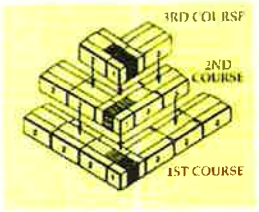
BC C05/BOLYN PRESS DRY STACKED, NO MORTAR JOINT

BOLYN HEAD OFFICE

BCC02/BOLYN DOUBLE BRICK PRESS (MULTI-PURPOSE)
SIZE: 2 NOS X 290mm X 140mm X 100mm



A WELL FINISHED BRICK HOUSE

LATERITE SOIL THAT IS ALSO CALLED MUD OR RED FILLING SAND.

PAVING BRICK PRESS

PAVING PRESSES
DOUBLE TEE
HEXA
CLOVER
ROMAN
WAVE
MAG

A BEAUTIFUL FENCE WALL

INTERLOCKING-DRY STACKED/LIQUID MORTAR/ SUPER BRICK/ BLOCK TECHNOLOGIES

FOR HOUSING CONSTRUCTION

INTERLOCKING BRICK HOUSE UNDER CONSTRUCTION

INCLUSIVE

INTERLOCKING PAVING/FLOORING TECHNOLOGY.

INTERLOCKING PRESS

BCC BOLYN
CONSTRUCTIONS COMPANY LIMITED

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...DETERMINED TO POPULARIZE LOCAL MATERIALS

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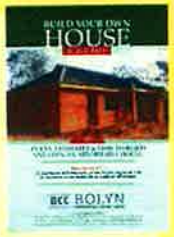

INTRODUCTION

This publication is written solely to explain the non-conventional system of building called **INTERLOCKING STRUCTURE** and the building components relating to them. We intend to show case the following components and their uses:-

a. Interlocking Block/Brick called Dry Stacked or No motar to join the walls.

b. Interlocking Brick- Liquid Mortar in Vertical holes.

c. Super I & II Blocks and other possible block types that uses laterite soil as its main materials.

d. Interlocking flooring bricks for the pavement of walk ways and motor ways.

The Introduction and adoption of the interlocking building system was first noticed in the early 90's. This system of housing construction is gaining ground slowly, but steadily and mostly in the urban towns of Lagos, Abuja etc. There are lots of people who either have not heard of it, talk less of seeing how or where these bricks or blocks are assembled in a motarless forms.

In the earlier days, it was difficult for a lot of people to agree to its possibility . Here we are today, in this age of computer, when a house can be built in a matter of days and motarless. The technology of interlocking construction like it name denote is a system that create a brick or block having recesses into which the top and one of the side of the brick or block enters into and lock themselves into the bottom and side of another brick/block.

This system has been researched internationally and used extensively around the world. Our company Bolyn Constructions Company Limited have designed a simple manual /mechanical press using the principle of Cinva Ram block press to make Bolyn Interlocking Blocks/ Bricks Press.

We have been promoting Laterite based cement stabilised brick since 1991 and the Interlocking Blocks were first used by us in 1995. We can confirm that lots and lots of people are now imbibing the technology because examples are now on the web and on television screen. Some saw it during their foreign travel or on sites in Nigeria.

This is the same technology that some State Government have imported the hydraulically operated machine costing over 6 (Six) million naira. Bolyn Brick Press of the Interlocking version is targeted at the Build it yourself customer and Small scale enterprises.

ELDER RUFUS B. AKINROLABU
12/FEBRAURY/2015

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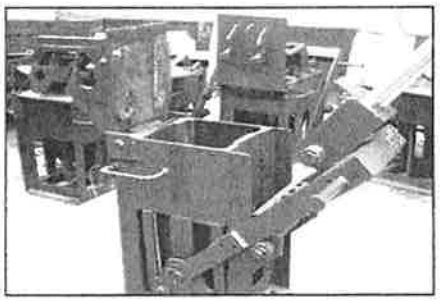
BOLYN INTERLOCKING BRICK PRESS.
(NO MORTAR-DRY STACKED).

Bolyn Constructions Company Limited first knew about this type of brick technology in 1995 and we have conducted a lot of researches and investigations that have enable us to develop a brick press after the Cinva Ram principle to make our own standards Bricks as follows:-

(a) 300mm x 230mm x 120mm - Super Block Size
(b) 230mm x 230mm x 120mm - Standard Block size
(c) 150mm x 230mm x 120mm - Half Block size

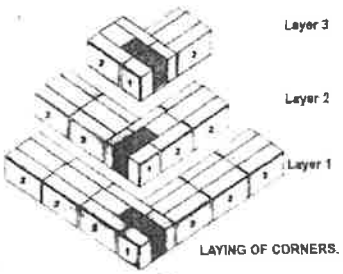
The above sizes are our Bolyn construction standards that are being made using our Bricks Press/es (Single Mould). There are internal fixtures that are inserted to achieve the desired Brick sizes.

Our Brick Presses are mechanical equipments that are operated manually. The Brick Presses are capable of exerting a considerable pressure on the moist soil – cement mixture to make a solid, strong and durable block.

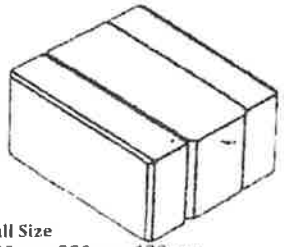


BCC/05/: BOLYN INTERLOCKING BRICK PRESS
STANDARD: DRY STACKED NO MORTAR JOINT
BRICK SIZE: 230mm x 230mm x 120mm

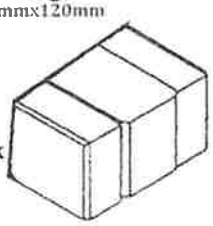
BCC/05/: SUPER BRICK PRESS
DRY STACKED: NO MORTAR JOINT
BRICK SIZE: 300mm X 230mm X 120mm
(Available on Special Request)



LAYING OF CORNERS.



Full Size
230mmx230mmx120mm



Half Brick

Bolyn Construction Company Limited have acquired great experience in the use of laterite materials with the mixture of Cement as stabilizer to build several structures since 1995.

The Foundation, Lintels, Gable ends, Door and Window levels construction in the interlocking Brick system is same as for other conventional building system, these portions of the building must be mortal joined.

TECHNICAL SPECIFICATIONS	SUPER BLOCK	STANDARD BLOCK
BLOCK SIZES	a) 300mm x 230mm x 120mm b) 150mm x 230mm x 120mm	a) 230mm x 230mm x 120mm b) 115mm x 230mm x 120mm
Numbers of Bag of cement	– 45 to 65 Blocks	70 to 80 Blocks
No Blocksper 5Cu.yd Tipper	280 to 300 Blocks	350 Blocks
Weight of Each Blocks	a) 18kg to 20kg. b) 9kg to 10kg	a) 12kg b) bkg
Price per unit	= N80.00 Naira	N 60 Naira
Labour Force required	= 2 / 3/ 4 men	2/3 Men
Nos of Blocks per day	= 300 / 450 / 600 Nos	300/ 400/ 500nos
Mix of proportions	= 1:20; 1:25; 1:30	1:20; 1:25; 1:30
Quantity per sq. Metre	= 28 Nos	36 nos

ADVANTAGES OF INTERLOCKING BLOCKS

SPEED = A House can be constructed in just a week.

ACCURACY = Blocks have the ability to be placed accurately.

REDUCTION IN COST OF BUILDING.

When used the Bolyn interlocking block/brick building system is capable of reducing the cost of construction drastically in the following ways:-

1. Labour cost in laying is reduced as no mortar joining is required and considerable time is saved.
2. Cement – Sand mortar requirement is significantly reduced as most walls do not require them except the foundation, lintel, ring beam, gable ends and

doors/windows level.

3. Interlocking block walls require lesser plastering material than other straight walls. It is laid in walls with side grooves that aids better adhesions.
4. A lot of man hours are saved because Bolyn interlocking blocks will be faster to erect than mortar joined walls.
5. Block moulding and block laying in Bolyn Interlocking system can be mostly handled by the less expensive unskilled labour.
6. The walls of the building constructed by Bolyn Interlocking blocks can be painted on directly, it require no plastering as a matter of compulsion.
7. The internal of the buildings constructed by Bolyn interlocking blocks are cooler because of the thermal properties of soil blocks and thickness of block-solid 230mm thick wall.
8. Only a few skilled labour in supervision are required for Bolyn system of interlocking wall blocks construction
9. About 4% or 5% cement by volume is adequate for most type of soil. After which proper curing with water over 7-8 days will provide durable cement stabilized blocks.
10. All activities of brick/block moulding can be site concluded without wasting resources to human and vehicle transportation of bricks/blocks from place to place.

An Evidence that the local Bricks can be used for a Multi-Storey Building

BCC /05 /INT. BOLYN INTERLOCKING BRICK PRESS. (NO MORTAR-DRY STACKED). OTHER GUIDELINES AND ADDITIONAL INFORMATION PECULIAR TO THE OPERATION OF THIS BRICK PRESS.

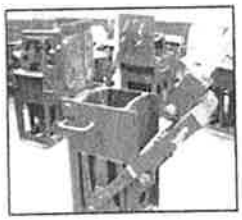
All Bolyn Constructions Company Limited brick presses are designed after the Cinva-ram principle for which our company is noted. The Company have two types of this press whose major differences from all other types is in the hinged cover plate, this became necessary in order for us to be able to achieve the inter lockings fixture as in the projected top and depressed bottom. We have incorporated 2 (two) piston rods to increase the compressions. The machine is original to Bolyn constructions company limited as we have not come across its type prior to our designing and adopting the model.

OPERATIONAL DIFFERENCE

Place (two) polythene sheets one at the mould base and another at the top after completing the filling of the soil cement. The cover plate is slammed on to close the lid and operated by raising the lever arm to the top and elbow compressed, it is ejected after the lever arm have been returned to its resting position and the mould cover lifted to open.

BCC/05/INT. BOLYN STANDARD INTERLOCKING BRICK PRESS INT. DRY STACKED NO MORTAR JOINT.

TECHNICAL SPECIFICATIONS.
Block Size-230mm x 230mm x 120mm.
Nos per Bag of cement - 70/80pieces.
5Cu. yd Tipper -300 to 350 Bricks/Blocks.
Weight of each Block/Brick – 12kg/6kg each.
Unit Price per Brick –N55 =60 =each .
Labour Force Required -2/3 men.



BCC/05/ STANDARD BRICK SIZE: BOLYN INTERLOCKING BRICK PRESS DRY STACKED NO MORTAR JOINT 230mm x 230mm x 120mm

.Nos. of Blocks per Day – 300/600 Nos .
Mix Proportion – 1:20 or 1:25.
Quantity per Sq. m -36 Nos.

BCC/15/SUP BOLYN SUPER INTRELOCKING BRICK PRESS.
DRY STACKED, NO MORTAR JOINT.

TECHNICALSPECIFICATIONS.
Block Size-300mm x 230mm x 120mm.
Nos Bag of cement - 45/60pieces.
5Cu. Yd Tipper -280 to 300 Bricks.
Weight of each Block/Brick – 18kg/20kg each.
Unit Price per Brick –N70 =80 =each
Labour Force Require -2/3 men.
Nos. of Blocks per Day – 300/500 Nos.
Mix Proportion – 1:20 or 1:25
Quantity per Sq. m -28 Nos.

BCC/15/: SUPER BRICK PRESS
DRY STACKED: NO MORTAR JOINT
BRICK SIZE: 300mm X 230mm X 120mm
(Available on Special Request)

The importance of the Nylon / Polythene sheet insertion covering is to ensure the non-sticking of the soil cement to the interlocking metal features inside the Brick Press. Note that the piston track is 4 (four) on this machine, 2 (two) on each side, you are to ensure proper oiling of the piston track to ease compression and ejection. Scrapper provided will ensure straight edges if used to remove excess materials from the corners.

INTERLOCKING BRICKS, ANSWER TO AFFORDABLE HOUSING – AKINROLABU.

Property News, Daily sun, Monday May 15, 2006. Page 43.
Stories by Peter Anosike.

With the price of cement, a major building material now at N1,300 per bag, housing to most Nigerians is now a fleeting illusion that can only be pursued but never attained.

However, the Managing Director of Bolyn Constructions Company Limited, Mr Rufus Bola Akinrolabu has advocated for

the use of interlocking bricks instead of cement blocks for the purpose of reducing high cost in building of houses. According to him, with the price of cement now on the roof top, interlocking brick is the solution to affordable housing. He said that complicated and complex as it may seem to be to the non-professional builders, interlocking brick remain till date a major solution capable of reducing the high cost of walling in buildings. According to him, laterite soil which is called red filling soil or mud, the type that were used in the ancient times to build houses is now mixed with 4 per cent or 5 per cent of cement and the two basic elements with water are mixed properly to make interlocking bricks. He said that interlocking bricks system of construction has a very long history as it has been used in Thailand where the Asian Institute of Technology, Thailand in conjunction with Catholic University of Leuven, Belgium has designed a manual/mechanical press using the Cinva Ram brick to build structures that include warehouses, churches, mosques, schools, residence etc adding that while in South Africa, hydraform machines were used to make interlocking bricks for the construction of houses. "Among the two types of machines, the Cinva Ram type of manual mechanical press is to be preferred because of its relatively cheap price of about N25,000 to N60,00 as against the hydraform hydraulic press which cost about N2 million. I want to say that the preference is based on affordability, performance and the ease of maintenance by the individuals or small groups," he said. According to him, the Cinva Ram type of manual mechanical press is operated by compressing moist mixture of laterite plus 4 per cent or 5 per cent cement in a steel mould as the piston is pushed up with the lid covered. The compressed brick he said, is thereafter ejected from the mould by operating on the lever pole, the ejected brick is capable of been carried without the use of any pallet, size of 230mm x 230mm x120mm.

He warned that the approved sizes are adopted universally and that they are experience of several years of experiments and any attempt to vary by increasing has been found to be unwarranted.

Akinrolabu said that several structures have been constructed

using the interlocking bricks and that a closer look at the buildings constructed with it show that mortar are not required to join the bricks and that it is heavily insulated against heat and cold, as well as being strong and beautiful.

"Some of the advantages of interlocking bricks are the use of laterite soil which is a tropical soil and is available throughout Nigeria. They are also very cheap and at time free. Unskilled labour can be employed in the construction and everybody can lay the bricks to form walls thereby reducing the cost of labour," he said.

Note:- The manual presses now cost over a hundred thousand and naira (N100,000) while the hydraulic presses are about N60.0Million in 2012

BOLYN INTERLOCKING BRICK TECHNOLOGY (NO MORTAR JOINT/DRYSTACKED).

This Technology was received by Bolyn Constructions Company Ltd., in form of a brick sample of the hydraform building system through a customer in 1995. We have to use our Experience and Expertise in the Designs and Fabrication of the Cinva Ram Presses to Design a brick press named Bolyn interlocking Brick Press. We built a 2 room workshop at Ikorodu with the first press and started producing the presses for sales. We have since Manufactured and sold about 30 units. Bolyn Constructions Company Ltd., eventually used this concept to develop two (2) Houses:-

HYDRAFORM BUILDING SYSTEM.

We have information that the Original HydraformM4 Agrivorm Machine that was received from South Africa and is Hydraulically powered has been used in the U.S.A., Argentina, Botswana, Zimbabwe, Switzerland, Malawi, Ghana, Zaire and Namibia. We have no intention to produce or import any of the latest models:-

a. HydraformM5 Mark 3 or
b. HydraformM6 E.

