

CEMENT CONCRETE HOLLOW BLOCKS

INTRODUCTION

Cement concrete hollow blocks have an important place in modern building industry. They are cost effective and better alternative to burnt clay bricks by virtue of their good durability, fire resistance, partial resistance to sound, thermal insulation, small dead load and high speed of construction. Concrete hollow blocks being usually larger in size than the normal clay building bricks and less mortar is required, faster construction is achieved. Also building construction with cement concrete hollow blocks provides facility for concealing electrical conduit, water and sewer pipes wherever so desired and requires less plastering.

MARKET POTENTIAL

Cement concrete hollow blocks are modern construction materials and as such are used in all the constructions viz. residential, commercial and industrial building constructions. Construction industry is a growing a sector. The demand for this product is always high in all cities and other urban centers due to construction of residential apartments, commercial buildings and industrial buildings.

Growing public awareness of the advantages of the product coupled with increase in the government and financial institutions support for housing which is a basic human necessity would ensure a healthy growth in the demand.

BASIS AND PRESUMPTIONS

- (1) **Interest rate:** 15% per annum on total capital investment is taken into consideration.
- (2) **Margin money:** The promoter may bring in one-third of both fixed capital and working capital requirements.
- (3) **Efficiency:** 75% utilisation of machinery and manpower has been

considered.

- (4) **Labour wages:** Minimum wages applicable for semi-skilled and unskilled workers were taken into consideration.
- (5) **Working shifts per day:** It is envisaged that the enterprise will be in operation on single shift of 8 hours per day basis for 300 working days in year.

IMPLEMENTATION SCHEDULE

It will take six months to complete all the formalities before starting the commercial production.

TECHNICAL ASPECTS

RAW MATERIALS

Concrete is a mixture of ordinary Portland cement, mineral aggregate (sand and stone chips) and water. The water used in preparing the concrete serves two purposes:

- (i) It combines with the cement to form a hardened paste
- (ii) It lubricates the aggregates to form a plastic and workable mass

The water that combines with the cement varies from about 22 to 28% of the total amount of mixing water in concrete.

Mineral aggregates (sand and stone chips) are normally divided into two fractions based on their particle size. Aggregate particles passing through the No.4 or 4.7 mm Indian Standard sieve are known as fine aggregate. The particles retained on this sieve are designated as coarse aggregate. Natural sand is often used as fine aggregate in cement concrete mixture. Coarse aggregate are crushed stone chips. Crushed stone chips broken into particle sizes passing through the 4.7 mm sieve may also be used as fine aggregate. The maximum size of the coarse aggregate that may be used in cement concrete hollow blocks is 12.5 mm. However, the particle size of the coarse aggregate should not exceed one third thickness of the thinnest web of the hollow blocks.

Ordinary Portland cement is the cementing material used in cement concrete hollow blocks. Cement is the highest priced material per unit weight of the concrete. Hence, the fine and coarse aggregates are combined in such proportions that the resulting concrete is workable and has minimum cement content for the desired quality.

MANUFACTURING PROCESS

The process of manufacture of cement concrete hollow blocks involves the following 5 stages;

- (1) Proportioning
- (2) Mixing
- (3) Compacting
- (4) Curing
- (5) Drying

(1) Proportioning:

The determination of suitable amounts of raw materials needed to produce concrete of desired quality under given conditions of mixing, placing and curing is known as proportioning. As per Indian Standard specifications, the combined aggregate content in the concrete mix used for making hollow blocks should not be more than 6 parts to 1 part by volume of Portland cement. If this ratio is taken in terms of weight basis this may average approximately at 1:7 (cement : aggregate). However, there have been instances of employing a lean mix of as high as 1:9 by manufacturers where hollow blocks are compacted by power operated vibrating machines. The water cement ratio of 0.62 by weight basis can be used for concrete hollow blocks.

(2) Mixing

The objective of thorough mixing of aggregates, cement and water is to ensure that the cement-water paste completely covers the surface of the aggregates. All the raw materials including water are collected in a concrete mixer, which is rotated for about 1 ½ minutes. The prepared mix is discharged

from the mixer and consumed within 30 minutes.

