STABILIZED COMPRESSED EARTH BLOCK (SCEB)

Production and Construction Guide

सत्यमेव जयते
Government of India
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Development Alternatives

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Disclaimer

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INTRODUCTION

This manual has been prepared as part of a project on '*Delivery Model for Eco-friendly Multi Hazard Resistant Construction Technologies and Habitat Solutions in Mountain States',* which has been implemented in Uttarkashi (Uttarakhand) under the TIME LEARN (Technology Innovation in Mountain Ecosystem Livelihood Enhancement through Action Research and Networking) programme of the Department of Science and Technology. The project envisage to introduce new system of construction in the region which are resource and energy efficient, can be produced locally in a decentralized production setup, cost effective and easy to adapt. Considering all the above factors, **Stabilized Compressed Earth Blocks (SCEB)** was proposed in the region. The technology was produced locally at an enterprise unit setup developed under the project. The local artisans and contractors were trained in the technology specifications, production and its implementation through demonstration buildings at the project area.

This manual has been prepared as a guide for the use of building artisans, entrepreneurs and government officials for production and implementation of Stabilized Compressed Earth Block wall masonry in mountain regions. The manual is comprised of six sections – First, **Background** which covers a brief about the SCEB technology and its application in the context of Uttrakhand region, Second, **Technology Profile** covers all the design and technical details of the technology. Third, **Production Infrastructure** covers all details of equipment, space and material and manpower requirement for the production of SCEB. Fourth, **Production Process** covers the production details and specification of the technology. Fifth, **Construction Process** covers the construction details and specification of the technology and Lastly**, Communication Products** shows all the posters developed for the community trainings.

Background

Construction practices in the mountain regions have been changing rapidly, mainly under the influence of cement-based practices. These are perceived as stronger, particularly to resist earthquakes and the penetration of cement and workforce from plain regions have accelerated this change. As a result, brick-and-RCC type construction is rapidly becoming common without understanding technical correctness. As a result, unsafe and thermally uncomfortable buildings are being constructed, traditional skills are being eroded and energy is being injudiciously expended in transporting building materials like red burnt clay bricks, steel and cement from faraway.

Stabilized Compressed Earth Block (SCEB) Masonry was introduced in the region as a replacement for red burnt clay bricks, transported from more than 200 km away plain regions to rural areas of the Uttarkashi. Red burnt clay bricks are energy intensive building materials – because it requires to be burnt in kilns and transportation of these bricks in hilly areas from plains adds up to the energy consumption and cost of the material. Apart from this, it was observed that- low grade red bricks are used in the region which along with incorrect technical practices adds to the structural vulnerability.

Red burnt clay bricks masonry in houses of Kamad village, Uttarkashi

Use of red burnt clay bricks in combination with stone masonry in one of the houses in Raithal village, Uttarkashi

There was an evident need to adopt low cost, eco-friendly technologies which can be produced locally, add benefits to local economy, can be standardized and constructed with technical correctness, as an alternative to burnt clay bricks for wall masonry. Considering all these factors, Stabilized Compressed Earth blocks (SCEB) for wall masonry was proposed in the region. SCEB has been introduced in Kamad village, Uttarkashi – the region was assessed for the availability of raw materials, primarily good quality soil for block production in the village. Potential spots were identified nearby production site in the village for soil extraction. The soil samples were then sent to labs for testing of its quality and contents, based on which required soil was procured. Simultaneously, production unit was setup near construction site with required machineries for the production of the blocks.

Three level of trainings were provided to locals in the technology – First was the production training in which group of local people including both men and women were trained in the production process of SCEB. The involvement of women at this stage was highly emphasized for skill development. Second was the hands on construction trainings in which local masons were trained in the workmanship and block handling while construction of wall masonry with SCEB. The third level of training was provided to people who were interested in taking on the entrepreneurship of SCEB in the region by running the production unit through market development. The similar model is applicable for other villages or districts of Uttarkashi region – The specifications and requirements for technology production and construction in any area have been discussed in the package.

Technology Profile

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SCEB Technology

Masonry using earthen blocks is a traditional technique in rural areas in India and many parts of the world. Stabilized Compressed Earth Blocks (SCEB), are an improved version of earthen masonry and a durable replacement for burnt clay bricks. The basic concept for Compressed Earth Blocks is densification of the soil mix using external energy. This imparts them sufficient strength, eliminating the need to fire them in as kiln, like in the case of burnt clay bricks.

The main raw materials for SCEB – soil and coarse sand are locally available – hence SCEB are a good option for local production of masonry material. Coarse sand is usually added to the soil mix which results in better densification of the soil mix leading to better strength. A small percentage of stabilizer – most commonly 5-10% cement is added to the soil mix to increase strength of blocks and their resistance to water. The soil-sand-cement mix is compressed by a simple machine which can be operated without electricity. Since the blocks produced are uniform and well-finished in appearance, cement plaster on the walls can be avoided. One of the biggest benefits of using SCEB is the involvement of community members in production of blocks. The involvement of women in the production is of special interest for generating a means of employment through a skilled job.

Stabilized Compressed Earth Blocks (SCEB) made using TARA Balram machine

Building using SCEB at TARAgram Madhya Pradesh

Eco-tourism cottages at Sonapani Himalayan Village, Uttarakhand

Community building in Kamad village, Dunda block in Uttarkashi

Technical Specifications

Stabilized Compressed Earth Block	Size	Depends on the block press used to produce the blocks. Some common sizes possible with different presses are- 230 x 115 x 75mm 230 x 190 x 100mm, 305 x 143 x 100mm 290 x 290 x 100mm
	Soil characteristics	Recommended particle size composition- Organic matter less than 1% Clay content 5-15%, strength reduces beyond 15% clay content Sand content – 60-70% Silt content 15-35%, combined silt+clay 30-40% **Non-expansive soil**- the clay in the soil should not expand in wet conditions.
	Design Mix	The objective of design mix is to arrive at a composition indicated above. For a given soil, generally sand and stabilizer quantities are to be determined for a good mix. Stabilizer : 7-8% Ordinary Portland Cement by weight of block Lime stabilization may also be done, but it is generally appropriate for very clayey soils.
	Density	The fresh block must have a density of at least 2.05 g/cc or 2050 kg/cm3
	Compressive Strength	Given the right design mix, as indicated above, indicative wet compressive strength at 28 days 4% cement stabilization – 35-45 kg/cm2 8% cement stabilization – 60-70 kg/cm2
	Water absorption	Not more than 15% by weight of block after 24 hours
Mortar	Design Mix	Composite mortars like cement-lime mortar or cement-soil mortar are better suited for use in SCEB masonry. When soil is used in the mortar, it should have a clay content of about 20%. Generally, cement mortar will have a good strength but poor plasticity and flow characteristics and is therefore not ideal for SCEB masonry. Recommended mix- Cement-lime-mortar 1:1:6, cement-soil mortar 1:2:6 or 1:2:7 or mud mortar. Cement-sand mortar 1:6

Applicability

The technology is particularly well suited where blocks can be produced for a cluster of houses – for instance, 20 houses in a village, since SCEB is suited for mass production by group of local people. The major criteria for cost-effectiveness is availability of appropriate soil *(generally falling in the range specified in specifications above)* in sufficient quantity and possibility to produce blocks closer to the construction site to avoid transport costs. It is also important that the block production is backed by a good understanding of quality parameters for producing SCEB. Therefore, training of construction personnel is necessary in SCEB construction.

Advantages of SCEB

Cost	Can be very cost-effective with favourable logistics - even if a reasonably appropriate soil is available close to the production site and if blocks are produced close to the site of use The walls, specially the internal face, can be left unplastered which enables further saving
Employment	Generates local employment through block production – a group of trained persons or members of SHG can easily produce blocks
Environment	Does not use top soil for brick making and almost no emissions because the bricks are not burnt
Aesthetics	SCEB are all of uniform size and shape- which makes it easier to construct good quality and neat masonry

Production Infrastructure

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Production Equipment

SCEB are produced by mechanical means. There are both manual and electrically operated hydraulic machines which are available for production. While the manual machine can be operated without electricity, the hydraulic machine has the advantage of greater productivity per day. In mountain regions, the manual production system is more suitable for catering to smaller demands which is more common. Development Alternatives designed TARA Balram Manual - SCEB press to suit typical conditions in rural areas in terms of skill level of manpower and accessibility of construction sites. The machine and its production accessories are fabricated by TARA Machines and Tech Services Pvt. Ltd. (TMTS).