They are very expensive, sophisticated and too advance for Spare Parts and Technology. Bolyn Interlocking Brick Press Produces exactly the same Brick types as the Hydraulic presses and are simpler, cheaper, effective, functional and conform to Africa Level of Technology Advancement.

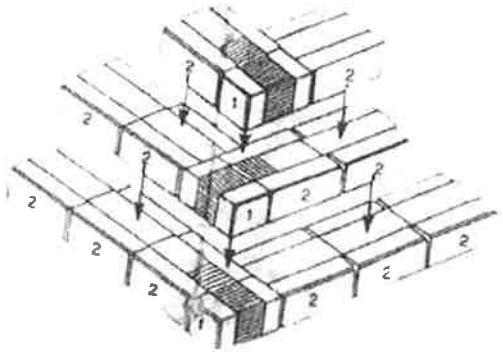
RECOMMENDED USES.

Bolyn Interlocking Bricks are recommended in the construction of Houses, Schools, Workshops, Churches, Markets and all Singles Storey Buildings. This building system is expected to eliminate all mortal laying systems of blocks and bricks. The Foundation, Lintels, Gable ends, Doors and Window level construction in the Interlocking Brick system is same as for other conventional building system as these portions of a building must be mortal joined.

REDUCTION IN COST OF BUILDING.

When used, the Bolyn Interlocking Block/Brick building system is capable of reducing the cost of construction drastically in the following ways:-

1. Labour cost in laying is reduced as No Mortal Joining is required and considerable time is saved.
2. Cement - Sand mortar requirement is significantly reduce as most walls do not require them except the foundation, lintel, ring beam, gable ends and door/window levels.
3. Interlocking Block Walls require lesser Plastering Material than other straight walls. It is laid in walls with side grooves that aids better adhesion.
4. A lot of man hours are saved because Bolyn Interlocking Blocks will be faster to erect than mortar joined walls.
5. Block moulding and Block laying in Bolyn Interlocking System can be mostly handled by the less expensive unskilled labour.
6. The walls of the buildings constructed by Bolyn Interlocking blocks can be painted on directly. It require no plastering as a matter of compulsion.



3rd Course.

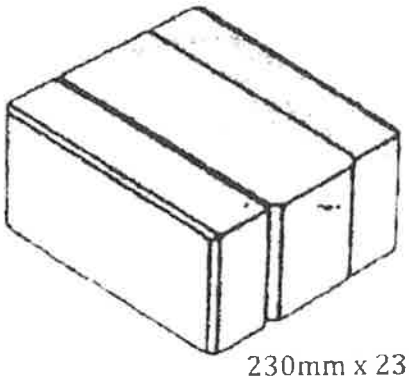
2nd Course.

1st Course.

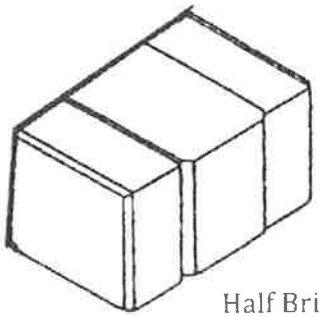
7. The internal of the buildings constructed by Bolyn Interlocking blocks are cooler because of the thermal properties of soil and thickness of the solidblock- 230mm thick wall.
8. Only a few skilled labour in supervision is required for Bolyn system of Interlocking Wall Bricks.
9. About 5% cement by volume is adequate for most type of soil. After which proper curing with water 7-8 days will provide durable cement stabilized blocks.
10. All activities of block moulding can be site concluded without recourse to human and vehicle transportation of Bricks/Blocks from place to place.

PRODUCTION OF BOLYN INTERLOCKING BLOCKS/BRICKS.

1. Procedures for the production of Bolyn Interlocking Blocks are same for the Cinva Ram bricks/blocks.



230mm x 230mm 120mm.
FULL SIZE BLOCK.



Half Brick.

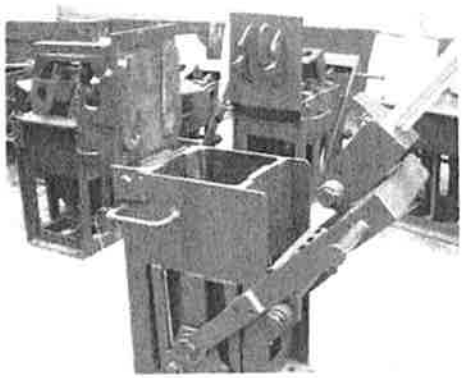
2. All Blocks must be properly cured (7-8 days of wetting) under polythene sheet cover.

3. The Blocks press has been designed to produce the following sizes of bricks in a single operation:
   (a) 230mm x 230mm x 120mm – 1 unit, (Full Size)
   (b) 115mm x 230mm x 120mm – 1 unit (Half Size)

PROCEDURE FOR BUILDING A BOLYN INTERLOCKING BLOCK HOUSE.

1. Adopt the Normal-Conventional Foundation used in your locality (i.e) Don't use this block below Foundation.
2. Ensure that the commencement layer of Bolyn Interlocking Blocks is totally level in all direction using cement mortal to join the 1st course to the DPC.
3. A half Brick is always required at the corners with the top and side projections removed. The next block must be full and with half of its top projection removed.
4. Top Courses near the roof level e.g Gable End Walls, Lintel or Ring Beam. Window and Door Frames are Mortar, Concreted and Cemented as in conventional Building Construction.

BOLYN CONSTRUCTIONS CO. LTD
HEAD OFFICE - BUILT USING NO MORTAR
INTERLOCKING BLOCK + CONCRETE ROOF



BCC/05/INT - BOLYN INTERLOCKING
BRICKS PRESS (NO MORTAR-DRY STACKED

5. Roof Wires are embedded in Walls as usual around the 3 or 4 top layer Blocks for Holding down the Roof Structure.
6. Conduit Wiring in Electrical and Plumbing Fittings are done in conventional way.
7. All types of Roofing System e.g Roof Tiles, Galvanized Sheets, Aluminium and Asbestos Roofing Sheets are all

approved for use.

8. All wall (Internal & External) are plasterable.

STRENGTH OF BOLYN INTERLOCKING BRICKS/BLOCKS.

The strength of Bolyn Interlocking Blocks/Bricks are as for most Cinva Ram Bricks with the Compression ratio of 1.65:1. The Compressive strength of Block ranges from 30kg.f/sq.cm to 50kg.f/sq.cm on the average. This is very adequate for a Single Storey Building. Strength is dependent on cement content and curing (i.e) you can increase the strength of these Bricks by increasing the cement contents and by proper curing.

HYDRAFORM BUILDING SYSTEM USING A HYDRAULIC PRESS.
(These information are supplied by the maker)HYDRAFORM BLOCKS.

The blocks are manufactured by hydraulically compressing a soil and cement mixture in a hydraform block making machine.

Since the first Hydraform block was produced in 1988, the design of the Hydraform blocks has become more sophisticated and the efficiency and capacity of the Hydraform block making has been increased dramatically.

The machine can be powered in three ways:-

- with its own diesel engine – very mobile.
- with its own electric motor.
- from an independent power source such as a tractor.

Extensive strength, durability and stability tests have been carried out successfully by a number of recognized local and international bodies on the Hydraform Building System and the system complies with the National Building Regulations of South Africa.

Hydraform building blocks are being used throughout South Africa as well as in Argentina, India and numerous African countries (i.e The World of Hydraform). Their use is predominantly in the construction of housing, schools, and general single and multi-storey buildings.

HYDRAFORM BUILDING SYSTEM.

The hydraform Building System replaces conventional bricks and mortar by the use of Hydraform blocks. These are largely dry-stacked. The other components of the conventional building system remain unchanged. (See Hydraform Building System Illustration).

HYDRAFORM BUILDING SYSTEM BENEFITS:-

Cost Saving:-

1. Blocks are cheaper than Bricks to produce because:-
   - soil constitutes the bulk of the raw materials used.
   - the blocks do not require costly burning.
   - transport costs are minimized as production takes place on site.
   - local labour is used.
2. The cost of labour is reduced because blocks are larger than bricks. They are interlocking and largely dry-stacked (with no mortar). Because of this, very little skilled construction in labour is required and construction is faster than conventional building.
3. The quantity of mortar used is reduced significantly because blocks are dry-stacked except in the foundation, ringbeam and gable layers of the wall. If plastering is applied, the straight walls requires less plaster than conventional walls.
4. Time is saved because the Hydraform Building System is simple to use.

COMMUNITY INVOLVEMENT.
The Hydraform Building System is designed to maximize the use of unskilled labour that can be drawn from the community. Thus the money expended on block production and construction largely stays in the community.

QUALITY OF PRODUCT.
The standard Hydraform Blocks have a face-brick finish and because they are interlocking, straight walls are easily achieved. Because its main ingredient is compressed soil, the Hydraform block has the highest thermal quality of all conventional building materials.

SIMPLICITY OF USE.
Both the production of Hydraform blocks and the erection of walls using Hydraform blocks are simple processes requiring unskilled labourers operating under a minimum of skilled supervision.

SPEED OF CONSTRUCTION.
Simplicity of construction using Hydraform blocks and internal control over block supplies ensures that building with the Hydraform Building is faster than conventional building methods.

ENVIRONMENTALLY FRIENDLY.
The high-compression system produces high-quality blocks without the need to deplete coal or fuel-wood resources in brick-burning.

INDEPENDENCE.
Hydraform blocks can be produced where and when required so the user of the Hydraform blockmaking machine is not dependent on brick supplies or transport.

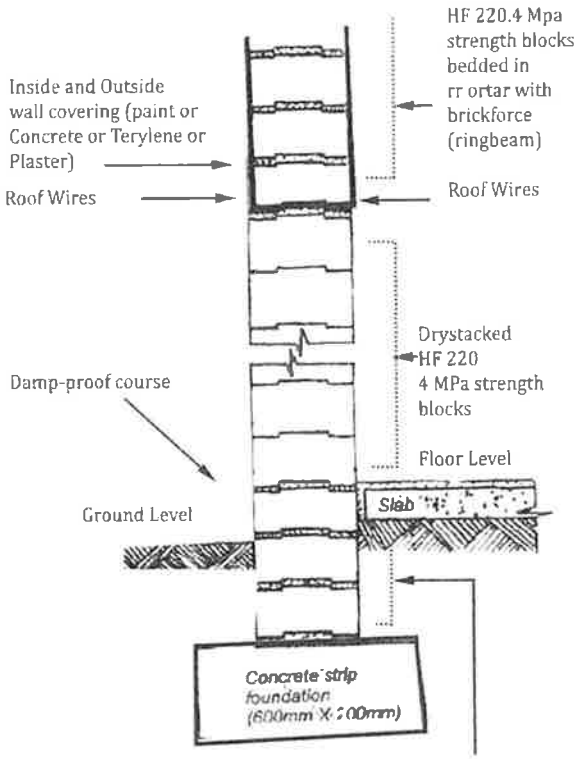
TRAINING AND TECHNICAL SUPPORT.
Hydraform provides full training in:-

- blockmaking.

- building.
- day to day maintenance of the Hydraform machine.

The engine and the Hydraform system of the machine are well known and widely used products.

ILLUSTRATION OF THE HYDRAFORM BUILDING SYSTEM.



TYPICAL SECTION THROUGH EXTERNAL WALL SHOWING FOUNDATION AND ROOF ANCHORAGE DETAILS

BLOCK STRENGTH.

The following figures are an indication only, as block strength is determined by soil type, quality of cement used and the extent of

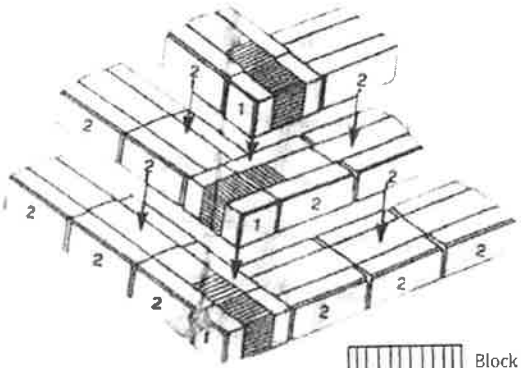
curing after manufacture.

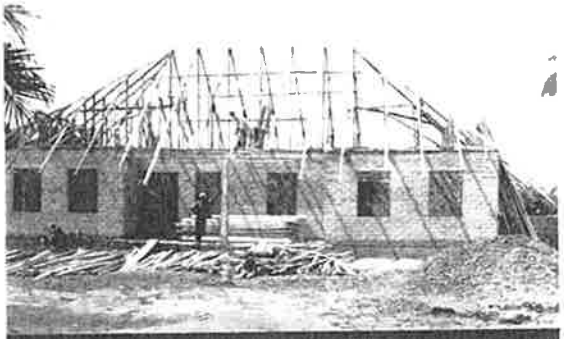
THERMAL QUALITY.
Can be up to 3 times higher than conventional products.

PRODUCING HYDRAFORM BLOCKS.

1. Source and test soil to be used.
2. Hydraform machine to construction site.
3. Mix soil and cement in pre-determined ratios per hand or in a pan mixer.
4. Mixture loaded into Hydraform blockmaking machine and block produced (16 seconds).
5. Produce corner blocks as required (per corner layer; one half HF 220 block with all protruding ridges removed and one full HF 220 block with 100mm of it's top horizontal protruding ridge removed-the cutter affixed to the machine is used to remove the ridges).
6. Hydraform block stacked for curing.
7. Because a Hydraform block contains cement, it must be cured. The stacked blocks must be covered with plastic immediately and then be watered daily for up to 6 days.

CONSTRUCTION OF A CORNER





A HOUSE UNDER CONSTRUCTION USING THE CINVA RAM BRICK SYSTEM

A HOUSE BUILT WITH LATERITE / CEMENT BRICKS

FORMING CORNER BLOCKS

PRICE
The price of the Hydraulic Press is about N6,500,000 =
(N6.5 million)

FOUNDATIONS.

1. Excavate trenches.
2. Cast concrete for strip.
3. Build foundation wall by laying HF 220 7MPa strength (see technical data) on mortar.
4. Ensure that the first layer of HF 220 blocks is totally level in all directions

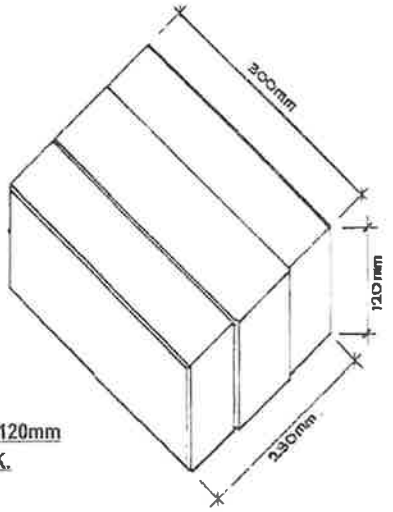
SLAB.

1. Lay damp proof course.
2. Cast 75mm concrete slab on properly compacted subgrade.
3. Floor level to be at least 150mm above ground level.

