

**Part—I**

**ESTIMATING AND COSTING**

# 1

## Procedure of Estimating

### 1.1. INTRODUCTION

For all Engineering Projects, small or big, heavy construction works or light construction works, it is necessary to know the probable cost, which can only be known by estimating. To keep the estimated cost within the limitations, specifications, designs and drawings are amended accordingly. In estimating, knowledge of mensuration, understanding of drawings and designs, correctness of specifications and schedule of rates are essential. Correct estimate is that, in which, during the actual execution of work, there are (i) no deviations in the estimated quantities of different items of work; (ii) no extra and additional items; (iii) no increase in the cost and (iv) no provision of lump-sum items. All this depends upon the knowledge of the estimator.

The calculations of different items of works (*i.e.* quantities) are carried out with the help of the drawings, specifications and designs.

### 1.2. METHOD OF ESTIMATING

For the preparation of detailed estimate, drawings, designs, specifications and schedule of rates, prevailing in that locality or city are needed. For calculation work, “details of measurement form, abstract of cost form, abstract of quantities form, material statement form and labour statement forms” etc., are needed. These are given below in Tables 1.1 to 1.5. Generally Delhi Schedule of Rates 1997 have been used.

**Table 1.1. Details of Measurement Form**

<i>S. No.</i>	<i>Description of Item</i>	<i>No.</i>	<i>Length (L)</i>	<i>Breadth (B)</i>	<i>Height or Depth (H)</i>	<i>Contents</i>	<i>Total</i>	<i>Remark</i>

**Table 1.2. Abstract of Cost Form**

<i>S. No.</i>	<i>Detail of Work</i>	<i>Quantity</i>	<i>Unit</i>	<i>Rate.</i> ₹ P.	<i>Amount</i> ₹ P.	<i>Remark</i>

**Table 1.3. Abstract of Quantity Form**

<i>S. No.</i>	<i>Detail of Work</i>	<i>Quantity</i>	<i>Remark</i>

**Table 1.4. Material Statement Form**

<i>S. No.</i>	<i>Particular of Work</i>	<i>Cement</i>	<i>M.S. Bar</i>	<i>Sand</i>	<i>Bricks</i>	<i>Grit</i>	<i>Wood</i>	<i>Lime</i>	<i>Paint</i>

**Table 1.5. Labour Statement Form**

<i>S. No.</i>	<i>Particular of Work</i>	<i>Mistry</i>	<i>Mason</i>	<i>Carpenter</i>	<i>Fitter</i>	<i>Black-smith</i>	<i>Bhisti</i>	<i>Beldar</i>

The above forms are used for calculating the details for different items of works, cost quantities, material and labour required.

The “abstract of quantity”, “material statement” and “labour statement” are needed for the planning and execution of work with the help of “network planning and scheduling” (C.P.M. or other methods). Detail about the resources, *i.e.* money, manpower, material and machinery required, are also known.

### 1.3. REDUCING CALCULATIONS

To save the time and labour, there are certain items, where detail calculations can be avoided with the help of the calculated items. The quantities of such items are reduced in the following ways :

1. Foundation concrete

$$= \frac{\text{Quantity of earthwork in excavation in foundation}}{\text{Depth of excavation}} \times \text{Thickness of concrete.}$$

2. Sand filling under floors

$$= \frac{\text{Quantity of earth filling in plinth}}{\text{Height of earth filling}} \times \text{Height of sand filling.}$$

Similarly the quantity of lime concrete under floors can be calculated.

3. Inside white washing. Quantity is equal to the inside plastering.
4. Outside colour washing. Quantity is equal to the outside plastering or pointing.

### 1.4. DEDUCTION FOR OPENINGS

Deductions on account of openings are given below.

