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SKAT

FCR / MCR TOOLKIT

ELEMENT 10

The Basics of

Concrete Roofing Elements

Fundamental Information on the Micro Concrete Roofing (MCR) and the Fibre Concrete Roofing (FCR) Technology for Newcomers, Decisionmakers, Technicians, Field Workers and all those who want to know more about MCR and FCR

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Contents

MCR and FCR can be produced by men and women like here in Malawi

Introduction

Who may be interested in this booklet?

- MCR or FCR newcomers: All those who want to start producing MCR or FCR Elements.
- Decisionmakers: All those who have to take the decision, whether to work with MCR/FCR Elements or not.
- Practitioners: All those who are already producing or using MCR or FCR.
- All those who are interested in MCR or FCR and want to know more about it.

What yo can find in this booklet:

- Basic information about MCR and FCR.
- Some advantages and disadvantages of MCR and FCR.
- Guidelines that you should consider and first steps towards MCR/FCR.
- Hints and particular details to avoid mistakes.
- Addresses and literature for more detailed information.

What you can NOT find in this booklet:

There is

- No detailed technical information.
- No detailed instruction on how to produce MCR or FCR Elements.
- No specifications of costs and profit in your specific case.
- No information about particular problems in particular countries.

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What is MCR and FCR ?

Low cost, good quality
MCR and FCR are building materials which have been developed for the covering of roofs, in advanced and low cost building construction.

Concrete and fibre
MCR/FCR Elements are made of concrete which is a mixture of sand, cement, water and eventually with natural or artificial fibres.

Small scale production
These Elements can be produced either as tiles, sheets or semi-sheets, in small decentralized plants.

Job creation
Since the roofing elements are produced manually, many jobs - for men and women - can be created in rural and urban areas.

Foreign exchange savings
Both MCR and FCR require little initial investment and little energy input in production. Generally the raw materials are available locally; this means foreign exchange savings instead of importing asbestos, cement tiles and corrugated iron sheets.

Failures and improvements
Between 1977 and 1984 FCR sheet technology failed in many cases, mainly because of insufficient training of the producers and bad roof substructures. The solution to these problems has been the development of tile and recently semi-sheet production as well as improved know-how transfer. While the tile production and application has grown and spread all over the world, sheet production continued successfully only at selected places and further dissemination remained limited.

Further development
Though the technology has reached a satisfactory state already, further research and development is still needed. The members of the Roofing Advisory Service of SKAT, the main suppliers of equipment and many MCR and FCR practitioners in the field are continuously improving the equipment and the production methods. The main efforts of the Roofing Advisory Service are heading towards research in raw materials, the role of the fibre and optimizing the size and the shape of the elements, as well as the development of tools for better management, of quality control and marketing. Last but not least the development of new elements which require less timber for the supporting structure will be a need for the future.

A farmers house in Malawi covered with a bamboo substructure and semi-sheets

Using MCR and FCR Elements

Where a need exists

MCR and FCR are suitable in all places where a need for a low-cost locally-produced roofing material exists. In this case concrete roofing may be a viable alternative to the traditional roofing materials. MCR and FCR Elements may be used by anybody who knows how to handle and apply similar roofing materials like clay tiles or asbestos cement sheets.

Roofing Materials / Characteristics	Industrial Roofing	Fibre Concrete Roofing
Production Unit	Big Industry	Small Industry
Production Process	High Tech	Intermediate Technology
Capital Input	High	Low
Labour Input	Low	High
Know-how	Difficult to obtain	Easily available
Raw materials	Not always available locally	Usually available locally
Production Location of production	Centralized Usually abroad	Decentralized Local

Characteristics of Industrial Roofing Materials and MCR/FCR

Lack of traditional materials

During the last few years, traditional roofing materials have increasingly lost their importance. Grass and thatch roofs have a short lifespan and the raw material is getting scarce. Burnt clay tiles require much energy input in production and a heavy timber substructure on the house; in many countries wood is becoming scarce.

Disadvantages of new materials

The existing industrial alternatives as for example Asbestos Cement or Galvanized Iron are the most widespread of non-traditional roofing products. They have some disadvantages, since their production requires a high initial investment and there is no known way of scaling down manufacture to decentralized small-scale production.

For a typical Third World Country with dept problems and high unemployment rates, MCR/FCR offers mainly two advantages: it creates jobs and uses, to a great extent, locally available raw materials.

The market

Experience has shown that the MCR or FCR tile is usually competitive with all industrial roofing materials except in some cases with Galvanized Iron Sheets.

For the rich and the poor

MCR and FCR Elements are designed to meet high quality standards in strength, shape and color. Therefore they are used on upper middle class villas as well as on low-cost houses. Tiles meet the need for efficient protection of a building, but they can also be rather decorative.

Limits of application

Experience in many countries has shown that the main limitations to the production and application of this product are:

- Insufficient standard of craftsmanship in manufacture and installation.
- Improper curing or lack of curing.
- Deficient roof structures.
- Lack of good production and business management.
- Extreme weather conditions like hailstorms and hurricanes.
- Vandalism, certain ball games and fruit trees dropping heavy fruits.
- Deficient raw materials.
- Deficient tools and equipment.
- Uncertain social prestige.
- Public does not trust the new material.

It has to be noted however that the same limits apply to other materials to a varying degree, particulary in the case of hurricanes.

Producing MCR and FCR Elements

In a small workshop

The production of MCR and of FCR Elements is labour intensive. It can take place close to the point of use and in a small workshop. A minimum of infrastructure, equipment and at least 2-3 workers are needed to work with one vibrating table.

By men and women

Both production and mounting of the MCR or FCR Elements can be made on the spot and by local (male and female) workers. So the cost of transportation of the finished product can almost be eliminated.

Training is a must

The simplicity of the technology makes it easy though inevitable to acquire the requisite technical skills in a relatively short period of training time. Professional training is offered by regional MCR/FCR centres and by suppliers of equipment.

Preparing the mortar

The first step of production is similar to the process of mortar preparation in basic masonry practice. For FCR the fibre is chopped up to a length of about 15-25 mm and mixed with the basic ingredients (sand, cement, water and fibre) into a concrete mortar.

Forming the tile

One of the most demanding and skill-intensive aspect of MCR and FCR production is the transformation of the fresh mortar into tiles or sheets. This involves spreading the fibre concrete mix on a vibrating table, compacting it by vibration and then lifting the wet concrete screed and casting it on a mould.

Curing and drying

On the mould it is dried for 24 hours. The "green" tiles are then placed into a tank filled with water for a curing period of two weeks. After the curing the hard tiles are dried for another two to three weeks before they can be used for installation on the roof.

