21

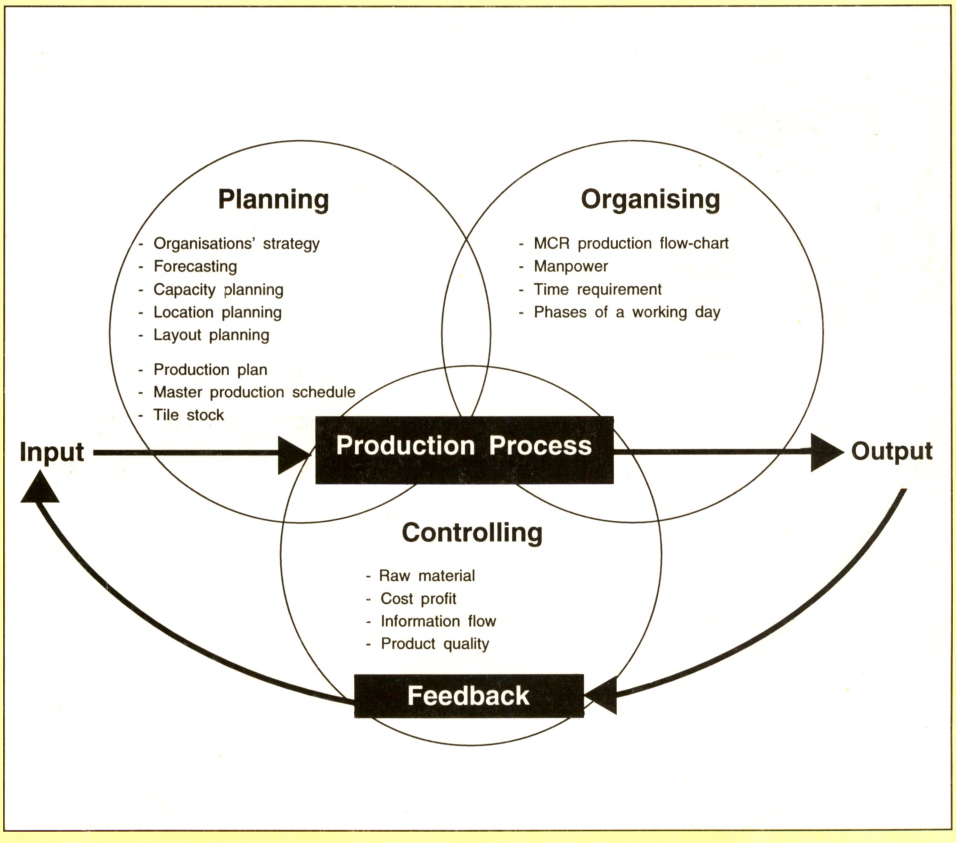
SKAT

MCR TOOLKIT ELEMENT 21

SKAT Swiss Centre for Development Cooperation
in Technology and Management

PRODUCTION AND OPERATIONS' MANAGEMENT

Production and operations' management for a profitable MCR tile business



BASIN

SKAT

CRATerre

Swiss Centre for Development Cooperation in Technology and Management

PRODUCTION AND OPERATIONS' MANAGEMENT

MCR Toolkit – Overview

National Centre Kit

1 National Centre Guide
2 Feasibility Study Guide
3 Teaching FCR/MCR Technology
4 Standards' Guidelines

Promotion Kit

10 FCR/MCR Basics
11 Case Reports
12 Product Information
13 Promotion Material Kit
14 FCR Video

Producer Kit

20 Workshop and Equipment
21 Production and Operations' Management
22 Production Guide
23 Quality Control Guidelines
24 Roof Structure Guide
25 Roof Cover Guide
26 Technical Bulletins
27 Equipment Producer Guide

30 Business Skills Guide
31 Marketing and Selling Guide

Authors: Heini Müller, **AProCon**, Nepal
Paul Gut, Intep AG, Zürich, Switzerland

Editing Committee: Karl Wehrle, SKAT
Roland Stulz, Intep AG

Co-Published by: **SKAT**, Swiss Centre for Development Cooperation in Technology and Management

First edition: 1997 by
SKAT, Swiss Centre for Development Cooperation in Technology and Management

Layout: Folio, G-68, Connaught Circus, New Delhi-110 001. Tel.: 3713825

English editing: K.T. Lama, Kathmandu

Illustrations: Heini Müller, **AProCon**, Nepal

Comments: Please send any comments concerning this publication to SKAT

Printed by: Devarsons, New Delhi

ISBN: 3-908001-74-9

Distributed by: Intermediate Technology Publications (it)
103-105 Southhampton Row
London WC1B 4HH, England
E-mail, itpubs@gn.apc.org
Fax: +44171 436 2013

