ESTIMATING & COSTING

RATE ANALYSIS

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DEFINITION

" The determination of rate per unit of a particular item of work, from the cost of quantities of materials, the cost of labourers and other miscellaneous petty expanses required for its completion know as the analysis of rates."

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RATE ANALYSIS DEPENDS ON…

1. Specification, Quality, Rates & Quantity of works and material

2. Proportion of mortar method of construction and operation

3. Number of different types of labourer and their rates

4. Location of site of work and its distance from the sources of materials and labourers

5. Availability of water

6. Profit, overhead expenses and other miscellaneous expenses of contractor

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OVERHEAD COSTS

- It includes general office expense, rents, taxes, supervision and other costs which are indirect expense and not productive expense of job.

- The miscellaneous expense on overheads may be under the following heads;

A. General overheads

   1. Establishment (office staff)

   2. Stationary, printing, postages etc.

   3. Travelling expense

   4. Telephone

   5. Rent and Taxes

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OVERHEAD COSTS

B.   Job overheads

1.   Supervision (salary of Engg., Overseers, Supervision etc.)

2.   Handling of materials

3.   Repairs, carriage and depreciation of T&P

4.   Amenities of labour

5.   Workmen's compensation and insurance

6.   Interest on investment

7.   Losses on advances

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Overall ....

- The contractor's profit of 6-8% and miscellaneous overheads expenses of about 5-10%

- Total 15% of the actual cost may be reasonable amount but it is usually practice to add 10%.

- The analysis of rate is usually worked out for the unit of the particular item of work under two heads

1.   Material

2.   Labour

- 1.5% of water charges is also added

- If material has to be transported from more than 8km than transportation charges are separately calculated

- 10% should be extra added to contractors profit if cement and steel has to be arranged by him.

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TASK OR TURN-OUT WORK

- The capacity of doing work by an artisan or skilled labour in the form of quantity of work per day.

- It varies to some extent according to the nature, size, height, situation, location etc.

for example,

For a Excavation of foundation of a building, 4 labours worked out for 2 days and total quantity of earthwork was 24cu.mt.

So total labours worked = 2 x 4 = 8 Nos

Task of one labour = 24/8 = 3 cu.mt.

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Bricks & Mortar calculation in Unit m^3 of work

1. Brick masonry
   - Numbers of brick required = volume of brick work / volume of one brick with mortar joint

     = 1 / 0.20 x 0.10 x 0.10 = 500 nos.
   - Mortar for 1 cu.mt of brick work = actual volume of bricks in 1 cu.mt of brick masonry

     = 500 x (0.19 x 0.09 x 0.09) = 0.77 cu.mt
   - So volume of wet mortar in 1 cu.mt of brick masonry = 1 - 0.77 = 0.23 cu.mt
   - For frog filling, cut bricks for bonding, wastage, etc. increasing this quantity by 15%
   - Volume of wet mortar = 0.23 + (0.15 x 0.23) = 0.264 cu.mt
   - Volume of dry mortar reduces by 25% when water is added
   - Volume of dry mortar = 0.264 + (0.25 x 0.264) = 0.33 cu.mt

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Materials for 1:6 brick work

Quantity of brick work	**10 m^3**
Proportion	**1:6**
Volume of dry mortar	**3.3 m^3 (for 1 m^3 it is 0.33 m^3)**
1:6 = 7	
Cement = 1/7 x 3.3	**0.4714 / 0.035 13.47 bags**
Sand = 6/7 x 3.3	**2.83 m^3**

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Calculations of Quantities

Concrete work			
For 1 m^3 of wet concrete, dry volume is taken about 52% more			
That is 1 m^3 of wet concrete = 1.52 m^3 of dry concrete			
Quantity of materials for 1: 1.5 : 3 cement concrete			
Proportion	1: 1.5 : 3	C : S : A	Total = 5.5
Cement	1/5.5 x 1.52	0.2763/0.035	7.89 say 8 nos. of bags
Sand	1.5/5.5 x 1.52	0.414 m^3	
Aggregate	3/5.5 x 1.52	0.829 m^3	