Special transport

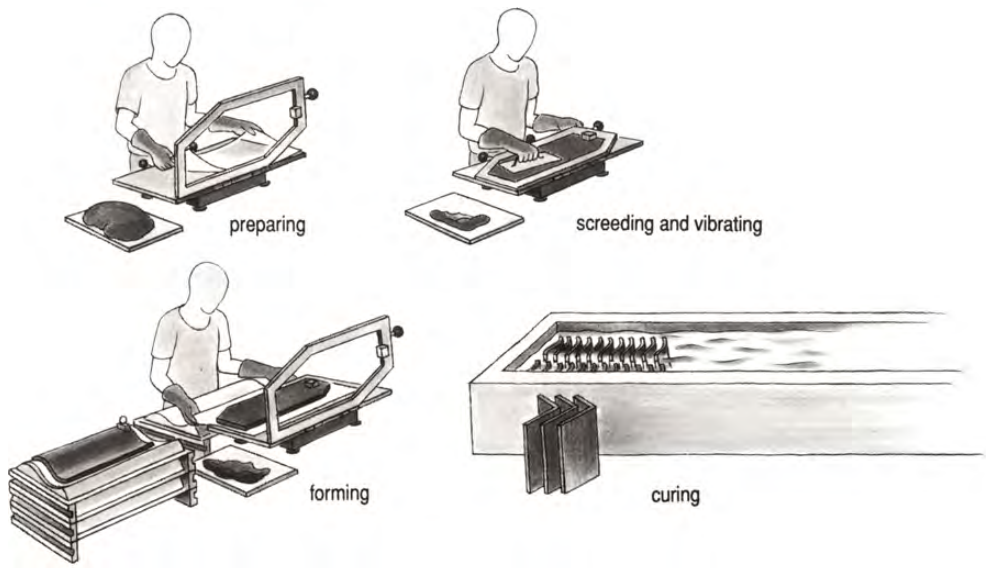
Since fibre concrete is a brittle material it has to be handled and laid with care. Whenever possible the tiles should be transported directly from the workshop to the building site. The transport vehicle must be specially prepared, e.g. with a bed of sand on the platform, so as to guarantee a smooth journey.

It is a sound technique...

The production of MCR and FCR is a sound technique and much practical experience is available. Failures can be identified and are usually due to production errors. Ongoing research and development as well as the evaluation of experiences will lead to the necessary improvement of know-how.

... if professional training is provided

Tile making can be started in most places with a fair chance of success, if professional training is provided and if the appropriate method is chosen. Beginning production should take into account the history and the state-of-the-art and not simply be in the spirit of "appropriate technology enthusiasm", trying to reinvent the wheel by making the same mistakes many others already have.



The four steps of tile production

MCR and FCR for organizations

What is the target

In principle everybody can produce and work with MCR or FCR. The question is whether producer and user are the same persons or not. Depending on the individual case, different problems and expectations will occur. One can distinguish between private entrepreneurs who have to make a profit from the production and Non Governmental or Governmental Organizations where financial profit is not a main target.

The producer is the user

The situation of Non Governmental and Governmental Organizations is rather easy because if the producer and user are the same organization, the problems are more production orientated. Acceptance of the product is easier in such cases, because the users are involved in the production process. On the other hand it has to be considered that a small industrial project like a MCR or FCR workshop should be able to become selfsupporting. Therefore MCR/FCR producers for Non Governmental or Governmental Organizations should be able to meet the same demands as the private entrepreneurs.

Many profits

For an Non Governmental or a Governmental Organization economics are not purely valued in profit but in socio-economic benefits such as

- job creation
- import savings
- use of local materials
- improvement of the roofing technology.

MCR and FCR offers above benefits and therefore it is a very interesting option for these organizations.

Three villages of a leprosy relief project in India are producing and using FCR sheets since many years

MCR and FCR for private entrepreneurs

Marketing of the new product

In cases where the producer and user are separate, as it is mostly for private MCR and FCR entrepreneurs, marketing becomes one of the main problems. Quality standards and costs will be judged by the market.

Quality control and guarantees

The buyer will ask for guarantees from the producer. But the quality of the roof depends as well on perfect production and quality control as on the appropriateness of the substructure and on how the roofing elements are mounted on the roof. In cases where the producer sells directly to the user he might be in a position to provide assistance and advice on the roof design and on the mounting of the tiles.

Good installation

The producer should be able to give guarantees for the product; but in many cases he has no influence on how the roofing elements are installed on the roof substructure. MCR and FCR products therefore should only be sold to customers who accept the installation of the tiles or assistance by the MCR/FCR producer.

A private producer selling FCR tiles in Kenya

How to start MCR and FCR

If you are considering starting working with concrete roofing elements or starting running an MCR or FCR workshop, please reflect carefully on the following points:

- professional training
- infrastructure and equipment
- marketing and management.

Please start your reflections by answering the following ten questions.

Ten key questions

yes	no	
❑	❑	Is there a genuine demand for a roofing alternative?
❑	❑	Are all the following materials available in your locality: • cement • sand • water • eventually organic fibres • good timber or metal supporting roof structures?
❑	❑	Do you have a secure, dry site with good access?
❑	❑	Can you use or sell a concrete roofing product that costs 2 to 4 US$ per sq.m in production?
❑	❑	Are you equipped for careful manufacturing with close supervision, maintenance of equipment and quality control?
❑	❑	Are you aware that there is expenditure involved before you can even try out this technology?
❑	❑	Are you prepared to pay high attention to the initial knowhow transfer and professional training as well as to continued education and service?
❑	❑	Are you aware that MCR and FCR manufacturing may present some initial problems like any other production method? These problems can be mastered by good workers and good management.
❑	❑	Are you interested in creating jobs and saving foreign exchange?
❑	❑	Do you realize that all building materials have a limit to their service life?

If you answer every question with yes, you have the potential to go into MCR or FCR technology. If not, you are advised to contact one of the specialist organizations for assistance in decisionmaking.

Ten steps to start a successful workshop

1. A feasibility and market study should be made in any case. For a single workshop it may be carried out with the help of a simplified method by a potential workshop owner himself. An MCR/FCR regional centre or a development project will require a more detailed study by a specialized person.
2. The definition of the products to be sold and the required productivity output for competitive marketing will be a result of the feasibility study. In many cases it is wise to produce several concrete products to spread the risk.
3. The securing of the financing of the workshop investment and the running capital is the next step which has to be made based on the results of the market study.
4. The terms of reference for the equipment must be clear for every single case.
5. The purchase and the installation of the equipment can be made simultaneously with the preparation of the site and the building.
6. The initial professional training course before or a short time after the beginning of production has to be attended at a competent institution.
7. The initial production will be a three to six month period of trial and error for the workshop team.
8. Improving the production method, quality control, productivity and application will be the next step which may be facilitated with the assistance of the Roofing Advisory Service or other competent partners.
9. Careful monitoring of the production process and quality control will be a continous task for the successful producer.
10. Good marketing, assistance to the installing persons and a certain service for maintenance of concrete roofs are additional tasks of a successful producer.

The Roofing Advisory Service at SKAT offers the tools

The Roofing Advisory Service has established several tools for the planning and running of an MCR or FCR workshop. SKAT will be pleased to send information about to you on request.

Marketing

A new product hasn't a ready sale

The building material market is conservative. It takes time and effort to introduce a new product. It is the dynamic (acceptance) of the market, which decides whether a product is appropriate for a given situation. That means, the producer has to improve his marketing efforts and, if necessary, the quality or the appearance of the product.