1997 500/Evaluation copy

Contents

Preface

Background Information

The history of FCR/MCR

The Fibre Concrete Roofing/Micro Concrete Roofing (FCR/MCR) technology was developed in the 1970s, based on many years experience with concrete tiles and asbestos cement sheets. During the 1980s, it found applications in many countries all over the world. Today, the technology is at a mature stage and experience shows it offers a reliable roofing material that can compete, in most cases, with conventional roofing materials.

Since MCR tiles are superior to FCR tiles in quality, durability and profitability, RAS promotes only MCR tiles today.

MCR Toolkit Series

This guide is part of the MCR Toolkit Series. The series present the entire know-how required in the field of FCR/MCR technology, covering technical as well as economic, organisational, management and marketing aspects. The MCR Toolkits' Overview shows how the series is structured.

Roles of BASIN, SKAT/RAS

SKAT and partly ILO are co-publishers of the MCR Toolkit Series, of which this guide is one element.

BASIN

SKAT is a member of BASIN (Building Advisory Service and Information Network), a network of experienced international professionals, which was established to provide qualified advice and information in the field of building materials and construction technologies.

The activities of BASIN are divided among four leading European, non-profit organisations in the field of appropriate technology, viz., GTZ/GATE Germany, ITDG Britain, SKAT Switzerland, CRATerre France. Each of these organisations covers a separate specialised subject area, and is thus able to provide qualified expertise with greater efficiency.

SKAT

SKAT is an information and documentation centre and a consultancy group engaged in promoting and implementing appropriate technology in partner countries worldwide.

RAS

As a member of BASIN, SKAT specialises in roofing technology, particularly MCR technology. Within BASIN, SKAT established the Roofing Advisory Service (RAS). To facilitate the promotion and dissemination of roofing technologies, SKAT/RAS produce the MCR Toolkit Series, of which the **Production and Operations' Management** is one element.

Network of specialists

A worldwide network of specialists and specialised institutions provides technical support to new and existing producers of MCR. This helps to ensure the reliability and quality of the products in this growing market. This MCR network is coordinated by SKAT/ RAS.

Contact address

Information on all the above is available from:

Roofing Advisory Service, c/o SKAT/RAS
Vadianstrasse 42
CH-9000 St. Gallen
Switzerland
Tel +41 71 228 54 54
Fax +41 71 228 54 55
e-mail info@skat.ch

Acknowledgements

We would like to thank all the experts, technicians and producers who contributed their valuable insights and comments to this publication.

Comments

Any comments and feedback that would help to improve this guide are welcome and may be sent to SKAT/RAS.

Introduction

FCR / MCR in General

What are FCR and MCR?

FCR (Fibre Concrete Roofing) is roofing made from concrete tiles of cement mortar mixed with a small amount of natural or synthetic fibre.

In the case of MCR (Micro Concrete Roofing), fine aggregate is used instead of fibre. For many years, RAS has recommended the production of MCR tiles only.

For more basic information, please refer to *FCR/MCR Basics, Element 10.*

Advantages of MCR

The technology provides an inexpensive and reliable roof cover and especially suits the needs of developing countries. The main advantages are :

- The raw materials are available locally and thus foreign exchange is saved.
- The use of appropriate technology enables decentralised and small-scale production.
- The technology requires little investment.
- The production is labour-intensive rather than capital-intensive, and thus creates jobs.
- Compared to metal sheeting, rooms covered with MCR provide greater comfort because of their better thermal insulation and ventilation.
- During rain, MCR-covered roofs are less noisy than those covered with metal sheeting.
- The product is environmentally appropriate.
- The technology is easy to learn.

Drawbacks of MCR

The durability of MCR is roughly the same as that of ordinary concrete tiles, with a service life-span that exceeds 50 years. At times, however, the material has been found to be of lesser strength than that of modern concrete tiles and AC-sheets. This generally occurs when production is carried out by small units, which produce with lesser consistency resulting from improper standards and skills in production and operations' management.

Contents of this Guide

Objectives

This guide provides the necessary basic information on how to establish the production and organisation management for a profitable MCR business.

It enables the entrepreneur

- to understand the importance of planning operations and production;
- to consider different management structures and select one suited for his operations.

