

* ANALYSIS OF RATES *

* Rate Analysis :- The determination of rate per unit of a particular item of work, from the cost of quantities of material, the cost of labour and other miscellaneous petty expenses required for its completion is known as rate analysis. A reasonable profit, usually 10% for the contractor is also included in the analysis of rate.

Rates of material are usually taken as the rates delivered at the site of work and include the first cost (cost at origin), cost of transport, railway freight if any, taxes, etc. If the material is carried to be from a distance place, more than 8 km then cost of transport is also added. The rates of material and labour vary from place to place and therefore, the rates of different items of work also vary from place to place.

For purpose of analysis, the details about all operation involved in carrying out the work should be available, the quantities of materials required and their cost should be known and the number of different categories of labourers required and capacity of doing work per labourer and their wages per day should be known.

* Overhead Cost :- Overhead costs include general office expense, rents, tax supervision and other cost which are indirect expenses and not productive expenses on the job.

(1) General Overhead :-

(i) Establishment (office staff) (ii) Stationary, printing, postage etc. (iii) Travelling expense (iv) Telephone (v) Rent and Taxes.

(2) Job Overheads :-

- (i) Supervision (Salary of engineers, Overseers, Supervision)
- (ii) Handling of material (c) Repairs, carriage and depreciation of T & P.
- (d) Amenities of labour (e) Workman's compensation, insurance etc.
- (f) Interest or investment (g) Losses on advance.

* TASK OR OUT TURN WORK :- The capacity of doing work by an artisan or skilled labour in the form of quantity of work per day is known as task work or out turn of the labour.

* IMPORTANCE OR REQUIREMENTS OF RATE ANALYSIS :-

- (1) Before approving a project, the cost of work required for project can be investigated by rate analysis.
- (2) Rate analysis, analysis the rate of each material and work individually which is very helpful.

- (3) Rate Analysis also tells which material should be used which is suitable from point of economy and strength.
- (4) Rate Analysis also tells which technique should be used for construction and if that technique is costly can be altered by rate analysis.
- (5) Rate Analysis tells us the Market value or ultimately Competition and ~~value~~^{cost} of each material.
- (6) By Rate Analysis, the cost of project can be calculated before starting the project.

* UNITS OF MEASUREMENT PREPARATION OF RATE ANALYSIS :-

The units used for measurement material and work and workers are termed as units of measurement for rate analysis.

- (1) Brickwork \rightarrow cu-m or cu-ft or sq-m.
- (2) Concrete Work \rightarrow Cu-m.
- (3) Plastering, White washing, colour washing, Pointing \rightarrow sq-m.
- (4) Excavation \rightarrow cu-m. Sand Filling \rightarrow Cu-m.
- (5) R.C.C or R.B \rightarrow cu-m.
- (6) Beldar \rightarrow NOS. (7) Cement - Bags. (8) Steel \rightarrow tonne.

* Preparing of Rate Analysis :- After knowing rates of different items of work the number of Mazdoors, Coolies, Bishties etc. may be adopted from general ideas and different operation of construction of particular item of work.

$$1 \text{ cu-m of cement} = 30 \text{ bags.}$$

$$1 \text{ bag} = \frac{1}{30} \text{ cu-m.} = 0.034 \text{ cu-m.}$$

In working out rate analysis of rate labour has been taken on daily wages basis for 8 hours working a day.

