Laurie Baker

A MANUAL OF COST CUTS FOR STRONG ACCEPTABLE HOUSING

COSTFORD

MANUAL OF COST CUTS FOR STRONG ACCEPTABLE HOUSING

LAURIE BAKER

(1999)

This manual is mainly put together to help deal with working out inexpensive, effective and acceptable housing schemes for the homeless families in Kerala.

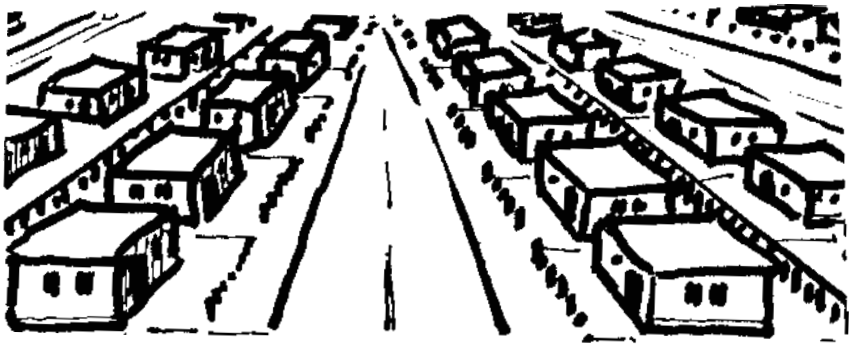
Perhaps much of the content of the manual may be of relevance to many other parts of India.

In Kerala we have no deserts and no big black cotton soil areas, but it is hoped that some sections of the manual will be of help to anyone planning to build small houses on small plots for homeless families.

Some of the material may also be of help when rebuilding houses which have been destroyed by cyclones, floods, earthquakes landslides and so on.

Almost everything in the manual has been used and tested by the writer over the past half a century in India.

This is the usual unplanned colony, made by the occupants, with mainly waste materials and with no thought of "planning".



This is the currently fashionable "Modern" new colony – long straight roads with identical cement blocks and roof "boxes" in straight rows.

The third sketch is what a colony COULD look like – for much less cost – with houses of equal area, but different plans and designs chosen by the occupant. The houses are in clusters round a common area to be used for community work, play and recreation. Each "cluster" adjoins a road.

TRADITION VS MODERN

This is NOT meant to be a battle between traditional and modern forms of architecture.

Especially in India there is no such thing as ONE traditional INDIAN Architecture.

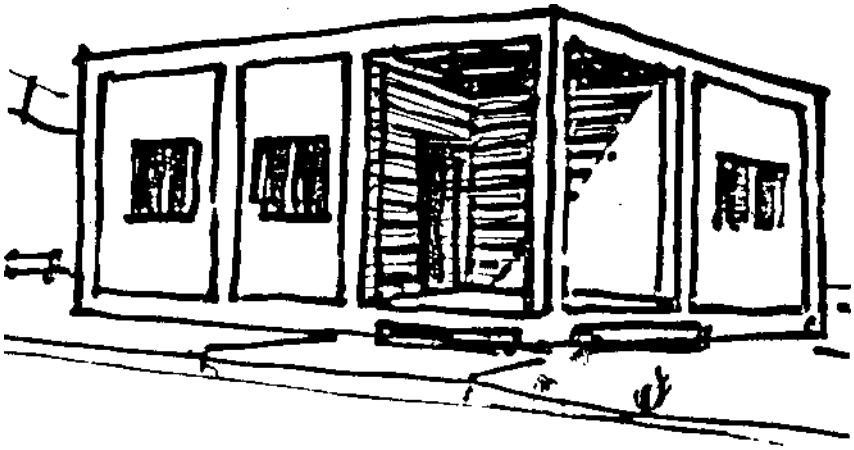
Every district has its own traditions and, by trial and error, over thousands of years, people have learned how to use, and to cope with, all the many factors which are involved in Architecture. – The Site, the Topography and Geology. The climate and vegetation, the available local materials – the religious and cultural patterns of living, and the main local occupants.

Unsatisfactory items have long since been discarded and alternatives have been tried until a satisfactory solution has been found.

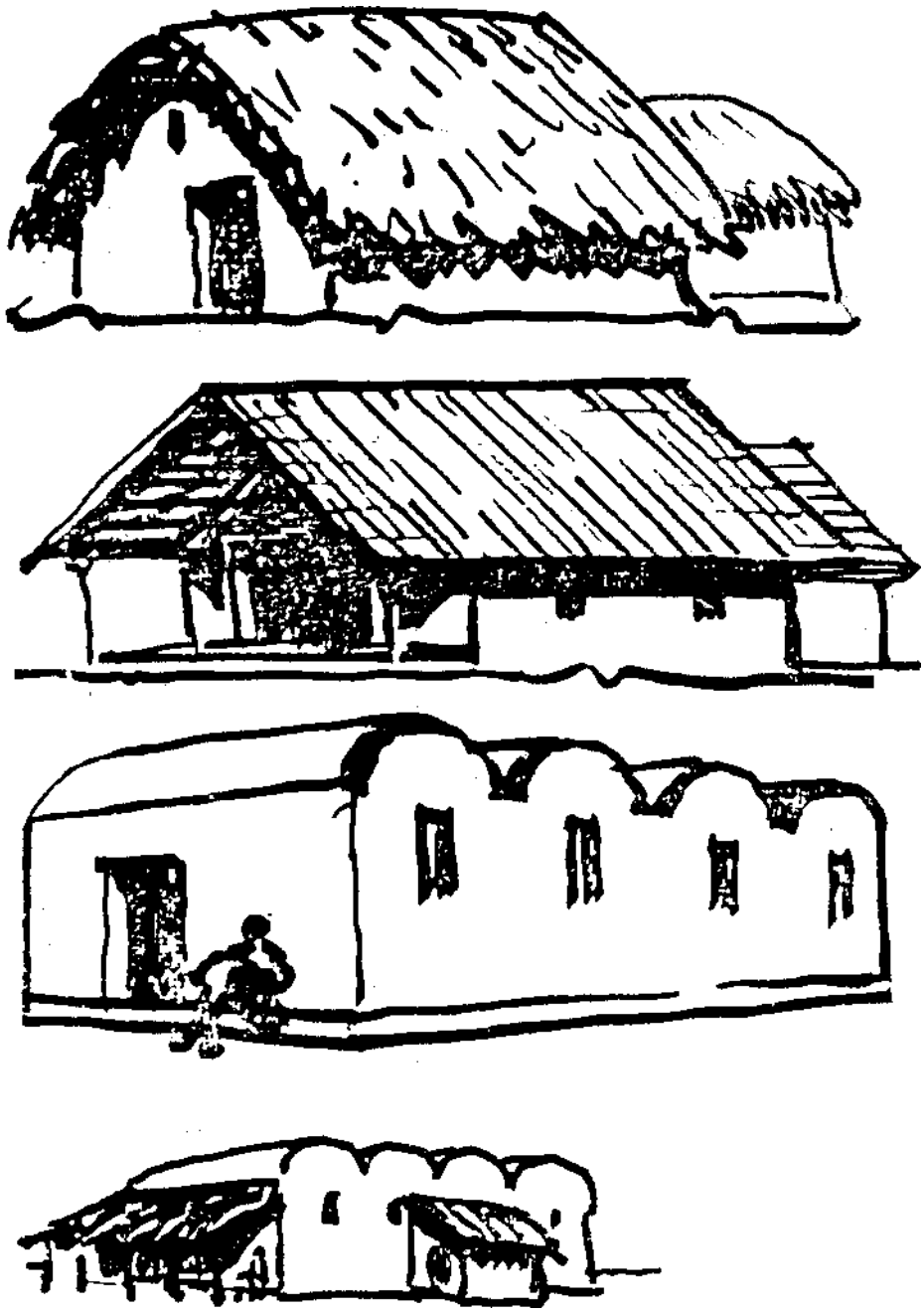
It seems foolish, therefore, to abandon the tested findings of centuries of "Science & Technology."

Here are typical regional styles of architecture – above from the northern Himalayan slopes as below from Kerala in the South.

Above is a sketch of one version of the "Modern", western style which can now be seen in the North, South, East, West and middle of India.



It is built of costly, energy intensive materials and has no regard for site, topography, climate, culture or religion, occupations or way of local life of the occupants.

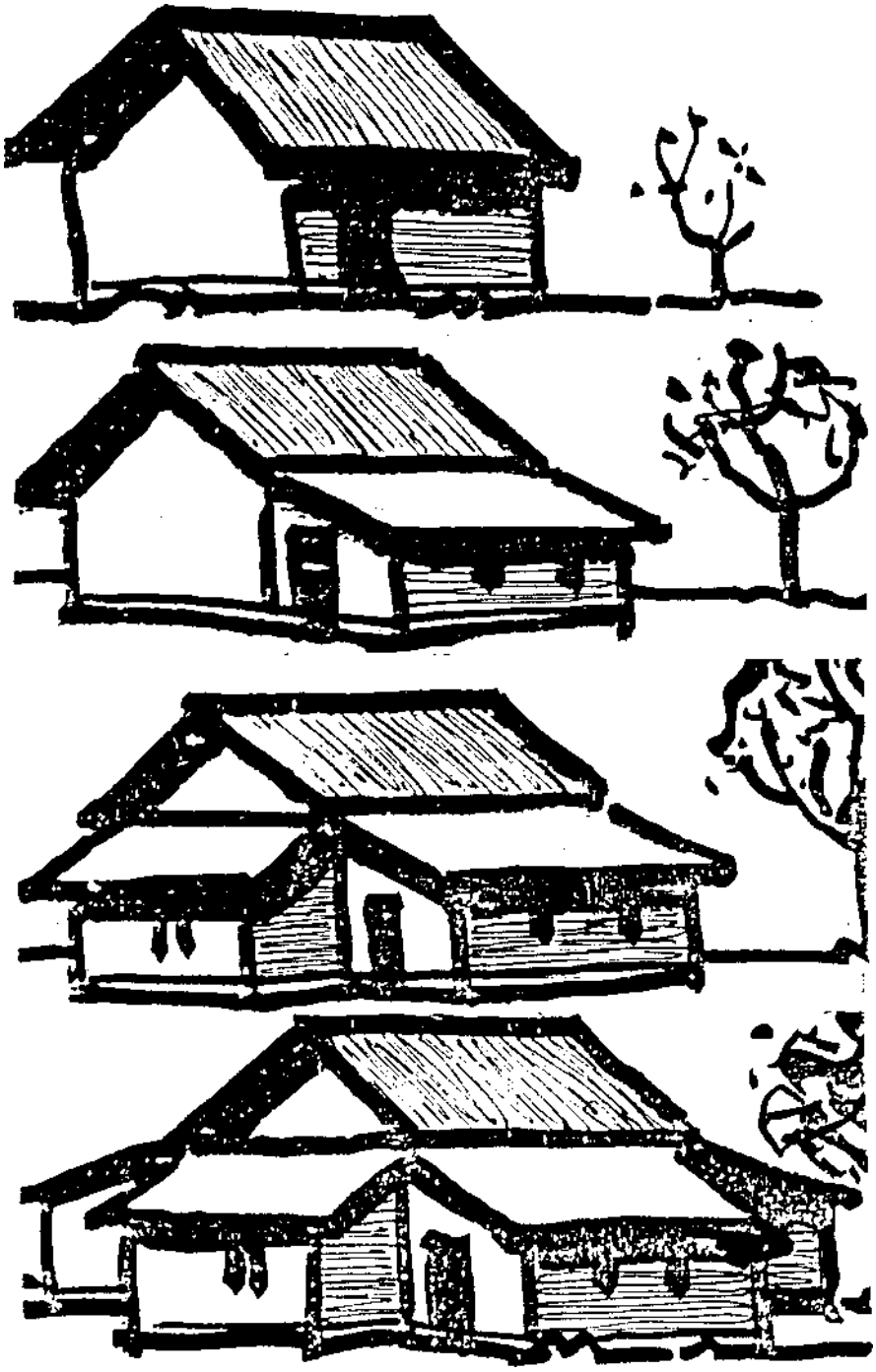


THATCH GIVES A COOL INTERIOR BUT IT NEEDS ANNUAL REPLACEMENT (THERE ARE WAYS TO PREVENT THIS). BUT IT IS EASY TO MAKE EXTENSIONS.

A TILE ROOF CAN ALSO BE EASILY EXTENDED – BUT YOU NEED MORE COSTLY TIMBER FOR IT.

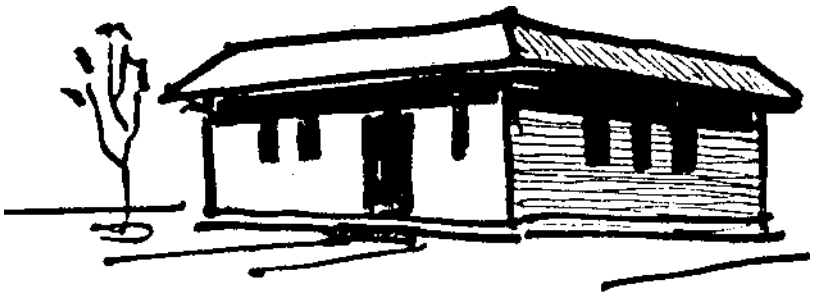
MODERN FERRO-CEMENT SHELLS, AND OTHER NEW CONCRETE SYSTEMS OF ROOFING, ABSORB AND RETAIN A LOT OF HEAT FROM THE SUN. JOINTS ALSO SOON LEAK FROM CONSTANT EXPANSION AND CONTRACTION. ONCE A COLONY IS COMPLETED, IT IS DIFFICULT TO MAKE ONES OWN EXTENSIONS AND THEY DON'T USUALLY ENHANCE THAT "MODERN LOOK"!

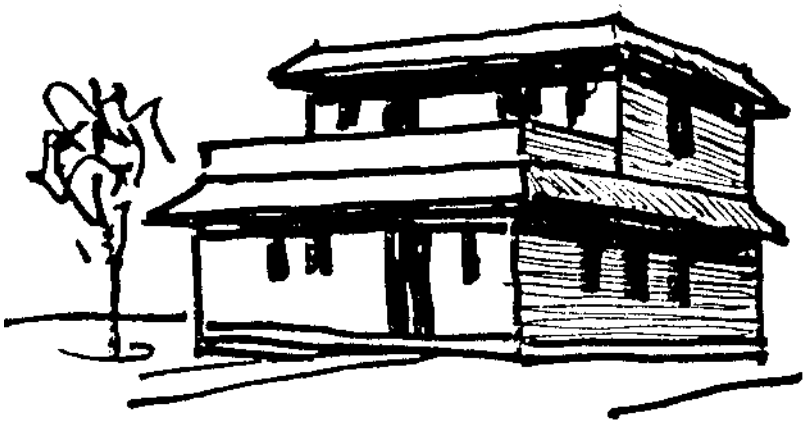
A CORE HOUSE



A CORE HOUSE SHOULD BE DESIGNED BOTH IN PLAN AND SECTION SO THAT AS AND WHEN EXTENSIONS ARE TO BE ADDED, ROOFS, DOORS, WINDOWS ETC. ARE IN THE RIGHT PLACES.

THE ORIGINAL UNIT MUST ALSO BE CAREFULLY PLACED ON THE PLOT SO THAT THERE IS SPACE FOR EXTENSION ON ALL SIDES AND BYE-LAWS AND DISTANCE FROM BOUNDARIES ARE NOT BROKEN.





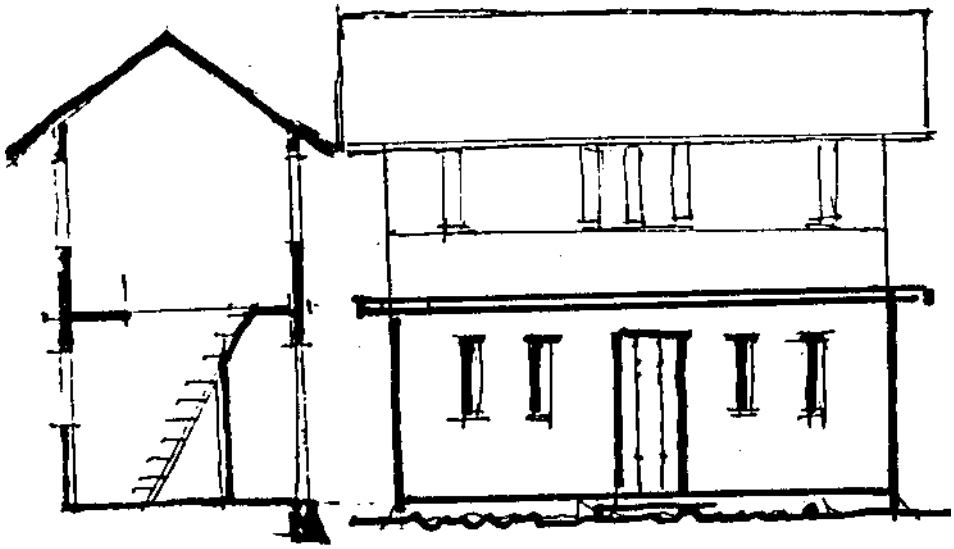
A VERTICAL CORE HOUSE

IF A SMALL PLOT WILL NOT ACCOMMODATE LATERAL EXPANSION OF A SMALL HOUSE YOU CAN PLAN FOR FUTURE VERTICAL EXPANSION.

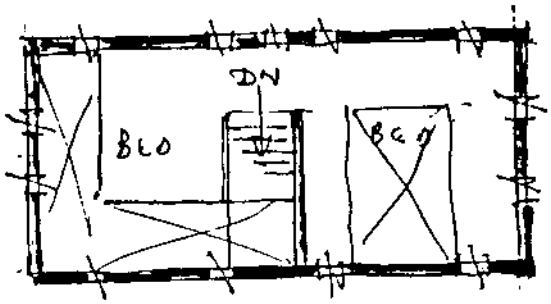
YOU MUST OF COURSE COVER YOUR GROUND FLOOR ROOMS WITH A FLAT ROOF AND IT IS PREFERABLE, ALSO FROM THE BEGINNING, TO PLAN FOR STAIRS.

THESE WILL MAKE YOUR FLAT ROOF UNABLE, AND OF COURSE WILL EVENTUALLY CONNECT THE ADDITIONAL FLOORS WITH THE ORIGINAL GROUND FLOOR.

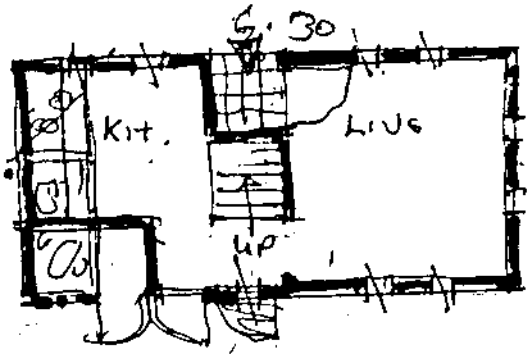
FUTURE VERTICAL EXPANSION



FUTURE FIRST FLOOR

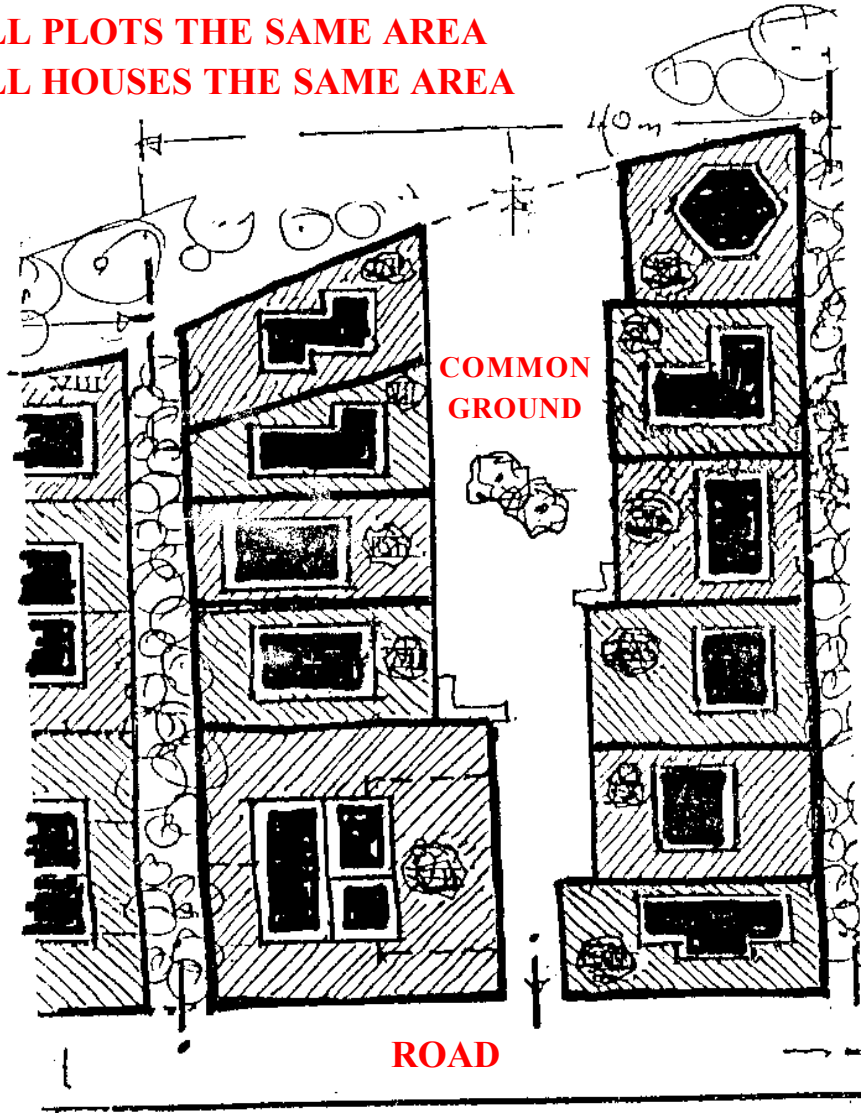


GROUND FLOOR

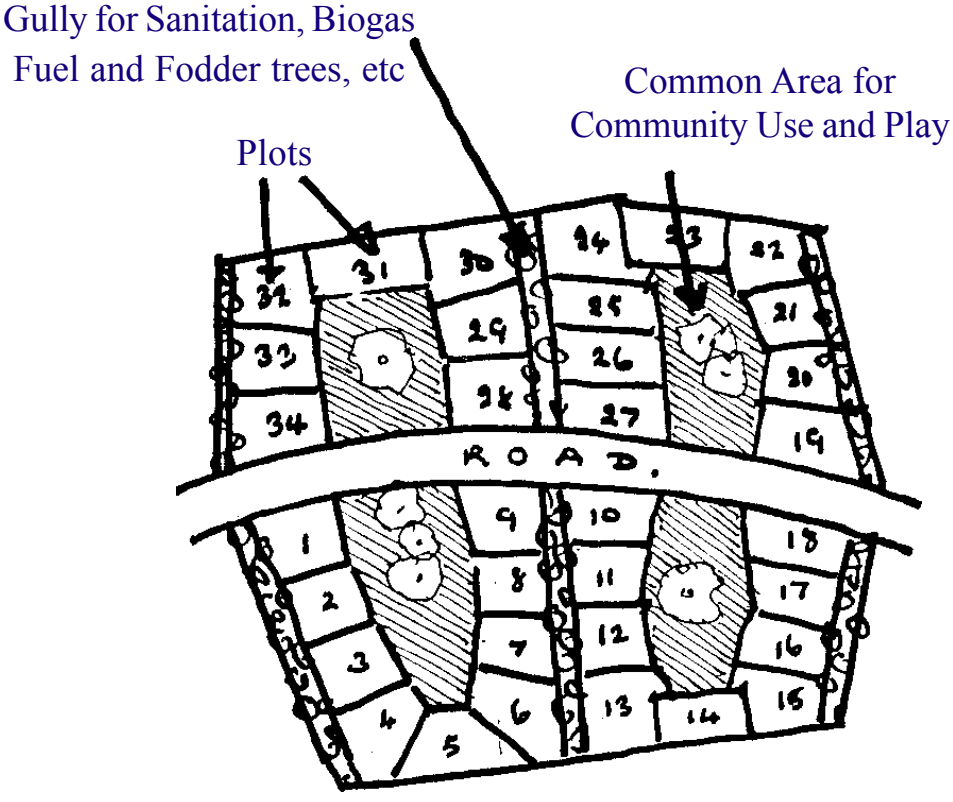


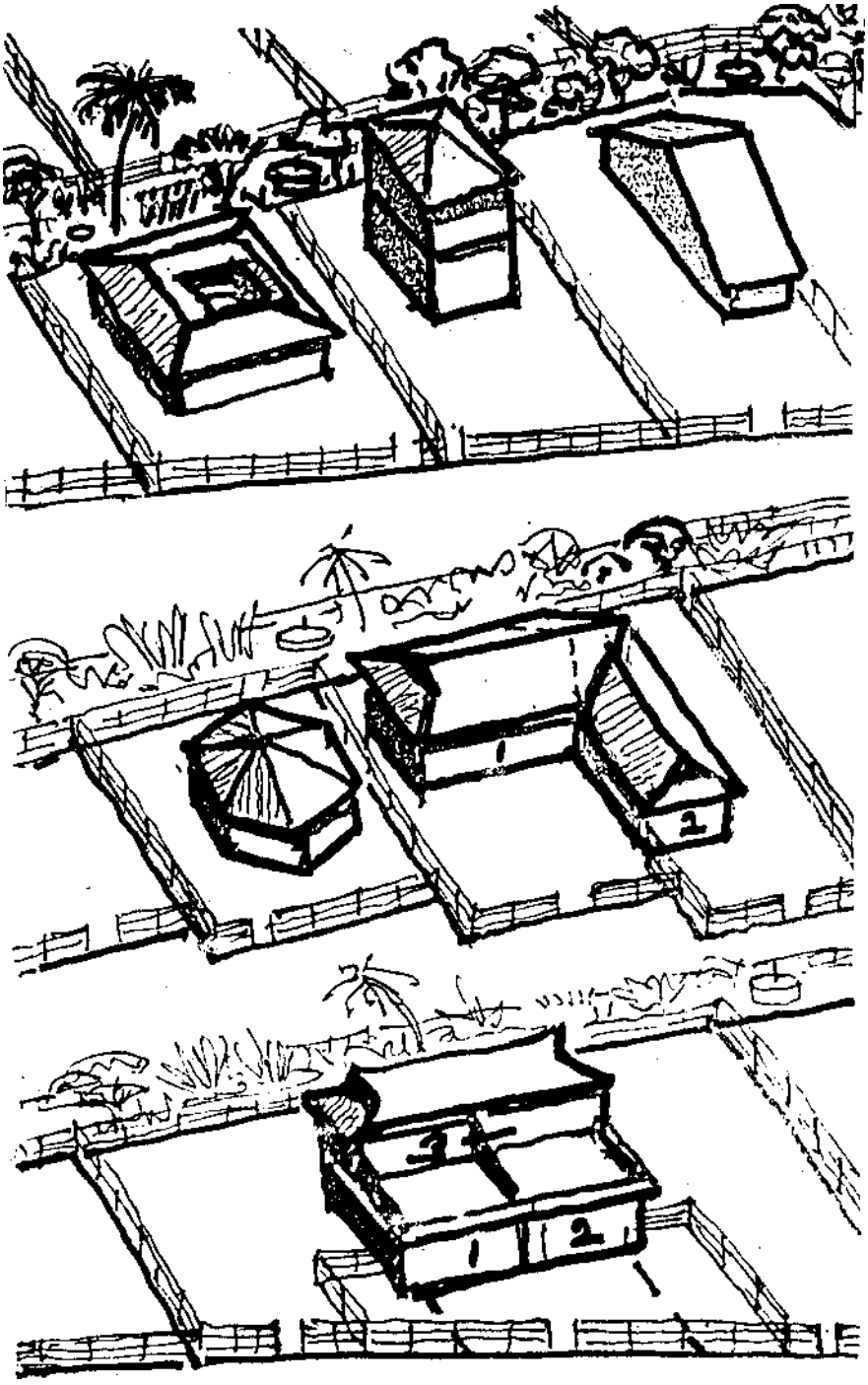
IF YOUR PLOT AND YOUR FUNDS ARE TOO SMALL, START OFF WITH THE GROUND FLOOR, BUT PLAN IT TO CONTAIN A STAIR TO TAKE YOU UP, FIRST TO AN OPEN FLAT ROOF, TO AN OPEN FLAT ROOF TERRACE, AND LATER TO ANOTHER FLOOR OF BEDROOMS ON THE FIRST FLOOR ABOVE THE ORIGINAL GROUND FLOOR COTTAGE. THIS EXTENSION WILL ONLY COST HALF AS MUCH AS THE FIRST BUILDING.

ALL PLOTS THE SAME AREA
ALL HOUSES THE SAME AREA



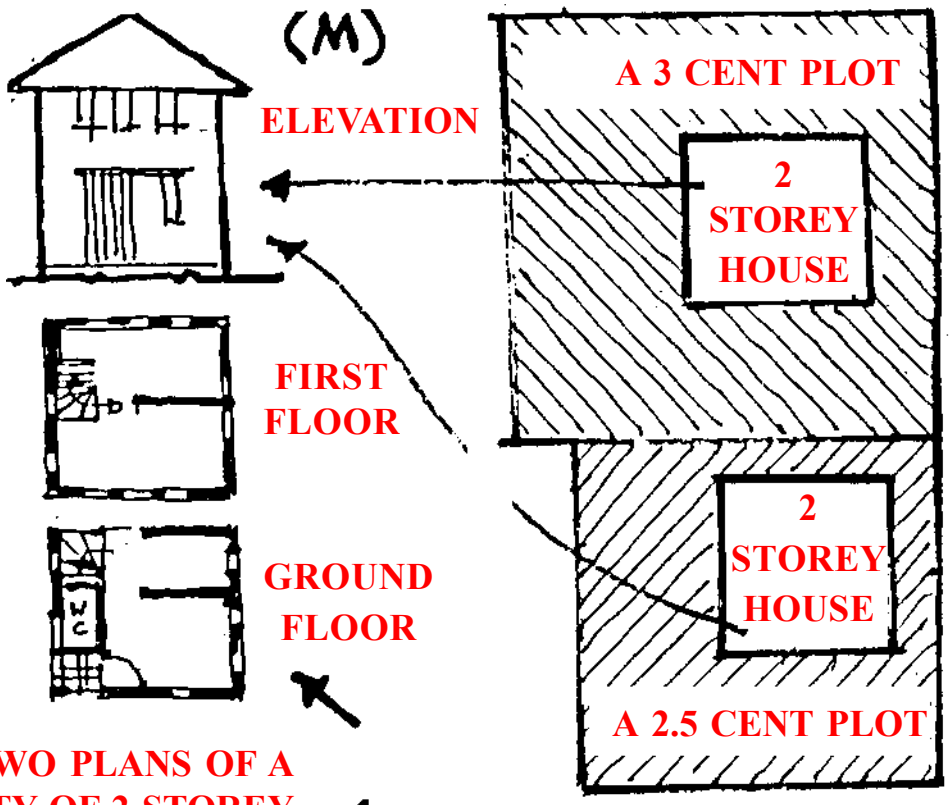
MINIMUM ROAD THROUGH COMMUNITY CLUSTERS



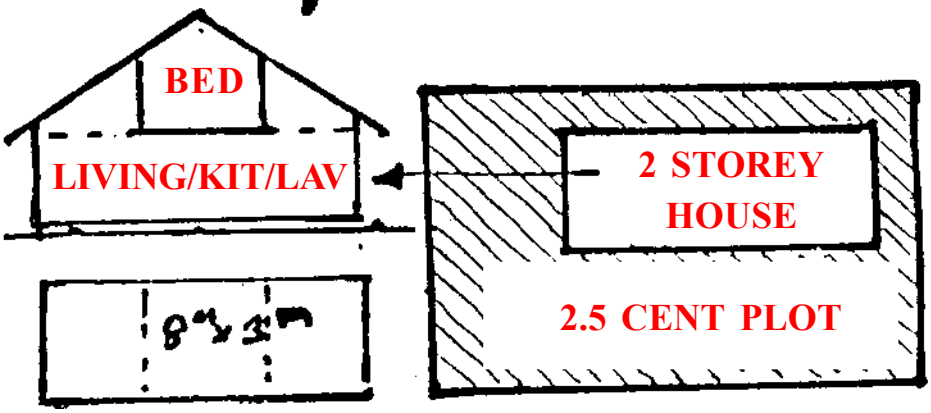


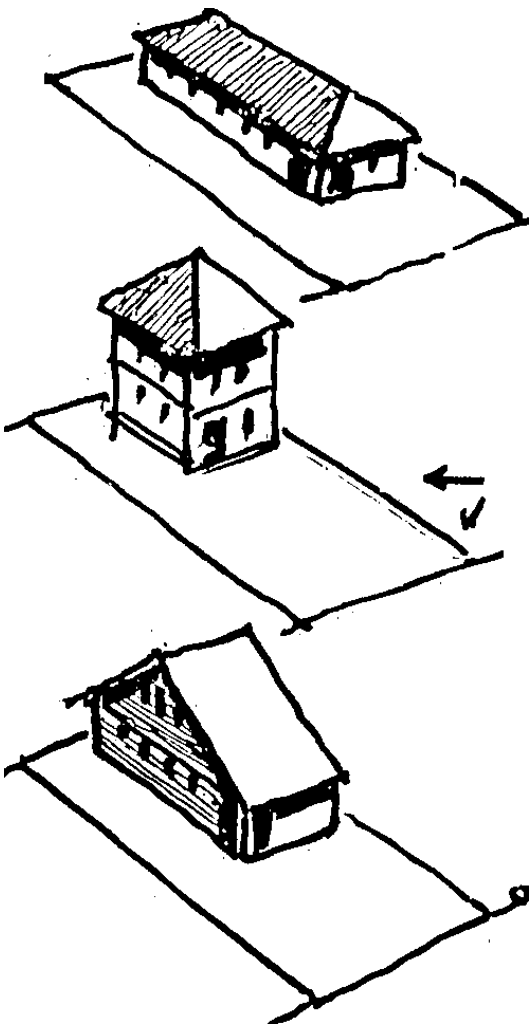
CLUSTER PLANNING AROUND A COMMON OPEN SPACE FOR COMMUNAL WORK AND PLAY (AND FOR BULLOCK CART PARKING ETC!) CUTS DOWN PUKKA ROAD LENGTHS, ALLOWS FOR A VARIETY OF HOUSE DESIGNS, AND ENCOURAGES NEIGHBOURLINESS.

AN OPEN NARROW SPACE BETWEEN CLUSTERS CAN CONTAIN FUEL AND FODDER AND FRUIT TREES, ALONG WITH SPACE FOR SANITATION INCLUDING COMMUNAL GAS PLANTS ETC.



HERE ARE TWO PLANS OF A WIDE VARIETY OF 2 STOREY HOUSES

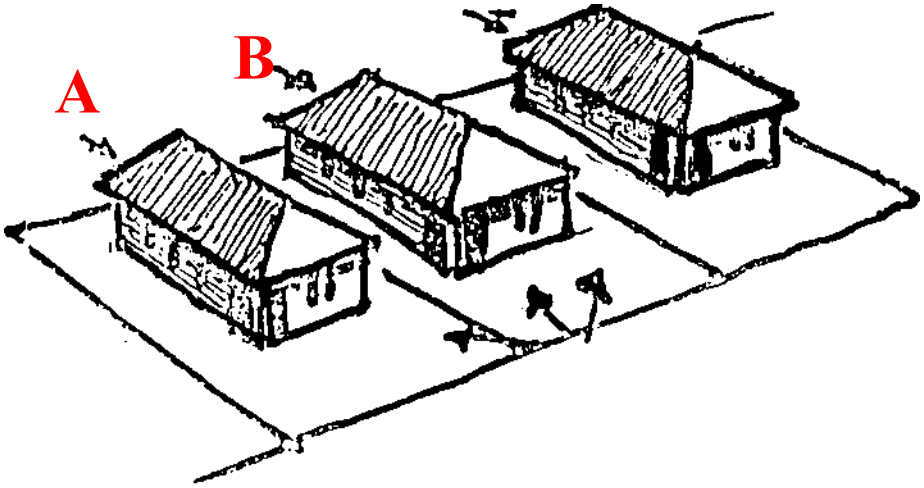




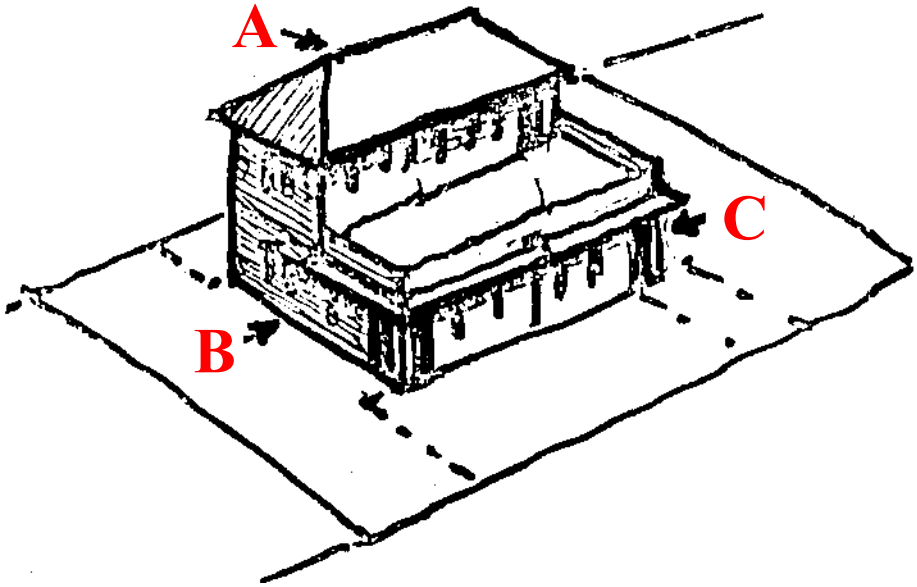
THIS IS TO SHOW THAT A SINGLE STOREY HOUSE ON A SMALL PLOT LEAVES VERY LITTLE SPACE FOR GARDEN ETC.

