

Low Cost Housing

It is the method in which the cost of the building is lowered down by using locally available material. By using material which is largely available near the site construction cost is decreased by 20%-30%. It should be remembered that when the cost of construction is lowered down the structure should be sound, good capable of strength, and resistant to atmospheric agency. By using some new modern material cost of construction can be lowered down by large extent. Some construction material are given below .

i. Non erodable mud plaster:

The plaster over mud walls gets eroded during rains, which necessitates costly annual repairs. This can be made non erodable by the use of bitumen cutback emulsion containing mixture of hot bitumen and kerosene oil. The mixture is pugged along with mud mortar and wheat/ rice straw. This mortar is applied on mud wall surface in thickness of 12 mm. One or two coats of mud cow dung slurry with cutback are applied after the plaster is dry. The maintenance cost is low due to enhanced durability of mud walls.(R.K.Garg, 2008)

ii. Fly -Ash sand lime bricks:

By mixing of lime and fly ash in the presence of moisture, fly ash sand lime bricks are made. Fly Ash reacts with lime at ordinary temperature and forms a compound possessing cementitious properties. After reactions between lime and fly ash, calcium silicate hydrates are produced which are responsible for the high strength of the compound. Bricks

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made by mixing lime and fly ash are therefore, chemically bonded bricks. The bricks are manufactured with the help of hydraulic press and are dried in the autoclave. These bricks have various advantages over the clay bricks, It possesses adequate crushing strength, uniform shape, smooth finish and does not require plastering and also are lighter in weight than ordinary clay bricks.

iii. Solid concrete and stone blocks:

This technique is suitable in areas where stones and aggregates for the blocks are available locally at cheaper rates. Innovative techniques of solid blocks with both lean concrete and stones have been developed for walls. The gang-mould is developed for semi-mechanized faster production of the blocks. In the manual process, single block moulds are used wherein the concrete is compacted with help of a plate vibrator. With the use of a portable power screw driven egg laying type machine, solid concrete blocks are made with higher productivity at low cost. Six blocks of 30 x 20 x 5 cm size are cast in single operation with an output of 120-150/hr.

In Floor and Roof: Structural floors/roofs account for substantial cost of a building in normal situation. Therefore, any savings achieved in floor/roof considerably reduce the cost of building. Traditional Cast-in-situ concrete roof involve

the use of temporary Shuttering which adds to the cost of construction and time. Use of standardized and optimized roofing components where shuttering is avoided prove to be economical, fast and better in quality. Some of the prefabricated roofing/flooring components found suitable in many low-cost housing projects are:

- i. Precast RC Planks.
- ii. Prefabricated Brick Panels
- iii. Precast RB Curved Panels.
- iv. Precast RC Channel Roofing
- v. Precast Hollow Slabs
- vi. Precast Concrete Panels

iii. Precast curved brick arch panel roofing

This roofing is same as RB panel roofing except that the panels do not have any reinforcement. A panel while casting is given a rise in the centre and thus an arching action is created. An overall economy of 30% has been achieved in single storeyed building and 20% in two or three storeyed buildings

iv. Precast RC channel roofing

Precast channels are trough shaped with the outer sides corrugated and grooved at the ends to provide shear key action and to transfer moments between adjacent units. Nominal width of units is 300 mm or 600 mm with overall depths of 130 mm to 200 mm (Figure 8). The lengths of the

units are adjusted to suit the span. The flange thickness is 30 mm to 35 mm. Where balcony is provided, the units are projected out as cantilever by providing necessary reinforcement for cantilever moment. A saving of 14% has been achieved in actual implementation in various projects.

v. Precast hollow slabs roofing

Precast hollow slabs are panels in which voids are created by earthen kulars. without decreasing the stiffness or strength. These hollow slabs are lighter than solid slabs and thus save the cost of concrete, steel and the cost of walling and foundations too due to less weight. The width of a panel is 300 mm and depth may vary from 100 mm to 150 mm as per the span, the length of the panel being adjusted to suit the span. The outer sides are corrugated to provide transfer of shear between adjacent units. The "kulars," are placed inverted so as to create a hollow during precasting (Figure 9). Extra reinforcement is provided at top also to take care of handling stresses during lifting and placement. There is saving of about 30% in cost of concrete and an overall saving of about 23%.

vi. L- Pan roofing

The pre cast full span RC L-panel is of section „L“. The L-panels are supported on parallel gable walls and are used for

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sloped roof of a building. The RC units can be cast with simple timber/ steel moulds and are easy for manual handling with simple lifting and hoisting gadgets. L-Panel roofing is quite lighter in weight, economic in construction and sound in performance and durability. In addition to roof, the L-panels can be used for making loft, cooking platforms, parapets and many other minor elements of buildings and structures. The techniques has been used widely in many mass housing programme in the country.

vii. Trapezonpan roofing flooring

Typical precast RC trapezonpanel has trapezium section in orthogonal directions. The components are sound and can be manually handled with ease. These components are placed in position to form roof/floor and haunch filling is done with in-situ concrete to make a monolithic surface. Trapezo-panels can be produced in stacks one above the other and have advantage in production, stacking and supply. These units are used for floors/ roofs with / without deck concrete

These are the few material which lowers down the price of construction .

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Areas from where cost can be reduced are:-

1) Reduce plinth area by using thinner wall concept.Ex.15 cms thick solid concrete block wall.

2) Use locally available material in an innovative form like soil cement blocks in place of burnt brick.

3) Use energy efficiency materials which consumes less energy like concrete block in place of burnt brick.

4) Use environmentally friendly materials which are substitute for conventional building components like use R.C.C. Door and window frames in place of wooden frames.

5) Preplan every component of a house and rationalize the design procedure for reducing the size of the component in the building.

6) By planning each and every component of a house the wastage of materials due to demolition of the unplanned component of the house can be avoided.

7) Each component of the house shall be checked whether if it's necessary, if it is not necessary, then that component should not be used.

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Cost reduction through adhoc methods 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

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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.

Walling

Wall thickness of 6 to 9" is recommended for adoption in the construction of walls all-round the building and 4 1/2 " 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 10 to 15% in the masonry cost. By adopting rat-trap bond method one can create aesthetically pleasing wall surface and plastering can be avoided.

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

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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.

Soil cement block technology

It is an alternative method of construction of walls using soil cement blocks in place of burnt bricks masonry. It is an energy efficient method of construction where soil mixed with 5% and above cement and pressed in hand operated machine and cured well and then used in the masonry. This masonry doesn't require plastering on both sides of the wall. The overall economy that could be achieved with the soil cement technology is about 15 to 20% compared to conventional method of construction.

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%. Similarly 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

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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.

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%.

Fillerslabs

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.

Jackarchroof/floor

They are easy to construct, save on cement and steel, are more appropriate in hot climates. These can be constructed using compressed earth blocks also as alternative to bricks for further economy.

Ferrocementchannel/shellunit

Provide an economic solution to RCC slab by providing 30 to 40% cost reduction on floor/roof unit over RCC slabs without

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compromising the strength. These being precast, construction is speedy, economical due to avoidance of shuttering and facilitate quality control.

FinishingWork

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.