmethodofvaluation

This method issuitable for properties which areunder the developmentalstage.Forexample, if alarge place of land is to be divided into plotsafter provision for roads and other amenities, this method is used.The probable selling price of theplots, the area required for amenities and other expenditures for development is considered for valuation.

:,Development method ofvaluation isalso used for properties or buildingswhich are required to be renovated bymaking alterations, additions, improvements etc.Thevalue iscalculatedbased on the anticipatednet income generatedfrom thebuilding after renovationwork is complete.

:,The netincome multiplied byyear's purchase givesthe valuation of theproperty.Theactual cost ofthe property with a total costof renovation shall be compared with the anticipated value of the property to decide if therenovation is justified.

6. DepreciationMethodofValuation

Basedon thedepreciationmethod,thevaluationofthebuildingsisdividedintofourparts:

1. Walls
2. Roofs
3. Floors
4. Doorsandwindows

Costofeachpart at the present rateiscalculated based on detailed measurement. Thelifeof each part is calculated by the formula:

D=P[(100-rd)/100)]n

where,

D = depreciated

valuer= rate

d=depreciation

n=ageofbuildinginyears

rdvaluesareconside redasperfollowin :table:

LifeofBuilding	rd
100years	1.0
75years	1.3
50years	2.0
25 years	4.0
20years	5.0

The valuationcalculatedis exclusive of thecostof land,amenities, water supply, electrical and sanitary fittingsetc.andisused onlyfor buildingswhich are well maintained.If it isnot well maintained,thensuitable deductions are considered in the valuation calculatedabove.The present values of theland, amenities,water supply, electrical and sanitary fittingsshould be added to find thevaluationof theproperty.

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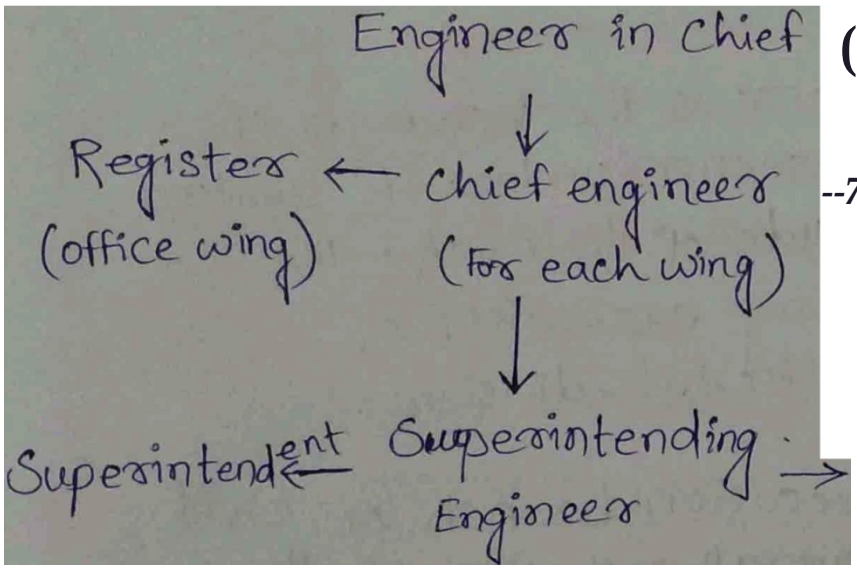

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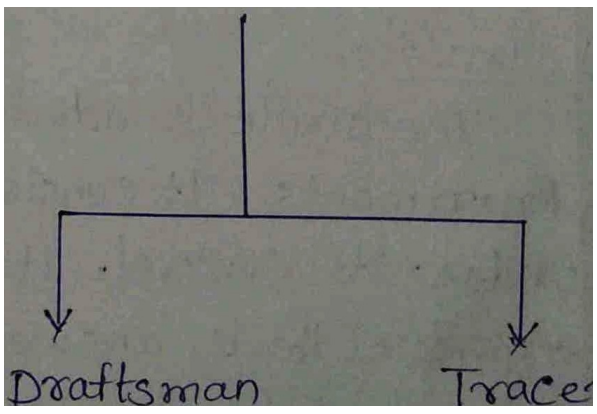

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Musterroll:**Itspreparation**&**useformakingpaymentofpay**&**wages**

Muster Roll is used for keeping a complete record of attendance, payment made , un-paid wages and work done by daily labour engaged on theexecution of works.It is thebasicrecordsofpaymentmadeto dailylabour.Aftertheayment
• smade,theMusterRollisketasaVoucher.

Musterrollsshould beprepared anddealt withinaccordance withthefollowing rules:

1. One or more muster rolls should be kept for each work, but muster rolls should never beprepared in duplicate. Itispermissible, however, tokeep onemusterrollforlabourersemployed uponseveralsmallworks,incases in which no harm can result if the total unpaid wages are regarded as relating only to thelargest work in the group.
2. Labourers maybepaidmorethanonceamonthandtheperiodcoveredby each payment may be determined locally; but separate rolls must be prepared for each period of payment.
3. Thedaily attendances and absencesoflabourers andthefinesinflicted on themshould berecorded dailyinpartIofthemusterrollinsucha wayas

    (i) tofacilitate thecorrect calculation of the net wagesof each person for the period of payment;
    (ii) torenderitdifficulttotamperwithortomakeunauthorized additions toor alterations, in entries once made, and
    (iii) tofacilitatethecorrectclassificationofthecostoflabourby works and sub-heads of works where necessary.
4. After a muster roll has been passed by thelocalofficer, payment thereon should be made asexpeditiously aspossible. Each payment should be made or witnessed by the official of highest standing available, whoshould certify to the payments individually or by groups, at thesametime specifying both in words and infigures, atthefoot of themuster roll, the total amount paid on each date. If any items remain unpaid, the details thereof should be recorded in part II of the register of arrears, before the memorandumatthefootofthemusterrolliscompletedbythepersonwho made the payment.
5. Unpaid items should subsequently becarried forward from muster roll to musterrolluntiltheyarepaid,thepaymentsbeingrecordedandcertifiedin partIIin thesame way aspayments of current items. Itisoptional, however, with the local officer to adopt any other alternative method of making payments of unpaid wages, provided that a systematic record of items remainingunpaidismaintainedonthebasisoftheoriginalentriesmadein partIIof themusterrolland thatsuitable precautions aretaken toprevent double payments.

6. Wages remammg unpaid for three monthsshouldbe refunded into Treasury.
7. Thepaymentofdailylabourthroughacontractorinsteadofbymusterroll intheusualway,isobjectionableinprinciple.Inacaseofgreatemergency it may sometimes be found impossible to employ labour otherwise than through acontractor.Shoulditbepossibleinsuchacase,todetermine the quantities of work done after its completion or at intervals during its progress,itisexpedienttopaythecontractor, atsuitablerates,onthebasis of work actually executed. To avoid disputes with the contractors, they shouldbeencouraged tosignthedailyreportsintokenoftheiracceptance as correct.

   N.B.-Theuseofthemusterrollisnotpermissibleinsuchcases.

8. Whenitis necessary tobringlabourers andartificersfromadistancethey may beallowed wagesforthenumber of daysoccupied in thejourney to and from thesiteof the work,if they join thework with proper despatch. Atthediscretion of thelocal officer, bona fide travelling expenses may also be allowed to them. The above charges must be borne by the estimate of the work.