THESE SKETCHES SHOW THAT ON THE SAME SIZED PLOT.

DOUBLE STOREYS OR "LOFT TYPE" HOUSES LEAVE MUCH MORE OPEN SPACE FOR OUT DOOR OCCUPATIONS.



HERE ARE 3 EQUAL SIZE HOUSES ON 3 EQUAL SIZE PLOTS



HERE ARE THE SAME 3 EQUAL SIZE HOUSES BUILT AS ONE BLOCK – GIVING MUCH MORE OPEN LAND THOUGH THE AREA IS THE SAME AS 3 PLOTS.

SMALL HOUSES ON SMALL PLOTS

LEAVE VERY LITTLE OPEN LAND AROUND EACH HOUSE.

WHEN THERE ARE THREE BROTHERS AND THEIR FAMILIES (OR PERHAPS 3 CLOSE FRIENDS) THE THREE HOUSES CAN BE BUILT AS ONE BLOCK AND THEN THERE IS MUCH MORE OPEN SPACE FOR EACH FAMILY.

FURTHER MORE – THE UPPER HOUSE ALSO HAS A NICE BIG TERRACE (AS LARGE AS HIS HOUSE) ABOVE THE TWO GROUND FLOOR HOUSES.

COST EFFICIENCY

With the country having millions of homeless families, it is imperative that what money is available must be used ONLY for essentials, and none of it for fancy frills!

There are many factors that must be kept in mind; MATERIALS – are the materials we want to use for building LOCALLY AVAILABLE? If not – can we afford transport costs? Can we not use only locally available items as far as possible?

Then we must ALWAYS keep the CLIENT in mind.

Remember that the CLIENT is the beneficiary – not a Government Department etc!

Will he be able to accommodate comfortably all his dependants?

Will he be able to extend the house when, later, his sons grow up and earn money?

Will the house be STRONG and SECURE?

Can sheds or verandas be added by him for home occupations, like carpentry or weaving etc?

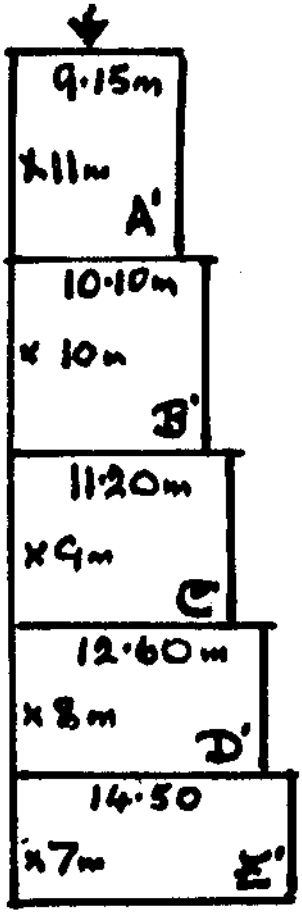
Does the plan allow for local cultural and religious ways of living?

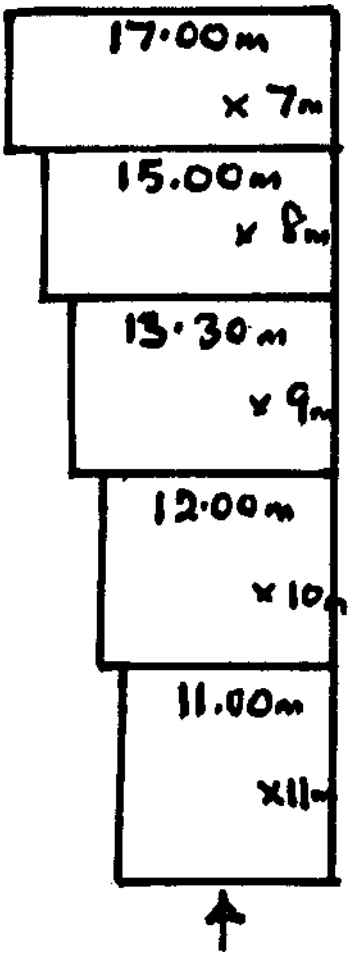
What about water and sanitation? And what about approachability?

Our aim of "Cost Efficiency" must include all these things.

PLOT SIZES

ALL THESE PLOTS ARE THE SAME AREA 2.5 CENTS



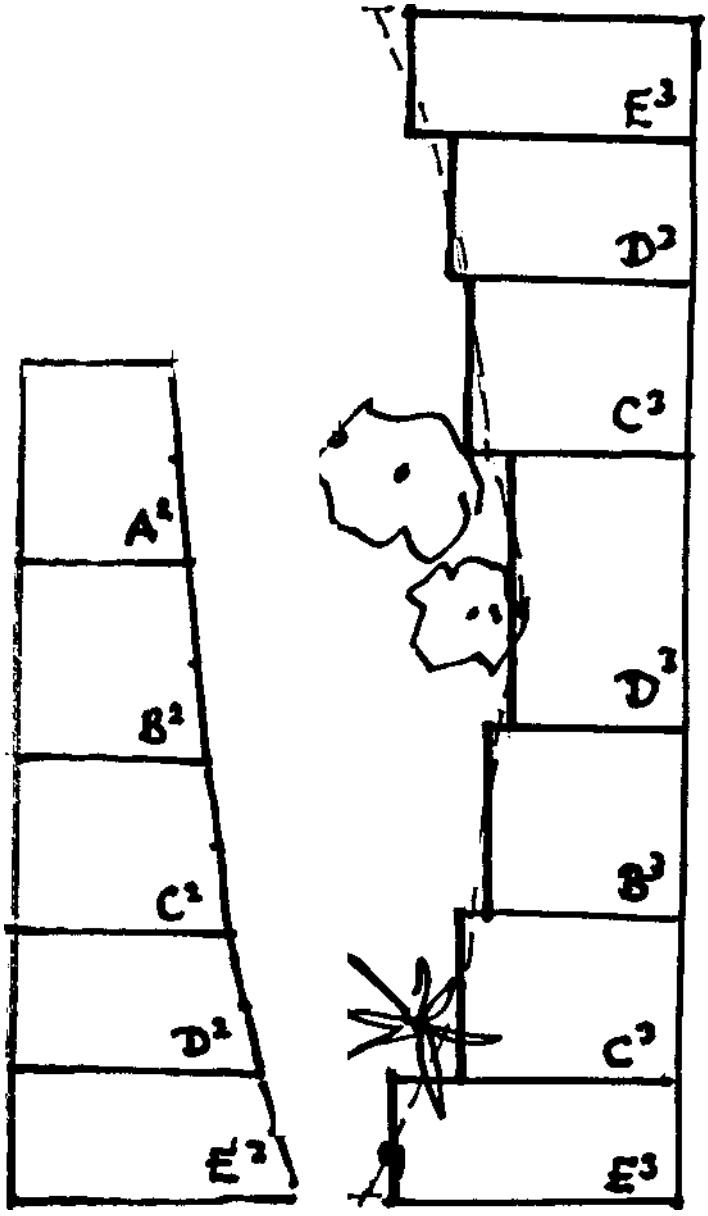


ALL THESE PLOTS ARE THE SAME AREA 3.0 CENTS & OF COURSE THERE WILL OFTEN BE IRREGULAR SHAPES

PLOT SHAPES NEED NOT ALWAYS BE SQUARE OR RECTANGULAR.

VERY OFTEN LAND AVAILABLE FOR COMMUNITY HOUSING IS IRREGULAR WASTE LAND – OFTEN WITH WASTE DUMPS OF RUBBISH – OR SMALL PONDS OF DIRTY WASTE WATER. IF THERE ARE ANY TREES, WE SHOULD KEEP THEM AND INCORPORATE THEM INTO THE PLAN.

THESE PLOTS ARE THE SAME AREAS AS THOSE ON THE PREVIOUS PAGE.



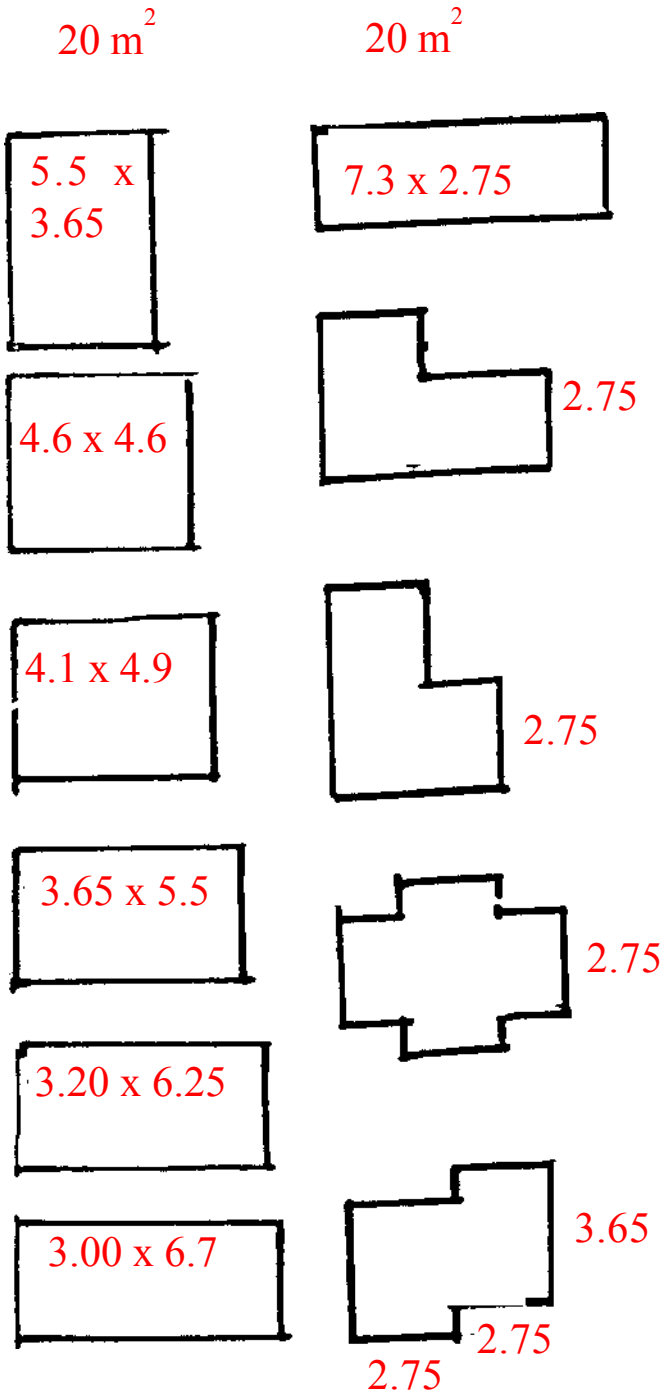
HOUSE PLAN SIZES

Very often, Authorities and Institutions limit the SIZES of houses they intend to build: sizes such as 20 m^2, 25 m^2, 30 m^2, etc.

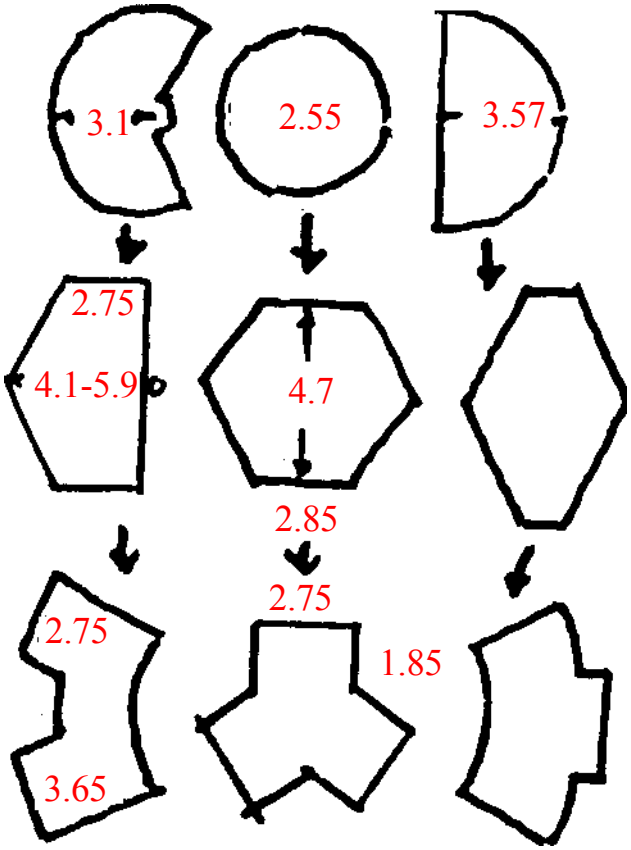
The general immediate reactions of planners and beneficiaries is "Horrors! What can you do in 20 m^2 – a mere 4 m x 5 m! and then we get accused of putting up rows of identical little concrete boxes – and call them houses…."

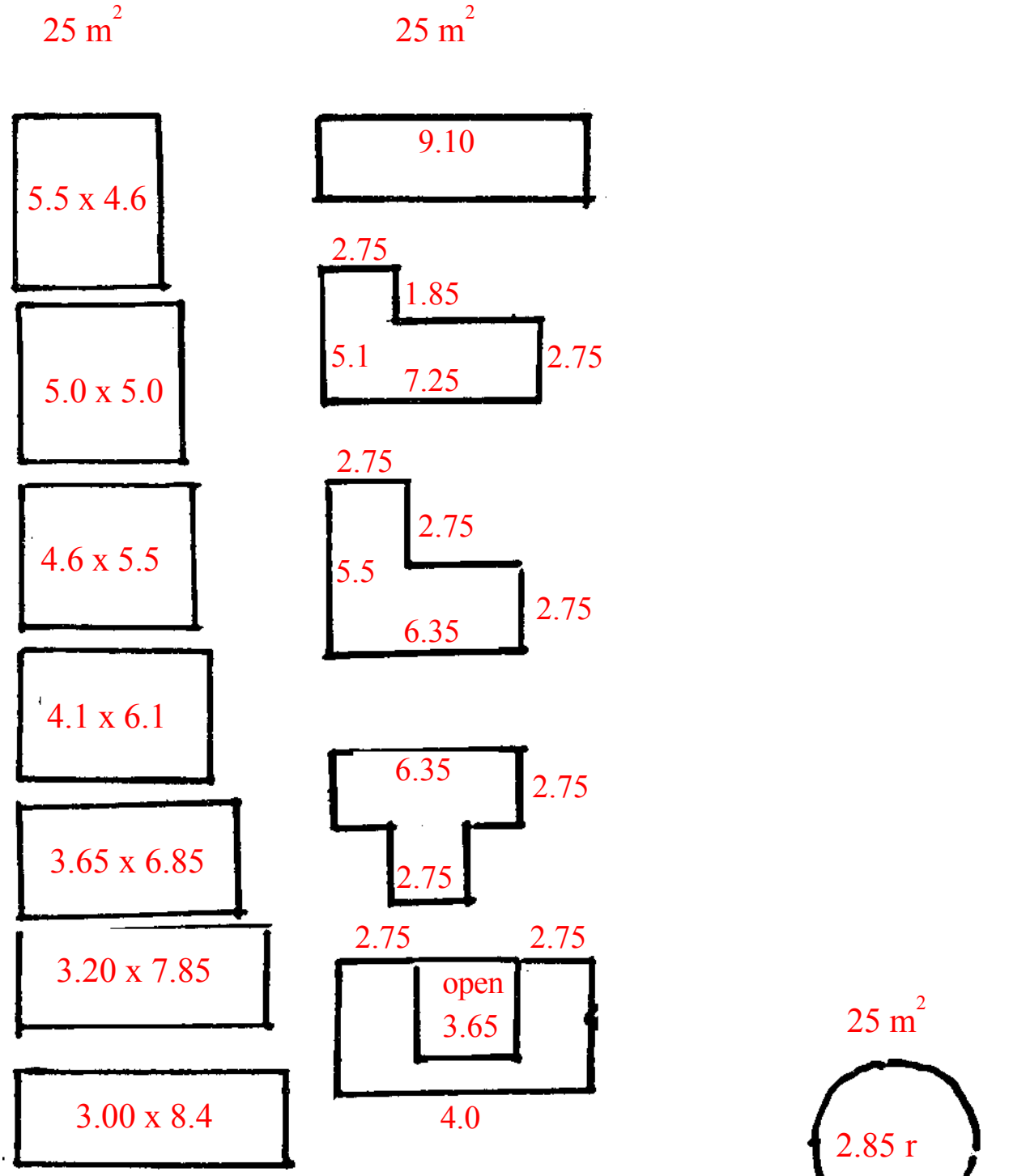
The following pages are to show that such small areas can be in many different shapes – for example on the following page TWENTY different shapes are shown – and all are approximately 20 m^2.

Obviously, the same variety can be given for other sized houses. The main object of these pages is to show that one PROTOTYPE house plan in INEXCUSABLE.



20 m^2 – All these shapes are about 20 m^2. Further pages will show that each shape can have a variety of interior room shapes and sizes to suit the needs of the occupants.

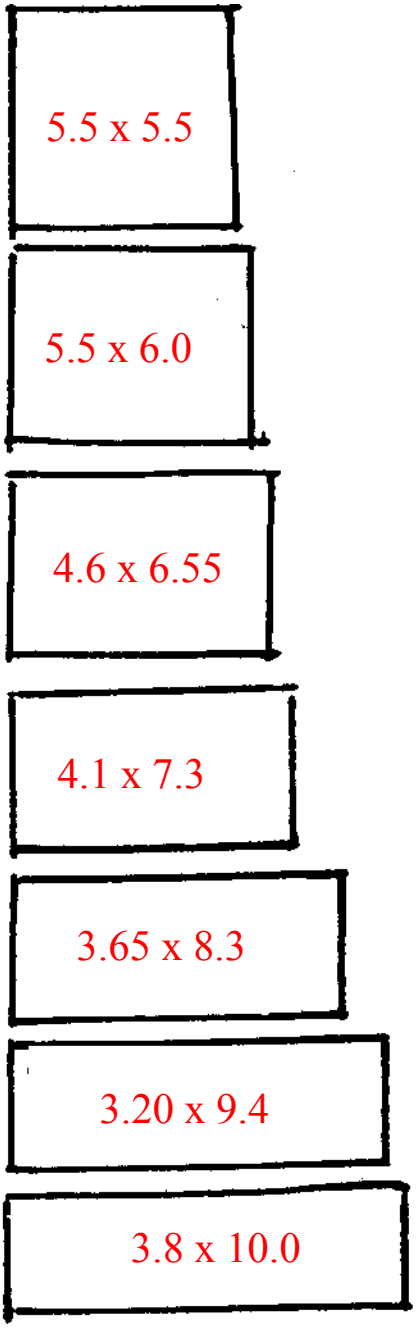




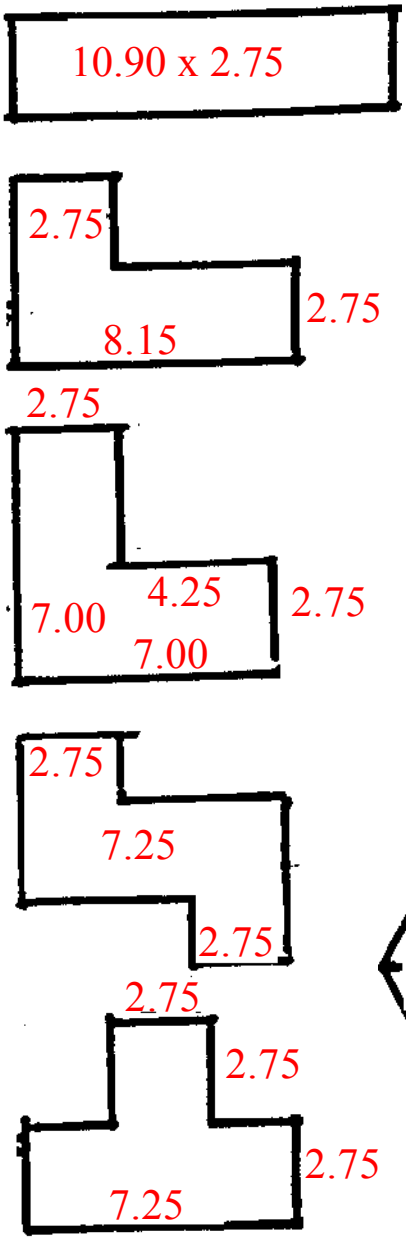
THESE ARE A SIMILAR VARIETY OF SHAPES WHEN 25 M² IS SPECIFIED BY THE PROMOTERS OF A COMMUNITY HOUSING SCHEME.

FAMILIES VARY IN NUMBERS, AGES, OCCUPATIONS ETC. – SO IT IS UNREASONABLE TO GIVE A COMMUNITY ONE PROTOTYPE PLAN.

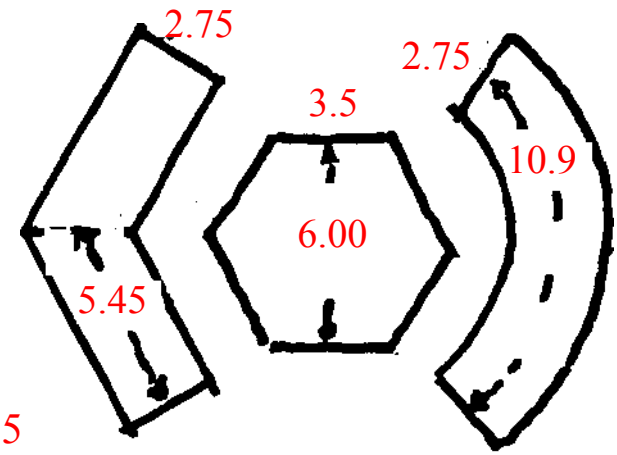
30 m^2

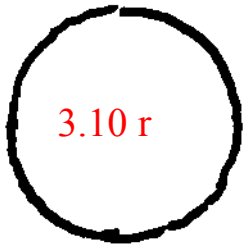


30 m^2

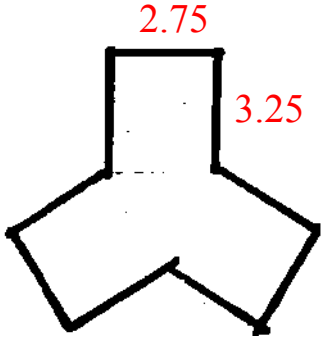


30 m^2

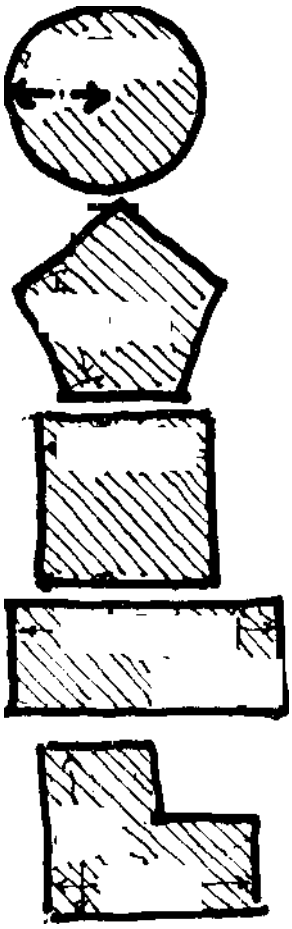




THESE ARE A SIMILAR VARIETY OF PLAN SHAPES – ALL OF THEM BEING APPROXIMATELY 30 M².



We can see that there are many SHAPES which all have the same area 20 m^2. However, THE LENGTHS of the outer walls VARY.

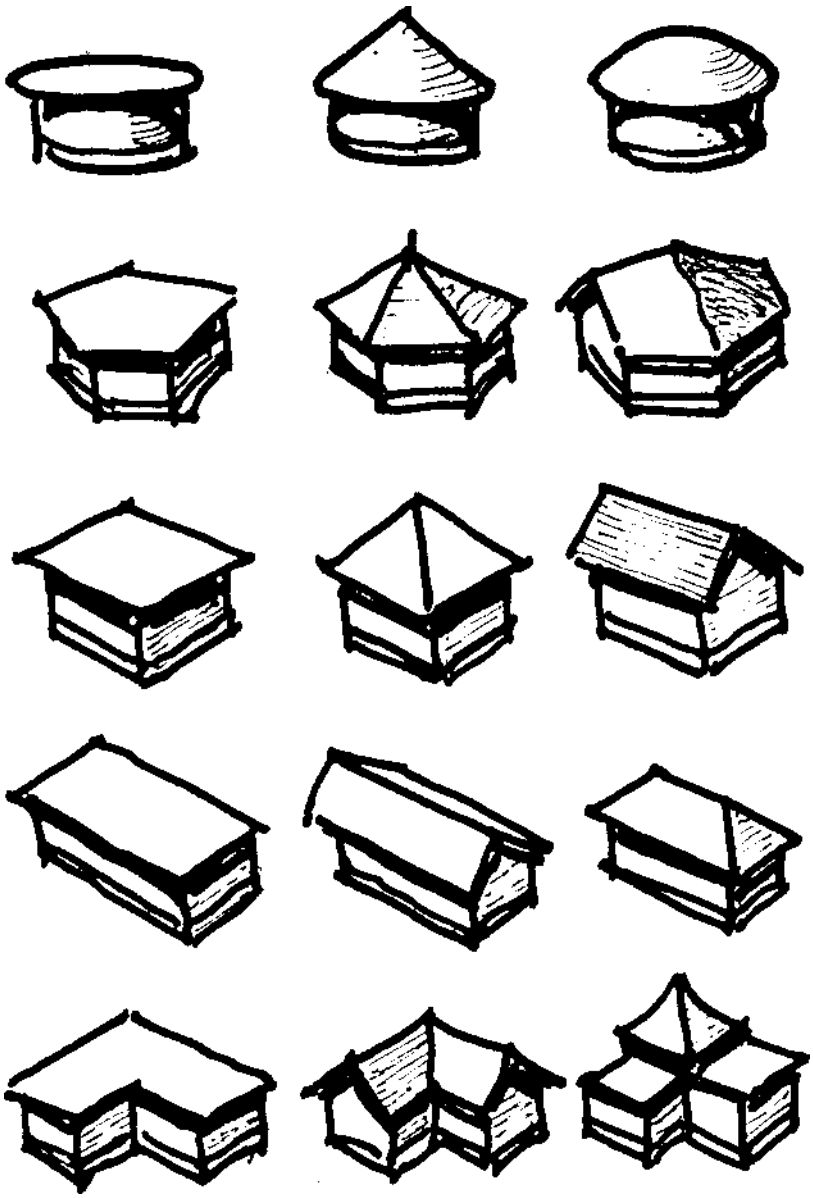
SHAPER AREA 20 m^2		LENGTH OF OUTERWALL
	20 m^2	15.70 m
	20 m^2	16.50 m
	20 m^2	17.88 m
	20 m^2	15.70 m
	20 m^2	15.70 m

Consequently the outer WALL SURFACE also VARIES for each shape – and, of course, so does the NUMBER OF BRICKS needed! And COSTS!

AREA OF WALL SURFACE	APPROX. NUMBER OF BRICKS
43.20 m^2	2420
45.37 m^2	2540
49.17 m^2	2750
55.27 m^2	3100
55.50 m^2	3200

ROOF VARIATIONS

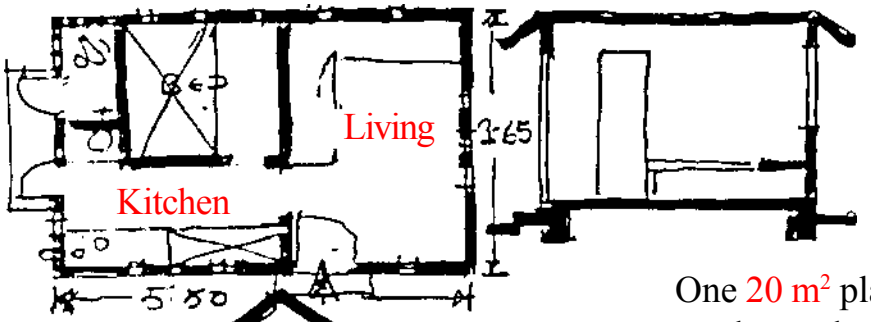
20 m^2 HOUSE AREA



THE CHOICE OF ROOF IS NOT JUST BETWEEN "PLAIN" OR "FANCY".

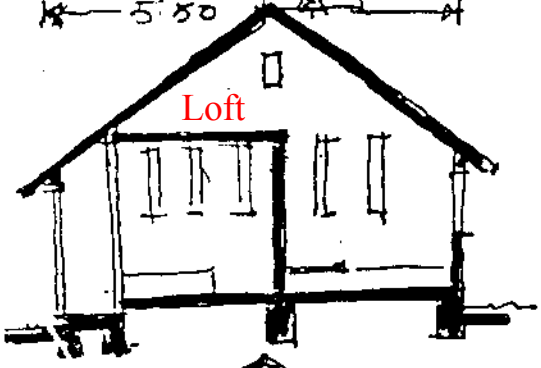
THE MAIN CONSIDERATIONS NEEDED ARE THE MATERIALS AVAILABLE, THE CLIMATE, THE RAINFALL AND THE WIND DIRECTIONS, AND, MOST IMPORTANT – THE TRADITIONAL SHAPE.

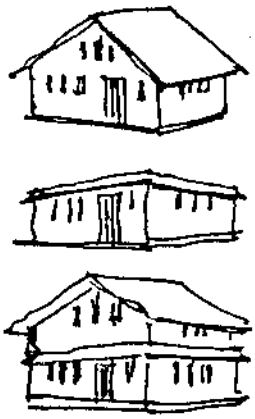
THE MAIN REASON FOR THESE SKETCHES IS TO SHOW THAT A COMMUNITY DOES NOT HAVE TO HAVE ROWS OF IDENTICAL BOXES.



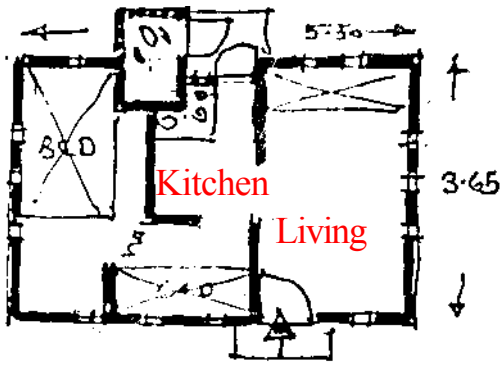
20 m^2

One 20 m^2 plan – but Section A has a flat roof which can later take an upper storey. Section B has a sloping roof which allows room now for a loft.



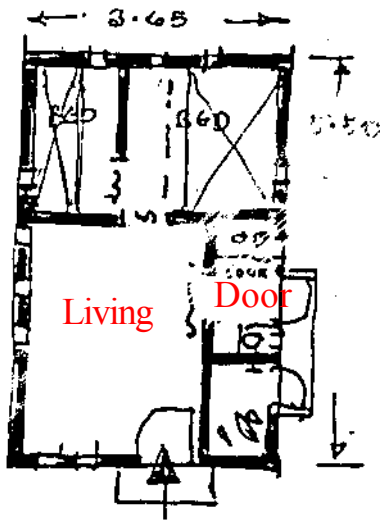


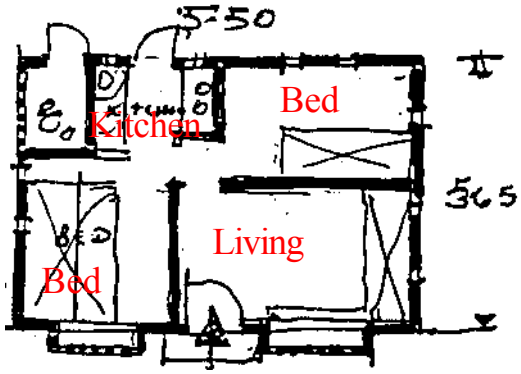
20 m^2



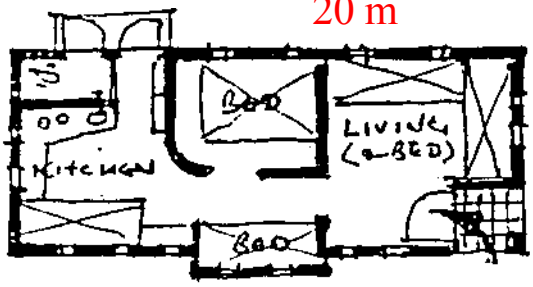
THESE 3 PLANS OF A 20 M^2 HOUSE SHOW VARYING INTERNAL ROOM ARRANGEMENTS.

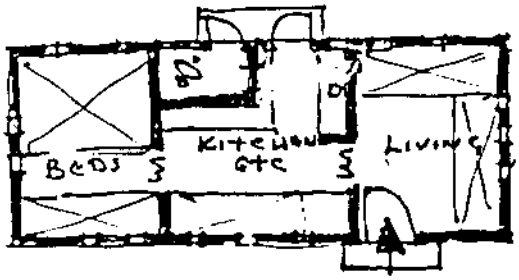
BENEFICIARIES SHOULD BE ALLOWED TO MAKE THEIR OWN CHOICES BEFORE BUILDING WORK STARTS.

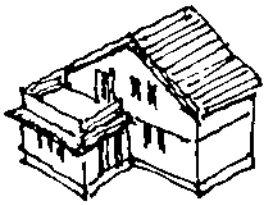


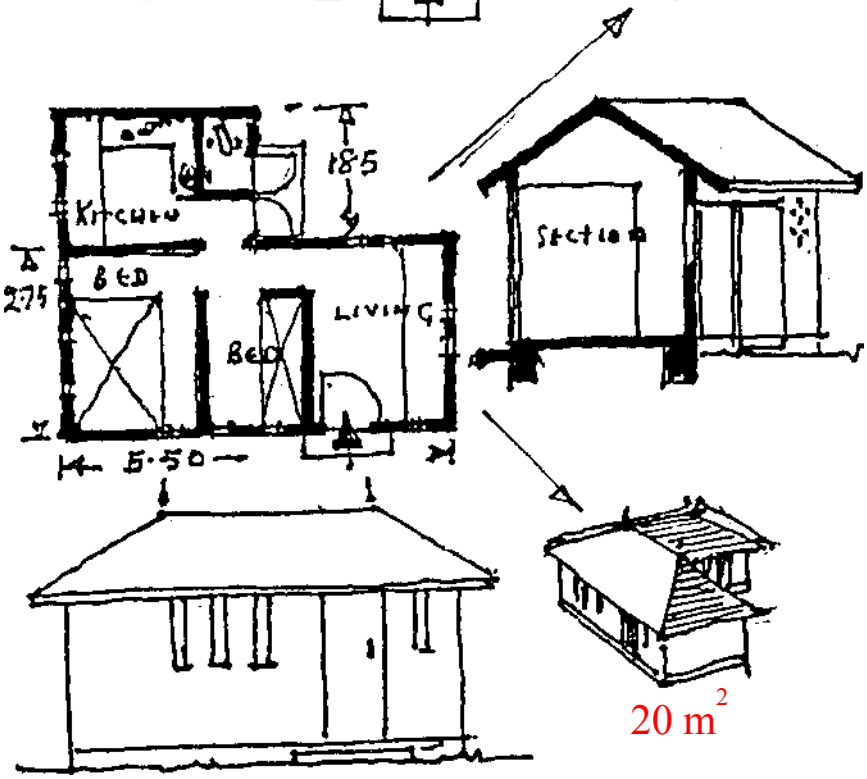


20 m^2

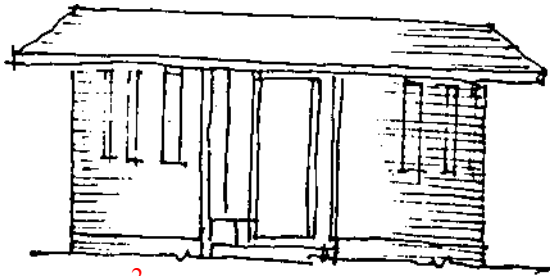




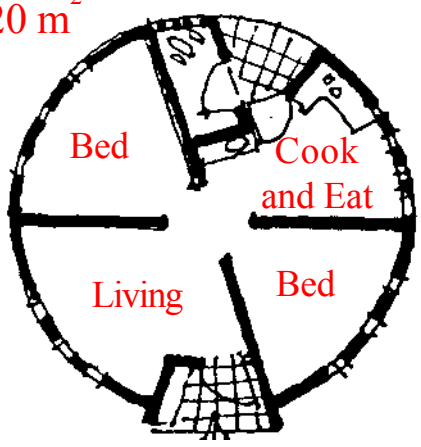




20 m^2



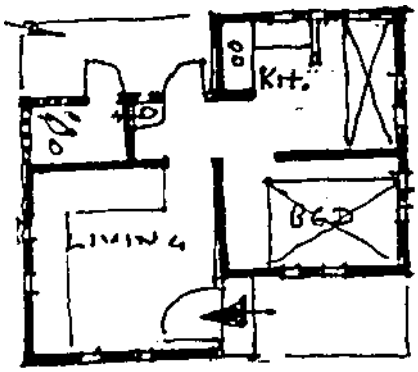
20 m^2

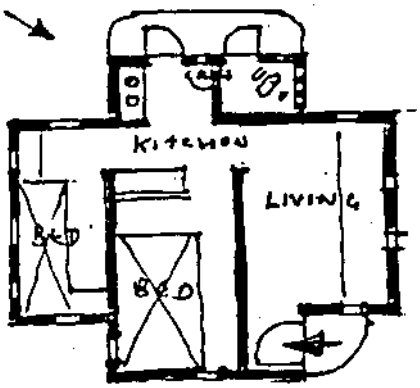


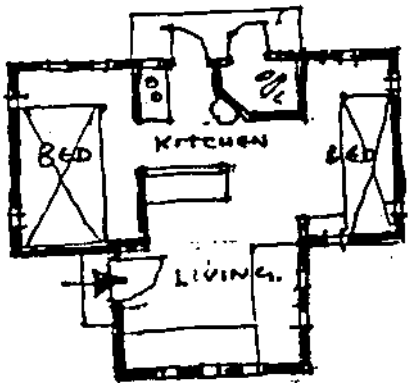
AGAIN, HERE ARE FOUR DIFFERENT PLAN SHAPES BUT THE SAME 20 M² AREA.