(3) Compacting

The purpose of compacting is to fill all air pockets with concrete as a whole without movement of free water through the concrete. Excessive compaction would result in formation of water pockets or layers with higher water content and poor quality of the product.

Semi-automatic vibrating table type machines are widely used for making cement concrete hollow blocks. The machine consists of an automatic vibrating unit, a lever operated up and down metallic mould box and a stripper head contained in a frame work.

Wooden pallet is kept on the vibrating platform of the machine. The mould box is lowered on to the pallet. Concrete mix is poured into the mould and evenly levelled. The motorised vibrating causes the concrete to settle down the mould by approximately $1\frac{1}{2}$ to $1\frac{3}{4}$ inches. More of concrete is then raked across the mould level. The stripper head is placed over the mould to bear on the levelled material. Vibration causes the concrete come down to its limit position. Then the mould box is lifted by the lever. The moulded hollow blocks resting on the pallet is removed and a new pallet is placed and the process repeated. The machine can accommodate interchangeable mould for producing blocks of different sizes of hollow or solid blocks.

(4) Curing

Hollow blocks removed from the mould are protected until they are sufficiently hardened to permit handling without damage. This may take about 24 hours in a shelter away from sun and winds. The hollow blocks thus hardened are cured in a curing yard to permit complete moisturisation for atleast 21 days. When the hollow blocks are cured by immersing them in a water tank, water should be changed atleast every four days.

The greatest strength benefits occur during the first three days and valuable effects are secured up to 10 or 14 days. The longer the curing time permitted the better the product.

(5) Drying

Concrete shrinks slightly with loss of moisture. It is therefore essential that after curing is over, the blocks should be allowed to dry out gradually in shade so that the initial drying shrinkage of the blocks is completed before they are used in the construction work. Hollow blocks are stacked with their cavities horizontal to facilitate thorough passage of air.

Generally a period of 7 to 15 days of drying will bring the blocks to the desired degree of dryness to complete their initial shrinkage. After this the blocks are ready for use in construction work.

PRODUCTION CAPACITY

The plant and machinery proposed in the project has a production capacity of 400000 Nos. of cement concrete hollow blocks of size 100 X 200 X 400 mm. At 75% utilisation of the capacity, productions of 300000 Nos. of blocks have been taken into consideration.

Cement concrete hollow blocks are usually of the following three dimensions:

100 X 200 X 400 mm, 150 X 200 X 400 mm and 200 X 200 X 400 mm. Although hollow blocks of all the three sizes could be made using the same machinery and equipment proposed in the project, for computation purpose only one size viz 100 X 200 X 400 mm is considered in the sales turnover.

Hollow blocks of other sizes could also be made depending on the user requirement. With the given set of machinery and equipment used in making the hollow blocks, solid blocks could also be made with the help of additional mould sets only.

UTILITIES

Electrical Power requirement: 25 HP power for industrial purpose is required. Water: water used in making concrete should be free from acids, alkalis, oil, dissolved carbon dioxide and decayed vegetable matter. Generally, water suitable for human consumption is considered adequate for concrete mixing.

FINANCIAL ASPECTS

A. FIXED CAPITAL

(1) LAND & BUILDING

SN	Description	Quantity	Units	Rate per unit(Rs)	Amount(Rs)
1	Land	800	Sq. meters	500	400000
2	Covered area	60	Sq. meters	6000	360000
3	Concrete platform	200	Sq. meters	1200	240000
4	Borewell with pump	Lumpsum			100000
	TOTAL				11,00,000

(2) MACHINERY & EQUIPMENT

SN	Description	Quantity	Units	Rate per unit(Rs)	Amount(Rs)
1	Hydraulically operated concrete block making machine with quadruple (4) vibrators: Hydraulic system – 5 HP Mould vibrators – 5 HP Ram vibrators – 3 HP (1.5 HP – 2 Nos.) Travel motor – 1 HP	1	No.	450000	4,50,000
2	Concrete mixer: 10/7 cft with 5 HP motor, hydraulic hopper and road wheels	1	No.	250000	2,50,000
3	Platform electronic weighing scale 500 kgs capacity	1	No.	100000	1,00,000
4	Water dosing pump	1	No.	30000	30,000
5	Electrical and EB charges for 25 HP power connection	Lumpsum			70,000
	Total				9,00,00
6	Erection and commissioning charges @ 10% of Total	Lumpsum			90,000
7	Ram and mould for hollow blocks	1	Sets	30000	1,20,000
8	Wheel borrows with pneumatic wheels	2	Nos.	15000	30,000
9	Office equipment	Lumpsum			1,50,000
10	Wooden palettes	Lumpsum			1,10,000
	TOTAL				14,00,000

