2.1 RATE ANALYSISANDCOSTING

STANDARD DATA

The process of working out the cost or rate per unit of each item is called as Data. In preparation of Data, the rates of materials and labour are obtained from current standard scheduled of rates and while the quantities of materials and labor required for one unit of item are taken from Standard Data Book.

OBSERVED DATA

In statistics, an estimator is a rule for calculating an estimate of a given quantity based on observed data: thus the rule (the estimator), the quantity of interest (the estimate) and its result (the estimate) are distinguished. For example, the sample mean is a commonly used estimator of the population mean.

SCHEDULE OF RATES

In order to determine the rate of a particular item, the factors affecting the rate of that item are studied carefully and then finally a rate is decided for that item. This process of determining the rates of an item is termed as analysis of rates or rate analysis.

The rate of particular item of work depends on the following.

1.Specifications of works and material about their quality, proportion and

ConstructionalOperation method.

2. Quantity of materials and theircosts.

3. Cost of labors and their wages.

4. Location of site of work and the distances from source and conveyancecharges.

5. Overhead and establishmentcharges

6. Profit

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MARKET RATES

This term indicates the cost per unit at which an article can be procured at a given time, at the store go down, from the public markets. The cost should be inclusive of carriage and and incidental charges, and may include a reasonable provision foe wastage and depreciation.

2.2 STANDARD DATA FOR MAN HOURS AND MACHINERIES FOR COMMON CIVIL WORKS

LABOUR (MAZDOOR) REQUIRED FOR DIFFERENT WORKS

Extracts from the report on productivity projects in building industries issued by NationalBuilding Organization are given below:-

(A) Earthwork per 28.30, cu m (1000 cu ft)-

(1) Excavation in foundations, trenches, etc. in ordinary soil including disposal up to 30 m(100') and lift of 1.5 m (5 ft)-5 Beldars and 4 Mazdoors can do 28.30 cu m (1000 cu ft) per day.

(2) Refilling excavated earth in foundations, plinth, etc., including consolidation in 15 cm (6")layers-3 Beldars, 2 Mazdoors and 1 Bhishti can do 28.30 cu m (1000 cu ft) per day.

(3) Disposal of surplus earth within a lead of 30 m (100')—1 Mazdoor can do 2.83 cu m(100 cuft) per day.

(B) Cement concrete work per 2.83 cu m (100 cu ft)-

Laying cement concrete-2 Beldars, 3 Mazdoors, % Bhishti and A Mason can do 2.83 cu m(100 cu ft) per day.

(C) R.C.C. Work-

(1) Laying reinforced concrete --- 3 Beldars, 3 Mazdoors, 1/3 Bhishti and / Mason can do 2.83cu m (100 cu ft) per day.

(2) Centering and shuttering for flat surfaces --- 4 Beldars and 4 Carpenters (II class) can do 9.6sq m (96 sq ft) per day.

(3) Reinforcement work for R.C.C.—1 Blacksmith or fitter and 1 Beldar can bend and place inposition 1 quintal (2 cwt) of steel per day.

(D) Stone work per 2.83 cu m (100 cu ft)-

Random rubble masonry with blue stone in foundations-3 Masons, 3 Beldars, 2 Mazdoorsand 14 Bhishti can do 2.83 cu m (100 cu ft) per day.

(E) Brickwork per 2.83 cu m (100 cu ft)-

First class brickwork in 1:4 cement mortar in superstructure partition walls, junctions of roof,parapet walls and string course—244 Masons, 417 Mazdoors and 12 Bhishti can do 2.83 cu m (100cu ft) per day.

(F) Wood work-

(1) For the frames of doors and windows-2 Carpenters and 1 Beldar can work 0.18 cu m (6.40cu ft) of wood equivalent to 4 door frames 7.5 cm x 10 cm of 1.2 m * 2.1 m (3"x4" of 3' — 11"X7') size per day.

2) For pannelled, glazed, etc., shutters-15 Carpenters and 4 Beldars can make and fix 4shutters 40 mm thick of size 2.00 mx 1.15 m (173" thick of size of 6–9"*3'—-9") per day. Quantityof wood per shutter - 0.075 cu m, i.e., 2.66 cu ft.

(G) Iron work-

(1) Fixing 40 mm 3 mm x 38 cm (1% *!%" X 15") flat iron holdfasts-1 Blacksmith (II class),1 Mason and I Beldar can fix 36 holdfasts per day.

(2) Fixing 16 mm dia (%" dia.) M.S. Tods1 Blacksmith (II class), 2 Carpenters (II class) and 3Beldars can fix 16.5 m (54 r ft) per day.

(H) Flooring-

4 cm thick (112") thick cement concrete flooring of 40 sq m (400 sq ft) require- 5 Masons,4 Beldars, 3 Mazdoors and 1 Bhishti per day for mixing, laying and finishing.(I) Finishing-(1) Plastering with any mortar 12 mm (1") thick_3 Masons, 3 Mazdoors and 1 Bhishti canplaster 40 sq m (400 sq ft) per day.

