

A Review on Soil Cement Blocks

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Abstract: Trenchless technology is a type of subsurface construction work that requires few trenches or no continuous trenches. It is a rapidly growing sector of the construction and civil engineering industry. It can be defined as "a family of methods, materials, and equipment capable of being used for the installation of new or replacement or rehabilitation of existing underground infrastructure with minimal disruption to surface traffic, business, and other activities."

KEYWORDS: Tunneling, Installation, Canal's pipe, Ducts pipes, Renewing



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I. INTRODUCTION

The large house building demand in developing countries, soil can be used as an alternative building material because of its high availability as a source material, its ease of processing, and its low environmental impact. 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 stabilizer. More than 15% by volume is not recommended. Ordinary Portland cement is the most usual stabilizer added 5 to 10% by weight to the soil.

Other stabilizers like lime is a combination of cement and lime are also used. Soil cement blocks being usually 2½ times larger in size than the normal burnt clay bricks, the construction is faster and the joints are consequently reduced.

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.

Indian Standard specification as per IS 1725 – 1982 specifies that 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.

History:

With reference to mud buildings, though rammed earth has a greater history behind it, building a stabilized mud block (SMB) or soil cement block (SCB) wall is much easier and convincing to a new client. Commonly, mud blocks measure 9"x9"x6" with minor size variations, edge profile and cornice decoration options, as may be required for the project.

The soil is prepared the same way as for ramming, but here it is packed into the molds within a small machine. The machine comes with a pressing lid, operated by two workers throwing their weight on it, so the soil gets adequately compacted. After compacting, the fresh blocks are lifted out of the machine and kept in the open outside for drying under the sun. All this can be managed within a 60x40 site or even smaller sites if the road sides can be used.

All the three major institutes, of ASTRA, Auroville and DA, have developed their own versions of the block making/pressing machine. The ASTRA model being popular in Bangalore. It is advisable to have three labourers as a team to start making blocks few weeks

before the wall construction, get the blocks sun dried and stock up at site. Ideally, the soil dug up from the site itself should be used for blocks, to save on transporting mud from outside.



Fig: Soil cement blocks



Fig: soil cement blocks

1.1. Uses of soil cement blocks:

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.

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.

II. MANUFACTURING PROCESS:

The soil material in soil-cement can be almost any combination of sand, silt, clay, gravel, or crushed stone. Local granular materials, such as slag, caliches, lime rock, and scoria, plus a wide variety of waste materials including cinders, fly ash, foundry sands, and screenings from quarries and gravel pits, can all be utilized as soil material. Old granular-base roads, with or without bituminous surfaces, can also be reclaimed to make great soil-cement.

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

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 can be satisfactorily with cement and lime.



Fig: Soil

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.

2. Sifting of soil:



Fig: Soil sifting

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 a handful can be squeezed

without water appearing on its surface, and the ball of soil disintegrates without lumps as it is released.

III. 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 stabilizer. More than 15% by volume is not recommended.

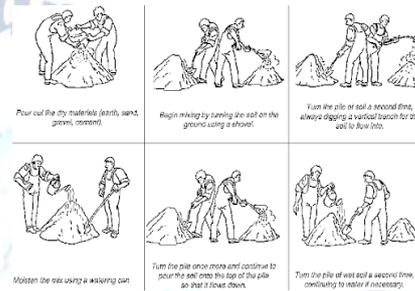


Fig: Manual mixing soil cement block

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 could should both hold its shape and not stain your palm.

IV. 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.



Fig: Manual soil cement block making machine

The prepared mix can be 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.

V. 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.



Fig: Manual curing

The slower the block dries, 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.

Advantages of soil cement blocks:

- Minimal or no need for mortar, thus reducing both the labor and materials costs.
- Suitable soils are often available at or near the construction site.
- Non-toxic: like bricks, materials are completely natural, non-toxic, and do not out-gas.

- Sound resistant: an important feature in high-density neighborhoods, residential areas adjacent to industrial zones.
- Fire resistant: like bricks, earthen walls do not burn.
- Insect resistant: like bricks, insects are discouraged because the walls are solid and very dense, and have no food value
- The usage of soil-cement blocks can even be cost-effective when the production site of burnt bricks is at a considerable distance from the construction site.
- Soil-cement blocks are any day better for the environment.

VI. CONCLUSIONS

- Housing is one of the three basic necessities of human life. Demand for housing is always far exceeds the supply.
- Soil cement blocks are the ideal alternative construction materials for low cost housing projects.
- These blocks consume less thermal energy than the burnt bricks, acting good for environmental concerns.

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