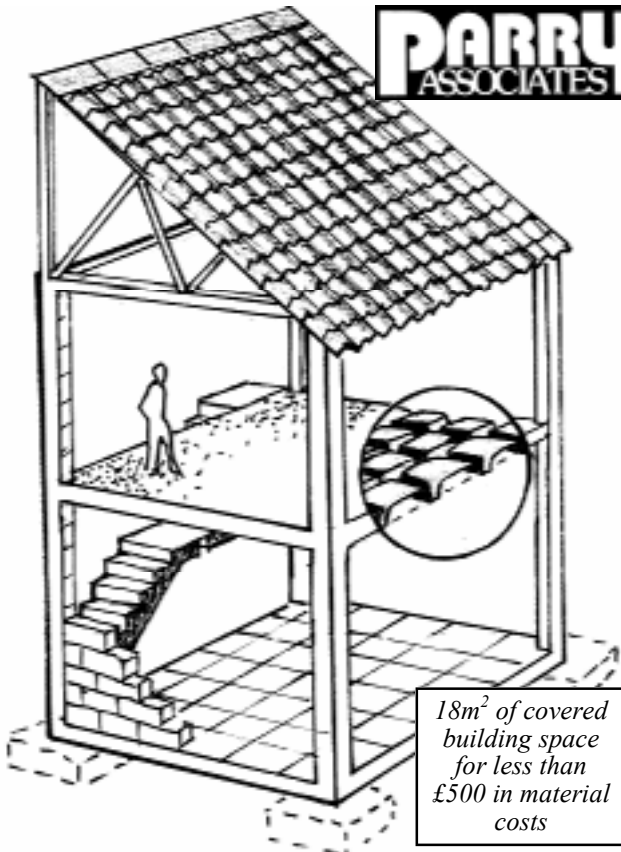


# TWO STOREY CONSTRUCTION MADE AFFORDABLE



*18m<sup>2</sup> of covered building space for less than £500 in material costs*

THE ECONOMIC BENEFIT of permanent construction largely depends on making land tenure legal and formalised. Without tenure a house builder's rights are often limited to those of a squatter, and any investment is constrained by insecurity. So how to make the building plot smaller and more affordable? The land price of surveyed plots takes into account road frontages and provision of services. Two storey construction provides the same covered area with the size of the ground plan and of the roof halved. Plot sizes can be reduced without loss of living space.

## The High and Dry System Explained

The Parry affordable two storey construction system achieves dramatic cost saving as a result of innovative methods of manufacturing using local materials and weight-saving designs of key elements in frame, floors and roofs.