ANALYSIS OF RATES

PLASTERING

12 mm thick, 1:6 Cement-Sand Ratio

Taking 100 sq. meter area

$$\text{Volume of Plaster} = \frac{12 \times 100}{1000} = 1.2 \text{ cubic meter.}$$

$$30\% \text{ extra for filling brick masonry joint} = 1.3 \times 1.2 = 1.56 \text{ cub met}$$

$$25\% \text{ allowance for dry volume} = 1.25 \times 1.56 = 1.95 \text{ cubic-meter}$$

$$\text{Cement} = 0.28 \text{ Cub-m, Sand} = 1.67 \text{ Cub-m}$$

Particulars	Quantity	Rate	Cost
Material	1.95 Cub-m.		
Cement (9 bag)	0.28 Cub-meter	350/- per bag	3150/-
Sand	1.67 Cub-m.	1000/- per Cub m.	1670/-
Total			4820/-
LABOUR			
Master (Head Mason)	$\frac{1}{3}$ nos.	550/-	183.33/-
Mason	10 nos.	450/-	4500/-
Magdoor Or Beldar	15 nos.	350/-	5250/-
Bishti (Curing)	$\frac{3}{4}$ nos.	250/-	187.51/-
Scaffolding T & P	lump sum	500/-	500
		T.O.S	+400/-
Total			10,620/-

$$1 \text{ cub-m} = 30 \text{ b}$$

$$0.28 \text{ Cub-m} = 30 \times 0.28 = 91$$

Total of Material and Labour = $48264/10620 = 15440/-$

Adding $1\frac{1}{2}\%$ water charges = $231.6/-$

Adding 10% Contractor Profit = $1544/-$

Grand Total = $17215/-$ for 100 sq. meter

Rate per square meter = $\frac{17215}{100} = 172.15/-$
(1:6, 12mm thick plaster)

Q2) Line Concrete in foundation with 40mm gauge Brick Ballast

Take 10 Cubic Meter

(a) With white lime and Surkhi (1:2) i.e. $1:2:6$ → Brick Ballast.
lime Surkhi
52% allowance = $10 \times 1.52 = 15.2$ Cub m.

Particular	Quantity	Rate	Cost
<u>Material</u>			
Brick Ballast	10.10 Cub-m	900/- per Cub-m	9090/-
40mm gauge Surkhi	3.37 Cub-m	1000/- per Cub-m	3370/-
White lime	1.68 Cub-m	750/- per Cub-meter	1260/-
<u>Total.</u>			13720/-
<u>Labour</u>			
Mistri (Head Mason)	$\frac{1}{2}$ nos.	550/-	275/-
Mason	1 nos.	450/-	450/-
Beldar/Majdoor	12 nos.	350/-	4200/-
Boy/Women	12 nos.	250/-	3000/-
Coolie.			50
Bishti (Curing)	2 nos.	250/-	500/-
			900/-

Total = 862

* Procedure of Rate Analysis (Steps for Rate Analysis)

- Step 1 > Take a suitable quantity e.g 10 cu-m concrete or 100 sq.m plaster etc.
- Step 2 > Find out volume of material used as per the ratio.
- Step 3 > Take existing market cost of material and multiply it with concerned value quantity.
- Step 4 > Take quantity of labour required to execute the above said volume or area of item.
- Step 5 > Take their respective and existing market wages and multiply to find out the labour cost involve
- Step 6 > Take the cost involve for Tools & Plant (T & P).
- Step 7 > Sum all these expenditure and $1\frac{1}{2}\%$ of water charge and 10% contractors profit.
- Step 8 > Sum all the three above to get cost of above said volume or area of item
- Step 9 > Now find out the per unit rate by dividing it with the concerned quantity taken.

Total Material and Mason = 18720/-

1½% Water Charges = 335/-

Adding 10% Contractor Profit = 2234.5/-

(2)

Grand Total = 24914.675/-

Rate per Cubic meter = $\frac{24914.675}{10} = 2491.4675/-$

3 Cement Concrete (1:2:4)

Take 10 Cubic Meter.

