Toppersnotes
Unleash the topper in you

BPSC - AE

ASSISTANT ENGINEER

Civil Engineering

Bihar Public Service Commission

Volume - 2

Estimate & Costing

SIERRA INNOVATIONS

Table of Content

1 CHAPTER

Rules of Measurement

THEORY

1.1 | DEFINATION OF ESTIMATE AND COSTING

For all engineering works it is required to know before hand the probable cost of construction known as the estimated cost. If the estimated cost is more than the money available and than attempts are made to reduce the cost by reducing the work or by changing it's specifications and design.

The subject of estimating is simple; nothing much to understand knowledge of drawing is essential. One who understands and can read drawing may find out the dimensions, lengths, widths, heights. Find out the dimensions, lengths, widths, heights etc. from the drawing without difficulty and may calculate the quantities. The calculations mainly consists of length × width × height.

Accuracy in estimate is very important, if estimate is exceeded it becomes a very difficult for and arrange for the additional money. In accuracy in preparing estimate, omission of items, and changes in designs, improper rates, etc. are the reasons for exceeding the estimate through increase in the rates is one of the main reason. In framing a correct estimate, care, should be taken to find out the dimensions of all the items correctly, and to avoid emissions of any kind of works or part thereof. The rate of each item should also be reasonable and workable. The rates in the estimate provide for the complete work, which consist of the cost of materials, cost of transport, cost of labour, cost of scaffolding, cost of tools and plants, cost of water, taxes, establishment and supervision cost, reasonable profit of contractor etc.

An uniformity in units for all item of works should be maintained throughout the country based on the Indian standard Institution, in preparing estimate the principle to be followed is to make each item or dimension clear and intelligible. So that they can be understood, checked or verified by anybody. A remark column may be introduced and notes may be given where necessary.

Estimating is the technique of calculating or computing the various quantities and the expected expenditure to be incurred on a particular work or project.

(a) Drawing like plan, elevation and section of important point.

(b) Detail specification about work ships properties of material.

(c) Standard Schedule of rates of the current year.

1.2 | NEED FOR ESTIMATION AND COSTING

Estimate prepare for following purpose.

(a) Estimation give an idea of cost of the work and hence it's feasibility can be determined.

(b) Estimate gives an idea of time required for the completion of the work.

(c) Estimate is required to invite the tender's and quotations and to arrange contact.

(d) Estimate is also required to control the expenditure during the execution of work.

(e) Estimate decides whether the proposed plan matches the funds available or not.

1.3 | PROCEDURE OF ESTIMATING OR METHOD OF ESTIMATING

(a) Preparing detailed estimate

(b) Calculation in rate of each unit of work

(c) Preparing abstract of estimate

1.4 | DATA REQUIRED TO PREPARE AN ESTIMATE

1.4.1 | Drawing

If the drawing are not clear and without complete dimensions and specification the preparation of estimation become very difficult, so, it is very essential before preparing estimate.

1.4.2 | Specifications

(a) General Specification : This give the nature, quality, class and work and materials in general terms to be used in various part's of work. It help number form a general idea of building.

(b) Detail Specification : These give's the detailed description of the various items of work laying down the quantities and qualities of materials their proportions the method of preparation workship and execution of work.

1.4.3 | Rates

For preparing the estimate the unit rates of each item of work are required.

(a) For arriving the unit rates each item.

(b) The rates of various material to be used in the construction.

(c) Transport costing of material.

(d) The wages labour, skilled or unskilled of mason, carpenters, mazdor.

1.5 | DEGREE OF ACCURACY IN ESTIMATING

The accuracy to be observed in preparing an estimate depends on the rate of the item and the unit of payment. The higher the rates the greater should be the accuracy with which the quantities are calculated. Where rates are high and paid per unit, dimension should be absolutely correct, through taking dimensions to the nearest 1 cm to 0.5 cm may be allowed for practical purposes. The quantities in such cases should be worked out to atleast two places of decimal but where rates are low.