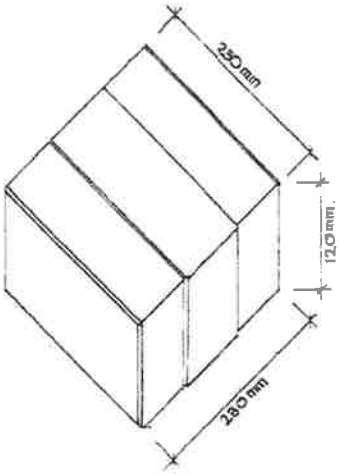
WALLS.

1. When using a raft foundation, embed first layer of HF 4 Mpa strength blocks (see technical data) in mortar, ensuring that its is totally level in all directions.
2. The following layers of HF 220 4 MPa strength blocks are then dry-stacked.
3. One half HF 220 block with all protruding ridges removed is always placed in the corner position with the side carrying the vertical protruding ridge (now removed) facing outwards. The half HF 220 block of the next layer is turned ninety degrees i.e. Right angle to the half block below.
4. Window and door frames are embedded in conventional ways and lintels.
5. Internal walls are constructed of HF 115 4 MPa strength blocks. The internal walls are tied to the external walls on every second layer by brickforce, the ends of which are secured in cavities in the Hf 220 blocks of the external wall. The brickforce is laid along the full length of the internal wall.
6. Plumbing and electrical piping are chased into walls in the conventional way.

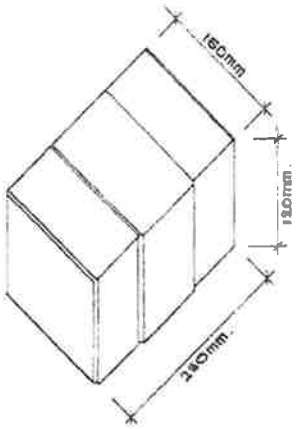
BOLYN SUPER INTERLOCKING BLOCK
PRESS TECHNOLOGY



300mm x 230mm x 120mm
FULL SIZE BRICK.



230mm x 230mm x 120mm
3/4 SIZE BRICK.



150mm x 230mm x 120mm
1/2 SIZE BRICK.

7. A ring beam is constructed by embedding the top 3 or 4 layers of the outside of the wall of HF 220 4Mpa blocks in mortar in which brickforce has been laid.

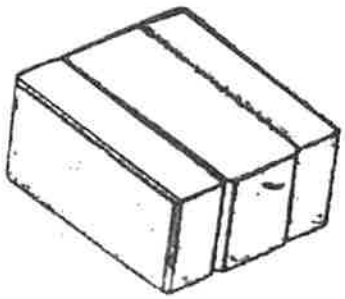
ROOF.

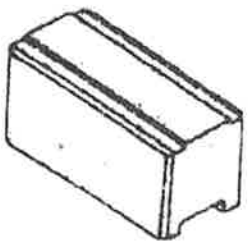
1. The roof structure is secured by affixing galvanized wire wrapped around 3 or 4 layers of the ring beam to the roof beams.
2. IBR, corrugated iron sheeting, roof tiles or any other approved roofing materials is affixed to the roof structure in the normal manner.

FINISHING.

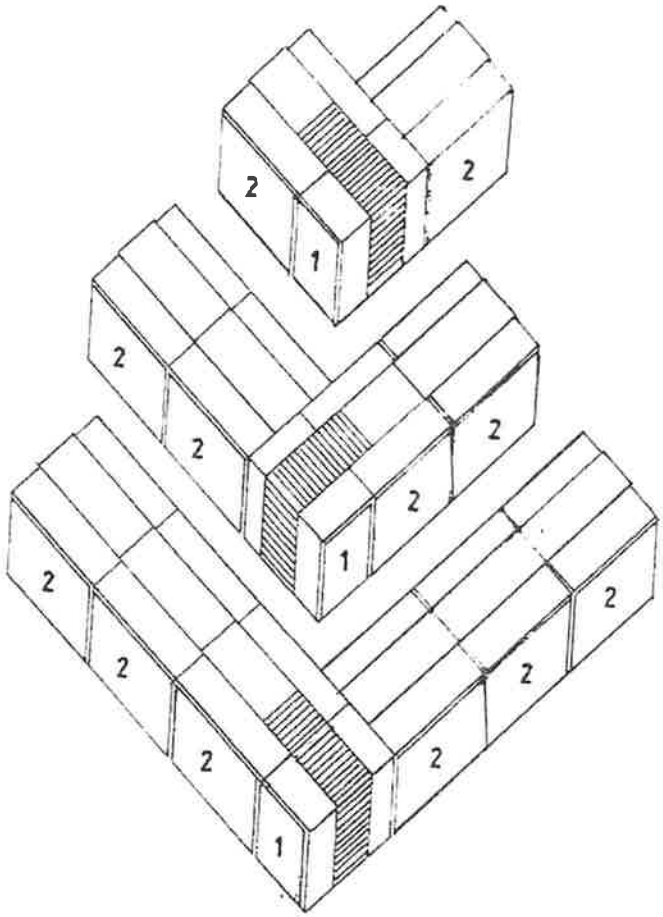
3. The external walls may be plastered, covered with paint or Terylene or other suitable materials.
4. Internal walls are finished as prescribed by the client but, at a minimum, bagging is recommended.

HF 220	HF 115
Use external walls	Internal walls
Width 220mm (9 inches)	115mm (4.5 inches)
Height 115mm	115mm
Length 50 to 240mm	50 to 220mm
Weight 12kg	6kg





By size, one HF 220 is equivalent to three conventional South African
222mm x 73mm x 90mm stock bricks.



LAYING OF CORNERS

STANDARD INTERLOCKING BLOCK (230mm x 230mm x 120mm)

House Types	One Room/ Shop	One Bed Room flat (i.e) One sitting room + One room + One kitchen + One toilet / bathroom.	Two Bed Room flat (i.e) One sitting room + two rooms + One dinning area + One kitchen + bath + toilet	Three Bed Room flat (i.e) Three bed rooms + One toilet + One dinning area + One bathroom + One kitchen.	Four Bed Rooms house (i.e) Four bed rooms + two sitting rooms + One dinning area + One kitchen + two toilets + two bath rooms.
Nos of Bricks / Blocks required	1200 Nos	3,250 Nos	4,600 Nos	5,800 Nos	7,000 Nos.
5Cu yd Tipper Lorry of laterite required	3 ½ Nos Tipper Lorries	9 Tipper lorries.	13 tipper lorries.	16 tipper lorries	20 tipper lorries.
Nos of bags of cement required	13/15/17.	36/40/45.	51/58/65	64/72/82.	78/88/100.

BOLYN INTERLOCKING BLOCK (300mm x 230mm x 120mm)

House Types.	One Room/ Shop	One Bed Room flat (i.e) One sitting room + One room + One kitchen + One toilet / bathroom.	Two Bed Room flat (i.e) One sitting room + two rooms + one dinning area + one kitchen + bath + toilet	Three Bed Rooms flat (i.e) Three bed rooms + One toilet + One dinning area + One bathroom + One kitchen.	Four Bed Rooms house (i.e) Four bed rooms + two sitting rooms + One dinning area + One kitchen + two toilets + two bath rooms.
Nos of Bricks / Blocks required	900 Nos.	2500 Nos.	3,600 Nos.	4,500 Nos.	5,400 Nos.
5Cu yd Tipper Lorry of laterite required.	3 Nos Tipper Lorries.	8 Tipper lorries.	12 tipper lorries.	15 tipper lorries.	18 tipper lorries.
Nos of bags of cement required.	12/15/18.	35/42/50.	50/60/70.	65/75/90.	78/90/108.

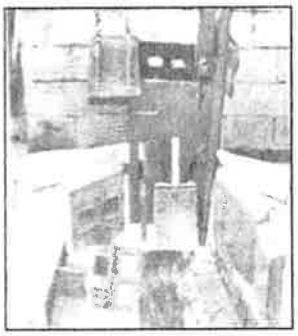
APPROXIMATE COST OF BRICK/BLOCK.

Nos.	Description	STANDARD BLOCK 230 x 230 x 120mm	BOLYN INTERLOCKING BLOCK. 300 x 230mm x 120mm.
1.	Bricks without cement	N55.00	N70.00
2.	Bricks with 3% cement	N60.00	N75.00
3.	Bricks with 4% cement	N65.00	N80.00
4.	Bricks with 5% cement	N70.00	N85.00

BOLYN SUPER BRICK PRESSES
SUPER BRICK ONE & TWO.

We have always informed our customer that a single wall of 6"(150mm) is enough for a single storey and a one storey building but we also know that people do require a 9"(230mm) wall for other reasons. It is because of those people that we have the Super I Brick. The Super II Brick was designed using the size of a fired clay brick that a customer desired that we produce same size. We have ever since that time maintained a stock of it in the believe that other customers may require same.

BCC/03/ SUPER ONE — BOLYN SUPER ONE BRICK PRESS. (ADJUSTABLE MOULD). 1 X 290 mm x 230mm x 100mm OR Alt. 1 x 290mm x 140mm X 100mm.



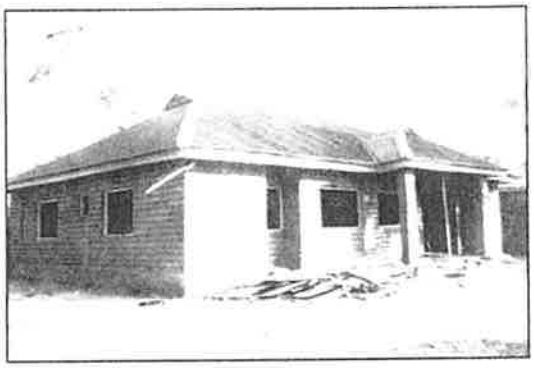
TECHNICAL SPECIFICATIONS

Block Types.	6" Blocks.	9" Blocks.
Wt. of each Block.	8kg/one.	12kg/one.
No of Block/Tipper Lorry load (5cu yd).	500 nos.	300 to 350 nos
Labour Force required.	3 men.	3 men.
Nos Blocks/day.	500 nos / 600 nos.	500 nos.
Quantity/meter square.	30 nos.	30 nos.

BOLYN SUPER II BLOCK PRESS.
Size: 335mm x155mm x 200mm ht.

We have not hidden our resolve not to produce Brick Presses that will make bigger Blocks that will be problematic in their production/handling before and during construction work. However, because we are in contact with hundreds of thousands Nigerians, we are aware that the major factor militating against the total acceptance of the Cement stabilized Laterite brick system for building purpose is the small sizes of the Bricks. Bolyn Constructions Company Limited have continued to intensify its

researches on how to attack this problem without offending the rules and regulations of sound building practices. We are happy to note that we have succeeded in producing a block type of the size of a Fired Clay brick that is 335mm long x 155mm wide x 200mm ht.

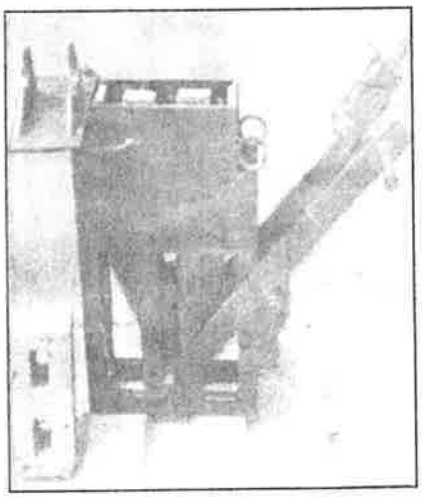


A HOUSE BUILT WITH CEMENT - LATERITE BRICKS

This effort came about as a result of a customer throwing challenge when he brought a factory made Brick of the stated size and shape.

BCC/14/ SUPER TWO

BOLYN SUPER TWO BRICK PRESS.
335mm X 155 mm x 200mm



TECHNICAL SPECIFICATIONS.

Block size	-	335mm x 155mm x 200mm.
Nos of Blocks per 5Cu. Yd Tipper	-	250 to 300 nos.
Weight of each Block/Brick	-	Approx.16kg to 18kg.
Unit price per Brick	-	N75.00 to N100.00.
Labour Force Required	-	2 to 3 men.
Nos of Blocks per Day	-	300 to 400 nos.
Mix proportion	-	1:30/1:25/1:20.
Quantity/Sq. Metre	-	14 Nos/Sq.m.
Comparative size against sandcrete Block	-	Approx. 75%.

BOLYN SUPER II BRICK PRESS.

Our Brick Press is designed to make both a solid (without hole) and perforated blocks. It is equally of note that the Blocks made will use wooden pallets that will support the bock for its first 24 hours life. Bolyn Constructions Co. Ltd. will supply customers with samples of the Wooden Pallets and other accessories such as: Oiling brush, Soil Scoop, Soil scrappers, Bolts/Nuts, Soild and Hollow wooden pallet, Flat metal, Half block metal, Lintel pallet etc.

TRAINING IN BLOCK MAKING.

We expect all customers interested in this Block Press to obtain proper training in the use of this Block Press because it will require a special technique rather than force to operate. We advise that you contact us directly for this training rather than adopt third party that will claim expertise. We as the maker have the formular for its ease of operation.

BOLYN SUPER 1 BRICK PRESS.

(With adjustable mould)

This Brick Press is a Cinva ram type machine which was modified and designed by us.

This Bolyn Super 1 Brick Press is designed to make a solid Block only. Customer can however order for it to be modified to make other varieties.

We have endeavoured to adapt what usually would have been a 230mm (9") wide. Brick Press/machine to equally make the multi-purpose bricks. We have usually hastened to inform client that all their requirements in housing construction is easily met in our multipurpose press. However, some client may specially require a 230mm (9") brick for sound insulation as in studio etc, for them this machine is suitable. The addition of the multipurpose accessories can enable them have other usage for the press after accomplishing their initial desire.

NOTE:-
Please note that this machine is not advantageous to House Builders. It is a 230mm (9") wide brick press and to change to 140mm (approx. 6") is NOT difficult, however, it is not as painless as getting the standard multipurpose press/es.

BOOK AN ORDER.
Client requesting for this machine types are enjoined to place an order for it since it is not always available in stock. It will take 2/3 weeks to produce same. A 70% down payment is required on order to guarantee that it will be picked up immediately after manufacture.

OPERATIONAL MODE.
This press is operated the same way as in all Cinva-Ram Type press.

BOLYN SUPER II BRICK PRESS.
BOLYN super II Brick machine require a special type of training to operate it because of the depth of this machine that is much deeper than any known manually operated press. The details to be noted very well are:-

a. The machine internal mould box must always be oiled by rubbing deep down the mould box.
b. The hollowing metals must always be oiled deep down.
c. The machine needed to be loaded one third (1/3) way and wooden plank rammed, then filled two third (2/3) way and wooden plank rammed, lastly filled totally and

Wooden plank rammed before finishing off and the lid closed for the compression to take place.

d. Ejecting the Brick/Block from this machine will look a little harder to achieve. It could be near impossible if brute force is used to try to eject the block.

e. The ejection of this Block is to be technically done with very less force than it will normally seems to the operator.

f. Each block require a wooden pallet for its removal and drying. The wooden pallet can be removed after about 24hours of production.

,g. The wooden pallet with the block on it will tend to trap operator's hand below it unless they are placed on some wooden laths/strips of wooden plank that will enable the operator to withdraw their fingers from underneath.

WARNINGS

1. We have warned that bigger Laterite Blocks are usually heavy and are not to be preferred.
2. Those preferring this block must therefore be patient to learn the technique of the machine operation.