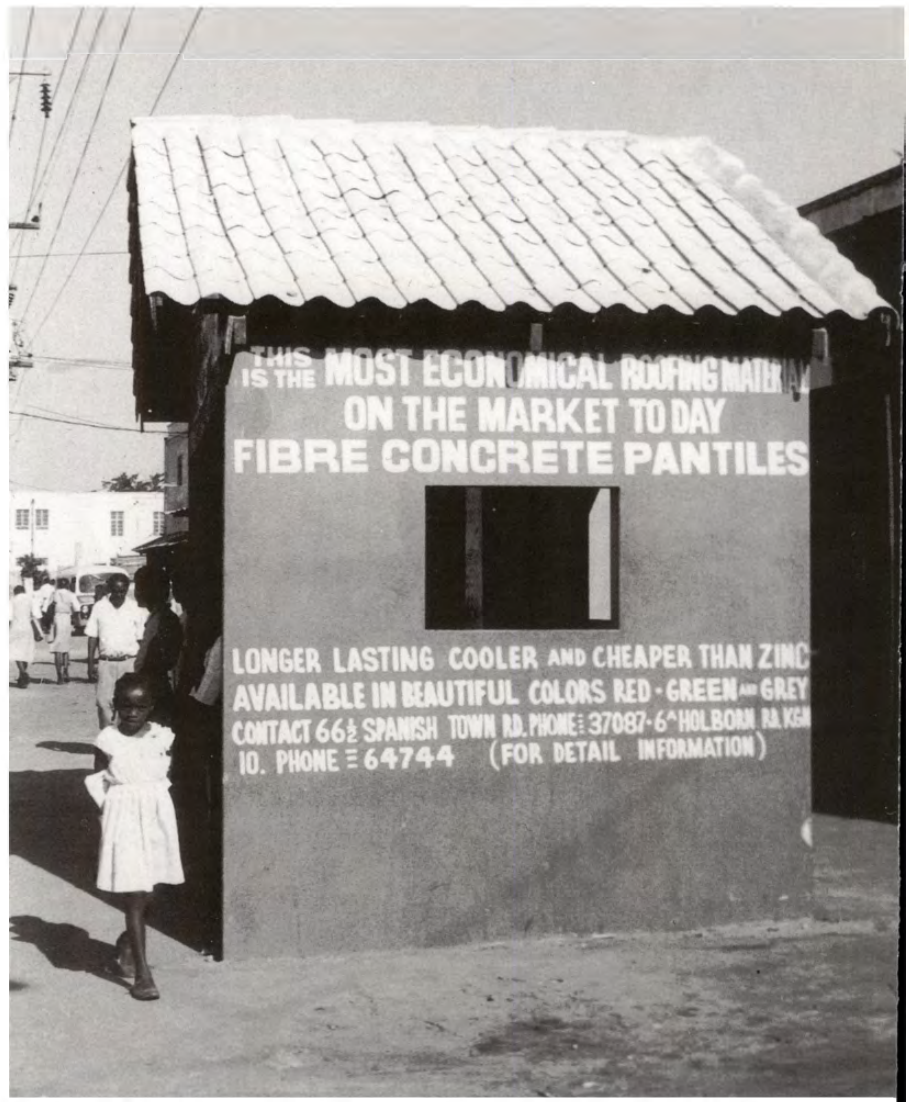
Proved quality standard

MCR and FCR Elements should last ten or more years. Therefore the careful producer will be interested in offering a certain guarantee to the customer. And he wants his products differed from others of lower quality. This can be made with a quality seal which is provided by an approved MCR or FCR institution.

Not in a shop

It is risky to sell MCR and FCR Elements in small building material shops "around the corner". Most probably the tiles would not be handled with the necessary care by salesmen and customers. Preferably the tiles and sheets should remain in the hands of persons, if possible professionals, who feel responsible for a careful handling of building materials.

A seal of a national MCR centre approving high quality standard of the product helps marketing the tiles



Busstop in Jamaica serving as demonstration and public relation building

Management

Problems are guaranteed...

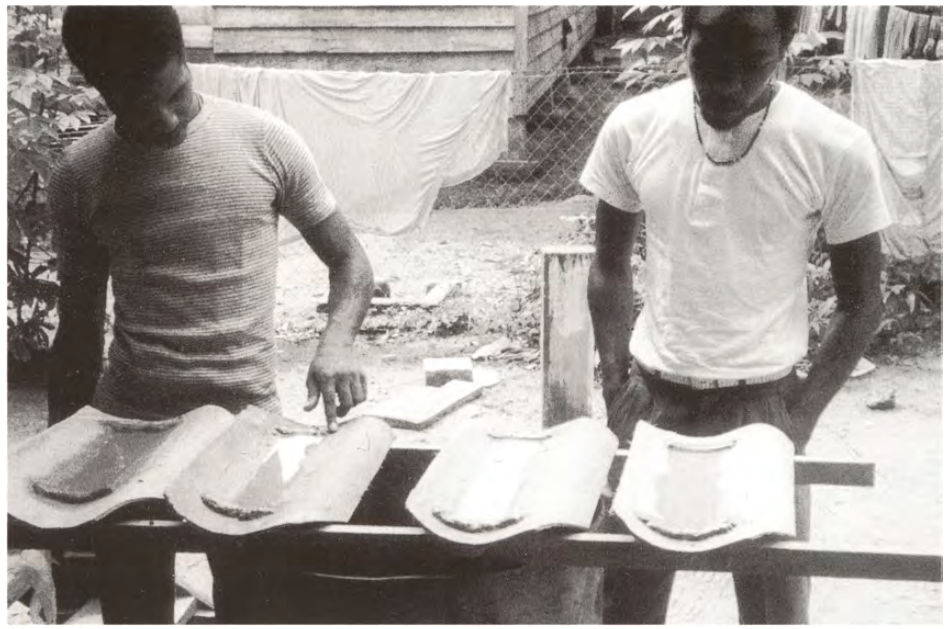
Improper "wild" production will most probably lead to bad prestige and to problems in the quality of the product.

... if management is neglected

Like any industrial or semi-industrial process, MCR and FCR production requires good management. This includes the acquisition of raw materials, hiring and guiding qualified workers, daily control of productivity, maintenance of equipment and workshop etc.

Quality control

The most important part of successful MCR and FCR production is continous quality control of raw materials as well as control of the finished product and its application on the roof. This includes testing cement, sand, fibre and water quality and also load bearing, impact strength and the water tightness of the elements. Guidelines for quality control are available at the Roofing Advisory Service at SKAT.



Regular quality control, here testing the water tightness in Surinam, is a must for every producer

Routine check of the load bearing capacity of a tile in Dominican Republic

Professional training

Training is a must

MCR and FCR production need professional training both in technique and business management. Therefore you must consider that most failures in MCR/FCR production and application so far were due to no or bad knowhow transfer and insufficient professional training.

Process of development

Since the technical rationale of MCR and FCR is still in a process of development, and marketing as well as management methods also have to be improved, the decision-makers should be kept conversant with the most up-to-date data and facts and the practitioners should be well trained before they start their production.

Hardware and knowhow

A good MCR/FCR hardware kit must be accompanied by a well adapted knowhow transfer package and professional training, if the production has to be successful in the long run.

There are different forms of MCR and FCR knowhow transfer like training courses, management guidelines, technical manuals etc. One has to choose the appropriate form for each specific case.

The dissemination of knowhow adapted to the local demands can be done through regional or national MCR/FCR centres, as they exist in some countries already.

For any question about MCR or FCR knowhow transfer and training facilities you are welcome to ask the Roofing Advisory Service at SKAT.

Martin Melendez giving a training course at a regional MCR centre in Dominican Republic

Rooflaying and roof construction need special training

Raw materials

Basic materials

The basic raw materials required for the production of MCR and FCR are cement, sand, eventually fibre and water. Optionally, colorants in the form of standard natural or chemical pigments, such as those already in use by the concrete industry, can be added.

Good cement

Ordinary Portland cement is the type used for MCR and FCR. In order to achieve the desired results in strength and durability, it is essential that the quality of cement measures up to the standards required for normal concrete and masonry practice. In some cases the use of pozzolanic binders may be taken into consideration.

Natural fibres

The chopped fibre plays its main role in giving a better cohesion to the fresh mix and it enables the moulding of corrugated products. It is possible to use many types of natural fibres in concrete roofing elements as long as they are clean. Coconut husk, stem fibre as for example jute or leaf fibre such as sisal are the most common examples of vegetable fibres which have been used with success.

No fibres?