1.6 | ESTIMATE

Before undertaking the construction of a project it is necessary to know its probable cost which is worked out by estimating. An estimate is a computation or calculation of the quantities required and expenditure likely to be incurred in the construction of a work. The primary object of the estimate is to enable one to know beforehand, the cost of the work (building, structures, etc.). The estimate is the probable cost of a work and is determined theoretically by mathematical calculations based on the plans and drawing and current rates. Approximate estimate may be prepared by various methods but accurate estimate is prepared by detailed estimate method.

1.7 | ACTUAL COST

The actual cost of a work is determine at the completion of the work. Account of all expenditure is maintained day-to-day during the execution of work in the account section and at the end of the completion of the work when the account is completed, the actual cost is known. The actual cost should not different much from the estimated cost worked out at the beginning.

1.8 | DETAILED ESTIMATE

Preparation of detailed estimate consists of working out the quantities of different item of work and then working out of the cost i.e. the estimate is prepared in two stages:

1.8.1 | Details of Measurements and Calculation of Quantities

The whole work is divided into different items of work as earthwork, concrete, brickwork, etc. and the items are classified and grouped under different sub-heads, and details of measurement of each item of work are taken out and quantities under each item are computed in prescribed from details of measurement form.

Details of Measurement Form

Item No.	Description or Particulars	No.	Length	Width	Height or Depth	Quantity

1.8.2 | Abstract of Estimated Cost

The cost under item of work is calculated from the quantities already computed at workable rate, and the total cost is worked out in a prescribed form, abstract of estimate form. A percentage of 3 to 5 percent is added for contingencies, to allow for petty contingent expenditures, unforeseen expenditures, changes in design, changes in rates etc. which may occur during the execution of the work. A percentage of 1.5 to 2 percent is also added to meet the expenditure of work charged establishment.

The grand total thus obtained is the estimated cost of the work.

Abstract of Estimate Form

Item No.	Description or Particulars	Quantity	Unit	Rate	Amount

In the above forms the description of each item should be such as to express exactly what work, material proportional of mortar etc. have been provided for.

In preparing an estimate items are usually classified and grouped sub-head wise but for beginners it is convenient to make up the items in the same order as far as possible, as they would be executed or constructed. If the principle of following the order of construction from foundation to upward direction is followed there is little chance of omission of items.

1.9 | UNIT'S OF MEASUREMENTS

The unit's of measurement are mainly categorised for their nature, shape and size and for making payments to the contractor and also. The principle of unit's of measurement normally consist's the following.

(a) Single unit work like door windows, trusses etc. are expressed in numbers.

(b) Work's consist's linear measurement's involve length like cornice, fencing hand rail, band's of specified width etc, are expressed in running meter's.

(c) Work consist's cubical content's which involve volume like earth work, cement concrete, masonry etc. are expressed in cubic meter's.

The units of dimensions for materials and works according to IS 1200 are as follows :-

	Particulars of Materials and Works	Dimensions
1.	Bricks, stone blocks, etc.	All dimensions in cm
2.	Files, slates, wall beard, glass panes, AC sheets, sheets, etc.	Length and width in cm or metre. Thickness in mm.
3.	Door, windows etc.	Height and width in cm or metre
4.	Parts of doors and windows as panels, shutters.	cm or mm.
5.	Timber	Length in metre and cross-sectional dimensions are in cm or mm.
6.	Masonry (Brickwork, Stone masonry etc.)	Length and Height in metre Thickness or width in cm.
7.	Cement concrete, lime concrete RCC flooring etc.	Length and width in metre Thickness in cm.
8.	White washing, colour washing, distempering, painting etc.	Length, width or height in metre
9.	Aggregates, ballast, grit, sand etc.	Size in mm.
10.	Rolled steel section as I-beam, channel, angle etc.	Length in meter, section in mm.
Earth work		
11.	Earth work in excavation in ordinary soil, earthwork in mixed soil with Kankar, bajri, etc. earth in hard soil.	cubic metre
12.	Rock excavation	cubic metre
13.	Earth filling in excavation in foundation.	cubic metre
14.	Earth filling in foundation trenches (Usually not measured and not paid separately).	cubic metre
15.	Earth filling in foundation trenches (usually not measured and not paid separately).	cubic metre
16.	Earth work in banking, cutting in road and irrigation channel.	cubic metre
17.	Surface dressing and levelling, cleaning etc.	square metre
18.	Cutting of trees (Girth specified).	numbers
19.	Pudding, puddle clay core	cubic metre
20.	Sand filling	cubic metre
21.	Quarrying of stone	cubic metre
22.	Blasting of rock (Blasted stone stacked and then measured)	cubic metre