Scope

This guide includes the following:

- Resource planning (manpower and raw material)
- Different management structure models (staffing pattern, manpower requirement, and work assignment)
- Production control (raw material, production monitoring, and inventory control)

This guide, however, does not include detailed information about the actual MCR tile production process. For this please refer to FCR/MCR Toolkit, *Element 22, Production Guide* and *Element 23, Quality Control Guidelines.*

Target group

The guide is aimed at persons who are familiar with the MCR production process or are already producing MCR tiles.

The guide is not designed for persons who are interested in general information on MCR technology and business.

For basic information we suggest the booklet, *The Basics of Concrete Roofing Elements*, available free of charge from SKAT in English, French and Spanish.

For detailed information on the various aspects of MCR technology and business, the respective elements of the MCR Toolkit Series can be consulted (available from SKAT).

1. Production and Operations' Management

1.1 Introduction

The main reason for studying production and operations' management is that every MCR enterprise involves a productive system. There is also an operations' function in all MCR enterprises. Production and operations' management refers to the utilisation of experience, techniques and tools that focus on economic efficiency (profitability) in production and organisation. Hence, the more a MCR entrepreneur knows about this subject, the less his risk of failure in business.

1.2 Definitions and Terminology

Aggregate capacity planning

Aggregate capacity planning is the process of testing the feasibility of total output plans and evaluating overall capacity utilisation.

Aggregate output planning

Aggregate output planning is the process of determining the total output over the coming six to 18 months on a weekly or monthly basis.

Available quantity

Available quantity is the quantity of an item (MCR tiles) expected to be available at the end of a period to meet (MCR tile) requirements in succeeding periods.

Buffer stock

Buffer stock is the inventory that is needed to protect the entrepreneur against unexpectedly high product demand and uncertain lead time.

Business plan

A business plan is a statement of an organisation's business activity for the next six to 18 months, usually expressed in terms of cash value of sales.

Controlling

Controlling is the activity that assures that actual performance matches planned performance.

Conversion process

Conversion process is the process of changing inputs of labour, capital, land, and management into output of goods and/or services.

Demand-based forecasting models

Demand-based forecasting is a statistical forecasting model based solely on historical demand data.

Feedback

Feedback is the term for the information in the control process that allows the management to determine if organisational activities need adjustment.

Flow process chart

The flow process chart is a graphic tool to analyse and categorise interstation activities so that the flow of the product throughout the overall production process is represented.

Forecast

Forecast describes the use of past data to determine future events and needs. Forecast is usually an objective computation.

Inventory

Inventory is the listing of goods and stocks in store, including raw material, production in process, and finished products.

Layout

Layout is the physical location or configuration of working centres and equipment in the conversion process as well as the physical resources used in creating the product.

Lead time

Lead time is the time passed between ordering and receiving goods.

Material Requirements' Planning

MRP is a system of planning and scheduling the time-phased material requirements for production operation.

Operations' system

Operations' system is the part of an organisation that produces the organisation's physical goods or services.

Planning

Planning is the activity that establishes a course of action and guides future decision-making.

Quality

Quality refers to the degree to which the design specifications for a product or service are appropriate to its function and use, and the degree to which the product or service conforms to its design specifications.

Random fluctuations

Random fluctuations refer to unplanned and uncontrollable environmental factors such as floods, earthquakes, strikes, political events, etc., that result in a discrepancy between planned and actual output.

