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AN OVERVIEW: LOW COST HOUSE MATERIALS & TECHNIQUES

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ABSTRACT

This paper aims to point out the various materials and techniques used for low cost housing. This paper presents the study of mixture of cow dung, straw dust, and sand and other materials are used as a supplementary to concrete and mortar in the construction of low cost, environment friendly house. The study includes live housing examples and highlights the method of construction and various innovative techniques used to make the building eco- friendly and cost effective. For progressing the sustainable development more utilization of waste materials for constructing the green buildings in future is required and to achieve effective economic construction.

KEYWORD – Cow dung, Rice Husk, Fly Ash sand lime, Rat trap bond, Filler slab

INTRODUCTION

To provide homes for everyone despite explosive population growth, the development and maximum use of locally-available building materials must be considered for most populations, particularly in developing countries. Adequate shelter for the reduction in cost is achieved through effective utilization of locally available material, waste materials and techniques. The material and techniques should be durable, economical, accepted by users and not requiring costly maintained .Economy is also achieved by postponing finishing and implementing low cost housing technology in phase's .High efficiency of workers, minimizes waste in design. Studies assessing the conditions of low cost housings have mostly focused on satisfaction levels and subjective perception of quality particularly with regard to the dwelling units or the larger neighborhood characteristics. Housing is a basic need for all people and is one of the challenges faced by developing countries. India is currently facing shortage of about 17.6 million houses.

Low cost housing can be considered affordable for low and moderate income earner if household can acquires a housing unit for an amount up to 30%of its household income. The low income group in developing country are generally unable to access the housing market .As the three basic needs of people are food, clothes and shelter so main objective is to provide one of the basic need i.e. shelter to low income earners .Low cost housing is a relative concept and has more to do with budgeting and seeks to reduces construction cost trough better management, appropriate use of local materials, skills and technology without sacrificing strength and life of structure.al need where families can have a comfortable living and work in a sustainable environment.

PURPOSE

1. To evaluate the performance of waste products used as a replacement to cement and mortar.
2. To minimize the overall environmental effects of concrete production using materials described below as replacement.
3. To promote the preservation of the environment and natural resources through a process optimization of waste.
4. To develop a low cost structure

MATERIALS

1. COW DUNG

The cow dung ash is obtained from cow excreta which is dried to sunlight and subjected to burning as a result ash is obtained in black color. In many parts of the developing world, caked and dried cow dung is used as fuel. Dung may also be collected and used to produce biogas to generate electricity and heat. Cow dung is also an optional ingredient in the manufacture of adobe mud brick housing depending on the availability of materials at hand. In many parts of the developing world, caked and dried cow dung is used as fuel. Dung may also be collected and used to produce biogas to generate electricity and heat. In cold places, cow dung is used to line the walls of rustic houses as a cheap thermal insulator.

Chemical properties of cow dung:

Cow dung is a nitrogen rich material, potassium, phosphorous and calcium. Cow dung has a relatively high carbon to the nitrogen ratio. Chemical composition of the cow dung revealed that while there was no difference in the organic matter (OM), nitrogen (N) and manganese (Mn). Contents of calcium (Ca), phosphorus (P), zinc (Zn) and copper (Cu) were higher by 10.8, 8.0, 84.1 and 21.7 percent in the dung.

Cow dung is said to have strong antibacterial properties. It works as a good disinfectant by keeping away insects. It is an excellent insulator; as it keeps house cool in summers and warm in

winters. Cow dung's use as construction material for houses encourages utilization of natural resources and minimizes waste.

Fig.1-Inside & Outside view of a hut made from cow dung

Fig.1-Inside & Outside view of a hut made from cow dung

2. 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 cementations properties. After reactions between lime and fly ash, calcium silicate hydrates are produced which are responsible for the high strength of the compound. Bricks 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. (R.K.Garg, 2008).

3. NON ERODABLE MUD PLASTER

Central Building Research Institute, India has developed an economical but effective process to protect mud walls by applying non-erodable mud plaster. Non-erodable mud is prepared by mixing bitumen cutback (Bitumen & Kerosene oil mixture) with a specified mud plaster. Soil should consist of clay 20-25%, sand 40-45% and remaining part may be silt, peat, loam etc, but it should be free from organic matter. Bitumen of 80/100 grade penetration and kerosene oil are mixed in the proportion of 5:1 (by weight) for preparing cutback. 64 kg of cutback is required for one cubic metre of soil. Non-erodable mud plastered walls are resistant to water erosion.