	Particulars of Materials and Works	Dimensions
Concrete		
23.	Lime concrete (L.C.) in foundation	cubic metre
24.	Lime concrete (L.C.) in roof terracting thickness specified.	square metre
25.	Cement concrete (C.C.)	cubic metre
26.	Reinforced cement concrete (R.C.C.)	cubic metre
27.	C.C. or R.C.C. Chujja, Sun shade	cubic metre
28.	Jali work or jaffri work or C.C. tracery panels (thickness specified)	square metre
29.	Cement concrete bed (foundation of floor)	cubic metre
D.P.C.		
30.	**Dam Proof Course :** Cement Concrete, Rich Cement Mortar, Asphalt, etc. (Thickness Specified).	square metre
Brick Work		
31.	Brickwork in foundation and plinth, in super-structure, in arches etc. in cement, lime or mud mortar.	cubic metre
32.	Sun dried brick work.	cubic metre
33.	Honey comb brick work, thickness specified	square metre
34.	Brick work in jack arches, if measured separately.	cubic metre
35.	Jack arch roofing including POP finishing.	square metre
36.	Brickwork in well steining.	cubic metre
37.	Half-brickwork with or without reinforcement.	square metre
38.	Thin partition wall (maximum thickness 10 cm)	square metre
39.	Reinforced brick work (R.B. work)	cubic metre
40.	String course, drip course, weather course, coping etc. (projection specified)	running metre
41.	Cornice (Projection and type specified).	running metre
42.	Brickwork on fire place, chulla, chimney (in building)	running metre
43.	Pargetting chimney, fire place flue	running metre
44.	Brick edging (by road side)	running metre

	Particulars of Materials and Works	Dimensions
Stone Work		
45.	Stone masonry, Random Rubble masonry coursed rubble masonry, ashlar masonry in walls, in arches etc.	cubic metre
46.	Cut stone work in lintel, beam etc.	cubic metre
47.	Stone slab in roof, slab etc. stone chujjas, stone sun shed, etc. (thickness specified)	square metre
48.	Stone work in wall facing or lining (Thickness specified).	square metre
Wood Work		
49.	Wood work, door and window frame or chowkhat, refters beams, roof trusses etc.	cubic metre
50.	Door and window shutters or leaves panelled battened, glazed, part panelled and part glazed, wire gauged etc. (Thickness specified).	square metre
51.	Door and window fittings as hinges tower bolts, sliding bolts, handles, etc.	numbers
52.	Timbering boarding (Thickness specified)	square metre
53.	Timbering or trenches (Area of face supported)	square metre
54.	Sawing of timber	square metre
55.	Wood work in partition, Plywood etc.	square metre
56.	Ballies (Diameter specified)	running metre
Steel Work		
57.	Rolled steel joists, channels, Angles, Firons, Flats, squares, rounds etc.	quintal
58.	Steel reinforcement bars etc. in RCC, R.B. Work	quintal
59.	Bending, binding of steel reinforcement	quintal
60.	Fabrication and hoisting of steel work	quintal
61.	Expended Metal (X.P.M.), size specified	square metre
62.	Fabric reinforcement, wire netting	square metre
63.	Gusset Plate (Minimum rectangular size from which cut)	quintal
64.	Cutting of Iron joists, channels	cm
65.	Cutting, Angles, Tees, Plate	square cm
66.	Iron work in struss	quintal

