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COST EFFECTIVE METHODS USED IN VARIOUS LEVELS OF A BUILDING

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Abstract—Every Builder or architect understands the importance of reducing the construction cost. In very recent years the cost of construction has increased faster. The rising cost of shelter is the present scenario in housing, which affects all of us.

Buildings are generally divided into 2 parts

- Substructure
- super structure

Substructure includes portion of building below the ground. i.e Foundation

Super structure includes portion of the building above the ground .which includes Plinth, wall, openings, roofs, floor, horizontal and vertical transportation . In this paper we shall discuss various methods. The present paper discusses various methods at different parts of a building which are cost effective.

Keywords—Cost Effective, Design , Architecture, Arch foundation, Brick on edge, Rat Trap Bond, steel frames, Arches ,Filler slab, Jack arch. Finishing.

INTRODUCTION

Cost effective is a new concept which deals with effective budgeting and following of techniques which help in reducing the cost of construction through the use of locally available materials along with improved skills and technology without sacrificing the strength, performance and life of the structure.

There is huge misconception that low cost housing is suitable for only sub standard works and they are constructed by utilizing cheap building materials of low quality.

Cost effective technology allows for reduction of costs and preserve scarce resources.

Cost Effective is achieved through four ways

- By replacing conventional materials with alternative materials
- By good construction skills which also heads to cost saving
- By proper building design which in turn leads to reduction in cost
- By proper planning and management of construction

FOUNDATION

Normally the foundation cost comes to about 10 to 15% of the total building and usually foundation depth of 3 to 4 ft. is adopted for single or double store building and also the concrete bed of 6″(15 Cms.) is used for the foundation which could be avoided.

It is recommended to adopt a foundation depth of 2 ft.(0.6m) for normal soil like gravely soil, red soils etc., and use the uncoursed rubble masonry with the bond stones and good packing. Similarly the foundation width is rationalized to 2 ft.(0.6m).

To avoid cracks formation in foundation the masonry shall be thoroughly packed with cement mortar of 1:8 boulders and bond stones at regular intervals.

It is further suggested adopt arch foundation in ordinary soil for effecting reduction in construction cost up to 40%.This kind of foundation will help in bridging the loose pockets of soil which occurs along the foundation.

In the case black cotton and other soft soils it is recommend to use under ream pile foundation which saves about 20 to 25% in cost over the conventional method of construction

PLINTH

It is suggested to adopt 1 ft. height above ground level for the plinth and may be constructed with a cement mortar of 1:6. The plinth slab of 4 to 6″ which is normally adopted can be avoided and in its place brick on edge can be used for reducing the cost. By adopting this procedure the cost of plinth foundation can be reduced by about 35 to 50%.It is necessary to take precaution of providing impervious blanket like concrete slabs or stone slabs all round the building for enabling to reduce erosion of soil and thereby avoiding exposure of foundation surface and crack formation.

It is suggested to adopt 1 ft. height above ground level for the plinth and may be constructed with The plinth slab of adopted can be brick on edge can reduce the cost

WALLING

Wall thickness of 6 to 9″ is recommended for adoption in the construction of walls all-round the building and 41/2 ” for inside walls. It is suggested to use burnt bricks which are immersed in water for 24 hours and then shall be used for the walls

RAT – TRAP BOND WALL

It is a cavity wall construction with added advantage of thermal comfort and reduction in the quantity of bricks required for masonry work. By adopting this method of bonding of brick masonry compared to traditional English or Flemish bond masonry, it is possible to reduce in the material cost of bricks by 25% and about 10to 15% in the masonry cost. By adopting rat-trap bond method one can create aesthetically pleasing wall surface and plastering can be avoided.

• Strength is equal to the standard 10″ (250 mm) brick wall, but consumes 20% less bricks.

Fig 1:Rat-trap bond wall

The air medium created between the brick layers helps in maintaining a good thermal comfort inside the building. This phenomenon is particularly helpful for the tropical climate of South Asian and other countries.

For extra stability:-

Vertical Rod should be placed at 245mm from the inner face of the Brickwork Rat-trap Bond (L-Joint)