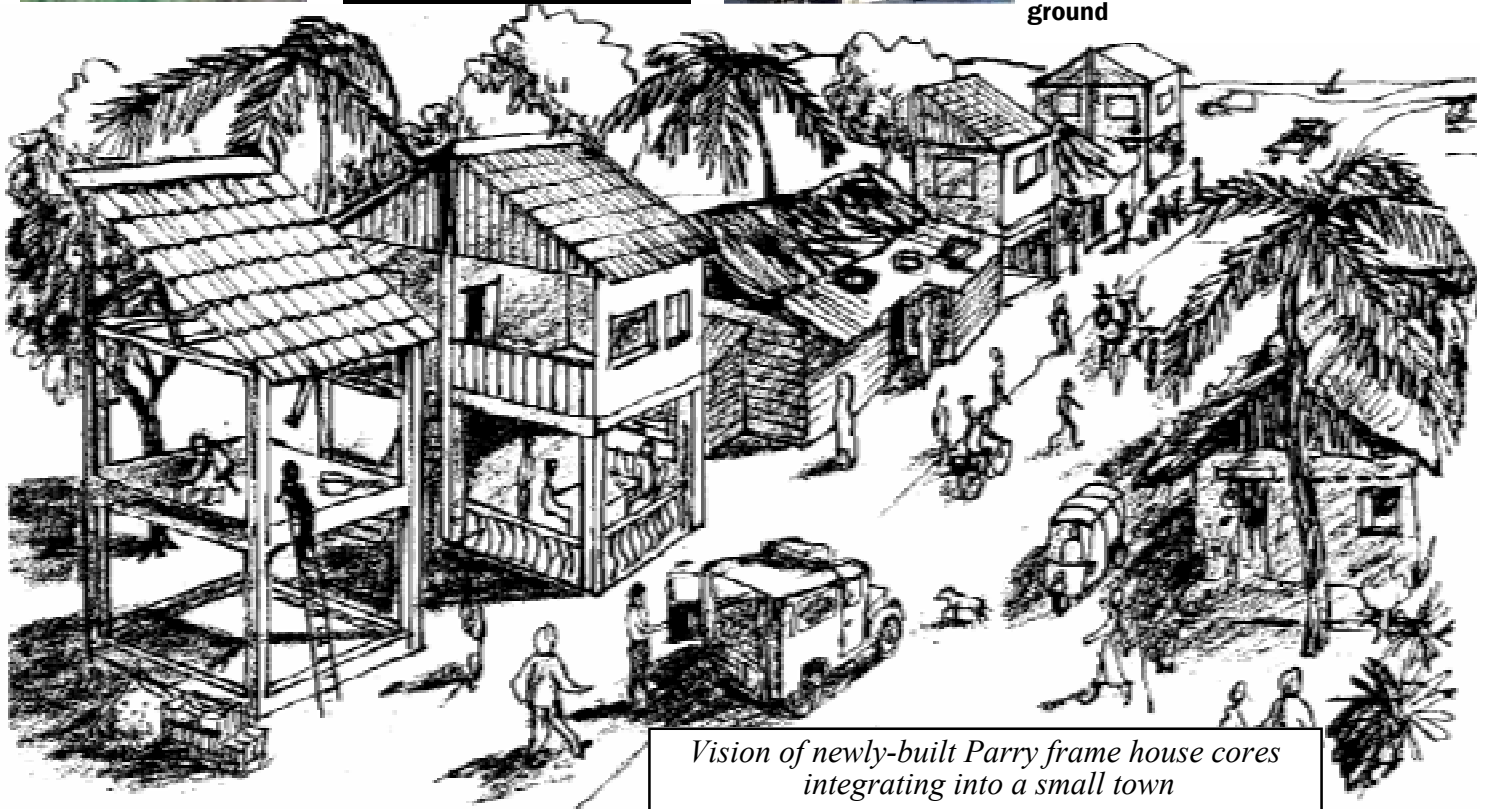


**Making the elements and assembling the structure**



## Beneficial features

- Permanent roof of lightweight micro-concrete tiles
- Special hollow shell blocks for material-saving, reinforced concrete columns
- Upper floor slab material costs halved by coffering system
- Frame system provides greater security during natural disasters
- The ability to build safely on hilly ground

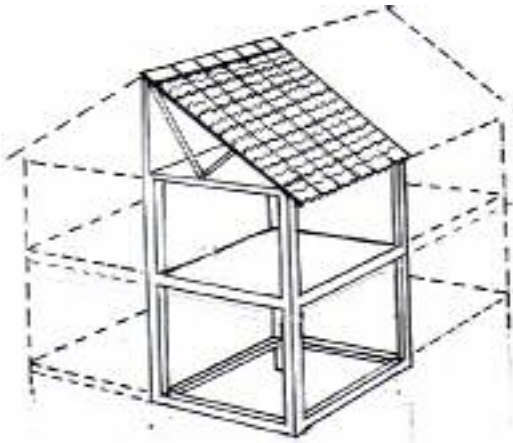


*Vision of newly-built Parry frame house cores integrating into a small town*

# THE PRODUCTS: ROOFS - FRAMES - FLOORS

## ROOF TILES

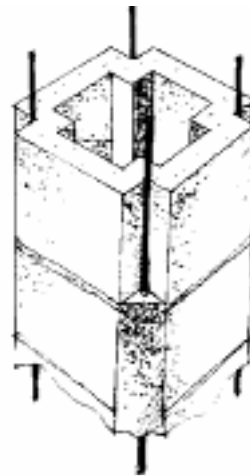
DEVELOPED IN the early 1980s, many millions of micro-concrete roof tiles made by the Parry process are in use in thousands of locations worldwide. Mainly used in house construction, Parry tiles are now also giving service in the education and health sectors, and in religious buildings. The folded screed method of manufacture coupled with high frequency mechanical vibration produces a tough, impervious canopy - half the weight of roofing tiles previously manufactured by other processes. Reduced weight provides the opportunity to cut the amount of timber used in the supporting structure.