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Calculations of Quantities

Plastering work			
For filling up the joints and for uneven surface, 25-30% more mortar is required			
To get the dry volume of mortar, wet volume may be further increased by 25%			
Materials for 100 m² area and 12mm thick plaster (1:4)			
Volume of wet mortar	Area x thickness	100 x 0.012	1.2 m³
For filling up joints and uneven surface, 30% more mortar is required			
Volume of wet mortar	1.2 x 1.30	1.56 m³	
To get dry volume of mortar, wet volume may be further increased by 25%			
Volume of dry mortar	1.56 x 1.25	1.95 say 2.00 m³	
Proportion is 1: 4 , so total is 5.			
Cement = 1/5 x 2 = 0.4 m³	(11.50 bags)	Sand = 4/5 x 2	1.6 m³

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Calculations of Quantities

Plastering work			
For filling up the joints and for uneven surface. 25-30% more mortar is required			
To get the dry volume of mortar, wet volume may be further increased by 25%			
Materials for 100 m² area and 20mm thick plaster (1:3)			
Volume of wet mortar	Area x thickness	100 x 0.020	2 m³
For filling up joints and uneven surface, 20% more mortar is required			
Volume of wet mortar	2 x 1.20	2.4 m³	
To get dry volume of mortar, wet volume may be further increased by 25%			
Volume of dry mortar	2.4 x 1.25	3.00 m³	
Proportion is 1: 3 , so total is 4.			
Cement = 1/4 x 3 = 0.75 m³	(21.50 bags)	Sand = 3/4 x 3	2.25 m³

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Labour required for different works

SL	PARTICULAR	UNIT WORK	REQUIRED MAN POWER
1	Earthwork in excavation 30mt lead and 1.5 mt lift	28.30 cu m	5 Beldars 4 Mazdoor
	Refilling the excavated earth in plinth	28.30 cu m	3 Beldars 2 Mazdoor ½ Bhisti
	Disposal of surplus earthwork	2.83 cu m	1 Mazdoor
2	Laying cement concrete	2.83 cu m	¼ Mason 2 Beldars 3 Mazdoor ¾ Bhisti
3	RCC Works : Laying reinforced concrete	2.83 cu m	½ Head Mason 3 Beldars 3 Mazdoor 1⅓ Bhisti

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Labour required for different works

SL	PARTICULAR	UNIT WORK	REQUIRED MAN POWER
3	**RCC Work**		
	Centering and shuttering for flat surface	9.6 Sq m	4 Beldars 4 Carpenters (II class)
	Reinforcement work for RCC	1.0 Quintal	1 Blacksmith or fitter 1 Beldar
4	**Stone work**		
	Random Rubble masonry	2.83 cu m	3 Masons 3 Beldars 2 Mazdoor ¼ Bhisti
5	**Brick work**		
	First class Brickwork in 1:4 CM	2.83 cu m	2 ¼ Masons 4 ½ Mazdoor ½ Bhisti

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Labour required for different works

SL	PARTICULAR	UNIT WORK	REQUIRED MAN POWER
6	**Finishing**		
	Plastering with any mortar 12mm thick	40.0 Sq m	3 Masons 3 Beldars ¼ Bhisti
	White washing or Colour washing	60.0 Sq m	1 White washer 1 Mazdoor
	Painting – 2 Coats	10.0 Sq m	3 Painter 2 Mazdoor
7	**Flooring – 4cm thick CC floor**	40.0 Sq m	5 Masons 4 Beldars 3 Mazdoors 1 Bhisti

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Labour rates

SR NO	PARTICULAR	RATE (RS/DAY)
1	Mason (Male/Female)	600
2	Mazdoor (Male/Female)	500
3	Beldar (Male/Female) - Labour	300
4	Bhisti	250
5	Carpenter	600
6	Blacksmith (Fitter)	400
7	Painter	400
8	White washer	400

