

Supplementary Units. — In the International System of units, the quantities, plane angle and solid angle, are treated as independent quantities with SI units *radian* (rad.) and *steradian* (sr) respectively.

One radian is the angle between two radii of a circle which cuts off on the circumference an equal in length to the radius.

One steradian is the solid angle which having its vertex in the centre of a sphere, cuts off an area of the surface of the sphere equal to that of square with sides of length equal to the radius of the sphere.

Derived Units — The expressions for the derived SI units are stated in terms of the basic units, as the SI units for velocity is metre per second (m/s). For some of the derived units, special names have been adopted together with special letters symbols, as the SI unit for force is *newton* (N), for energy is (J), for power is *watt* (W), etc. Some derived SI units are also expressed in terms of the units from which they are derived as the SI unit for area is *square metre* (m²) for volume is *cubic metre* (m³) for density is *kilogram per cubic metre* (kg/m³), etc.

Refer ISI publication — 'Guide to the use of International System (SI) Units, S.P. : 5-1969.'

METHOD OF ESTIMATING

✓ **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 (buildings, 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*.

✓ **Actual Cost.** — The actual cost of a work is known 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 differ much from the estimated cost worked out at the beginning.

Detailed Estimate. — Preparation of detailed estimate consists of working out the quantities of different items of work and then working out the cost i.e. the estimate is prepared in two stages:--

(i) **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 form — *Details of Measurement Form*.

Details of Measurement Form —

Item No.	Description or Particulars	No.	Length	Breadth	Height or Depth	Content or Quantity

PROCEDURE OF ESTIMATING

It is better to add one more column for total quantity or content.

- (ii) **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 per cent 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 1½ to 2 per cent 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, proportions 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.

Note—For different types of estimates, etc., See Chapter 10. 'Types of Estimate'.

MAIN ITEMS OF WORK

1. Earthwork. — Earthwork in excavation and Earthwork in filling are usually taken out separately under different items, and quantities are calculated in cu m. 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 × breadth × depth. Filling in trenches after the construction of foundation masonry is ordinarily neglected. If the trench filling is accounted, this may be calculated by deducting the masonry from the excavation.

Earthwork in plinth filling is calculated by taking the internal dimensions in between plinth wall (Length × Breadth) which are usually less than the internal dimensions of the room by two off-sets of plinth wall *i.e.* 10 cm (4½") and height is taken after deducting the thickness of concrete in floor, usually 7.5 cm (3"). If sand filling is done in plinth, this should be taken separately. The length and breadth 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 trench filling and plinth filling and usually not paid for separately, but may also be included under a separate item—*"Return fill and ram or backfill"* and 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 carted away and removed.

2. Concrete in foundation. — The concrete is taken out in cu m by length × breadth × thickness. The length and breadth 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 (9" to 18", usually 12"). Foundation concrete consists of lime concrete or weak cement concrete. The proportion of cement concrete in foundation may be 1 : 4 : 8 or 1 : 5 : 10.

3. Soling. — When the soil is soft or bad, one layer of dry brick or stone soling is applied below the foundation concrete. The soling layer is computed in sq m (Length × Breadth) specifying the thickness.