National Council for Cement and Building Materials

CONCRETE BLOCKS : AN ALTERNATIVE TO BURNT CLAY BRICKS

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NCB TECHNOLOGY DIGEST

CONCRETE BLOCKS : AN ALTERNATIVE TO BURNT CLAY BRICKS

INTRODUCTION

THE National Housing Policy aims at providing houses to the millions and eradicate houselessness from this country by the turn of this century. A gigantic programme of this nature calls for enormous resources in terms of materials. While the supply of cement, steel, etc, may not pose any problem, the availability of other construction materials, particularly bricks is likely to cause concern. The current production of bricks is placed at around 60 billion bricks. Taking into consideration the supply position of coal and availability of land for bricks making, the average growth rate in the brick industry is not expected to be more than 3 per cent during the Eighth and Ninth Plans.

For making first class burnt clay bricks, clay soils of deltaic alluvium are best suited. The alluvial belt suitable for making good quality bricks is mainly confined to the plains of North India. Other areas, namely, Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra and parts of Gujarat, Madhya Pradesh, Orissa, etc, excepting isolated pockets near to the coastal region, are comprised of different grades of black soils, red soils or laterite soils which are either unsuitable for making bricks or render bricks of poor quality. Black soils and its derivatives and mixtures do not make good bricks as these soils swell enormously when wetted and consequently shrink upon drying, producing cracks in the bricks. Red soils are of low plasticity and succumb to lime bursting upon firing. The bricks made of these soils are porous and of low compressive strength. The laterite soils are non-plastic and cannot be moulded in plastic form. Because of this, the bricks produced in the states of Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu are of poor quality having a compressive strength of 30 kg/sq cm compared to a strength of 70 kg/sq cm and above for the bricks manufactured in the Northern Region.