Recent research has shown that tiles can be produced without fibres. This technology, named Micro Concrete Roofing (MCR), requires more care in the selection of raw materials (e.g. grading of sand). However the quality of MCR is compatible to that of FCR.

Ordinary sand

Normally any type of clean sand which is suitable for cement mortars can be used for MCR and FCR. Sand with particle sizes between 0.125 mm and 2 mm is suitable. Aggregates up to 4 mm may be added in MCR elements.

Clean water

The production of good quality MCR and FCR requires good quality water, preferably standard potable water.

Golden age home in Jamaica

Workshop and site

Selection of a site
The MCR and FCR workshop needs a minimum of infrastructure: site and buildings. The accessibility and availability of water and to some extent sand have to be taken into account when selecting a site.
Electricity from the main or from batteries has to be available when using an electric vibrator.

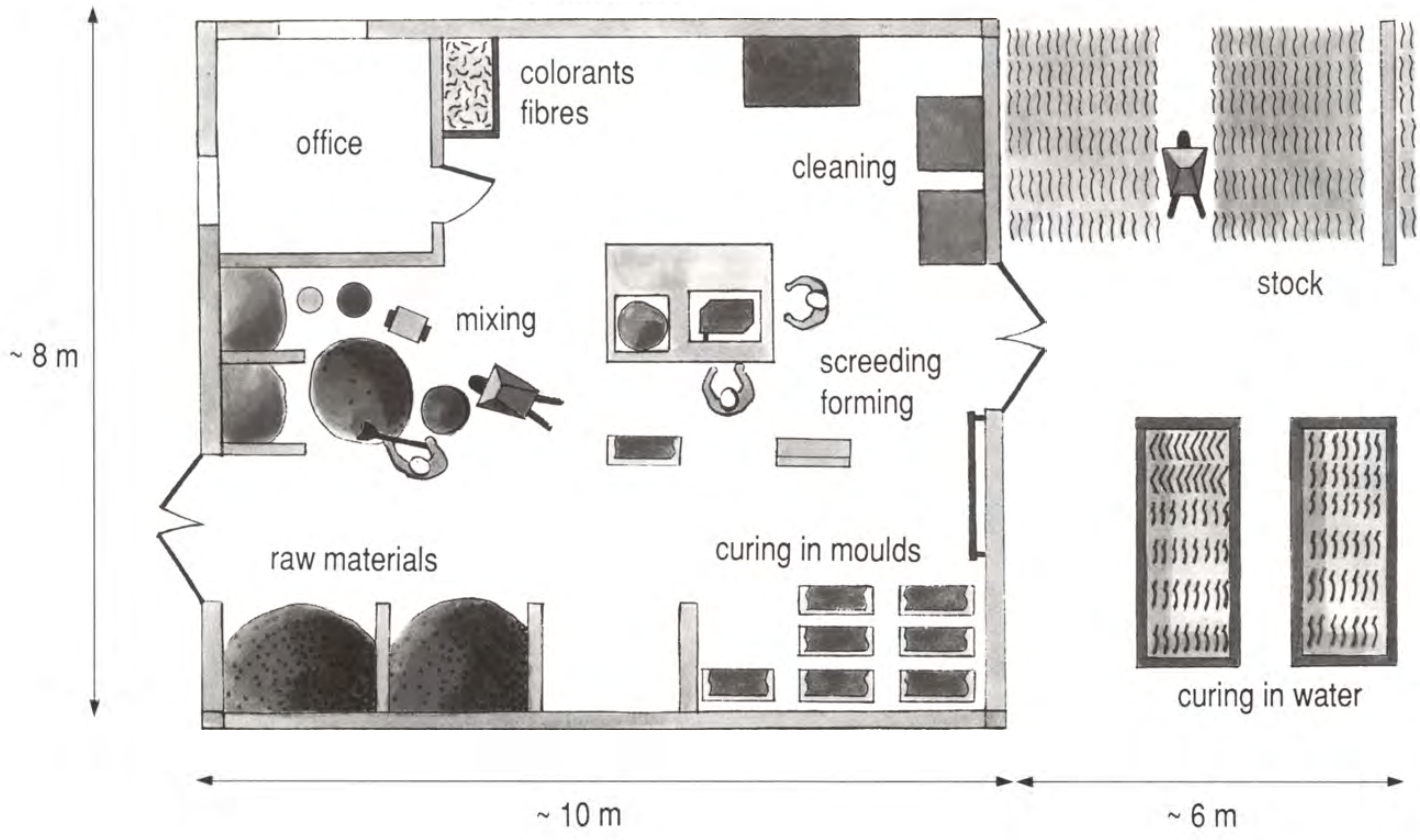
Enough water
Water is in constant demand; not only for mixing but also for general cleaning and refreshing of the curing tanks. Therefore the site must offer a reliable water supply.

Store and office
There must be a room for storage and safekeeping of cement and tools and some provision for administration would be useful. This room should be closed by a door.

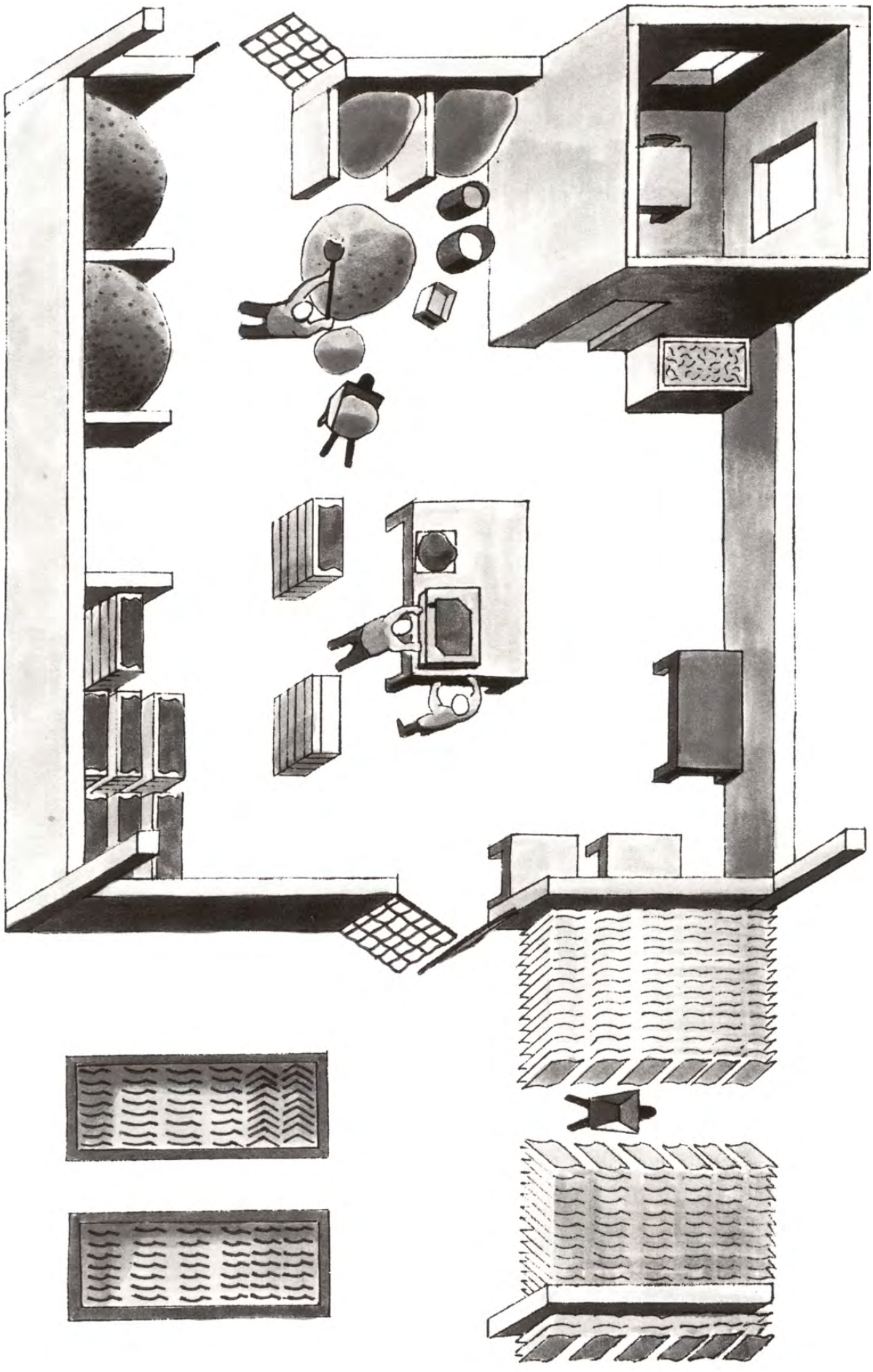
Working space
The production of MCR and FCR has to take place under cover. The space in the workshop is needed for storage of sand and fibres, mixing, screeding and compaction of the mortar on the table, storage of fresh roofing elements and storage of moulds. For a one-table-operation a covered floor area of about 25 to 35 sq.m is recommended.