(2) White washing or colour washing (3 coats)--1 White washer and 1 Mazdoor can do 60 sqm.(600 sq ft) per day.

(3) Painting two coats such as chocolate; red, grey, etc., on wood or steel - 3 Painters and2 Mazdoors can paint 10 sq m (100 sq ft) per day.

LOAD FOR TRUCKS

On pucca metalled road-

Trucks	... 3 Tonners	5 Tonners	8 Tonners
Brick or Allahabad tiles	1000Nos	1500 Nos	2000 Nos.

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Cement, steel and other heavy materials	3 Tonne	5 Tonne	8 Tonne
Other materials-Ballast, kankar, grit, sand coal, etc.	2.8 cum (100 cu ft)	4.20 cu m (150 cu ft)	5.6 cum (200 cu ft)

On kachcha earthen rad the load will be less by 33 per cent.

2.3 PROCEDURE OF RATE ANALYSIS

Cost of materials at source and at site of construction.

The costs of materials are taken as delivered at site inclusive of the transport local taxes and other charges.

Purpose of Analysis of rates:

1. To work out the actual cost of per unit of the items.

2. To work out the economical use of materials and processes in completing theparticulars item.

3. To work out the cost of extra items which are not provided in the contract bond, butareto be done as per the directions of the department.

4. To revise the schedule of rates due to increase in the cost of material and labour or dueto change in technique.

2.3.1 RATE ANALYSIS FOR ALL BUILDING WORKS,

CEMENT CONCRETE

Sum total quantity of determining the quantity of materials for 10 cu m concrete is to divide 15.2 bythe sum of the numerals of the proportion of the materials which gives the quantity of cement in cu m.

Illustration. -To find the materials for 10 cu m of cement of 1:4:8 proportion.
Cement =15.2/1+4+8 =15.2/13 = 1.17 cu m = Say 1.15 cu m.

Therefore, sand = 1.15 x 4 = 4.60 cu m and ballast = 1.15 x 8 = 9.20 cu m.

Materials required for different Proportion of Cement Concrete - 10 cu m.

Quantity of materials may be calculated by 15.2 as sum total and dividing by sum of the proportions.

Proportion	Ballast	Sand	Cement
1:.1 ½ :3	8.40 cu m	4.20 cu m	2.80 cu m (84 bags)
1:2:4	8.80 cu m	4.40 cum	2.20 cu m (66 bags)
1:3:6	9.00 cu m	4.50 cu m	1.50 cu m (45 bags)
1:4:8	9.20 cu m	4.60 cu m	1.15cu m (341/2 bags)
1:5:10	9.50 cu m	4.75 cum	0.95 cu m (282 bags)
1:6:12	9.60 cum	4.80 cu m	0.80 cu m (24 bags)

1.Cement concrete 1:5:10 in foundation or Floor with Brick Ballast 40 mm (11/2")
Thick gauge- unit 1 cu m. Take - 10 cu m.

Materials-

Brick ballast 1st class 40 mm gauge...	650.00 per cum
Sand (local)	700.00 per cu m
Cement	7650.00 per cu m

Labour-

Mistri (Head mason)	1.5 no.	350.00 per day
Mason	1.5 no.	300.00 per day
Mazdoor (Beldar)	12 nos.	220.00 per day
Boy or woman coolie	18 nos.	200.00 per day
Bhishti (including curing)	4 nos.	200.00 per day
Sundries T. and P. etc.	Lump sum	120.00 L.S.

Solution:

Particulars	Qntty or Nos	Rate		Cost
		Rs.	P.	Rs P.
Materials-				
Brick ballast 1st class 40 mm gauge...	9.50 cum	650.00 per cum		6175.00
Sand (local)	4.75 cu m	700.00 per cu m		3325.00
Cement (28 1/2 bags)	0:95 cu m	7650.00 per cu m		7267.50
		Total		16767.50
Labour-				
Mistri (Head mason)	1.5 no.	350.00 per day		175.00
Mason	1.5 no.	300.00 per day		450.00
Mazdoor (Beldar)	12 nos.	220.00 per day		2640.00
Boy or woman coolie	18 nos.	200.00 per day		3600.00
Bhishti (including curing)	4 nos.	200.00 per day		800.00
Sundries T. and P. etc.	Lump sum	120.00 L.S.		120.00
		Total		7785.00
Total of materials and labour				24552.50
Add 1.5% Water charges				368.00
Add 10% Contractor's profit ...				2455.25
Grand Total				27375.75
Rate per cu m - Rs.27375.75 / 10 = Rs.2737.50 for 10 cu m				

2.Cement concrete 1:2:4- Unit 1 cum Take - 10 cu m.