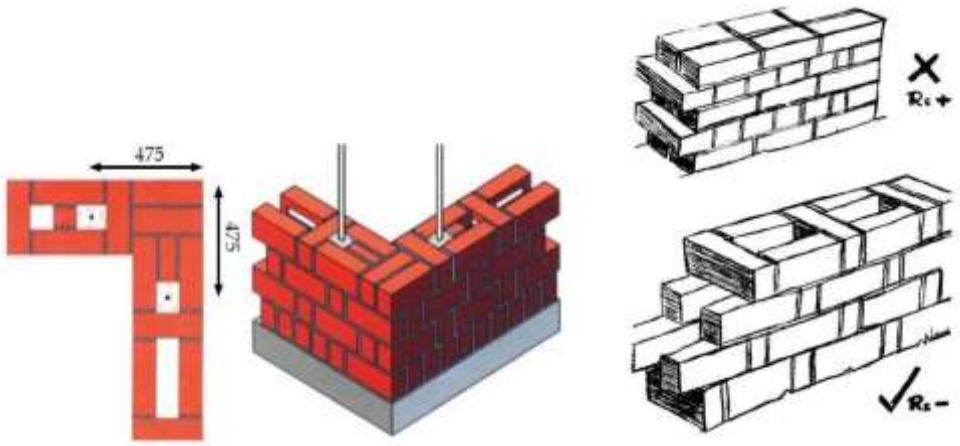

Fig 2: Construction of Rat-trap bond wall

• Buildings up to two stories can easily be constructed with this technique

CONCRETE BLOCK WALLING

In view of high energy consumption by burnt brick it is suggested to use concrete block (block hollow and solid) which consumes about only 1/3 of the energy of the burnt bricks in its production. By using concrete block masonry the wall thickness can be reduced from 20 cms to 15 Cms. Concrete block masonry saves mortar consumption, speedy construction of wall resulting in higher output of labour, plastering can be avoided thereby an overall saving of 10 to 25% can be achieved.

Fig 3: Concrete block walling

DOORS AND WINDOWS

It is suggested not to use wood for doors and windows and in its place concrete or steel section frames shall be used for achieving saving in cost up to 30 to 40%.Similiarly for shutters commercially available block boards, fibre or wooden practical boards etc., shall be used for reducing the cost by about 25%.By adopting brick jelly work and precast components effective ventilation could be provided to the building and also the construction cost could be saved up to 50% over the window components.

LINTELS AND CHAJJAS

The traditional R.C.C. lintels which are costly can be replaced by brick arches for small spans and save construction cost up to 30 to 40% over the traditional method of construction. By adopting arches of different shapes a good architectural pleasing appearance can be given to the external wall surfaces of the brick masonry.

Brick arches: The traditional RCC lintels which are costly, can be replaced by brick arches for small spans and save construction cost up to 30–40% over the traditional method of construction (Figure 3 a). By adopting arches of different shapes blended with brick corbelling , a good architecturally pleasing appearance can be given to the external wall surfaces of the brick masonry.

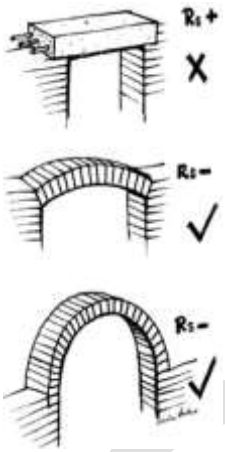

Fig 4: Usage of Arches

ROOFING

Normally 5″(12.5 cms) thick R.C.C. slabs is used for roofing of residential buildings. By adopting rationally designed insitu construction practices like filler slab and precast elements the construction cost of roofing can be reduced by about 20 to 25%.

Filler slab in roof: This They are normal RCC slabs where bottom half (tension) concrete portions are replaced by filler materials such as bricks, tiles, cellular concrete blocks, etc.These filler materials are so placed as not to compromise structural strength, result in replacing unwanted and nonfunctional tension concrete, thus resulting in economy. These are safe, sound and provide aesthetically pleasing pattern ceilings and also need no plaster.

The main features of the filler slab are:

• Consumes less concrete and steel due to reduced

weight of slab by the introduction of a less heavy, low-cost filler material like two layers of burnt clay tiles.

Slab thickness minimum 112.5 mm

• Enhances thermal comfort inside the building due to heat-resistant qualities of filler materials and the gap

• Makes saving on cost of this slab compared to the traditional slab by about 23%.

• Reduces use of concrete and saves cement and steel by about 40%.

Fig 5 :Filler Slabs

FERROCEMENT CHANNEL/SHELL UNIT

Provide an economic solution to RCC slab by providing 30 to 40% cost reduction on floor/roof unit over RCC slabs without compromising the strength. These being precast, construction is speedy, economical due to avoidance of shuttering and facilitates quality control.

PLASTERING

Plastering can be avoided on the walls, frequent expenditure on finishes and its maintenance is avoided. Properly protected brick wall will never loose its color or finish.

FLOORING

Flooring is generally made of terracotta tiles or color oxides. Bedding is made out of broken brick bats. Various patterns and designs are used, depending on shape, size of tiles, span of flooring, and client's personal preference.

WINDOWS

Windows are generally made up of wood. Instead of wooden windows, brick jali's are used. They are used just more than a decorative element. They are also used in parapets.

FINISHING WORK

The cost of finishing items like sanitary, electricity, painting etc., varies depending upon the type and quality of products used in the building and its cost reduction is left to the individual choice and liking.

CONCLUSION

The above list of suggestion for reducing construction cost is of general nature and it varies depending upon the nature of the building to be constructed, budget of the owner, geographical location where the house is to be constructed, availability of the building material, good construction management practices etc. However it is necessary that good planning and design methods shall be adopted by utilizing the services of an experienced engineer or an architect for supervising the work, thereby achieving overall cost effectiveness to the extent of 25% in actual practice.

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