IT IS WORTH NOTING THAT "CORRIDOR" SPACE BETWEEN ROOMS IS VERY SMALL IN THE ROUND PLAN.

20 m^2

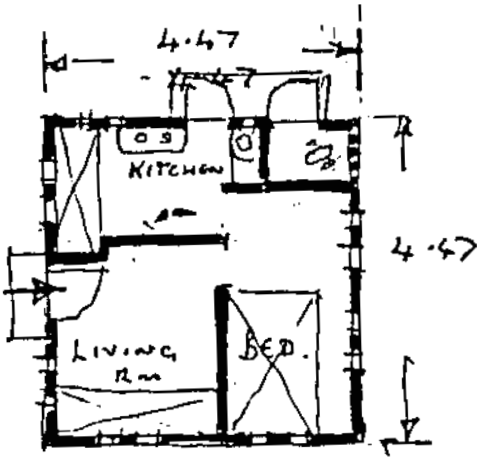


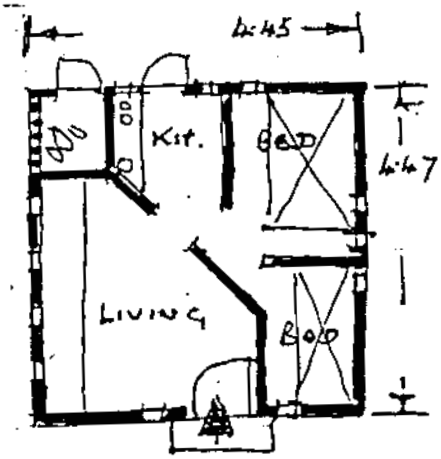


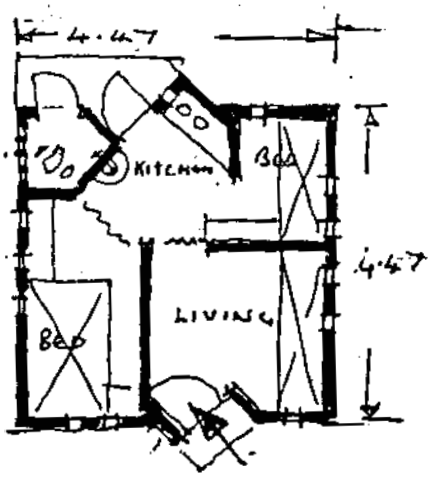


THESE THREE PLANS ALSO HAVE THE SAME AREA - 20 M^2 BUT THE SHAPE AND ARRANGEMENT OF THE ROOMS VARY, IN EACH PLAN, TO SUIT THE REQUIREMENTS OF THE OCCUPYING FAMILY.

20 m^2

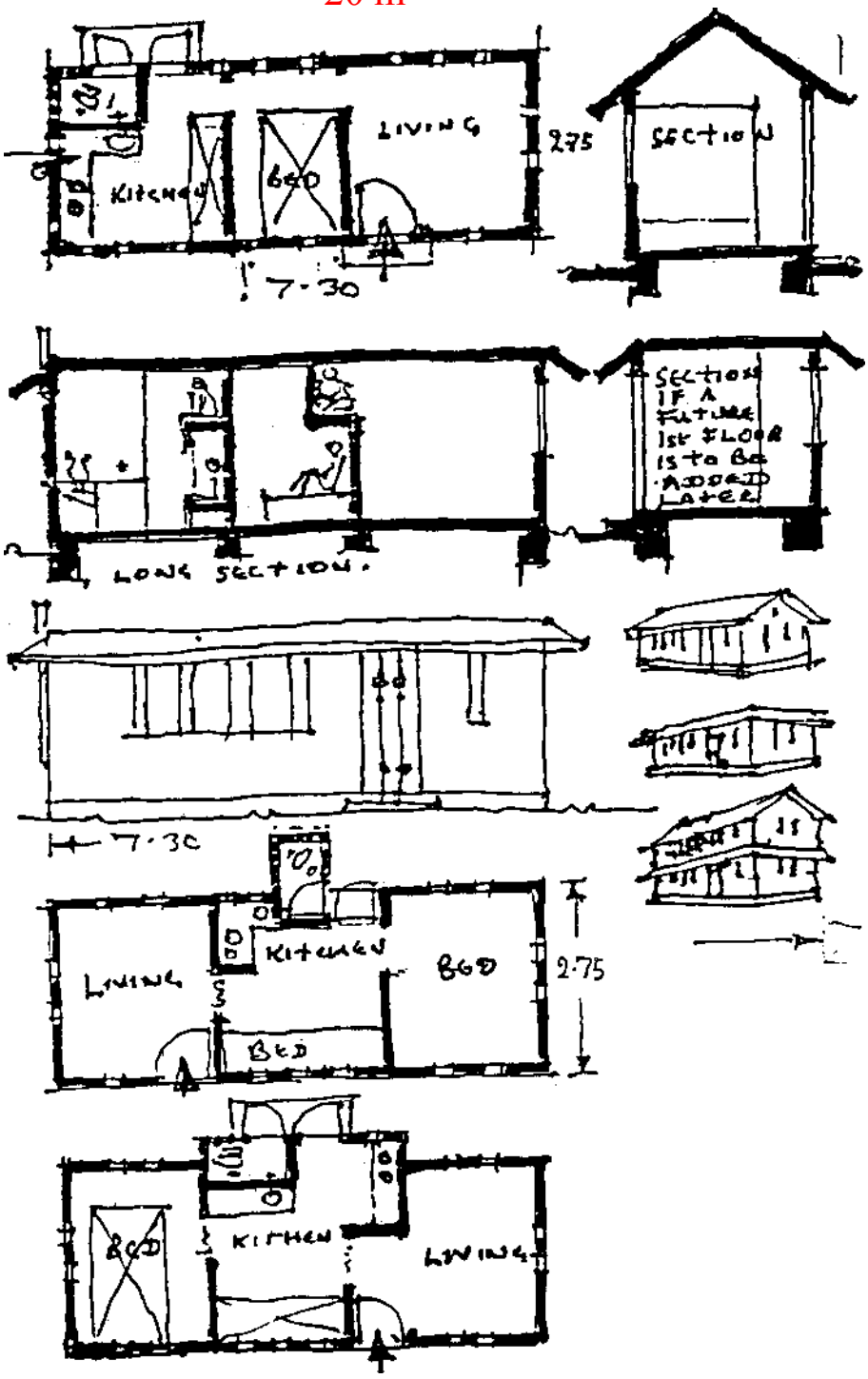






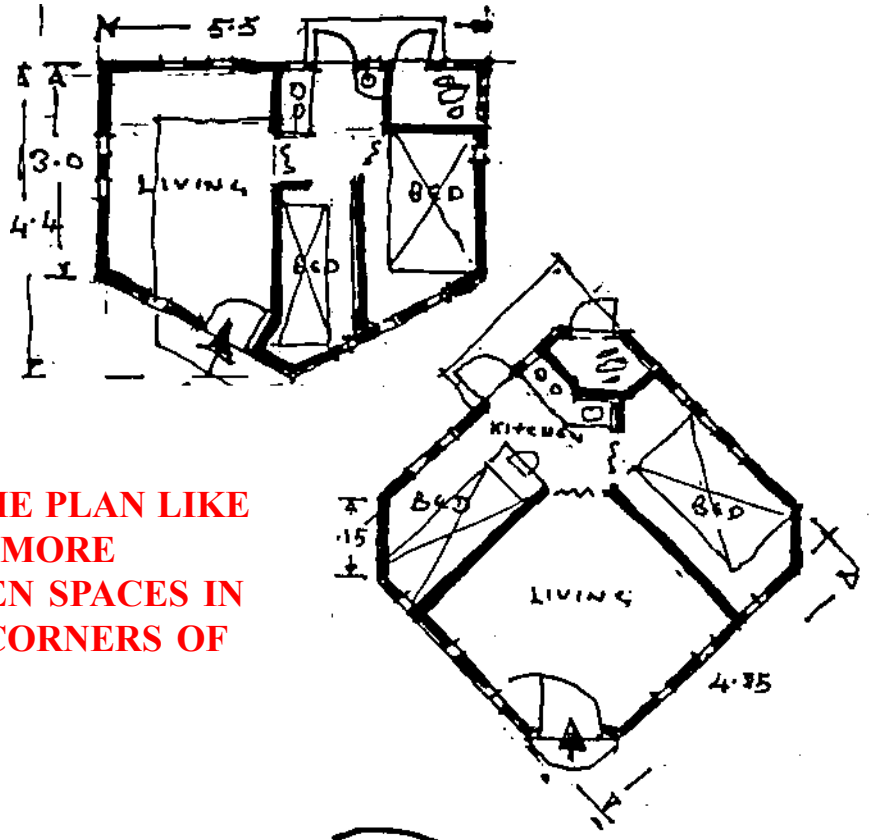
EVEN IF SEVERAL HOMES ARE THE SAME SHAPE, THERE CAN BE A VARIETY OF ROOM SHAPES AND SIZES, AS IS SEEN WITH THESE THREE SQUARE PLANS, EACH 20 M^2

20 m^2

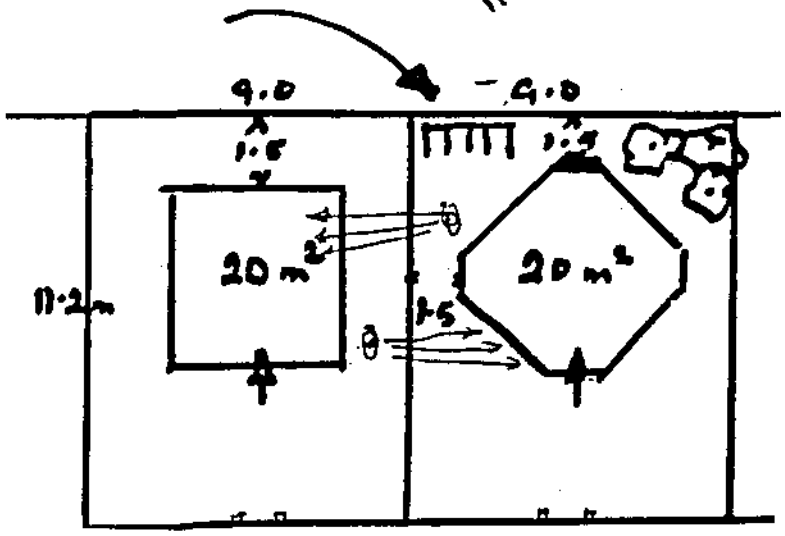


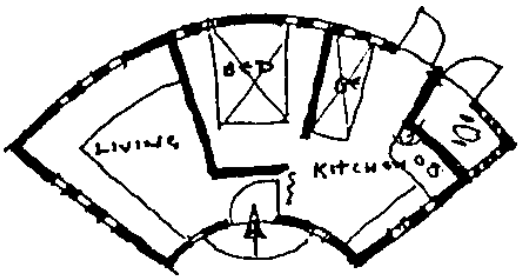
ONE SHAPE AND SIZE
BUT VARIOUS ROOM ARRANGEMENTS.

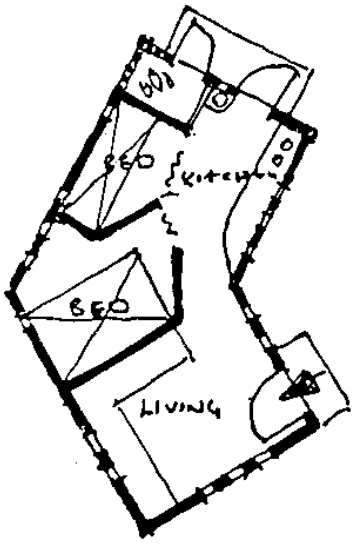
20 m^2



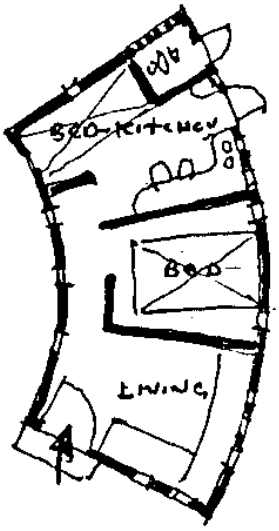
TURNING THE PLAN LIKE THIS GIVES MORE USABLE OPEN SPACES IN THE REAR CORNERS OF THE PLOT.

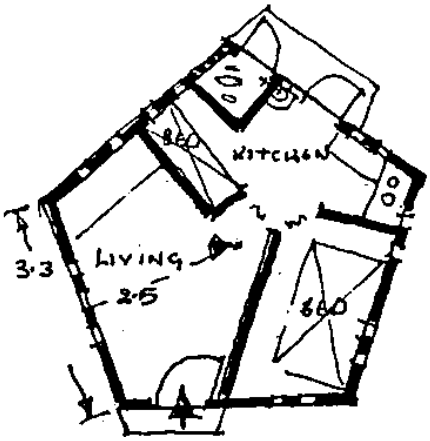




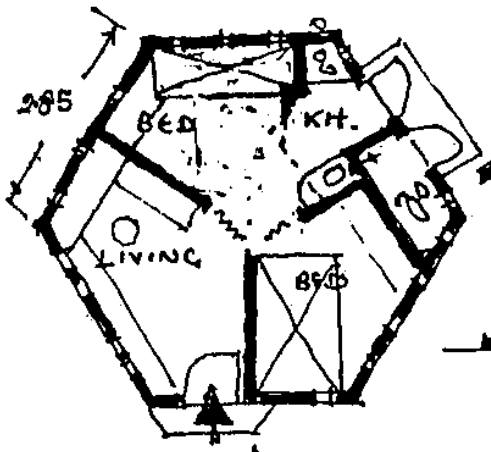


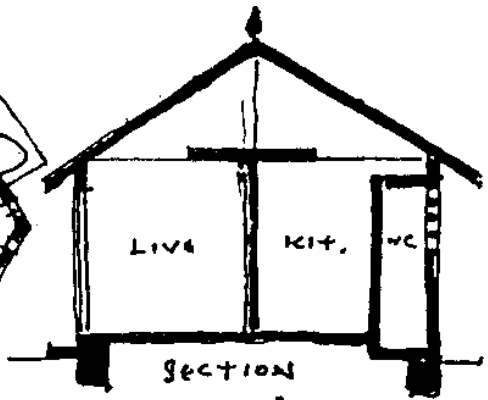
20 m^2

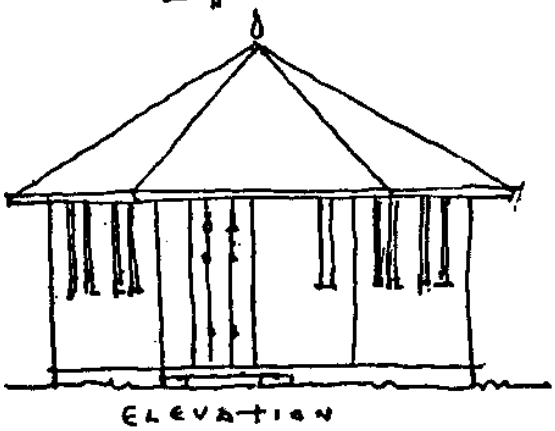


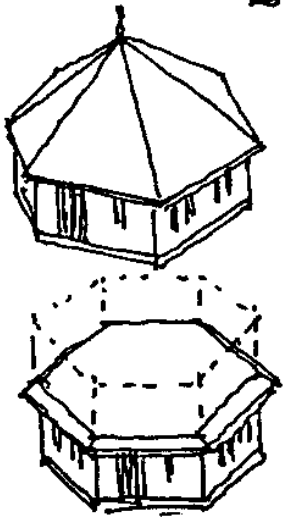


20 m^2



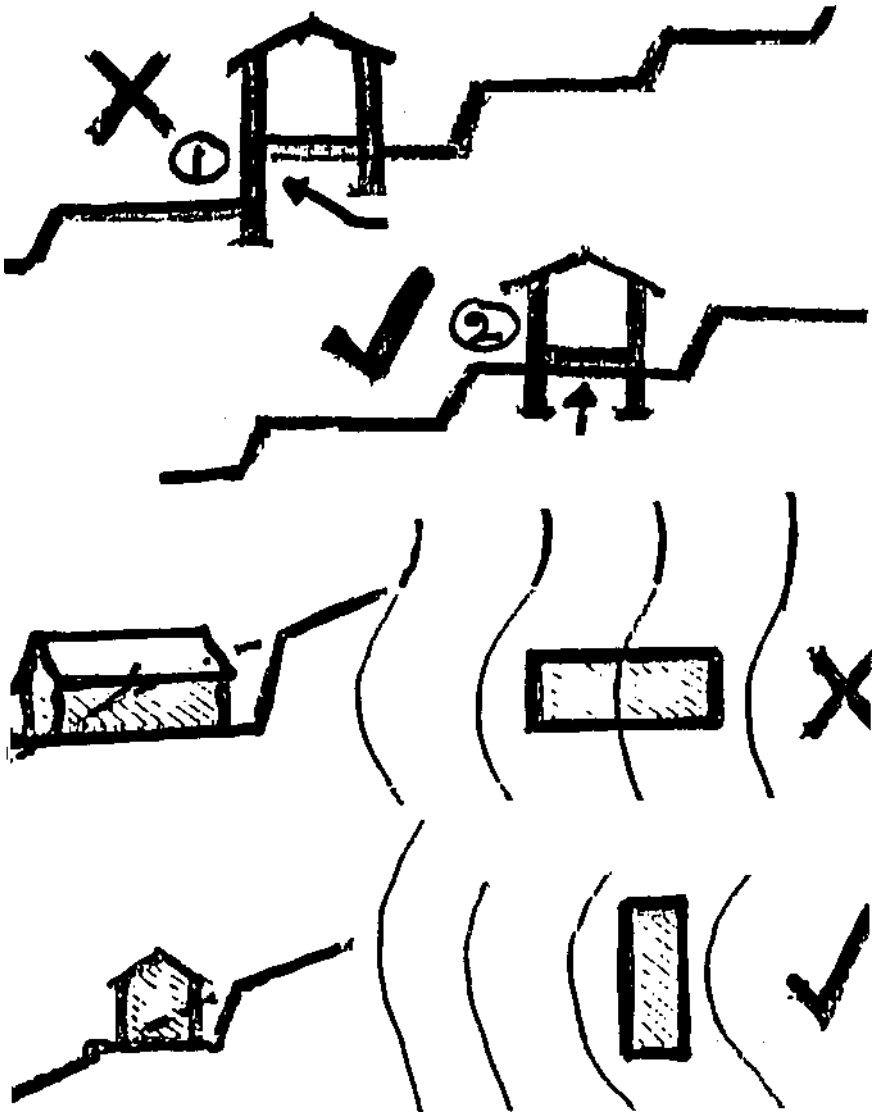






THESE PLANS SHOW HOW ODD SHAPES WHICH MAY BETTER FIT INTO ODD, OR CORNER SHAPED PLOTS.

SLOPING SITES

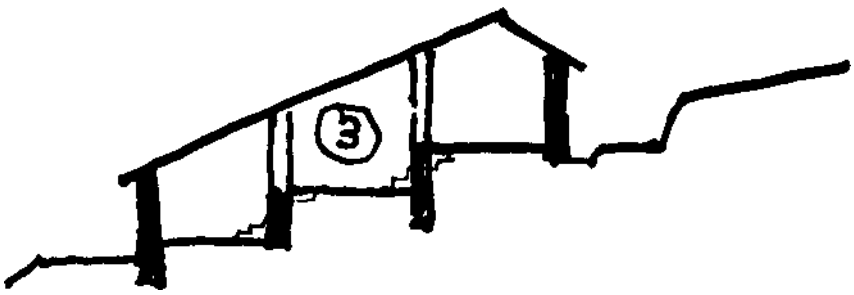


WHERE LAND IS STEEPLY SLOPING OR TERRACED

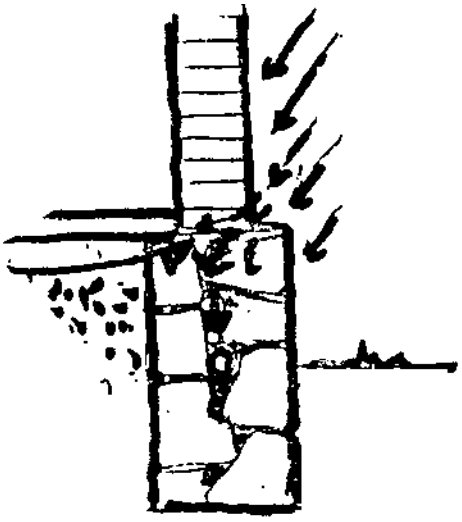
1. DON'T BUILD ON THE OUTER EDGE OF THE TERRACE. YOU WOULD NEED TO BUILD A STRONG EXPENSIVE RETAINING WALL.

2. BUILD THE HOUSE ALONG THE MIDDLE OF THE TERRACE AND USE A LONG RECTANGULAR PLAN, NOT A SQUARE ONE.

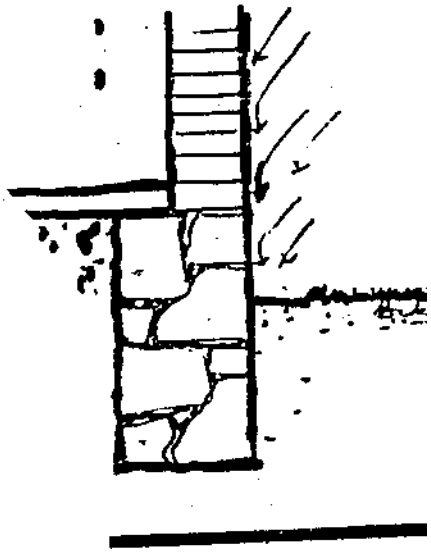
3. IF THE TERRACES ARE NARROW IT IS SOMETIMES POSSIBLE TO BUILD A "STEPPED HOUSE".



FOUNDATIONS

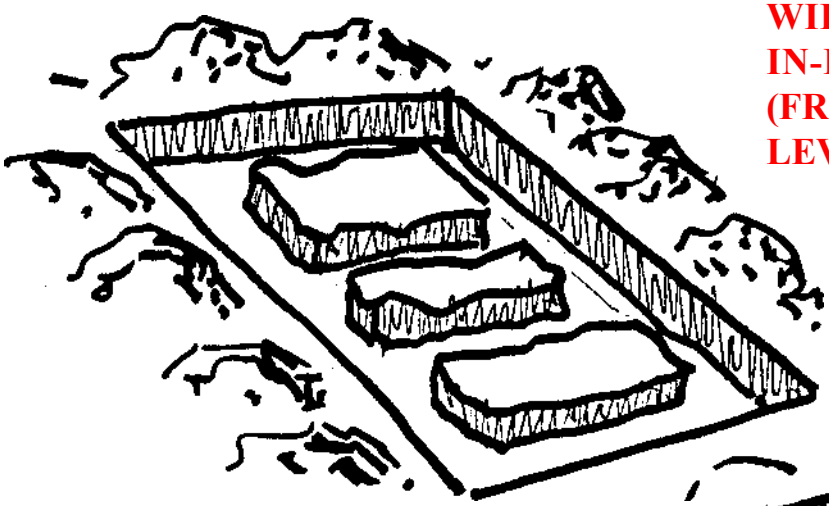


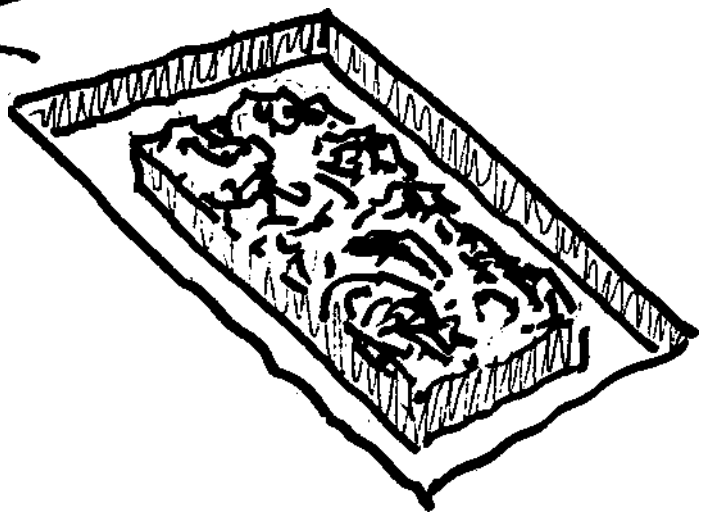
FOR SMALL HOUSES (AND ESPECIALLY FOR SINGLE STOREY ONES) THERE IS NO NEED TO BUILD THE UPPER BRICK WALLS OVER THE MIDDLE OF THE FOUNDATION WALL.



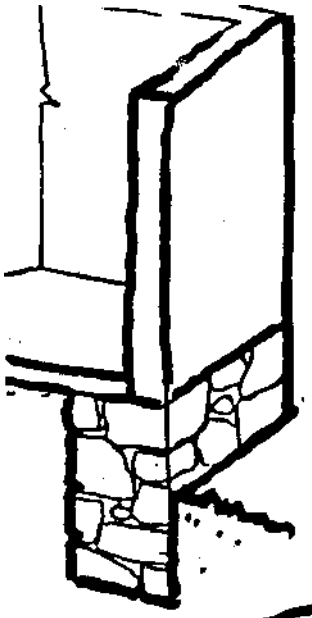
SET THE UPPER WALL OVER THE OUTER HALF OF THE FOUNDATION WALLS. IT PREVENTS RAIN SEEPAGE.

WHEN DIGGING OUT THE TRENCHES FOR THE FOUNDATION WALLS, DO NOT SCATTER THE SOIL ALL OVER THE PLACE. KEEP IT ALTOGETHER IN THE MIDDLE AS IT WILL BE NEEDED FOR INFILLING IN-BETWEEN THE PLINTH WALLS (FROM GROUND LEVEL TO FLOOR LEVEL.)

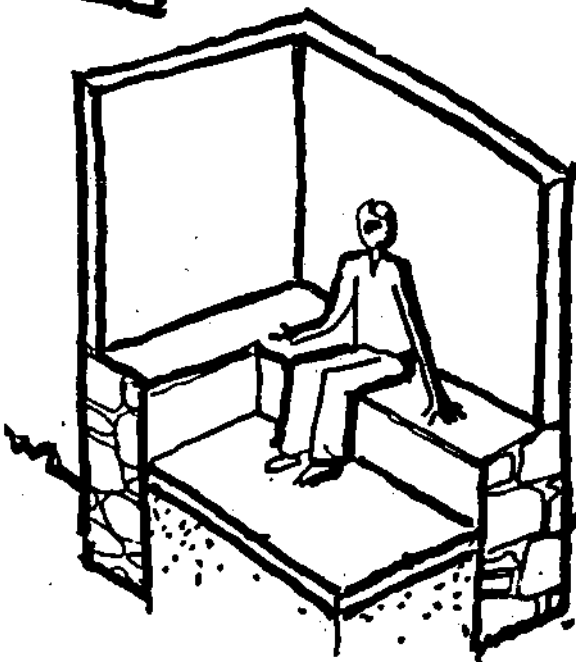




STONE FOUNDATIONS



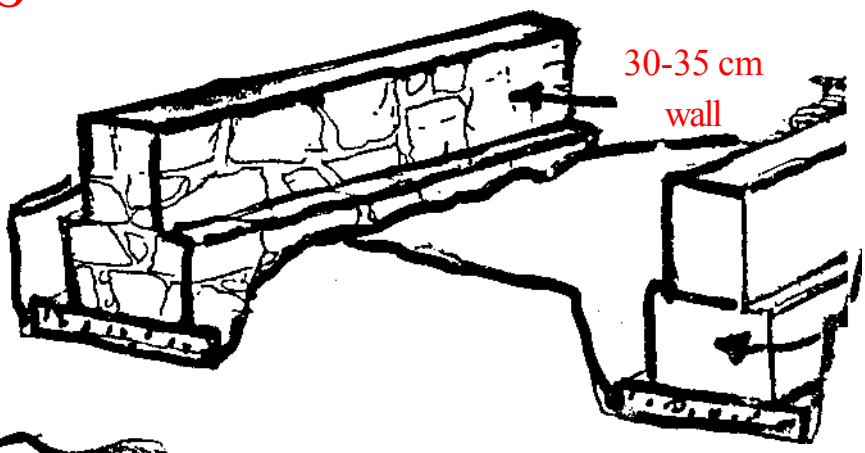
Usually stop at floor level (30 or 40 cm above ground level.).

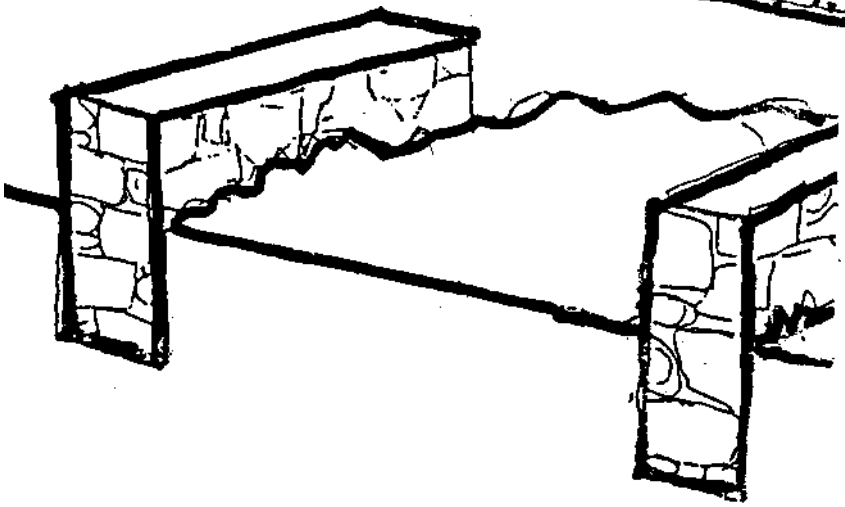


Take them 45 cm higher and you have a ready made bed or seat!

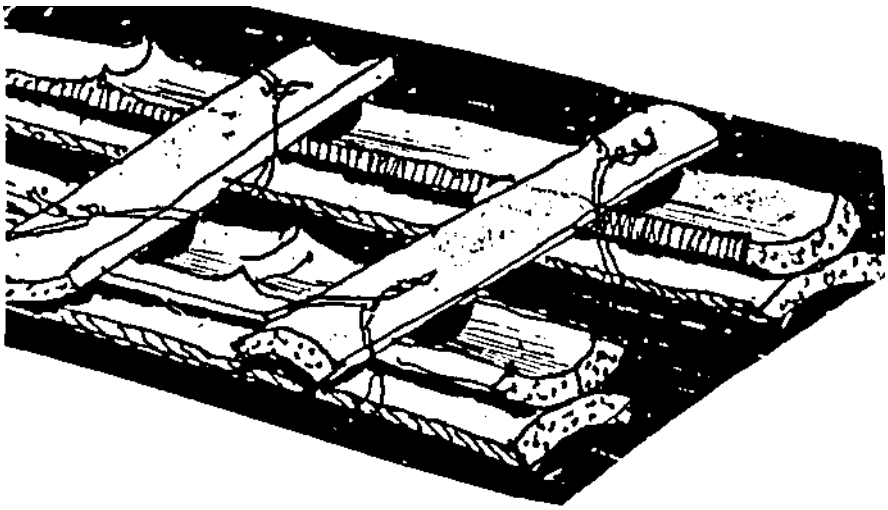
FOUNDATIONS

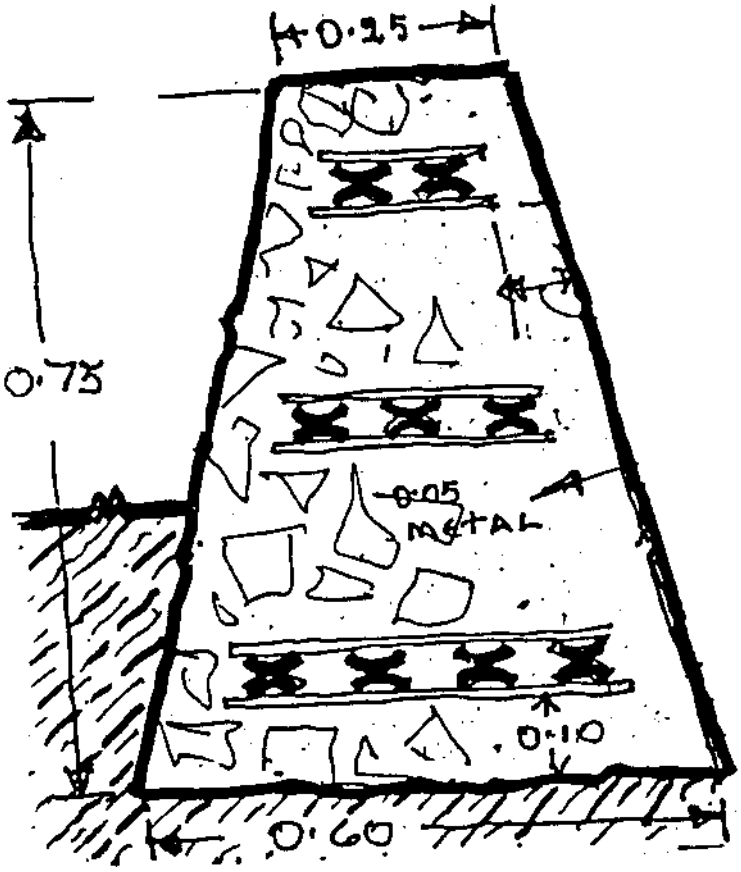
When soil is poor and soft – it is usual to dig a wide trench and cover the bottom with concrete. On this a wide stone wall 50-60cm is built on top of that.



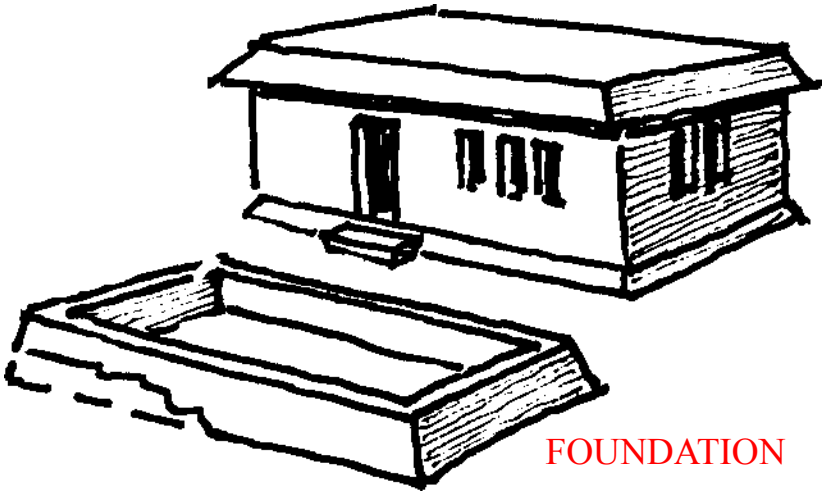


When the soil is strong and hard there is no need for either to concrete or the layer of thick stone work.