MACHINES	SPECIFICATIONS	QUANTITY
TARA Balram - Manual with Chamfered (230x 110 x75mm) moulds *Separate mould 230 x 230 x 75 mm block size, should be fixed on same manual Balram machine	• Size of the machine : 1500 x 600 x 1200 mm • Weight of machine : 180 kg • Size of block : 230 x 110 x 75 mm • No. of blocks per cycle : 2 Nos. • Type : Portable • Manpower required : 5-8 person • Energy source : Manual • Compaction by : Pressure	1
TARA Pan Mixer	• Size of the machine : 1200 mm radius, 1200mm height. • Weight of machine : 400-500 Kg • Mix capacity per cycle : 200 kg • Manpower required : 1 person • Energy source : Powered by 7.5 HP, 3 phased induction geared motor	1

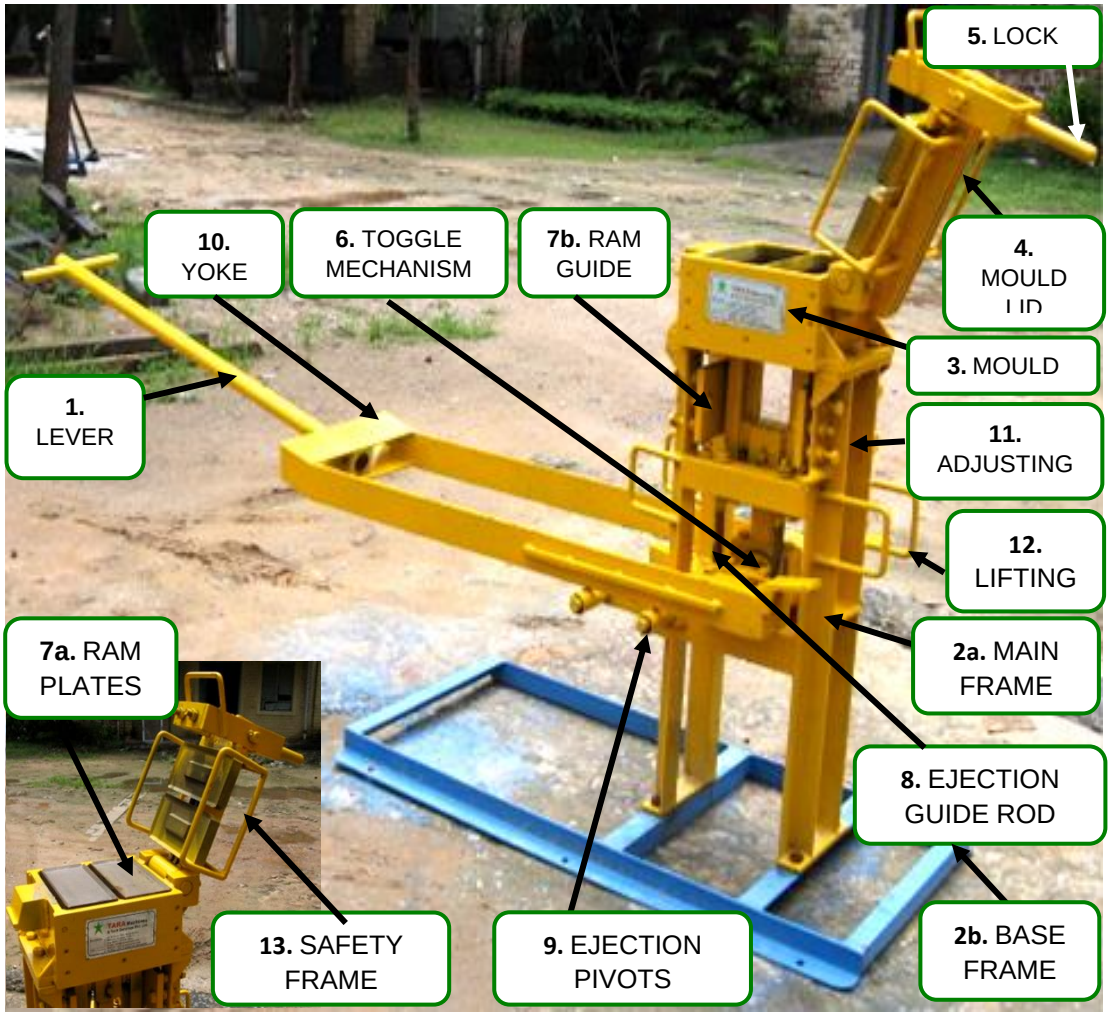
TARA Balram – Manual SCEB Machine

TARA Pan mixer

TARA Balram – SCEB Machine

The ramming action of the TARA Balram manual machine is powered by a toggle and crank mechanism. Soil is filled and manufactured blocks ejected from the top of the mould. While ramming takes place from the bottom. The lockable mould is a twin chamber that produces two conventional sized blocks (230mm x 110mm x 75mm) in one cycle. The centre plate in the machine can be removed to make larger blocks.

TARA Balram can produce upto 600 blocks in one day if mix is prepared manually. However, in the initial stages with a new production team, a productivity of 300-400 blocks per day would be reasonable. The productivity can easily be increased by 200 blocks, if the mis is prepared using an electrically operated mixer. A team of 5 persons is needed for producing blocks with TARA Balram machine.



1. Setting up the TARA Balram Machine

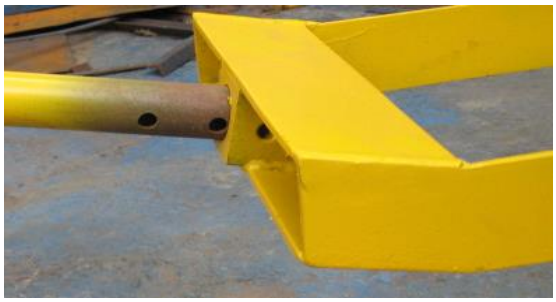
Step 1: *Place the steel base frame on level ground. Insert the four ½ inch bolts in the holes and screw the threaded steel washer over the bolts.*

Step 2*: Mount the machine over the base frame in such a manner that the ejection pivot side is towards the longer size of the base frame. Secure the machine to the base by fully tightening the nuts on to the four bolts.*

NOTE: It is very important to have a level surface on which to install the base frame AND to secure the frame firmly into the ground. If this is not done, the production cycle will not be smooth and the machine will get damaged.

Step 3a: *Fit the two arms of the yoke on the toggle mechanism.*

Step 3b: *Move it down to rest in a horizontal position and secure it to the machine with the help of 4 bolts.*



Step 4a: *Take the metal pipe lever and insert it into the square socket welded on to the yoke.*

Step 4b: *Secure the lever to the yoke socket with the two bolts.*

2. Checking the functioning of TARA Balram machine

The compaction plus ejection cycle of the Balram machine should be tested to check whether it has been correctly assembled. Six essential steps needs to be followed for the same-


Step1: *Unlock the locking lever and open the mould lid.*


Step 2: *Move yoke with the lever till it rests on the same side as the mould lid. The mould plates should go down. (This is the filling position). Measure the depth with the help of a scale.*


Step 3: *Move the lever and yoke over the mould to the other side of the machine till the yoke rests on the ejection pivots. The ram should have moved up. This completes the compaction stage. Check the vertical distance travelled by the ram should be 40mm (+1.5mm).*

Step 4: *Push the lever below the horizontal position the mould plates will rise till they project out of the mould. This is the ejection stage.*

Step 5: *Unlock the locking lever and open the mould lid.*

Step 6: *Close the mould lid and push the locks outward with its handle and check that it is fully engaged on the mould box. If gaps are found, then tighten the two bolts.*

Repeat the process four or five times to be confident that the machine is operating correctly and check that there is no obstruction in the movement of the mechanism. Special attention should be given to safety measures, such as avoidance of projecting moving parts, designing manual operations such that hands cannot get jammed between moving parts, clearly marking and/or protecting dangerous points, incorporating thermal fuses, security pins, etc. Automatic machines must at all cost be equipped with an emergency stop switch, which is easily accessible.