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Materials rates

SR NO	PARTICULAR	Unit	RATE (Rs)
1	Cement – 50.0 Kg bag	Bags	350
2	Course Aggregates	Cu.m.	1200
3	Sand - Fine Aggregates	Cu.m.	800
4	Bricks – 1000 Nos	Nos.	4250
5	Brick Bats	Cu.m.	600
6	Mild Steel	Kg	45
7	HYSD Steel	Kg	45
8	Binding Wires	Kg	42
9	Lime	5Kg bag	50

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Rate analysis of Plain cement concrete (1 : 4 : 8) – for sample of 10.0 m^3

(A) Material required					
Sr	Type of material	Quantity	Rate	Per	Amount
1	Cement: Q = 1/13 x 1.52 x 10 = 33.5 bags	34.0	350	bag	11900
2	Sand : Q = 4/13 x 1.52 x 10 = 4.68 m^3	4.68	800	m^3	3744
3	Aggregate : Q = 8/13 x 1.52 x 10 = 9.36 m^3	9.36	1200	m^3	11232
4	Miscellaneous	-	-	Lum sum	500
				Total (A)	27376

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Rate analysis of Plain cement concrete (1 : 4 : 8) – for sample of 10.0 m³

Sr	Type	Quantity	Rate	Per	Amount
(B) Labour required					
1	Mason (0.25 for 2.83 Cu.m.)	1	600	day	600
2	Beldar (2 for 2.83 Cu.m.)	7	300	day	2100
3	Mazdoor (3 for 2.83 Cu.m.)	10	500	day	5000
4	Bhisti (0.75 for 2.83 Cu.m.)	3	250	day	750
				Total (B)	8450

Total (A + B) = Rs. 35826

Add 1.5% of water charges = Rs. 537

Add 10% of contractor's profit = Rs. 3583

Rate for 10.0 m³ = Rs. 39946

Rate for 1.0 m³ = Rs. 3994.60 say 3495.0

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Rate analysis of First class Brick Masonry Work in cement mortar (1:6) in super structure – for sample of 10.0 m³

Sr	Type of material	Quantity	Rate	Per	Amount
(A) Material required					
1	Bricks : Q = 5000 (1m³ = 500)	5000	4250	1000 No.	21250
2	Cement Volume of mortar = total vol.- vol of bricks = 10 – 5000 (0.19x0.09x0.09) =2.305 + (0.40 x 2.305) = 3.28 m³ Q= 1/7 x 3.28 = 0.47/0.035	13.42 Say 13.0	350	bags	4550
3	Sand Q = 6/7 x 3.28 = 2.81 m³	2.81	800	m³	2248
4	Miscellaneous	-	-	Lum sum	500
				Total (A)	28548

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Rate analysis of First class Brick Masonry Work in cement mortar (1:6) in super structure – for sample of 10.0 m³

(B) Labour required					
Sr	Type	Quantity	Rate	Per	Amount
1	Mason (2.25 for 2.83 Cu.m.)	8	600	day	4800
2	Mazdoor (4.25 for 2.83 Cu.m.)	15	500	day	7500
3	Bhsiti (0.50 for 2.83 Cu.m.)	2	250	day	500
				Total (B)	12808

Total (A + B) = Rs. 41356
Add 1.5% of water charges = Rs. 620
Add 10% of contractor's profit = Rs. 4136
Rate for 10.0 m³ = Rs. 46121
Rate for 1.0 m³ = Rs. 4612

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Rate analysis of 10cm thick Brick Masonry partition wall in cement mortar (1:4) – for sample of 10.0 m²

(A) Material required					
Sr	Type of material	Quantity	Rate	Per	Amount
1	Bricks Volume = A x thickness = 10 x 0.1 Volume = 1.0 m³ ,so Q = 500	500	4250	1000 No.	21250
2	Cement Volume of mortar = 0.33 m³ Q= 1/5 x 0.33 = 0.06/0.035	2.0	350	bags	700
3	Sand Q = 4/5 x 0.33 = 0.24 m³	0.26	800	m³	208
4	Miscellaneous	-	-	Lum sum	500
				Total (A)	22158