Loose Volume = $1.52 \times 10 = 15.2 \text{ m}^3$

Taking 52% allowance for loose volume

Stone Ballast 40mm Gauge = $\frac{4}{7} \times 15.2 = 8.68 \text{ m}^3$

Sand = $\frac{2}{7} \times 15.2 = 4.34 \text{ m}^3$

Cement = $\frac{1}{7} \times 15.2 = 2.17 \text{ m}^3$

S.No.	Particulars	Quantity or Nos	Rate	Cost
	<u>Material</u>			
1.	Stone Ballast (40mm gauge)	8.68 m ³	1800/- per m ³	15624/-
2.	Sand	4.34 m ³	1000/- per m ³	4340/-
3.	Cement	2.17 m ³ (36 bags)	350/- per bag	23,100/-
			Total	43064/-
	<u>Labour</u>			
	Mistri (Head Mason)	1/3 NOS.	550/-	183.33/-
	Mason	2	450/-	900/-
	Mazdoor (Beldar)	12	350/-	4200/-
	Boy or Women Coolie	20	250/-	5000/-
	Bishli	6	250/-	1500/-
	Forms	Lump Sum	1500/-	1500/-
	Surcharge	Lump Sum	500/-	500/-

Total of Material and labour = 58847.33/-

Add 1/2% Water Charges = 882.71/-

Add 10% Contractors Profit = 5884.73/-

Grand Total (for 10 Cub-m) = 65614.77/-

For 1 Cub-meter = 6562/-

(4) R.C.C WORK IN BEAM SLAB etc (1:2:4

Take 10 Cubic Meter

Loose Volume = $1.52 \times 10 = 15.2 \text{ m}^3$

Stone Ballast (20mm gauge) = $\frac{4}{7} \times 15.2 = 8.68 \text{ Cub-m}$

Sand = 4.34 Cub-m

Cement = 2.17 Cub-m

Steel (M.S. bars) = 1% of volume of concrete
(78.5 ~~Cub-m~~)
9/Cub-m

(2 = Quintal)

0.01 Cub-m Steel = $78.5 \times 0.01 \text{ Cub-m} = 78.5 \text{ g}$

Particular	Quantity or Nos.	Rate	Cost
Material			
Stone Ballast (20mm Gauge)	8.68 Cub-meter	2000/-	17360/-
Sand	4.34 Cub-meter	1000/-	4340/-
Cement	2.17 Cub-m (66 bags)	350/-	24100/-
M.S	78.5 g	6000/-	47100/-
Binding Wire	105 Kg	80/-	120/-
Total			92020/-

<u>Laborer</u>	<u>Quantity or Nos.</u>	<u>Rate</u>	<u>Cost</u>
Head Mason	1/2 Nos.	550/-	225/-
Mason	3	450/-	1350/-
Maddoor (Beldoor)	12	350/-	4200/-
Boys or Women Coolie	20	250/-	5000/-
Bish-ti	6	250/-	1500/-
Sundries T&P	lump sum	250/-	250/-
		Total	12525/-
<u>Bonding Granking and Binding Steel Bars in Position</u>			3
Blacksmith (II class)	8 nos.	450/-	3600/-
Maddoor	8 nos.	350/-	2800/-
T&P	lump sum	200/-	200/-
		Total	6600/-
<u>Centering & Shuttering Both Erection & de- mentally</u>			
Timber, Plancks, Nails	lump sum	2000/-	2000/-
Carpenter (II class)	10 nos.	450/-	4500/-
Maddoor	10 nos.	350/-	3500/-
Nails	lump sum	250/-	250/-
T&P	lump sum	100/-	100/-
		Total	10350/-

Total of Material and labour = 121545/-

Add 1 1/2% of water = 1823/-

Add 10% of Contractor Profit = 135522/- for 10 Cub-

(5) REINFORCED BRICK WORK ON SLABS ETC.

Take 10 Cub-meter of Volume

No of Bricks = 450 nos/cub-meter

Bricks for 10 cubic meter volume = $450 \times 10 = 4500$ nos.

Dry mortar of reinforced Brick work = 45%

Volume of Mortar = 4.5 cubic meter

Sand = 3.375 Cub-m Cement = 1.125 Cub-m.

Mild Steel Bars = 0.8% = 0.08 Cub-m.