	Particulars of Materials and Works	Dimensions
67.	Threading in iron	cm
68.	Welding, Solder of sheets, plates (welding of rails, steel, trusses, rods per numbers)	cm
69.	Boring holes in iron	numbers
70.	Cast iron (C.I.) pipe, dia. specified	running metre
71.	Rivets, Bolts and nuts, Anchor bolts, Lewis Bolts, Holding down bolts etc.	quintal
72.	Barbed wire fencing	running metre
73.	Iron gate (may also be by weight, quintal)	square metre
74.	Iron hold fast (may also be by number)	quintal or numbers
75.	Iron railing (Height and types specified)	running metre
76.	Iron grill, collapsible gate (may also be by weight, quintal)	square metre
77.	Rolling shutter	square metre
78.	Steel doors and windows (types and fixing specified roofing)	square metre
79.	Tiled roof - Allahabad tile, Faizabad tile, Magalore tile etc. including battens	square metre
80.	Country tile roof including bamboo jaffri	square metre
81.	Corrugated iron (G.I.) roof, Asbestos cement (A.C.) sheet roof	square metre
82.	Slate, roofing, timber roofing	square metre
83.	Roofing including bamboo jaffari (thickness specified)	square metre
84.	Eave board (Thickness specified)	square metre
85.	R.C.C., R.B., Slab roof (excluding steel)	cubic metre
86.	Lime concrete roof over and inclusive of tiles or brick, or stone slab etc. (Thickness specified)	square metre
87.	Mud roof over and inclusive of tiles or bricks or stone slab etc. (thickness and type specified)	square metre
88.	Ridges, Valleys, gutters (girth specified)	metre
89.	Tar felting, bituminous painting	square metre
90.	Insulating layer in roof of sand and clay asphalt etc.	square metre
91.	Expansion, contraction or construction joint	metre
92.	Ceiling	square metre
93.	Centering, shuttering and de-shuttering	square metre

	Particulars of Materials and Works	Dimensions
Plastering, Painting and Finishing		
94.	Plastering work	square metre
95.	Painting work	square metre
96.	Dado work (Thickness and type specified)	square metre
97.	Skirting (Thickness type and height specified)	metre
98.	Cement mortar or lime mortar rubbing	square metre
99.	White washing, colour washing, cement washing (numbers of coat specified)	square metre
100.	Distempering (Numbers of coat specified)	square metre
101.	Snow cement washing or finishing (numbers of coat specified).	square metre
102.	Painting, Varnishing	square metre
103.	Oiling and Clearing of doors and windows	square metre
104.	Coat tarring (Numbers of coat specified)	square metre
105.	Removing of paint or varnish	square metre
Flooring		
106.	2.5 cm cc over 7.5 cm L.C. floor (including L.C.)	square metre
107.	Conglomerate floor, artificial patent stone floor 2.5 cm c.c. cover 7.5 cm, L.C. [including L.C.]	square metre
108.	4 cm thick stone floor flag stone floor over 7.5 cm L.C. [including L.C.]	square metre
109.	2.5 cm marble flooring over 7.5 cm, L.C. [including L.C.]	square metre
110.	Mosaic or terrazo or graholithic floor over 7.5 cm L.C. [including L.C.]	square metre
111.	Brick flat floor over 7.5 cm L.C. [including L.C.]	square metre
112.	Brick on edge floor over 7.5 cm L.C. [including L.C.]	square metre
113.	2.5 cm or 4 cm cement concrete floor	square metre
114.	Mud flooring finished gobri lepping	square metre
115.	Apron or Plinth protection [may be of C.C., I.O., brick etc.]	square metre
116.	Door and Window Sill (C.C. or Cement mortar plastered)	square metre

Particulars of Materials and Works	Dimensions
Miscellaneous Item	
117. Ornamental cornice (projection type specified)	running metre
118. Moulding string course, drip course, breading throating etc.	running metre
119. Ornamental Pillar Caps, Pillar base, flowers Brackets, etc.	numbers
120. Railing [Height and type specified]	running metre
121. Surface drain small [size, material etc. specified]	running metre
122. Surface drain large (item wise)	
(i) Masonry	cubic metre
(ii) Plastering	square metre
123. Pipe-rainwater, sanitary, water pipe, etc. (Diameter specified)	running metre
124. Laying pipe line - sanitary, water pipe, etc. (Diameter, depth, bedding etc. specified)	running metre
125. Jungle clearance [May also be per km or road and irrigation channel]	square metre or hectare
126. Silt clearance in irrigation channels (similar to earth work)	cubic metre
127. Trestle crate	numbers
128. Cleaning flues	numbers
129. Cotton cords in sky light	numbers
130. Easing door and windows	numbers
131. Fixing doors and windows	numbers
132. Supply and fixing of hinges, tower bolts, hasp and staples, handles, hardwares etc.	numbers
133. Glazing	square metre
134. Glass panes (supply)	square metre
135. Fixing of glass panes or cleaning	numbers
136. Renewing of glass panes	numbers
137. Well sinking (Masonry or tube well)	numbers
138. Pile driving or sinking	running metre
139. Furnitures – Chairs, tables etc. (size shape specified)	numbers
140. Painting furniture	numbers