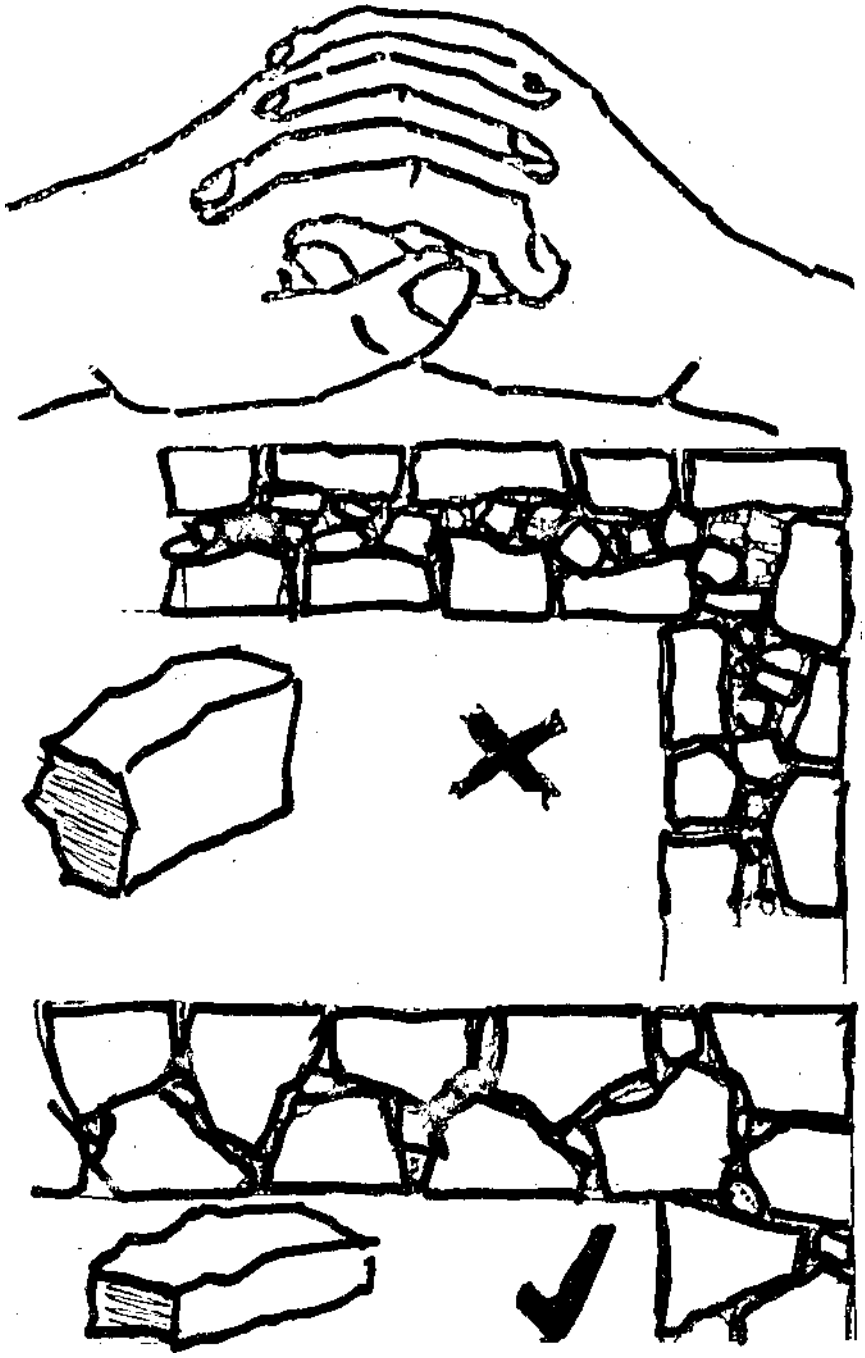




Another use for split building BAMBOO in LIME concrete is for foundations, especially in sandy areas along the sea coast. Salt and Saline will not affect or destroy either the concrete or the reinforcement. (Ordinary foundations will crack with shifting sands.)

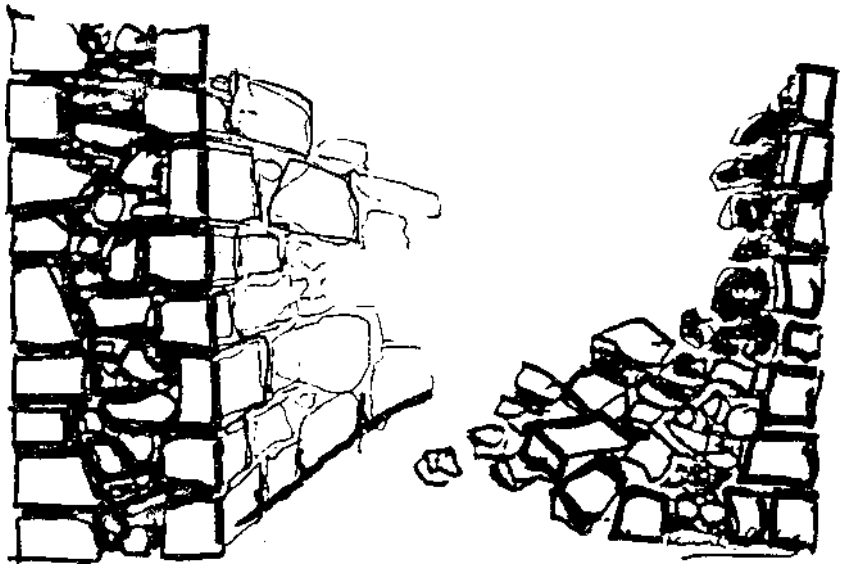


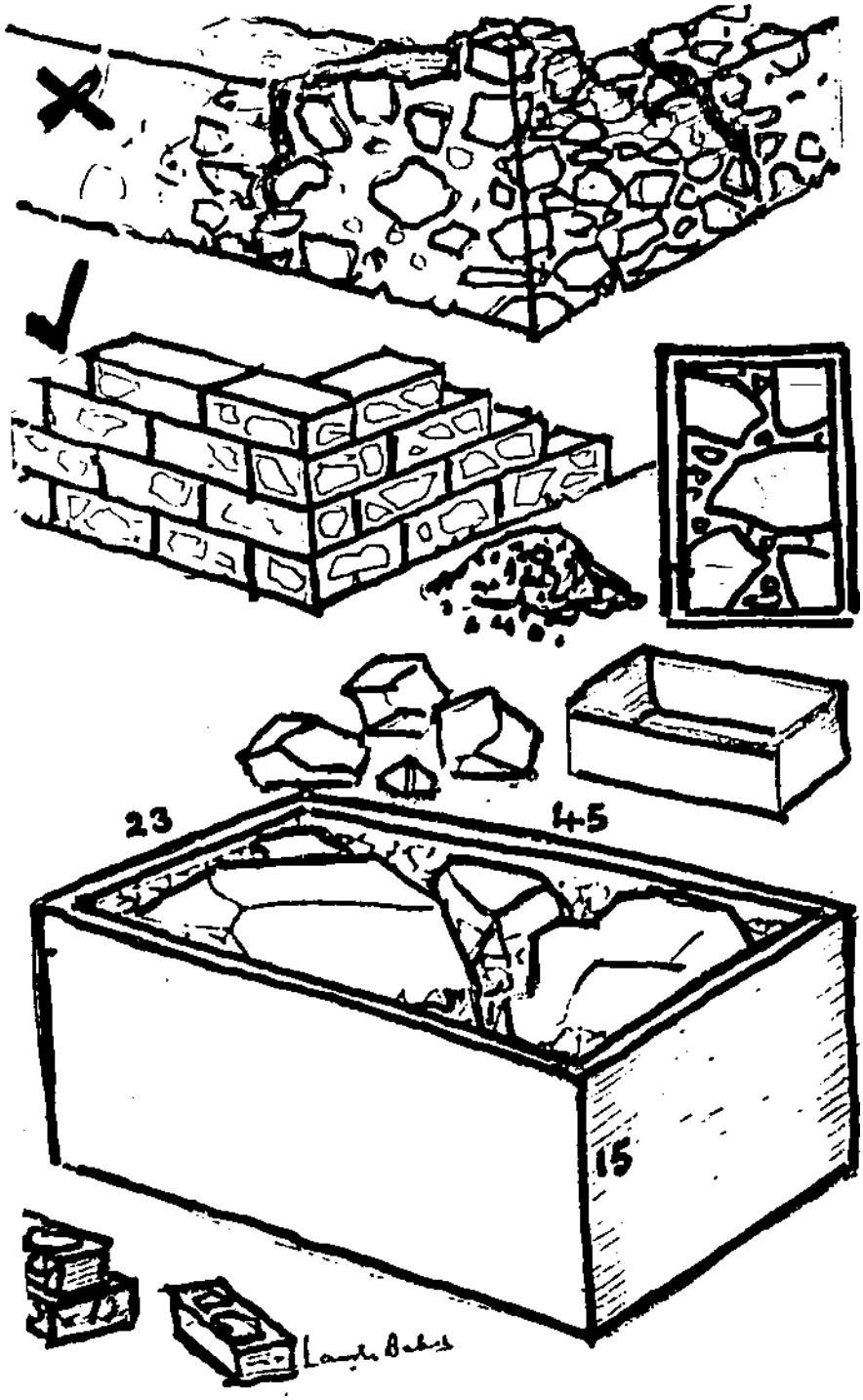
FOUNDATION



BONDING

is the very essential art of making BRICKS, BLOCKS & STONES ON BOTH sides of a wall interlock with each other.



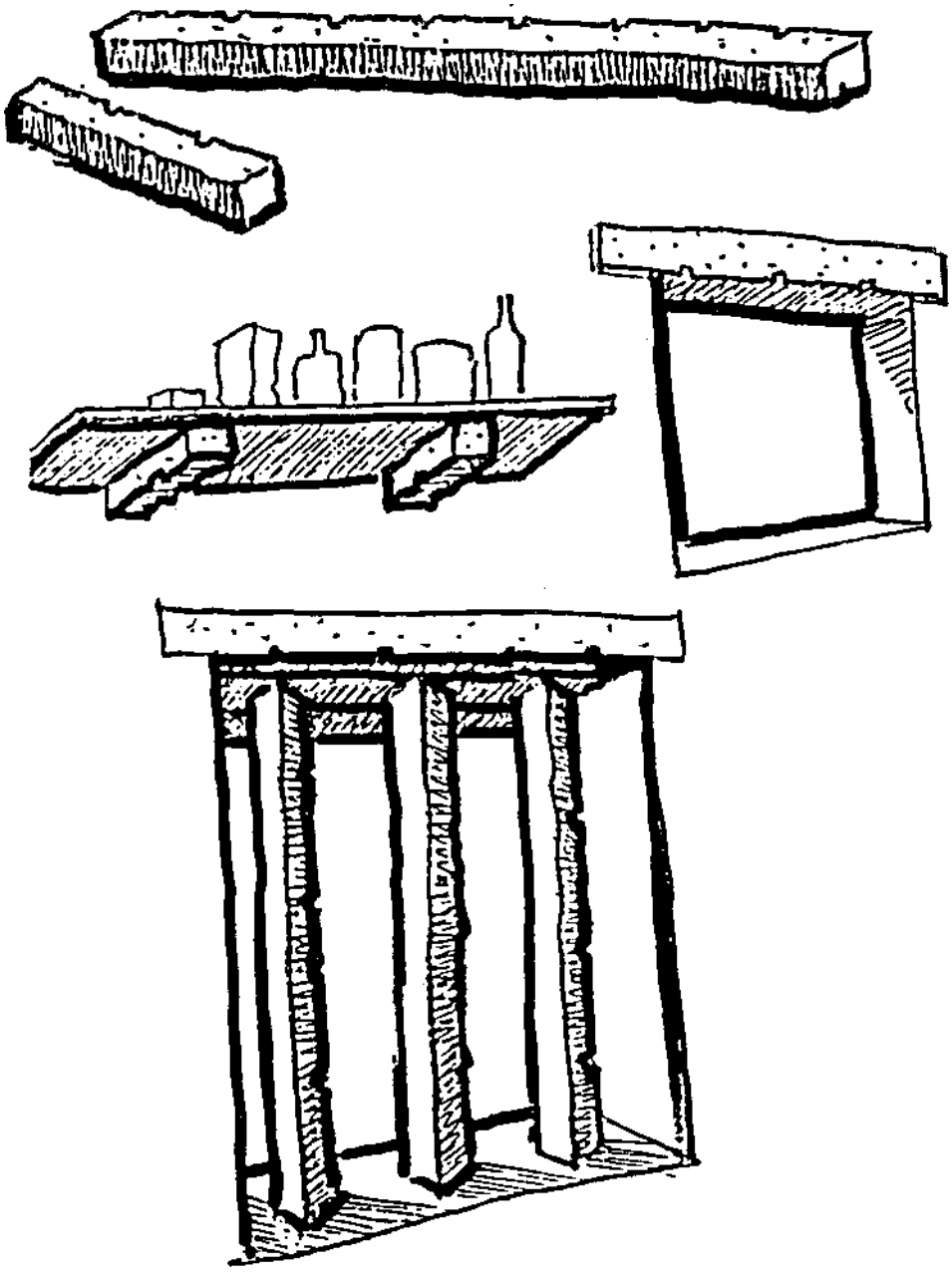


IN SOME DISTRICTS STONE IS AVAILABLE, BUT ONLY IN SMALL IRREGULAR LUMPS. THESE MAKE VERY POOR WALLS WITH NO POSSIBILITY OF GOOD BONDING. CRACKS SOON DEVELOP.

MAKE A METAL (OR WOOD) BOX (WITHOUT TOP OR BOTTOM) ABOUT 45 CM LONG 23 CM WIDE AND 15 CM HIGH.

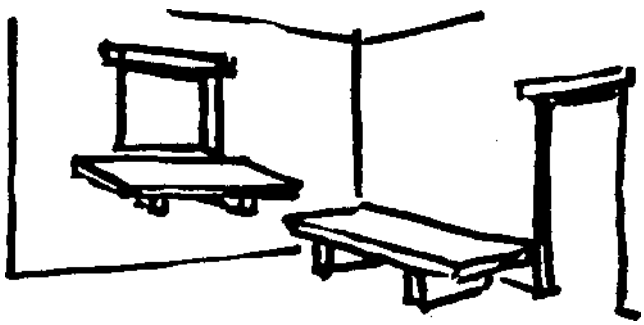
PLACE IN IT THE LARGER STONES AND THEN FILL IN, ALL ROUND, WITH CONCRETE MADE OF THE SMALL STONES. AFTER DRYING AND REMOVING THE BOX YOU HAVE AN EXCELLENT BUILDING BLOCK.

SPLIT STONE



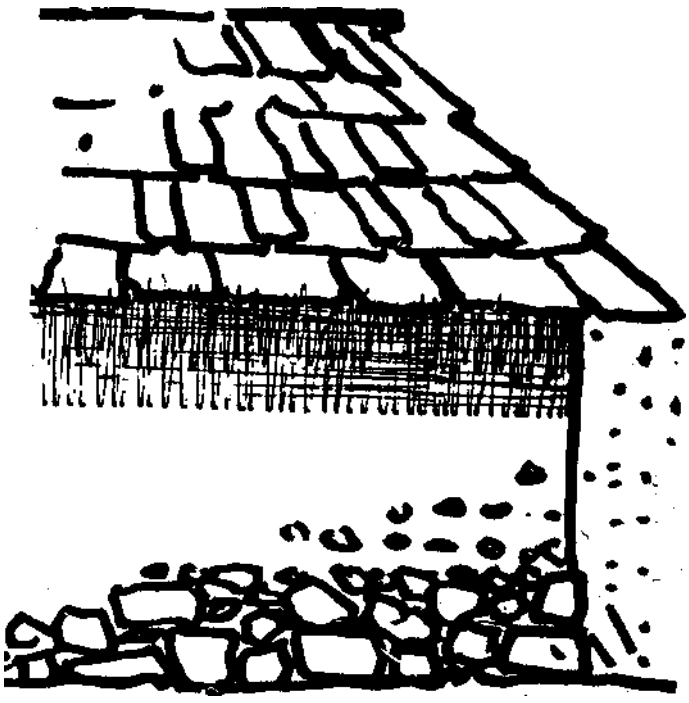
IN SOME DISTRICTS GRANITE IS SPLIT FROM LARGE ROCKS TO GIVE POSTS AND SLABS.

YOU CAN INCORPORATE THESE STONES AS LINTELS, SHELVES, WINDOW "GRILLS" AND CHILD-PROOF FURNITURE. SHORT BROKEN POSTS CAN USUALLY BE HAD AT VERY LOW PRICES.

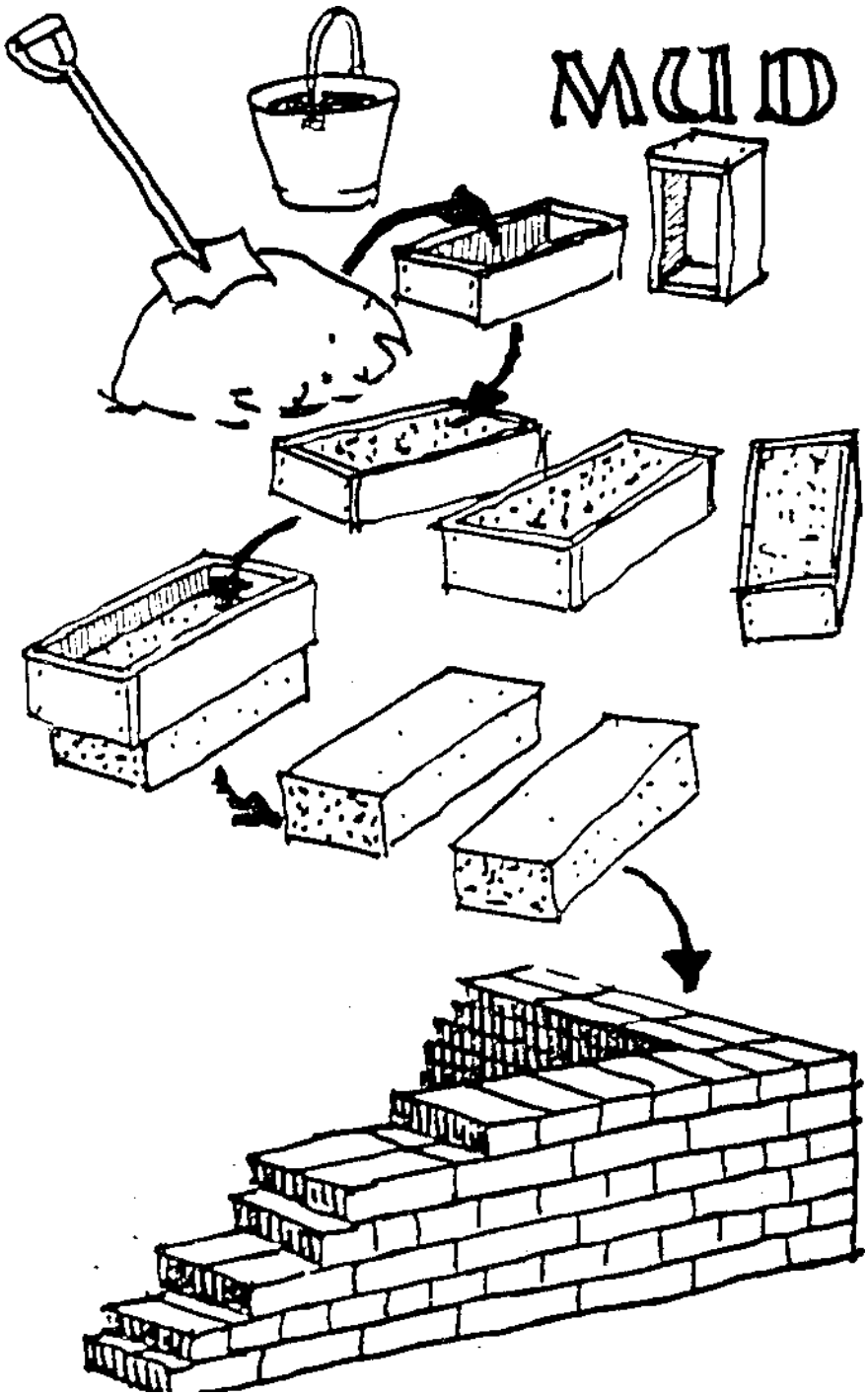


Mud walls must be protected from water

OVERHANGING ROOFS MUST ACT AS AN UMBRELLA.

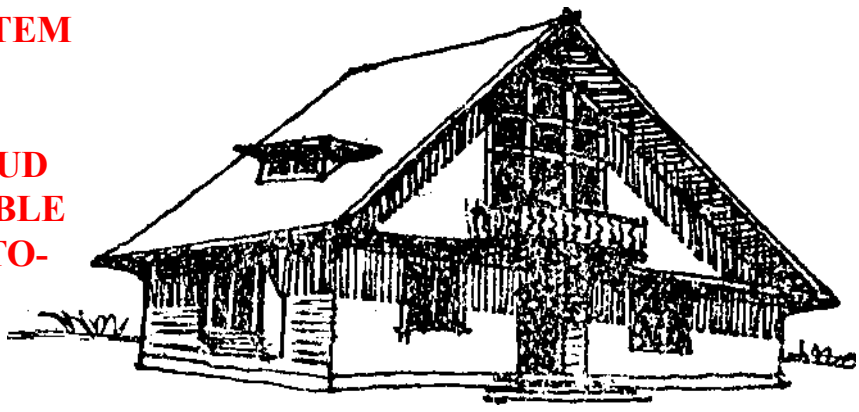


PROTECT THE BASE OF MUD WALLS FROM ROOF RAIN WATER SPLASHING UP FROM THE GROUND.



ADOBE OR SUN DRIED BRICKS

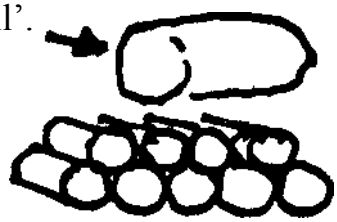
THIS IS VERY OLD, WELL TRIED AND TESTED MUD BRICK SYSTEM COMMON IN MANY PARTS OF KERALA.
IF PROPERLY MADE, THESE MUD SUN DRIED BRICKS ARE CAPABLE OF BEING USED FOR A TWO STO-REY HOUSE.



MUD

COB

Mix soil with only a little water - pick up as much as you can in your two hands and make a ‘roll’.

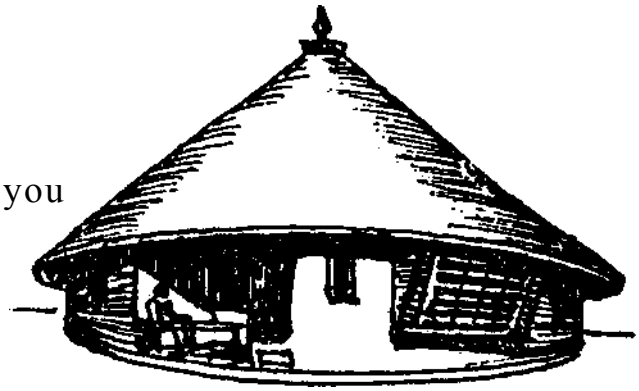


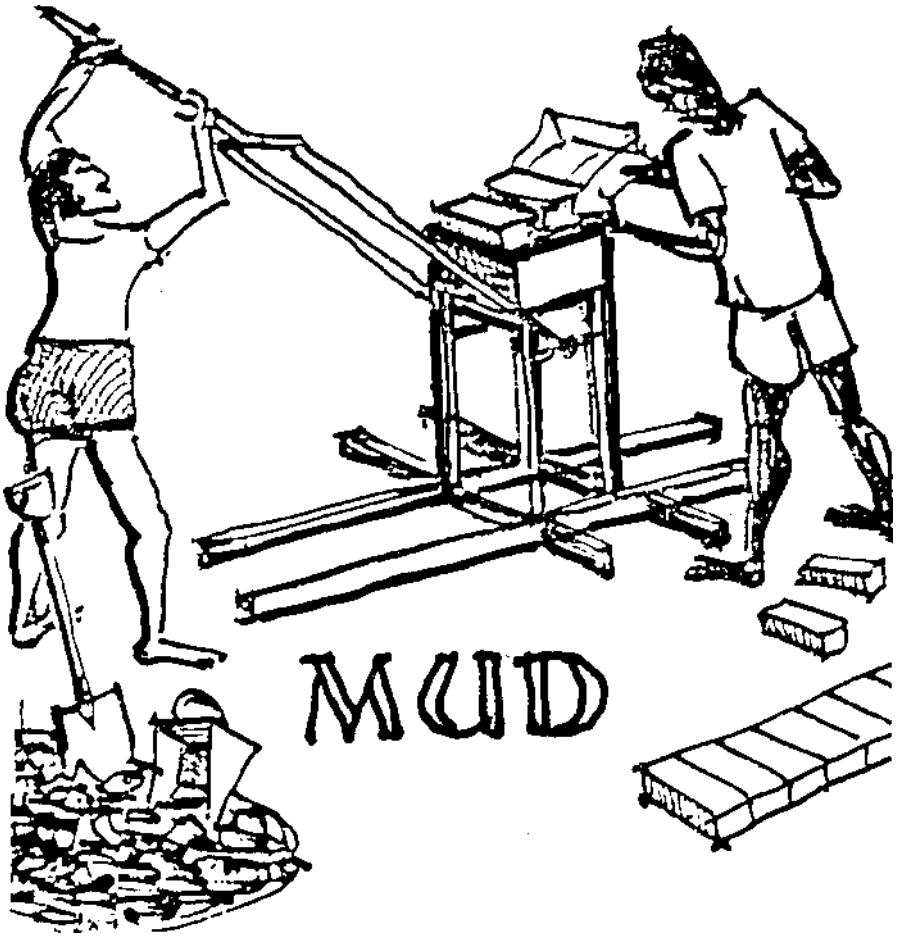
Place these rolls closely together in rows;

Then smooth one of the ends.

Anyone can make this sort of a wall but you CANNOT MAKE A HIGH WALL.

It is very good for curved or circular walls.

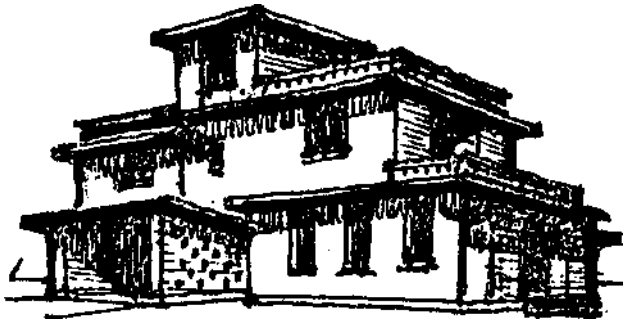


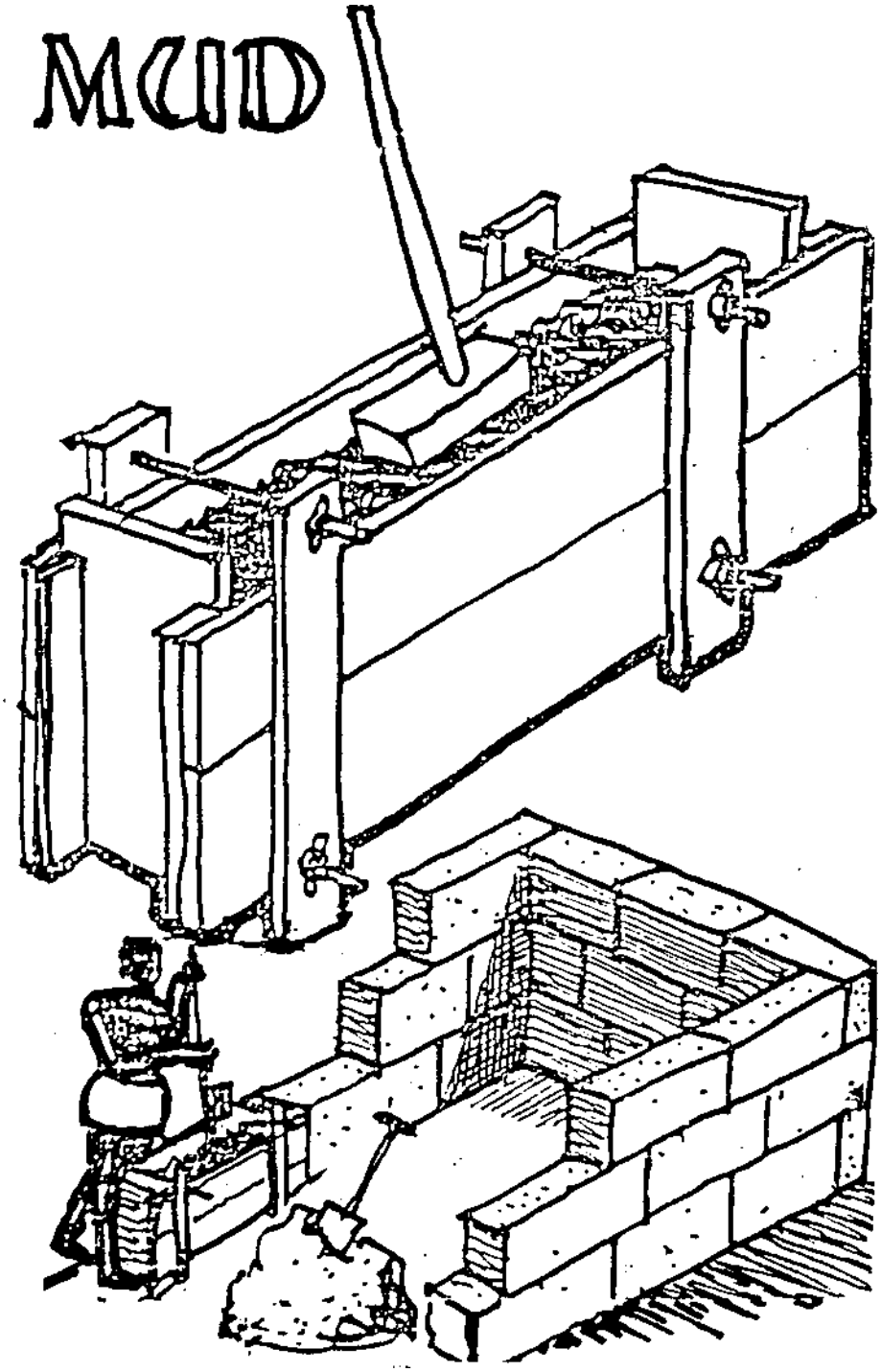


PRESSED BRICKS

A HAND OPERATED MACHINE COMPRESSES THE EARTH INTO HARD, SMOOTH, STRONG BRICKS (THE MACHINE CAN BE OWNED BY THE COMMUNITY OR PANCHAYAT).

THESE CAN BE USED FOR EVEN THREE STOREY HOUSES, THOUGH EACH STOREY MUST BE PROTECTED FORM RAIN BY OVERHANGING SLABS.

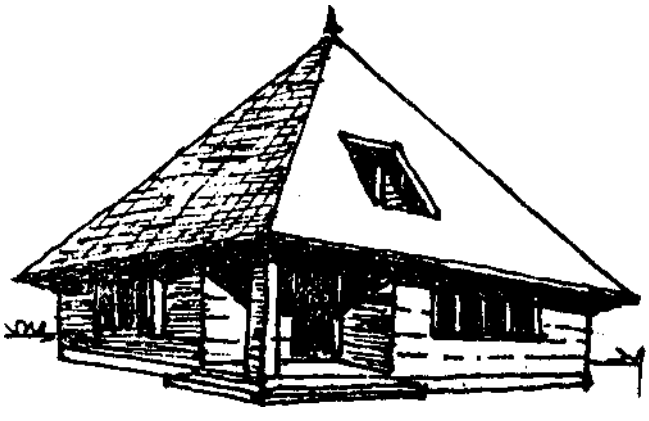




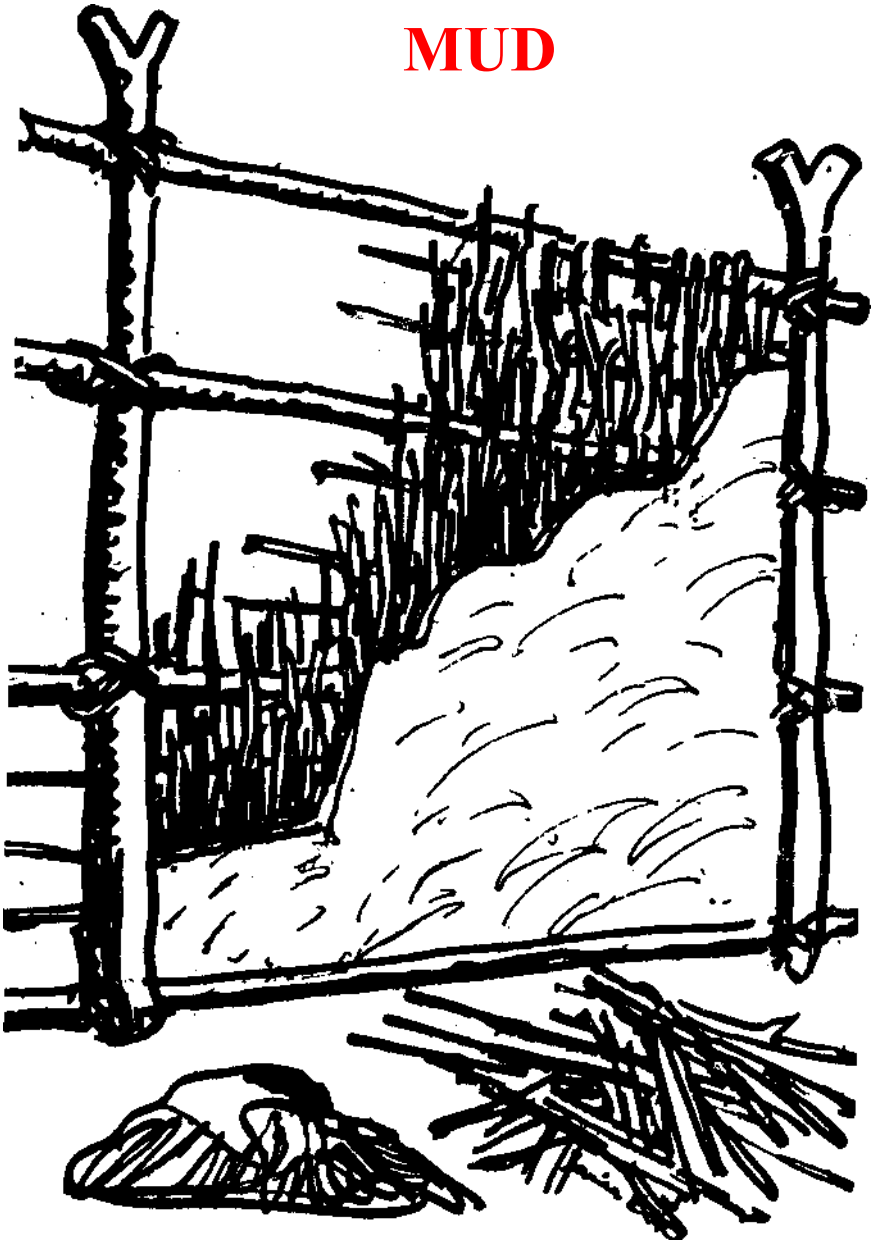
PISE (RAMMED EARTH)

WITH A PROPERLY MADE FRAME (WHICH CAN BE TAKEN TO PIECES) RAMMED EARTH MAKES A VERY STRONG WALL.

IT IS ESSENTIALLY GOOD FOR LARGE, LOW, SOLID LOOKING BUILDINGS OR IT CAN TAKE THE WEIGHT OF HEAVY ROOFING SUCH AS REINFORCED CONCRETE.