78.59/Cub-m

Wt. of Mild Steel Bars = $0.08 \times 78.5 = 6.28$ g

Particulars	Quantity or Nos.	Rate	Cost
<u>Material</u>			
Brick (I class) 450 nos. per cub m.	4500 nos.	4500/- %	20250/-
Cement (1.125 Cub-m)	34 nos. of bag	350/- per bag	11,900/-
Sand	3.375 Cub-m	1000/- per cub m	3375/-
M.S. Bars	6.28 g	6000/- per g	37680/-
		Total	73205
<u>Labour</u>			
Head Mason	1/2 NOS.	5,500/-	2750/-
Mason	10 NOS.	450/-	4500/-
Beolar	10 NOS.	350/-	3500/-
Boy or Woman Coolie	10 NOS.	250/-	2500/-
Bishti (Including Curing)	4 NOS.	250/-	1000/-
Sundries T&P	lump sum	200/-	200/-
		Total	11975/-
<u>Binding of Cracking Steel Bars.</u>			

Beldare	6 nos.	350/-	2100/-
TSP	Lump Sum	150/-	150/-
		Total	4950/-
Centering And Shuttling Brick Erection And Discontinually			
Tube Poles & Ballies	Lump Sum	2000/-	2000/-
Carpenter (II class)	8 nos.	450/-	3600/-
Beldare	8 nos.	350/-	2800/-
Nails	Lump Sum	250/-	250/-
TSP	Lump Sum	100/-	100/-
		Total	8750/-

Total of material and labour = 92820/-

Adding $1\frac{1}{2}\%$ water charges = 1483/-

Adding 10% contractor's profit = 9088/-

Grand Total for 10 cub-m = 110251/-

Rate of 1 cub-m = 11025/-

6 RB WORK 1:2 Cement Sand Mortar

TAKE 10 Cub-m.

No. of Bricks = 4500 nos per Cub-m.

Bricks for 10 cub-m = 4500 x 1 nos.

Dry Mortar for RB Work = 45%

Volume of Mortar = 4.5 Cub-m.

Sand = 3 Cub-m Cement = 1.5 Cub-m.

Mild Steel Bars = 0.8% = 0.08 Cub-m.

78.5 g/Cub-m.

Wt of M.S. bar = $0.08 \times 78.5 = 6.28 \text{ g}$

Particulars	Quantity or Nos	Rate	Cost
Material			
Brick (I-class)	4500 nos.	4500/-	20250/-
4500 nos. per Cub-m		%	
Cement (1.5 Cub-m)	15 Bags	250/- per bag	15750/-

<u>Sand</u>		3 Cub-m	1000/- per Cub-m	3000/-
M.S Bar		6.28 q	6000/- per q	37680/-
			Total	76,680/-
<u>Labour</u>				
Head Mason		1/2 nos.	550/-	275/-
Mason		10 nos.	450/-	4500/-
Beldar		10 nos.	350/-	3500/-
Boy or Woman Coolie		10 nos.	250/-	2500/-
Bishti Including Curing		4 nos.	250/-	1000/-
Sundries & TSP		Lump Sum	200/-	200/-
			Total	11,975/-
<u>Binding & Cranking Steel Bars</u>				
Blacksmith (II Class)		6 nos.	450/-	2700/-
Beldar		6 nos.	350/-	2100/-
TSP		Lump Sum	150/-	150/-
			Total	4950/-
<u>Centering & Shuttering Both Erection & Dismantling</u>				
Timber Plank & Battens		Lump Sum	2000/-	2000/-
Carpenter (II class)		8 nos.	450/-	3600/-
Beldar		8 nos.	350/-	2800/-
Nails		Lump Sum	250/-	250/-
TSP		Lump Sum	100	100/-
			Total	8750/-
Total of Material and Labour =				102355/-