#### Deduction for Openings in Masonry

1. *Rectangular openings* doors, window and, ventilators.

$$\begin{aligned} \text{Quantities to be deducted} &= h \text{ (m)} \times b \text{ (m)} \times \text{Thickness of the wall (m)} \\ &= \text{cum (See Fig. 1.1)} \end{aligned}$$

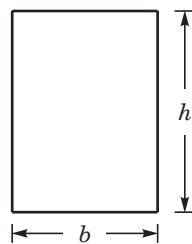


Fig. 1.1

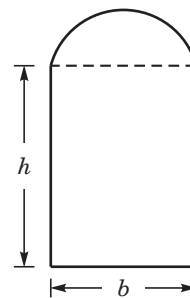


Fig. 1.2

2. *Doors and windows with small segmental arches.*

$$\begin{aligned} \text{Quantities to be deducted} &= h \text{ (m)} \times b \text{ (m)} \times \text{Thickness of wall (m)} \\ &= \text{cum} \end{aligned}$$

Segmental portion is considered as solid to cover the additional expenses in the arch masonry. (See Fig. 1.2)

3. *Segmental arch openings.*

$R$  is the rise.

$$\text{Area of semi-circular portion} = \frac{3}{4} \times b \times R$$

Quantities to be deducted

$$= h \times b \times \text{Thickness of the wall} + \frac{3}{4} \times b \times R \times \text{Thickness of wall}$$

$$= \{h \times b + (\frac{3}{4} \times b \times R)\} \times \text{Thickness of wall.} \quad (\text{See Fig. 1.3})$$

4. *Semicircular arch openings.*

Quantities to be deducted = {Area of rectangle + Area of semi-circle}  $\times$  Thickness of wall

$$= \left\{ (b \times h) + \pi \left( \frac{b}{2} \right)^2 \times \frac{1}{2} \right\} \times \text{Thickness of wall}$$

$$= \left\{ (b \times h) + \pi \left( \frac{b}{2} \right)^2 \times \frac{1}{2} \right\} \times \text{Thickness of wall} \quad (\text{See Fig. 1.4})$$

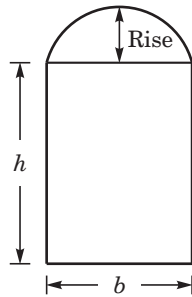


Fig. 1.3

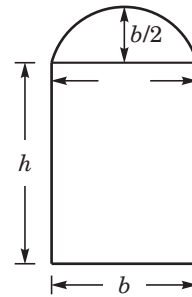


Fig. 1.4

5. *Elliptical openings.*

Major axis  $AC = D$

Minor axis  $BD = d$ ; then area  $A = 1/4\pi Dd = 0.7854 Dd$ .

Deduction  $= \frac{AC}{2} \times \frac{BD}{2} \times \pi \times \text{Thickness of wall} = \text{cum} \quad (\text{See Fig. 1.5})$

## 1.5. MASONRY WORKS IN ARCHES

(a) Masonry work in the arch

= Mean length ( $l_m$ )  $\times$  Thickness of arch ( $t$ )  $\times$  Thickness of the wall

=  $l_m \times t \times \text{Thickness of the wall}$

= cum (See Fig. 1.6)

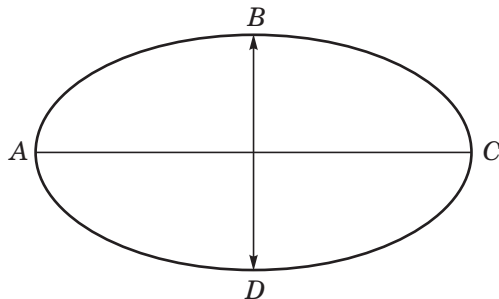


Fig. 1.5

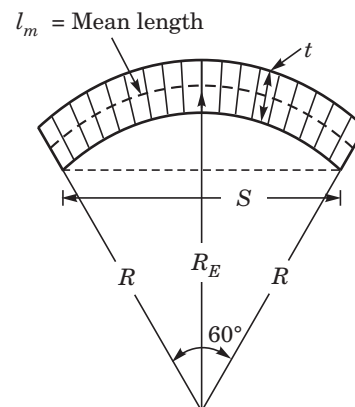


Fig. 1.6

(b) *Arch over doors and windows* is generally segmental with an angle of  $60^\circ$  at the centre. The  $60^\circ$  arch forms an equilateral triangle, with two radii and span as its sides.