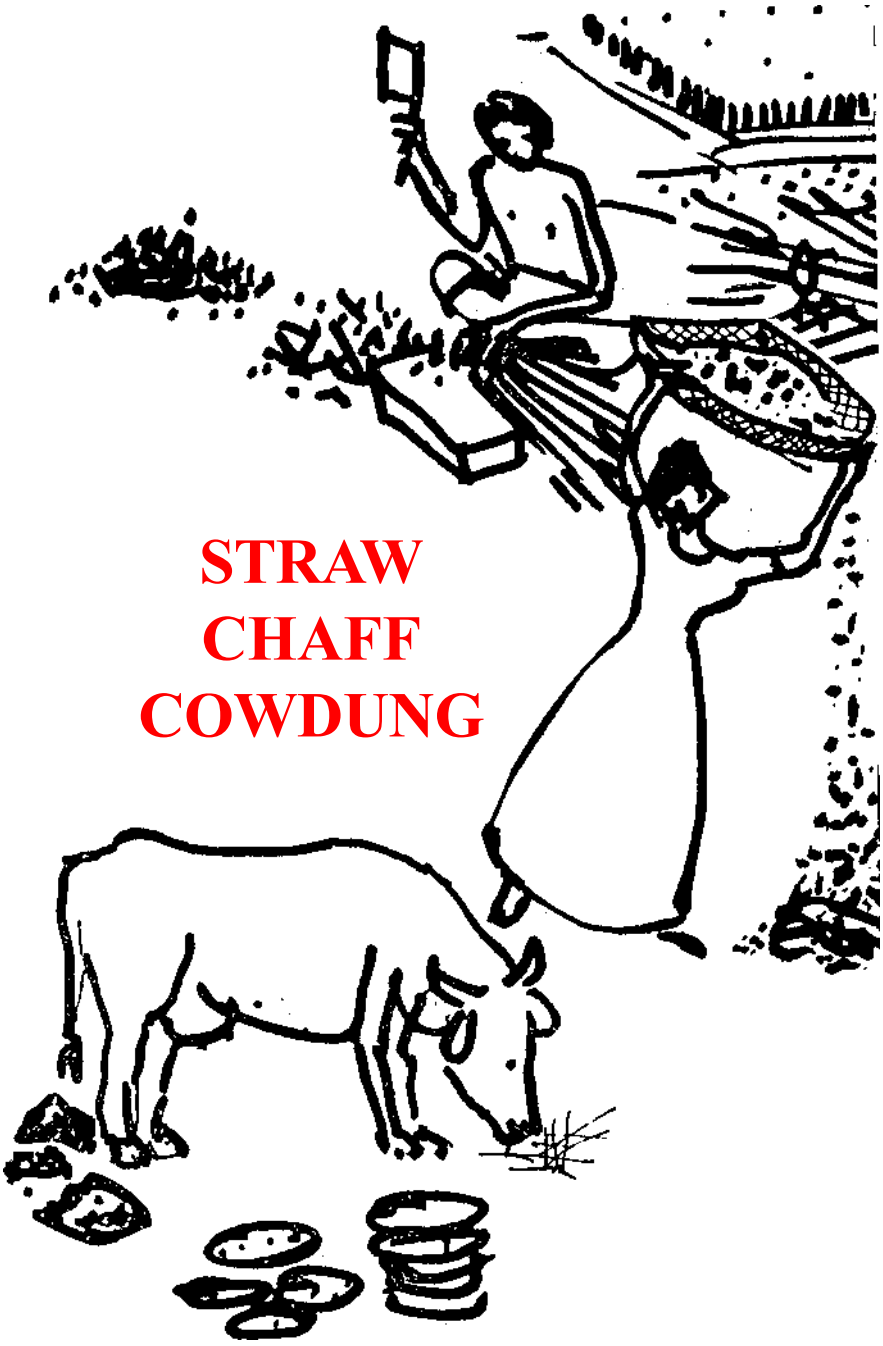


MUD



WATTLE AND DAUB

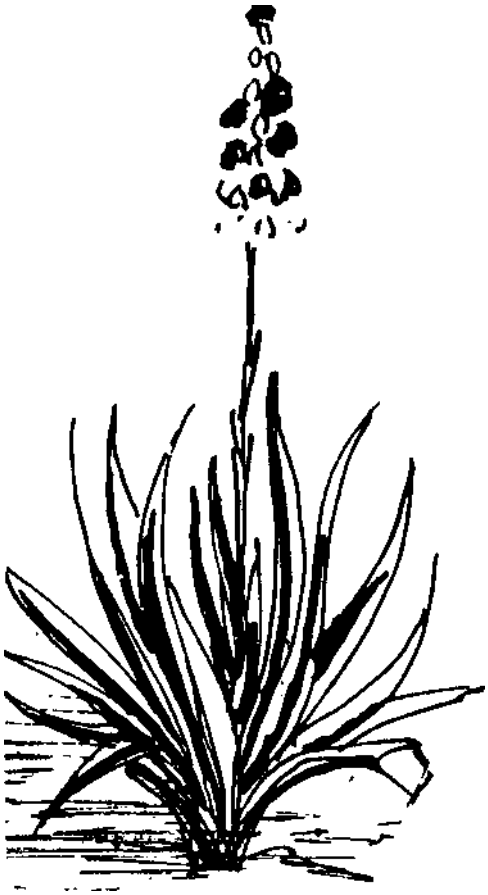
THIS SYSTEM OF USING MUD FOR HOUSE BUILDING IS MORE USUAL IN INDIA'S EASTERN STATES.
IT IS MAINLY USED IN BAMBOO GROWING AREAS.
IT IS PARTICULARLY GOOD AND 'SAFE' IN AREAS PRONE TO EARTH TREMORS.
IT IS ALSO ADAPTABLE TO ANY SHAPE OF BUILDING.



STRAW
CHAFF
COWDUNG

RURAL STABILISERS

PLANT JUICES
SISAL
CACTI
ETC.



LATERITE

Laterite is found in many parts of Kerala (and in other states too). It is natural, compressed earth and uses no energy (fuel) at all.

Unfortunately, unlike soil or sand, once 'mined', the quarry remains as a big hole n the ground.

It is also very heavy and lifting it up to masons working at high levels is both labour intensive and slow, hard work.

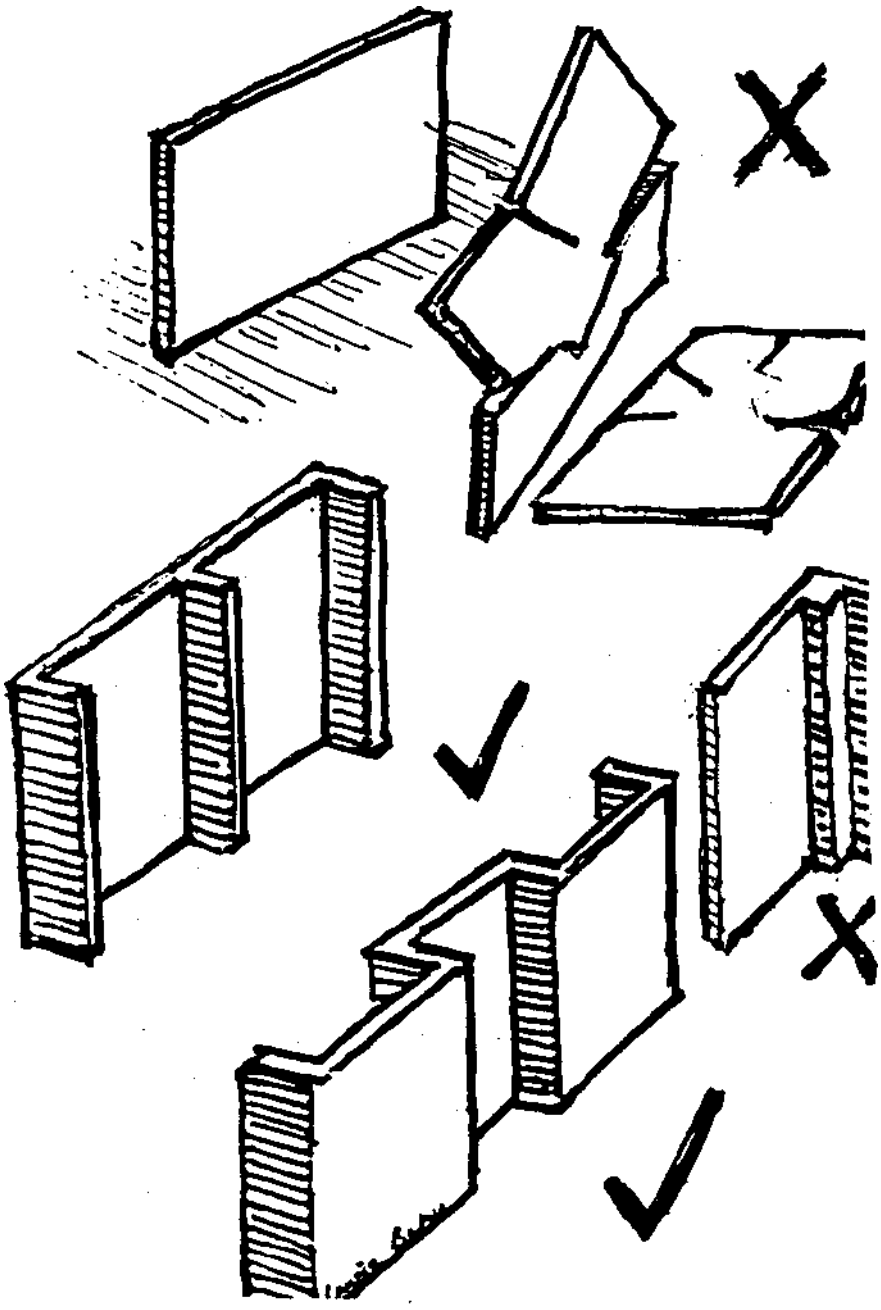
It is however far more acceptable than cement blocks.

CEMENT BLOCKS

These are currently used very extensively. This is NOT acceptable when building for thousands and millions. Cement is highly ENERGY (Fuel) INTENSIVE item and India is short of energy and has to IMPORT much of it.

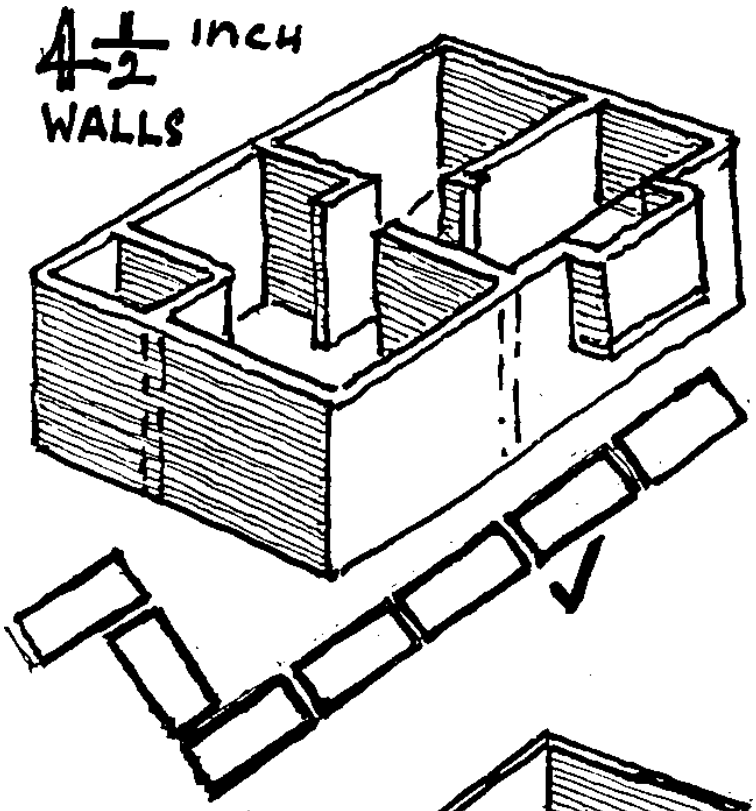
The cement used in a Block Wall is considerably more than the comparatively small amount used in a brick wall.

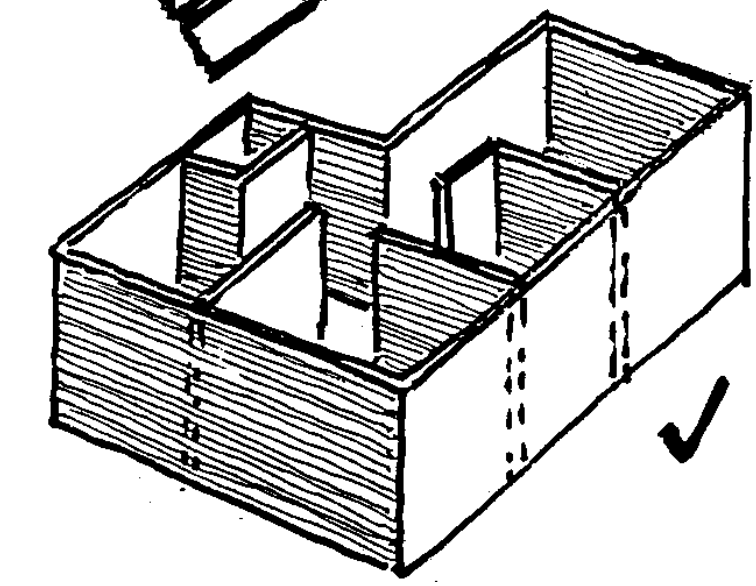
Blocks are very heavy and lifting, especially above waist level – slows down construction time and calls for more labour. Bricks are easily thrown up to any height.

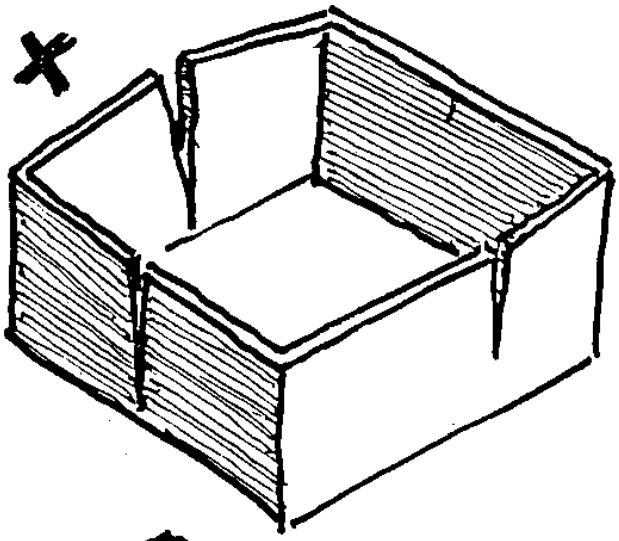


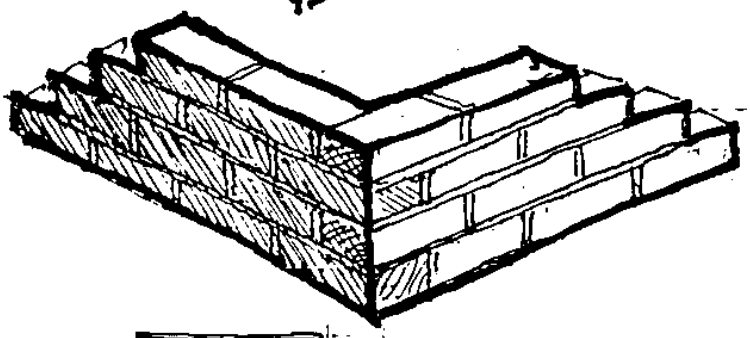
FOUR AND HALF INCH OR HALF BRICK WALLS

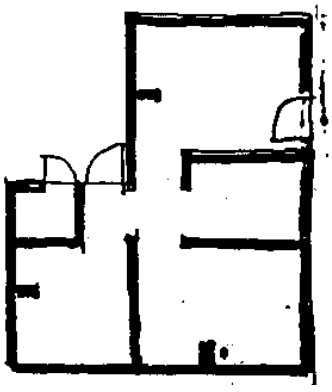
If properly and well constructed and bonded, in short stretches, (say up to 2 m), are safe, strong, and perfectly capable of carrying an upper storey. A good roof overhang (50 cm) will protect the walls from driving rain and damp.





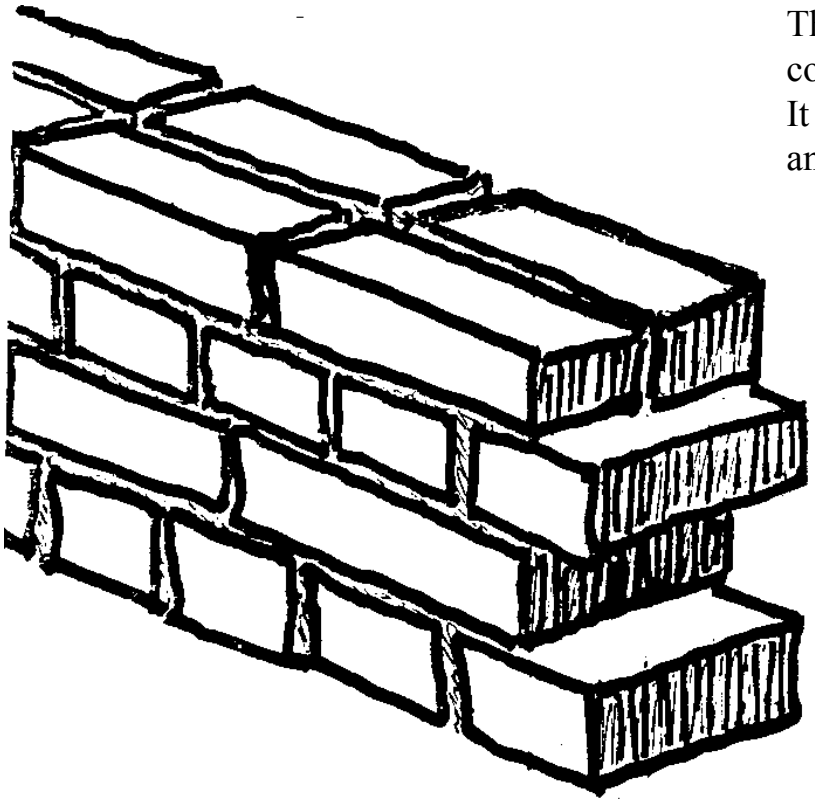




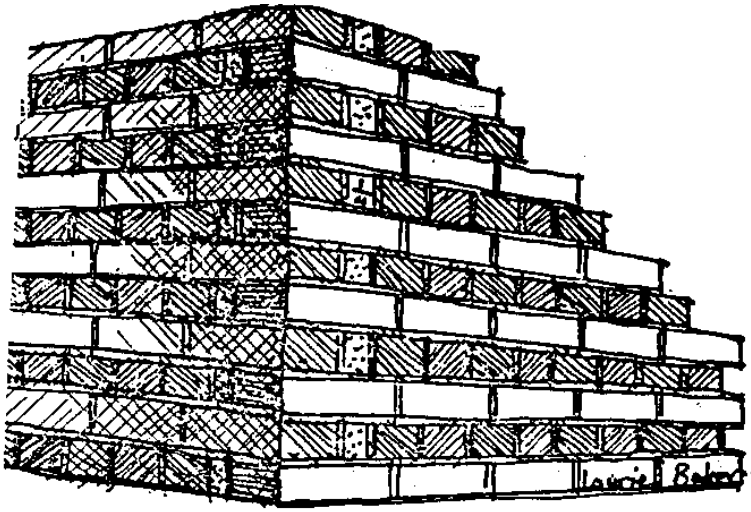


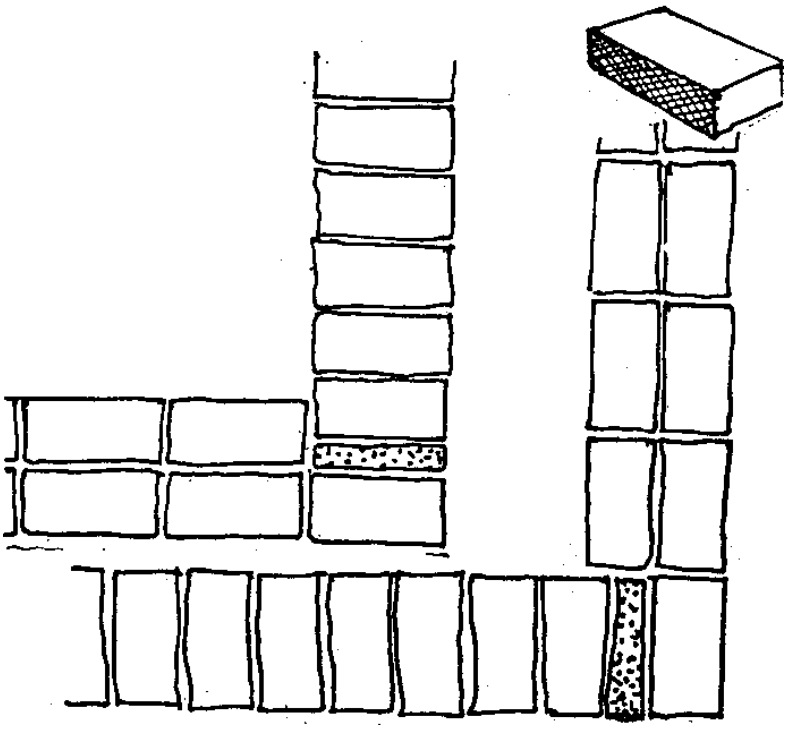
STRAIGHT, LONG, THIN WALLS CAN NOT BE EXPECTED TO CARRY ROOF LOADS AND MUST BE EXPECTED TO BULGE, CRACK AND BREAK, IF NOT WELL PLANNED.

BRICKWORK

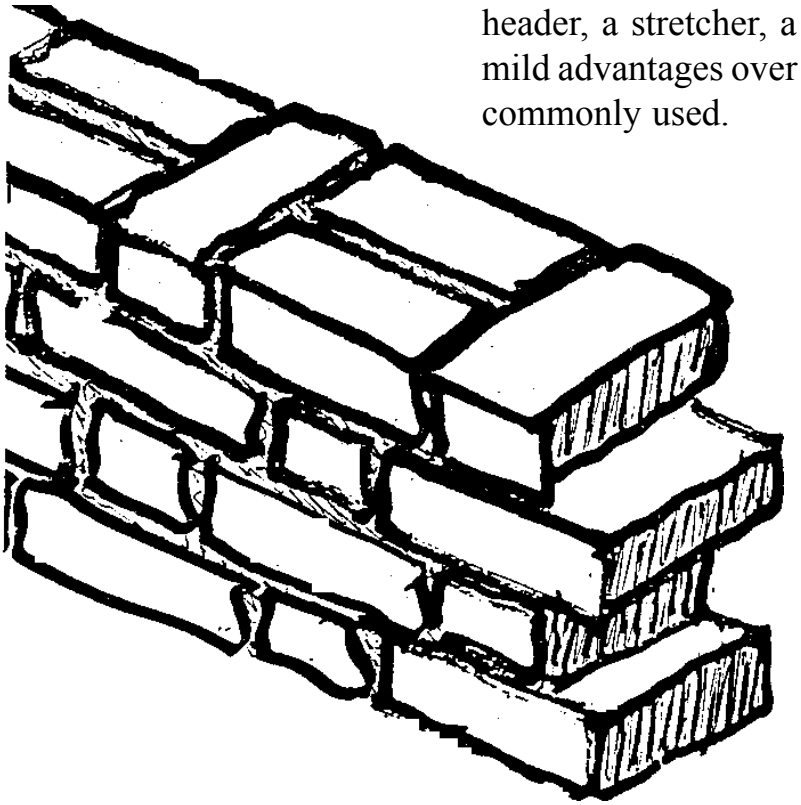


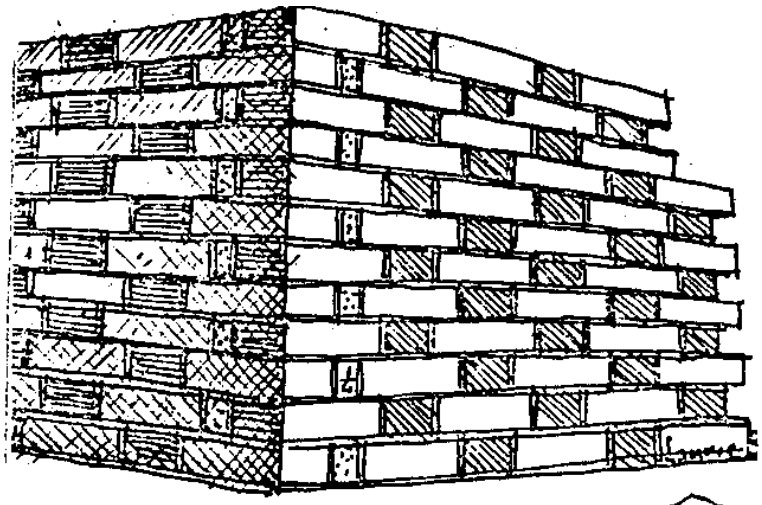
The **ENGLISH BOND** was not the most commonly used 9” brick wall in India. It consists of alternate rows of ‘headers’ and ‘stretchers’.

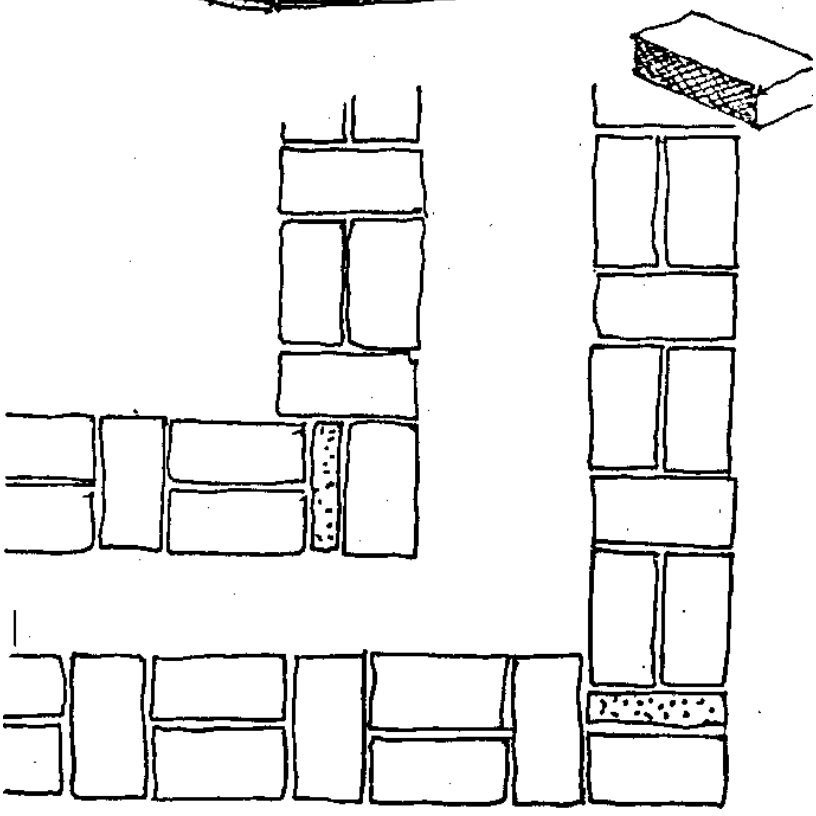




The **FLEMISH BOND** places bricks alternating a header, a stretcher, a header and so on. It has a few mild advantages over the English Bond, but is still not commonly used.

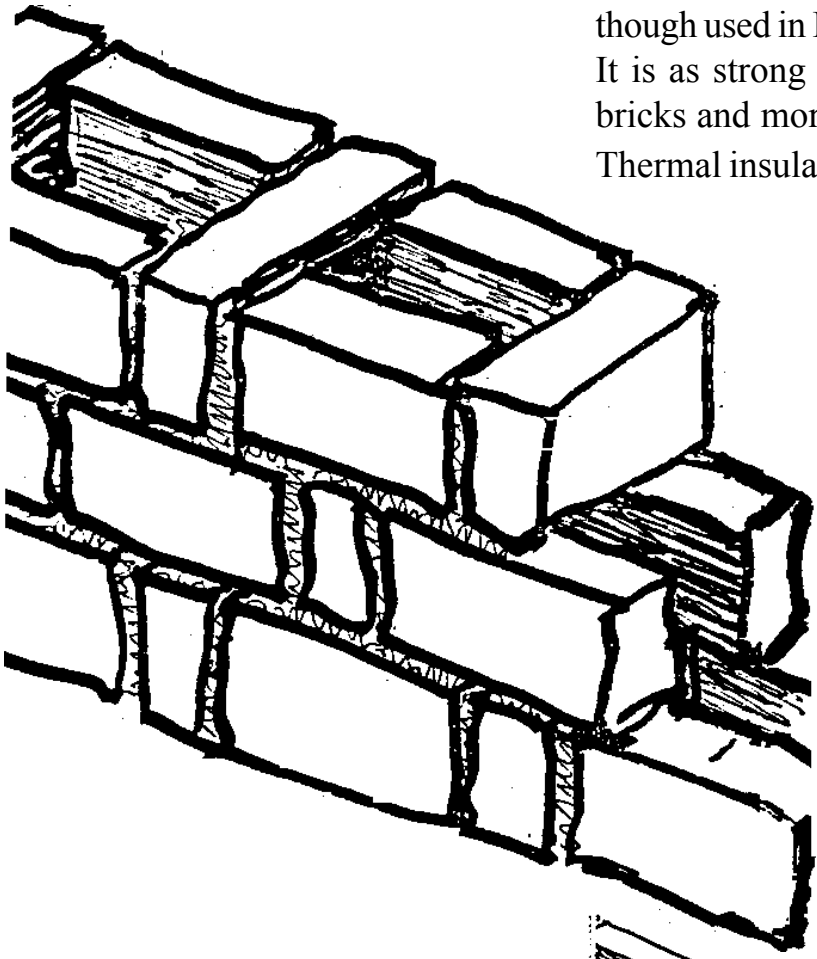


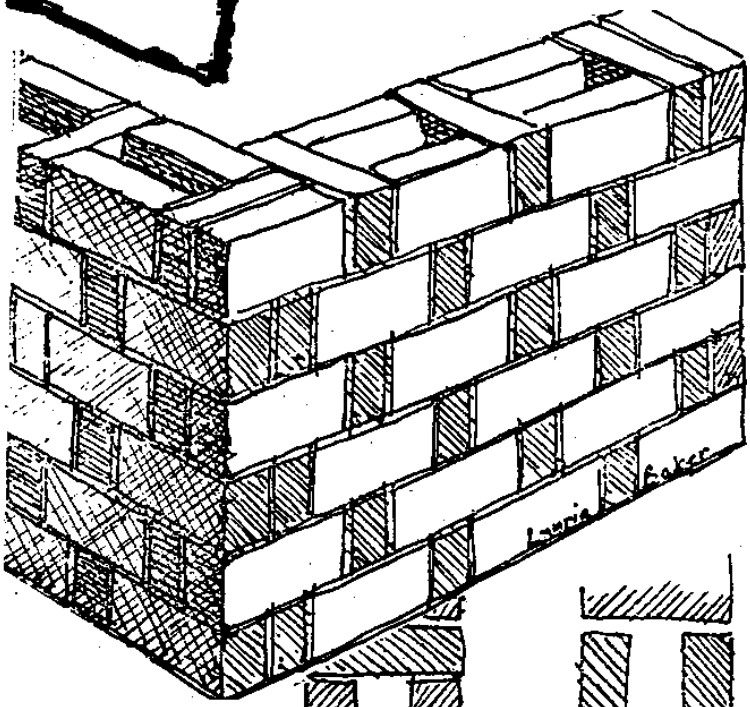




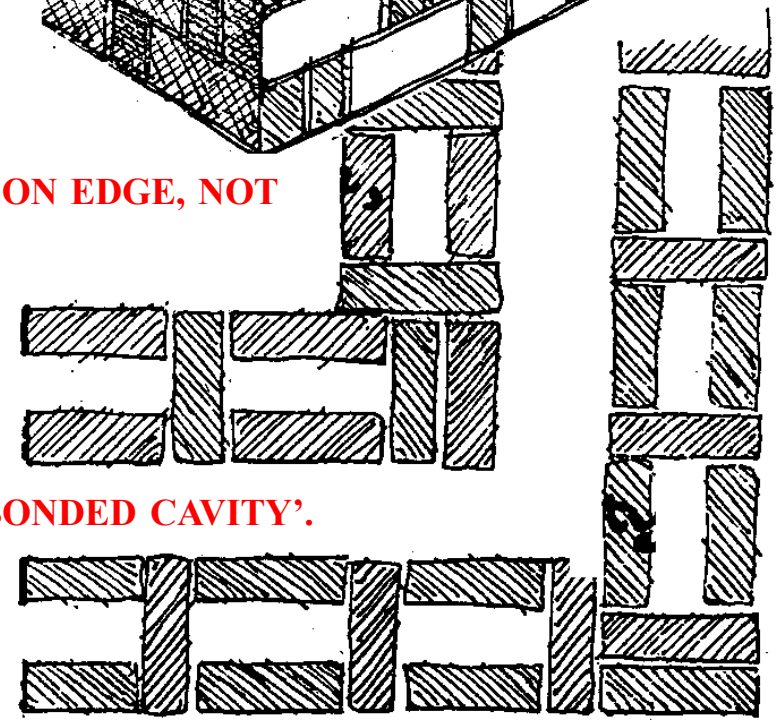
The **RAT TRAP BOND** is still mainly unknown in India, though used in England for the past several hundred years. It is as strong as the other bonds but uses **25% LESS** bricks and mortar.

Thermal insulation is very much better.





BRICKS ARE LAID ON EDGE, NOT FLAT.



THIS CREATES A 'BONDED CAVITY'.

RAT TRAP BOND

The CAVITY in the RAT TRAP BOND wall ensures good insulation from heat and cold.

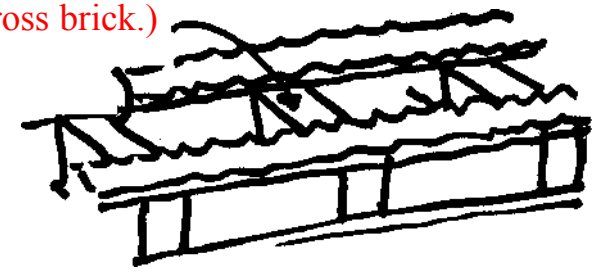
This can be ruined by a poor mason carelessly slopping mortar into the cavity while he is building.

To avoid this

1.Make sure the mortar is not too wet, and

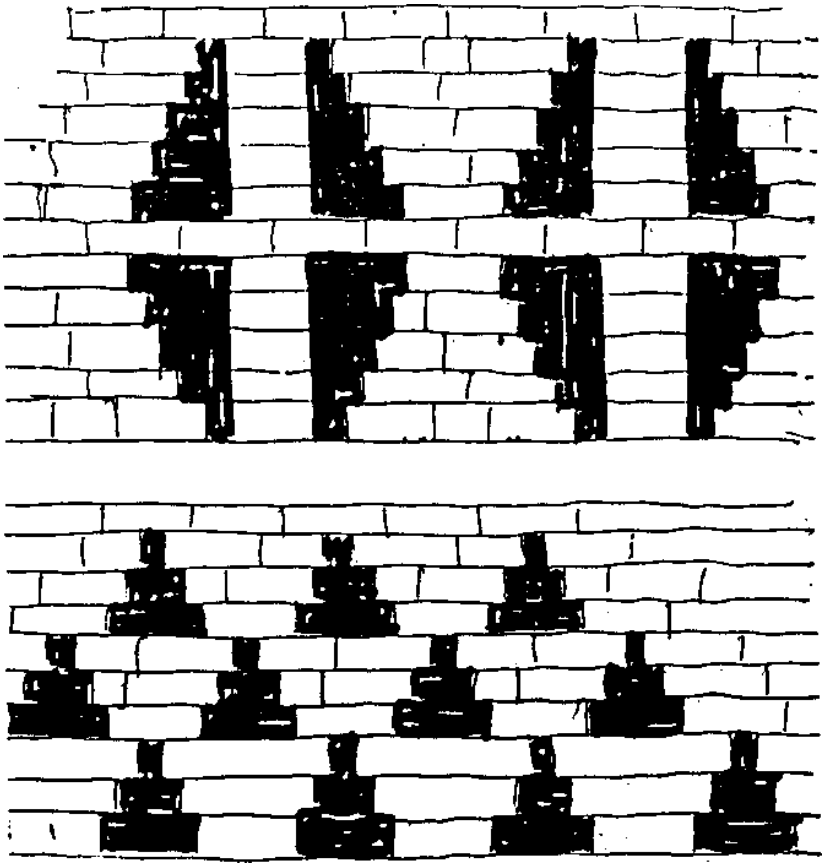
2. Use a 3” wide strip of wood, laid over the central cavity and place the mortar on both sided of it.

(No mortar is required on the middle of the cross brick.)

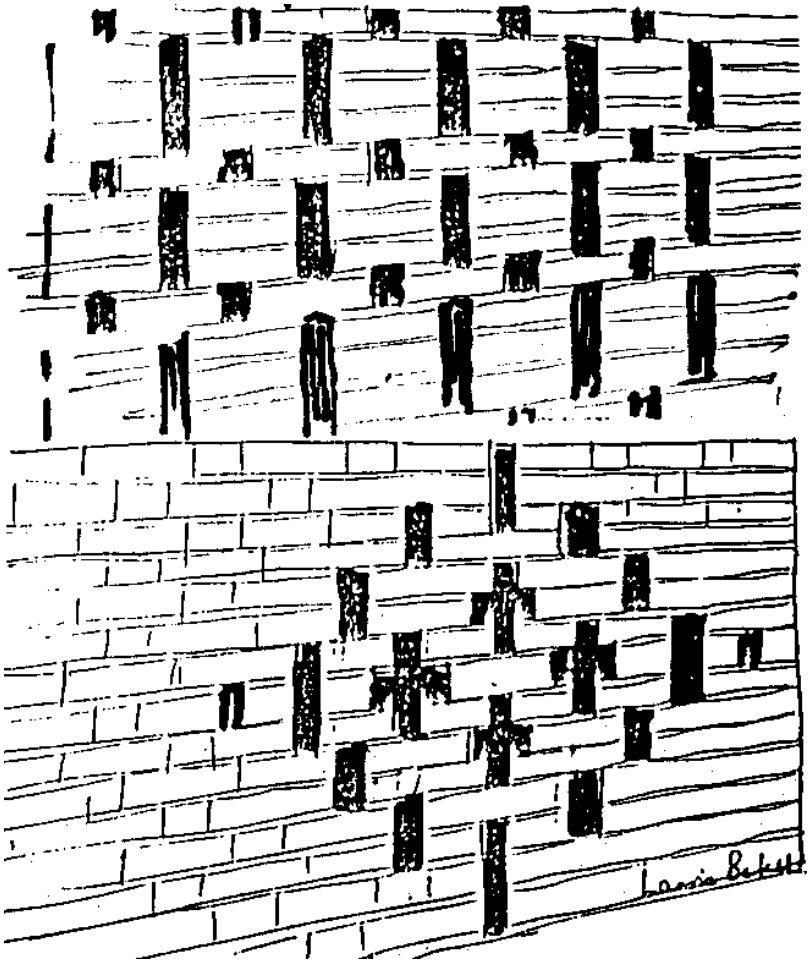


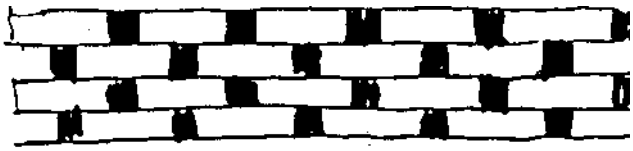
BRICK JALI

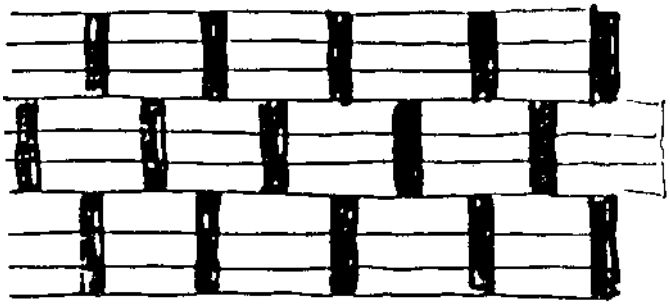
'Jali' - formerly pierced stone panels – is one of India's oldest methods of letting into a building filtered light and ventilation but maintaining privacy and security.