Particulars of Materials and Works	Dimensions
141. Caning Chairs	numbers
142. Pitching of brick, stone, Kankar etc.	cubic metre
143. Lining of irrigation channel, tunnel etc. Materials, thickness specified [thick lining may be in volume basis in cubic metre]	square metre
144. Kankar quarrying, kankar supply	cubic metre
145. Kankar consolidation, road metal consolidation	cubic metre
146. Dag-Belling	metre
147. Bituminous road surfacing	square metre
148. Dismantling	same as for different items
149. Dismantling of brick masonry	cubic metre
150. Grouting (Bituminous grouting of road metal, cement grouting of concrete]	square metre
151. Grouting of crack joints etc.	running metre
152. Electric wiring or Electrification light, fan, plug points	numbers or points
153. Watercloset (w.c.), wash hand basin, man-hole etc. (size specified)	numbers
Materials	
154. Supply of bricks	numbers
155. Supply of sand, surkhi, cinder etc.	cubic metre
156. Supply of cement	numbers of bag (50 kg)
157. Supply of lime unslaked	quintal
158. Supply of lime	quintal
159. Supply of brick ballast, stone ballast, Aggregate etc.	cubic metre
160. Broken bricks, kankar etc.	cubic metre
161. Supply of timber	cubic metre
162. Supply of Steel	quintal
163. Supply of bitumen, Tar	tonne
164. Supply of coal	tonne
165. Supply of AC sheets (measured flat)	square metre
166. Supply of G.I. Sheet	square metre
167. Supply of switches, plugs, ceiling roses, bulbs, brackets etc.	numbers
168. Supply of insulated electric wire (size specified)	quintal
169. Supply of electric wire [size specified]	running metre
170. Tents, sholdaries (size specified)	numbers

Particulars of Materials and Works	Dimensions
171. Supply of water closet, W.C. (Size specified)	numbers
172. Supply of wash hand basin (size specified)	numbers
173. Supply of cowl, Mica valve, Intercepting trap etc. (size specified)	numbers
174. Supply of Bib cock, stop cock, ball cock etc. (size specified)	numbers
175. Supply of Ferrule, C.I. Tank, Water meter etc. [Size specified]	numbers
176. Supply of Pipe, C.I. Pipe, S.W. pipe, Hume pipe, A.C. Pipe, G.I. pipe etc. [Dia. specified]	running metre
177. Supply of lead, lead wool	kg or quintal
178. Spun yarn	kg
179. Supply of varnish, oil etc.	litre
180. Supply of paint ready mix	litre
181. Supply of stiff paint	kg
182. Explosive for Blasting	kg

1.10 | MAIN ITEMS OF WORK

1.10.1 | Earthwork

Earthwork in excavation and earthwork in filling are usually taken out separately under different items and quantities are calculated in cubic metre. Foundation trenches are usually dug to the exact width of foundation with vertical sides. Earthwork in excavation in foundation is calculated by taking the dimensions of each trench length × width × depth. Filling in trenches after the construction of foundation masonry is ordinary neglected. If the trench filling is accounted, this may be calculated by deducting the masonry from the excavation.

Earth work in plinth filling is calculated by taking the internal dimensions in between plinth wall (length × width) which are usually less than the internal dimensions of the room by two off-sets of plinth wall i.e. 10 cm and height is taken after deduction the thickness of concrete in floor, usually 7.5 cm. If sand filling is done in plinth, this should be taken separately. The length and width for each filling may be same as the internal dimensions of the room if there is no off-set in plinth wall.