A single frame to be finished using materials to hand

## FRAME COLUMNS

USING TECHNOLOGY developed by Parry engineers for extreme climate conditions, the vibrated precast column block with its hollow core provides maximum stability with minimum material use. The blocks are joined at the corners by steel reinforcement bars for optimum performance. Extra load bearing capability in lower storeys can be provided by packing the internal space with rubble.



Coffer slab seen from below

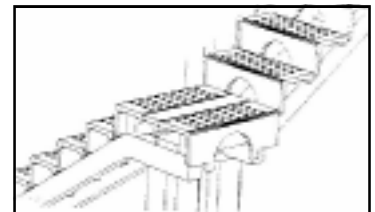
## COFFERED FLOOR SLAB

USING an innovative system of vibrating reusable formwork with a special kit supplied, Parry technology delivers yet another breakthrough. Floor slabs as thin as 150mm (6 inches) can be coffered to create a grid of slender beams and thin square panels of well vibrated concrete. Half the weight of a conventional raised floor, the system reduces the self-weight of multi-storey structures

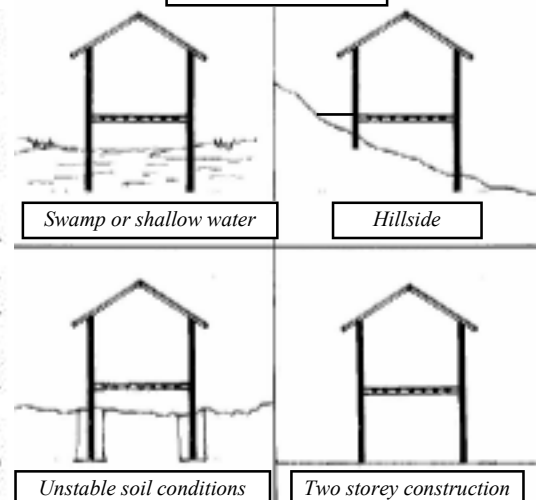
with the opportunity to save materials in foundations and frames. Environmentalists will praise the elimination of the consumption of large sheets of plywood and blockboard for the shuttering work in conventional raised-floor concrete construction. The Parry vibrated coffering moulds can be cleaned and used over and over again.

## STAIR BUILDING ELEMENTS

CONTRACTORS CONSTRUCT staircases in a variety of ways, usually with the loss of otherwise usable space beneath. Parry Associates are introducing a lightweight precast system based on twin parallel beams with individual treads to provide storage space below.



## APPLICATIONS



Swamp or shallow water

Hillside

Unstable soil conditions

Two storey construction

## COSTS OF RAW MATERIALS

FOR THE PURPOSE of comparison, a quantity-measuring exercise has been undertaken during the construction of a prototype 3m x 3m module comprising:

- a two storey frame;
- ground floor quarry tiles on compacted soil base;
- coffered raised floor;
- trussed rafter roof providing additional storage space.

The following calculation excludes the stairs.

MATERIAL	QUANTITY	UNIT COST (UK)	TOTAL COST (UK)
Cement (OPC)	666kg	\$0.17/kg	\$113.00
Gravel medium coarse	2120kg	\$0.05/kg	\$106.00
Sand building grade	1552kg	\$0.05/kg	\$78.00
Re-bar 12mm & 6mm	0.125t	\$2000/t	\$250.00
Reclaimed Timber various misci			\$229.00
			\$776.00

# THE PROCESS OF ELEMENT MANUFACTURE



*Smaller precast elements do not require physical strength to make. Parry technology can integrate women and disabled people into the local economy.*



THE PARRY PROCEDURES for the manufacture of precast concrete elements are applied very widely in all regions of sub-Saharan Africa, Central America, the Caribbean, and South and South East Asia. The machines and moulds are simple and robust and, with correct materials and skills applied, form products of the highest quality.



*Organised production workshops can have multiple production lines making a variety of products.*



*With a multi-use steel mould, after vibration a worker can immediately release the product after vibration to set and cure on the ground.*

Vibrating machines are supplied with the option of electric power (12V dc) or manually operated. Two different moulding methods are used:

- 1) multiple use steel moulds cast the products onto the floor or onto flat units which can be built up into stacks of ten, saving floor space.
- 2) polyurethane or ABS plastic setting moulds which hold the products overnight.