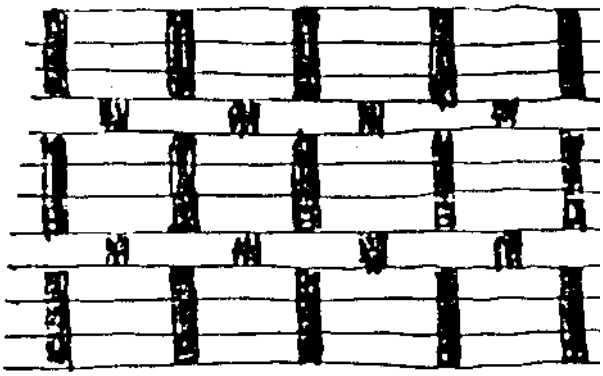


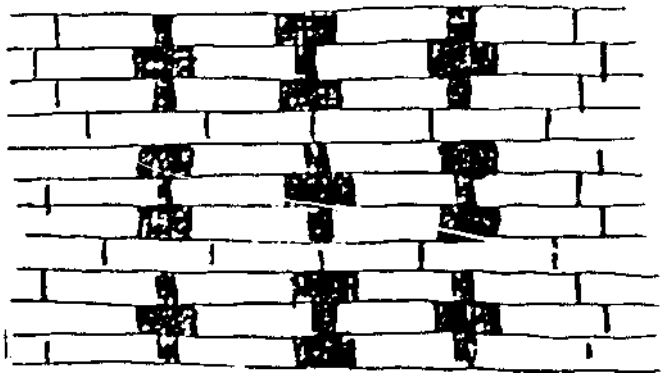
BRICK JALI can function in the same way – either as panels or as a complete load bearing wall.









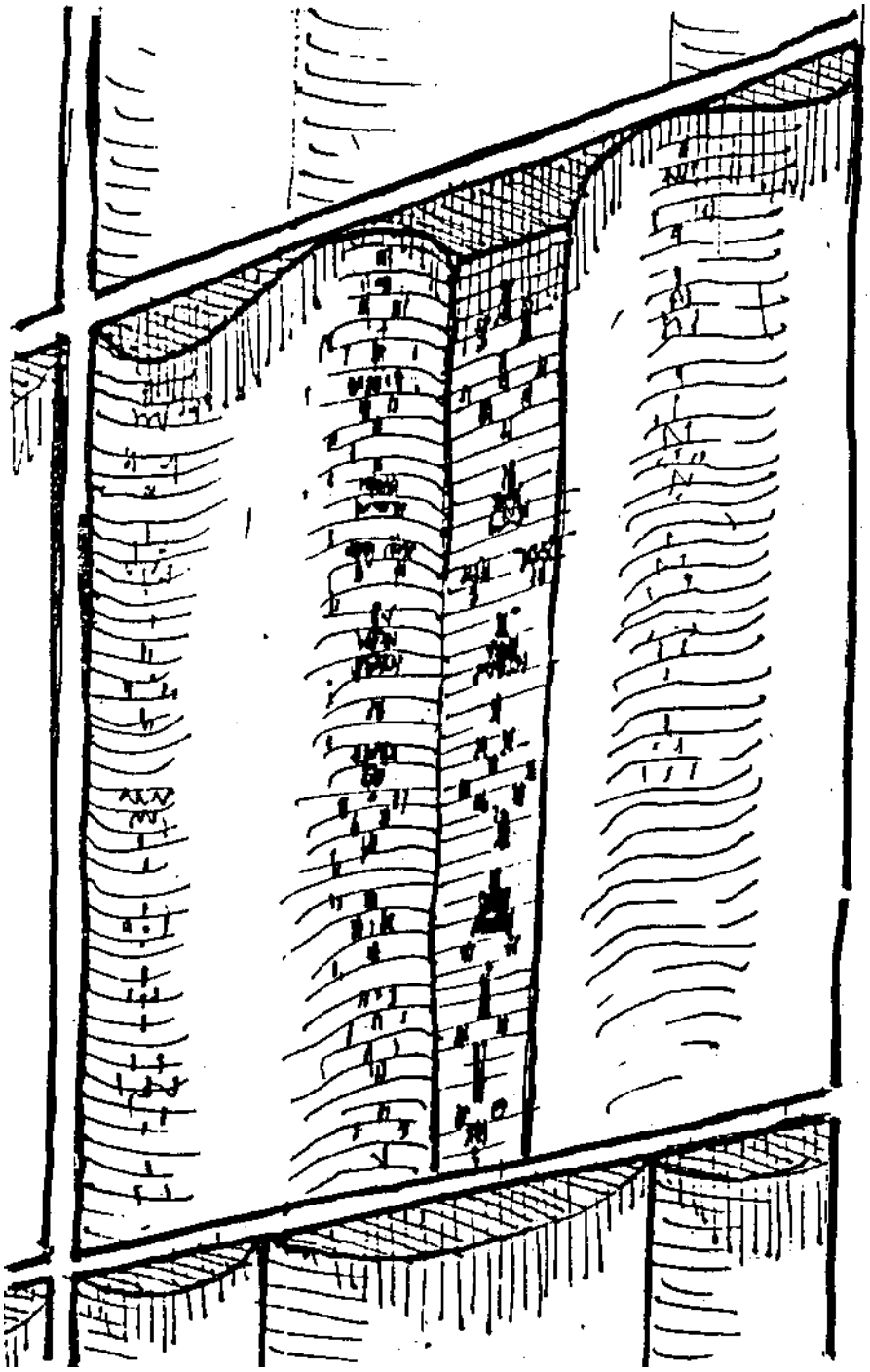


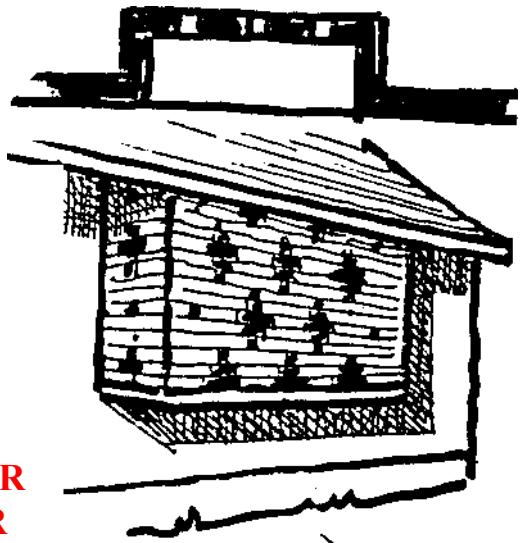
THERE IS THE OLD “HONEY COMB” PATTERN OF ‘JALI’ BRICK WORK.

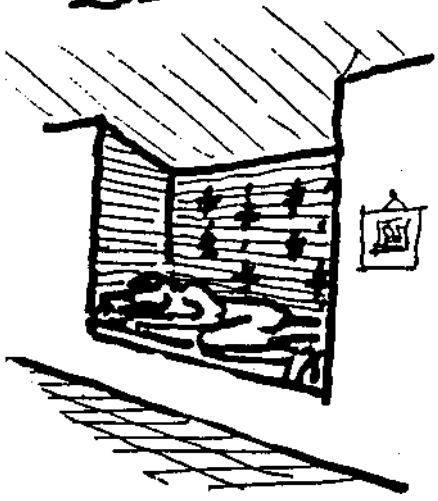
THE HOLES CAN BE EXTENDED VERTICALLY.

OR THERE CAN BE ALTERNATING SECTIONS OF ONE ROW OF HOLES FOLLOWED BY 2 OR 3 ROWS OF HOLES, THEN THE SINGLE HOLE ROW AGAIN – AND SO ON.

ONCE THESE PATTERNS HAVE BEEN USED – A GOOD MASON CAN DEVISE AND ENJOY DOING MANY PATTERNS.

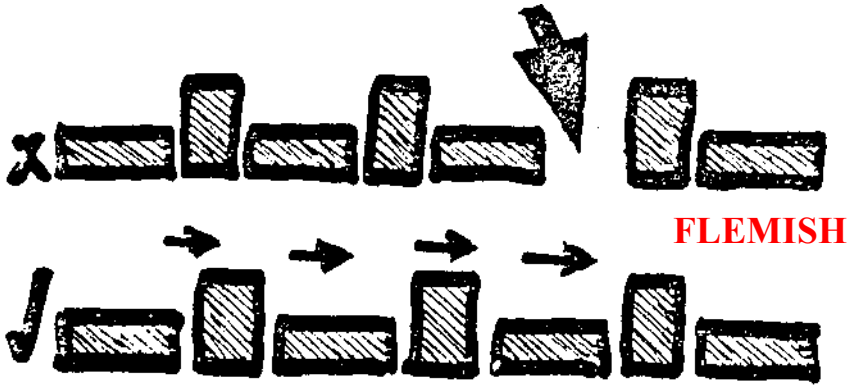




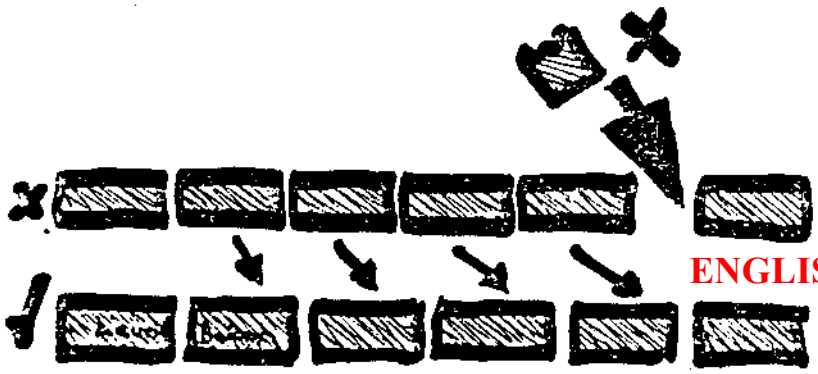


FLOOR TO CEILING, AND COLUMN TO COLUMN, LARGE PANELS OF JAIL CAN BE 'CORRUGATED' OR 'FOLDED' (FOR STRENGTH – AND EVEN FOR FOUR AND HALF INCH BRICK WALLS) AND GIVEN FIRST CLASS LIGHTING AND VENTILATION TO CORRIDORS, CLASS ROOMS, AND EVEN FOR LARGE HALLS AND AUDITORIA. BAY 'WINDOWS' MAKE EXCELLENT BEDS IN THE HOT WEATHER.

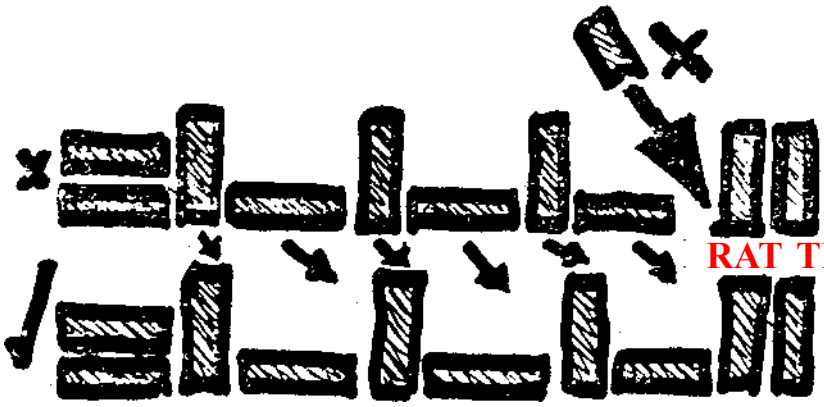
BRICK SPACING



FLEMISH



ENGLISH

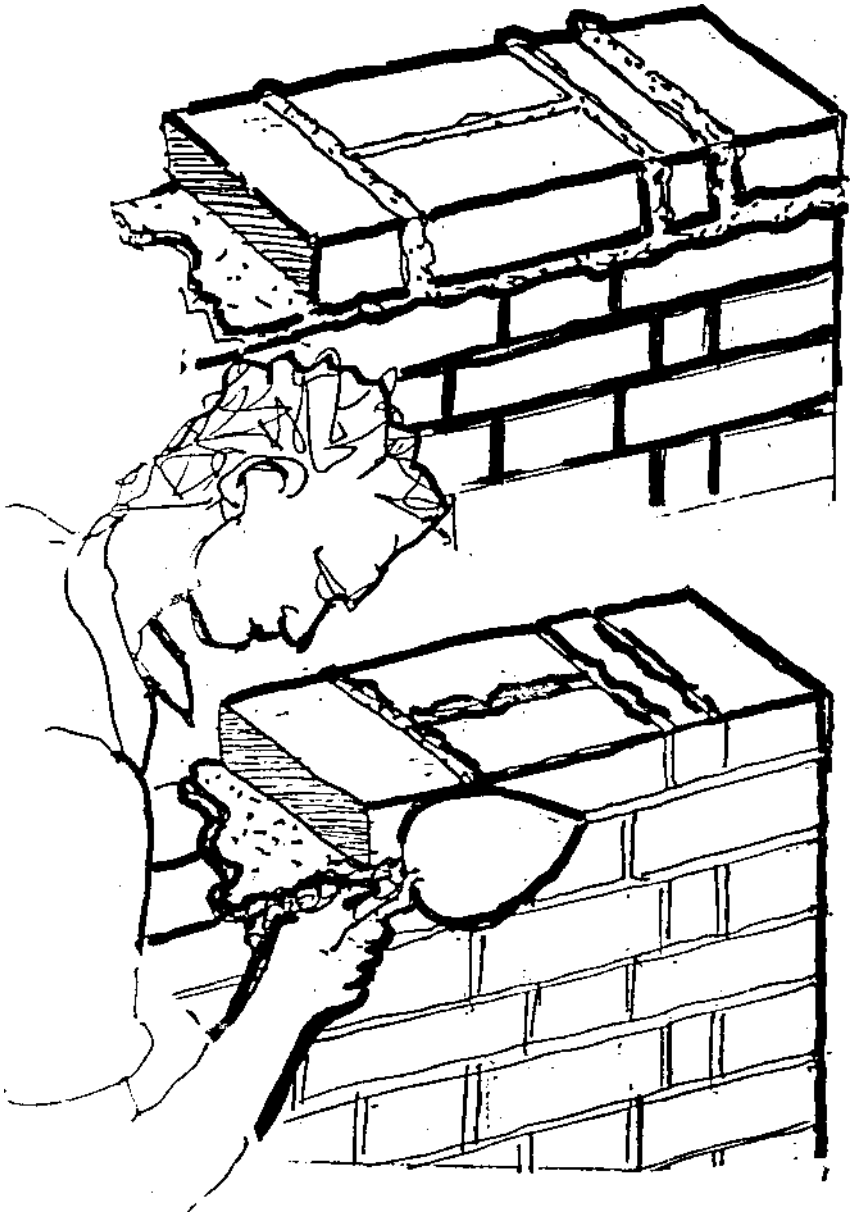


RAT TRAP

WHEN LAYING OUT A BRICK WALL OF A SPECIFIC LENGTH, ALWAYS FIRST LAY OUT ONE ROW OF BRICKS. THIS MAY LEAVE A SMALL GAP, OR OVER-RUN THE END OF THE WALL.

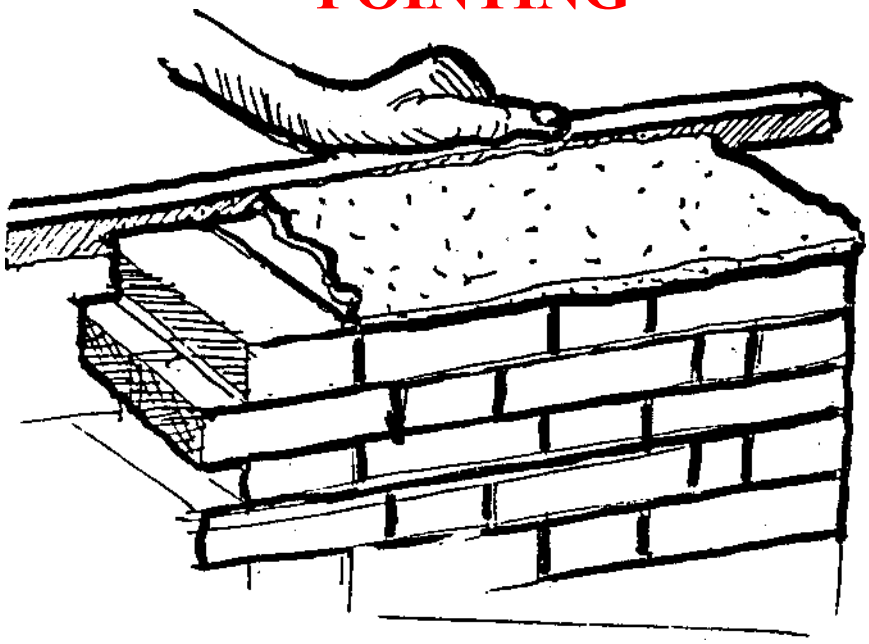
DO NOT INSERT A SMALL PIECE – BY DOING SO YOU WILL CREATE BONDING PROBLEMS UP THE WHOLE HEIGHT OF THE WALL.

JUST BY MOVING EACH BRICK A TINY FRACTION – YOU CAN MAKE THE RIGHT THE RIGHT NUMBER OF BRICKS FIT CORRECTLY INTO THE LENGTH OF THE WALL REQUIRED.



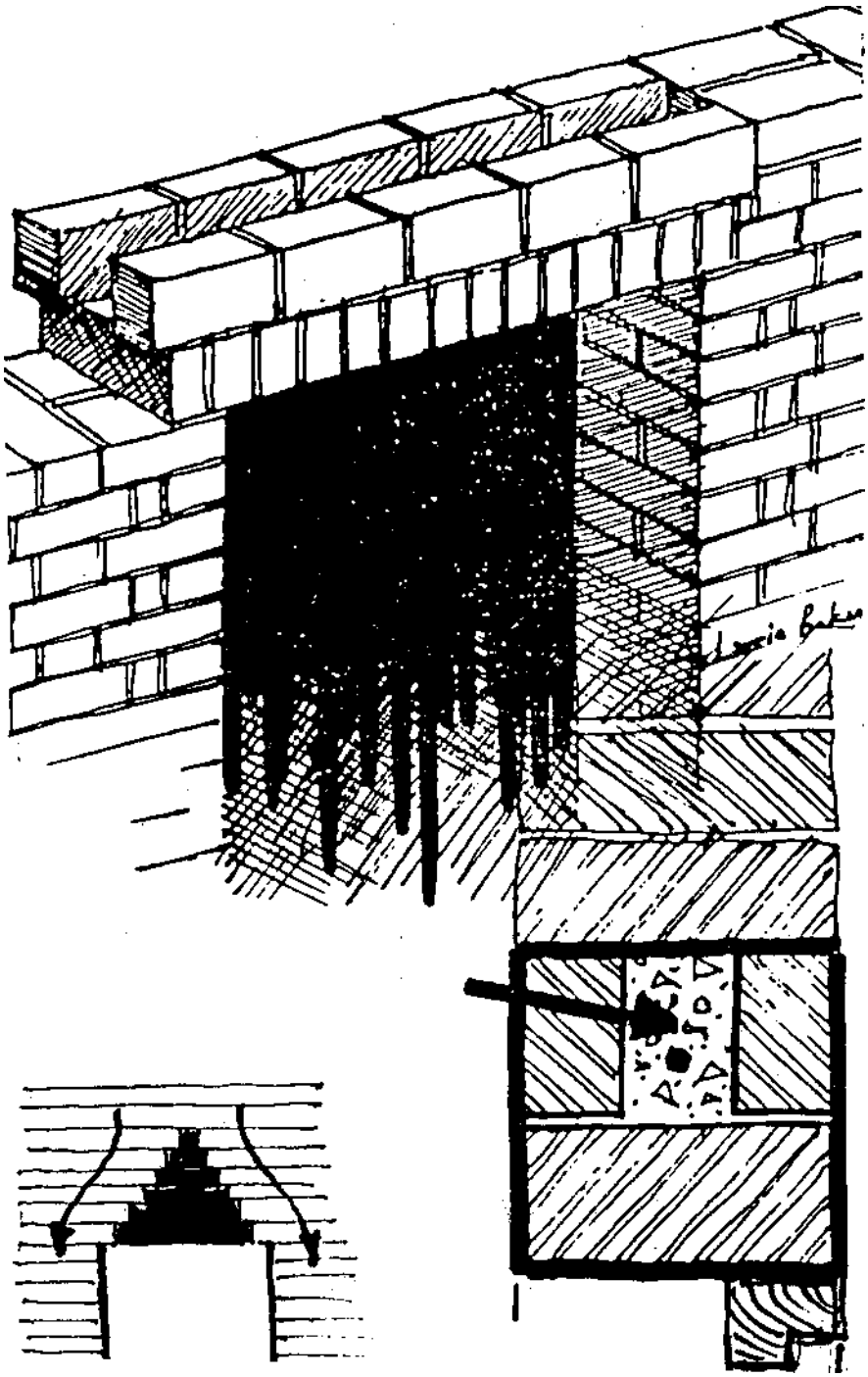
THIS WAY OF POINTING SHOULD BE DONE AS THE WORK PROCEEDS – NOT AS AN EXTRA.

POINTING



Gives a smooth finish to an unplastered wall and is usually done as an extra job after the wall construction is complete.

Much less costly is to lay the mortar, place on it the bricks, give a mild blow with your fists to the brick and then press in the bulging mortar with your trowel.



LINTELS

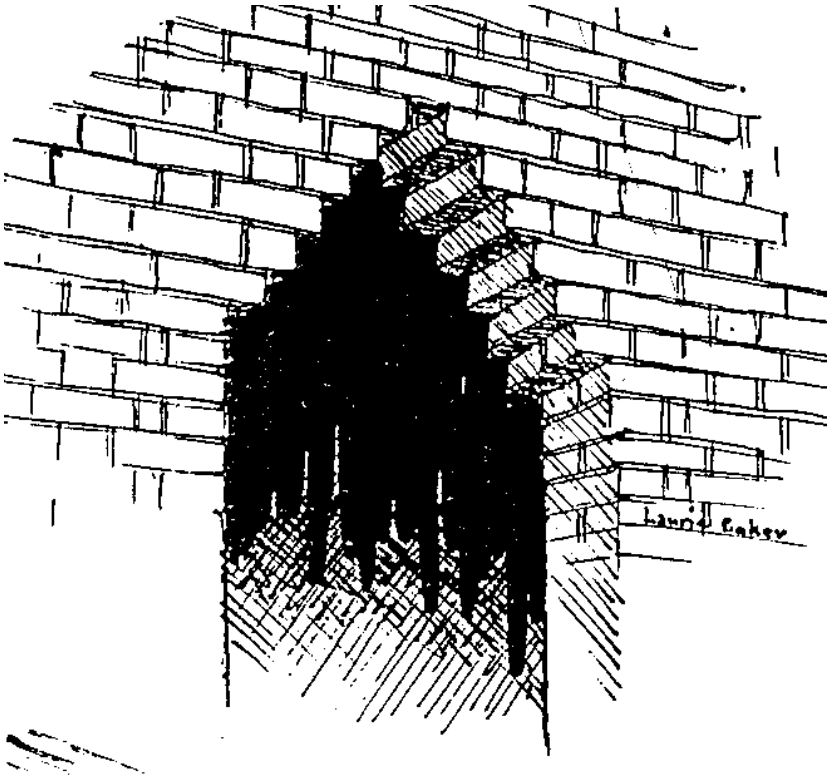
A LOT OF UNNECESSARY STEEL AND CEMENT CONCRETE IS USED FOR LINTELS.

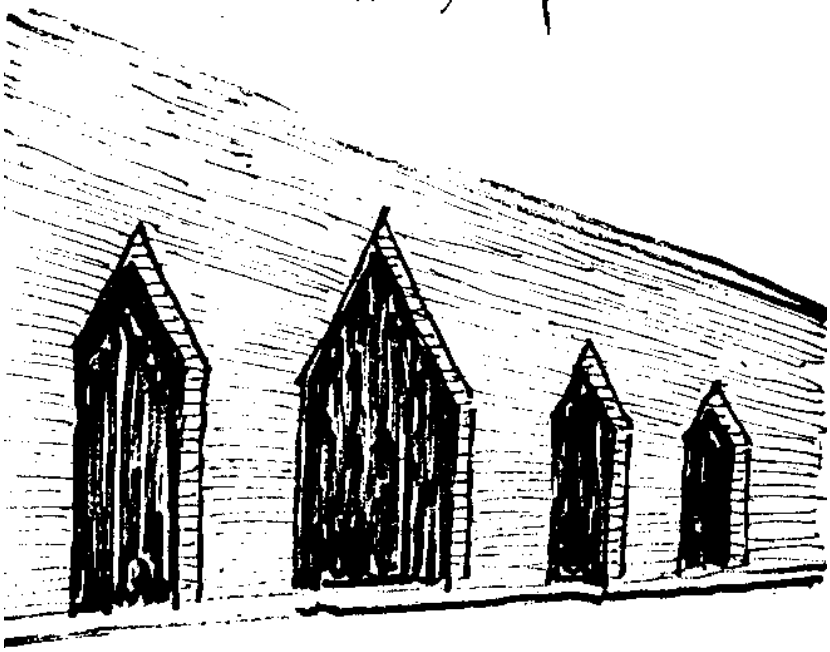
INSTEAD, PLACE ONE ROW OF BRICKS ON THE EDGE OVER THE FRAME (OR SPACE) AND THEN ABOVE THE, ONE ON EACH SIDE, A ROW OF MORE BRICKS ON EDGE.

THE SPACE BETWEEN THESE UPPER TWO ROWS OF BRICKS IS THEN FILLED WITH CONCRETE IN WHICH A SMALL STEEL ROD IS PLACED.

THE ONLY WEIGHT THE LINTEL IS EVENTUALLY CARRYING IS A SMALL TRIANGLE OF BRICKWORK. ALL OTHER WEIGHT OF WALLS, FLOORS ETC ABOVE ARE CARRIED BY THE WALL AT THE SIDES OF THE OPENING.

CORBEL ARCH

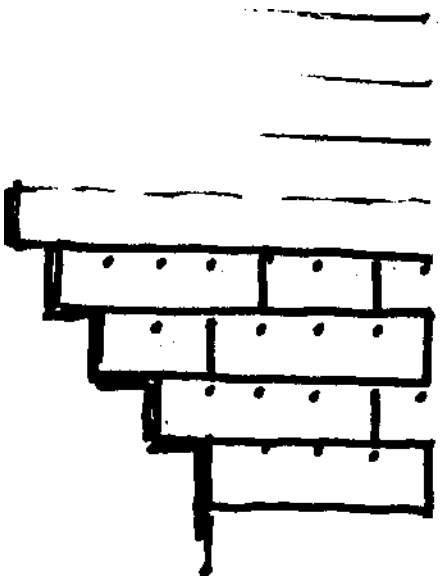




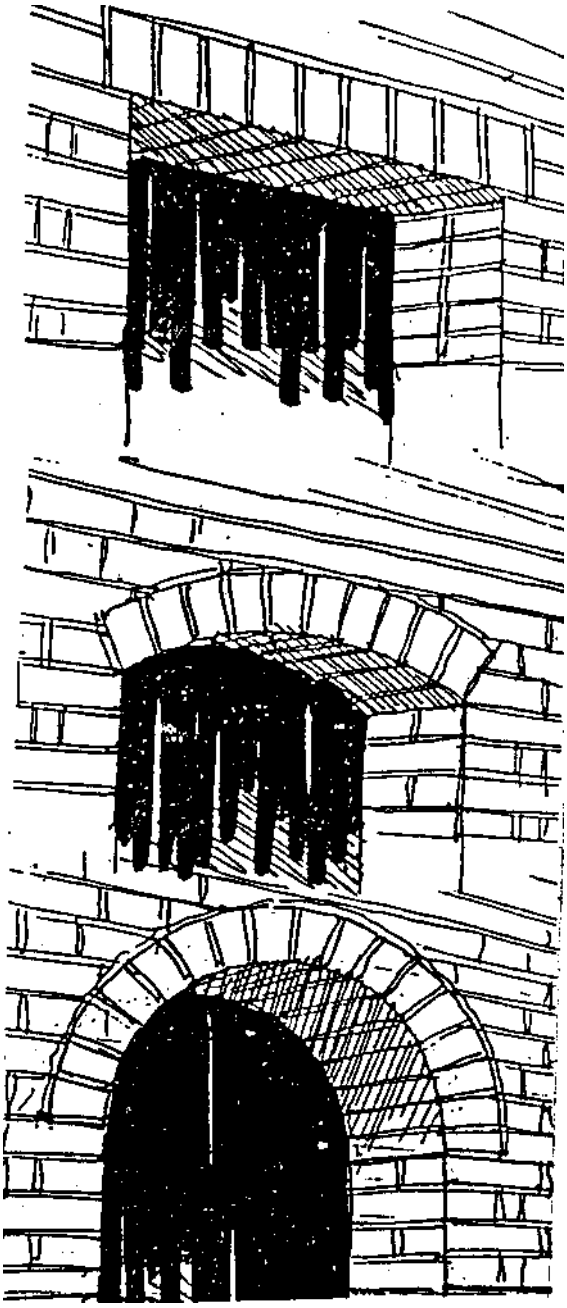
THE USUAL ROUND AND SEGMENTAL ARCHES NEED SHUTTERING OR SUPPORT DURING CONSTRUCTION.

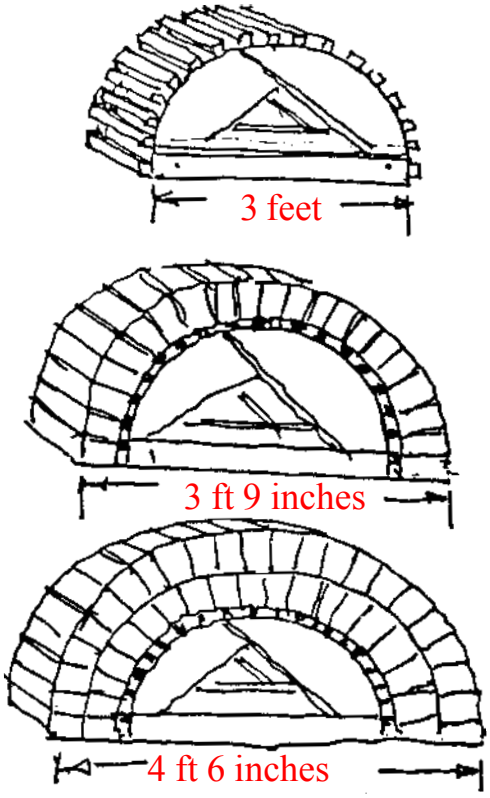
THE CORBEL ARCH NEEDS NO SUPPORT AND IS EXTREMELY SIMPLE AND EASY TO MAKE.

ONE QUARTER OF A BRICK IS EXTENDED OUT FROM THE BRICK BELOW IT. THE WRITER SUCCESSFULLY USED SUCH ‘ARCHES’ OVER OPENINGS UP TO 5 METERS WIDE.



ARCHES



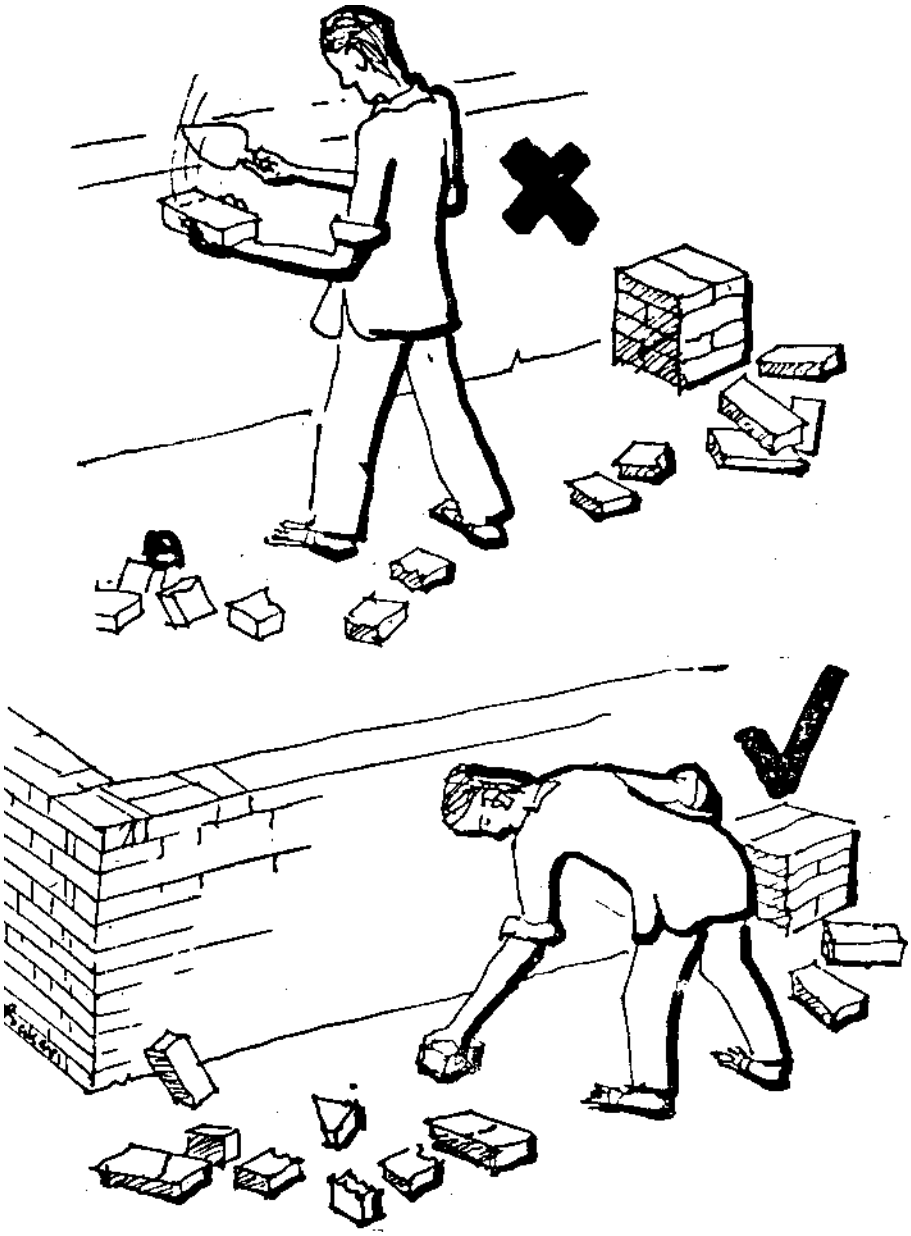


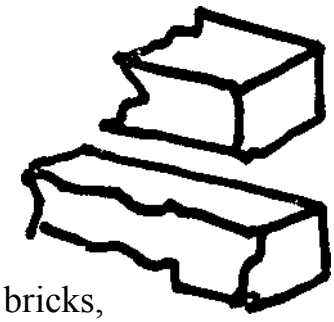
ARCHES CAN BE OF DIFFERENT SHAPES AND SIZES AND ARE MUCH LESS COSTLY THAN R.C. LINTELS.

BUT WHILE CONSTRUCTING THEM, SOME SORT OF FRAME WORK OR SUPPORT IS NECESSARY.

IN ONE BUILDING THERE MAY BE ARCHES OF DIFFERENT SIZES SO MAKE THE FRAME FOR THE SMALLEST – AND ADD A ROW OR TWO OF DRY BRICKS
(NO MORTAR) FOR THE LARGER ARCHES.