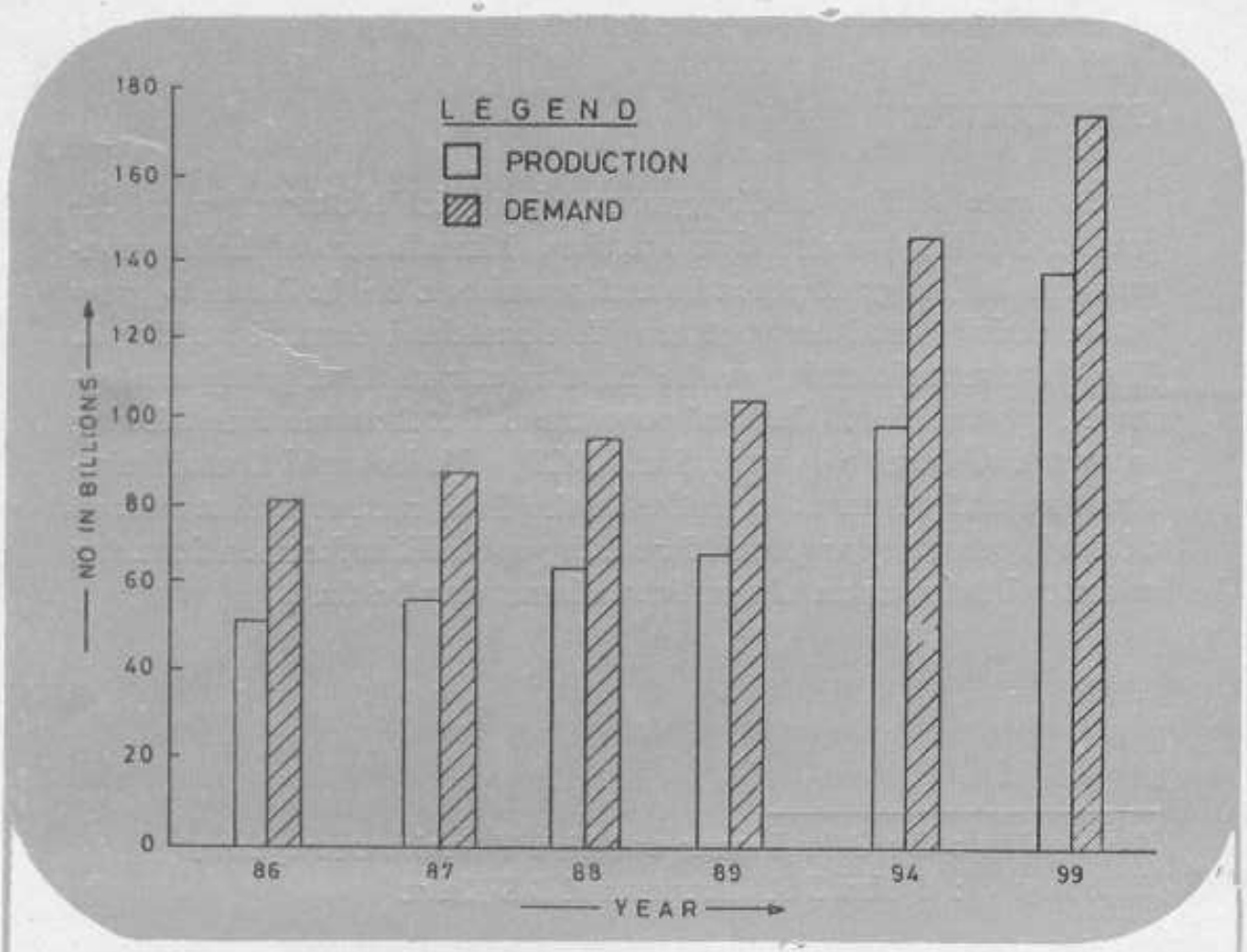

Fig 1 Brick Production

The estimate on production and demand for burnt clay bricks show that this gap will persist for years to come, as is clear from Fig. 1. Also, even though housing activity is more intense around urban centres, the brick manufacturing units are pushed away from urban areas due to scarcity of suitable land, resulting in shortage leading to high prices in certain urban areas. On account of poor quality and high cost of bricks, concrete block is a feasible alternative walling material.

It is interesting to note that a good number of cement plants are situated in or near areas identified as having soils unsuitable for making good bricks, ie, Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu, etc. In such areas, the proximity of the cement plants ensures regular supply of cement to the units manufacturing these blocks. Also, the quality of burnt bricks available in these areas being poor, concrete blocks can compete as a suitable substitute walling material.

This Technology Digest presents the manufacturing technology and cost economics of concrete blocks for walling purposes.

WALLING

Concrete block construction scores over brick masonry in a number of aspects, making it a promising alternative walling material. Concrete blocks may be solid or hollow. Hollow blocks are preferred in general building works as they are more economical, light and possess heat and sound insulation properties. The dimensions of various types of blocks are detailed in IS : 2185-1979. Blocks are laid on end in single layer for general wall construction (Fig 2). While the normal thickness adopted for brick wall construction is 23 cm, using hollow concrete blocks, 20 cm walls are made if load bearing and still thinner sections may be adopted for partition walls. This results in economy. For constructing a wall of same thickness, comparison of brick masonry and hollow block masonry indicates that in case of the latter there is about 60% reduction in the requirement of mortar. Concrete block walling is faster as one block is equivalent to about 10 bricks. This reduces

