PROJECT PROFILE ON SOIL CEMENT BLOCKS

PRODUCT	:	Soil Cement blocks
PRODUCTION CAPACITY	:	
Quantity	:	720000 Nos. per annum
Value	:	Rs 50.40 Lakhs per annum
QUALITY STANDARD	:	IS 1725 – 1982 (First Revision) (Reaffirmed 1997)
MONTH & YEAR of Preparation	:	December 2010
PREPARED BY	:	Glass & Ceramics Division MSME Development Institute Govt of India, Ministry of MSME 65/1, G.S.T. Road, Guindy, Chennai - 600 032 Phone: 044-22501011

INTRODUCTION OF THE PRODUCT

Soil cement blocks are cost effective and energy efficient alternative materials to the normal burnt clay bricks used for construction of buildings. Soil cement blocks are also known as stabilized mud blocks (SMB) or stabilized compressed earth block (SCEB).

Ordinary Portland cement is the most usual stabiliser added 5 to 10% by weight to the soil. Other stabilisers like lime, puzzolana or a combination of cement and lime are also used.

Soil cement blocks being usually 2 ½ times larger in size the normal burnt clay bricks, the construction is faster and the joints are consequently reduced. The less number of joints also result in cutting down the amount of mortar required. From the environmental considerations also, use of soil cement blocks in construction work result a substantial saving of energy as no fuel is required for its manufacture.

While in general building construction, soil cement blocks may be used as a substitute for normal burnt clay bricks, their use should be avoided in the case of isolated load bearing columns, piers and such heavily loaded structures.

MARKET & DEMAND ASPECTS

Housing is one of the three basic necessities of human life. Demand for housing is always far exceeds the supply. There is bound to be good scope for projects of this nature.

Traditionally, the burnt clay brick has been the common form of building construction material. There are other alternative construction materials like natural stone, cement concrete hollow blocks, etc.

Soil cement blocks are the ideal construction materials for low cost housing projects undertaken by the government under various housing schemes for upbringing of the common man. A number of government agencies are promoting the usage of this alternative building material in the construction activities.

Public awareness about the low cost housing using alternative building materials is more pronounced in urban areas rather than in rural areas where it is more required to be promoted. There is a need for suitable mechanism by which

more and more rural housing schemes using low cost building materials are encouraged.

IMPLEMENTATION SCHEDULE

Sl	Description of the activity	Time (approx.)
1	Selection of the product	1 month
2	Preparation of the project report	
3	Selection of the location	
4	Registration of enterprise with DIC	
5	Mobilising finance for the project	4 months
4	Purchase of land	
5	Construction of building	
6	Procurement of machinery and equipment	
7	Obtaining EB connection	
8	Erection and commissioning of machinery and equipment	
9	Recruitment of manpower	1 month
10	Trial run and commencement of production	
	Total project implementation period	**6 months**

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.

(6) Implementation period: Project implementation period of 6 months is envisaged

RAW MATERIALS

Soil or raw earth is the principal raw material. Ordinary Portland cement and water are other two constituents required for manufacture of soil cement blocks. Sand and crushed stone dust may also be added to the soil depending on the type of soil. Lime and puzzolana cement are the alternative soil stabilising materials may also be used. A combination of cement and lime is also used as a soil stabiliser.

MANUFACTURING PROCESS

The process of manufacture of soil cement blocks involves the following five steps:;

(1) Analysis of the soil
(2) Sifting of the soil
(3) Preparation of the mix
(4) Compaction of the blocks
(5) Curing of the blocks

(1) Analysis of the soil

Soil composition and analysis through comprehensive tests in a laboratory is very important. This will be required to estimate amount of cement, and other missing native constituents that must be added to the final mix. All soils are made up of three components: sand, silt, and clay. These components are defined on the basis of particle size, sand being the coarsest of the three and clay the finest.

Optimum composition of soil for soil cement blocks is made up of approximately 75% sand and only 25% of silt and clay. The clay content should never comprise less than 10% or more than 50% of the soil. Most soils , when reasonably free from vegetable matter, can be satisfactorily with cement, lime or cement and lime.

We can get a rough idea of the composition of the soil by simply picking up a handful and feeling it. Sand naturally has a corse and gritty texture, while silt has the consistency of flour. Moist clay is smooth to the touch, is somewhat sticky, and will form a ribbon as you compress it between your thumb and forefinger.