Block Compaction Process- Machine Operation

Once an adequate soil mix and water content is determined, the soil is prepared for compacting using the BALRAM

Step-1: *Disengage the locking lever and completely open the mould lid.*

Step-2: *Fill prepared soil into the scoop and fill the mould. Take care the mould is filled to the top and level the surface.*

Step-3: *Close the mould lid with an impact using the lever handle and engage the lock.*

Step-4: *Move (throw) the lever and yoke to the compaction side.*

Step-5: *On the compaction side,* ***'press'*** *the lever till it rests on the ejection pivots.*

Step-6: *Raise the lever and yoke by 1 inch, disengage the lock and open the mould lid. Move the lever below the horizontal plane till the entire block and part of ram plate comes out of mould.*

Step-7: *Remove the blocks carefully and place it on the wooden tray. Move the lever and the yoke at the initial position.*

Step-8: *Transfer the blocks at the stacking yard for curing.*

Maintenance

For trouble-free usage, one must ensure that the machine is clean, oiled and properly aligned. This can be done through daily and weekly maintenance with the following tools:

- 1/2'' BSW spanners (2 sets)
- An oil can, and
- Some cotton rags (Dhoti)

Daily maintenance- This takes only 5 minutes and can be done before the starting the day's production and at the end of it. Follow the 9 steps carefully:

1. Move the lever to its lowest position on the ejection side so that it touches the ground. Hold it in place.
2. With cotton rags clean out all the soil and dirt from the toggle mechanism. It should be absolutely clean. After checking that there are no soil particles left. Apply a generous coating of oil to all moving surfaces.
3. Similarly, clean and oil the ram and ram guide.
4. Transfer the lever to the other side, so that the TARA Balram is in filling position. While doing so, check if the ram is moving smoothly.
5. Clean the mould lid plates and inside walls of the mould. Remove any soil that is sticking to the mould. Especially corners. Rub oil on the mould walls and the corners.
6. Drop the sheet metal plates inside the mould after cleaning them.
7. Clean the locking mechanism assembly and apply oil. Adjust the bolt at the top of the lock lever to ensure tight locking.
8. Oil the hinging shaft of the mould lid by dropping oil into the oil/cups.
9. Check all nuts and bolts are tight. Loose connections between the mould and the body cause undesirable impact that will reduce the life and efficiency of the machine.

Weekly Maintenance - It is important to thoroughly clean the TARA Balram once a week during regular operation to keep it trouble-free. If daily maintenance is properly carried out, it will just require half an hour a week to take apart the TARA Balram, clean all the parts and reassemble the machine by following 9 easy steps:

1. Remove the ram plates.
2. Loosen the bolts and remove the pin that pivots the lid by hammering with a wooden rod.
3. Lift the lid from the mould box.
4. Loosen the six bolts that connect the mould box to the frame.
5. Remove the mould box from the frame. Be careful not to disturb the ram.
6. Keep the bolts which have been removed in identifiable order with their respective nuts and washers.
7. Clean the toggle mechanism by manipulating the crank and connecting rod cleaning the parts and greasing all movable surfaces refit the mould box and lid.
8. Clean and lubricate the locking mechanism and tighten the locking bolts.
9. Clean all other parts of the machine and tighten any bolts that might be loose

Production unit

The most important component for setting up production unit is the identification of land at appropriate location, which fulfils the production unit space requirements. The location of the production unit must have an easy access to labour, material and transportation facilities. The table below shows the space and other facility requirements for setting up a production unit.

PRODUCTION UNIT SPACE REQUIREMENT	SPECIFICATIONS
Total area of production yard	**500 sq.ft (minimum)**
Area for machines and operation of machines	20% of total space (approx. 100 sq.ft)
Area for storage of raw materials (soil, cement and sand)	40% of total space (approx. 200 sq.ft)
Area for stacking of blocks and curing	40% of total space (approx. 200 sq.ft)
INFRASTRUCTURAL REQUIREMENTS	
Availability of electricity for minimum 6 hours, for a full production day (3 phased electricity connection for TARA Pan mixer)	
Supply of clean water for minimum of 3-4 hours or water storage for curing of blocks	

Setting up the production unit requires an initial investment – in terms of land, infrastructural cost, cost of machines and equipments and other registration/paperwork charges. Additionally, working capital is needed for raw materials, labour and transportation. The fixed capital is one time investment which is needed for setting up the production unit and working capital is a recurring cost which would be needed as the demand of technology and production requirements.

COMPONENTS	
Land and infrastructure, includes- production unit land, levelling of land and floor preparation, construction of shed, provision of electricity and water supply line.	***Costing entirely varies as per the market rate of the land and the choice of materials used in the construction of components.
Machinery and equipment, includes – TARA Balram – Manual Machine, TARA Pan Mixer.	Approx. 3-4 Lakhs

Floor preparation and levelling of land for stacking of freshly de-moulded SCEB

SCEB production unit at Kamad village, Uttarkashi

Material and Labour requirement for production

The material quantity required for production is calculated as per weight of 1 Block and weightage of each raw material required for production of single block. Daily production capacity of the production unit is 300-500 blocks per day by TARA Balram – manual machine, hence

Average weight of 1 SCEB		**3.5 Kg**
Cement	10%	0.35 Kg
Soil	50%	1.75 Kg
Sand	40%	1.4 Kg

MATERIAL	**UNITS**	**TOTAL QUANTITY FOR 500 BLOCKS**
Soil	Bags (40 kg each)	22
Cement	Bags (50 kg each)	3.5
Sand	Bags (40 kg each)	15
MANPOWER		
Production	Skilled worker days Unskilled worker days	1 skilled machine operator 3 semi-skilled machine operator 4 unskilled worker

Production Process

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Like in conventional masonry, quality of SCEB masonry is governed by the quality of the SCEB, the quality of mortar and structural principles of load bearing construction, same design principles as conventional brick masonry. The quality of SCEB is determined by the composition of soil mix and the optimum moisture content at which the soil mix will achieve its maximum density. Although many soils are suited for SCEB, a sandy-clay is the most appropriate soil type. The use of SCEB is particularly well-suited to load-bearing construction and various techniques based on it, such as arches, corbels, domes and vaults.

Soil identification

The first step in making SCEB is identification of soil which is suitable for block production and will be available locally in the required quantity. The most important thing to keep in mind is that there should be enough coarse sand particles and also some amount of clay in the soil mix. Sand provides structural strength to the SCEB and also reduces shrinkage cracking in the block.

In general, soils containing 10-20% clay and 50-75% sand are satisfactory for making SCEB. Many different kinds of soils can be used for producing SCEB. Usually, coarse sand will need to be added to the soil mix separately if cement is added to the soil mix.

The site for sourcing soil should be as close as possible to the production location. In mountain areas, it is possible to source soil from hill sides. It is important to ensure that extraction of soil from hill sides does not de-stabilize the hill slope in any way. For manual extraction of soil, simple tools like pick-axe and shovel are good enough. To save time and labour, hydraulic excavator can also be used.

Sol extraction by group of women

Removal of big stones etc from soil

Seiving process of soil

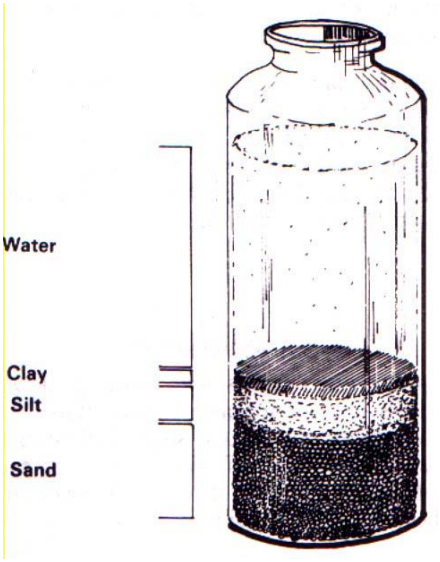
Earth suitable for preparation comes from the subsoil layers. **Do not use the top soil layer for block making since it contains organic matter which decomposes and has a negative effect on the stabilizer, Soil for block preparation should be excavated from deep pits, preferably 3 feet below the ground level.**

Field tests for soil

The second step is to conduct the field tests to check the quality of soil. It is important to have a good idea about the particle sizes in the soil. This can be done accurately in a laboratory. But there are some field tests which can indicate some important facts about the type of soil.