Curing tanks
The curing tanks are situated close to the workshop. They can be dug out or built up by using bricks or concrete.

Storing and manoeuvring
Additional space is needed for the finished roofing elements. Sufficient manoeuvring space for vehicles bringing raw materials or collecting finished products must be available.
The recommended minimum area is about 200 sq.m, more space may be useful for future expansion.



Typical lay-out of a MCR/FCR workshop



Equipment

Special equipment
The production of Fibre Concrete Elements requires special equipment which can be obtained from specialized suppliers. Though some pioneer FCR producers have developed their own equipment with some success, experience has shown that this cannot be recommended in general.

Selfmade equipment
Do not try to develop your own MCR and FCR equipment. So far no self-built vibrating table meets the quality which is necessary for reliable broad dissemination at a competitive price.

Vibrating screeding table
The vibrating table is the main piece of equipment for tile and semi-sheet production. The vibrating device can either be hand- or foot-powered or driven by a car battery or connected to the mains. The metal table is covered with a special plastic sheet before the fresh concrete mix is screeded on it.

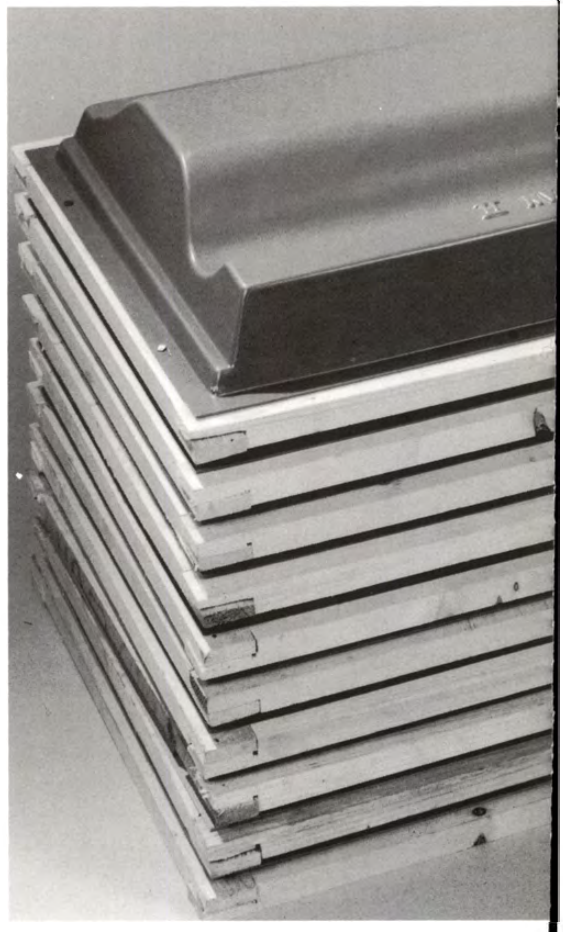
Pedal driven prototype vibrating table in Nepal

Workshop with curing tanks in Malawi

Wooden or metal bench
The vibrating table is fixed on a working bench, on which other accessories may be placed also.

Accessory tools
A set of masonry equipment, i.e. spades, measuring pans, sieves and a trowel, sand and cement batching boxes, a fibre cutter, fibre weighing balance and a shovel are the basic tools.

Moulds
Moulds are obtainable for several shapes and sizes of tiles. To start MCR or FCR production a set of at least 100 moulds for regular tiles and some additional moulds for ridge tiles are required. The moulds are usually made of either PVC or fibre glass when sold by a supplier or of concrete when produced locally.

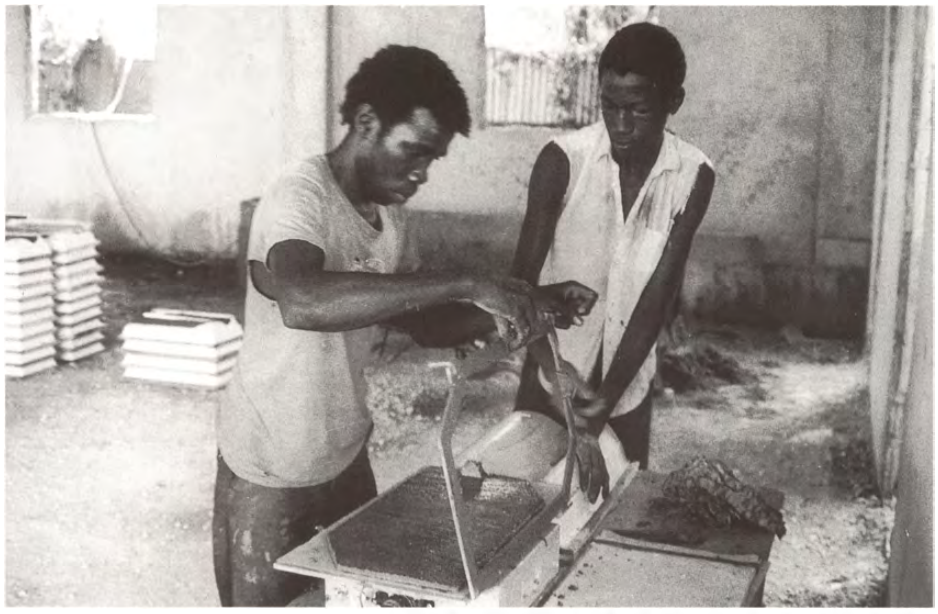


Curing area

The curing tank is usually made of clay bricks, concrete blocks or stone. Whenever possible the air curing area should be protected from the sun by a shed.

Sheetmaking equipment

The equipment described above is for MCR and FCR tile or semi-sheet production. MCR/FCR sheet production requires a quite different table. Since compaction is done by hand a solid wooden table with a frame is required to prepare the matrix while corrugated asbestos sheets serve as molds.



Producing tiles with an electrical vibrating table

The moulds must guarantee air-tight stacking of the green tiles

Buying an equipment set

If you buy a set of equipment, we strongly recommend to ask for a good service network providing spareparts and technical assistance in the case of production problems arising.

We strongly recommend not to "reinvent the wheel". Equipment design and production is a very demanding and expensive task. It should be reserved for large development programmes. Therefore you normally buy a kit.