Research and development

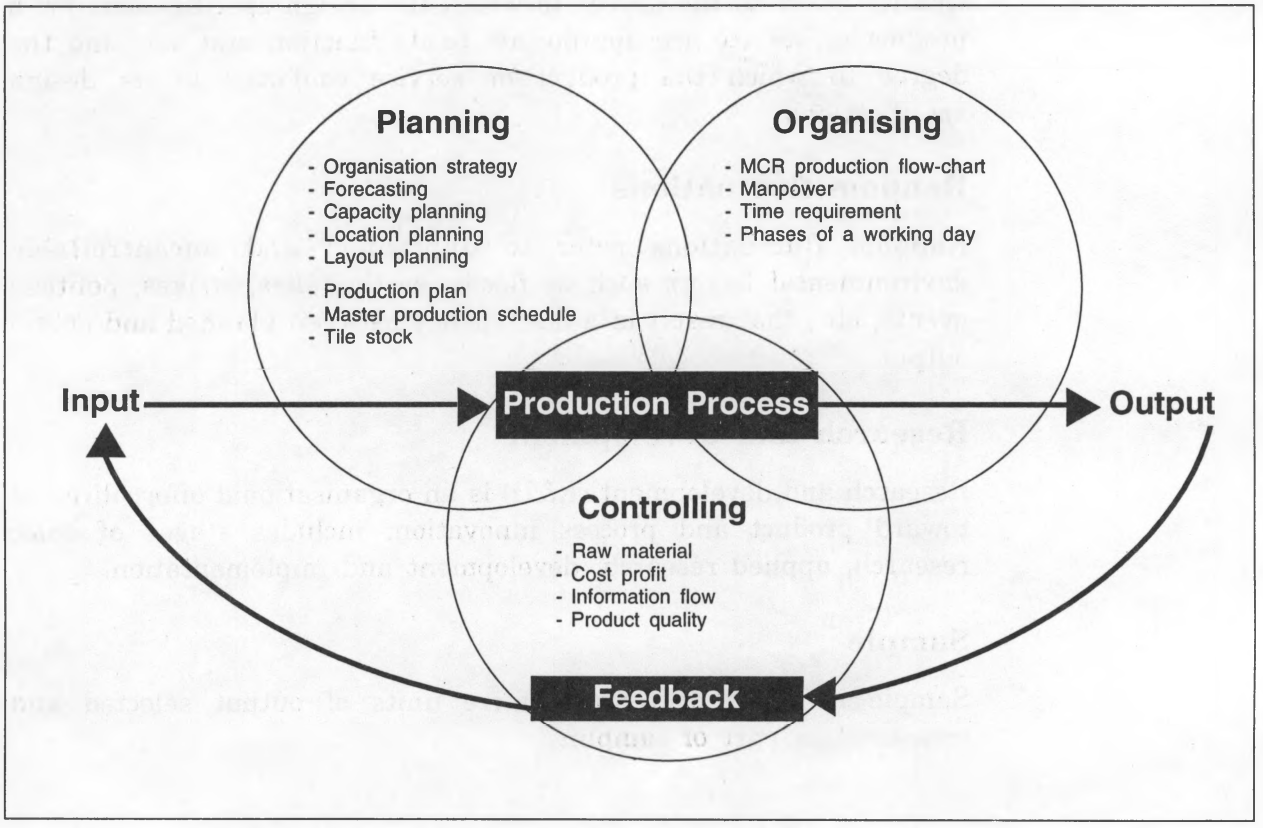
Research and development (R&D) is an organisational effort directed toward product and process innovation; includes stages of basic research, applied research, development and implementation.

Sample

Sample is a set of representative units of output selected and measured as part of sampling.

1.3 Basic Elements of Management

This manual is organised around the management subfunctions of **planning, organising** and **controlling**.



- **Planning**

The MCR entrepreneur defines the objectives for the operations' subsystem of the organisation, and the policies, programmes and procedures for achieving the objectives. It also refers to the setting of production goals based on sound market studies and feedback mechanisms from production and sales' performance.