Sedimentation test

The test gives an idea of the distribution of soil particles of different sizes. It is useful for knowing if the soil contains too much of sand, silt or clay.



1. Take a transparent cylindrical jar or bottle of at least 1/2 litre capacity and fill it with approximately 1/4 soil and 3/4 water.
2. Seal the top using your hand and shake well.
3. Leave to stand for at least 30 minutes and observe the sedimentation layers.

Coarse material (gravels) will be deposited on the bottom, followed by sands, then silts, with clays at the top.

The depth of each layer gives an indication of the proportions of each type of material. These proportions are only approximate.

Mix soil and water in a transparent jar and shake it well

Allow the content to settle for 30 minutes

Check the layers after sedimentation process

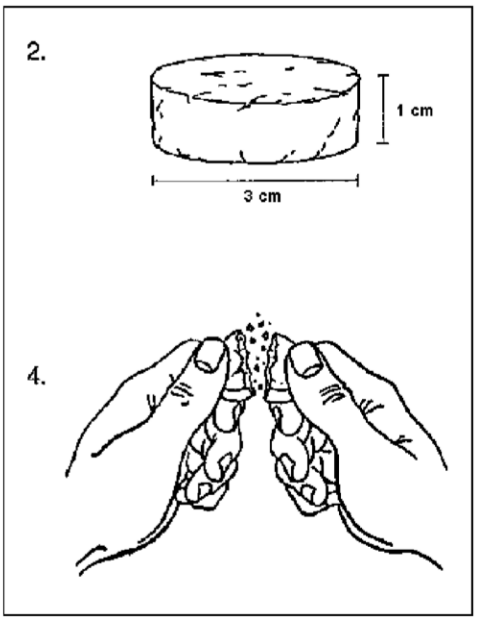
Biscuit test

1. Remove all gravel and kneading the sample well until a smooth paste is obtained.

2. Mould it into flat biscuit-shaped discs approximately 3 cm in diameter and 1 cm thick.

3. Leave to dry and observe any signs of shrinkage or cracking.

4. Break the "biscuit" noting how hard it is.



Shrinkage:
If the biscuit is cracked or if there is a clear gap between the dried sample and the sides of the mould, the soil contains too much clay.

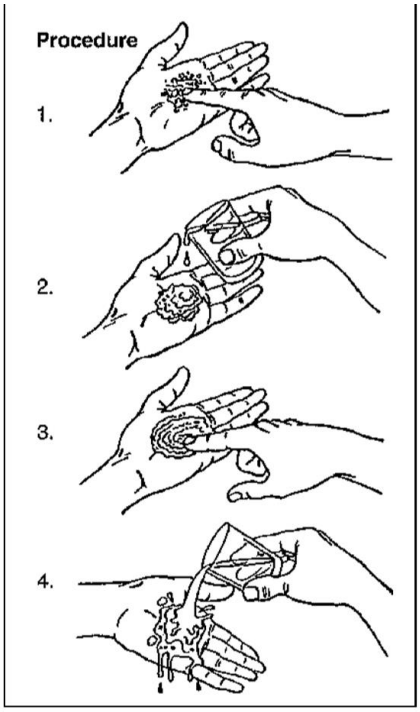
Breaking:
- If it is very hard to break; breaks with an audible crack: the soil has a high clay content;
- If it is brittle, but breaks fairly easily and can be crumbled between the thumb and forefinger: a good, sandy-clayey soil;
- If it breaks readily and is easily reduced to powder: the soil has a high sand or silt content.

Mix moulded into flat round biscuit shape

Try to break the biscuit into two parts after it is dried. The force needed to break the biscuit indicates the proportion of clay which is the binding material in soil

Checking texture of soil

The texture of the soil can be checked to give an idea of the relative proportion of sand, silt and clay. If the soil contains clay, then it will feel coarse when dry and will feel smooth when moistened. If it has high proportion of clay, its texture will feel gritty.



1. Take a small quantity of dry soil and rub it in the palm of the hand feeling its texture.

2. Moisten the soil; if it begins to give off a musty smell, it contains organic material.

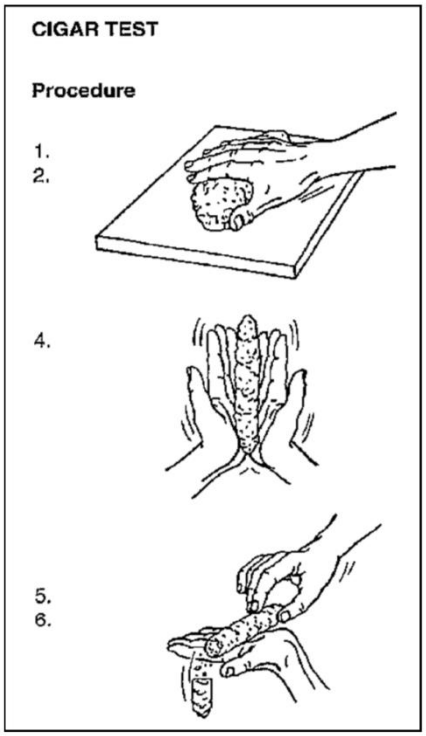
3. Gently rub the moistened soil, again feeling its texture.

4. Gently wash the soil off the palm of the hand, noting how sticky it is.

If the soil is not sticky and washes off easily, it has a high gravel and/or sand content, if the soil is sticky and difficult to wash off, it has a high silt content, if the soil is very sticky and very difficult to wash off (leaving traces of colour) it has a high clay content.

Cigar test

This test gives an idea of the quantity and quality of the clays present



1. Remove all gravel from the sample.

2. Moisten and knead it well until a smooth paste is obtained.

3. Leave to stand for 30 minutes, or more if possible, to allow it to become very smooth.

4. Roll between the hands into a cigar shape 3 cm in diameter.

5. Place the cigar across the palm of the hand and push it gently forward with the other hand.

6. Measure the length of the piece which breaks off.

7. Repeat the test 6-8 times

.

Calculate the average length of the piece which breaks off –

Less than 2” length: the soil contains too much sand, between 2”-6” the soil is good more than 6” the soil contains too much clay.

Soil Preparation

*For uniform and clean soil***:** Often the excavated earth is uniform and clean enough to be used directly in block production after breaking the few lumps that exist.

*For non-uniform soil with gravel and stone***:** The soil which is to be used for making earth blocks with TARA Balram, has to be sieved using 4-5mm sieve. This removes big stones, gravel and any large soil lumps and limits the maximum soil size that goes in for the block production. It is necessary, for the economics of blocks production, that the percentage of soil rejected through sieving is as low as possible. The sieved soil, whose granulometry is known and found to be within the specified range is then taken for further processing.

*For soil that needs crushing***:** Sometime the available good soil, or the clay component of the soil is in lump form. It is not useful in such a condition. It needs to be broken down so as to form a homogenous soil mix, to be effective. It has been found that a good deal of labor is required to produce enough soil for one day's production. Mechanized machines that are available to crush clay are both very expensive and not so easy to maintain.

Preparation of SCEB mix

Sand and Stabilizer are two important materials to be mixed with soil to prepare the mix-. It is recommended to use coarse sand for the production, as coarser the sand – higher the density and higher the strength of the blocks. Stabilizers such as lime and/or cement are mixed in the soil to increase the strength and water proofing qualities of the blocks.

Average ***weight of SCEB is 3.5 kg***, hence block mix has to be prepared in the following proportion-

Material	Proportion	Weight (Kg)
Soil	50%	1.75
Cement	10%	0.35
Coarse sand	40%	1.4

The mixture prepared can be either mixed manually by hand or by pan mixer.

Manually mixing

- Mixture is prepared by hand with the help of 3-4 people, mix is rubbed for at least 15 minutes In this process dry soil id ribbed properly and each and every part of the soil has to rubbed thoroughly by hands in the similar manner.
- Do not use any mechanical tool like 'spade' for this purpose.

