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# LOW-COST SCHOOL BUILDING

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**Abstract** - *School is a basic need of education which indeed results in the development of the country, but a huge amount of money has been invested by the government for constructing school buildings. Low-cost school buildings reduce the total amount of investment for the construction and also facilitate to increase the number of schools in the country. In this, a study has been conducted by using various methods and materials to achieve low-cost school building in both economy and safety point of view. This report mainly focuses on construction materials and economy. A few low-cost materials are selected and reports are also included in specification chapter for easy understanding. The suggested materials and methods may be useful for constructing school buildings in economically.*

***Keywords-*** *low-cost, economy, school building, cost-effective, safety*

## I. INTRODUCTION

In developing countries like India, school is an important parameter for the national development. The fund allotment for constructing the school building is a mandatory thing in the budget. The school construction established by perfect dimensional planning by using locally available material and manpower may reduce the cost of a building. The low- cost school building will not be achieved by only using the low-cost material. The low-cost school can be achieved by the use of locally available material [1] thus cutting the transportation and implementation of the alternative methods. In school building construction it has unique infrastructure requirement which has taken into consideration in prior to utilizing the alternate material.

## II. SECTIONAL PLANNING

Perfect Dimensional planning and regulation have been considered as the main cause for efficient and economic construction [2]. It is important to plan classrooms on a structural basis so that the dimension of the school building will obey to the standard dimensions of a modular product without extra works like cutting and patching at any part of the components at the site. The suitable school building shape can be accomplished by making use of concrete hollow blocks and other prefabricated building elements of exclusive size. So that, if the size of all classrooms and height of roof are made up to perfect size according to the requirement like strength of the class without more complication in workmanship which would help in an appreciable saving in cost of material and labours. In constructions, it is mandatory to make openings for doors and windows which can firm to the principles.

## III. FIGURE OF THE SCHOOL

The figure of school has a significant influence on cost of the construction due to the amount of exterior wall and roof area required to make a closed space. The square is considered to be the most cost-effective shape as it provides the all-out amount of floor area with the less volume of wall area. Corner structure cost is high when compared to standard wall structure due to the extra spending of the amount in the corner and cumulating the length of the wall, it proves that the square and rectangular shapes with the proper plan are more economic shapes. The investment in constructing can also be affected by building just 1or 2 small rooms in schools, whereas it can be overcome by increasing the number of rooms which may save the construction cost in the low-cost school buildings.

### 3.1. Size of a room

A huge amount of money can be saved in a school building construction by reducing the size of a classroom. The positioning of furniture, doors, windows, the size of a classroom can be reduced to a great extent without any negative impact on building work standards for which the minimum size is of 35sq.mt per classroom.

### 3.2 Elementary requirements

The elementary requirements in a school designing are on the basis of the following factors which has been studied and incorporated for the suggestion in the low-cost school building.

 

- Natural daylight
- Natural and permanent ventilation in classrooms and toilet
- Durability of materials
- Low maintenance
- Central plant area
- Thermal insulation
- Safety against fire

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**3.3 Strength and stability**

Every school building is supposed to be strong enough to withstand all the loads that come with it and should be stable under all the conditions. The materials that are suggested will fulfil the requirements of a school building which can withstand all the permissible load conditions. The laboratory results prove that the suggested materials are suitable for the requirements in constructing a low-cost school building.

**3.4 Comfort and convenience.**

The low-cost school building should be planned in such a way that people in any room can move without any feeling of disturbance with one another. Room need not certainly be too capacious but in case of passage outside the classroom is supposed to the avoided confusion of entering one room for another and to ensuring that no disturbance is caused when the classroom is being engaged. This should be provided for each and every classroom in the school Whenever possible rooms or spaces should stay apart for caring on various activities such as meeting hall, dining and hobbies in which the school members can engage in.

## IV. FLY ASH SAND LIME BRICKS

In past few decades, America and European countries using Fly-ash sand lime bricks in large quantity [3]. The reason for its popularity is optimum cost, which has been providing desirable properties in masonry construction such as strength, durability, resistance to fire and good appearance. This type of masonry can be used in India to reduce the total cost of the school building, it has been adopted for some buildings since 40 years and those buildings are standing still very well. Nowadays this material had become famous in both economy and durability, utilization of this type of bricks may be economic in low-cost school building construction.

## V. BRICK ARCH LINTEL

The brick arch lintel is adopted instead of the Reinforced Cement Concrete (RCC) lintels. The brick arch lintel is cost-effective along with aesthetic appearance to the building [4]. It reduces the cost of the construction of lintel when compared to the RCC lintel by 30% to 40% without compromising the stability.

## V. RANDOM STONE RUBBLE MASONRY

Random rubble masonry may be used in the foundation replacing the conventional RCC foundation. It can be built in a specified shape that will not create tensile force with stones from specified quality [5]. Irregular size of stones can be used but it requires cement mortar of 1:6 in the ratio [6]. This type of foundation reduces the cost of the foundation by 90% without compromising the strength parameter.

## VI. LOW-COST SCHOOL BUILDING FOR DEVELOPING COUNTRIES

Tropical zone areas of the world are mostly of developing countries in which Schooling requirements have been gradually increasing. In rural areas of developing countries, the budget allotted in constructing a school building in the rural area is not as like in the cities. The existing availability of schools in the rural areas is poor, which has more than 80% of people are surviving in villages. Research in the low-cost building was accepted as one of the major goals of the United Nations development in decades and during the year 1987 [7], it was declared the international year of shelter for the homeless. As like, the similar logic has been implemented in the construction of low-cost school building. Low-cost school building is a step towards better school with better technology for tackling the all economic problems without any compromising the standards.

## VII. ECONOMIC MEASURES TO CONTROL COST

The measures to be taken by the private and government agencies to economize the cost of the school project are suggested below

 

**A.** The plan of the building should be simple to minimize the length of wall and number of doors and windows
**B.** The use of common materials like cement and steel should be reduced and specification should be slightly lower down to reduce the cost[8]
**C.** The overhangs and decorative work using cement and steel should be reduced
**D.** The built-up area of the school should also reduce without affecting the utility of building

## VIII. ADVANTAGES

**A.** Less use of cement and steel for any given section compared with RCC with a corresponding reduction in self-weight
**B.** A utilization of random rubble masonry a major cutting in cost expenses
**C.** The appointment of semi-skilled labour may be economical in non-skilled works like earthwork, filling, etc.,
**D.** The brick arch lintel technique and its installation practice is economic one when compared to RCC
**E.** The technique does not require either concrete mixer nor a vibrator
**F.** The structure has less permeability and resistance to cracking
**G.** The suggested structure requires minimal maintenance
**H.** The suggested structure is economical when compared to components built with steel, concrete, or brick walls

## XII. CONCLUSION

The practising of the suggested materials and methods may minimize the cost of constructing the school building. The method may also support to increase the number of schools in the country. The utilization of random stone rubble masonry for foundations, brick arch lintel instead of RCC lintel, fly ash lime bricks and suggestion made may be useful to construct the low-cost school buildings. The outcome of the study indicates to construct the school building in both economic and durability.

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