$l_m$  = Mean length of the arch

$R_m$  = Mean radius

$S$  = Span

$R$  = Radius

$R = S$

and

$$R_M = R + \frac{t}{2}$$

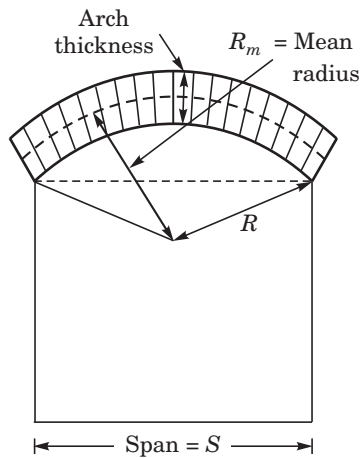


Fig. 1.7

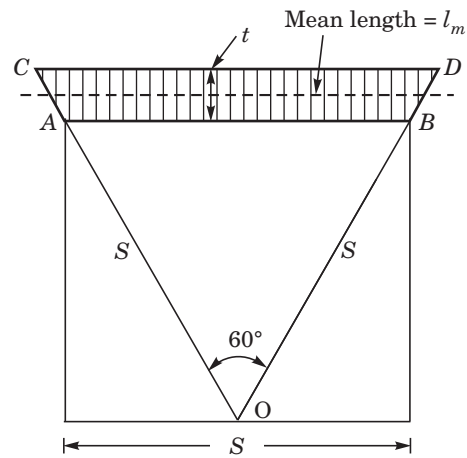


Fig. 1.8

$$\frac{l_m}{\text{Circumference (mean)}} = \frac{60^\circ}{360^\circ} = \frac{1}{6}$$

$$l_m = \frac{1}{6} \times 2\pi R_m = \frac{1}{6} \times \pi \times \text{dia (mean arch)}$$

Quantity of masonry

$$= l_m \times \text{Breadth of wall} \times \text{Thickness of arch}$$

$$= l_m \times \text{Breadth of wall} \times t.$$

Doors, windows and ventilators have lintels. The length of the lintel is equal to the span of the window, ventilator or door plus bearing on each end, which is generally 15 cm. The thickness of a lintel is generally from 10 to 15 cm.

The quantity of lintel = Length  $\times$  Thickness of the lintel  $\times$  Thickness of the wall  
= cum (See Fig. 1.7)

(c) *Flat Arches*

Flat arch subtends an angle of  $60^\circ$  at the centre

$$OA = AB = OB = S$$

$OAB$  and  $OCD$  are two equilateral triangles

$$l_m \text{ (mean length)} = S + \frac{t}{2}$$

$$\text{Quantity} = l_m \times b \times t = \left( S + \frac{t}{2} \right) \times b \times t.$$

### 1.6. UNIT OF MEASUREMENT AND UNIT OF PAYMENT OF DIFFERENT ITEMS OF WORKS

The units of different items of works depend upon the nomenclature of item; cost of materials used, their nature, size and shape after the completion of item itself. In general the units are based on the following principles :

(i) For items, where it is possible to measure, length, breadth and height or depth, easily, volume is calculated, the unit shall be in cubic contents.

(ii) For items, when it is only possible to measure, length and breadth only, area is calculated, the unit shall be of square contents.

(iii) For items, when it is only possible to measure, length and it is not possible to measure breadth and depth or height, only length is calculated. The unit shall be of running contents.

(iv) For items, when it is not convenient to measure the length, breadth and thickness, because of their nature, shape and size, the unit shall be of number or each contents.

If the cost is high, for the payment, the unit shall be small, and if the cost is low, the unit shall be large.

**Table 1.6. Units of Measurements and Payments for Various Works**

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
	<b>(A) Earthwork</b>		
1.	Earthwork in excavation over areas, including levelling and dressing in ordinary or hard soil or rocks.	cum	per cum
2.	Surface dressing of the ground in ordinary or hard soil or rocks.	sq m	per 100 sq m
3.	Earthwork in excavation in foundation trenches in ordinary or hard soil or rocks.	cum	per cum
4.	Ploughing the existing ground and watering the same.	sq m	per 100 sq m
5.	Banking excavated earth in layers in ordinary or hard soil.	cum	per cum
6.	Earthwork in filling with available earth in trenches, plinth etc.	cum	per cum
7.	Excavating trenches of required width and depths for pipes etc.	metre	per metre
8.	Pumping out water caused by springs, tidal or river seepage, broken water, mains or drains and the like.	litre	per kilo litre
9.	Timbering in trenches including strutting and shoring complete.	sq m	per sq m
10.	Excavating holes in rocks for blasting.	No.	per No.
11.	Blasting of rock, or quarrying of stones etc.	cum	per cum
12.	Clearing jungle including uprooting of rank vegetation, grass, bushwood and removal of rubbish.	sq m	per 100 sq m