Using Pan Mixer

- Mixture to be added in the pan mixer and allowed to be mixed mechanically through electricity till the mix is formed of similar color.

Step -1 Prepare the soil in batches

- To get a good block with homogenous quality, the block composition should be the same throughout. The thumb-rule or field test for homogenous soil is generally its color. If the color is same throughout then it is homogenous, otherwise not.
- If soil is wet, then it should be dried first before use.
- Each batch should consist of 30 cft of soil.
- Remove any impurities from the soil, like leaves, large stones. For this soil is to be sieved through net with 4-5mm spacing.
- Break the lumps of soil.
- Weight the soil before mixing to measure the quantity.

Sieving process of soil

Step -2 Add coarse sand

- If sand is wet, then it should be dried first before use.
- Remove any impurities from the sand, like leaves, large stones. For this sand is to be sieved through net with 4-5mm spacing.
- Weight the sand before mixing to measure the quantity.

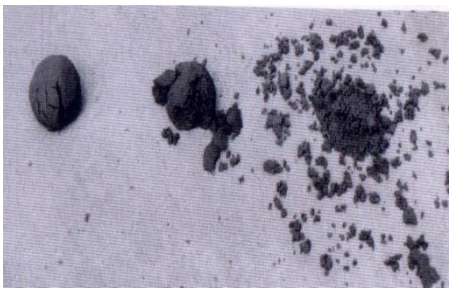
Preparation of SCEB mix by hand

Step-3 Add Stabilizers

- Stabilizers are required to improve soils or in extreme weather conditions. To have maximum impact on the final quality of the block. It needs to be mixed properly. Cement stabilization requires making blocks before the cement 'sets', and it is important that this is done within 30 minutes.
- Weight the stabilizer before mixing to measure the quantity.

Step-4 Add Water

- The quality of earth construction is critically dependent on water content at compaction. For stabilized soil blocks the soil mix requires slight high-water contents above the optimum for easy compaction.
- After dry mixing, water is added evenly through the soil mass to prevent "lump" formation (preferably using sprinkler). Mixing should be till the mix is homogenous. The optimum water content is ascertained using field test or laboratory tests.



SCEB mix testing

Step-5 Testing

To test if the mix is right, drop a small fist ball of soil from the eye level. The ball of soil should:

- Break into about 5-10 smaller pieces.
- Neither stick nor disintegrate completely.

Block production

In addition to the composition of soil mix used to produce blocks, their quality depends a lot on the correct process followed while producing the blocks. Below are the SCEB production process followed at Kamad village, Uttarkashi – the produced blocks were used in the construction of Community building in the same village.

One of the biggest advantages of compressed earth blocks is that they can be engineered to suit specific requirements. We can specify the quality of block we want to produce in terms of strength and water resistance. These targets are set on the basis of load considerations and choice of exposed/plastered finish on the walls. Nature of soil and cost limitations determine the soil mix, degree of stabilization etc. Normally this is done in a small experiment before actual production of blocks begins at site. The target should be displayed in the quality control area at site or laboratory.

Fill prepared soil into the scoop and fill the mould. Take care the mould is filled to the top and level the surface.

Close the mould lid with an impact using the lever handle and engage the lock.

Move (throw) the lever and yoke to the compaction side.


*On the compaction side, **'press'** the lever till it rests on the ejection pivots.*


Raise the lever and yoke by 1 inch, disengage the lock and open the mould lid. Move the lever below the horizontal plane till the entire block and part of ram plate comes out of mould.

Remove the blocks carefully and place it on the wooden tray. Move the lever and the yoke at the initial position.


Transfer the blocks at the stacking yard for curing.

The wet ejected blocks are kept in a row on flat, well drained ground with 1 inch of space in between on its longer side. Place the block in the stocking yard; cover with plastic sheet.
Do not disturb the blocks for 3 days. From day 4 to 14 cure the blocks daily by sprinkling water. On day 15, stack the blocks for final storage and drying.

Common Problems	Solutions
The lock does not disengage	• Loosen the locking bolt head which rests on the mould box. • If the operation is stiff, then grease the locking mechanism.
The ram does not descend and the lever does not move to the initial position	• Check if ram is jammed in the ram guide; ease it by loosening the adjusting guide bolts. • Check if pebbles have got stuck between the ram plate and the body of the mould. Remove them.
The mould lid does not completely close	• Check if the lock is obstructing its path. Pull the locking mechanism back. • Remove the soil in the groove between the two plates of mould lid. • If this procedure does not help, remove some soil, from the mould.
Lock does not hold.	• Tighten the locking bolt head and make it touch the mould lid plate.
Blocks are difficult to compact, yoke does not move over to the ejection side or ram does not descend.	• Check for pebbles or soil in between the ram plate and the mould box. If they exist, remove them. • Check moisture content of soil mix. • If the above process is not effective, then remove some soil from mould.
Blocks compact very easily	• Put some more soil into the mould.
Mould lid hag opened up during compaction	• Lock the mould lid properly and tightly, before re-compacting. • Remove some soil from the mould.
Block sticks to the ram plate.	• Check the water content of the soil mix. It may be too high. • Check if you are using black cotton soil. Do not use this soil.
Blocks crumble at corners.	• Mix the soil properly to ensure uniform composition. • Align the ram plate. • Press the corners slightly with hand before closing the lid for compaction.
Blocks crumble on handling	• Check soil mix for uniform composition. • Fill more soil. • Check moisture content of the soil mix
Blocks are of irregular shape	• Align the ram using adjustable guide bolts.

Quality Control of Blocks

The following checks should be carried out during block production:

Weight of block – After every 50 blocks, check the weight of three sample blocks. The average weight should not be less than 3.5kg.

Dimensional accuracy – In every 100 blocks, measure all three dimensions of 3 blocks, using a ruler. Any variation in dimension should not be more than 3mm.

Curing – Remove the tarpaulin/ polythene sheet cover from the stack of blocks being cured. There should be condensation or drops of water on the inside surface of the cover – this indicates that adequate curing is taking place.

Surface hardness – From the fully cured blocks, choose three blocks randomly and scratch their surface with a metal brush 3 times, each time applying the same gentle pressure. This is more important for the surface which will be exposed to atmosphere. The surface should offer good resistance to scratching and there should be only very little loosening of fine particles form the surface.

Lab testing:

Another method for testing the compressive strength and stability of the SCEB is the lab testing. The selection process of blocks for testing remains same – in this case the blocks should be sent out to one of the testing lab in the nearby area for better results. Ideally, the compressive strength of SCEB should be minimum 40 N/mm² and water absorption should be not more than 10-15%.

Construction Process

Government of India
Department of Science & Technology
Ministry of Science & Technology

Development Alternatives

Design

SCEB Masonry can be used in varied building components – Foundations, walls, arched openings and jack arched roofs. Although, one of the easiest adaptability of material is in wall construction. SCEB masonry can be done as per the user's need and wall construction techniques followed in a particular region. However, since no plastering is required over SCEB masonry, a special attention and artisan work with patience is needed to attain good exposed finishing.

SCEB Masonry over Random rubble masonry in Community building at Kamad village, Uttarkashi.

Community building constructed under the project '*Delivery Model for Eco-friendly Multi Hazard Resistant Construction Technologies and Habitat Solutions in Mountain States'*, demonstrated SCEB wall masonry with possible options of English brick bond. SCEB were used in 13 inch thick walls of the community hall. The wall thickness of 13 inches have been maintained to attain adequate thermal comfort suitable to the cold weather conditions of the site. The building has been designed as a load bearing structure with single vertical reinforcements and horizontal RCC bands. The walls have been designed with 3 feet Random Rubble Masonry (RRM) from foundation till sill level and SCEB masonry of 4.5 feet high over RRM. The course of blocks have been designed to accommodate single vertical reinforcements at the corners.

13 inch thick SCEB wall in the same community building.

