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Siting Criteria For Low Rent Public Housing

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Work that is being carried out on this floor is described in para 5.

v) Precast Cellular slab-beam type.

This floor system was developed by the Central Building Research Institute, Roorkee, India.[8] It is similar to the composite Joist-Filler block type (Fig.10) except that the filler blocks are replaced by 4" thick cellular slabs of size 20" x 40" allowing a larger spacing of 40" for the joists. The floor can be made of entirely precast units or composite in construction.

vi) Precast Hollow beam type.Vide Fig.11.

The units for such floors are manufactured in one piece to the required span and therefore are restricted to a maximum span of 14' as beyond this limit the individual units become too heavy for easy handling. The beams are usually made 12" wide and their depth is varied to suit the span. The hollow cores are made by means of pneumatic tubes, which are inflated to the necessary pressure and fixed in position. About 12 hours after the concrete is laid the tubes are deflated and removed.

vii) Precast Joist-brick type.Vide Fig.12.

The floor system consists of precast trapezoidal joists with bevelled bricks on edge placed between them. The bricks can be bevelled at edges by masons during construction or they can be specially manufactured. This system is recommended where bricks of good quality are available at a reasonable rate. The depth and spacing of joists are governed by the dimensions of the brick.

viii) Precast panel type. Vide Fig.13.

The special feature of this floor is that a standard panel of size 8" x 24" x 168" has been developed by the Calcutta Metropolitan Planning Organization[2] for the purpose of using it for low-cost housing in rural areas. The use of this standard panel eliminates completely the forms and scaffoldings and the need for plastering the concrete surfaces. The amount of concrete and steel required for this panel is found to be considerably less than that required under conventional cast-in-situ flooring.

ix) Precast doubly curved tile type.[9]Vide Fig.21a.

This floor system consists of 3/4" to 1" thick plain concrete doubly curved tiles square or rectangular in plan supported on partially precast concrete joists. The method of making tiles and joists and construction of the floor is so devised that it can easily be adopted by unskilled workers, even at the village level. By adopting a smaller size of the tile (shell) units, even the normally required R.C.C. edge beams can be omitted.

4.2.2.Roofs:

The construction of precast roofs is similar to that of floors except that the roofs require improved insulation through a ceiling or by an additional insulation course. The special requirements for roofs are given below:

Water Proofing: In order that a roof is leak-proof against heavy rains, it is adequately sloped to drain away water and a water proof course is laid over the structural slab. The slope required is generally 1 in 50 and is provided either in the structural roof or in the insulation layer.

Several methods of water proofing are available including.

i) Lime terracing - an indigeneous method popular in the Eastern and Northern parts of the country.

and ii) Laying a bitumen compound or felt.

A simple method of water proofing is to place a layer of paper or bitumen and cover it with another layer of 1 1/2" thick flat tiles set in cement mortar.

Thermal insulation: Due to the prevalence of high temperatures in India, thermal insulation of roofs is very essential for comfortable living.

A number of proprietory insulating materials, which are costly, are available but equally effective results can be obtained with a 3" layer of earth preferably mixed with rice husk and covered with 3/4" flat tiles set in cement mortar or a 2" insulating concrete layer made with rice husk, cinder or other light weight aggregates.

As air is a good insulating medium, the adoption of such roof systems as Hollow beam, Cellular slab-beam or composite joist-filler block type in which air spaces are preformed in the structural portion of the roof itself is advantageous. In such roofs, the insulation layer may be dispersed with or its thickness can be considerably reduced.

4.3. New forms of door and window frames.

Since good seasoned wood is not easily available except at exorbitant prices, substantial savings in cost can be affected by replacing the timber frames of doors and windows by those of reinforced concrete. They cost about half the price of country teakwood and are becoming increasingly popular, especially for low-cost houses. The details of doors and windows with R.C.C. frames are given in Fig.17.