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
13.	Felling trees of girth including cutting of trunks and branches etc. (Girth specified)	No.	per No.
14.	Filling in plinth with stand under floors.	cum	per cum
	<b>(B) Concrete work</b>		
1.	Providing and laying in foundation and plinth lime concrete.	cum	per cum
2.	Providing and laying cement concrete in foundations and plinth, R.C.C. work, etc.	cum	per cum
3.	Centring and shuttering including strutting, propping etc. and removed of form work for R.C.C. work.	sq m	per cum
4.	Precast cement concrete work or R.C.C. work.	cum	per cum
5.	Reinforced cement concrete work in foundations, walls, slabs, etc.	cum	per cum
6.	Laying concrete in or under water and/or liquid mud.	cum/m depth	per m depth
7.	Providing and laying Damp Proof course with cement concrete of specified thickness	sq m	per sq m
8.	Providing and mixing water proofing material in cement concrete work.	kg	per kg
9.	Applying a coat of bitumen on damp proof course.	sq m	per sq m
10.	Providing and laying in foundations mud concrete.	cum	per cum
	<b>(C) Reinforced Cement Concrete</b>		
1.	Reinforced cement concrete work 1 : 2 : 4 mix in foundations, footings, column bases, mass concrete, lintels, beams, slabs, columns, stair-cases, etc.	cum	per cum
2.	Centring and shuttering including shuttering, propping etc. and removal of formwork for all types of R.C.C. work.	sq m	per sq m
3.	Providing and fixing expanded metal mesh of sizes in R.C.C. work.	sq m	per sq m
4.	Mild steel reinforced for R.C.C. work including bending, binding and placing in position.	kg	per kg
5.	Hard drawn steel wire fabric for R.C.C. work.	kg	per kg
6.	Rendering smooth the top of suspended floors of R.C.C. work.	sq m	per sq m
7.	Applying cement slurry on R.C.C. work slabs, etc.	sq m	per sq m

(Contd.)



<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
8.	Precast cement concrete jali of specified thickness	sq m	per sq m
9.	Filling in position bitumen mix filler for expansion joints.	metre	per cm depth, per cm width per 100 m
10.	Fixing in position copper plate as per design for expansion joints.	kg	per kg
11.	Fixing 6 mm thick asbestos sheet covering over expansion joints of specified width.	metre	per metre
12.	Extra for laying R.C.C. in or under water.	cum/m depth	per cum per m depth
	<b>(D) Brickwork</b>		
1.	Brickwork in foundations and plinth in lime mortar.	cum	per cum
2.	Brickwork in foundations and plinth in cement mortar.	cum	per cum
3.	Brickwork in foundations and plinth in mud mortar.	cum	per cum
4.	Brickwork in superstructure.	cum	per cum
5.	Brickwork in square, or rectangular pillars, or circular pillars, or curved on plan, or making tapered surface.	cum	per cum
6.	Brickwork in arches in cement mortar.	cum	per cum
7.	Centring for arches.	sq m	per sq m
8.	Half brick masonry work, in cement mortar.	sq m	per sq m
9.	Brick tile masonry work in cement mortar.	cum	per cum
10.	Brick tile masonry work 5 cum thick in cement mortar, in partitions.	sq m	per sq m
11.	Constructing brick masonry chullah with holes, in cement mortar.	No.	per No.
12.	Asbestos cement flue.	metre	per metre
13.	Honeycomb brickwork 10 cm thick, in cement mortar.	sq m	per sq m
14.	Joining old brick with new brickwork.	sq m	per sq m
15.	10 cm thick brick drip course at junctions of roof and wall.	metre	per metre
16.	10 cm thick and 5 cm projected brick string course in cement mortar.	metre	per metre
17.	Moulding and cornices in brickwork with cement plaster.	m per cm girth	per m per cm girth
18.	Foam concrete block partitions 100 mm thick.	sq m	per sq m