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Rate analysis of 10cm thick Brick Masonry partition wall in cement mortar (1:4) – for sample of 10.0 m²

(B) Labour required					
Sr	Type	Quantity	Rate	Per	Amount
1	Mason (2.25 for 2.83 Cu.m.)	1	600	day	600
2	Mazdoor (4.25 for 2.83 Cu.m.)	2	500	day	1000
3	Bhsiti (0.50 for 2.83 Cu.m.)	1	250	day	250
				Total (B)	1850
Total (A + B) = Rs. 24008					
Add 1.5% of water charges = Rs. 360					
Add 10% of contractor's profit = Rs. 2400					
Rate for 1.0 m³ = Rs. 26768					

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Rate Analysis of 12mm thk cement plaster with (1:4) ratio – for sample of 100.0 m²

(A) Material required					
Sr	Type of material	Quantity	Rate	Per	Amount
1	Cement Volume = A x t= 100x0.012=1.2 m³ Add 25% for shrinkage = 0.3 m³ Add 40% for wastage = 0.48m³ Total = 1.98 say 2.00 m³ Q=1/5 x 2 = 0.4 / 0.035	11.5 Say 12.0	350	bags	4200
2	Sand Q= 1/5 x 2 = 1.6	1.6	800	m³	1280
3	Lime	5 kg	50	Kg	250
4	Miscellaneous	-	-	Lum sum	500
				Total (A)	6230

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Rate Analysis of 12mm thk cement plaster with (1:4) ratio – for sample of 100.0 m²

Sr	Type	Quantity	Rate	Per	Amount
(B) Labour required					
1	Mason (3 per 40.0 Sq.m.)	8	600	day	4800
2	Beldar (3 per 40.0 Sq.m.)	8	300	day	2400
3	Bhisti (0.25 per 40.0 Sq.m.)	1	250	day	250
				Total (B)	7450
Total (A + B) = Rs. 13688					
Add 1.5% of water charges = Rs. 205					
Add 10% of contractor's profit = Rs. 1368					
Rate for 10.0 m³ = Rs. 15161					
Rate for 1.0 m³ = Rs. 1516					

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Rate analysis of RCC (1:2:4) for slab (0.200 m thick)– 10 m³

Sr	Type of material	Quantity	Rate	Per	Amount
(A) Material required					
1	Cement Q=1/7 x 10 x 1.52 = 2.17 / 0.035	62	350	bags	21700
2	Sand (Fine Agg.) Q= 2/7 x 10 x 1.52	4.34	1200	m³	5208
3	Course Agg. Q= 4/7 x 10 x 1.52	8.68	1100	m³	9548
4	Steel (Assuming 1.0%)	785	50	Kg	39250
4	Miscellaneous	-	-	Lum sum	500
				Total (A)	76206

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Rate analysis of RCC (1:2:4) for slab (0.200 m thick)– 10 m^3

(B) Labour required; Surface area = 10x0.200 = 50.0 sq.m.					
Sr	Type	Quantity	Rate	Per	Amount
1	Head Mason (1/2 per 2.83 cu.m.)	2	600	day	1200
2	Beldar (3 per 2.83 cu.m.)	10	300	day	3000
3	Carpenters (4 per 9.60 sq.m.)	21	600	day	12600
4	Fitter (1 per 100 kg)	8	400	day	3200
5	Rent for Equipments	Lump Sump	-	day	2000
				Total (B)	22000
Total (A + B) = Rs. 98206					
Add 1.5% of water charges = Rs. 1473					
Add 10% of contractor's profit = Rs. 9820					
Rate for 10.0 m^3 = Rs. 109499					
Rate for 1.0 m^3 = Rs. 10950					

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Labour rates

SR NO	PARTICULAR	RATE (RS/DAY)
1	Mason (Male/Female)	600
2	Mazdoor (Male/Female)	500
3	Beldar (Male/Female) - Labour	300
4	Bhisti	250
5	Carpenter	600
6	Blacksmith (Fitter)	400
7	Painter	400
8	White washer	400

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