

PROJECT PROFILE ON SOIL CEMENT BLOCKS

PRODUCT	:	Soil Cement blocks
NIC CODE (based on NIC 2008)	:	23959
PRODUCT CODE (based on ASICC – 2009)	:	94489
PRODUCTION CAPACITY	:	
Quantity	:	7,20,000 Nos. per annum
Value	:	Rs. 118.80 Lakhs per annum
QUALITY STANDARD	:	IS 1725 – 2013 (Second Revision) (Reaffirmed 2019)
MONTH & YEAR of Preparation	:	March 2021 (updated)
PREPARED BY	:	MSME - Development Institute (Br. DI) Ministry of MSME Government of India 386, Patel Road, Ramnagar Coimbatore – 641 009 Tamil Nadu (India) Email id: brcdi-coim@dcmsme.gov.in Tel: 0422-2230426, 2233956

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.no.	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	1 month
9	Recruitment of manpower	
10	Trial run and commencement of production	6 months
	Total project implementation period	

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 a 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 coarse 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 the 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 – 2013: Indian Standard Specification for Soil based Blocks used in General Building Construction (Second Revision) (Reaffirmed 2019)

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 – 2013 specifies the various sizes for modular and non-modular soil cement blocks. Although soil cement blocks of all the 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) CSIR - Central Building Research Institute, Roorkee – 247667 (UTTARAKHAND)

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

FINANCIAL ASPECTS

FIXED CAPITAL

(1) LAND & BUILDING

Sl. no.	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Land	1000	Sq. meters	1000	10,00,000
2	Covered area	50	Sq. meters	5000	2,50,000
3	Brick platform	250	Sq. meters	2000	5,00,000
4	Bore well with pump				1,00,000
	TOTAL				18,50,000

(2) MACHINERY & EQUIPMENT

Sl. no.	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Hydraulic Automatic block making machine with 15 HP motor	1	No.	1300000	13,00,000
2	Concrete mixer: 10/7 cft with 5 HP motor	1	No.	125000	1,25,000
3	Water dosing pump	1	No.	40000	40,000
4	Electrical and EB charges for 25 HP power connection				1,00,000
	Total				15,65,000
5	Erection and commissioning charges @ 10%				1,56,500
6	Moulds	2	Sets	50000	1,00,000
7	Wheel borrows with pneumatic wheels	4	Nos.	15000	90,000
8	Office equipment	LS			1,20,000
9	Wooden palettes	LS			1,00,000
	TOTAL				21,31,500

(3) REOPERATIVE EXPENSES

Rs 1,18,500

(4) TOTAL FIXED CAPITAL

Rs 41,00,000

WORKING CAPITAL (PER MONTH)

(1) SALARY & WAGES (PER MONTH)

Sl. no.	Description	No.	Salary (Rs)	Amount (Rs)
1	Skilled or semi-skilled workers	2	18000	36,000
2	Unskilled workers	6	12000	72,000
3	Watch and ward	1	12000	12,000
4	Manager/Supervisor	1	30000	30,000
	Total			1,50,000
	Perquisites @ 15%			22,500
	TOTAL			1,72,500

(2) RAW MATERIALS (PER MONTH)

Sl. no.	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Cement	30	Tons	8000	2,40,000
2	Sand or crushed stone sand	200	Tons	1000	2,00,000
3	Soil or raw earth	400	Tons	250	1,00,000
	TOTAL				5,40,000

(3) UTILITIES (PER MONTH)

Sl. no.	Description	Quantity	Units	Rate per unit (Rs)	Amount (Rs)
1	Power	1500	kWh	6	9,000
2	Water	125	KL	20	2,500
	TOTAL				11,500

(4) MISCELLANEOUS EXPENSES (PER MONTH)

Sl. no.	Description	Amount (Rs)
1	Office expenses	4000
2	Consumables	6000
3	Repairs and maintenance	5000
4	Sales expenses	5000
	TOTAL	20,000

(5) TOTAL WORKING CAPITAL (PER MONTH)

Rs 7,44,000

(6) WORKING CAPITAL FOR THREE MONTHS

Rs 22,32,000

(7) TOTAL CAPITAL INVESTMENT

Rs 63,32,000

FINANCIAL ANALYSIS

(1) COST OF PRODUCTION (PER ANNUM)

Sl.no.	Description	Amount (Rs)
1	Total recurring cost	89,28,000
2	Depreciation on building @ 5%	42,500
3	Depreciation on machinery and equipment @ 10%	1,72,150
4	Depreciation on moulds, wheel borrows, etc. @20%	82,000
5	Amortisation of pre-operative expenses @ 10%	11,850
6	Interest on capital investment @ 15%	9,49,800
	TOTAL	1,01,86,300

(2) SALES TURNOVER (PER YEAR)

Sl.no	Product item	Quantity	Rate	Value
1	Soil cement blocks of size 29X19X9 cm	720000 Nos.	Rs. 16.50 each	Rs. 1,18,80,000

(3) NET PROFIT (PER YEAR)

Rs 16,93,700

(4) PROFIT RATIO ON SALES

14.26%

$$\text{Profit Ratio On Sales} = \frac{\text{Net Profit}}{\text{Sales Turn Over Per Year}} \times 100 = \frac{16,93,700}{1,18,80,000} \times 100 = 14.26\%$$

(5) RATE OF RETURN

26.75%

$$\text{Rate Of Return} = \frac{\text{Net Profit Per Year}}{\text{Total Capital Investment}} \times 100 = \frac{16,93,700}{63,32,000} \times 100 = 26.75\%$$

BREAK EVEN ANALYSIS

(1) FIXED COST PER YEAR

Sl.no.	Description	Amount (Rs)
1	Interest on capital investment	9,49,800
2	Depreciations	2,96,650
3	40% of salaries and wages	8,28,000
4	40% of miscellaneous expenses	96,000
	TOTAL	21,70,450

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

56.17%

$$\text{B.E.P} = \frac{\text{Fixed Cost Per Year}}{\text{Fixed Cost Per Year} + \text{Net Profit Per Year}} \times 100$$

$$\frac{21,70,450}{21,70,450 + 16,93,700} \times 100 = 56.17\%$$

LIST OF SUPPLIER ADDRESS FOR PLANT & MACHINERY:

- (1) J Star Engineering, Ganapathy, Coimbatore, Tamil Nadu
- (2) Everon Impex, No. 105, Sanganur Main Road, Ganapathy Post, Ganapathypudur, Coimbatore - 641006, Tamil Nadu, India
- (3) K Tech Machines, S. F. No. 315/1D, Muthusamy Industrial Estate, Sanganoor Road, (Ganesh Theater Opposite) Jayaprakash Nagar, Via Ganapathy, Coimbatore - 641006, Tamil Nadu, India
- (4) KOVAI ENGINEERING, 37A, Nethaji Nagar, Sanganoor, Rathinapuri(po), Coimbatore-641 027.
- (5) Engineers Enterprises, No.189, Bharathiyar Road, Maniyakaranpalayam Road, Ganapathy, Coimbatore – 641 006
- (6) BTEC Concrete Block Machines, No.466, Kamarajar Road, Lakshmipuram, Peelamedu, Coimbatore – 641 004

LIST OF SUPPLIER FOR RAW MATERIAL:

Local Stockists and dealers in the location of the project