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
19.	Forming cavity 5 to 7.5 cm wide in cavity walls.	sq m	per sq m
20.	Brick band 10 cm thick and 5 cm projected from wall face.	metre	per metre
<b>(E) Stonework</b>			
1.	Random rubble masonry with hard stone in foundations, plinths and superstructure, in lime or cement mortar.	cum	per cum
2.	Stonework in plain Ashlar cyclopean in superstructure.	cu dm	per 100 cu dm
3.	Stonework, plain, in copings, cornices, string courses and plinth courses, etc.	cu dm	per 10 cu dm
4.	40 mm thick stonework for wall lining.	sq m	per sq m
5.	Fixing gun metal cramps or dowels of required shape.	No.	per No.
6.	30 mm thick stone shelves.	sq m	per sq m
<b>(F) Marble Work</b>			
1.	Marble work in steps, jambs, walls, pillars and other plain works.	cu dm	10 cu dm
2.	Marble work for wall lining.	sq m	per sq m
3.	Fixing metal cramps, dowels and copper pins	No.	per No.
4.	Providing and fixing 40 mm thick marble Jali.	sq m	per sq m
<b>(G) Woodwork</b>			
1.	Woodwork in frames of doors, windows and other frames.	cu dm	10 cu dm
2.	50 mm thick, doors, windows and other shutters.	sq m	per sq m
3.	Plain jaffri work.	sq m	per sq m
4.	50 × 50 × 50 mm wood plugs.	No.	per No.
5.	40 mm thick lining work.	sq m	per sq m
6.	50 × 20 mm moulded beading.	metre	per metre
7.	15 mm thick and 100 mm wide pelmet.	metre	per metre
8.	Curtain rails.	metre	per metre
9.	40 mm thick wooden partitions.	sq m	per sq m
10.	M.S. grills of required pattern.	kg	per kg
11.	M.S. wire gauge, or steel wire fabric, or expanded metal.	sq m	per sq m
12.	40 cm long, 40 mm × 5 mm flat iron hold fasts.	No.	per No.
13.	Wooden joists.	cu dm	10 cu dm

(Contd.)

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
14.	Sal ballies 100 mm diameter.	metre	per metre
15.	All types of fittings—brass or iron.	No.	per No.
	<b>(H) Steel work</b>		
1.	Steel work in single sections such as joists, tee, angles, flat and channels etc.	kg	per quintal
2.	Steel work in built-up sections, trusses and framed work.	kg	per quintal
3.	Collapsible steel shutters, sliding shutters, M.S. sheet garage shutters, of specified sizes.	sq m	per sq m
4.	Wire springs, bearings etc.	No.	per No.
5.	Steel or aluminium doors, windows and ventilators etc.	sq m	per sq m
6.	Clamps rings, and fan clamps.	No.	per No.
7.	M.S. round holding down bolts, and M.S. rivets etc.	kg	per quintal
8.	Welding by gas or electric plant.	cm	per cm length
	<b>(I) Flooring</b>		
1.	Brick flooring in cement mortar or dry brick flooring.	sq m	per sq m
2.	40 mm thick cement concrete flooring.	sq m	per sq m
3.	Cement concrete pavement.	cum	per cum
4.	30 cm high cement plaster skirting.	sq m	per sq m
5.	40 mm thick marble chips flooring.	sq m	per sq m
6.	30 cm high marble chips skirting.	sq m	per sq m
7.	Glass, aluminium or copper strips of specified sizes.	metre	per metre
8.	Special surface finishings.	sq m	per sq m
9.	20 mm thick precast tiles	sq m	per sq m
10.	Marble stone flooring 20 mm thick.	sq m	per sq m
11.	15 mm thick skirting, dado, walls, and other finishings.	sq m	per sq m
12.	40 mm thick Kota stone flooring, or sand stone flooring.	sq m	per sq m
13.	40 mm thick wooden flooring.	sq m	per sq m
14.	40 mm wide aluminium strip.	metre	per metre
	<b>(J) Roofing</b>		
1.	G.I. sheet roofing.	sq m	per sq m
2.	G.I. ridges, and hips, etc.	metre	per metre