BOLYN INTERLOCKING BRICK PRESS (LIQUID MORTAR IN HOLES).

This is a Cinva Ram type of Brick Press and have a similar way of operation. The press have some internal features enabling the machine to produce bricks with a diameter 60mm hole at the centre and a half circle at each end that make up for a full circle when laid end to end. The bricks have two depression at their bases and projections (2) at the top made in such a way that they lock themselves together when constructed into walls. The brick press is supplied with basic accessories which include those that allow for the making of:-

a. Full size block.
b. Half size block.
c. Lintel or Channel type block.

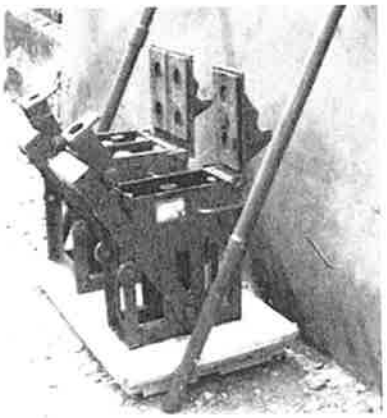
Some of the internal features are made to be removable, interchangeable and replaceable thus enabling one to vary the side/s where the full size and half size holes are to be placed.

We advised the use of interface sheet (polythene sheet) at the base and the top of the machine internal mould. This is to allow the complete detachment of the newly made bricks from the faces of the internal features. This will give the best result, please ensure compliance(if) sound bricks are to be made.

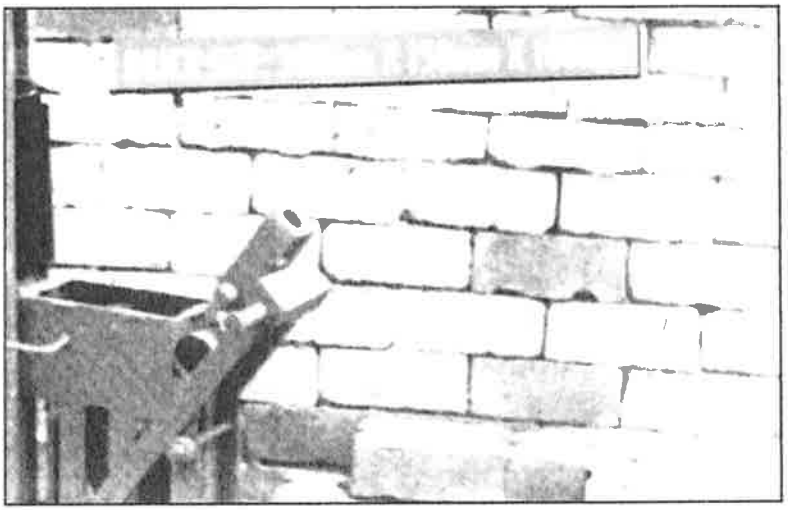
MACHINE OPERATION.
It is same as for all other Cinva Ram types of Brick presses and the design is peculiar to Bolyn Construction Co. Ltd., as we modified the V.S. Cinva Ram Press to achieve this version.

HOW ARE THE BRICKS USED ?
The machine can make end bricks, corner bricks and the main bricks. These bricks are to be laid in ten (10) with the first course firmly fitted to the D.P.C. and the other nine (9) course laid dryly without mortar joining. When the bricks are fully in place, cement and sand mortar are made into liquid and poured into the holes. Ensure that you fill the holes, stopping on the last brick when it is half filled.

BRICK PRESS SPECIFICATIONS	
No. OF BLOCKS/STANDARD ROOM	1200Nos.
BLOCK SIZE	300 x 150 x 100MM
Nos. OF BLOCK PER 5Cu. YD. TIPPER	500Nos. BRICKS
WEIGHT OF EACH BLOCK/BRICK	7.5 TO 8KG
UNIT PRICE PER BLOCK	N25.00 TO N50:00
MIX PROPORTION	1:20 OR 1:25
QUANTITY/SQ. METRE	32/35 Nos



BOLYN DOUBLE LIQUID MORTAR PRESSES



Brick size: 300mm x 150mm x 100mm
BCC/04/INT (THAI) Bolyn interlocking brick press
(liquid mortar)

BOLYN INTERLOCKING BRICK TECHNOLOGY.
(LIQUID MORTAR IN HOLES).

Bolyn Constructions Company Limited first knew about Liquid Mortar type Interlocking construction through AUS BILDUNGS VER BUND METAL RESSULSHELM IN GERMANY who obliged us a design drawing of their Brick Press, we later got an insight to the technology though a joint publication by PGCHS & AIT-HSD, THAILAND/BELGIUM. We also receive some details of the system as developed by Dr. A Bruce Etherington formerly of AIT, Bangkok, it was the combination of the effect of all the above with the expertise already gathered by us on the design of various Cinva Ram Brick Presses that enabled us at Bolyn Constructions Company Limited to be able to come up with our model of the Liquid Mortar Interlocking Brick construction and Brick Press design which is similar to the ones mentioned above in all respect.

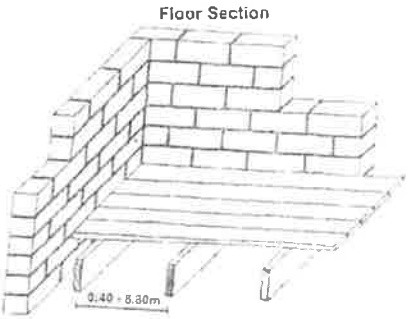
REASON FOR THE ORIGINAL AIT CONCEPT OF LIQUID MORTAR INTERLOCKING BLOCK CONSTRUCTION.

The Asian Institute of Technology established a department to liaise with International and National organizations including NGO's to find solution to Rural Housing and Low Income Housing Construction in view of the fact that Building materials are the main issue militating against self help and community participation in housing construction. Countries try to find solution to the population explosion in a World that is supposed to hit 10 billion in this 21st century and problems like Nutrition, Health, Education, Infrastructure and Shelter will compete with each other.

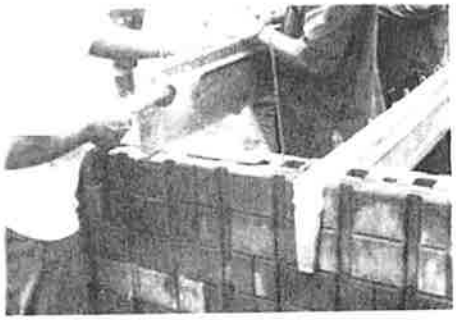
The answer to the problem of low income housing lies in small scale production of building components, use of non-skilled labour in production and construction of houses as well as using materials that are available easily and cheaply, which can be produced locally. A significant success has been made in the use of Cinva Ram Brick Presses to mould solid Bricks which are to be mortar joined, however, even though unskilled labour are able to mould the Bricks, it require skilled labour to lay them in the walls. Such walls are massive and sufficiently stable for a single storey building while for multi-storey building it may not be for reasons that only light re-inforcement could be practiced.

The design of the liquid mortar interlocking Bricks system through the modified version of the Cinva Ram Brick Press allows:-

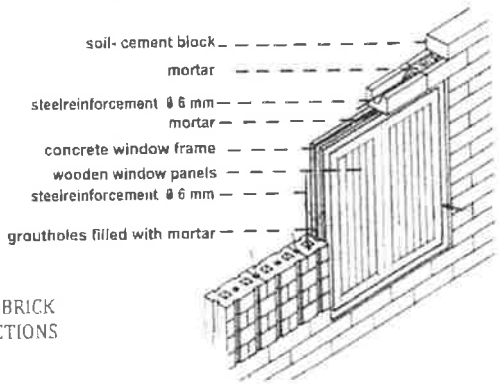
a. A demountable, fire, wind and earthquake resistant shelters for use in natural or man-made disasters (including squatter eviction and resettlement).
b. The system, as designed by AIT has grown to be an inexpensive, quickly and easily erected housing system whose costs consistently undercut by 30% to 50% conventional construction system.
c. Hand operated Presses make the technology labour intensive and well suited to small scale projects.



ROOF-OVERHANG AND CONCRETE PAVEMENT



JOISTS / WALL CONNECTION



LIQUID MORTAR BRICK
WALL CONSTRUCTIONS

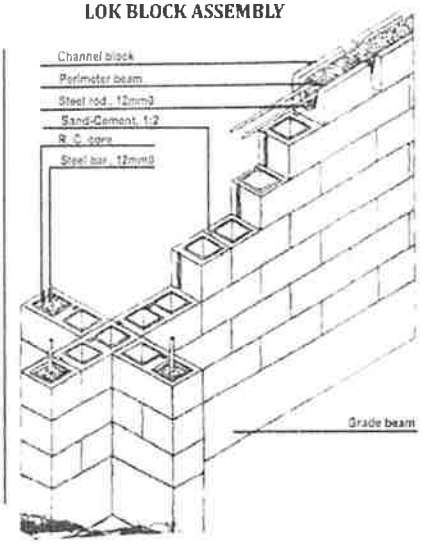
Ordinary Block

Half Block

Channel Block

LIQUID MORTAR INTERLOCKING BRICK SYSTEM
Capable of making
a). Full Bricks
b). Half Bricks
c). Channel/Lintel Bricks
d). It is also Re-inforced steel possible.

LOK BLOCK ASSEMBLY



d. Brick Presses are capable of being used to make regular, half size & U-shaped stabilized brick. Bricks with up to 40kgf/cm compressive strength.

e. Because positive and negative elements are provided in the top and bottom surface, Bricks can be laid dry and aligned automatically thus achieving a higher production rate than conventional mortar jointed Bricks laid by skilled masons.

f. The Interlocking liquid mortar construction is water and air tight as both water and air are prevented from passing through the horizontal joints by the mortar.

g. The amount of grout (i.e) mortar used in the laying of liquid mortar interlocking Bricks is about 30% of the requirement for the conventionally laid Bricks.

h. The Interlocking (no mortar) Bricks can be made of crush stone/sand with cement or stabilized earth with cement.

i. Depending on the availability of materials for Bricks making near the site of production, a manual press can be

HOUSES & FENCE BUILT BY - STABILISED LATERITE SOIL BRICKS IN NIGERIA.

A BEAUTIFUL SOIL-CEMENT HOUSE.

A BEAUTIFUL HOUSE WITH BOLYN ROOFING SHEET

A BUILDING BUILT WITH SOIL-CEMENT BRICKS.

BUILDING WITH STABILISED BRICKS

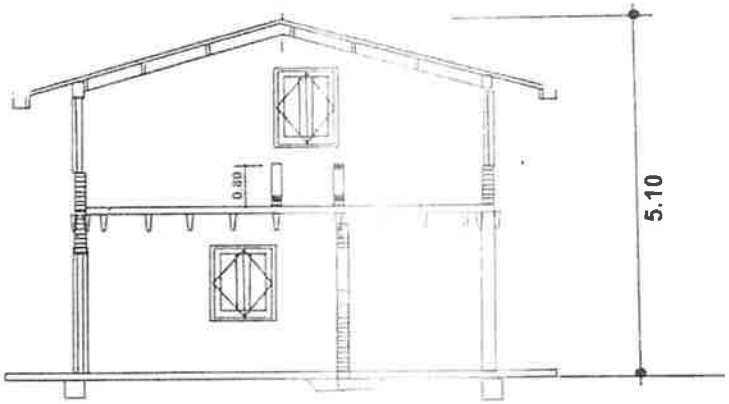
SOME PARTICIPANTS DURING ONE OF OUR SEMINAR AT THE HEAD OFFICE

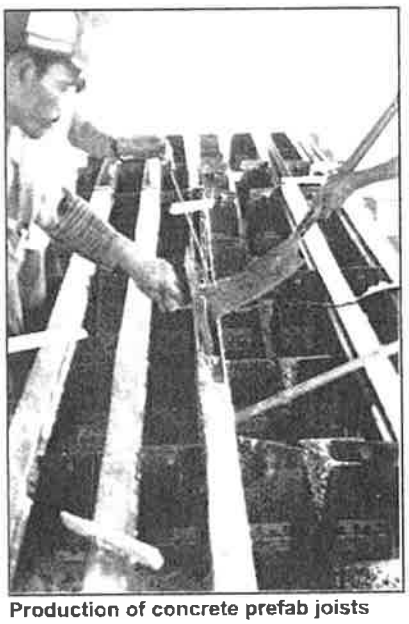
CINVA RAM BRICKS
(PRODUCED BY TYPE 01 & 02 BRICK PRESSES)

A BEAUTIFUL SOIL-CEMENT HOUSE.

A HOUSE UNDER CONSTRUCTION USING THE CINVA RAM BRICK SYSTEM

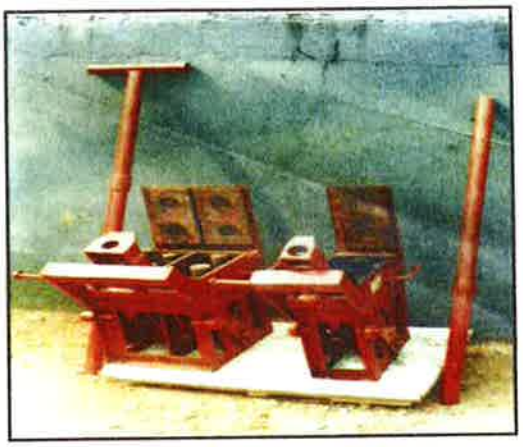
A SECTION OF A BUILDING





Production of concrete prefab joists

BOLYN INTERLOCKING BRICK TECHNOLOGY



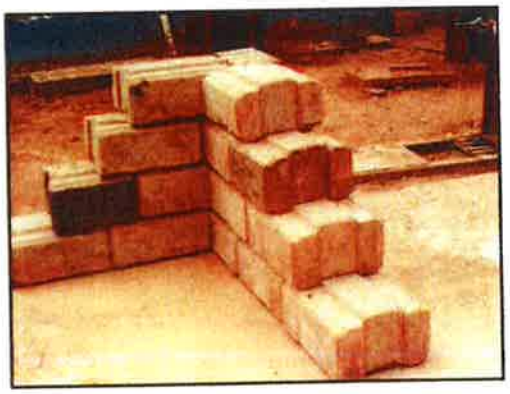
BOLYN DOUBLE INTERLOCKING BRICK PRESS, LIQUID MORTAR

INTERLOCKING FLOOR TILES

INTERLOCKING HOUSE

INTERLOCKING HOUSE UNDER CONSTRUCTION

INTERLOCKING BLOCK HOUSE UNDER CONSTRUCTION



BOLYN INTERLOCKING BRICK LAYING METHOD

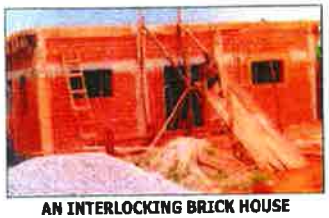
BOLYN INTERLOCKING BRICK TECHNOLOGY

BUILDING WITH STABILISED BRICKS

A BEAUTIFUL FENCE IN LAGOS.

BOLYN INTERLOCKING FLOOR TILE

BOLYN INTERLOCKING BRICK PRESS (NEW MODEL)



AN INTERLOCKING BRICK HOUSE

BCC/05/ BOLYN INTERLOCKING BRICK PRESS
- STANDARD TYPE INT.
INT. DRY STACKED NO. MORTAR JOINT.
BRICKSIZE: 230mm x 230mm x 120mm.