The new semi-sheet vibrating table

Roof design

Covering a roof with semi-sheets

A most important part

The importance of the supporting structure of a roof is often underestimated. Most damages to concrete roofing elements on roofs can be tracked down to faults in the roof structure and in the way the elements were placed and fixed.

Be aware of wind suction

In many cases the wind suction is higher than the wind pressure on the roof. If the roof structure is not designed to these strong uplift forces, heavy winds may destroy the whole roof. This fact has to be considered in any kind of roof, be it covered with corrugated iron sheets, clay tiles or concrete elements.

Roof design

The design of the roof for tiles and sheets should be simple. The minimum pitch should be 22° in moderate climatic areas, whereas 30° are recommended for areas where torrential driving rains occur.

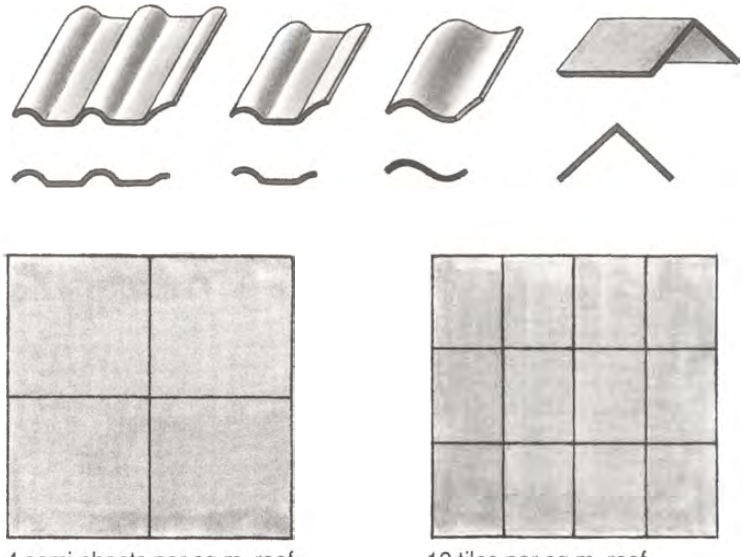
The span of the rafters should not exceed 3,5 metres for lean-to roofs and 6 metres for gable roofs. For wider buildings, triangular trusses provide an economical solution up to a limit of around 10 metres width.

Rigid timber structures

Good quality timber is desirable for the roof substructure though wood is getting scarce and expensive. Tiles and in particular pantiles are more adaptive to uneven substructures than semi-sheets and sheets. Pantiles may even be used on carefully selected poles. The timber consumption of a correctly dimesioned substructure is about equal for concrete tiles, semi-sheets or sheets as well as for a corrugated iron sheet roof. A clay tile roof normally requires more timber.

Careful craftsmanship

The installation of the substructure and the laying of the sheets should be done by a team of specialised carpenters and tilemakers. The tiles are fixed to the laths with special wire loops or fixing bolts.



Shape and size of the tiles may be adapted to the local needs

Tiles, sheets and semi-sheets

MCR and FCR Elements exist in three sizes: tiles, sheets and semi-sheets, which may be coloured according to your taste.

Tiles

The dimension of the tiles can be adapted to the local needs. So far the FCR tiles produced all over the world are mostly formed as pantiles or roman tiles of 25 cm by 50 cm and 6 mm thickness (up to 10 mm for high risk areas). The handling of the tiles is easy since their weight is only 2 kg. Because they are brittle like any clay or concrete product, they must be handled with the same care as a clay tile.

Semi-sheets

The semi-sheets are designed to improve the efficiency of production output and to ease the installation on the roof. So far semi-sheets have a size of 60 cm by 60 cm. Other shapes and sizes may occur in the near future.

Sheets

The dimension of the sheets vary between 50 to 80 cm width by 100 cm length and 10 mm thickness. In some cases the sheets may be a useful alternative to the tiles provided they are produced, transported and installed with great care.

Tiles or sheets

In most cases however the Fibre Conrete tiles or semi-sheets will be the more appropriate product and cause less problems than the Fibre Conrete sheets.

Product size (Dimensions)	**Thickness**	**Effective cover**	**Weight per m²**	**Cement content**	**Cement per m²**
Tiles 500x250 mm	6 mm	0.08 sq.m	20 kg	0.4 kg	5 kg
Semi-Sheets 600x600 mm	8 mm	0.25 sq.m	29 kg	1.8 kg	7.2 kg
Sheets 1000x780 mm	10 mm	0.62 sq.m	32 kg	9.0 kg	15 kg

Summary of basic production data for comparison between FCR sheets, semi-sheets and tiles

Tile workshop in Kenya △

Producing sheets in Nicaragua ▽

What does it cost?

The workshop

The typical cost structure of an MCR or FCR workshop in a Third World Country looks as follows:

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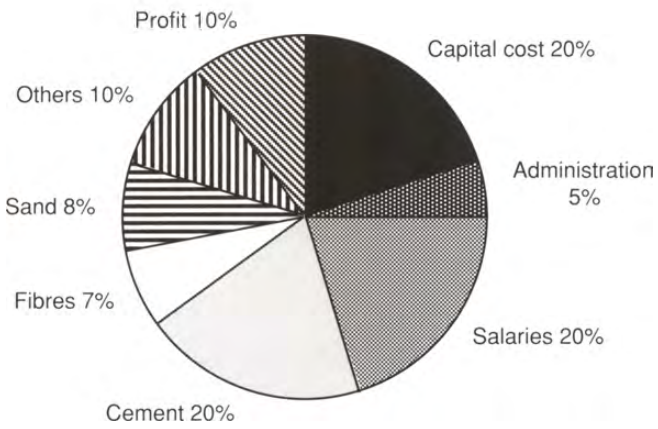