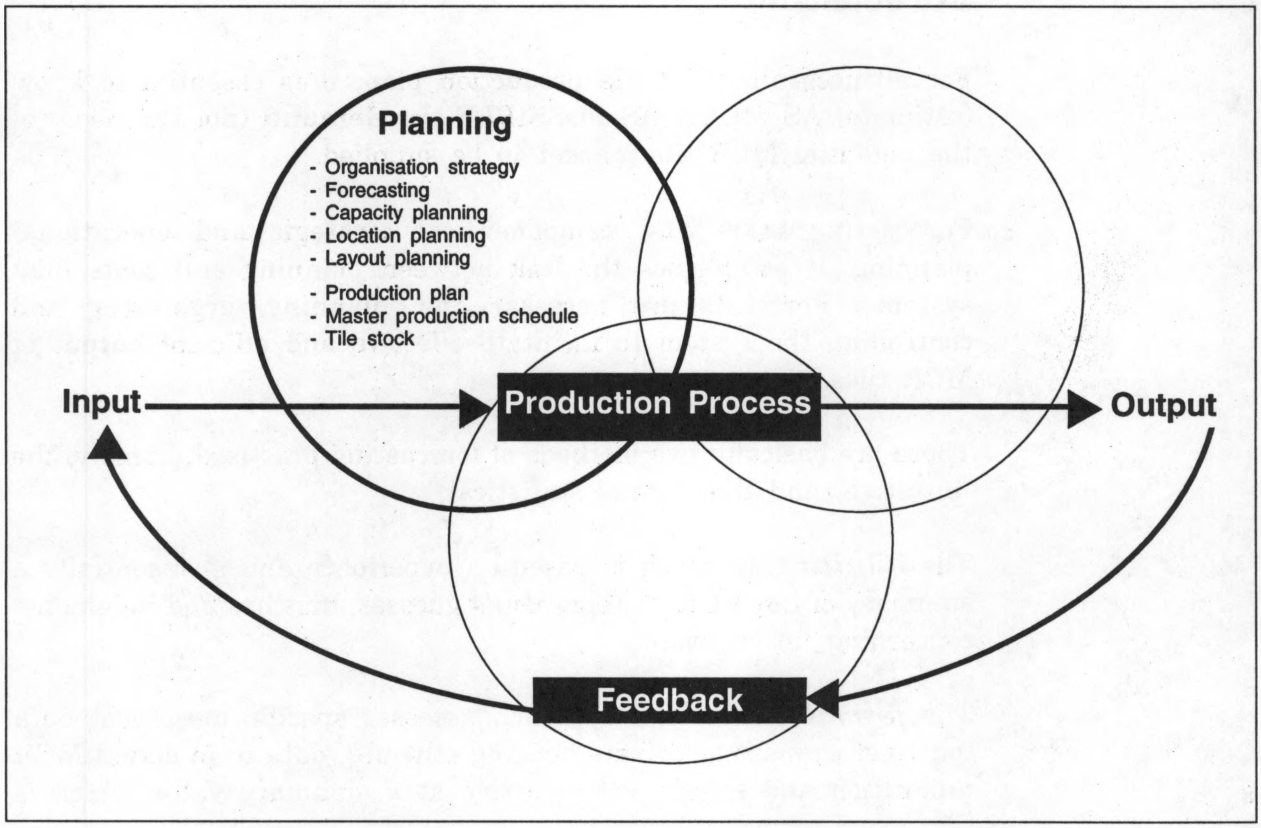
- **Organising**

The MCR entrepreneur establishes a structure of roles and the flow of information within the operations' subsystem. This enables him to determine the activities required to achieve the objectives of the operations' subsystem and to assign authority and responsibility for carrying them out.

- **Controlling**

The MCR entrepreneur must ensure that the plans for the operations' subsystem are in place. The MCR entrepreneur establishes a mechanism of control by measuring actual output against planned output. Controlling costs, quality, and schedules is at the very heart of operations' management.

2. Planning



2.1 Designing the MCR Business System

2.1.1 Operations' strategy

First of all, a MCR entrepreneur should design his company's operations' strategy. Depending on this strategy, the entire management size and production facility is planned. The ultimate aim of the strategy of a MCR enterprise is to integrate all management functions such as marketing, operations, finance, human resources, and the legal and social environment. The operations' strategy also depends largely on the market segment a MCR tile producer is aiming at.

If the entrepreneur selects the high-income group market segment, he might choose the "Quality and Productivity" operations' strategy. There is a clear relationship between quality and productivity. Generally, an increase in quality brings about an increase in productivity. Why? Because waste is eliminated. By reducing the amount of inputs, productivity increases.

However, professional help is needed in formulating the operations' strategy. This investment might prove to be the key to a successful MCR business.

2.1.2 Forecasting

For an accurate MCR tile production plan, it is essential to know (estimate) AS MUCH AS POSSIBLE the **demand** (not the need) of the potential MCR tile market to be supplied.

Forecasting is a vital component of strategic and operational planning. It establishes the link between planning and controlling systems. Forecasts are necessary for planning, organising and controlling the system to facilitate effective and efficient output of MCR tiles.

There are basically two methods of forecasting practised, namely, the "intuitive" and the "formal statistical."

The ***intuitive*** approach is based on experience and is essentially a summary of the MCR entrepreneur's guesses, hunches and judgments concerning future events.

The ***formal statistical*** approach assesses specific numerical data (past government or private housing schemes, data from actual MCR production and sales, etc.) to arrive at a summary value which is then used to make forecasts.

2.1.3 Capacity planning

On first thought, capacity planning may not seem relevant for a MCR tile business. In fact, it is very important. The key reason is that the volume of work can fluctuate considerably, not only from year to year, but from season to season.

Based on the forecast, capacity planning is the first task of a MCR entrepreneur. The appropriate capacity is needed to meet the customers' demand in a timely manner. Further, the capacity determines the cost effectiveness of operations and the level of investment. Accordingly, the MCR tile entrepreneur needs to recruit the appropriate number of working staff.