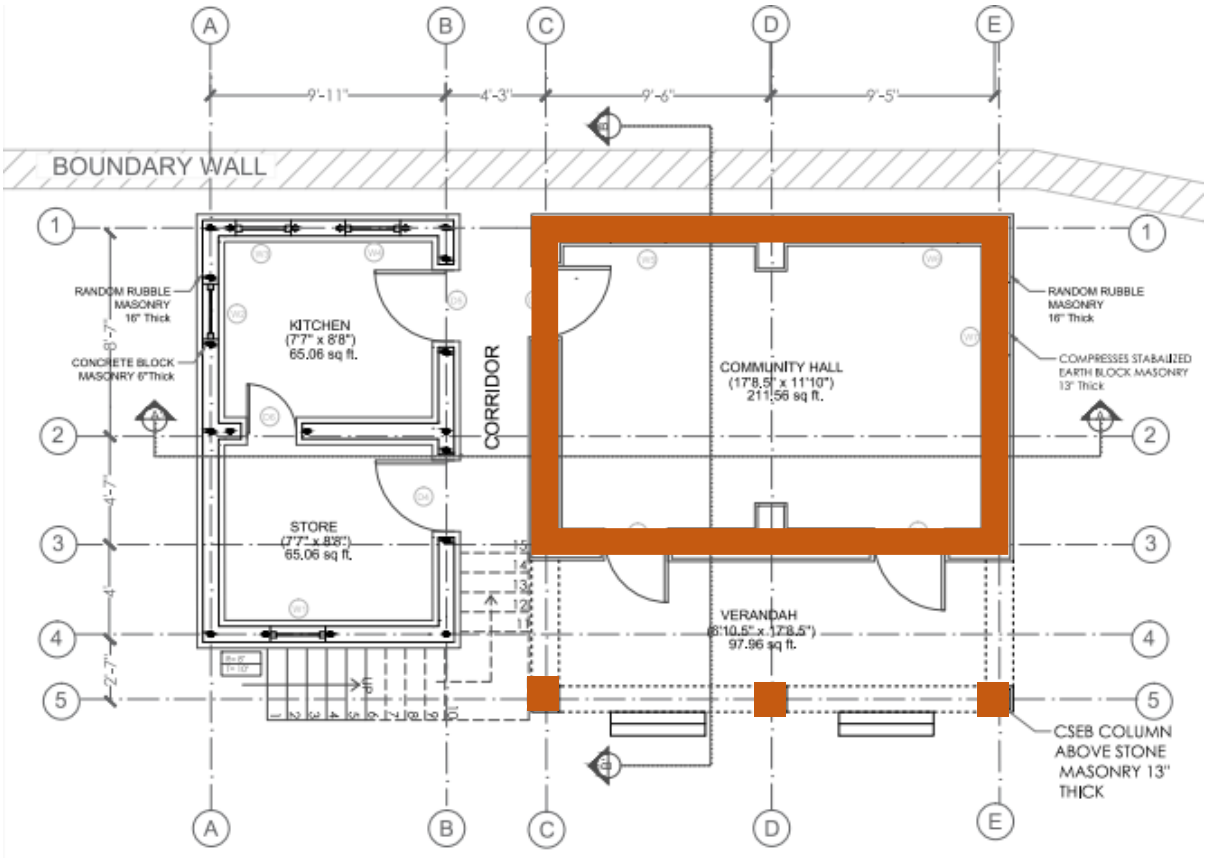
Similar masonry has been followed in columns of the verandah – SCEB masonry over RRM. The 13 inch x 13 inch columns have been provided with an infill of RCC with single block SCEB masonry around it.

Sectional plan of SCEB column in verandah of the building.

SCEB Masonry

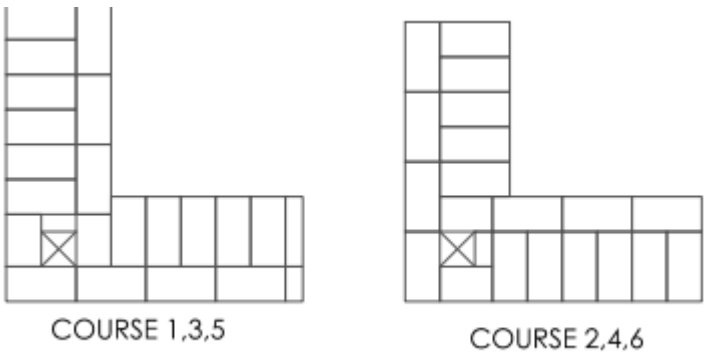
Local mason and artisans were provided with hands on training in SCEB masonry in Community building at Kamad village. If a good quality SCEB masonry is maintained, it can be left exposed, otherwise lime plaster or mud plaster can also be applied as per aesthetic requirements of the building.

In community building, layer of lime plaster with coulour tint has been applied over SCEB masonry to add to the thermal comfort and aesthetic value of the building.



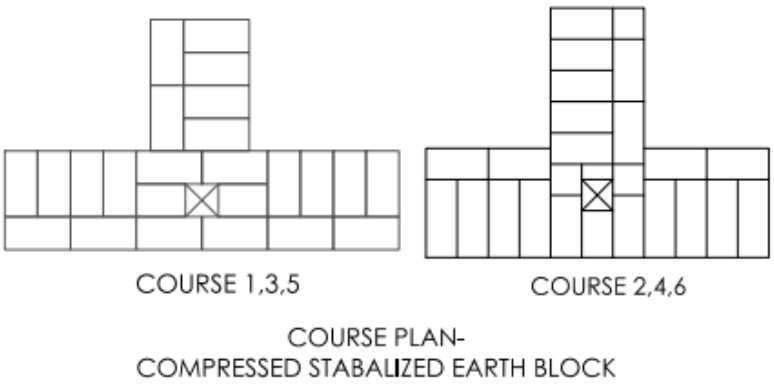
SCEB masory with 13 inch wall thickness and 13inch x 13inch columns in verandah

Layout plan of Community building at Kamad village, Uttarkashi



SCEB course layout at L junction in English bond with RCC infill in the corners

Brick placement around RCC infill



SCEB course layout at T junction in English bond with RCC infill in the corners

Masonry in English bond

SCEB wall finish in lime plaster and paint in Community building, Kamad village, Uttarkashi

SCEB Masonry

Communication Material

Government of India
Department of Science & Technology
Ministry of Science & Technology

Development Alternatives

Technology Production Poster – A3 size

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

मिट्टी कैसी हो? **(1)**

ब्लॉक बनाने का मिश्रण **(2)**

मिश्रण तैयार करने की प्रक्रिया **(3)**

बलराम मशीन से ब्लाक बनाने की प्रक्रिया? **(4)**

नई ईंट पकड़ने का तरीका **(5)**

ब्लॉक का चट्टा लगाना **(6)**

तराई **(7)**

Development Alternatives

Government of India
Department of Science & Technology
Ministry of Science & Technology

Himalayan Environmental Studies and Conservation

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

1: मिट्टी कैसी हो?

- मिट्टी में जैविक पदार्थ नहीं होना चाहिए। खेती के लायक मिट्टी ब्लॉक बनाने के लिए सही नहीं है।
- इसलिए ऊपर के 2–3 फिट हटा कर उसके नीचे से मिट्टी लें।
- मिट्टी मे कम से कम आधी मात्रा बालू की होनी चाहिए।
- मिट्टी में थोड़ी चिकनाहट होना भी जरूरी है।
- मिट्टी में कंकड़ पत्थर की मात्रा ना के बराबर होनी चाहिए।
- मिट्टी का स्रोत स्थानीय होना चाहिए।

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

2: ब्लॉक बनाने का मिश्रण

- सी. एस. ई. बी ब्लॉक बनाने के लिए मिट्टी, बालू, सीमेंट और पानी का मिश्रण बनाया जाता है।

- बालू और सीमेंट की मात्रा मिट्टी के प्रकार पर निर्भर करता है। आमतौर पर मिट्टी में 20–40% बालू और 7–10% सीमेंट मिलाया जाता है। इसका मतलब 100 किलो के मिश्रण में 20 से 40 किलो बालू और 7–10 किलो सीमेंट

- पानी सिर्फ उतना ही डालें जिससे मिश्रण को नमी मिल सके।
- **मिट्टी, बालू और सीमेंट का मिश्रण उनका वजन तोल कर बनाना आवश्यक है।**