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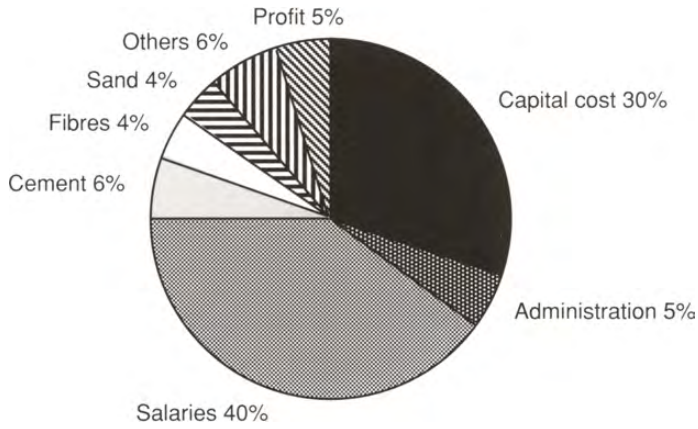
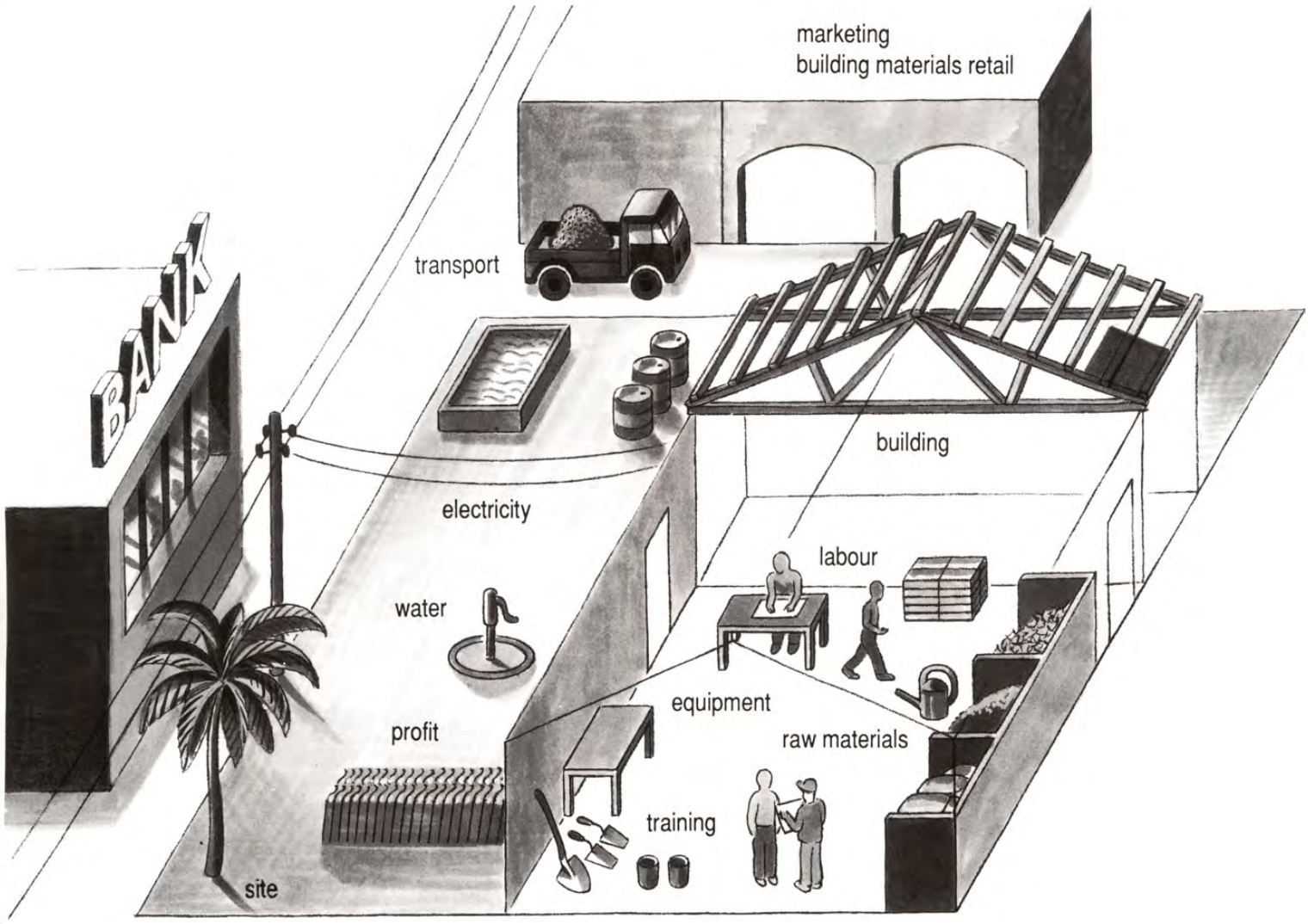


The cost structure includes amortisation and interest for: equipment, building and land, know-how transfer and working capital. The capital investment for an electrical vibrating table with 200 moulds is around US$ 4.000. Adding working capital, costs for site and building, the investment is between US$ 7.000 and US$ 12.000.

Tiles made per week	1.000	2.000	5.000	10.000
Value of annual turnover (US$)	12.000	24.000	60.000	120.000
Number of production lines	1	2	5	10
Workforce (Direct Labour)	3	5	12	24
Minimum covered space required for Workshop Area (sq.m)	25	50	200	400
Minimum external yard area needed (sq.m)	40	80	200	350
Ex-works value of equipment to be supplied (US$)	4.000	8.000	19.000	38.000

Approximate investment costs at different scales of output (in the year 1989). To these costs you will have to add the investment for the building, fencing, water supply, etc. as well as the working capital.



Synoptic view of cost factors in a MCR and FCR project

A square metre of tiles

Once a workshop is installed, Fibre Conrete sheets or tiles can be produced in most countries at a cost between 2 and 4 US$ per sq.m. This includes costs for raw materials, labour, depreciation, profit and interest for initial investment.

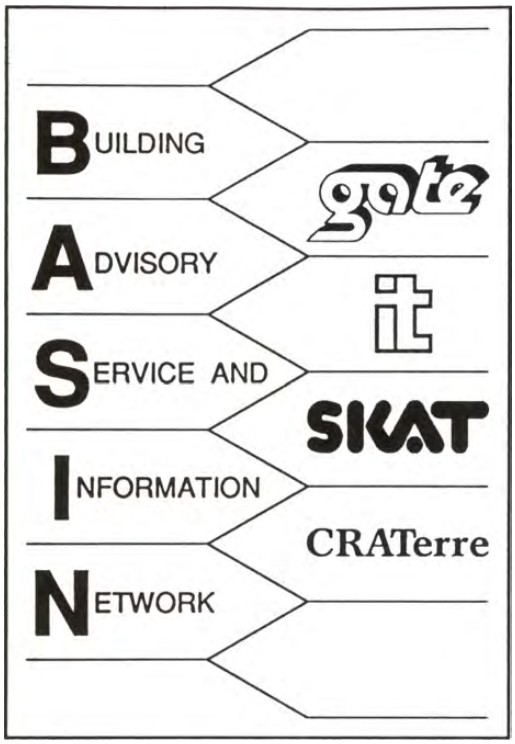
A competitive material

Analysis of field-experience allows the following statement: Compared with other roofing methods, a fibre concrete roof including roof structure can be built at 2/3 to 3/4 of the cost of a similar roof covered with Asbestos-Cement. There is no apparent difference in the costs of the roof structure whether concrete roofing tiles or sheets are used.

The most serious competitor

Galvanized Iron Sheets are the most serious competitor to MCR and FCR. However, this is only apparent: Galvanized Iron Sheets have usually a lower life expectancy and the roof substructure needed is the same as for MCR/FCR if made properly. However, these quality arguments often do not count for buyers with low income, and the correct roof substructure is in most cases neglected.

The conclusion is that in comparison to Asbestos Sheets MCR and FCR are "as good but cheaper" and that in comparison to Galvanized Iron Sheets MCR and FCR "are better in quality and in the medium run as cheap".



BASIN

Building materials and construction technologies that are appropriate for developing countries, particularly in the low-income sector, are being developed, applied and documented in many parts of the world. This is an important prerequisite for providing safe, decent and affordable buildings for an ever-growing population.

But such new developments can do little to improve the building situation, as long as the information does not reach potential builders. The types and sources of information on standard and innovative building technologies are numerous and very diverse, making access to them difficult.

Thus, in order to remedy this drawback, GATE, ITDG, SKAT and CRATerre are cooperating in the Building Advisory Service and Information Network, which covers four principal subject areas and coordinates the documentation, evaluation and dissemination of information.

All four groups have a coordinated database from which information is available on Documents, Technologies, Equipment, Institutions, Consultants as well as on Projects and Programs. In addition, printed material or individual advice on certain special subjects is provided on request. Research projects, training programs and other field work can be implemented in cooperation with local organizations, if a distinct need can be identified and the circumstances permit.

BASIN is a service available to all institutions and individuals concerned with housing, building and planning in developing countries, but can only function efficiently if there is a regular feedback. Therefore, any publications, information, personal experiences, etc. that can be made available to BASIN are always welcome and will help BASIN to help others.