Often decisions about capacity are inseparable from decisions about MCR production location. Capacity depends upon demand and demand often depends on location.

Capacity planning usually involves the following activities:

- assessing existing capacity
- forecasting capacity needs
- identifying alternative ways to modify capacity (e.g., association)
- evaluating financial, economic and technological capacity alternatives
- selecting a capacity alternative most suitable to achieve the organisation's objectives

2.1.4 Location planning

Successful MCR entrepreneurs have learned from experience that there are three secrets to success in selling MCR tiles: location, location, and location. Serving the market from an advantageous location can make a MCR enterprise successful. However, if the MCR enterprise is selling by indirect means (hardware shops, franchising, etc.), the location of the MCR tile production should be near the source of raw materials, cheap labour, etc., to cut down on production costs.

2.1.5 Layout planning

The layout of a MCR workshop is product-oriented. A product-oriented layout is appropriate for producing one standardised product, usually in large volume. This manual does not, however, deal with the layout planning of a MCR tile production workshop.

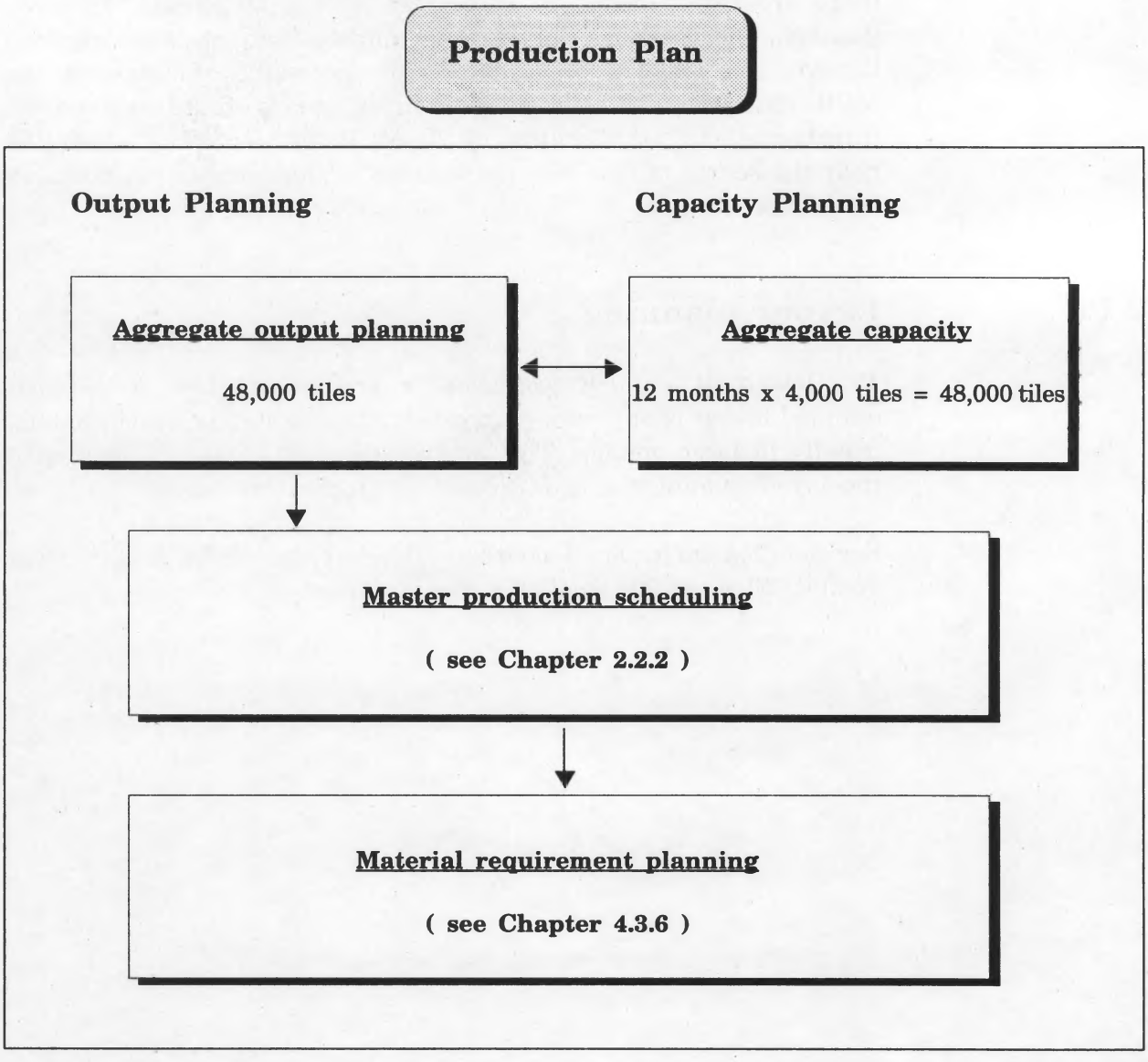
For detailed information on this subject, please refer to the MCR Toolkit, *Element 20, Workshop and Equipment.*