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

3: मिश्रण तैयार करने की प्रक्रिया

मिट्टी की तैयारी

- मिक्स बनाने से पहले मिट्टी को तैयार करें। मिट्टी अगर गीली हो तो उसे पहले सूखा लें। अगर मिट्टी में ज्यादा ढेले हों तो उन्हे पहले तोड़ लें।

मिट्टी को छानना

- मिट्टी को 4 या 5 एम.एम की छन्नी से छानें।
- छन्नी को तिरछा कर के इस्तेमाल करें। ध्यान रहे कि छोटे कंकड़ पत्थर छन के बाहर हो जायें।
- छनी हुई मिट्टी में वजन के माप के हिसाब से बालू और सीमेंट मिलाएं।

मिटटी को मिलाना – हाथ से

- ब्लॉक बनाने की सामग्री हाथ से या पैन मिक्सर से मिलायी जा सकती है।
- हाथों से मिक्स बनाना – सूखी सामग्री को दोनों हाथों के बीच मल कर मिलाएं। सामग्री का हर हिस्सा इसी प्रकार से मिलाएं। तीन चार लोगों की मदद से कम से कम 15 मिनट तक सूखा मिक्स बनाएं। इस के लिए बेलचा का इस्तेमाल ना करें।

मिटटी को मिलाना – पैन मिक्सर से

- तब तक इसे मिलाएं जब तक पूरी मिलायी जा रही सामग्री का रंग एक जैसा ना हो जाए।
- **याद रहे – ब्लॉक उतना ही अच्छा बनेगा जितना अच्छा सूखी सामग्री को मिलाया जाएगा।**

छानना

हाथ से मिलावट

मशीन से मिलावट

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

4: बलराम मशीन से ब्लाक बनाने की प्रक्रिया

1

मिश्रण को बलराम मभीन के खांचों में भरें।

2

खांचा भरने के बाद, इसका ढक्कन बंद करें, ढक्कन बंद करने के बाद उससे लॉक कर दें। इससे भरने के किये मशीने के साथ दिए गए स्कूप का प्रयोग करें। इससे उतना ही मिश्रण डाला जायेगा जितना आवश्यक हैं। स्कूप के माप से अगर कम मिश्रण डाला जायेगा तो ब्लॉक हल्का और कमजोर बनेगा और अगर ज्यादा मिश्रण डाला जाएगा तो खांचे को बंद करने में मुश्किल होगी इससे मशीन भी खराब होने का खतरा रहेगा।

3

लॉक हो जाने के बाद, डंडे को उलटी तरफ लाएं और डैम लगा कर नीचे दबायें।

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

4: बलराम मशीन से ब्लाक बनाने की प्रक्रिया?

4

अब डंडे को थोड़ा ऊपर उठाइएं। ये करने से, खांचे का लॉक ढीला हो जाता है और आसानी से खोला जा सकता है।

5

खांचे का ढक्कन खोलें, इसमें थोड़ा डैम लग सकता है। डंडे को और ऊपर उठाने से, ये काम थोड़ा आसान हो सकता है।

6

खाँच खुलने के बाद, डंडा दोबारा नीचे दबाएं, इससे ईंट अपने आप ऊपर उभर के आएगी। ईंट को आराम से, दोनों हाथों से उठाएं और सूखने की जगह पर रख दें।

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

5: नई ईंट पकड़ने का तरीका

नई ईंट को दोनों हाथों से अंगूठे और पहली दो उँगलियों के बीच दबा कर उठायें। ध्यान रखिये की ये कोनो से भुरनी या टूटनी नहीं चाहिए। ब्लॉक को खड़ा कर के रखें।

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

6: ब्लॉक का चट्टा लगाना

ब्लॉक का चट्टा लगाने के लिए पक्की और समतल जमीन होनी आवश्यक हैं। चट्टे की ऊंचाई 5 या ६ ब्लॉक से ज्यादा ऊँची ना हो। ब्लॉक को एक के ऊपर एक आड़े तिरछे तरीके से इस प्रकार रखें जिससे उनके बीच थोड़ी जगह बनी रहे यह तराई के लिए आवश्यक हैं।

सी. एस. ई. बी (CSEB) ब्लॉक बनाने की प्रक्रिया

7: तराई

- तराई कम से कम १४ दिन के लिए की जानी चाहिए।
- ईंट को दिन में तीन बार पानी देना चाहिए। ईंटों को काले रंग की तारपोलिन की चादर से ढका जाना चाहिए क्यूंकि ईंट को तराई के लिए गर्मी और नमी की जरुरत होती है। तराई के समय, इन ईंटों को सख्त गर्मी से बचाना चाहिए।
- ब्लॉक की अच्छी, सही तराई और क्वालिटी हम सब की जिम्मेदारी है।
- हर 100 ब्लॉक बनाने के ब्लॉक का वनज अवभय मापें। ब्लॉक का वजन 3.5 – 3.8 किलो के बीच होना आवभयक हैं।

Technology Production Poster – A2 size

सी. एस. ई. बी (CSEB) ब्लॉक

1: मिट्टी कैसी हो?

- मिट्टी में जैविक पदार्थ नहीं होना चाहिए। खेती के लायक मिट्टी ब्लॉक बनाने के लिए सही नहीं है।
- इसलिए ऊपर के 2–3 फिट हटा कर उसके नीचे से मिट्टी लें।
- मिट्टी मे कम से कम आधी मात्रा बालू की होनी चाहिए।

2: ब्लॉक बनाने का मिश्रण

सी. एस. ई. बी ब्लॉक बनाने के लिए मिट्टी, बालू, सीमेंट और पानी का मिश्रण बनाया जाता है।

- आमतौर पर मिट्टी में 30-40% बालू और 7-10% सीमेंट मिलाया जाता है। 100 किलो के मिश्रण में 30 से 40 किलो बालू और 7-10 किलो सीमेंट
- पानी सिर्फ उतना ही डालें जिससे मिश्रण को नमी मिल सके।
- मिट्टी, बालू और सीमेंट का मिश्रण उनका वजन तोल कर बनाना आवश्यक है।

3: मिश्रण तैयार करने की प्रक्रिया

मिट्टी की तैयारी

- मिट्टी अगर गीली हो तो उसे पहले सूखा लें। अगर मिट्टी में ज्यादा ढेले हों तो उन्हे पहले तोड़ लें।

मिट्टी को छानना

- मिट्टी को 4 या 5 एम.एम की छन्नी से छानें।
- छन्नी को तिरछा कर के इस्तेमाल करें। ध्यान रहे कि छोटे कंकड़ पत्थर छन के बाहर हो जायें।

मिट्टी को मिलाना – हाथ से

- ब्लॉक बनाने की सामग्री हाथ से या पैन मिक्सर से मिलायी जा सकती है।
- हाथों से मिक्स बनाना – सूखी सामग्री को दोनों हाथों के बीच मल कर मिलाएं। कम से कम 15 मिनट तक सूखा मिक्स बनाएं। इस के लिए बेलचा का इस्तेमाल ना करें।

मिट्टी को मिलाना – पैन मिक्सर से

- तब तक इसे मिलाएं जब तक पूरी मिलायी जा रही सामग्री का रंग एक जैसा ना हो जाए।

4: बलराम मशीन से ब्लॉक बनाने की प्रक्रिया?