(3) PRE-OPERATIVE EXPENSES	Rs 1,00,000
(4) TOTAL FIXED CAPITAL	Rs 26,00,000

B. WORKING CAPITAL (PER MONTH)

(1) SALARY & WAGES (PER MONTH)

SN	Description	Nos.	Salary	Amount
1	Skilled or semi-skilled workers	2	12000	24,000
2	Unskilled workers	8	8000	64,000
3	Watch and ward	1	6000	6,000
4	Manager/Supervisor	1	16000	16,000
Total				1,10,000
Perquisites @ 15%				16,500
Total				1,26,500

(2) RAW MATERIALS (PER MONTH)

SN	Description	Quantity	Units	Rate per unit	Amount
1	Cement	50	Tons	5000	2,50,000
2	Sand or crushed stone sand	200	Tons	400	80,000
3	Crushed stone chips	300	Tons	600	1,80,000
TOTAL					5,30,000

(3) UTILITIES (PER MONTH)

SN	Description	Quantity	Units	Rate per unit	Amount
1	Power	1500	KWh	6	9,000
2	Water	250	KL	30	7,500
TOTAL					16,500

(4) MISCELLANEOUS EXPENSES (PER MONTH)

SN	Description	Amount
1	Office expenses	6,000
2	Consumables	6,000
3	Repairs and maintenance	8,000
4	Sales expenses	10,000
TOTAL		34,000

(5) TOTAL WORKING CAPITAL (PER MONTH)	7,07,000
(6) WORKING CAPITAL FOR THREE MONTHS	21,21,000

(7) TOTAL CAPITAL INVESTMENT 47,21,000

FINANCIAL ANALYSIS

(1) COST OF PRODUCTION (PER ANNUM)

SN	Description	Amount
1	Total recurring cost	84,84,000
2	Depreciation on building @ 5%	35,000
3	Depreciation on machinery and equipment @ 10%	99,000
4	Depreciation on moulds, wheel borrows, etc. @20%	82,000
5	Amortisation of pre operative expenses @ 10%	10,000
6	Interest on capital investment @ 15%	7,08,150
	TOTAL	94,18,150

(2) SALES TURNOVER (PER YEAR)

SN	Production Item	Quantity	Rate	Amount
1	cement concrete hollow blocks of size 100X200X400 mm.	600000	20 each	1,20,00,000

(3) NET PROFIT (PER YEAR) 25,81,850

(4) PROFIT RATIO ON SALES 21.51%

Profit Ratio On Sales =

$$\frac{\text{Net Profit Per Year} \times 100}{\text{Sales Turnover Per Year}} = \frac{25,81,850 \times 100}{1,20,00,000} = 21.51\%$$

$$\text{Sales Turnover Per Year} = 1,20,00,000$$

(5) RATE OF RETURN

$$\text{Rate of Return} = \frac{\text{Net Profit Per Year}}{\text{Total Capital Investment}} \times 100 = \frac{25,81,850}{47,21,000} \times 100 = 54.69\%$$

BREAK EVEN ANALYSIS

(1) FIXED COST PER YEAR

SN	Description	Amount
1	Interest on capital investment @ 15%	6,18,150
2	Depreciations (Machinery @ 10%, Tools @ 25% & Furniture @ 20%)	1,79,500
3	40% of salaries and wages	6,07,200
4	40% of miscellaneous expenses	1,63,200
	TOTAL	15,68,050

Fixed Cost Per Year 15,68,050

B.E.P = 37.79 %

LIST OF SUPPLIER ADDRESS FOR PLANT & MACHINERY

- (1) M/S Maya Engineers, No.19, Gandhipuram, Coimbatore – 641 001
- (2) M/S VRT Concrete Block Machines, No.46, Kamarajar Road, Peelamedu, Coimbatore – 641 004