We can estimate the percentages of each of the three components in the soil: (1) Fill a straight-sided glass jar about one-full of soil. (2) Add an equal amount of water. (3) Cover the jar and shake vigorously to suspend all the dirt. (4) Finally, allow the slurry to sit undisturbed about 30 minutes or until the soil has settled into three separate layers with the sand at the bottom.

(2) Sifting of soil

Soil should be dried and sieved (to remove large lumps, stones, leaves, and other impurities) before it can be used properly mixed with cement and

compressed into blocks. Sturdy frames with metallic meshes can be used for sifting of soil.
The soil has the proper moisture content for sifting when (1) a handful can be squeezed without water appearing on its surface, and (2) the ball of soil disintegrates without lumps as it is released.

(3) Preparation of the mix

Once soil has been dried and sifted, we can begin to prepare the mix from which blocks will be pressed. The amount of Portland cement to be used will depend on the composition of the soil. Sandy soils require 5 to 9% cement by volume. Silty soils need 8 to 12%, and clayey soils require 12 to 15% cement as stabiliser. More than 15% by volume is not recommended.

Mix thoroughly all the ingredients: cement, soil, and special additions such as sand or clay that may be needed. After drying mixing of all the ingredients, water is added a little at a time until the damp soil-cement reaches the right consistency. We can use a garden hose with te nozzle adjusted to produce a fine spray. A concrete mixer machine is suitable for preparing the mix.

Do the simple test to know the right consistency of the mix. Take a small amount of mix and form it into a ball in your hand, the resulting clod should both hold its shape and not stain your palm..

(4) Compaction of the blocks

Hydraulic operated machine is proposed in the project for compacting soil-cement into blocks of desired size. Hand-operated machines may also be used in place of power operated machines.

The prepared mix can placed into the mould of the machine and pressure is applied and after compaction, the block formed is ejected from the mould and stacked. Delicate touch is needed for removing the fresh blocks from the mould and stacking, as blocks are plastic and fragile when newly formed.

(5) Curing of the blocks

Place the blocks as soon as possible on a flat, non-absorbent surface in a shady environment to cure. Set each block on edges and space the blocks far enough apart so that they do not touch each other. After 24 hours of moulding blocks must be thoroughly sprinkled three times a day with the fine water spray. The slower the block dry, the stronger they will be. So, during the first four days of curing, blocks be covered with plastic.

Blocks may be stacked after four days, but the sprinkling should be continued for another eight days. Finally, three weeks after leaving the mould, the blocks can be used in construction.

QUALITY SPECIFICATIONS

IS 1725 – 1982: Indian Standard Specification for Soil based Blocks used in General Building Construction (First Revision) (Reaffirmed 1997)

The above standard specifies requirements for soil cement blocks on the following parameters: sizes of blocks, compressive strength, water absorption, and weathering.

PRODUCTION CAPACITY

The plant and machinery proposed in the project has a production capacity of 900000 Nos. of soil cement blocks of size 29 x 9 x 9 cm. At 75% utilisation of the capacity, productions of 720000 Nos. of blocks have been taken into consideration.

The above mentioned Indian Standard specification IS 1725 – 1982 specifies the following three sizes for soil cement blocks: 29 x 19 x 9 cm, 19 x 9 x 9 cm and 19 x 9 x 4 cm. Although soil cement 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 29 x 19 x 9 cm is considered in the sales turnover.

UTILITIES

Electrical Power requirement: 25 HP power for industrial purpose is required.

Water: water used should be free from acids, alkalis, oil, dissolved carbon dioxide and decayed vegetable matter. Generally, water suitable for human consumption is considered adequate for using with soil-cement mix.

RESOURCE CENTRE OF TECHNOLOGY

(1) Centre for Sustainable Technologies, Department of Civil Engineering, Indian Institute of Science, Bangalore – 560 012
(2) Development Alternatives, No.111/9-2, Kishangarh, Vasanth Kunj, New Delhi – 110 070

The above institutions may be contacted for comprehensive guidance on technology.