मिश्रण को बलराम मशीन के खांचों में भरें। इससे भरने के लिए मशीने के साथ दिए गए स्कूप का प्रयोग करें। इससे उतना ही मिश्रण डाला जायेगा जितना आवश्यक हैं।

खांचा भरने के बाद, इसका ढक्कन बंद करें, और उसे लॉक कर दें।

लॉक हो जाने के बाद, मशीन के लीवर को उलटी तरफ लाएं पूरी तरह से नीचे दबायें।

लीवर को थोड़ा ऊपर उठा कर खाँचे का लॉक ढीला करें और उसे खोलें

खांचे का ढक्कन खोलें

खाँच खुलने के बाद, लीवर दोबारा नीचे दबाएं, इससे ईंट अपने आप ऊपर उभर के आएगी।

5: ब्लॉक पकड़ने का तरीका

नई ईंट को दोनों हाथों से अंगूठे और पहली दो उँगलियों के बीच दबा कर उठायें। ध्यान रखिये की ये कोनो से भुरनी या टूटनी नहीं चाहिए।

हर 100 ब्लॉक बनाने के बाद ब्लॉक का वजन करें। ब्लॉक का वजन 3.5 – 3.8 किलो होना चाहिए।

6: ब्लॉक का चट्टा लगाना

ब्लॉक का चट्टा–लगाने के लिए पक्की और समतल जमीन होनी आवश्यक हैं। चट्टे की ऊंचाई 5 या 6 ब्लॉक से ज्यादा ऊँची ना हो। ब्लॉक को एक के ऊपर एक आड़े तिरछे तरीके से इस प्रकार रखें जिससे उनके बीच थोड़ी जगह बनी रहे, यह तराई के लिए आवश्यक हैं।

7: तराई

- तराई कम से कम 14 दिन के लिए की जानी चाहिए।
- ईंटों को काले रंग की तारपोलिन की चादर से ढका जाना चाहिए क्योंकि ईंट को तराई के लिए गर्मी और नमी की जरुरत होती है। तराई के समय, इन ईंटों को सख्त गर्मी से बचाना चाहिए।

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ब्लॉक बनाने की टीम

व्यक्ति 1: मिट्टी को संपीड़ित करके चिनाई के लिए ब्लॉक बनाती है।

व्यक्ति 2: लीवर और मोल्ड के ढक्कन को खोलने और बंद करने के लिए और ब्लॉक को मोल्ड से निकालने के लिए।

व्यक्ति 3: लीवर और योक को चलाना मिट्टी मिश्रण को दबाने के लिए।

व्यक्ति 4 और 5: मिट्टी मिश्रण को तैयार करना और उस के माध्यम से मिश्रण की नपी–तुली मात्रा मोल्ड में डालना।

असेंबली की जांच

चरण 1: मोल्ड के ढक्कन का लॉक खोलें और ढक्कन को उठाए।

चरण 2: योक और मोल्ड को उठाकर पूरी तरह से मोल्ड की तरफ ले जाएं। इस स्थिति में मोल्ड की प्लेट नीचे जाएगी यह मोल्ड भरने की स्थिति है। मोल्ड की गहराई नापे। लीवर को तब तक नीचे ले जाएं जब तक रैम ऊपर की तरफ आकर ब्लॉक को मोल्ड से बाहर ना निकाल दें।

चरण 3: अब लीवर और योग को दूसरी तरफ ले जाएं जब तक कि योक पिवट पर आ कर ना रुके। इस स्थिति में मोल्ड की प्लेट ऊपर जाएगी। यह मिश्रण को दबाने के काम को पूरा करता है। ध्यान दें चरण 2 और 3 के बीच मोल्ड प्लेट को 1. 5" (40 mm) ऊपर जाना चाहिए

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चरण 4: लीवर को पूरी तरह से नीचे ले आए। इस स्थिति में मोल्ड प्लेट पूरी तरह बाहर निकल आएंगे, इस तरह ब्लॉक को बाहर निकाला जाएगा।

चरण 5: लॉकिंग लीवर अनलॉक करें (5) और मोल्ड ढक्कन (4 ए) खोलें।

चरण 6: मोल्ड ढक्कन (4 ए) बंद करें और ताले को अपने हैंडल से बाहर धक्का दें और जांचें कि यह मोल्ड बॉक्स पर पूरी तरह से जुड़ा हुआ है। यदि ऐसा ना हो तो मोल्ड में दिए गए दोनों बोल्ट कस लें।

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उत्पादन की प्रक्रिया

1 ताला खोलें, मोल्ड ढक्कन खोलें।

2 मोल्ड भरें। लीवर लॉकिंग लीवर के विपरीत तरफ रहता है।

3 लीवर हैंडल का उपयोग करके मोल्ड ढक्कन को एक झटके के साथ बंद करें और लॉक कर दें।

4 लीवर और योक को कॉम्पैक्शन प्रक्रिया में ले जाएं (फेंक दें)

5 लीवर दबाएं जब तक कि यह निकास पिवट पर न टिके।

6 लीवर और योक को 1 से बढ़ाएं, लॉक को निष्क्रिय करें और मोल्ड ढक्कन खोलें।

7 लीवर को तब तक नीचे ले जाए जब तक

8 ब्लॉक को ध्यान से हटाएं और इसे लकड़ी के ट्रे पर रखें। लीवर और योक को प्रारंभिक स्थिति में ले जाए।

9 ब्लॉक को ले जाकर तराई के लिए रखें।

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रखरखाव

1. ताला असंगत नहीं है
- लॉकिंग बोल्ट हेड को ढीला करें जो मोल्ड बॉक्स पर रहता है।
- यदि ऑपरेशन कठोर है, तो लॉकिंग तंत्र को तेल दें।

2. रैम उतरता नहीं है और लीवर प्रारंभिक स्थिति में नहीं जाता है।
- रैम गाइड में रैम को जाम किया गया है या नहीं, एडजस्टिंग गाइड बोल्ट को ढीला करके इसे कम करें।
- रैम प्लेट और मोल्ड के शरीर के बीच कंकड़ फंस गया है या नहीं। उन्हें हटा दो।

3. मोल्ड ढक्कन पूरी तरह से बंद नहीं है।
- जांच करें कि लॉक अपने रास्ते में बाधा डाल रहा है या नहीं। लॉकिंग तंत्र को वापस खींचें।
- मोल्ड ढक्कन की दो प्लेटों के बीच नाली में मिट्टी को हटा दें।
- अगर यह प्रक्रिया मदद नहीं करती है, तो मोल्ड से कुछ मिट्टी हटा दें।

4. ताला पकड नहीं रखेगा।
- लॉकिंग बोल्ट हेड को कस लें और इससे मोल्ड ढक्कन प्लेट को छूएं।

5. ब्लॉक को कॉम्पैक्ट करना मुश्किल होता है, योक इंजेक्शन पक्ष में नहीं जाता है या रैम उतरता नहीं है।
- रैम प्लेट और मोल्ड बॉक्स के बीच में कंकड़ या मिट्टी की जांच करें। यदि वे मौजूद हैं, तो उन्हें हटा दें।
- मिट्टी के मिश्रण की नमी सामग्री की जांच करें।
- यदि उपर्युक्त प्रक्रिया प्रभावी नहीं है, तो मोल्ड से कुछ मिट्टी हटा दें।

6. ब्लॉक बहुत आसानी से कॉम्पैक्ट।
- मोल्ड में कुछ और मिट्टी डाल दें।

7. मोल्ड ढक्कन hag compaction के दौरान खोला।
- फिर से कॉम्पैक्ट करने से पहले मोल्ड ढक्कन को ठीक से और कसकर लॉक करें।
- मोल्ड से कुछ मिट्टी निकालें।

8. रैम प्लेट में ब्लॉक चिपक जाती है।
- मिट्टी के मिश्रण की पानी की सामग्री की जांच करें। यह बहुत अधिक हो सकता है।
- जांचें कि क्या आप काली सूखी मिट्टी का उपयोग कर रहे हैं। इस मिट्टी का प्रयोग न करें।

9. कोनों पर ब्लॉक टूट जाते हैं।
- समान संरचना सुनिश्चित करने के लिए मिट्टी को ठीक से मिलाएं।
- रैम प्लेट संरेखित करें।
- कॉम्पैक्शन के लिए ढक्कन बंद करने से पहले कोनों को थोड़ा हाथ से दबाएं।

10. हैंडलिंग पर ब्लॉक टूट जाते हैं।
- वर्दी संरचना के लिए मिट्टी मिश्रण की जांच करें।
- अधिक मिट्टी भरें।
- मिट्टी के मिश्रण की नमी सामग्री की जांच करें।

11. ब्लॉक अनियमित आकार के हैं।
- समायोज्य गाइड बोल्ट का उपयोग कर रैम को संरेखित करें।.

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About Development Alternatives Group

Development Alternatives (DA) is a premier social enterprise with a global presence in the fields of green economic development, social equity and environmental management. It is credited with numerous technology and delivery system innovations that help create sustainable livelihoods in the developing world. DA focuses on empowering communities through strengthening people's institutions and facilitating their access to basic needs; enabling economic opportunities through skill development for green jobs and enterprise creation; and promoting low carbon pathways for development through natural resource management models and clean technology solutions.

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