WASTE BRICKS





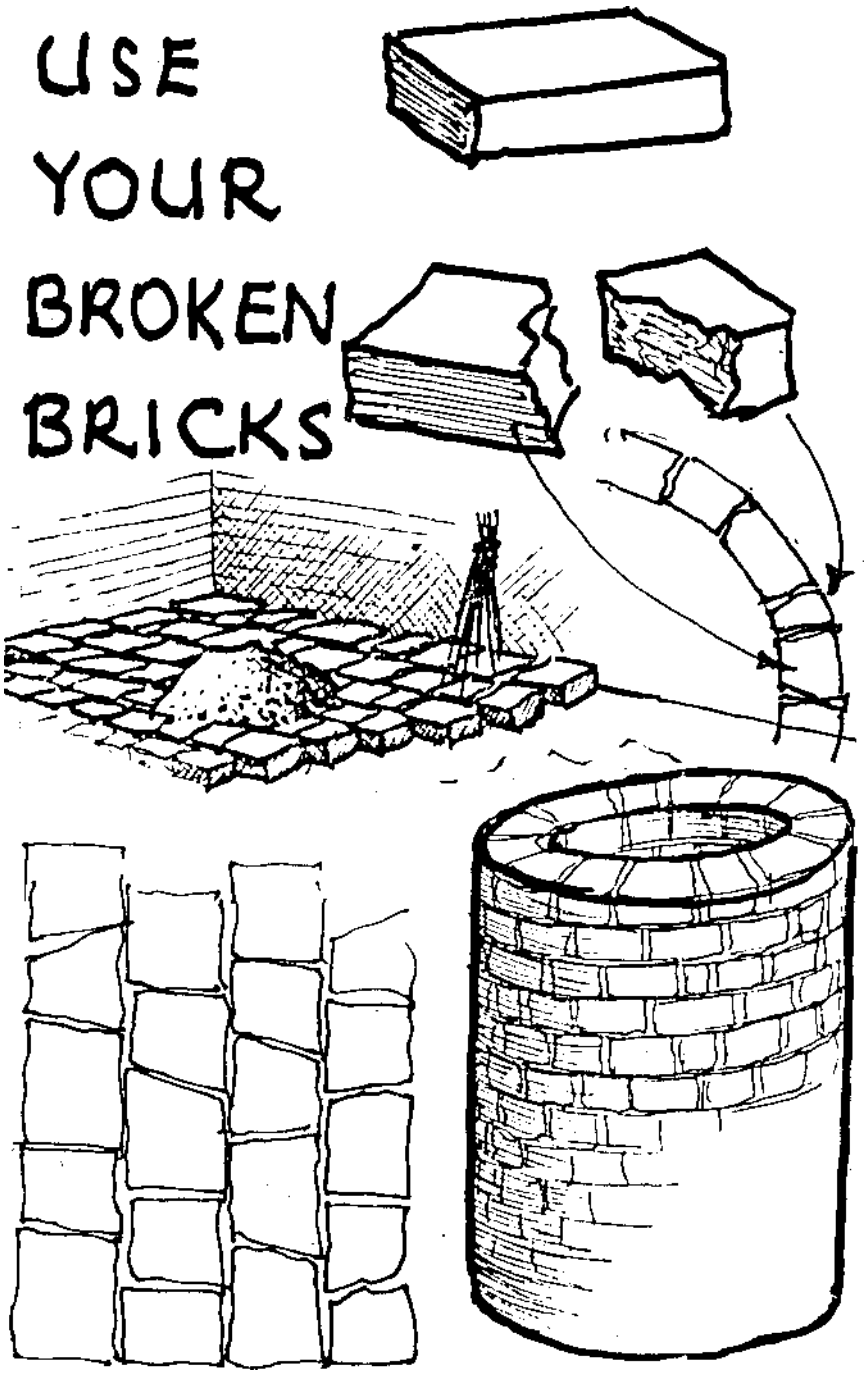
Frequently, when building a brick wall, a half brick is needed.

DO NOT CUT UP A GOOD WHOLE BRICK!

Just BEND DOWN and you will find several brick ‘bats, or chipped bricks, lying on the floor.

USE AND CUT THEM.

Bricks are increasingly costly!



BROKEN BRICK PIECES

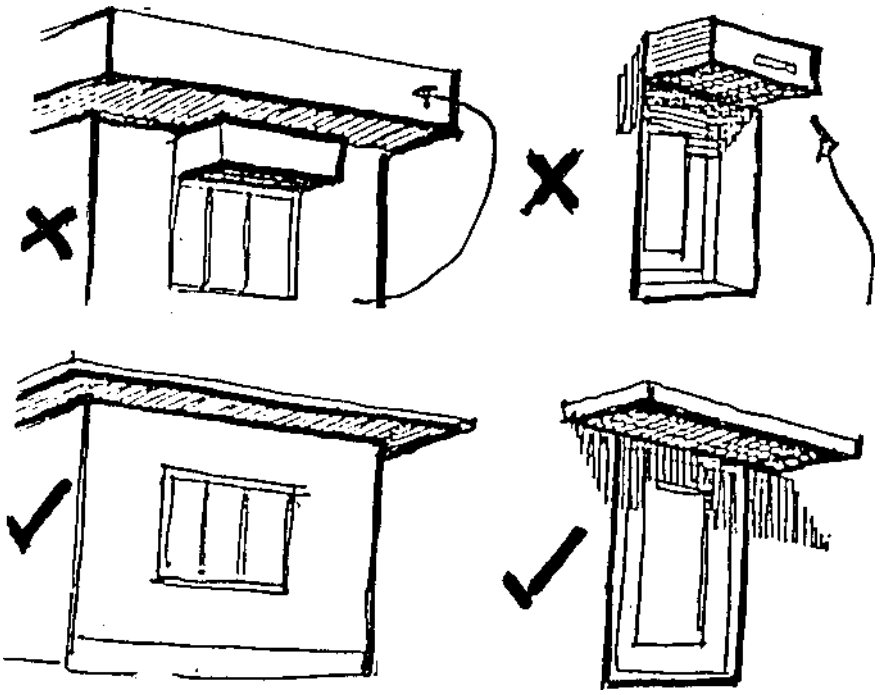
On most sites where brick is being used,
there are plenty of broken pieces lying on the ground.

USE THEM!

Beat hard and level your earth in filling ‘floor’.
Lay the broken bricks close together. Mix on top a weak lime mortar and brush it in and you have an excellent base for the tile or plaster flooring.

FOR LEECH PITS

(see elsewhere) lay the broken pieces in a circle with DRY joints.
Then a layer of horizontal mortar – and another layer.



FANCY SUNSHADES

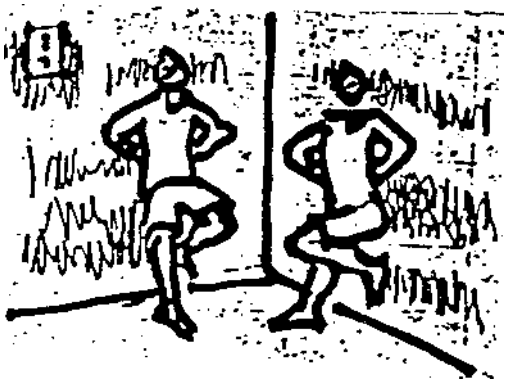
SERVE NO PURPOSE EXCEPT TO COLLECT LEAVES.

THEY ARE UNNECESSARY AND COSTLY - SO

DON'T USE THEM.

DON'T USE PLASTER

Unless it is really necessary. Put it all over a building and it accounts for about 10% of the total cost!



Fungus grows on it outside. People finger it, and lean on it, inside. It either looks dirty and ugly or you have to repaint it every year at considerable cost.

There are a few places where it is useful - kitchen, bathrooms, but elsewhere, neat brick work looks better.

MORTARS AND PLASTERS

CEMENT (1 PART)
AND SAND (8 PARTS)

Use cement only if nothing else is available.
It is an ‘energy-intensive’ material.

LIME (1 PART), CEMENT (4 PARTS)
AND SAND (14 PARTS)

Good for all types of brick and stone work.
(The setting time is slower than cement).

LIME (1 PART), CEMENT (4 PARTS)
AND SAND (14 PARTS)

This sets almost as quickly as cement.

LIME (1 PART), SURKI (2 PARTS)
AND SAND (6 PARTS)

This is a little stronger than lime alone and sets more quickly.

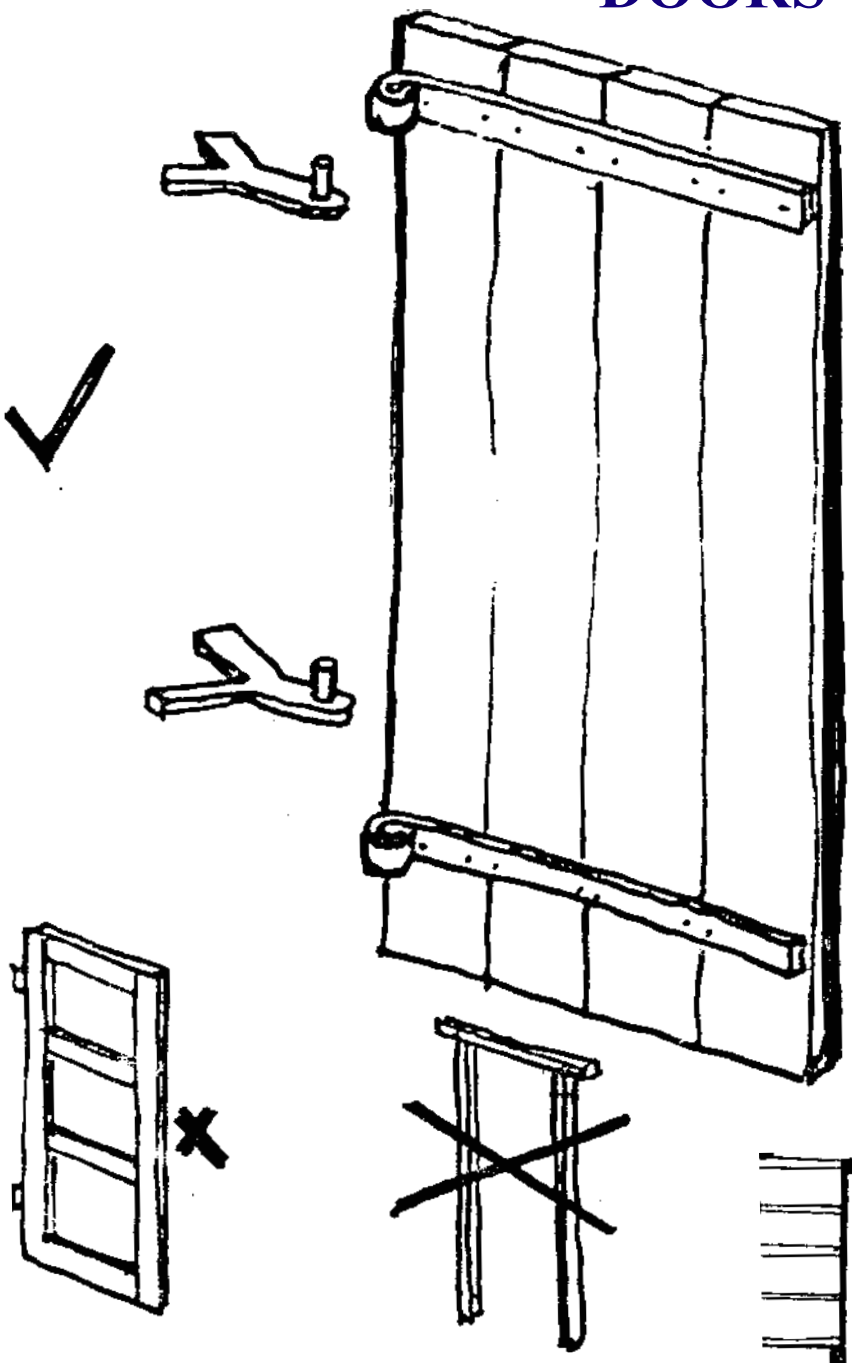
LIME (1 PART), SURKI (2 PARTS), CEMENT (4 PARTS)
AND SAND (20 PARTS)

This sets almost as quickly as cement.

MUD

Use the same mud that mud blocks are made of.
Sift it and mix it with only enough water to make it ‘plastic and usable.

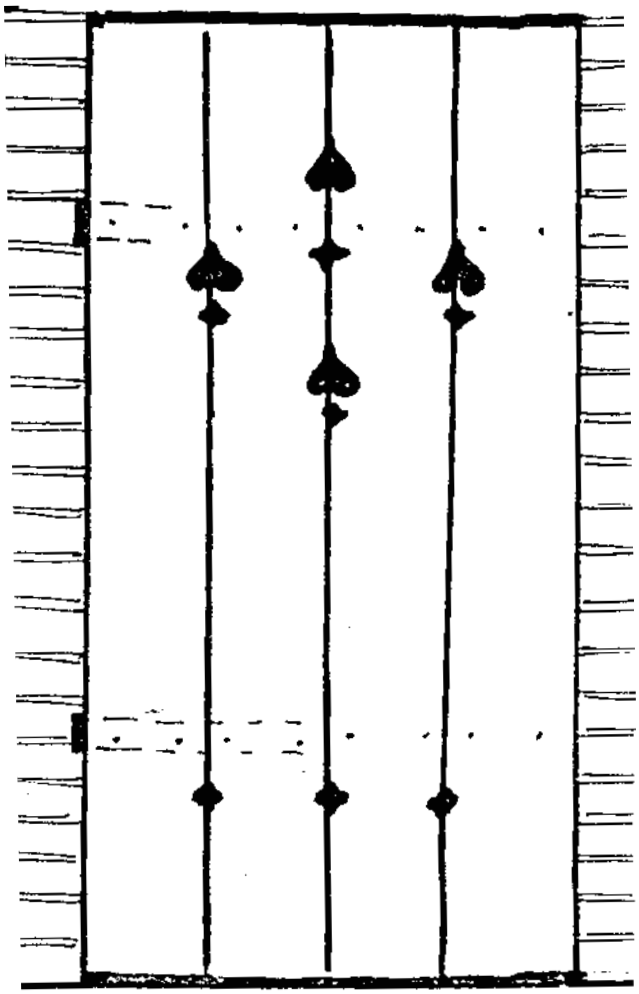
DOORS

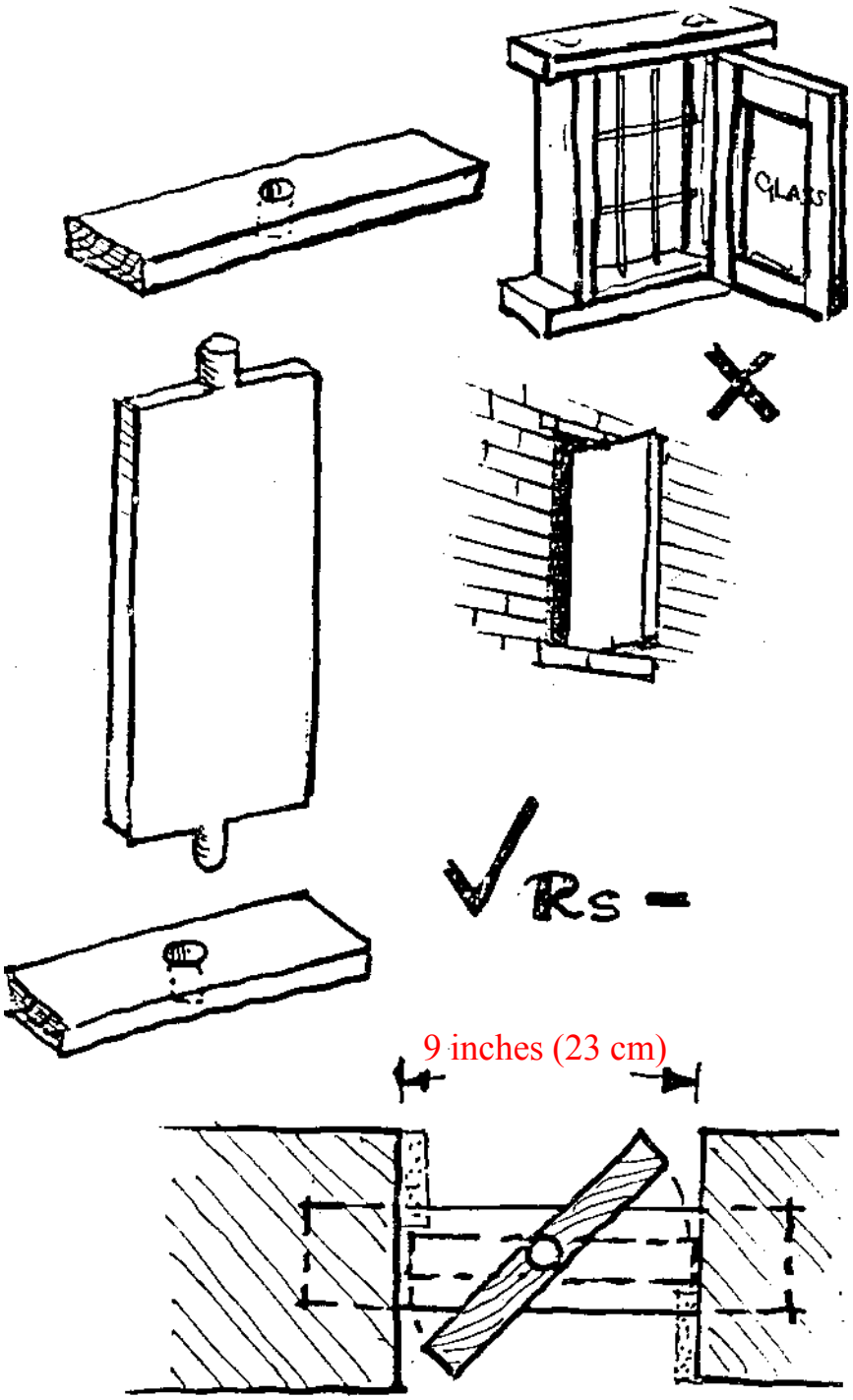


DOORS DO NOT HAVE TO HAVE FRAMES, PANELS, ETC. A FEW PLANKS CAN BE FIXED TOGETHER WITH STRAP HINGES TO FORM A STRONG DOOR.

A LITTLE BIT OF CUTTING CAN GIVE A SMALL PATTERN.

THE COST WILL BE MUCH LESS THAN HALF THE COST OF A NORMAL DOOR.

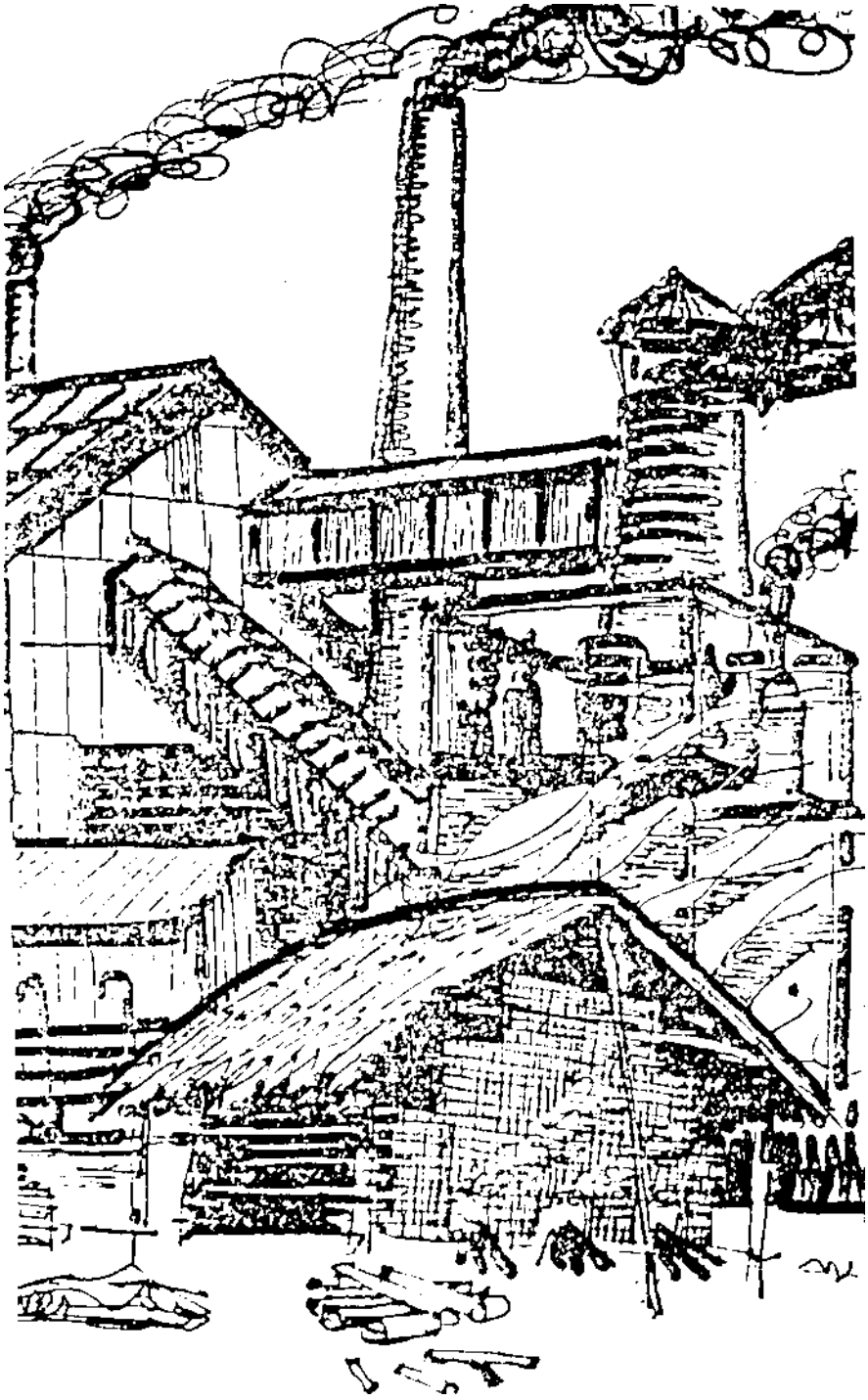




A WINDOW with a frame and a shutter, with glass, and perhaps a metal grill, is very costly.

A simple 1” thick, 9” wide plank of wood, with a rounded protrusion at both ends, will fit into 2 strips of wood (30 or 35 cm long, 8 cm wide) and you have a ‘window’!

Even when it is open, no one can climb through the two 4 inch openings, so no grill is required. If a larger window is needed, put 2 or 3 in a row.

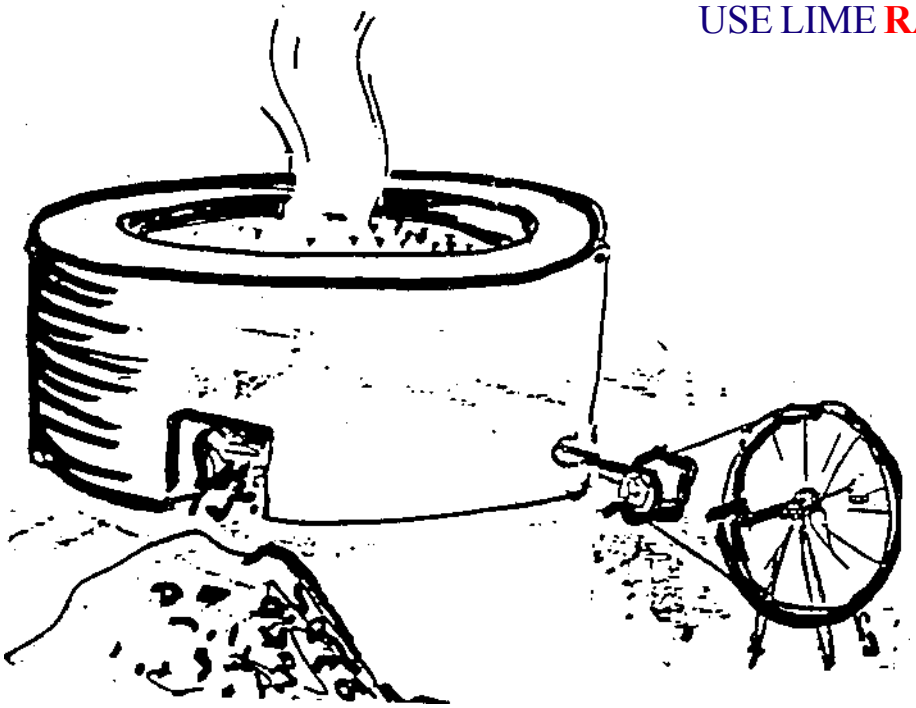


THE PRODUCTION OF CEMENT AND STEEL BOTH USE AN ENORMOUS AMOUNT OF ENERGY (FUEL) AND CAUSE A LOT OF AIR POLLUTION. ALSO MOUNTAINS OF UGLY USELESS WASTE MATERIAL IS DUMPED ALL ROUND THE FACTORIES.

PRODUCTION IS COSTLY AND INDIA IS SHORT OF ENERGY.

INDIA **IS SHORT OF ENERGY.**
LIME **MANUFACTURE USES ALMOST NO ENERGY.**

USE LIME **RATHER THAN CEMENT.**



LIME

CEMENT AND LIME ARE BOTH MADE FROM THE CALCIUM FOUND IN LIMESTONE AND SHELLS.

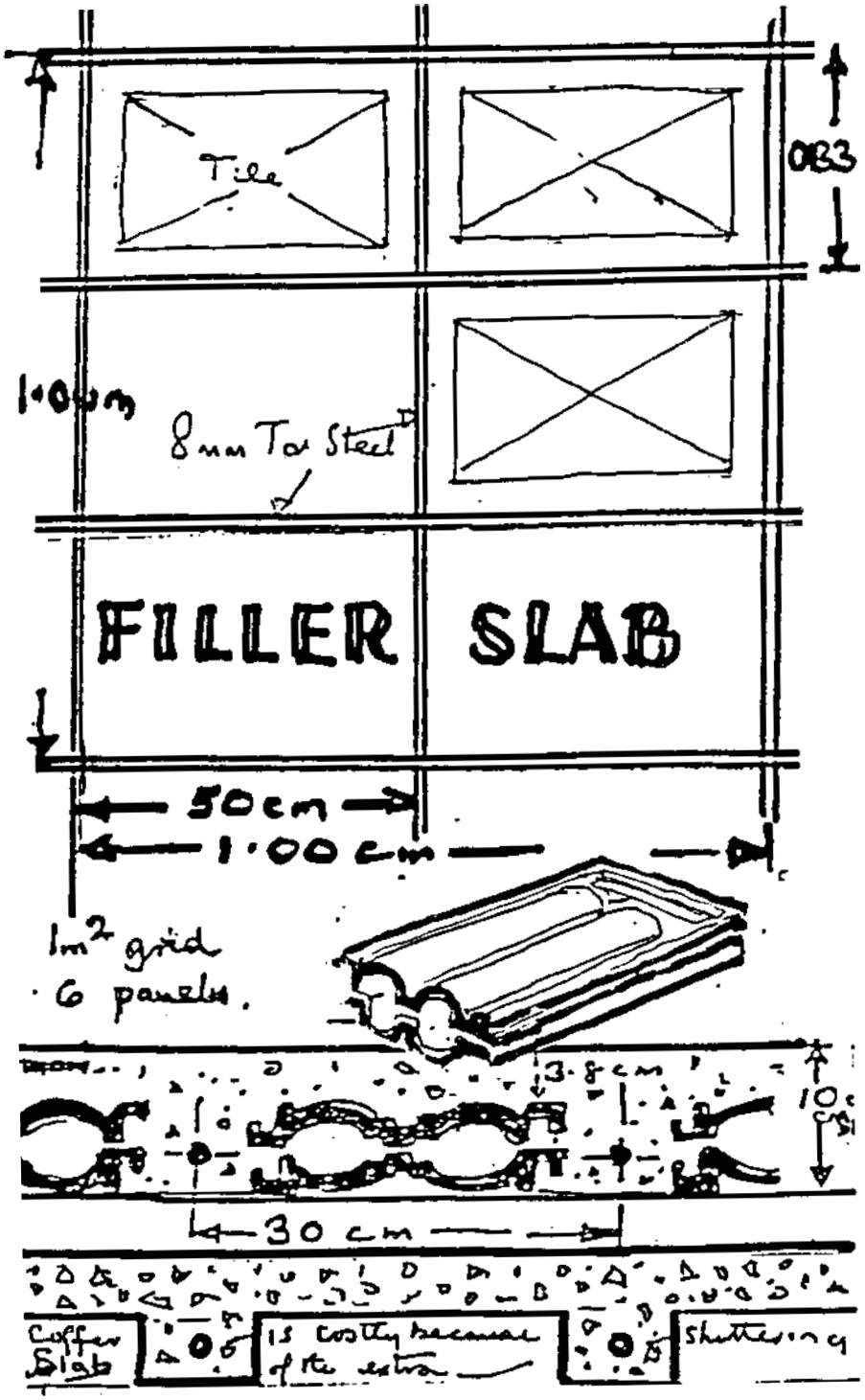
THESE CAN BE BURNED IN A MUD KILN (ONLY A HANDFUL OF CHARCOAL IS NEEDED TO START THE BURNING PROCESS). AFTER BURNING AND COOLING SIFTING THE REMAINS GIVES YOU LIME.

CEMENT IS ALSO MADE FROM THE SAME INGREDIENTS, ALONG WITH OTHER ITEMS – AND IT USES A LOT OF FUEL AND PROCESSING.

THE ULTIMATE STRENGTH, IN MORTAR, PLASTER, CONCRETE ETC FOR LIME AND CEMENT IS THE SAME.

WE DENUDE OUR FORESTS TO GET BUILDING TIMBER – BUT NEW TREES CAN BE PLANTED FOR BUILDING PURPOSES.

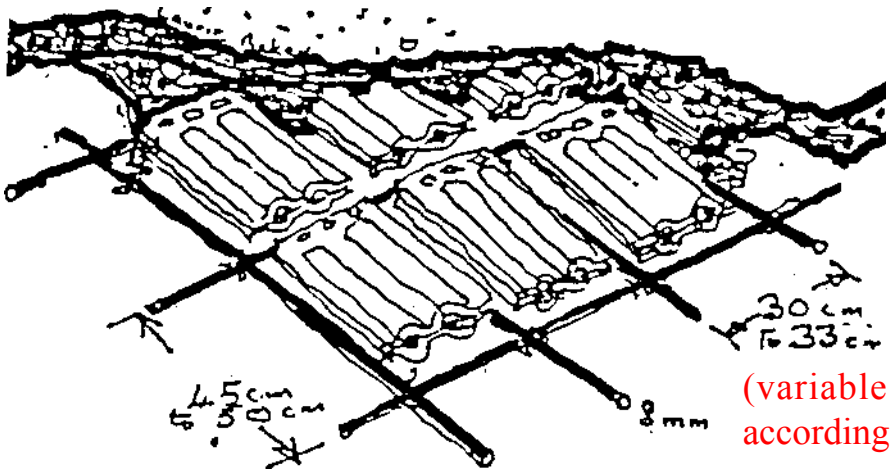
MOUNTAINS ARE DESTROYED TO GET IRON ORE AND LIMESTONE FOR STEEL AND CEMENT.
ONCE DESTROYED, THE MOUNTAINS CANNOT BE REPLACED.



In the orthodox reinforced concrete slab the dead weight of its concrete is heavy. This weight can be lessened by putting light weight material between the steel rods.

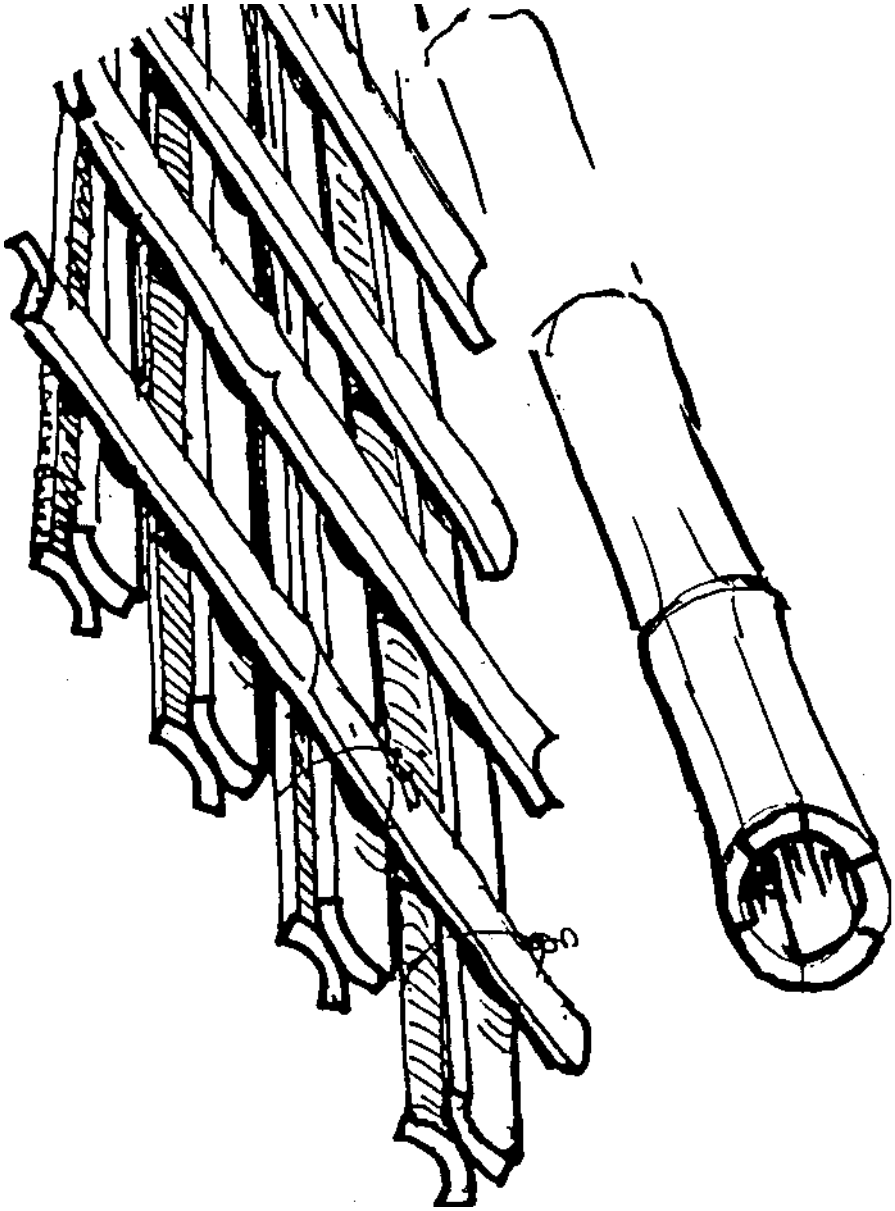
The simplest 'filler' is to use two _____ grade Mangalore Tiles. These have no structural strength value – they are mere 'Fillers'.

Using them saves about 30% dead weight of the 'slab' – so less steel is needed – so much steel, sand, cement metal and cost is saved.



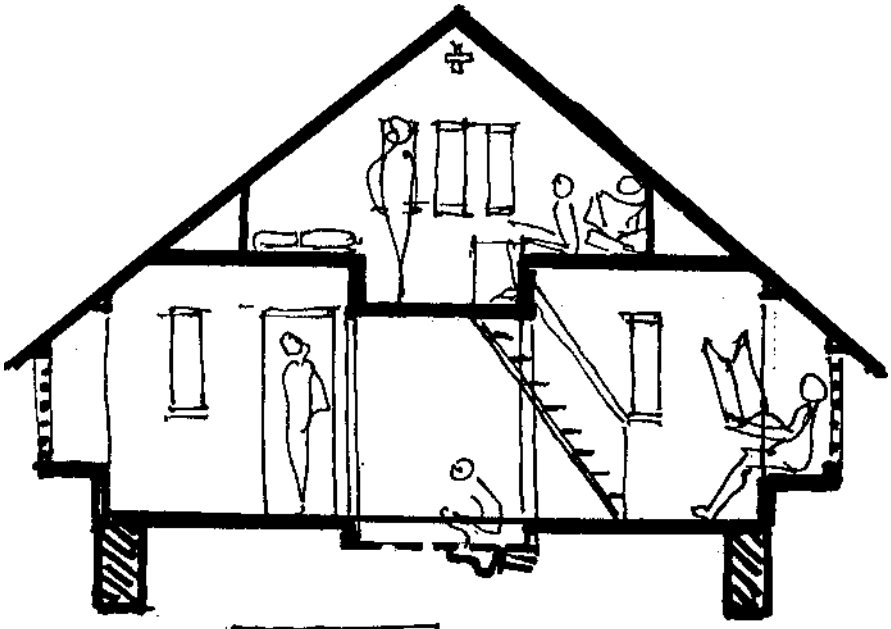
(variable rod size according to span)

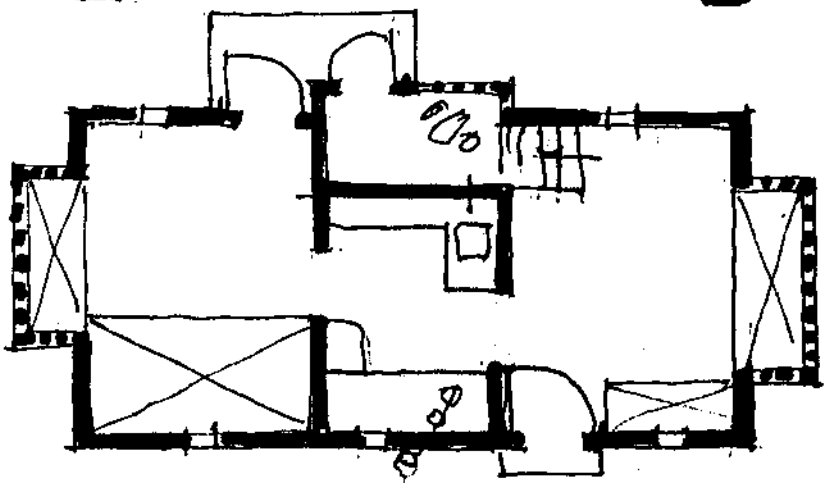
BAMBOO FOR REINFORCEMENT



CERTAIN TYPES OF BUILDING BAMBOO HAVE APPROXIMATELY THE SAME TENSILE STRENGTH AS TORSTEEL. SEE ELSEWHERE, BUT STEEL WILL CORRODE IN LIME CONCRETE (MUCH CHEAPER THAN CEMENT CONCRETE) WHEREAS BAMBOO REINFORCEMENT WILL NOT CORODE IN LIME CONCRETE.