Materials-

Brick ballast 1st class 40 mm gauge...	1800.00 per cum
Sand (local)	1500.00 per cu m
Cement	7650.00 per cu m

Labour-

Mistri (Head mason)	1/3 no.	350.00 per day
Mason	2 no.	300.00 per day
Mazdoor (Beldar)	12 nos.	220.00 per day
Boy or woman coolie	20 nos.	200.00 per day
Bhishti (including curing)	6 nos.	200.00 per day
Forms etc.	Lump sum	1300.00 L.S.
Sundries T. and P. etc.	Lump sum	150.00 L.S.

Particulars	Qntty or Nos	Rate		Cost
		Rs.	P.	Rs P.
Materials-				
Brick ballast 1st class 40 mm gauge...	8.80 cum	1800.00 per cum		15840.00
Sand (coarse)	4.75 cu m	1500.00 per cu m		6600.00
Cement (66 bags)	0:95 cu m	7650.00 per cu m		16830.00
		Total		39270.00
Labour-				
Mistri (Head mason)	1/3 no.	350.00 per day		116.70
Mason	2 no.	300.00 per day		600.00
Mazdoor (Beldar)	12 nos.	220.00 per day		2640.00
Boy or woman coolie	20 nos.	200.00 per day		4000.00
Bhishti (including curing)	6 nos.	200.00 per day		1200.00
	Lump sum	1300.00 L.S.		1300.00

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Forms etc. Sundries T. and P. etc.	Lump sum	150.00 L.S.	150.00
		Total	10006.70
Total of materials and labour			49276.70
Add 1.5% Water charges			739.00
Add 10% Contractor's profit ...			4927.70
Grand Total			**54943.40**
Rate per cu m - Rs.54943.40 / 10 = Rs.5497.00for 10 cu m			

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2.3.2 RATE ANALYSIS FOR ROADS

1.Bituminous painting or surface Dressing First coat – unit 1sqm. Take –100 sqm.

Particulars	Qntty or Nos	Rate		Cost
		Rs.	P.	Rs P.
Materials :-				
Stone chips (grit) 20 mm (3/4") gauge @ 1.35cu m % sq m	1.35 cu m	1800.00 per cum		2430.00
Asphalt 80/100 @ 220 kg % sq m including 2 1/2% wastage (transported to	0.22 tonne	50000.0 per cum		11000.00

road side)			
Labour :-			
Mazdoor (Beldar) for brushing and cleaning roadsurface	4nos	220.00 per day	880.00
Mazdoor (Beldar) for heating and spraying asphalt	4nos	220.00 per day	880.00
Mazdoor (Beldar) for rolling and brushing chips	½ nos	220.00 per day	110.00
Hire of Tar Boiler @ 6.00 sq m per day (about 4 km per day for 3.70 m wide road)	1/6 nos	400.00 per day	66.67
Fuel, Firewood for heating ashpalt @ 4 quintalper tonne of asphalt (for coal take 2 q per toneof asphalt)	0.88 q	500.00 per q	440.00
Hire of Roller @ 600 sq m per day (including driver and fire man or cleaner and coal/diesel)	1/6 day	2000.00 per day	333.33

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Sundries, T. and P., brushes, etc.	Lump sum	125.00 L.S	125.00
		Total	9265.00
Add 10% contractors profit			926.50
Grand Total			**10191.50**
Rate per sq m- Rs.10191.50/100 = 102.00 for 100 sq m			

2. Bituminous painting or surface Dressing Second coat – unit 1sqm. Take –100 sqm.

Particulars	Qntty or Nos	Rate		Cost
		Rs.	P.	Rs P.
Materials :-				
Stone chips (grit) 12 mm (1/2") gauge @ 0.75cu m % sq m	0.75 cu m	1700.00 per cum		1275.00
Asphalt 80/100 @ 220 kg % sq m including 2½% wastage (transported to road side)	0.22 tonne	50000.0 per cum		11000.00
Labour :-				
Mazdoor (Beldar) for heating and cleaning roadsurface	2nos	220.00 per day		440.00
Mazdoor (Beldar) forbrushing and spraying asphalt	1 ½ nos	220.00 per day		330.00

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Mazdoor (Beldar) spreading stone chips	1 ½ nos	220.00 per day	330.00
Mazdoor (Beldar) for rolling and brushing chips	½ nos	220.00 per day	110.00
Hire of Tar Boiler @ 800 sq m per day (215 m length, about 1/5 km per day for 3.70 m wide road)	1/8nos	400.00 per day	50.00
Fuel, Firewood for heating ashpalt @ 4 quintalper tonne of asphalt (for coal take 2 q per toneof asphalt)	0.48 q	500.00 per q	240.00
Hire of Roller @ 800 sq m per day (including driver and fire man or cleaner and coal/diesel)	1/8 day	2000.00 per day	250.00
Sundries, T. and P., brushes, etc.	Lump sum	100.00 L.S	100.00
		Total	14125.00
Add 10% contractors profit			1412.50
		Grand Total	**15537.50**
Rate per sq m- Rs.15537.50/100 = 155.00 for 100 sq m			

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