*Handy stacking system enables floor tiles and slabs to cure in a confined space.*

Where training for new staff is needed, a course of one week is sufficient for most people to become competent.

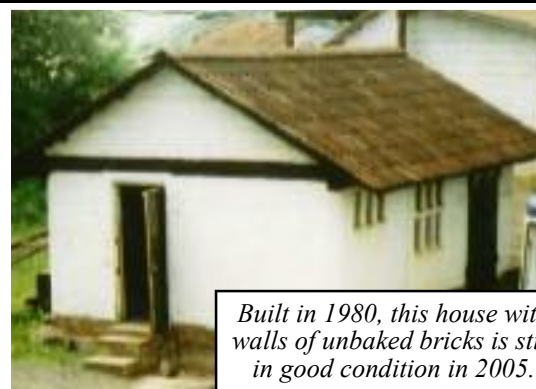
## HOW LOW INCOME HOUSE BUILDERS CAN FINISH THE JOB



*Within a structural frame which has protected it, this wattle and daub panel has survived for 25 years. The adjacent panel on the left is made more presentable by cement plastering the surface.*



*Another method using building rubble trapped between a framework of bush poles and bamboo laths has proved equally durable.*



*Built in 1980, this house with walls of unbaked bricks is still in good condition in 2005.*

PEOPLE IN MANY tropical countries have a remarkable flair for recycling compared with the West's "throwaway society". Various methods of constructing walls out of low cost or no-cost materials have been the subject of long term testing at Parry Associates' Cradley Heath base – over at least 20 years. In each case the material is

not used structurally but protected by being contained within a frame. Parry advice is available regarding the use of unbaked bricks, bamboo, pebbles and throwaway items such as car tyres, cans and bottles to complete the external and internal walls of the new type of affordable two storey house.

# THE PROCESS OF COFFERED FLOOR CONSTRUCTION



1. Foundations are dug for the columns in the normal manner with the ends of the four steel reinforcing bars (rebars) embedded into the base.

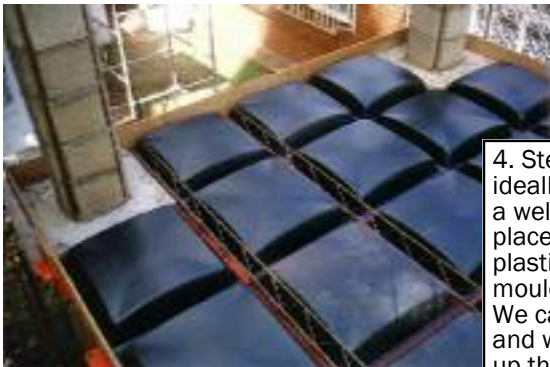


2. Block laying begins below the ground using conventional skills. The rebars are then grouted into the corners.

3. The vibrating formwork is installed in stages. A complete skeleton of steel frames is put in place on wooden props and made completely level before installing the grid of plastic coffer moulds.



5. The steel assembly is equipped to hold the portable vibrating machines (Parry Multivibe units). These are repositioned into different areas of the floor as each load of fresh concrete arrives.



4. Steel reinforcement ideally takes the form of a welded 'V'-shaped grid placed between the plastic coffer (or 'waffle') moulds. We can supply bending and welding jigs to make up these reinforcements to order.



6. Concrete is poured over the moulds.



7. While the concrete floor is being vibrated, the workers on the roof level the screed with trowels. The whole process takes 2 hours.

8. Minor blemishes on the underside of the floor can be attended to once the formwork is taken away after a week.



## PARRY ASSOCIATES: 30 YEARS CREATING LIVELIHOODS AND MEANS FOR AFFORDABLE CONSTRUCTION

JPM PARRY & ASSOCIATES Ltd is a design and engineering company which develops and propagates new technologies which are appropriate – in terms of cost, complexity and economic return – to the markets for which they are intended. The company provides services for clients (research, analysis, modelling, prototyping, implementation, etc.) and it designs and commercialises equipment on its own account. Parry Associates is based in Cradley Heath, in the heart of the UK's Black Country,

where it has the benefit of an unmatched range of engineering facilities at close range, in addition to its own workshops. Its staff of technicians, workshop operators and graduates, is supplemented by an extensive network of associate consultants. The company also has overseas associates, especially in the developing world, who not only provide a research and commercial network but support the company's experimental activity in local conditions.



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