CLOVER PAVING BRICK PRESS

A BEAUTIFUL SOIL-CEMENT HOUSE.

AN INTERLOCKING FENCE

INTERLOCKING HOUSE UNDER CONSTRUCTION

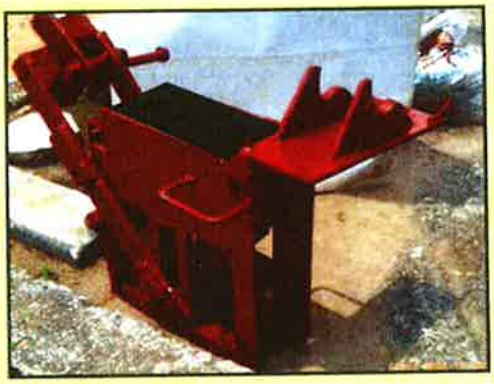
COLLECTION OF LATERITE SOIL THAT IS ALSO CALLED MUD OR RED FILLING SAND

A NEWLY COMPLETED INTERLOCKING BRICK HOUSE IN IKORODU, LAGOS.

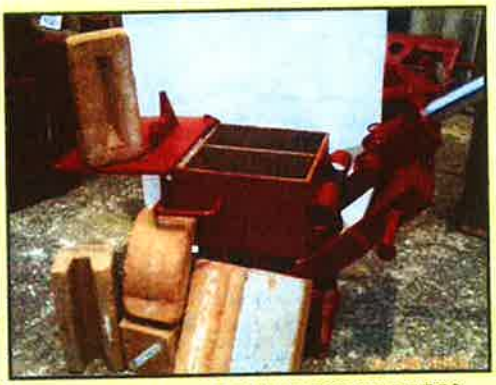
SOME BOLYN PRODUCTS

BCC/07/ BOLYN PAVING BRICK PRESS P.HEXA (HEXA PAVER).

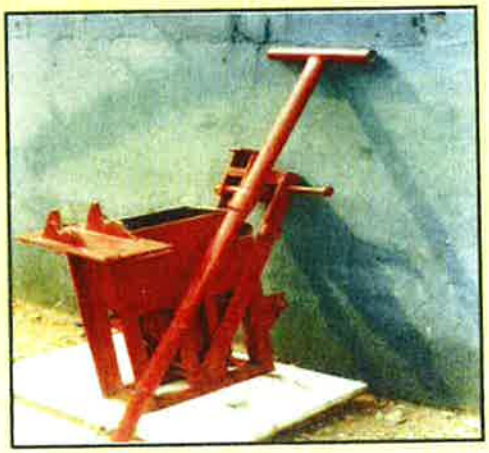
BCC/13 BOLYN-SUPER SEMI - ROOFING SHEET VIBRATION TABLE.



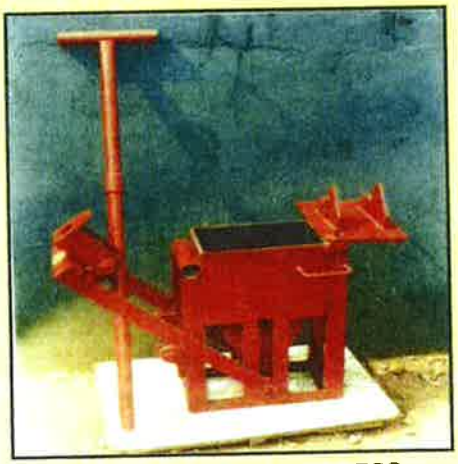
BCC/01/ V.S. CINVA RAM PRESS (MULTI-PURPOSE). SINGLE. BRICHSIZE: 290mm x 140mm



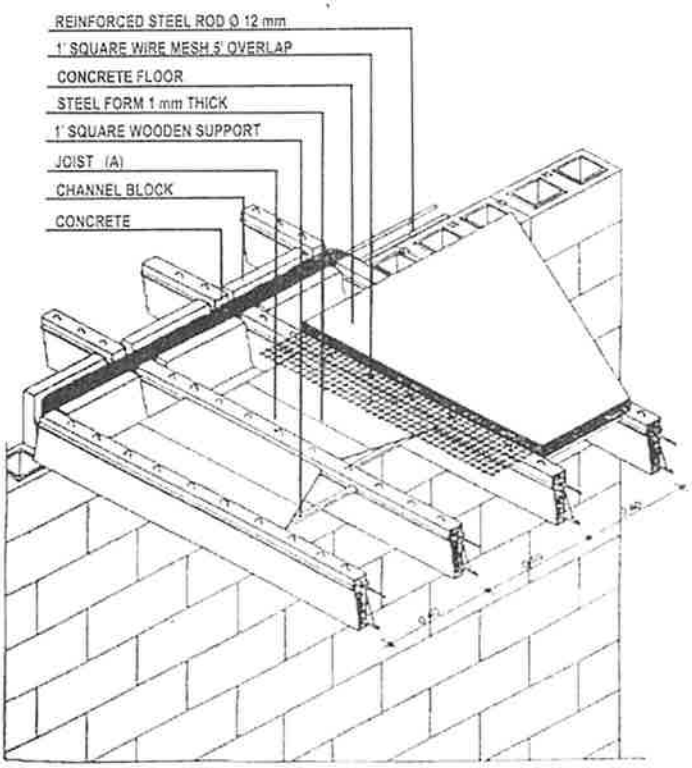
BCC/02/BOLYN DOUBLE BRICK PRESS (MULTI-PURPOSE) DOUBLE BRICK SIZE: 2NOS x 290mm x 140mm x 100m



BOLYN SUPER II BLOCK PRESS

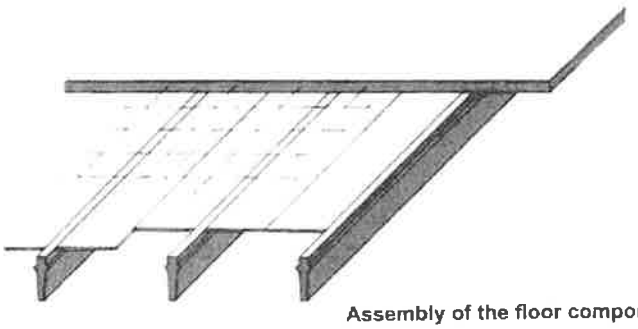


BOLYN MUD BRICK PRESS



FLOOR ASSEMBLY

This is typical mode of casting the Re-intorced concrete floor on the concrete joist (beam)



Assembly of the floor components

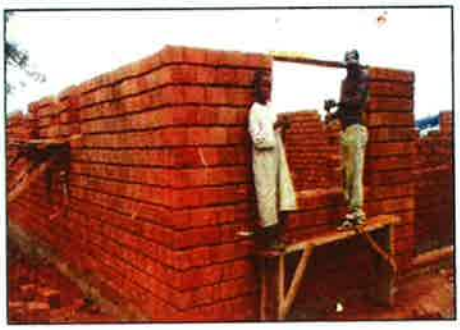
BOLYN INTERLOCKING HOUSES AND FENCES

A BEAUTIFUL SOIL-CEMENT HOUSE.

BOLYN INTERLOCKING FENCE

AN INTERLOCKING FENCE

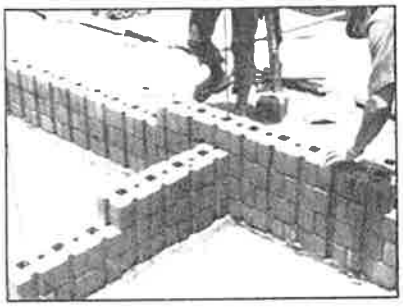
BOLYN MD ONDO HOUSE



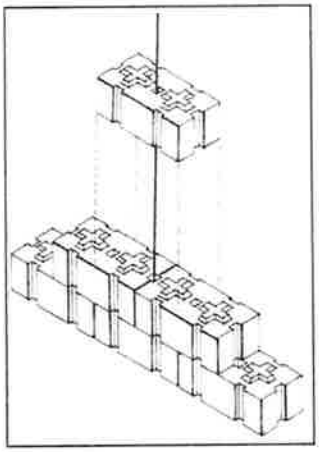
INTERLOCKING HOUSE UNDER CONSTRUCTION

BCC/05/ BOLYN INTERLOCKING BRICK PRESS
- STANDARD TYPE INT.
INT. DRY STACKED NO. MORTAR JOINT.
BRICKSIZE: 230mm x 230mm x 120mm.

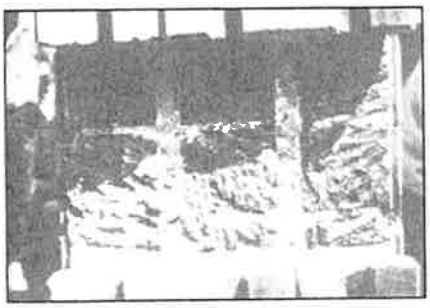
Laying the Soil-Cement Brick Dryly into the walls.



How to install steel Re-inforcement into the soil Cement Brick Holes



Pouring Cement Grout into Brick Holes to form Mortar Joints



Vertical Section of Soil-Cement wall showing the cement-sand grout poured previously into the soil-cement Bricks Holes

Used to make 200 – 400 – 600 Bricks per day depending on whether a single or double Brick Press is used.

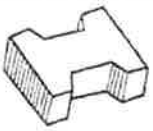
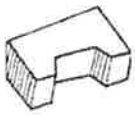
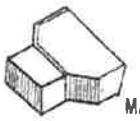
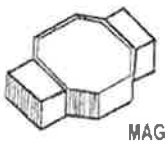
Bricks can be laid dry and are automatically aligned when the interlocking is completed allowing the unskilled labour to actively participate. The Brick size of 300mm length x 150mm wide x 100mm high allow the bricks to be used at corners, T-junctions and crossings. Because the Bricks have hollows, re-enforcement of rod and concrete are thus possible for effecting a multi-storey structure. Liquid cement mortar is introduced into the Grout Holes of the Interlocking Bricks in lieu of the normal/conventional mortar joints of the Bricks construction.

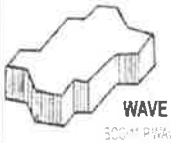
Bolyn Constructions Company Limited can supply the Bricks Press named Bolyn Interlocking Brick Press (Liquid Mortar in Grout Holes) modeled after the technology as detailed by the Asian Institute of Technology, Thailand.

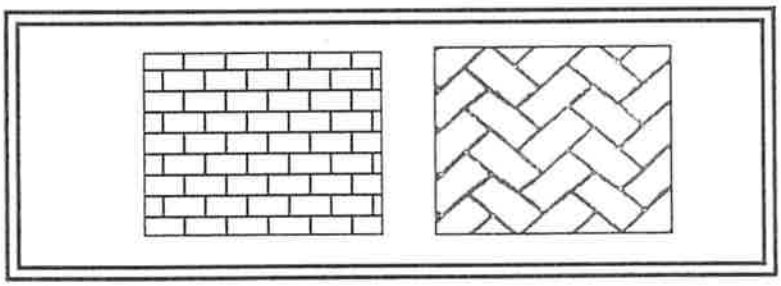
INTERLOCKING PAVING BRICK PRESSES.

*ROAD *DRIVE WAYS * PAVEMENT * WALKWAYS * ETC.
BCC/06/DOUBLE TEE PAVER.
BCC/07/P.HEXA – HEXA PAVER.
BCC/08/P.CLOV – CLOVER PAVER.
BCC/09/P.MAG – MAG PAVER.
BCC/10/P.ROMM –ROMAN PAVER.
BCC/11/P/WAVE – WAVE PAVER.

BOLYN PAVING BLOCK AND PRESSES MAKES:-
*ROAD *DRIVE WAYS * PAVEMENT * WALKWAYS * ETC.

	QTY./Sq.m	Wt./Sq.m
 DOUBLE TEE (FULL) BCC/06/P DTEE	38 Nos	190kg
 DOUBLE TEE (HALF) BCC/06/P DTEE	76 Nos	190kg
 MAG (HALF) BCC/08/P MAG	76 Nos	190kg
 MAG (FULL) BCC/09/P MAG	39 Nos	220kg

 ROMAN BCC/05/P ROM	32 Nos	160kg
 WAVE BCC/11/P WAVE	42 Nos	170kg
 HEXA BCC/07/P HEXA	26 Nos	165kg
 (FULL) CLOVER BCC/08/P CLOV	28 Nos	200kg
 (HALF) CLOVER BCC/08/P CLOV	56 Nos	200kg



REGULAR PAVER

	QTY /Sq.m	WT./Sq.m
DOUBLE TEE (FULL) BCC/06/P.D TEE	38 Nos	190kg
DOUBLE TEE (HALF) BCC/06/P.D TEE	76 Nos	190kg
MAG (HALF) BCC/09/P.MAG	76 Nos	190kg
MAG (FULL) BCC/09/P.MAG	39 Nos	220kg
ROMAN BCC/10/P.ROM	32 Nos	160kg
WAVE BCC/11/P.WAVE	42 Nos	170kg
HEXA BCC/07 P.HEXA	26 Nos	165kg
(FULL) CLOVER BCC/08/P.CLOV	26 Nos	200kg
(HALF) CLOVER BCC/08/P.CLOV	56 Nos	200kg

Collection of newly made Paving Bricks

LATERITE CEMENT BASED PAVING BLOCKS can be made on our Paving Presses with a soil: cement mix of richer proportion. The objective being to make the tile more resistant to wear to which they may be subjected. Still better result can be obtained, if a fine layer of sand and cement (2:1) is uniformly spread on the bottom of the mould box before filling it with the soil-cement mix. This tile is compressed in the usual manner of block making. The resultant compressed tile will have a sand: cement facing and a soil: cement backing. After curing, the tiles are laid as flooring tiles (with the sand: cement facing on top).

Interlocking Paving Stone can be made with stone dust, soft sand and cement in a Ratio of 2:1:1.

BOLYN INTERLOCKING PAVING BRICK PRESSES.

*DOUBLE TEE *HEXA * WAVE *CLOVER * MAG * ROMAN * HI * DIAMOND .

In Nigeria of today, it is fastly becoming the vogue for building surrounds; pathways and motor ways to be paved with paving stone made from stone dust, sand and cement. We at Bolyn Constructions Company Limited found the formular for the use of laterite and cement with a sand cement facing in an Indian technology book as follows:-

FLOOR TILES:-

Floor tiles of sizes 29 x 14 x 5cms (12" x 53/4 x"2") can also be produced on the Bolyn presses using our block / brick mould and employing a soil: cement mix of richer proportion. The objective being to make the tiles more resistant to the wear to which they may be subjected. Still better results can be obtained, if a fine layer of sand; cement (2:1) is uniformly spread on the bottom of the mould box before filing it with the soil-cement mix. The tile is compressed in the usual manner of block making. The resultant compressed tile will have a sand: cement facing and a soil: cement backing. After curing, the tiles are laid as flooring tiles (with the sand: cement facing on top) over a layer of rammed earth and sand bed and the floor surface is finally completed with a screed of cement grout followed by finishing and string impressions along the joints. Reduction in block height to produce tiles can be realized by placing a suitable wooden pallet on the piston plate. Each tile or paving brick will then require a metal or wooden plywood pallet to lift the newly made product to its resting or drying place. These pallets are re-usable.

PAVING BRICK MAHINE OPERATION.

The brick press have the same operation mode like any other Cinva-Ram Brick Press model.