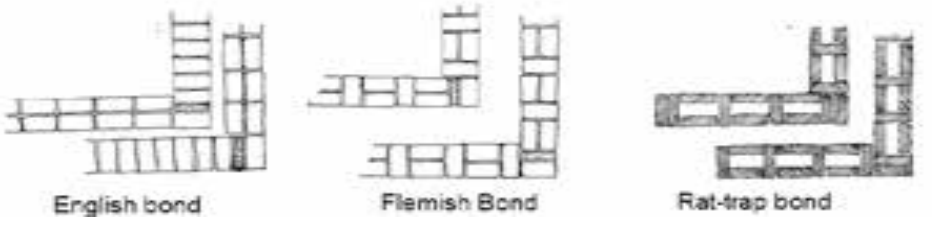
4. Rice Husk as Building Material

India alone produces about 20 million tons of rice husk annually. Rice husk ash has been found to be a useful building material. It can be mixed with cement up to 20% without affecting strength and thus cost of construction can be reduced and problem of disposal of this ash can also be solved by using it.

TECHNIQUES

1. Rat-trap Bond Technology

The rat trap bond is a masonry technique, where the bricks are used in a way which creates a cavity within the wall, while maintaining the same wall thickness as for a conventional brick masonry wall. While in a conventional English bond or Flemish bond, bricks are laid flat, in a Rat trap bond, they are placed on edge forming the inner and outer face of the wall, with cross bricks bridging the two faces. The main advantage of Rat-trap bond is reduction in the number of bricks and mortar required as compared to English/Flemish bond because of the cavity formed in the wall.

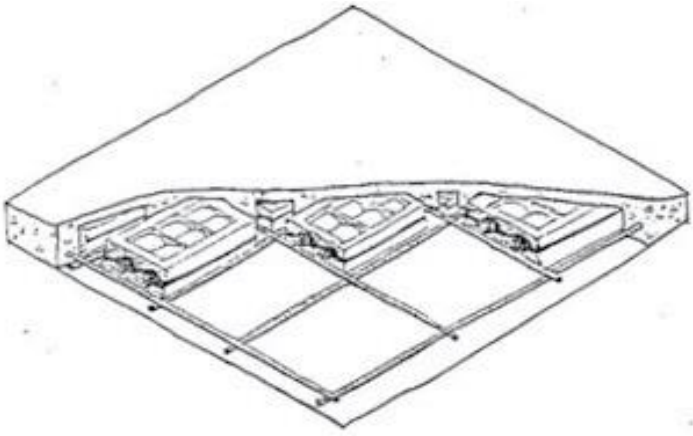


2. Solid concrete and stone blocks

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. (R.K.Garg, 2008)

3. FILLER SLAB TECHNOLOGY

Filler slab is a variation of conventional reinforced cement concrete slab in which part of the concrete is replaced with a filler material which can be a waste material to ensure economical advantage over an RCC slab. The basic principle in a filler slab is that, considering an RCC slab of a given thickness, the concrete in the bottom half of the slab is simply dead weight and does not play a role in taking up compressive load, which is normally taken up by concrete in an RCC slab. So, this concrete can be replaced by a suitable lightweight filler material which can be accommodated in the bottom half of the slab. The design of the filler slab is based on the same procedures which are adopted for design of conventional reinforced concrete slabs. The underlying principle of the filler slab is that for roofs which are simply supported, the upper part of the slab – above the neutral axis - is subjected to compressive forces and the lower part of the slab experience tensile forces.



ADVANTAGES

1. Reduction of waste materials
2. Environment friendly
3. Low cost

4. Temperature difference of approximately 5-6 degree Celsius
5. Less use of cement mortar
6. Less use of bricks
7. Less beam, column and steel bars are used.

CONCLUSION

As explained by using various alternative materials cost of Construction will reduce up to 19%. By using various technologies as explained the cost reduction is up to 20 to 30 %. People will get all primary and basic services at their affordable price. Congestion will be reducing. This paper mainly highlights the significance and necessity of consumption of the various waste materials, low cost materials and other techniques for the manufacturing of sustainable green buildings which would serve as an example in future.

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