**Project Report**

**On**

**“ALTERNATE AND LOW COST CONSTRUCTION MATERIALS**

**AND TECHNIQUES”**

**SUBMITTED**

**TO**

FOR DIPLOMA IN CIVIL ENGINEERING

SUBMITTED BY: GUIDED BY:

**INTRODUCTION**

The Council for Works and Housing (CWHR) is an R & D organization under the aegis of the Ministry of Science and Technology. The main function of this council is to promote scientific research on problems related to different types of civil engineering structures such as buildings, roads, bridges, dams, harbors, treatment plants etc.

The CWHR has endeavored in R & D work for the development of durable, economical and innovative materials for the construction industry with focus on the utilization of local/ indigenous techniques and materials for import substitution of construction inputs.

**SYNOPSIS**

* Environment friendly low cost demonstration model houses and rooms constructed by CWHR.
* Ferrocement products developed at CWHR as replacement of RCC, timber etc.
* Mechanized pre-cast concrete water course lining units and construction of model channels.
* Production of fiber cement sheets as replacement to asbestos cement at CWHR.
* Common defects of clay bricks and different brick moulding systems developed at CWHR for improving the quality of clay bricks.
* Some innovative building products developed at CWHR
* Some building components used in the construction of low cost housing unit.

**CONSTRUCTION OF A LOW COST HOUSE USING RICE HUSK ASHAND LIME AS PARTIAL REPLACEMENT OF CEMENT**

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For utilization of agro-wastes a house was constructed for the first time, using rice husk ash and lime as partial replacement of cement in construction.

**MATERIALS AND TECHNIQUES**

* Rice Husk Ash and Lime has been used as cement in the fabrication of hollow, load bearing blocks and for mortar in plaster.
* The roof is prefabricated and consists of battens tiles; here too port land cement has been replaced by Rice Husk Ash to the extent of 30%.
* The foundation and base course are made up with soil stabilized with cement.

The cost of construction was reduced by 37%as compared to cost of construction by conventional methods.

**CONSTRUCTION OF A ROOM USING GROUND**

**GRANULATED BLAST FURNANCE SLAG AS**

**PARTIAL REPLACEMENT OF CEMENT**

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For utilization of industrial waste material, a room was constructed, using ground granulated blast furnace slag, (a waste product of Pakistan Steel Mills,) as partial replacement of cement in construction.

**MATERIALS AND TECHNIQUES**

* Load bearing walls are made of lime-slag-soil stabilized blocks.
* The lime-slag mixture consists of 30% lime and 70% slag. The blocks contain 10% of this mixture and 90% of soil by weight.
* The roof is prefabricated and consists of battens and tiles.
* 30% Portland Cement has been saved in the tiles by replacing with it with slag.
* The mosaic floor constitutes the mixture of slag, lime, cement and marble chips.

The cost of construction was reduced by 25% to 30% as compared to cost of construction by conventional methods.

**CONSTRUCTION OF A LOW COST SCHOOL USING SOIL CEMENT STABILIZED BLOCKS FOR MASONRY WALLS AND PRE-FABRICATED ROOF WITH SLAG CEMENT**

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For utilization of industrial wastes, a five room school was constructed using Soil-Cement Stabilized blocks for masonry walls and pre-fabricated roof using slag as partial replacement of cement in construction.

**MATERIALS AND TECHNIQUES**

* The foundation and base course of the floor is made of soil cement stabilized material.
* The load bearing walls have been constructed using soil cement stabilized blocks.
* The roof is constructed with precast batten tiles wherein 30% Portland cement has been replaced with finely ground granular slag.
* Air cooled slag was used in all the roofing elements as coarse aggregate.

The cost of construction was reduced by 43% as compared to cost of construction by conventional methods.

**CONSTRUCTION OF LOW COST HOUSING UNIT**



A demonstration and experimental low cost housing unit was constructed by utilization of alternative low cost construction materials and techniques including wastes. The overall saving of this house is 24% as compared to cost of construction by conventional methods.

**MATERIALS AND TECHNIQUES**

* Masonry walls have been constructed using irregular stone pieces, cast in low grade concrete to obtain shape of regular block masonry.
* Saving in the cost of shuttering has been achieved by using pre-cast U-Shaped Channel Blocks as lintels. The hollow spaces are filled with concrete with reinforcement bars.
* Arches have been constructed by using old truck tyres to save shuttering and labour cost.
* Cost of doors, windows, and their frames has been reduced by casting them with ferrocement.

1. Reinforced burnt clay pot slab tiles,
2. Reinforced burnt clay brick slab tile,
3. Precast RCC battens and ferrocement barrel shell planks.

**SOME BUILDING COMPONENTS USED IN THE CONSTRUCTION LOW COST HOUSING UNIT**

 

PRE-CAST REINFORCEMENTVBURNT CLAY FERROCEMENT BARREL

BRICK WAFFLE SLAB TILES FOR ROOFING SHELL ROOFING SYSTEM

 

PRE-CAST CONCRETE STONE U-SHAPED CHANNEL BLOCKS FOR LINTELS

MASONRY BLOCKS

**A MODEL ROOM BUILT WITH WHEAT STRAW CONCRETE BLOCK MASONARY WALLS AND**

**PRECAST BATTEN TILE ROOF**



A model room is constructed by using wheat straw concrete block masonry for load bearing walls with lightweight R.C.C. Tile Batten-Roofing system. This type of construction is economical and thermally comfortable for rural houses. The construction is simple, low cost and can be constructed on self help basis.

Mold Release Agents have been developed to provide the very best concrete stamp release and still allow optimum color retention in decorative concrete. It can be used in conjunction with Concrete Stamping Store Color Hardener to insure the best combination on the market today. Concrete Stamping Store Release Agents give a beautiful antique finish to the surface of stamped concrete. When used alone, it highlights the natural gray concrete with the defining lines of the concrete stamp. When used together, the color hardener and release agent create a very pleasing contrast.