PROPORTIONING, MIXING AND MAKING OF PAVING BRICKS.

a. For external use-Main body – adopt a 10% cement (i.e) 1:10 (1 head pan of cement to 10 head pans of laterite soil, while the fine face is to be 1:2(i.e) 1 head pan of cement to 2 head pans of fine sand.

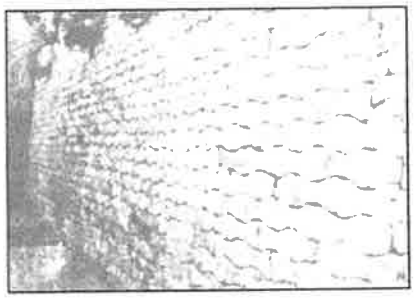
b. FOR INTERNAL USE: 1:10 or 1:15 could be used to make the bricks that will be laid on a rammed earth and light concrete, the finished floor can now be screeded completely level and finished as necessary.

BRICK PRESS OPERATIONAL MODE.

1. Insert a wooden/plywood pallet with an interface sheet (nylon) on its face.

2. Put 2 or 3 trowel full of fine sand: cement (2:1) mix on the interface sheet (nylon) face and spread same.
3. Scoop and fill the mould with your cement: Laterite soil mixture to the top of the mould box/es.
4. Close the Brick Press mould and operate as in all Cinva Ram Brick Press operation.
5. The resultant Brick are left on the pallet overnight.
6. The Bricks are strong enough on second morning and are ready to be stacked for proper curing.
7. Note that the above can also be reversed e.g it may be the soil- cement that should go into the mould box first before the facing materials of sand-cement is introduced.

A 1995 example of a motorable Paving Brick of the Double Tee type.



BOLYN MUD BLOCK PRESS.

(BLOCK SIZE 300 mm x 230mm x 180mm).

Mud Block have continuously been used for building houses in the developing countries of the world. A visit to rural centres across Nigeria reveal that the practice although no longer rampant have not shown any sign of being fazed out. Bolyn Constructions Company Limited have by the designing of this MUD ONLY Press shown our sympathy for an understanding of the requirement of the ordinary Nigerian. Our type of Mud Block Press have adopted the local standard size and is recommended to use wooden pallets samples of which will be supplied with the machine. Customers are enjoined to make as many wooden pallets as the number of blocks that they are capable of making daily. These pallets are re-usable after 24-48 hours of initial use.

It is noted that the weight of this Mud Block is much, the reason being the size and the compression exerted by the machine. We have once advise the following as ways of reducing the weight of the Block:-

a. Reduction of the thickness/height of the block which is possible if more than one wooden pallets is placed inside the machine.

b. The soil can be mixed with other light weighted materials such as fly ash or saw dust.

OPERATION MODE

It is to be operated like all other Brick or Block presses made by Bolyn Constructions Company Limited. The Blocks can be cement stabilized, while the Block Press can be adapted to other Block making purposes because of its large size mould box.

TECHNICAL SPECIFICATIONS.	
BOLYN MUD BLOCK PRESS.	
NOS. OF BLOCK PER 5 CU. YD. TIPPER	200 to 250 nos
NOS. OF BLOCKS PER BAG. OF CEMENT	Usually Non-cement Stabilized.
WEIGHT OF EACH BLOCK	20kg / 25kg
UNIT PRICE PER BLOCK	N35.00 to N40.00
NOS OF MEN/8HR WORK	2 to 3 men
NOS OF BLOCKS PER DAY	400 to 600
WORKING HOUR PERDAY	8 hours
BRICK SIZE	300mm x 230mm x 180mm Approximately 12" x 9" x 7"

BOLYN MUD BRICK PRESS

EDO/DELTA SUPER BLOCK PRESS.

This Block Press that makes a Super Block of the sizes commonly used in parts of Edo and Delta States was a result of request made to us by customers from that part of the country when we visited the states on exhibition in 1995 and 1996. We were able to design a Super Brick Press that we call EDO/DELTA Super Block Press. This block Press was designed to make laterite only or stabilized Soil Block of the sizes:-

a. 18"x6"x9" = 455mmx150mmx225mm.

b. 18"x5"x9" = 455mmx125mmx225mm.

The type A or type B is easy to make by inserting one wooden pallet for A and 2 nos wooden pallets for types B. The Brick Press is Heavy Duty, designed to make one Block at a time.

LATERITE ONLY BLOCK.

It is possible to make a mud block (i.e) laterite only block. Once you find a good muddy soil (laterite soil) that has a good soil composition. This Block will be dried for at least 2 weeks when it must be turned on the edges for proper sun drying. It must not be allowed to dry too fastly in order to avoid it cracking. Plant fibres such as grasses could be added to re-inforce the block.

CEMENT STABILISED LATERITE BLOCK.

Cement stabilized laterite block can be produced on the Edo/Delta Block Press e.g

5% Cement stabilized (1:20) – Very Good

a. 18" x 6" x 9" (455mm x 150mm x 225mm) blocks can be made using 1 head pan or ½ half bag of cement plus 20 head pans of laterite soil (mud).

(i) Half Bag of Cement can be used to produce = 25 nos

(ii) A 50kg bag of cement can be used to produce 50 nos.

b. 18" x 5" x 9" (455mm x 125mm x 225mm) Blocks can be made using 1 head pan or 1/2 Bag of cement plus 20 head pans of laterite soil (mud).

(i) Half Bag of Cement can be used to produce = 30 nos

(ii) A 50kg bag of cement can be used to produce 60 nos.

4% cement stabilization (1:25) – Good.

Nos of Block that can be produced are as follows:-

18" x 6" x 9" or 455mm x 150mm x 225mm	18" x 5" x 9" or 455mm x 125mm x 225mm
Half Bag of cement 30 Nos blocks	Half bag of cement 35 Nos blocks
Full bag (50kg) of cement 60 Nos	Full bag (50kg) of cement 70 Nos plus

BOLYN EDO/DELTA BRICK PRESS

STRENGTH AND DURAILITY OF BLOCK.

Mud have been used for building from ages and machine made Mud blocks and Mud cement blocks are strong, durable and guaranteed for low and medium cost housing. It has comparative strength with Cement Sand Block called Sandcrete Blocks.

REMARKS/COMMENTSMADE BY SOME REPUTABLE NIGERIANS DURING THEIR VISITS TO SOME OF OUR EXHIBITIONS.

1. A good innovation in cost reduction in Building Construction – Engr. A.T. Ajetumobi, Oshogbo, Osun State.
2. This is a good encouragement for the use of local materials to produce what we can use for building. – Chief (Mrs.) M.A. Olawoyin, Oshogbo.
3. This shows the technological know how of the indigenous industries in our country. It is a new dimension, very reliable and good. – Chief E.K. Osungbohungbe, O.A.U. Ile-Ife.
4. A lot of effort has gone into the design of the Machine. This Machine should be of interest to a lot of Nigerians. – Prof. C.A. Ajayi, Dean Faculty of E.D.M, O.A.U., Ile-Ife.
5. Excellent innovation that require the support and encouragement of the Government and people of Nigeria. Please keep it up. – Olu Adeosun, Ado-Ekiti.
6. I am seriously overwhelmed. This should be encouraged. – Mr. S.S. Moniedafe, Enugu.
7. A very wonderful technology, the Company should be encouraged by both the state and federal government. – Deacon F. Ohagwa, Enugu.
8. I was so impressed about your company when I saw the Interlocking bricks produced. I will like to purchase one. – Opatola Kayode Joshua, Lagos.
9. Beautiful discovery. It should please be exposed to other Nigerians. Keep it up. – Chief C.O. Nwane, Lagos.
10. Housing for all is a reality. Very interesting and fascinating display. I am impressed. – Yakubu Dauda, Kaduna.

11. It is a way out of homelessness for the poor. – Pastor A.A. Odetola, Esa-Oke, Osun state.
12. Economically viable and shows our wealth. If practicalised, could carry us to better height. – Elder M.A.O. Otun, Oshogbo.
13. I really commend your effort because this will reduce the cost of construction and make housing for all citizenry easy. – Arch. Adeolu Adewale, Oshogbo.
14. I have used it before and I found it okay. The Government should encourage the manufacturers. – Sam Akinloye, Ile-Ife
15. It is an excellent machine designed most especially for the low income earners. – Gideon J.M., O.A.U., Ile-Ife.
16. A good invention for a time like this, that prices of building materials are outrageous. – Ogunmoroti O.H., O.A.U., Ile-Ife.
17. This innovation will motivate and encourage every one to own a house with less money. – Israel Ehibe, Ado-Ekiti
18. I am really convinced that it is a good alternative to cement blocks. – Bode Awoniyi, Ado-Ekiti.
19. Thanks to God that Nigerians are now able to make use of their God given gift in producing this machine. It is good and economical. – Prince G.O.A. Oni, Ado-Ekiti/Ikole Ekiti.
20. A good step towards housing for all. – Dr. Olayemi M.K., Oshogbo.
21. Very good and encouraging for Nigeria economy. Bolyn Constructions Company. You are well done. – Dr. J.A. Dosumu, Lagos.
22. Nigerian Entrepreneurs like Bolyn Constructions are wonderful and deserve encouragements to grow. The displayed machines are just too good. – Elder Chuks Ekwuruke, Lagos.
23. Your technology is fine, please invent more of these. This country needs people of courage like you. – Engr. C.N. Obehdibe, Ado-Ekiti
24. Very beautiful, solid and reliable for building. – Chief I.A. Ayeni, Ado-Ekiti.
25. This is a perfect engineering work done locally with local input. I am highly impressed. I will book for one. – O. Ayenimelo, Oshogbo.
26. Bolyn is too great in making housing for all with local material a reality. – Engr. J.A.O. Adewoye, Ipetumodu, Osun State.

SOME QUESTIONS AND ANSWERS.

Q.1: We learnt that you now Produce paving Brick/Paving stone making machines. How is this machine like?

Ans: Bolyn Construction Co. Ltd. first incorporated into its walling Brick presses several years ago the Floor Brick of size 290mm x 140mm x 50mm. The materials for use are:-

(a) Facing materials:- 1:2 cement: (surface.)
(b) Main body materials:- 1:10cement Laterite Soil.

This was used and found to be strong and wear resistant. This experience was gotten from India and applied by the Managing Director of Bolyn Const. Co. Ltd. In 1999, Bolyn received samples of paving stones from some customers and we embarked on the design of Brick Presses after our Cinva Ram models. These Presses are available as Double Tee, Mag, Clover, Roman, Wave and Hexa types. These Cinva Ram paving Brick Presses have equally been used to make Paving stones.

Q.2: How can I use the Paving Brick Press to make Paving Stone, what are the materials requirement for making Paving Stones?

Ans: Operated in the same way as for Brick making the Cinva Ram Press can press the paving stone materials into the needed form, however, enough wooden pallets have to be found for each days productions as the paving stones require pallets for 12 hours. The materials requirement for making paving stones are: 1:1:2 combination of Cement to soft sand to stone dust.

Q3: Are these Paving Stone/Brick presses always available in your showroom and at what price?

Ans: We have some designs of it but we prefer to take order for them and produce thereafter. We can also accepts designs that are not mentioned in our collection, provided, the client produce a sample of their requirement. The prices of the machine are N60,000:00 for Single Paving Brick/Stone press and N110,000:00 for a Double Paving Brick/ Stone press.

Q.4: How easy are the installation of Paving Stones Bricks?

Who can help in the installation?

Ans: The procedure for laying of Paving Stones/Bricks is sample e.g. scrape the top soil, level the surface, fill with soil sand, gravel or stone dust and sharp sand of about 25mm (1 inch) thickness before laying the interlocking Paving Stones/Bricks. All bricklayers should be able to do it. We can also recommend somebody that has done this types of installation to any one that so require.

Q.5: Can Vehicle go on top of these Paving Blocks / Bricks / Stone without breaking them?

Ans: There is no magic in the making of Paving Bricks/Stones. Once the materials for making them are introduced in the product in the prescribed quantities and curing (the aspect of watering for 7/8 days) is properly done the strength is guaranteed to be able to resist vehicular traffic.

Q.6: What percentage savings can one get if he decided to make his Paving Brick himself?

Ans: Up to 50% saving is possible because right now only the well to do are using Paving Stone and the prices of the factory made ones are tailored to the rich. When they are made locally considerable amount of money are possible to be saved.

Q.7: How much per square metre of floor is the likely price of the paving bricks?

Ans: Paving stone can come to N1,5000 per sq/m and Paving Bricks could be about 1,000:00 for those who owns the machine and are producing it themselves.

Q.8: What of the issue of stagnant water. How is this taken care of in a Paving Bricks floor?

Ans: A Paving brick floor can never be flooded. The rain water is able to sink between the spaces around each Brick to the ground below. The use of these Brick does not allow stagnancy of water in the compound.

Q9: Can one make coloured Paving Bricks?

Ans: Yes, with the addition of colour cement that are available in different colours such as yellow, red, green, blue, white etc. Paving Bricks can be made in the different colours.

Q10: What is the relationship between Bolyn Construction company Limited and the Nigerian Road and Building Research Institute since they are known to be equally promoting local materials for building?

Ans: The is no agreed relationship between us both except that we at Bolyn Constructions Company Limited, a private limited liability company are doing much more in the promotion of Mud Bricks, Concrete Roofing Tiles by the reason that we manufacture Presses and Machines, train people, empower Nigerians by wholesale advancement in the Technologies. We apply more than the research of one country to the problem of housing. We can then say that we are complimenting the work of NRBRI, they are a governmental agency and we a business concern.

Q11: You mentioned some housing corporations that have bought your equipments. How come we have not seen much of the type of buildings being built by them?

Ans: The answer, simply can be that organs of government including housing corporation are prone to frequent changes in hierarchy and there is no continuity. Some state have built prototypes, some have built estates using all local materials e.g. Cement stabilized laterite Bricks. It is still debatable if our government and their agencies are actually interested in achieving lower cost in buildings. An observation is that "no poor man" (i.e) Low income earner has ever been able to own any of the Houses built by the housing corporations except in those days of Alhaji Lateef Jakande in Lagos State.

TECHNOLOGY DEVELOPMENT DEPARTMENT

The Technology Development Department of Bolyn Constructions Company Limited have been organizing series of workshop for interested Housing Corporations, State Government, International Donor Agencies nominees in the Cement Stabilised Laterite soil Bricks/ Blocks and Concrete Roofing Tiles/Sheets making.

5 (FIVE) DAYS TECHNOLOGY TRAINING PROGRAMME ON CEMENT STABILISED LATERITE SOIL BRICKS/BLOCKS AND CONCRETE ROOFING TILES MAKING.