2.2 Operations' Planning and Scheduling System

Operations' planning and scheduling system concerns the volume and timing of output, utilisation of operations' capacity, and balancing output with capacity at desired levels for competitive effectiveness.

2.2.1 The production plan

The production plan is a statement of the organisation's overall MCR tile production activities for the coming six to 18 months. This production plan is developed by the MCR tile entrepreneur and reflects his business strategy for the coming year.



Aggregate output planning

The aggregate output plan addresses the ***demand*** side of the MCR tile entrepreneur and shows what output will be produced. This aggregate output planning covers the coming six to 18 months. Planning at this level ignores details such as the number of ridge tiles, whether they are coloured or double-nib tiles, etc.

Practical example

In our example, the output planning corresponds to 48,000 tiles (one MCR vibration table and 200 moulds, weekly production of 1,000 MCR tiles), ensuring that all workers are fully utilised for the next 12 months. (52 weeks x 1,000 tiles minus 4 weeks of holidays, etc. = 48,000 tiles). No subcontracting or franchising is planned for the next 12 months.

Aggregate capacity planning

A statement of desired output is only useful if it corresponds with the capacity utilisation of the MCR equipment. Thus, it addresses the ***supply*** side of the MCR tile entrepreneur's ability to meet the demand. Capacity and output must be in balance. Although the basic capacity is fixed, the MCR entrepreneur can manipulate the short-term capacities in a variety of ways such as by subcontracting, franchising, or multiple-production shifts.

Practical example

In our example, the capacity planning corresponds to 48,000 tiles (one MCR vibration table and 200 moulds, weekly production of 1,000 MCR tiles), ensuring that all workers are fully utilised for the next 12 months. (52 weeks x 1,000 tiles minus 4 weeks of holidays, etc. = 48,000 tiles). No subcontracting or franchising is planned for the next 12 months.

Master Production Scheduling

The purpose of the Master Production Scheduling (MPS) is to meet the MCR tile demand in time. The MPS is an important link between the marketing and production of MCR tiles. It shows when incoming sales' orders can be scheduled into production, and when each shipment can be scheduled for delivery. It also takes into account current backlogs so that MCR tile production and delivery schedules are realistic.

Practical example

Under Chapter 2.2.2, a practical example of Master Production Scheduling has been provided as a working reference.

Material Requirement Planning

The MRP refers to the important process of ensuring that all raw materials such as cement, sand, aggregates and wires, etc., are available at the right time. MRP helps the entrepreneur to prevent overstoring of raw material, the use of old cement, and production stops due to shortage or late delivery of raw material.

Practical example

In Chapter 4.2.6, a practical MRP example is provided to show the different planning elements of a MCR business.

2.2.2 Master production scheduling

The Master Production Schedule (MPS) is initially designed on the basis of confirmed customer orders and/or from forecasts of demand. Out of the various scheduling systems, the Forward Scheduling System is the most appropriate for a MCR tile production business.

Forward scheduling

The Forward Scheduling System places the customer orders on a **"need-as-soon-as-possible"** basis. Forward scheduling determines the start and finish dates for the production of the next order, as well as the final delivery dates of the various MCR tile orders.