Grand Tot
= 114125.5
For 10 Cub.
For 1 Cub m
= 11412.5

BRICK WORK

BRICK SIZE WITHOUT MORTAR

$$9'' \times 4.5'' \times 3''$$

$$22.9 \text{ cm} \times 11.4 \text{ cm} \times 7.6 \text{ cm}$$

$$= 1984 \text{ cm}^3$$

BRICK SIZE INCLUDING MORTAR

Nominal Brick | Modular Brick

$$20 \text{ cm} \times 10 \text{ cm} \times 10 \text{ cm} = 2000 \text{ cm}^3$$

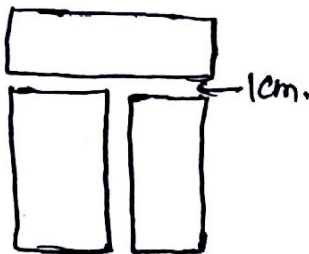
$$0.2 \text{ m} \times 0.1 \text{ m} \times 0.1 \text{ m} = 0.002 \text{ m}^3$$

10 Cub-m Brick Work

$$\text{No of Brick} = \frac{10}{0.002} = 5000 \text{ bricks}$$

1 Cub-m brick = 500 bricks.
20m length and 5m Ht

TAKE A WALL of $1\frac{1}{2}$ brick thick



$$1\frac{1}{2} \text{ brick} = 20 + 10 = 30 \text{ cm} = 0.3 \text{ m}$$

$$\text{Volume} = 0.3 \text{ m} \times 20 \text{ m} \times 5 \text{ m} = 30 \text{ Cub-m}$$

Deduction of 1 cm mortar thickness from wall thickness

$$= 30 \text{ cm} - 1 \text{ cm} = 29 \text{ cm} = 0.29 \text{ m}$$

$$\text{New Volume} = 0.29 \text{ m} \times 20 \text{ m} \times 5 \text{ m} = 29 \text{ Cub-m}$$

$$\text{No of Brick} = \frac{29}{0.2 \times 0.1 \times 0.1} = \frac{29}{0.002} = 14500 \text{ nos.}$$

No of bricks in 30 Cub-m brick Masonry = 14,500

No. of Brick in 1 Cub-m masonry = 14500

$$\frac{14500}{30} = 483 \text{ nos.}$$

Volume of Mortar

$$= 29 - 0.1 \times 0.9 \times 0.9 \times 14500$$

$$= 29 - 22.3155 = 6.685 \text{ Cub-m}$$

Adding 15% extra for wastage and filling up unevenness

$$= 6.685 + 1.0025 = 7.688 \text{ Cub-m}$$

$$\text{Allowance 25% for dry volume} = 7.688 + 0.25 \times 7.688$$

$$= 9.61 \text{ Cub-m}$$

9.61 Cub-m mortar for 30 Cub-m Brick Work.

$$\text{for 10 Cub-m} = \frac{9.61}{3} = 3.2 \text{ Cub-m mortar}$$

In general practice 3 Cub-m dry volume for cement mortar and 3.5 Cub-m dry volume for ~~concrete~~ lime mortar is taken for 10 Cub-m brick work as an approximate 30% of brick work can also be taken as dry volume.

I Class Brick Work in Foundation and Plinth with
(200 mm x 100 mm x 100 mm) Nominal brick with 1:6 Cement
Sand Mortar

Take 10 Cub-m volume of Brick Work.

Dry Volume of Mortar = 3.2 Cub-m

Cement = $\frac{1}{7} \times 3.2 = 0.45$ Cub-m

Sand = $\frac{6}{7} \times 3.2 = 2.7$ Cub-m.

Brick Volume = $0.2 \times 0.1 \times 0.1 = 0.002 \text{ m}^3$

Total Bricks in 10 Cub-m volume = $\frac{10}{0.002} = 5,000$

Particular	Quantity	Rate	Cost
<u>Material</u>			
Brick (I-class) 5000 nos - per Cub-m	5000 nos		