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
3.	Wind ties of 40 × 6 mm flat iron section.	metre	per metre
4.	A.C. sheet roofing.	sq m	per sq m
5.	A.C. ridges, hips etc.	metre	per metre
6.	Gutters, nozzles, J-hooks etc.	No.	per No.
7.	40 mm thick stone slab roofing.	sq m	per sq m
8.	10 cm thick mud phuska.	sq m	per sq m
9.	Filling cinder.	cum	per cum
10.	100 mm thick lime concrete terracing.	sq m	per sq m
11.	Gola in lime concrete.	metre	per metre
12.	Water purnalas.	metre	per metre
13.	Painting top of roof with bitumen.	sq m	per sq m
14.	Khurras 45 × 45 cm and 5 cm thick.	No.	per No.
15.	20 mm thick ceiling.	sq m	per sq m
16.	C.I. rain water pipe 100 mm diameter.	metre	per metre
17.	M.S. holder bat clamps.	No.	per No.
18.	C.I. bend, shoes, branches, offset etc.	No.	per No.
<b>(K) Finishing</b>			
1.	12 mm thick lime plaster, or cement plaster.	sq m	per sq m
2.	Flushbands or moulded bands, 12 mm thick.	cm/m	per cm per m
3.	Pointing on brickwork.	sq m	per sq m
4.	White washing or colour washing or dis-tempering or painting or varnishing or polishing etc.	sq m	per sq m
5.	Painting or rain water pipes etc.	metre	per metre
6.	Lettering.	letters/cm	per letter/cm
<b>(L) Repair to building</b>			
1.	Repair to plaster in patches.	sq m	per sq m
2.	Fixing doors, windows, or any other frames in openings.	No.	per No.
3.	Providing and fixing glass panes.	sq m	per sq m
4.	Regarding mud phuska.	sq m	per sq m
5.	Replacing sand stone slabs.	sq m	per sq m
<b>(M) Dismantling and Demolishing</b>			
1.	Demolishing lime concrete or cement concrete.	cum	per cum
2.	Demolishing brickwork.	cum	per cum
3.	Demolishing stone masonry work.	cum	per cum

(Contd.)

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
4.	Cutting reinforcement bars in R.C.C. or R.B. work.	kg	per quintal
5.	Dismantling wood work.	cum	per cum
6.	Dismantling steel work.	kg	per quintal
7.	Dismantling flooring.	sq m	per sq m
8.	Demolishing mud phuska.	cum	per cum
9.	Dismantling A.C. sheet or G.I. sheet roofing.	sq m	per sq m
10.	Dismantling arch roofing.	sq m	per sq m
11.	Dismantling tiled roofing.	sq m	per sq m
12.	Dismantling rain water pipes.	metre	per metre
	<b>(N) Miscellaneous Works</b>		
1.	Constructing wooden cupboards of specified wood as per drawings.	No.	per No.
2.	Rough cast plaster 12 mm thick.	sq m	per sq m
3.	Pebble dash plaster.	sq m	per sq m
4.	Making plinth protection 50 mm thick	sq m	per sq m
5.	Brick edging 10 cm wide 10 cm deep.	metre	per metre
6.	Finishing edges of floors.	metre	per metre
7.	Upholstering soda chains.	No.	per No.
	<b>Road Work</b>		
	<b>Road</b>		
1.	Preparation of subgrade.	sq m	per 100 sq m
2.	Consolidation of subgrade.	sq m	per 100 sq m
3.	Supplying stone for soling.	cum	per cum
4.	Supplying of bricks.	No.	per 100 No.
5.	Laying stone soling.	cum	per cum
6.	Supplying moorum or aggregate or bajri etc.	cum	per cum
7.	Laying wearing course including consolidation.	cum	per cum
8.	Supplying and laying kerb stone.	metre	per metre
9.	Brick edging.	metre	per metre
10.	Scarifying metalled road surface.	sq m	per 100 sq m
	<b>Fencing</b>		
1.	R.C.C. Standard Post.	No.	per No.
2.	1.2 m high fencing as per design with G.I. barbed wire.	metre	per metre