Excavated earth is used in plinth wall. Excavated earth is used in trench filling and usually not paid for separately, but may also be included under a separate item "Return fill" paid at a lesser rate. Extra earth if required for filling is brought from outside. If there is surplus earth after trench and plinth filling, this may be utilised in levelling and dressing of site or darted away and removed.

1.10.2| Concrete in Foundation

The concrete in taken out in cubic metre by length × width × thickness. The length and width of foundation concrete are usually the same as for excavation, only the depth or thickness differs. The thickness of concrete varies from 20 cm to 45 cm, usually 30 cm. Foundation concrete consists of lime concrete or weak cement concrete. The proportional of cement concrete consists of lime concrete or weak cement concrete. The proportion of cement concrete in foundation may be 1 : 3 : 6 or 1 : 4 : 8.

1.10.3| Soiling

When the soil is soft or bad, one layer of dry brick or stone soiling is applied below the foundation concrete. The soling layer is computed in square metre (length × width) specifying the thickness.

1.10.4| Damp Proof Course

D.P.C. usually of 2.5 cm thick rich cement concrete 1 : 1.5 : 3 or 2 cm, thick rich cement mortar 1 : 2, mixed with standard water proofing material, is provided at the plinth level of full width of plinth wall, and the quantities are computed in square metre, (length × width). Usually D.P.C. is not provided at the sills of doors and verandah openings, for which deduction are made. (One kg of cem-seal or impermo or other standard waterproofing compound per bag of cement is generally used).

1.10.5| Masonry

Masonry is computed in cubic metre (length × width × height). Foundation and plinth masonry is taken under one item and masonry is superstructure is taken under a separate item. In storeyed building the masonry in each storey as ground floor above plinth level, first floor, etc. is computed separately. In taking out quantities the walls are measured as solid and then deduction are made for openings as doors, windows etc. and such other portions as necessary.

Masonry of different types or classes, masonry with different mortar, etc. are taken out under separate items. Arch masonry work is taken out separately. Splayed or rounded sides of wall are considered as rectangular and extreme dimensions are taken to find out the quantities, thin partition wall is measured in square metre Honey comb brick wall is taken under a separate item in square metre, no deduction is made for holes. Stone masonry is calculated in the same manner as for brick masonry.

Deduction for opening, Bearings etc. in Masonry No deduction is made for following:

(i) Opening each up to 1000 square cm

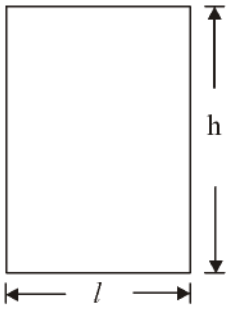
(ii) Ends of beams, posts, rafters, purlins, etc. upto 500 square cm or 0.05 square metre in section.

(iii) Bed plate, wall plate, bearing of chajja and the like upto 10 cm depth.

Bearings of floor and roof slabs are not deducted from masonry.

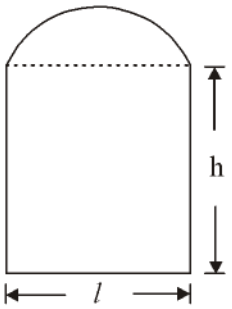
For other openings deduction are made in the following manner:

(i) Rectangular Openings : Full deduction is made.



Deduction : l × h × thickness of wall.

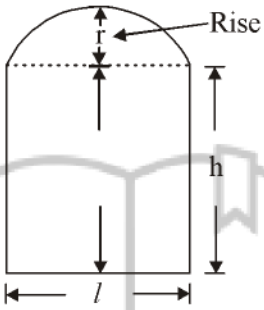
(ii) Doors and Windows with small segmental arches.



Deduction is made for rectangular portion only upto the spring line. The segmental portion is considered as solid to allow for the extra expenses in constructing the arch, and the filling up with thin wall.

Deduction : $l \times \text{h} \times$ thickness of wall.