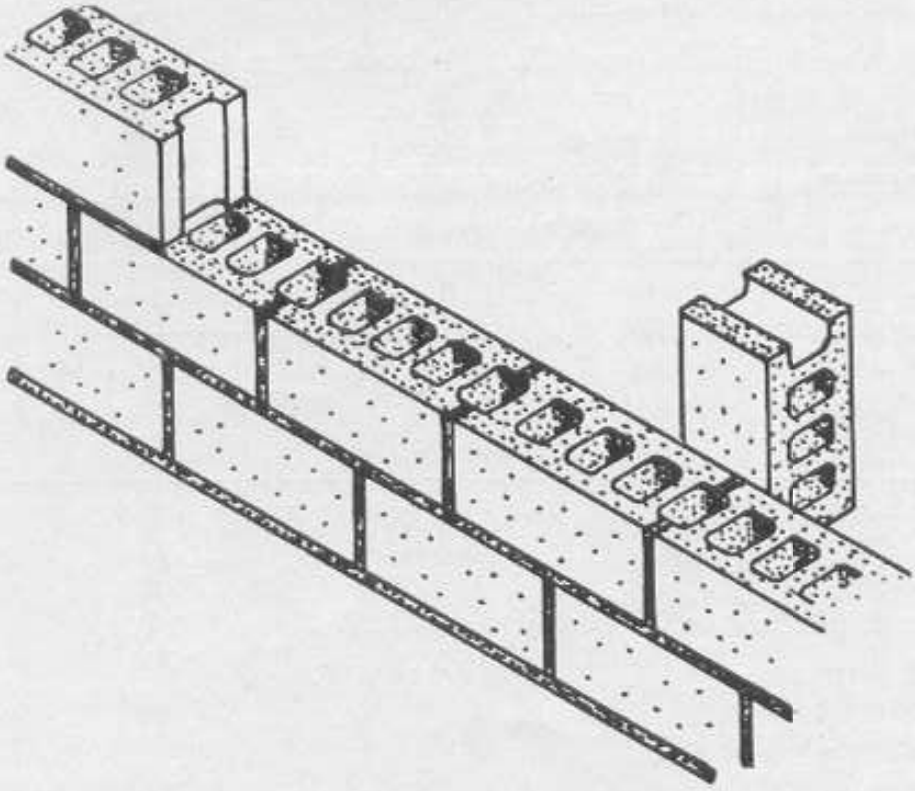

Fig 2 Laying af Blocks

construction time and overhead costs. With lesser water absorption and hard surface, concrete block masonry is more durable than brick masonry and requires lesser maintenance.

MANUFACTURE

Basic raw materials required for production of concrete blocks are cement and coarse and fine aggregates. In addition, availability of water has to be ensured for mixing and curing operations. If any of these materials are not available locally in the required quantity, it may not be practicable to adopt production of hollow concrete blocks.

Manufacturing of hollow concrete blocks can be undertaken as a cottage industry or as a small scale industry depending upon the demand projection and capacity of production envisaged. Concrete hollow blocks are commercially produced in a concrete block making machine. For small requirements in remote areas, hand moulding may be adopted. As the transportation of these blocks is likely to increase its cost and make it incompetent vis-a-vis local bricks, it is necessary that these manufacturing units be established as near as possible to the demand centres.

Ordinary portland cement or portland pozzolana cement may be used for making the blocks. The coarse aggregate should be of 10 mm maximum size. Sand complying with zone II may be used. All materials should be conforming to the relevant BIS Standards. A mix proportion of 1:5:6 with a water/cement ratio of 0.45 is recommended.

The raw materials are weigh batched and mixed in a concrete mixer. The concrete is fed into the concrete block making machine and the blocks are cast on the floor of the casting yard. The blocks are left in its position for 24 hours to set and gain some strength. They should be kept in shade and should be protected from dry winds. The blocks are then transferred to the damp curing yard and kept unstacked for another two days. Thereafter the blocks are stacked in layers of up to 8 levels and cured. Curing may be done by sprinkling water on the entire exposed surface of the stack. Curing should proceed for at least 14 days and preferably for 21 days.

Depending on the intended use, the blocks should possess the required minimum compressive strength and water absorption characteristics as per IS : 2185-1979.

ECONOMICS*

The project details for setting up a concrete block manufacturing unit of 2000 blocks per day capacity are given in Table 1. As a typical example, blocks of dimensions 39 cm × 19 cm × 19 cm are being considered.

TABLE 1

ABSTRACT COST ESTIMATE
(January 1989)

1	Project	:	Manufacture of concrete hollow blocks, 39 x 19 x 19 cm size
2	Capacity	:	600,000 blocks per annum (300 working days)
3.1	Fixed Capital	:	Rs 426,000
3.2	Working Capital	:	Rs 240,200
4	Manpower	:	33 Nos
5	Land Requirement	:	4000 sq m
6	Turn over	:	Rs 3,101,400 per annum
7	Production Cost	:	Rs 5,170 per 1000 blocks

The production cost of these blocks works out to be Rs 5.17 per unit (January 1989). Working capital is based on one month's production cost. After giving a profit margin of 12%, a tentative ex-factory sales price of Rs 5.80 per unit (excluding taxes and transportation charges) is proposed. The break up on unit price is shown in Fig 3.

A comparative analysis of brick masonry and concrete hollow block masonry is presented in Table 2. Even though the cost of concrete blocks may be slightly more than that of burnt clay bricks per unit area of walling, considering the saving in mortar, the overall cost is estimated to be about 10% less than that of brick masonry.