4.4. New forms of lintels.

For low cost houses, dressed stone lintels upto a clear span of 3'-0" are used. Even stone sunshades are used when they are locally available. Also present R.C.C. lintels with or without sunshades are widely used. The details of a precast lintel with sunshade are given in Fig.18.

4.5. Erection.

A simple device of lifting precast roof units is illustrated in Fig.19. In this device, no special mechanical lifting tackle is used. The units are tied with ropes and dragged up along the inclined rafters by two unskilled laborers.

5. WORK BEING CARRIED OUT BY THE AUTHORS.

The authors are now investigating the various aspects of the composite joist-filler block system (Fig.10) with a view to effecting further economy. This system, because of its flat ceiling, has better appearance. It also has better insulating properties due to the presence of hollow spaces in it. The cast-in-situ concrete while acting as a compression

flange of the joist, makes the system monolithic. It uses less quantity of steel for the same covered area and virtually eliminates the costly forms and scaffoldings. It is about 25% cheaper than the conventional R.C.C. roof. The units (Filler blocks and joists) are manufactured using simple wooden moulds shown in Fig.14 and 15 respectively.

In some of the filler blocks, cement is partly replaced by fly ash to reduce their cost and sand is replaced by coal ash to reduce their weight. Also short pieces of binding wire are mixed in the cement mortar on the tension side of some of the filler blocks to see whether they will improve the tensile strength. In order to study the short and long time behavior of this roof, a demonstration room is constructed and it is now under observation. The photographs showing the filler blocks as they are manufactured and the wooden mould used to manufacture the same are given in Fig. 16a and 16b respectively. The photograph showing the arrangement of the filler blocks on joists is given in Fig. 16c.

6. TYPICAL LOW-COST HOUSES.

In India, according to a recent estimate, there is a dearth of about 12 million houses in urban areas and 72 million houses in rural areas. Most of these houses are generally needed for slum clearance schemes in big and small cities and for accommodating the growing number of industrial workers, whose needs can be met by low-cost houses. A low-cost house is generally meant for a small family with low-income and consists of one or two living rooms in addition to a kitchen with dining room, bath and lavatory. The bath and the lavatory rooms may not always be roofed. The area of such houses varies from 150 to 400 sq.ft. and the cost is about Rs. 25/-per sq.ft. of plinth area, if the conventional type of construction is adopted. The typical layout of a low cost house with conventional type of construction is given in Fig. 20. The sections of three units of low cost-houses with load bearing walls using new forms of construction are shown in Fig. 21.

Also the plan, section and elevation of a typical low-cost house with non-load bearing walls and candella type hyperbolic paraboloid roof[10] are shown in Fig. 22. The photographs showing the form work for the shell and the partition walls of the house are given in Fig. 23a and 23b respectively.

The houses, the details of which are given in Fig. 21 and 22 are actually constructed at Visakhapatnam by Town-Planning Trust[10] for demonstration. A statement of comparative costs based on the type of construction is given in Table. I.

TABLE.I.

Statement of comparative costs.

Sl. No.	Type of construction.	Plinth area of one unit, sq.ft.	Plinth area cost/ sq.ft.	Remarks.
			Rs.Ps.	
1.	Conventional brick masonry (load-bearing) for walls with R.C.C.roofing and cement or stone slab flooring (Fig. 20).	340	25.00	
2.	Precast concrete hollow block masonry for walls with D.C.shell roofing and Hessian flooring(Fig.21)	170	14.64	This cost is based on the existing rates of materials and labor in Andhra Pradesh South India.
3.	Precast concrete hollow block masonry for walls with precast T-beam roofing and precast slab flooring (Fig.21)	170	15.04	
4.	Precast concrete hollow block masonry with composite joist-filler block roofing and brick on-edge flooring (Fig.21)	170	14.15	
5.	9" and 6" brick masonry for partition walls with Candella type H.P.shell roofing and brick-on-edge flooring (Fig.22)	264	11.50	Bath and W.C. not roofed.