MONDAY	9.00am to 10.30am	REGISTRATION AND INTRODUCTION OF PARTICIPANTS
	11.00am to1.00pm	Introduction to Cement Stabilised soil Block Technology using V.S CINVA, RAM PRESS.
	3.00pm to 4.30pm.	Introduction to Fibre -Concrete Roofing Tiles Technology using a Hand Operated vibrating Table.
TUESDAY	9.00am to 10.30am	Testing methods - Good Laterite, Shrinkage, Cement Quantity and required Moisture content.
	11.00am. to.1.00pm	Practical- Proportion, mixing, wetting, filling, making and handling of cement bricks.
	3.00p.m to 4:30p.m	Practical-Materials Preparation, Proportioning and Roofing Tiles making.
WEDNESDAY	9.00am. to 10.30am	Cement Bricks -Mortar joints, plastering, Blocks without Cement, Construction method and Machine maintenance
	11.00am to 1.00pm	Brick making, curing method, stacking and uses of the various types of Bricks.
	3.00pm. to. 4:30pm	Demoulding of Roofing Tiles, Preparation, Handling, curing and Drying etc.
THURSDAY	9.00pm to. 10.30am	Setting up of a Brick and Roofing Tiles making Enterprise and Simple Estimation.
	11.00am to.1.00pm	Brick making and Curing procedure continues.
	3:00pm to 4:30pm	Roofing Tile making and curing procedure continues.
FRIDAY	9:00am to. 11.00am	Fielding of Questions from all participants with anwers by Course Director.
	11:00am to.1.00pm	Address by Course Director /Lunch.
	2.00pm to 4:00pm	Closing Ceremony, Photography and Departure.

SOME OF OUR REPUTABLE CUSTOMERS.

1.	Individual sales of our equipments.	-	10,000 units
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33. National Directorate of Employment, Abuja. - 300 units
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35. Umudioku Community Bank, Awka, Anambra State. - 1 unit
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83. Unicef – Niger, Zamfara & Sokoto.	-	1080 units
84. Bama Innovation.	-	2 units
85. Bankole Dada.	-	4 units
86. Unicef, Abuja.	-	1,080 units

EXTRACT FROM THE FINAL REPORT
UNIDO
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION.
PROJECT NO: XA/RAF/98/602.
WORKSHOP ON SMALL SCALE AND ENERGY EFFICIENT BRICK MAKING TECHNOLOGY.
BANDUNG, INDONESIA.
20-30 MARCH, 1998
SUBJECT IV: GOVERNMENT POLICY – SMALL AND MEDIUM ENTERPRISES (SMEs) ON BRICKS / TILES.

GROUP MEMBERS:

1.	Mr. Rufus Akinrolabu Nigeria	(Group Leader).
2.	Mr. Silas Nwaniki Kiragu	Kenya.
3.	Ms. Eva Kissedu	Ghana.
4.	Ms.Lucia Basson	Namibia.

PREVIEW OF THE IMPORTANCE OF BRICKS/TILES TO THE LIFE, LIVING AND DEVELOPMENT OF ALL AFRICAN STATES.

The committee recognizes the following facts:-

a. That earth and clay should be the first consideration for building construction in Africa because of the ease of its availability and cheaper cost.
b. That African Government can save scarce foreign exchange that it usually used for the importation of building materials and components.
c. That bricks making and roofing tiles making have the tendency of employment generation and poverty alleviation if African countries patronize them.
d. That cost of houses can be considerably reduced and the African people can enjoy affordable housing if bricks/roof tiles are adopted by their government.
e. That shelter is of importance to all African states since there is shortage of decent houses. We recognize that housing is one of the four (4) basic essentials of life and good living.

f. That bricks and roofing tiles has the advantage of moderating room temperature in houses and will be of advantage to African States that is usually hot.

OUR RECOMMENDATIONS.

We call on all African leaders to formulate the right policies that can encourage, assist and compel their people to adopt bricks/tiles for their housing construction by taking the following steps:-

i. African government should encourage the use of bricks and tiles by taking a lead in it uses itself.

ii. African government should create awareness for bricks/tiles by publishing the technology on its radio and television network.

iii. They should establish research institutes to investigate and collect information on necessary data and information on materials for bricks/tiles making.

iv. They should compel the established research institute to work closely with the people. The research institutes must be decentralized and made to produce result that must be checked periodically and accessed by the people themselves.

v. Technical assistance must be provided to small scale entrepreneurs. Technical information and research findings should be preferably made available for purchase in the open market even in the local government councils and small cities.

vi. All government primary and secondary schools, offices, market stall and halls built by government should be built with bricks and tiles.

vii. African government should encourage small scale business and register them, they should give them necessary attention and financial incentives e.g A 10 year tax holidays.

viii. Government should assist small scale entrepreneurs to acquire needed land for their industrial development. These lands must be handed to their associations to manage on behalf of the government.

ix. Technical training should be conducted for aspiring small scale industrialist and these training must be heavily subsidized to encourage more people to take advantage of it.

x. Bricks making/tiles making should be included in the vocational studies at High schools in African states.

ADDRESSES OF INTERNATIONAL ORGANISATIONS PROMOTING ALTERNATIVE TECHNOLOGIES OF HOUSING.

WAS/BASIN
GATE - GTZ.
P.O. BOox 5180,
D - 65726 ESCHBORN,
GERMANY.
Tel: (49)6196793190.
Telefax: (49)6196797352.
Telex: 407501-gtz d.
GATE (German Appropriate Technology Exchange) a programme of the Duetshe Gesellschaft fur Technishe Zusammenarbelt (GTZ) GmbH. Is a centre for the disseminating and promotion of appropriate technologies for developing countries.

SKAT.
Vadlantrasse 42,
CH-9000 ST. GALLEN,
SWITZERLAND.
Tel: (41) 71237475
Telefax: (41) 71237545
Telex: 881226 skat ch
SKAT (Swiss Centre for Development Cooperation in Technology and Management) is an information and documentation centre as well as a consulting group which specializes in energy, drinking water & sanitation and building materials in developing countries.

ITDG
Myson House,
Railway Terrace,
UK-RUGBY CV21 3HT,
UNITED KINGDOM.
Tel: (44) 788 560 631.
Telefax: (44) 788 540 270.
Telex: 31 7466 ltdg g.
IT (International Technology) is an independent British NGO, which aims to help increase the range of income-generating and employment opportunities in developing countries.

CRATerre-EAG.
BP 53,
F-38092 VILLEFONTAINE CEDEX,
FRANCE.
Tel: (33) 7495 4391.
Telefax: (33) 74 956421.
Telex: 308658 F CRATERE.
CRATerre-EAG (International Centre for Earth Construction) is an international scientific and technological organization, dedicated to the promotion of earth as a building material.

ADDRESSES OF NATIONAL ORGANISATIONS IN THE AFFORDABLE HOUSING DELIVERY IN AFRICA.

NIGERIAN BUILDING AND ROAD RESEARCH INSTITUTE, Km 10, Ota-Idiroko Road, P.M.B. 1055, Ota, Ogun State, Nigeria	FEDERAL HOUSING AUTHORITY Off Ecowas Secretariat Road, Asokoro P.M.B. 101, Garki, Abuja, Nigeria
NIGERIAN INSTITUTE OF ARCHITECTS 2, Idowu Tailor Street, Victoria Island, P.O. Box. 178, Lagos - Nigeria	CENTRE FOR EARTH CONSTRUCTION TECHNOLOGY NATIONAL MUSEUM P.M.B. 2031, Jos, Plateau State, Nigeria
NIGERIAN INSTITUTE OF BUILDING Eric Moore Tower complex, Bode Thomas P.M.B. 3098, Surulere, Lagos Nigeria	UNIVERSITY OF SCIENCE & TECHNOLOGY Faculty of Architecture, Department of Housing & Planning, University Post Office, Kumasi, Ghana W. Africa
HOUSING RESEARCH & DEV. UNIT University of Nairobi P.O. Box 30197, Nairobi, Kenya East Africa	B.R.R.I Building & Road Research Institute P.O. Box 40, University P. O. Kumasi, Ghana
BUILDING RESEARCH UNIT MPAKARI Road, P.O. Box 1964, Dares Salam, Tanzania E. Africa	NATIONAL BUILDING RESEARCH INST. P.O. Box 395,Pretoria 0001. South Africa

CHAPTER SIX
BUILDING MATERIALS AND CONSTRUCTION COSTS
6.3. STRATEGIES FOR THE ENHANCEMENT OF BUILDING MATERIALS PRODUCTION, HOUSING DESIGN AND CONSTRUCTION METHODS (p. 420 OF THE REPORT)

OBSERVATIONS

The Committee observed that the building materials subsector cannot be left to develop haphazardly since it is intimately connected with the process of national industrial development and in any case, the expansion of local capabilities is one' major way to stem the indiscriminate importation of foreign building materials. It is, therefore, Necessary that Nigeria should gradually and systematically develop appropriate capabilities to achieve self sufficiency in the production of basic building materials and components from local resources by the year 2015.

RECOMMENDATIONS

6.3.1. In order lo enhance building materials production, housing design and construction methods, which will result in the reduction of costs, Government shall pursue vigorously the following strategies :

(i) Adopt design standards that facilitate cost reduction, affordability and acceptability by adopting standard functional plans that will respond to the cultural and regional peculiarities of potentials users.

(ii) Expand manufacturing base for building materials production from all available local raw materials and evolve a more efficient distribution system.

(a) encouraging the expansion of existing industries producing building materials from local sources such as clay, bricks, concrete products, timber, etc.

(b) encouraging the identification of new local materials available for manufacture of required building components.

(c) collaborating with other developing countries in the development of technical Know-how for building materials manufacture.

(d) encouraging regional spread of building materials industries lo stabilize cost and widen distribution.

(iii) Encourage the use of locally manufactured building materials and lead by example by :

(a) providing incentives to, and creating the enabling environment for the private sector in order to encourage rapid flow of funds into the building materials manufacture through tax relief, accelerated depreciation and generous capital allowances.

(b) providing matching grants for investments into research in the use of local materials for building materials manufacturers.

(b) providing matching grants for investments into research in the use of local materials for building materials manufacturers.

(c) providing loans at reduced rate of interest lo manufacturers who will in turn supply self-built bousing co-operatives and developers of low income housing with their products at reasonable prices and

(d) attracting foreign participation into the building materials industry.

(iv) Restructure and adequately fund the Nigerian Building and Road Research Institute and create more regional centres under it.

(v) Encouraging construction companies to promote research and development of appropriate technology.

(vi) Facilitate the use of local building materials through the development of appropriate technology and

(vii) Develop effective manpower training programme to raise the output of the building industry by:

(a) restructuring the Apprenticeship System and expanding vocational training centres for the training of site personnel such as masons, plumbers, carpenters, electricians, welders, bricklayers and other artisans in the building industry.

(b) upgrade and provide structured training of indigenous contractors through short-term programmes in project management, construction management, building methods, etc.

Comment

Government accepts these recommendations.

MATERIALS FOR ONE CUBIC METRE OF CONCRETE.

MIX	GRAVEL 40% VOIDS)			BROKEN STONES (45% VOIDS)		
	CEMENT kg	SAND m3	GRAVEL m3	CEMENT kg	SAND m3	STONE m3
1 : 1½ : 3	395	0.41	0.82	415	0.43	0.86
1 : 1⅔: 3⅓	365	0.42	0.84	380	0.44	0.88
1 : 2 : 4	310	0.43	0.86	325	0.45	0.90
1 : 3 : 6	215	0.45	0.90	230	0.47	0.94

HOW TO OPERATE OUR BOLYIN INTERLOCKING BRICK/BLOCK PRESS

a. Place the block press in its rails on flat, solid ground near the mixing platform.

b. Open the mould box by raising it up and place a polythene sheet at the mould base.

c. Half-fill the mould box with the laterite cement mix.

d. Press the mix firmly into the corners with a piece of wood.

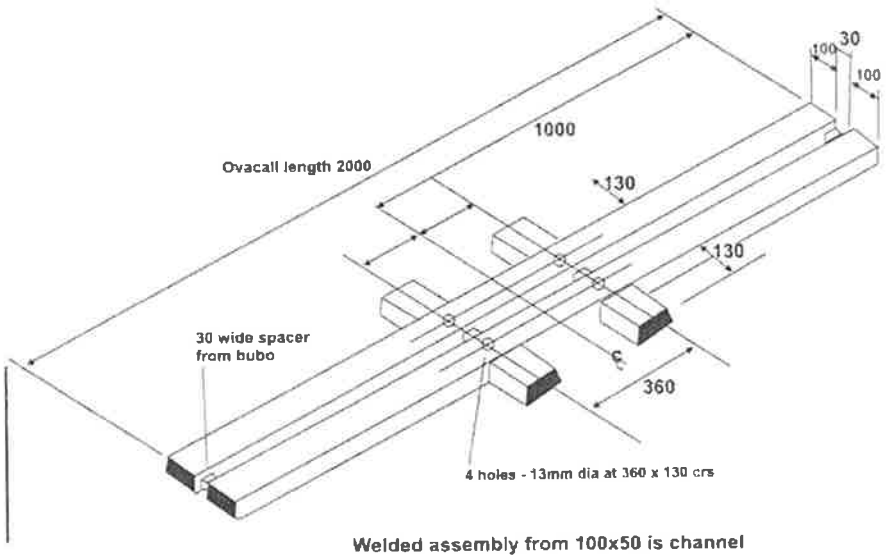
e. Fill the mould to the top and compact the corners again.

f. Add a little more so that the mould is filled flush to its top edge.

g. Close the mould box by banging the cover on to the machine mould top.

h. Now raise the lever arm on to the top of the cover and press it down to compress the soil inside the press.

i. Press until the Elbow touches the top of the cover.
If the mix is too dry, the handle will not go all the way down to the horizontal position. In this case do not force it, as the handle may break.



Welded assembly from 100x50 is channel

Instead, eject the unfinished block so that you can refill the mould box after adding a little water to the mix.
On no account should more than one man at a time work the handle.

**APPROXIMATE NOS OF BLOCKS/
MIXING RATIO OF CEMENT LATERITE SOIL BRICKS
PER BAG OF CEMENT.**

Percentage of Stabilisation	Ratio	300mm x 230mm x 120mm	230mm x 230mm x 120mm
10% Cement Stabilisation	Ratio 1:15	50 Blocks	60 Blocks
5% Cement Stabilisation	Ratio 1:20	60 Blocks	70 Blocks
4% Cement Stabilisation	Ratio 1:25	70 Blocks	80 Blocks
3% Cement Stabilisation	Ratio 1:33	80 Blocks	90 Blocks
Bricks without Cement	Soil only	Not Applicable	

N.B: The measurement is done using headpans.
One (1) Headpan can hold Half
Bag of Cement.

HABITECH - BUILDING - SYSTEM

WALL STRUCTURE
INTERLOCKING BRICK MANUAL BRICK PRESS.

Developed by:

Habitech Center
School of Engineering and Technology.
Asian institute of technology
km, 42, Phaholyothin Highway
PO Box 4, Klong Luang, Pathumthani-12120,
Thailand
Tel: (66-2) 524 5621
Fax: (66-2) 524 6384
Email: <sthapit@ait.ac.th>

DESCRIPTION

The manual brick press is specifically designed for the production of interlocking bricks. It is made entirely of steel and consist of a mould box, top and bottom plate, a handle and additional accessories to make different three different types of bricks: regular, half size and U-channel. The press can be mounted on a floor, a wooden or concrete plank to ensure stability during production. Aside from periodic cleaning and greasing of moving parts with a standard grease pump, there is no need for additional maintenance.
The moulding of interlocking bricks is done by the top and bottom plate of the press which are specially designed for this purpose. The height of the bricks produced can be adjusted by tightening and loosening bolt located under the bottom plate.