(iii) Segmental Arch Opening :



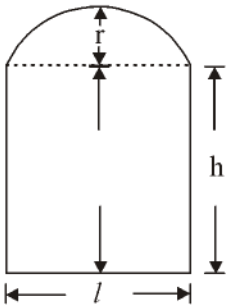
Deduction is made for the whole opening, the rectangular portion as well as the segmental portion.

The area of segmental portion $= \frac{2}{3}l\text{r} + \frac{\text{r}^3}{2l}$

But for deduction the area of the segmental portion is obtained approximately by taking 2/3 of span × rise, $\left(\frac{2}{3} \times l \times \text{r}\right)$ and the quantity for deduction is $\frac{2}{3} \times l \times \text{r} \times$ thickness of wall.

The total deduction will be $= \left[(l \times \text{h}) + \left(\frac{2}{3} \times l \times \text{r}\right)\right] \times$ Thickness of wall.

(iv) Semi-circular arch opening



The area of semi-circular portion $= \frac{l}{2}\pi\text{r}^2$

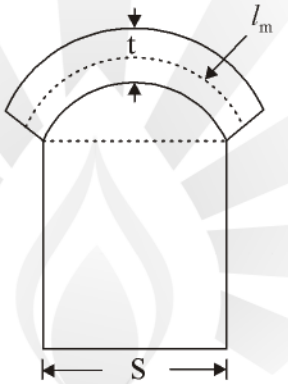
But for the deduction, the area of the semi-circular portion is obtained approximately by 3/4 of span × rise $\left(\frac{3}{4} \times l \times \mathrm{r}\right)$.

$$\text{Total Deduction} = \left[(l \times \mathrm{h}) + \frac{3}{4} \times l \times \mathrm{r}\right] \times \text{thickness of wall.}$$

Elliptical arches may be considered as semi-circular arches and may be dealt in the same manner. For large arches the actual area of opening should be calculated correctly by mensuration formula, and deduction should be made for actual area.

1.10.6 | Arch Masonry Work

Masonry work in arches is calculated in cubic metre separately by multiplying the mean length of the arch by the thickness of arch and by the width of the wall.

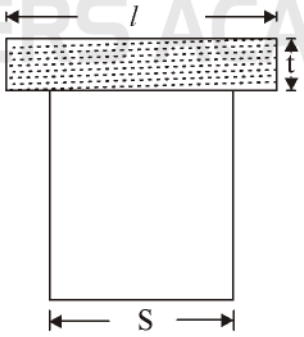


Quantity of arch masonry $= l_m \times \mathrm{t} \times$ thickness of wall.

Deduction : $l_m \times \mathrm{t} \times$ thickness of wall.

1.10.7| Lintels Over Openings

Lintels are either of RCC or of R.B., quantities are calculated in cubic metre. Length of the lintel is equal to the bearing may be taken as same as the thickness of lintel with a minimum of 12 cm.



Thus the length of the lintel, l = s + 2t, i.e. clear span plus two bearings.

Quantitity of lintel $= l \times \mathrm{t} \times$ thickness of wall.

Deduction $= l \times \mathrm{t} \times$ thickness of wall.

1.10.8 | RCC and RB Work

RCC and RB work may be roof or floor slab, in beams, lintels, columns, foundation, etc. and the quantities are calculated in cubic metre. Length, width and thickness are found correctly from the plan, elevation and section or from other detailed drawings. Bearings are added with the clear span to get the dimensions. The quantities are calculated in cubic metre exclusive of steel reinforcement and its bending but inclusive of centering and shuttering and fixing and binding reinforcement in position. The reinforcement including its bending is taken up separately under steel works in quintal. For this purpose 0.6% to 1.1% [usually 1%] of RCC or RB work by volume may be taken for steel, if other details are not given. The volume of steel is not required to be deducted from the RCC or RB work.

RCC and RB work may also be estimated inclusive of steel and shuttering for the complete works, if specified.

Shuttering (form work) are usually included in the RCC or RB work, but may also be taken separately in square metre of surface in contact with concrete.

In RCC work plastering is not taken separately but the exposed surface are finished with thin rich cement sand mortar plastering to give smooth and even surface which usually is not taken into consideration.