FURTHER MORE (AND OF GREAT NATURAL IMPORTANCE) LIME AND BAMBOO USE PRACTICALLY NO 'ENERGY', WHILE CEMENT AND STEEL ARE BOTH ENERGY INTENSIVE MATERIALS.

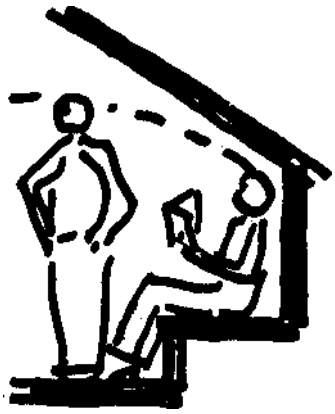


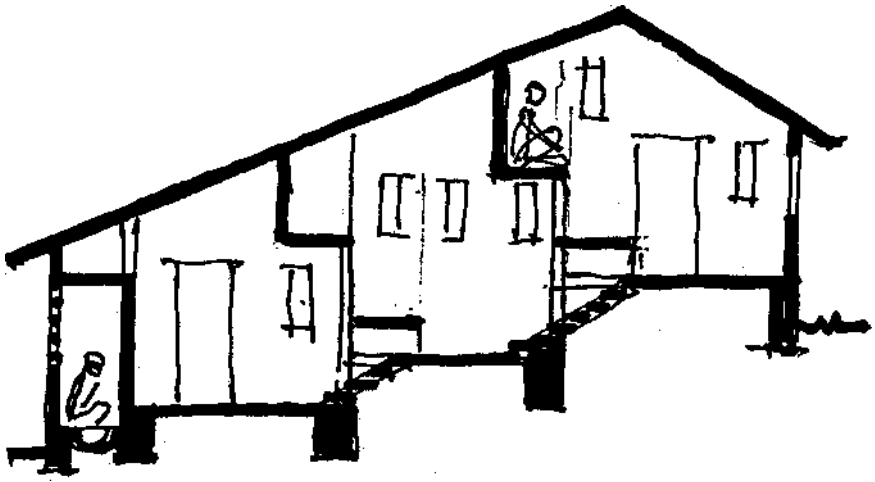


THESE SECTIONS SHOW HOW THE 'LIVING SPACE' IS INCREASED WITHOUT ENLARGING THE TOTAL FLOOR AREA OF A SMALL HOUSE.

LOFTS AND BUNKS

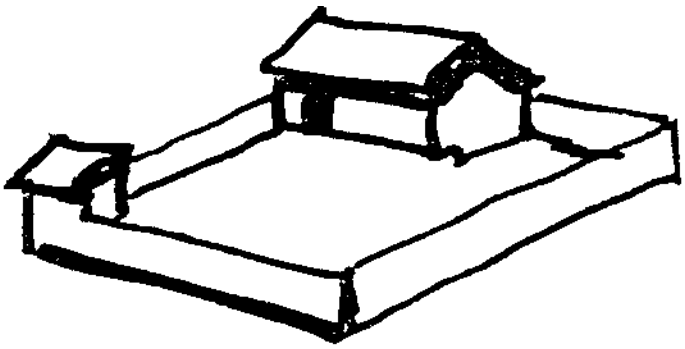
WHEN A SLOPING ROOF IS ASKED FOR (OR A SLOPING SITE MAKES A SLOPING ROOF MORE ECONOMICAL) THERE IS USUALLY QUOTE A LOT OF SPARE SPACE UNDER THE LOWER SLOPING PARTS AND THESE CAN BE USED NOT ONLY FOR SHELVES AND STORAGE BUT ALSO FOR SEATS AND BEDS.

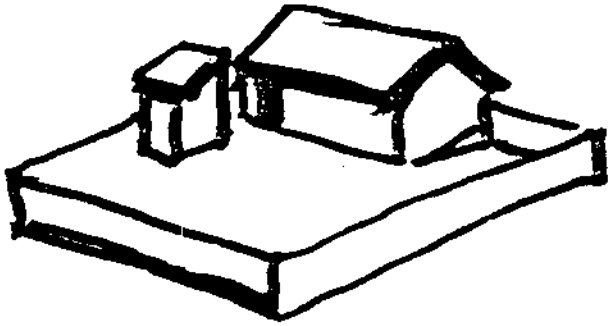




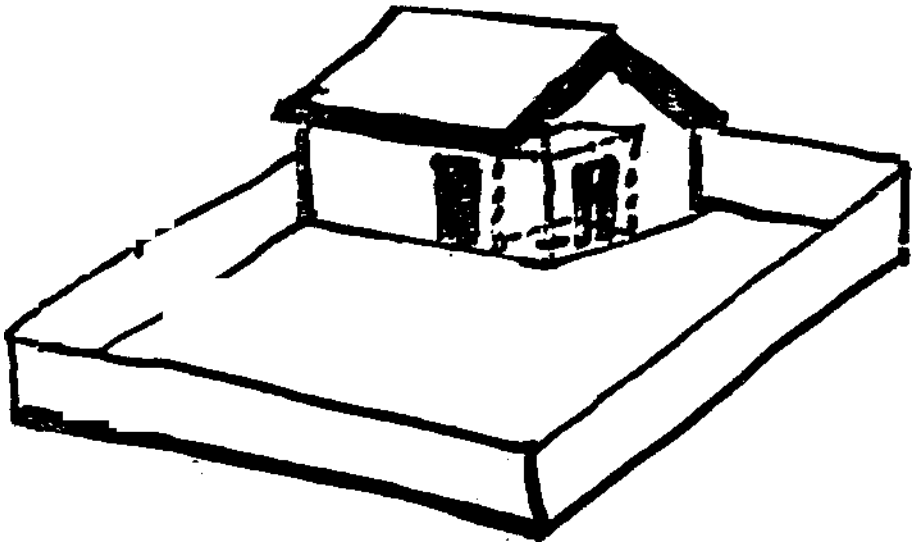
LATRINES

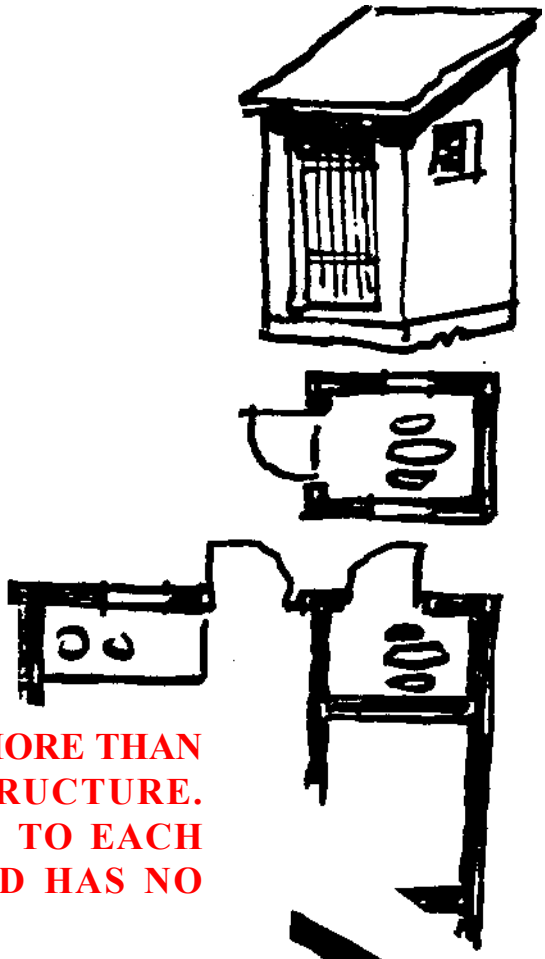
WHENEVER THE NEED FOR HOUSING SCHEMES COMES UP, INEVITABLY EVENTUALLY THE SUBJECT OF LATRINES SURFACES.
ALMOST INVARIABLY, FOR COMMUNITY HOUSING, SOMEONE SUGGESTS 'GROUP LATRINES'. THIS IDEA HAS RARELY, IF EVER, BEEN SUCCESSFUL AND THERE IS EVERY REASON WHY ALL NEW HOUSES SHOULD HAVE THEIR OWN LATRINE.
THE OLD SEPTIC TANK SYSTEM IS STILL GOOD (IF BUILT PROPERLY) BUT IS COMPARATIVELY VERY COSTLY. A FEW OTHER SYSTEMS AND PROBLEMS ARE DISCUSSED NOW.



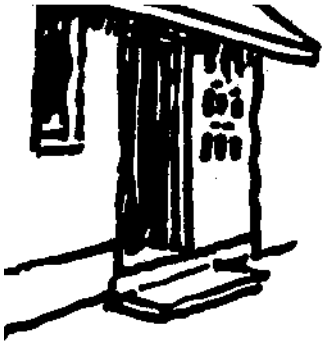


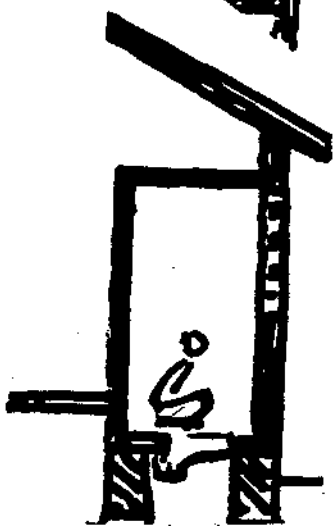
THE ELDERLY MOST WOMEN, AND CHILDREN, DO NOT LIKE GOING DOWN THE GARDEN DURING THE NIGHT. SO PUT YOUR LATRINE IN THE HOUSE – BUT SEE THAT IT IS SEALED OFF FROM THE REST OF THE HOUSE.

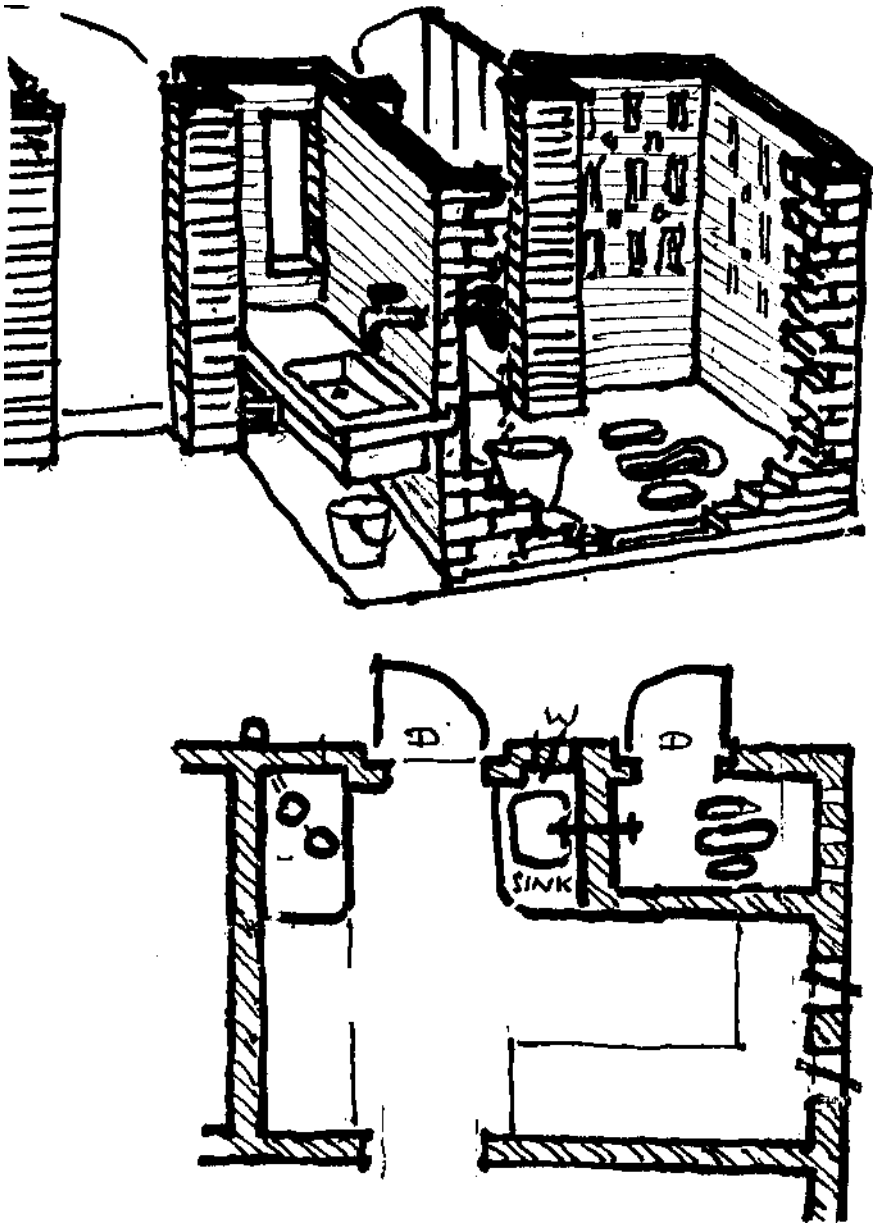




THIS LATRINE DOWN THE GARDEN COSTS A LOT MORE THAN ONE INCORPORATED IN THE MAIN HOUSE STRUCTURE. KITCHEN AND LATRINE DOORS CAN BE CLOSE TO EACH OTHER BUT THE LATRINE IS SEALED OFF AND HAS NO CONNECTION WITH THE HOUSE INTERIOR.



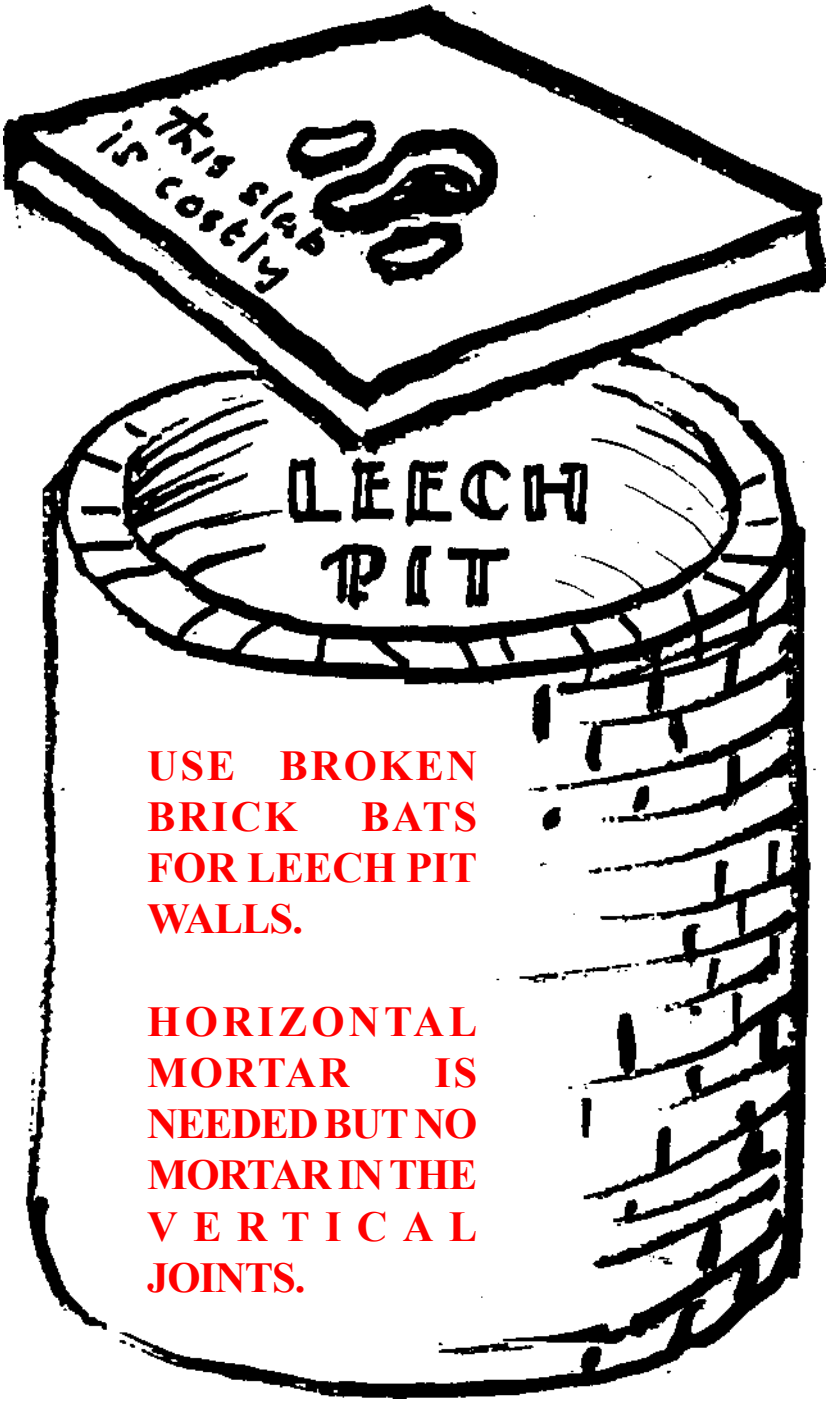




MANY FAMILIES DO NOT LIKE TO HAVE THE LATRINE UNDER THE HOUSE ROOF. SUCH PREJUDICES CAN BE REMOVED IF THE LAVATORY IS SEALED OFF FROM THE REST OF THE HOUSE (BOTH WALLS AND ROOF). WATER PIPING IS ALMOST ELIMINATED WITH A BATH TAP ON ONE SIDE OF THE WALL AND A SINK TAP ON THE OTHER.

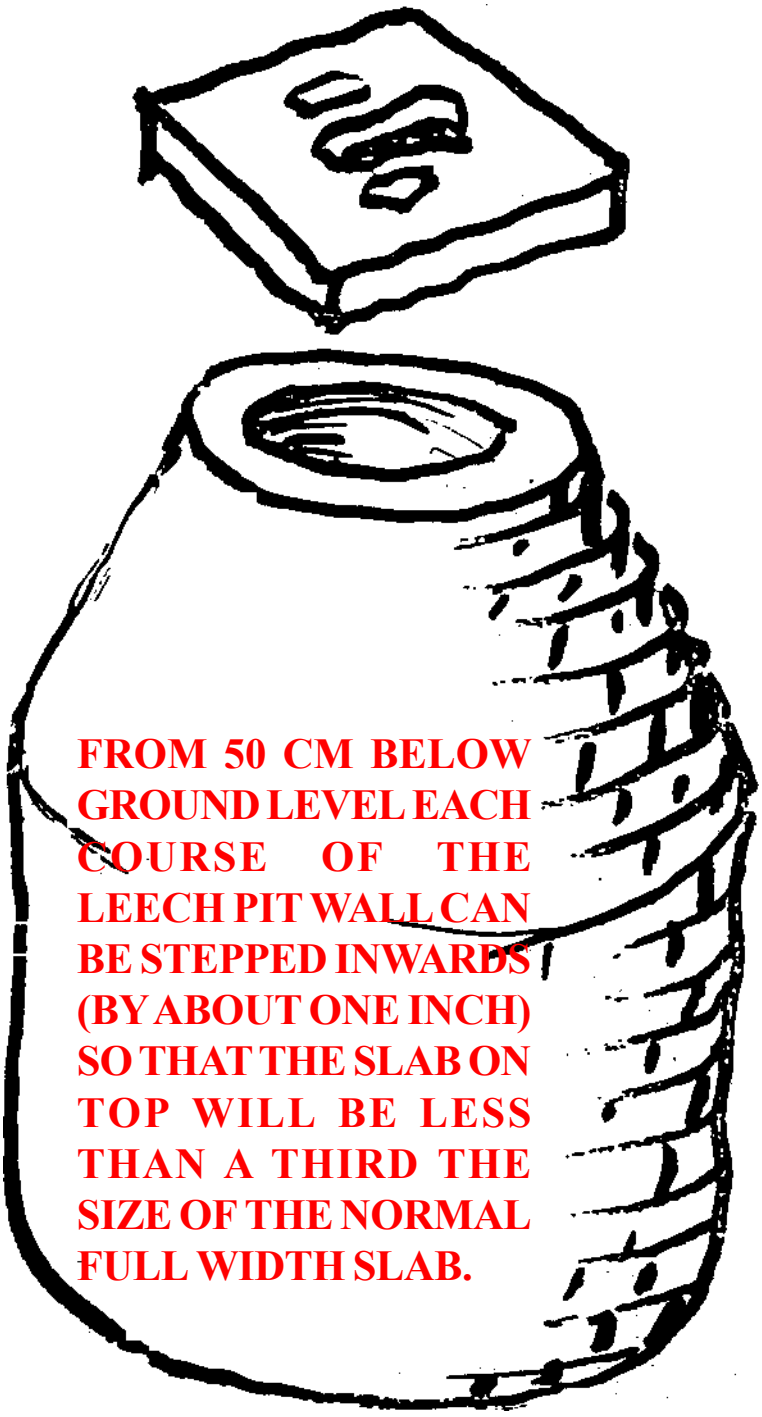
A WIDE BUILT IN SEAT IN THE KITCHEN CAN ACT AS AN EXTRA BED AT NIGHT.

A SMOKELESS CHULA CAN BE NEAR THE DOOR.



USE BROKEN BRICK BATS FOR LEECH PIT WALLS.

HORIZONTAL MORTAR IS NEEDED BUT NO MORTAR IN THE VERTICAL JOINTS.

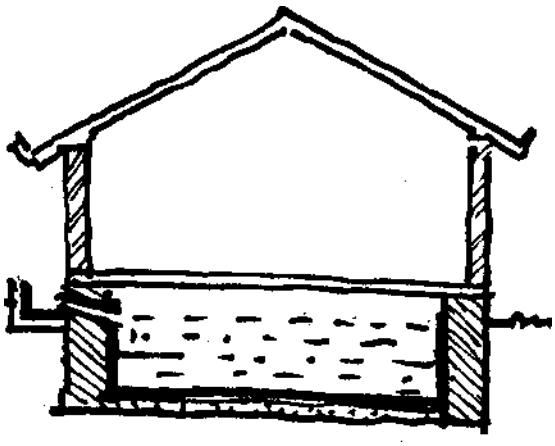


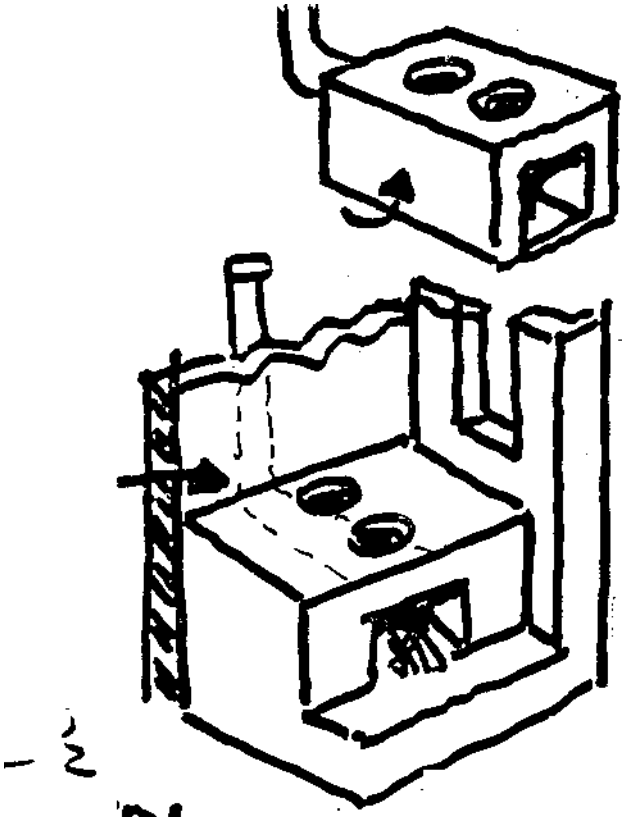
FROM 50 CM BELOW GROUND LEVEL EACH COURSE OF THE LEECH PIT WALL CAN BE STEPPED INWARDS (BY ABOUT ONE INCH) SO THAT THE SLAB ON TOP WILL BE LESS THAN A THIRD THE SIZE OF THE NORMAL FULL WIDTH SLAB.

RAIN WATER HARVESTING

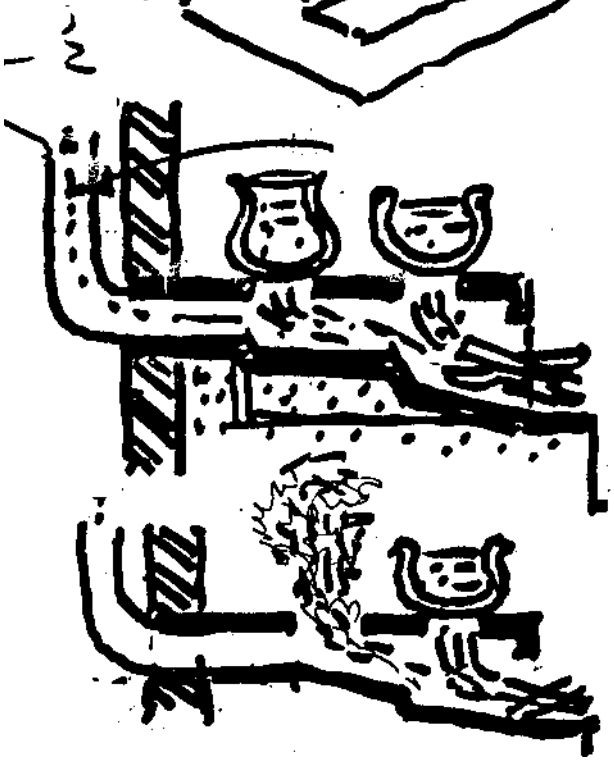
IS CURRENTLY MUCH TALKED ABOUT AND DESIRABLE. HOWEVER THERE MUST BE SUITABLE PLACES TO STORE THE 'HARVEST'! WE ALSO HAVE TO AVOID EVAPORATION.
ONE SUCH PLACE IS THE SPACE BETWEEN FOUNDATION AND GROUND FLOOR – BUT SUCH A FLOOR WILL BE COSTLY, AS ALSO THE WATER PROOFING OF BASE AND PLINTH WALLS.

THE SYSTEM WOULD BE BETTER IS WE HAD CONTINUOUS RAIN!





Burnt Clay Chulas can be built into the kitchen work table. If there are two holes, two pots can be used at the same time.

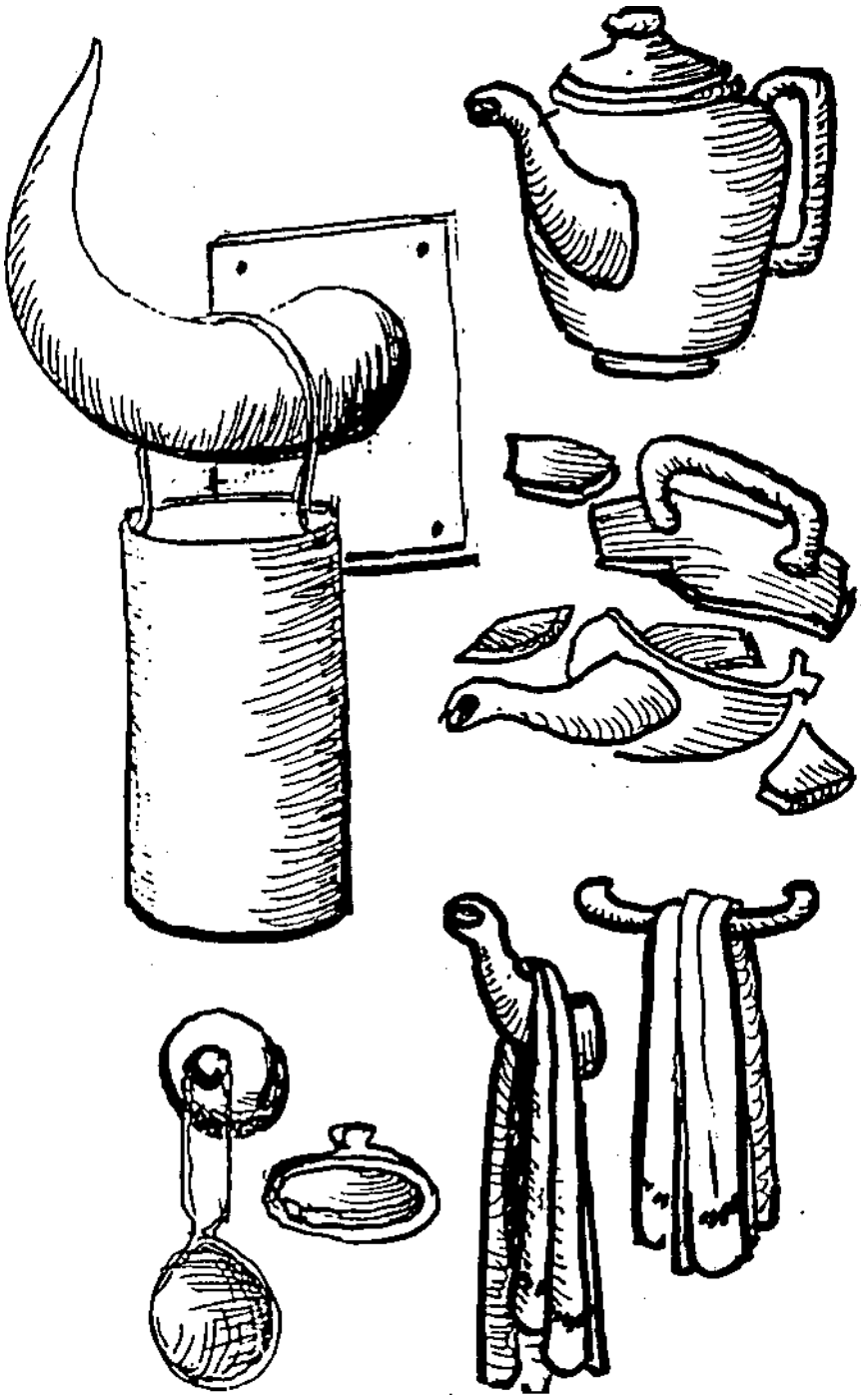


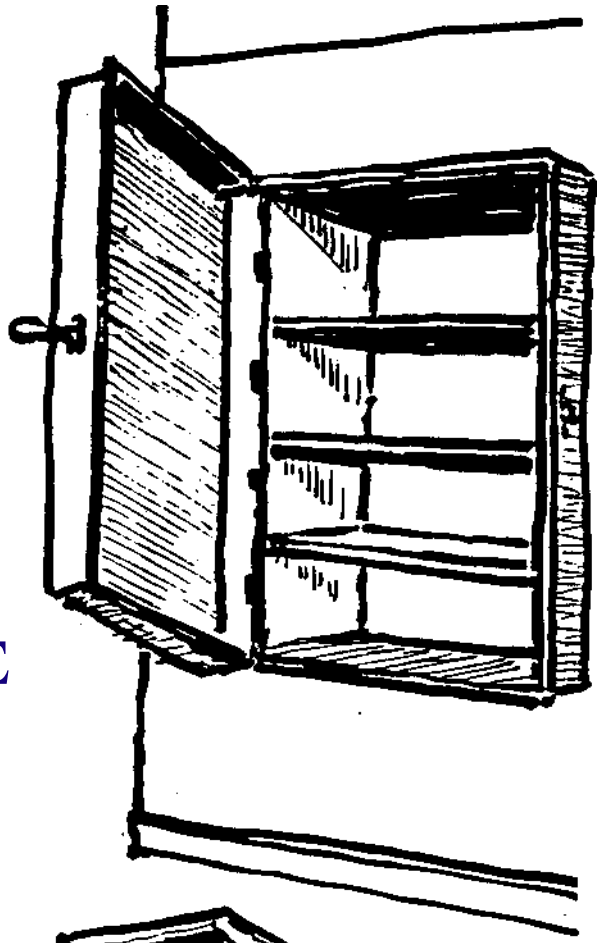
If you are using one pot - then put a pot of water on the back hole or the chula will NOT be smokeless.

SMOKELESS CHULAS

Formerly most people did their cooking on the floor. Now many prefer to cook while standing – but often the hole for the pot is too high and the cook has to stand on the tip-toe to see what is cooking.

So be sure to plan for the
TOP OF THE POT
to be at table level.

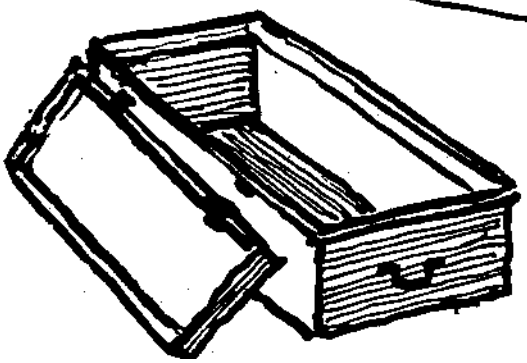




MAKE USE OF OLD WASTE

FIX BACK THE LID ON TO AN OLD TIN TRUNK AND BUILD IT IN TO THE WALL AND YOU HAVE A RAT AND INSECT PROOF ALMIRA.

BROKEN-OFF LIDS, SPOUTS, HORNS, ETC. CAN ALL BE USED AS HOOKS AND HANGERS.



Baker's life is a legend. He belongs to a rare species of scholars who found the roots of wisdom in common man. Laurence Wilfred Baker was born in England in 1917. He had his education from King Edwards Grammar School, Aston. After studying at the Birmingham School of Architecture, he became an Associate of the Royal Institute of British Architects. He started his career as an anaesthetist to Friends Ambulance Unit, S. England during the world war and worked in China and Burma.

As an architect to a leprosy mission, he came to India in 1945 where he was exposed to an entirely new environment. He was fascinated to see the skills of the ordinary, poor village people working with the most unpromising and crude materials with almost no recognizable tools to make useful everyday buildings and articles.

In 1948, Baker married Elizabeth Jacob, a like minded doctor from Kerala and settled down in remote area of the Himalayas to run their own schools and hospitals – mixture of medical and architectural work there for more than one and a half decade.

The land and its people enlightened his ideas and the compendium of information from ordinary people enriched his vision. He discovered a hidden heritage in local indigenous style of architecture, the result of thousands and thousands of years of research and collective experience of many generations on how to use only immediately available, local materials to make structurally stable buildings that could cope with local climatic conditions, with the local geography and topography, with all the hazards of nature, with possible hostile neighbours, houses that could accommodate all the requirements of local religious, social and cultural patterns of living. He learnt about more and more local materials and devised new patterns using burnt bricks, stone, mud, tiles and timber and applied new kinds of mortar and plaster in his works.

Baker abhorred all forms of extravagance and waste. Two important characteristics evolved in Baker's architecture- the small is not only beautiful but if often essential and even more important than large, and if architects are even to start interacting effectively with the real building problems and the housing needs of the world, they must learn to build as inexpensive as possible. The ideal is that there is a form of direct unity with the creator, that man experiences this at any time, in any place and under any circumstances.

For a number of reasons, the Baker's pulled up their roots from the Himalayas and moved to Kerala and settled in a remote mountain area among the neglected tribal and settlers. Baker's interest and work spread and concentrated more o housing and rural development work. Some Industrial buildings in North and Mid-India, a lot of Churches and Cathedral were his important contribution during this period.

By this time the Government moved in to examine what is going on. The then Chief Minister C. Achutha Menon became a convert to his architectural style and baker built the State Institute of Languages for a small sum of money which the works and housing department had declared was impossible. Following this a fairly large and prestigious complex known as Centre for Development Studies and some other Government Institutions were constructed by him.

The people were quick to understand the principles involved in cost reduction and real priorities of building a house. The upper strata came forward with interest when quite a lot of them built their houses using these simple cost reducing techniques. For the lower middle class this style was rewarding as hey can construct a house within their reach.

As a popular specialist in the cost effective building and conservation of energy by avoiding energy intensive materials – with a stress on updating the wonderful Indian vernacular ways and styles of building, Baker brought people close to their culture. Through out his working life, the whole business planning and designing has been intensely absorbing and fun for him. Always living close to nature he learned many lessons from the design of God's creations. He has produced innumerable designs each has a unique identity whether big or small. He breaks all conventions of shape. The free flowing lines and graceful curves in his design create a harmonious atmosphere for living. His buildings invite the dweller to be part of it. Planning of space in design is an important factor in cost reducing construction. In a country with 40 million homeless it is improper to use money, natural resources or energy lavishly or unnecessarily.

As an architect of vision and vast experience Baker is ac active participant of various Government schemes. He is and has been advisor to planning and Governing bodies of institutions like HUDCO, NID, CBRI, FRI, UPDESCO etc. and has been active with and designed for Milk Marketing Board, Livestock Development Board. He is honorary fellow of the Centre for Development Studies.

Baker defended critics with good humour and his sketches are excellent. He has produced do-it-yourself books, illustrated by him titled How to Reduce building costs, Brick work, Mud, Community Buildings, Schools, Rural hospitals etc. his writings brim with information. In all he stresses cost control and avoiding energy waste and intensive materials. He has given two reports to Government on Earthquake.