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
	<b>Road Signs and Stones</b>		
1.	R.C.C. standard sign boards as per design	No.	per No.
	<b>Surfacing</b>		
1.	Painting with paving bitumen of road surfaces.	sq m	per sq m
2.	Premix carpet surfacing.	sq m	per sq m
3.	Seal coat.	sq m	per sq m
4.	Joint fitler in expansion joints.	metre	per cm depth per cm width per metre
	<b>Horticultural Work</b>		
1.	Trenching in soil.	cum	per cum
2.	Supplying of good earth.	cum	per cum
3.	Supplying of sludge.	cum	per cum
4.	Rough dressing of ground.	sq m	per 100 sq m
5.	Grassing with "Doob" grass in lawns.	sq m	per 100 sq m
6.	Digging holes in soil 1.2 m dia and 1.2 m deep.	No.	per No.
7.	Tree guards as per drawing and design.	No.	per No.
	<b>Sanitary Installations, Water Supply and Drainage</b>		
	<b>(A) Sanitary Installations</b>		
1.	Providing and fixing Indian type W.C. pan with trap and flushing cistern etc. complete.	No.	per No.
2.	Providing and fixing white flat back or wall-corner type lipped front urinal basin with flushing cistern etc. complete.	No.	per No.
3.	Providing, and fixing white wash basin complete.	No.	per No.
4.	Providing and fixing kitchen sink.	No.	per No.
5.	Providing and fixing draining boards.	No.	per No.
6.	Providing and fixing bath tubs.	No.	per No.
7.	Providing and fixing bevelled edge mirror of superior glass.	No.	per No.
8.	Glass shelf, or towel rails, or toilet paper holder, or liquid soap container, or soap dish etc.	No.	per No.
9.	Providing and fixing C.I. soil, waste and vent pipe 100 mm dia.	metre	per metre
10.	Providing and fixing M.S. holder bat clamp; C.I. bend or heel rest bend, or junctions, or branch, or door piece or terminal guard, or collar, or passover pipe, or lead caulked joints, or trapes etc.	No.	per No.
11.	Painting C.I. cistern.	No.	per No.

(Contd.)

<i>S. No.</i>	<i>Description</i>	<i>Units of Measurement</i>	<i>Units of Payment</i>
12.	Painting C.I. soil waste, vent pipe and fittings.	metre	per metre
13.	Providing and fixing G.I. pipes complete with G.I. fittings.	metre	per metre
14.	Making connection of G.I. distribution branch with G.I. main.	No.	per No.
15.	Providing and fixing brass bib cock, or stop cock, or valves; or mouth cover; or unions, or shower rose etc.	No.	per No.
16.	M.S. sheet or R.C.C. storage tank.	No.	per No.
17.	C.I. pipes and specials for water supply.	kg	per quintal
18.	C.I. pipes of specified dia.	metre	per metre
19.	C.I. standard types of fittings.	No.	per No.
20.	C.I. sluice valves and hydrants.	No.	per No.
21.	R.C.C. pipes of specified dia.	metre	per metre
22.	R.C.C. fittings standard types.	No.	per No.
23.	Stoneware pipes of specified dia.	metre	per metre
24.	S.W. gully trap etc.	No.	per No.
25.	Manhole, or M.S. foot rests, or C.I. cover, or vent shafts etc.	No.	per No.
26.	Boring with 100 mm dia for tube well	metre	per metre
27.	Disinfecting C.I. water mains.	metre	per metre
28.	Cutting C.I. pipe with steel saw.	No.	per each cut

**Table 1.7. Approximate Breakup of Construction Cost—Stage Wise Percentage to Total Cost**

<i>S. No.</i>	<i>Stage</i>	<i>Load bearing structure %</i>	<i>Framed structure G + 1 structure %</i>	<i>Framed structure G + 1 structure %</i>
1.	Excavation and foundation up to plinth level	15	15	12.5
2.	Super structure up to roof level	23	7.5	7
3.	R.C. roof slab i/c form work i/c beam, column in framed structure	15	35	36
4.	Roof finishes	4.5	4	3.5
5.	Doors, windows, steel grills, ventilators and similar openings	12	9	8.5
6.	Plastering and pointing	6.0	6.0	6.5
7.	Colouring and painting	2.5	2	2.5
8.	Flooring	5.0	5.5	4.0
9.	Water supply and sanitary electrical etc.	15	14	15
10.	Miscellaneous	2.0	2.0	2.0
	Total	100	100	100