The press is manually operated, by pulling a 1.5 m. handle downwards, lifting the bottom plate of the mould compressing the admixture mixture placed in the box. The bricks once formed are ejected by opening the cover of the box and reversing the handle motion

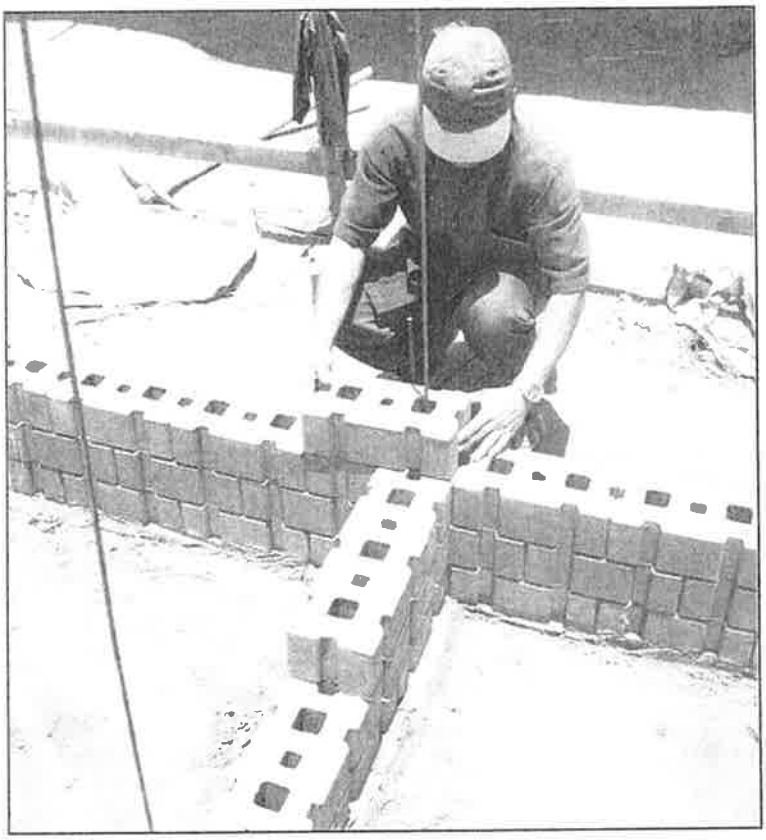
Half and U shaped bricks are produced by putting insert into the box. Half bricks are used where there are opening in the walls such as doors and windows to achieve regular bonding.

U-channel bricks are used to introduce horizontal reinforcement such as beams, lintels and sills and link with vertical reinforcement introduced in the cavity holes of the bricks.

While the press can be operated efficiently by two people, the simplicity of the press does not require highly skilled labour. Two persons can produce up to 400 bricks per day.

Interlocking Brick Characteristics

Use for:	Walls(regular or load bearing), Lintels, Sill, beams, buttresses, retaining walls
Material used:	Concrete (Cement and stone dust) Soil (cement and soil)
Shape:	Rectangular
Standard size:	30 cm x 15 cm x 10 cm
Weight:	7.5kg (concrete brick) 6.2kg (soil brick)
Compressive strength:	Up to 300 kg/sq. cm (concrete) up to 120 kg/sq. cm (Lateritic soil)
Production Capacity:	200-400 bricks per day per brick



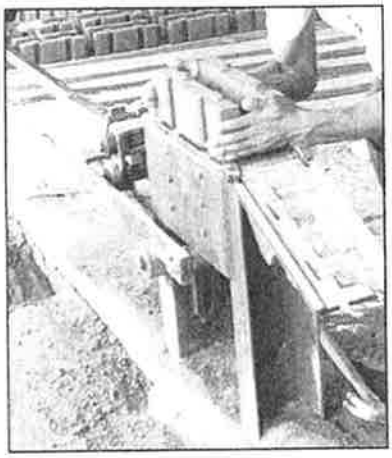
INTERLOCKING BRICKS: The brick's sizes are modular and rectangular (10 cm high-15 cm wide -30 cm long) in shape, the length of the bricks is exactly twice its width so that right angle corner can be achieved without special corner bricks. its dimensions permit multi-dimensional walls making configuration such as buttresses or hollow columns possible.

The interlocking bricks are different from conventional bricks since they do not require mortar to be laid in masonry work. Because of this characteristic, the process of building walls is faster and require less skilled labour as the bricks are laid dry and lock into place. Once a section of wall is built, grout holes are filled with a lean cement mixture to seal the wall and making a permanent solid bond. The amount of grout used in calculated to be only 7.5% of the mortar used in conventional masonry.

LOAD BEARING WALLS

The cavity holes of the interlocking bricks permit the introduction of vertical reinforcement embedded in concrete without the need for any form work thus eliminating the use of wood in form work. Reinforcement can be introduced to make the building withstand earthquakes and heavy wind load. A single bricks wall can be used for double storey construction load bearing walls. There are 33.3 bricks per square meter of wall.

Because of the size and resistence of the bricks, load bearing walls can be constructed. Since the interlocking bricks may be laid at right angle to each other, it is feasible to construct walls of multi-bricks thickness making multiple storey construction possible.



RAW MATERIALS:

The press can be used to produce interlocking bricks either from stone dust or lateritic soil with cement as a stabilizer.

Cement: The most commonly used cement for the production of interlocking bricks is portland cement. The quality of the cement should be high , equal to that required for normal concrete work. A bag of cement can produce 64 bricks at a 1: 8-cement/soil ratio. Comprehensive strength of brick can be as high as 300kg/cm2 depending on the mixture used.

Stone-dust: The stone-dust should be well graded, clean and free of organic materials. The maximum size of the aggregate should not exceed 5.5mm. and should be clean and free from clay. It is better to have laboratory test before its use.

Lateritie soil: The lateritie soil should be well graded and free of organic impurities. Soils should contain a good proportion of sand in order to obtain high strength in the bricks. Soils should be tested for their composition before been used. A field testing press can be made available for testing different soil sources and finding wet compressive strength.

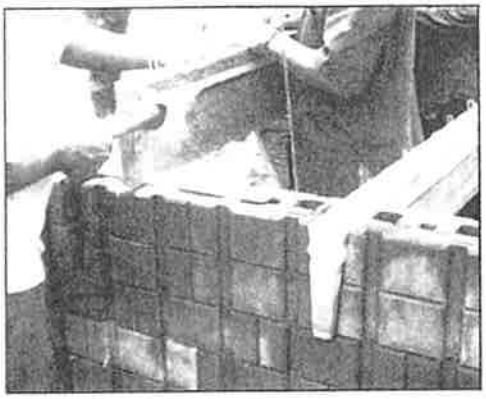
Sand: The sand should be well graded, clean and free of organic materials. The clay and silt content should not exceed 4%. The quality of sand should be tested by a laboratory before its use.

Water: The water should be clean and fresh, and free of salt. If the water quality is doubtful, it can be tested in a laboratory to determine salt content and other chamical contamination.

PRODUCTION PROCESS

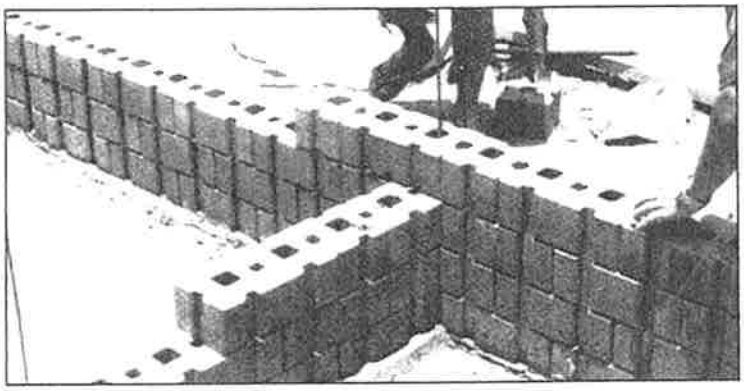
The general steps are as follows:

- Sieving of aggregates
- Preparation of mixes
- Moulding
- Compression
- Extraction
- Air Curing/storage
- Testing



TRAINING:

Training in the production process as well as training in construction with the bricks can be provided by Habitech Center. Group training might carried out either at the manufacturer's own training center or at a project site with the equipment provided. The training cost are established on a case by case basis. For more information and details, please write to the manufacture.



Equipment Characteristics

Size of Brick Press:	60 cm x 64 cm x 92 cm
Total Weight of Brick Press:	170 kg.
Volume of Brick Press:	cu.m
Compression Ration:	1.65 : 1
Size of Pallets:	20 cm x 35 cm
Shipment (ex-works)	Can be arranged by manufacturer
Cost of the Equipment:	(ex-works) US $

COMPRESSED STABILISED EARTH AS LOAD BEARING INTERLOCKING BLOCK

Nasly M.A.[1], A.A.M.Yassin[2], Zahrizan Zakaria[3], Khairunisa Abdullah[4] [1]Professor, Faculty of Civil Engineering, Universiti Teknology Malaysia, *nasly.ccas@gmail.com* [2]Executive Director, CCA System Sdn Bhd [3]Lecture, Faculty of Civil Engineering and Environmental Resources, Universiti Malaysia Pahang.

ABSTRACT: The rising cost of construction materials and the need to adhere to sustainability, alternative construction techniques and materials are being sought. Earth as a construction material has been used worldwide since thousands of years. Many methods have been used to produce earth blocks varying according to local climate and environment as well as local traditions and customs. Compressed earth stabilised with cement can be produced by special high compacting pressure machines. Tests have been carried out to get the optimum mix to give the required strength as compressed stabilised soil hollow blocks. The blocks are intended as modular elements in the construction of walls using the load bearing interlocking block technique.

KEYWORDS: Load bearing interlock block, stabilised earth, mortarless building system, IBS.

1. INTRODUCTION

With the increase in material costs in the construction industry, there is a need to find more cost saving alternative so as to maintain the cost of constructing house at prices affordable to clients. The potential for using earth as an alternatives construction material have being seriously considered since earth has been used as a brick in house construction throughout the Ages. The methods used from the traditional techniques are being further developed to improve the quality of earth stabilised block hence will broaden the potential for its application. Earth construction is very cost effective, energy efficient(excellent thermal properties and low energy input require for production), environmental friendly, and safe, these are the qualities which are particularly relevant and important with the ever growing need for increased awareness to reduce energy consumption world wide.

Production techniques had been developed so as to achieve better quality block and reduce production costs. In order to do this the following points need to be considered.

- Mix proportion between soil and stabiliser need to be optimised, by considering the specific characteristics of the soil.
- Sufficient compaction pressure should be applied to the moist soil mix so as to produce blocks that fit its purpose.
- Smooth blocks surface produced will reduce additional surface coating or render.

2. INTERLOCKING BLOCK TECHNIQUE

The block's size are modular and rectangular (100 mm high, 125 mm to 150 mm wide and 300 mm long) in shape. Its dimension permit multi-dimension walls making configuration such as buttress, lintel or columns possible. Corner or junction block is required to maintain right angled corner or a proper T junction.

The interlocking blocks are different from conventional bricks since they do not require mortar to be laid during bricklaying work. Because of this characteristic, the process of building walls is faster and require less skilled labour as the blocks are laid dry and lock into place.

Compressed stabilised soil blocks (CSSB) may be produced with hollow centres to reduce weight, avoid seepages or improve insulation. The holes inside the blocks allow rebar and concreting (creating reinforced concrete) to run vertically through the block to compensate for the lack of tensile strength. Rebar used can be of mild steel instead of the usual higher grade steel. Once a section of wall is built, grout holes are filled with a lean cement mixture to seal the wall and making a permanent solid wall. The amount of grout used was calculated to be less than 7.5% of the mortar used in conventional masonry.

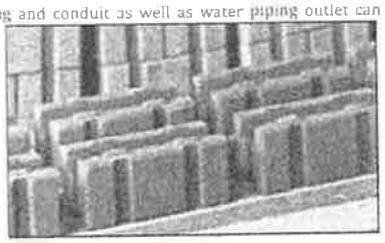
The concept of interlocking blocks is based on the following principle:

- The blocks were shaped with protruding parts, which fit exactly into recess parts in the blocks placed above, such that they are automatically aligned horizontally and vertically- thus bricklaying is possible without specialised bricklaying skills.
- Since the blocks can be laid dry, no mortar is required and a considerable amount of cement is saved.
- Each blocks has vertical holes, which serve four purposes:
  1. To reduce the weight of the block,
  2. To insert steel rods or treated kenaf bar for reinforcement,
  3. To act as conduit for electrical and water piping,
  4. To pour liquid mortar (grout) into the holes, which run through the full height of the wall thus increasing its stability and providing barrier to seepages.
- The length of each block is exactly double its width, in order to achieve accurate alignment of blocks placed at right angles, else, a junction block is required.

3. SHAPES AND SIZES

A variety of interlocking blocks have been developed during the past years, differing in shape and size, depending on the required strength and uses. The system developed has the following shapes and forms:

- Full blocks (300x125-150x100 mm) for all standard walls (single or double block thick)
- Half blocks (150x125-150x100 mm), which can be moulded to sizes, or made by cutting freshly moulded full block in half.
- Channel blocks, same sizes as full and half blocks, but with a channel along the long axis, into which reinforcing steel and concrete can be placed to form lintel or ring beams.
- The vertical sides of the blocks can be flat or have recesses, and the vertical grout holes can be square or round
- Inserts for electrical switch housing and conduit as well as water piping outlet can be incorporated.
- Special blocks for windows sills.



A BRIEF ABOUT ELDER RUFUS B. AKINROLABU AND HIS BOLYN CONSTRUCTIONS COMPANY LIMITED, LAGOS.

Since 1991 Bolyn Constructions Company Limited under the able leadership of Elder Rufus Bola Akinrolabu has been championing indigenous housing technologies and have won several laurels among which are:-

(a) 1995 Best Merit Award Winner of the Nigerian Institute of Architects in Local Materials Sourcing.
(b) 1996 Best Merit Award of the Nigerian Institute of Architects in Innovative Building Technologies.
(c) 2004 Award of Excellence for Meritorious Contributions to the growth of the Nigerian Housing Sector at the Lagos Housing fair.
(d) 2008 - Lagos Chambers of Commerce & Industry speaker at the 1st housing expo.

Elder Rufus B. Akinrolabu who studied Civil Engineering at the Madras College of Engineering, Madras, India has attended short courses and workshops on Engineering and low cost housing related technologies such as:-

(a) The Post – Experience Short Course in Plant management at the Dept of Industrial Engineering, University of Ibadan in 1985.
(b) Course on Amelioration of Brick presses in Nigeria by CE Tech, Jos, May 1995
(c) 1998 UNDP Sponsored Only Nigerian Company to "The Small scale Energy Efficient Brick Making" workshop in Bandung, Indonesia.

Bolyn Constructions Company Limited has trained more than 10,000 Nigerians over the last 25yrs in the Aspect of low cost housing construction and supplied them with Simple Mechanical presses for Brick making, Floor paving, Interlocking Block making and Roofing Tiles/Sheets making equipment. Houses has been built all over Nigeria using all local materials which include the residences of Bolyn Const. Co. Ltd. Chief Executive Officer in Lagos and Ondo town and Bolyn's Head Office in Lagos and its workshop in Ikorodu.

In March 2004, Elder Rufus B. Akinrolabu was elected the president of BUMPAN, Building Materials Producers Association of Nigeria as its first president.

ACKNOWLEDGMENT

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3. Property News, Daily Sun - Peter Anosike
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7. Habitech - Building System AIT, Thailand.