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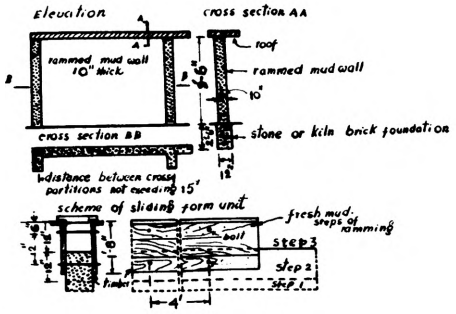

FIG. 1. RAMMED STABILISED MUD WALL.

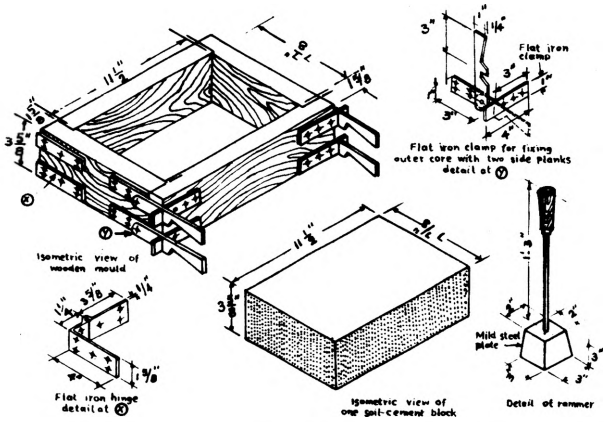

FIG. 2. A WOODEN MOULD FOR MAKING SOIL-CEMENT BLOCKS.

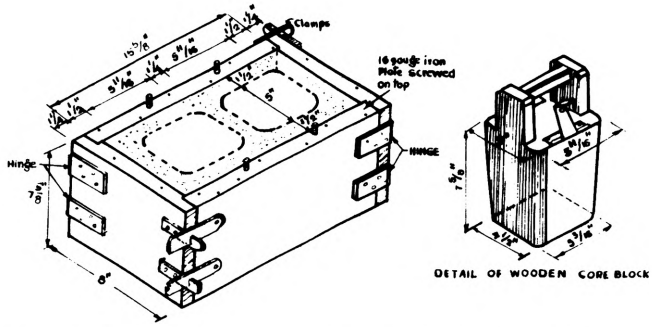

FIG. 3(a) WOODEN MOULD FOR MAKING ONE HOLLOW CONCRETE BLOCK AT A TIME.

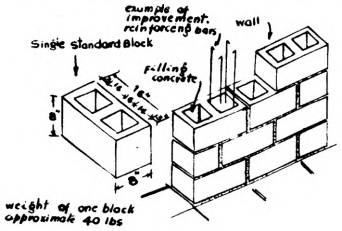

FIG. 3(b) CONCRETE HOLLOW BLOCK WALL

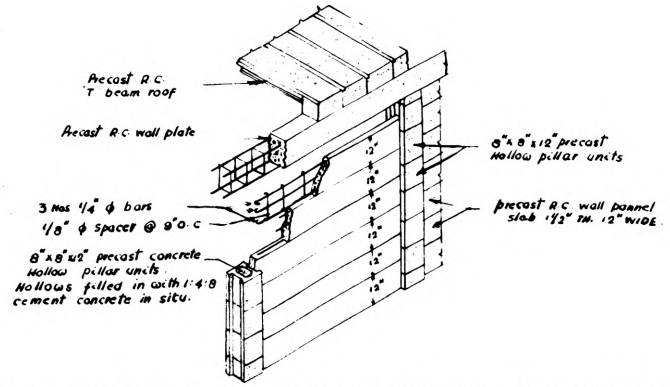

FIG. 4. GENERAL DETAILS OF PILLAR AND PANEL CONSTRUCTION.