1.10.9 | Flooring and Roofing

(i) **Ground Floor :** The base lime concrete and floor finishing of cement concrete or stone or marble or mosaic etc. are usually taken as one job or one item (combined in one item), and the quantity is calculated in square metre, multiplying the length by the width. The length and width are measured as inside dimensions from wall to wall of superstructure. Both the works of base concrete and floor finishing are paid under one item.

(ii) **1st Floor, 2nd Floor etc. :** Supporting structure is taken separately in cubic metre as RCC, RB etc. and the floor finishing is taken separately in square metre as 2.5 cm or 4 cm cement concrete or marble or mosaic etc.

If a cushioning layer of lime concrete is given in between the slab and the floor, the cushion concrete may be measured with the floor under one item or taken separately.

(iii) **Roof :** Supporting structure is taken separately in cubic metre and the lime concrete terracing is computed in square metre with thickness specified, under a separate item including surface rendering smooth. The compacted thickness of lime concrete terracing is 7.5 cm to 12 cm average, L.C. terracing may also be calculated in cubic metre with average thickness.

The bearing of roof or floor slab is given same as the thickness of slab, usually 10 cm to 15 cm.

In case of tiled, galvanised iron sheet, or asbestos cement sheet roofing the roof covering are taken out in square metre and measured flat including overlaps with all fittings and supporting trusses and members are taken under separate item.

Floor of door sills and sills of opening, should also be taken into account. In the case of ground floor sills should be taken, separately as there is no lime concrete in sills.

1.10.10 | Plastering and Pointing

Plastering usually 12 mm thick is calculated in square metre For walls the measurements are taken for the whole face of the wall for sides as solid and deduction for openings are made in the following manner:

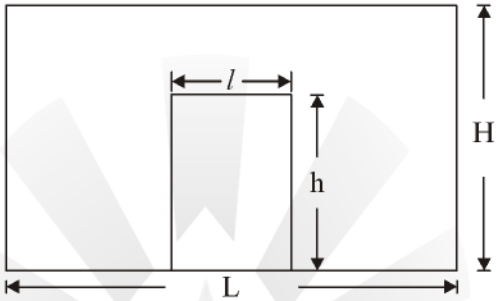
(i) No deduction is made for ends of beams, posts, rafters, etc.

(ii) For small opening up to 0.5 square metre no deduction is made, and at the same time no additions are made for jambs, soffits and of sills of these openings.

(iii) For opening exceeding 0.5 square metre but not exceeding 3 square metre deduction is made for one face only and the other face is allowed for jambs, soffits and sills which are not taken into account separately.

(iv) For openings above 3 square metre deduction is made for both faces of the opening and the jambs, soffits and sills are taken into account and added.

As the outer jams, etc. are much smaller than the inner ones, the deduction is usually made from the outer face.



Inside Plaster $= L \times H$

Outside Plaster $= (L \times H) - (l \times h)$

For deduction for arch opening the same principle as for masonry work is followed.

Plastering of ceiling usually of 6-10 mm thick is computed in square metre under a separate head as this work is done with richer mortar. For RCC work usually no plastering is allowed but for fair finish a thin plaster of rich cement mortar may be allowed which should not be taken in the measurement separately. Thin rich cement mortar plastering in RCC work may also be taken under a separate item, specially in the ceiling inside room.

Pointing : Pointing in walls is calculated in square metre for whole surface and deductions similar to plastering are made. Task work for pointing is 10 m^2/mason/day.

1.10.11 | Cornice

Ornamental or large cornice is measured in running metre for the complete work, which includes masonry, plastering, mouldings, etc and paid for in running metre.

Similarly, string course, drip course, cor-belling, coping etc. are measured and paid for in running metre for the complete work.

1.10.12 | Pillars

Pillars are taken separately in cubic metre. For their net volume and quantities are calculated by correct geometrical measurements by simple mensuration method.

$$\text{Quantity} = \text{Cross-sectional area} \times \text{ht} = \pi\frac{d^2}{4} \times \text{ht}$$

cubic metre for round pillers, d is the diameter, $a^2 \times$ ht. Cubic metre for square pillers a is the side.