Advisory Service provided by

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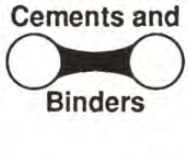
GATE (German Appropriate Technology Exchange) a programme of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, acts as a centre for the dissemination and promotion of appropriate technologies for developing countries.

The Information and Advisory Service on Appropriate Technologies (ISAT), a project of GATE, has accumulated specific know-how in the wall building sector through its own research and development programmes, studies and publications. Own capacities and a team of experts are available for advice on wall construction and wall building materials.



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The Intermediate Technology Development Group (ITDG) is an independent British charity, founded by Dr. E.F. Schumacher, author of Small is Beautiful, to help increase the income-generating and employment opportunities of small-scale industrial activities in developing countries.
ITDG offers expertise in a wide range of technical areas (eg Mineral Industries, Shelter, Agro Processing, Textiles), provides advice and assistance in the selection and application of appropriate technologies aimed at improving the productivity of communities and small enterprises, and provides several other services through the Group's subsidiaries.

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SKAT (Swiss Center for Development Cooperation in Technology and Management) is a documentation centre and consultancy group which is engaged in promoting appropriate technologies in the Third World.
The services of SKAT are: 1. Technical Enquiry Service; 2. Consultancies, Projects, Studies; Documentation Centre; 4. Bookshop; 5. Publishing Department; 6. International Cooperation; 7. Public Relations for Appropriate Technologies.
SKAT's main fields of activity are Building Materials, Energy (with emphasis on hydropower), Small-Scale Industrial Development (with emphasis on the metal-working industry), as well as Water, Sanitation and Wastewater.

Advisory Service provided by

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CRATerre, the International Centre for Earth Construction, is a non-governmental, non-profit organization of the School of Architecture of Grenoble, dedicated to the promotion of earth as a building material.
CRATerre has an integrated working method in which research, application, consultancy, training and communication are permanently linked.
The three main programs of development are: i. Industrialization; ii. Economic Housing; iii. Preservation.
The competence of CRATerre covers every aspect of the different earth construction technologies at all levels.

Literature

Publication available at SKAT updated until September 1993

1. BASIN-NEWS

BASIN-News is the communication and information journal of the Building Advisory Service and Information Network (BASIN) The subscription of this journal is free of charge to readers from developing countries, groups and individuals involved in work for the Third World. This journal replaced the previous FAS-News, which was in particular oriented towards the FCR/MCR technology. The FAS-News are still available to interested persons. Practical hints and tips for the implementation of roofs are now provided in a separate RAS "Technical Bulletin" to practitioners.

2. FCR/MCR Toolkit

The entire know-how required in the field of MCR and FCR technology (Micro and Fibre Concrete Roofing) is now available in a Toolkit covering all technical questions as well as the economic, organizational, management and marketing aspects. This Toolkit is divided into different parts; promotion, technology and economics. These different parts are addressed to particular interested groups like; tile producers, managers, promoters, architects, government officials etc.

This whole Toolkit (see below) as a unit is meant for national FCR/MCR reference centres and /or libraries. For individuals, the different elements can be ordered according to need and interest. The price per element is between 25.- to 50.- Sfr.

3. Product Information Fibre Concrete (FCR) / Micro Concrete (MCR) Roofing Equipment Product Information, a GATE publication.

This Product Information Portfolio was conceived to inform users as objectively as possible about FCR/MCR roofing in general, and more specifically about the available equipment, as well as selecting and buying the most suitable type.
This GATE publication shows all available FCR/MCR tile production equipment. Order from GATE, free of cost

4. FCR - Fibre Concrete Roofing

Co-publication by SKAT and IT-Publications. 1987. 185 p., sev. tables, phot. and illus. Sfr. 25.- (Switzerland) £ 7.95 (UK).
A comprehensive report on the potential of FCR, the limits of application, the state of the art.

5. Appropriate Building Materials

A catalogue of potential solutions. By Roland Stulz and Kiran Mukerji. Revised third edition 1993. SKAT/IT-P/GATE. 430p Order-Nr.SKAT-7-002 (Sfr. 35.-)

Gives an introduction to basic knowledge of low-cost construction technology; a survey of examples of appropriate building materials which are field proven.

The following publications can be ordered by:

INSTEAD
Technology and Employment Branch,
International Labour Office,
CH-1211 Geneva 22, Switzerland

1. Tuiles en fibromortier.

Procédé de production et pose en toiture. ILO. 1988, G.Brys. (Sfr.15.-)
Detailed description of the FCR technology - raw materials, equipment, production process, production organization, quality control - and small scale enterprises.

2. Fibre and Micro Concrete Roofing Element

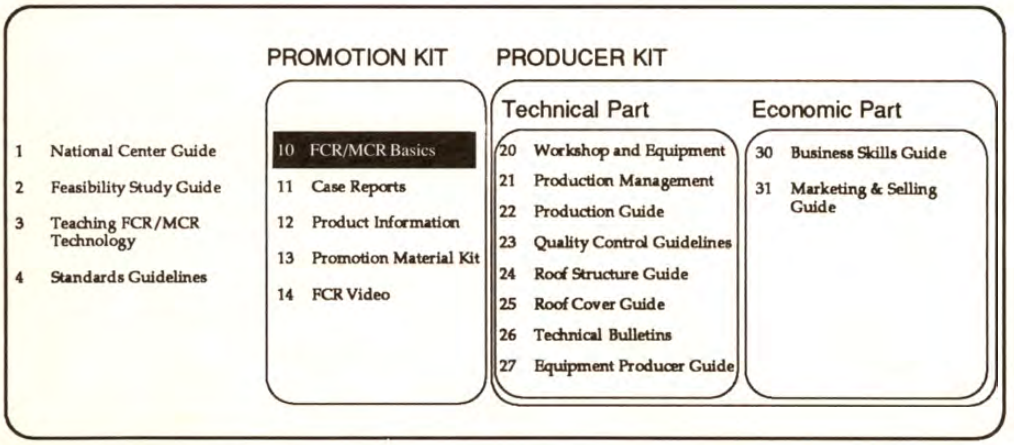
This publication describes the FCR/MCR tile production process and tile laying techniques. ILO. 1992, G. Brys. (Sfr. 15.-)

3. Building Technology Series

Technical reports on FCR/MCR project implementation from various countries in Africa and Asia. These reports are free of cost.

FCR / MCR TOOLKIT-OVERVIEW

NATIONAL CENTER KIT



The Roofing Advisory Service (RAS) at SKAT

The Roofing Advisory Service has been founded to serve as an information centre specialized in all aspects of roofing materials and their application. In close collaboration and coordination with professional organizations (BASIN partners and others), housing experts and practitioners, the Roofing Advisory Service offers technical and managerial advice and knowhow to all organizations and individuals interested in producing or disseminating roofing materials.
The Roofing Advisory Service offers GENERAL SERVICES as for example networking, organization of seminars and meetings, promotion of regional MCR/FCR centres, the BASIN enquiry and answer service, monitoring, BASIN News and a Technical Bulletin, processing and systematization of MCR, FCR and other roofing material information.

The Roofing Advisory Service produces TOOLS needed for roofing material dissemination such as: guides for feasibility and market studies, checklists for potential entrepreneurs, manuals, testing facilities for raw materials and FCR/MCR products, case studies, study on best size and shape of products, on the need for fibres in the product, use of pozzolanas, and equipment requirements.

- Do you have questions and ideas on MCR or FCR?
- Do you have information which may be important for our activity, for example contributions to our Technical Bulletin?
- Do you produce, or want to produce MCR/FCR products?
- Do you know institutions or individuals interested in receiving roofing information?

Then, please do not hesitate to contact us!

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