*as on January 1989 price

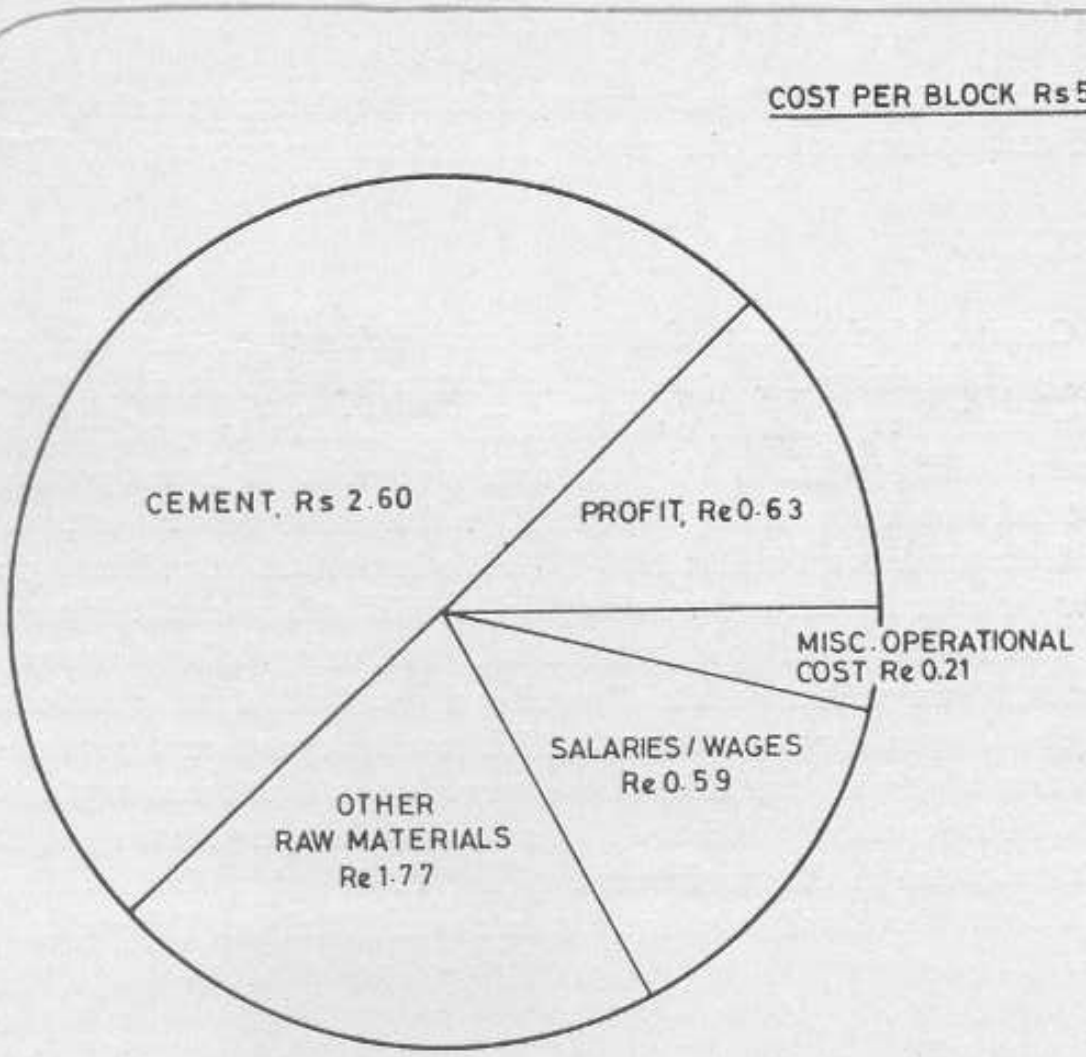

Fig 3 Break-up of Unit Cost of Concrete Block (1989)

TABLE 2

COST COMPARISON FOR ERECTING WALL OF 1 SQ. M AREA
(Based on January 1989 Prices)

Sl No	Description	Brick Masonry		Concrete Block Masonry 19 cm thick
		Ordinary Bricks 23 cm Thick	*Nodular Bricks 19 cm Thick*	
1.1	No of bricks/blocks	94	100	12.5
1.2	Rate/1000, Rs	600	800	5,800
1.3	Cost, Rs	56.40	80.00	72.50
2.1	Quantity of mortar, lit	41.0	36.1	14.0
2.2	Cost, Rs	27.70	23.50	9.10
3	Labour charges, Rs	8.10	8.10	4.20
4	Plastering charges, Rs	51.00	41.00	41.00
5.1	Net cost, Rs	142.20	152.60	126.80
5.2	Cost Ratio	1.12	1.20	1

CONCLUSION

Concrete hollow block masonry is a viable alternative to the present building construction practices. Manufacture of hollow concrete blocks has great potential and promises a bright future to grow into a thriving business venture with a sustained demand backing it. The block manufacturing can be taken up at rural level giving employment opportunities to the local populace and at the same time ushering in an era of durable construction. NCB, with its sophisticated infrastructure and advanced expertise in the field, renders assistance and advice in executing proposals for setting up facilities for manufacturing concrete blocks, as an alternative to burnt clay bricks.

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