FINANCIAL ASPECTS

FIXED CAPITAL

(1) LAND & BUILDING

Sl	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Land	2000	Sq. meters	100	200000
2	Covered area	50	Sq. meters	5000	250000
3	Brick platform	250	Sq. meters	500	125000
4	Borewell with pump				50000
	TOTAL				**625000**

(2) MACHINERY & EQUIPMENT

Sl	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Hydraulic block making machine with 15 HP motor	1	No.	800000	800000
2	Concrete mixer: 10/7 cft with 5 HP motor	1	No.	100000	100000
3	Water dosing pump	1	No.	25000	25000
4	Electrical and EB charges for 25 HP power connection				100000
	Total				1025000
5	Erection and commission-ing charges @ 10%				102500
6	Moulds	2	Sets	25000	50000
7	Wheel borrows with pneumatic wheels	2	Nos.	10000	20000
8	Office equipment	LS			52500
9	Wooden palettes	LS			50000
	TOTAL				**1300000**

(3) PREOPERATIVE EXPENSES Rs 75000

(4) TOTAL FIXED CAPITAL Rs 2000000

WORKING CAPITAL (PER MONTH)

(1) SALARY & WAGES (PER MONTH)

Sl	Description	No.	Salary (Rs)	Amount (Rs)
1	Skilled or semi-skilled workers	2	5000	10000
2	Unskilled workers	6	4000	24000
3	Watch and ward	1	4000	4000
4	Manager/Supervisor	1	10000	10000
	Total			48000
	Perquisites @ 15%			7200
	TOTAL			**55200**

(2) RAW MATERIALS (PER MONTH)

Sl	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Cement	30	Tons	4000	120000
2	Sand or crushed stone sand	200	Tons	250	50000
3	Soil or raw earth	400	Tons	100	40000
	TOTAL				**210000**

(3) UTILITIES (PER MONTH)

Sl	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Power	1500	kWh	5	7500
2	Water	125	KL	20	2500
	TOTAL				**10000**

(4) MISCELLANEOUS EXPENSES (PER MONTH)

Sl	Description	Amount (Rs)
1	Office expenses	2000
2	Consumables	4000
3	Repairs and maintenance	4000
4	Sales expenses	5000
	TOTAL	**15000**

(5) TOTAL WORKING CAPITAL (PER MONTH) Rs 290200

(6) WORKING CAPITAL FOR THREE MONTHS Rs 870600
(7) TOTAL CAPITAL INVESTMENT Rs 2870600

FINANCIAL ANALYSIS

(1) COST OF PRODUCTION (PER ANNUM)

Sl	Description	Amount (Rs)
1	Total recurring cost	3482400
2	Depreciation on building @ 5%	12500
3	Depreciation on machinery and equipment @ 10%	130250
4	Depreciation on moulds, wheel borrows, etc. @20%	34500
5	Amortisation of pre operative expenses @ 10%	7500
6	Interest on capital investment @ 15%	430600
	TOTAL	**4097750**

(2) SALES TURNOVER (PER YEAR)

Sl	Product item	Quantity	Rate	Value
1	Soil cement blocks of size 29X19X9 cm	720000 Nos.	Rs 7 each	Rs 5040000

(3) NET PROFIT (PER YEAR) Rs 942250

(4) PROFIT RATIO ON SALES 18.70%

$$\text{Profit Ratio On Sales} = \frac{\text{Net Profit Per Year}}{\text{Sales Turnover Per Year}} X\ 100 = \frac{942250}{5040000} X\ 100 = 18.70\%$$

(5) RATE OF RETURN 32.70%

$$\text{Rate of Return} = \frac{\text{Net Profit Per Year}}{\text{Total Capital Investment}} X\ 100 = \frac{942250}{2870600} X\ 100 = 32.70\%$$

BREAK EVEN ANALYSIS

(1) FIXED COST PER YEAR

Sl	Description	Amount (Rs)
1	Interest on capital investment	430600
2	Depreciations	184750
3	40% of salaries and wages	264960
4	40% of miscellaneous expenses	72000

	TOTAL	**952310**

(2) BREAK EVEN POINT (B.E.P.) 50.30%

$$B.E.P. = \frac{Fixed\ Cost\ Per\ Year}{Fixed\ Cost\ Per\ Year + Net\ \Pr oift\ Per\ Year}\ X\ 100 = \frac{952310}{1894560}\ X\ 100 = 50.30\%$$

LIST OF SUPPLIER ADDRESS FOR PLANT & MACHINERY

(1) Engineers Enterprises, No.189, Bharathiyar Road, Maniyakaranpalayam Road, Ganapathy, Coimbatore – 641 006

LIST OF SUPPLIER FOR RAW MATERIAL

Local stockists and dealers in the location of the project