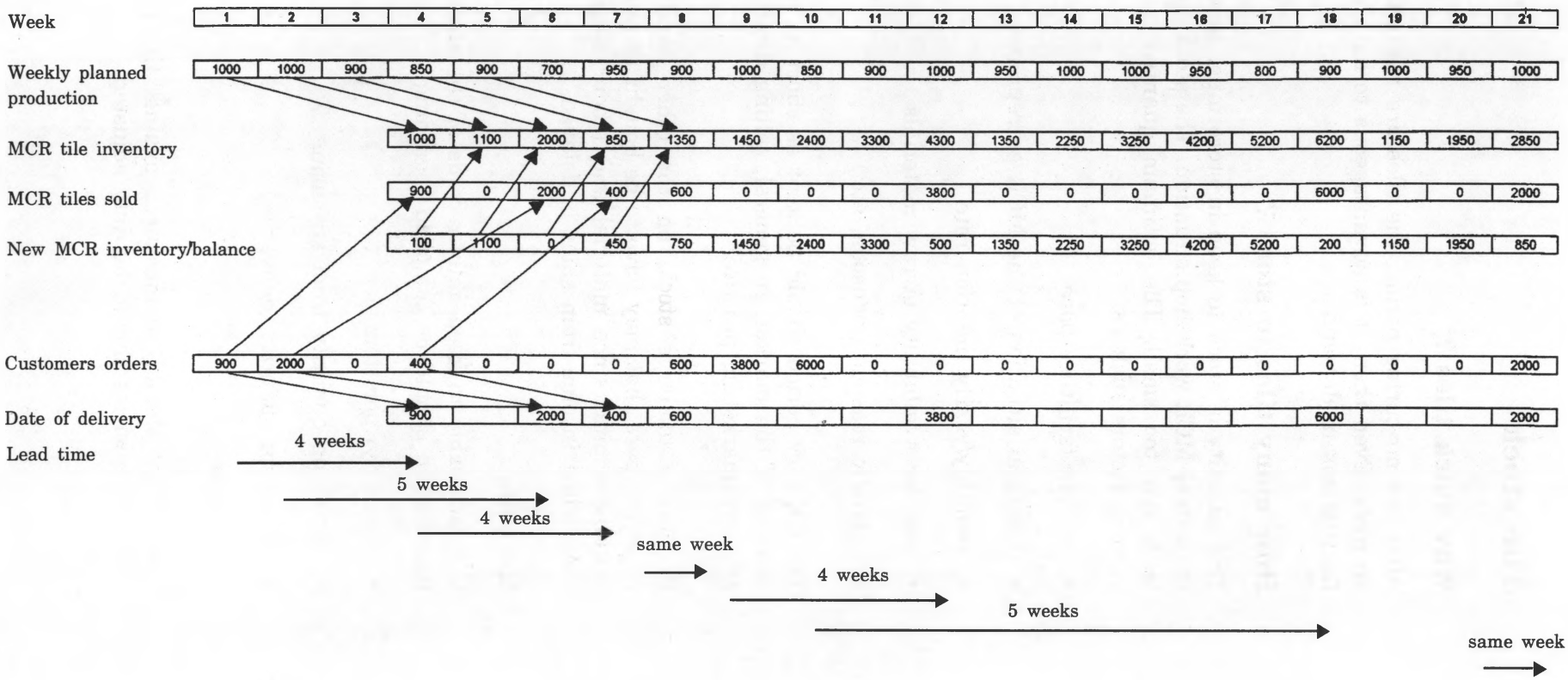
Forward scheduling is simple to use and effective in getting the job done in shorter lead times.

Practical example

The following practical example shows the basic form of a Forward Scheduling Plan for MCR tiles. The plan can be made more detailed, so that even the day of delivery can be determined. It is advisable to devise plans for the different types of tiles such as whether they are coloured, hip or ridge, roman or pan, and their size, etc.

As shown in the example, the MCR order of 400 tiles from week 4 can only be delivered with a lead time of 4 weeks. This is because the MCR entrepreneur has no MCR tile inventory. In a real business situation, the customer may choose not to wait and to purchase another roofing material. Hence, it is advisable for a producer to keep a reasonable MCR tile stock in order to immediately fulfill small orders. (Also, see Chapter 2.2.3.)

Forward Scheduling Chart



2.2.3 Tile stock

Why stock tiles ?

After the air-curing period, the tiles are ready for sale and for use on roofs. Even then, it is advantageous to have extra stock to cover fluctuations in demand.

How many tiles to store ?

The quantity of stock to keep in store must be determined by each individual MCR workshop situation. The stock should neither be too large nor too small. The optimum quantity to stock depends on various factors such as:

- storing facilities/space
- financial situation of the MCR entrepreneur
- monthly/yearly inflation rate
- regular availability of raw materials
- climatic reasons (monsoon, etc.)

The delivery period should be kept as short as possible to meet the demand of the market. In general, selling directly from stock is an effective marketing practice.

Keeping a too-large stock, on the other hand, can be costly: it requires space that may have to be bought or rented; and it uses up working capital since material and labour wages have to be paid even when income from sales is delayed.

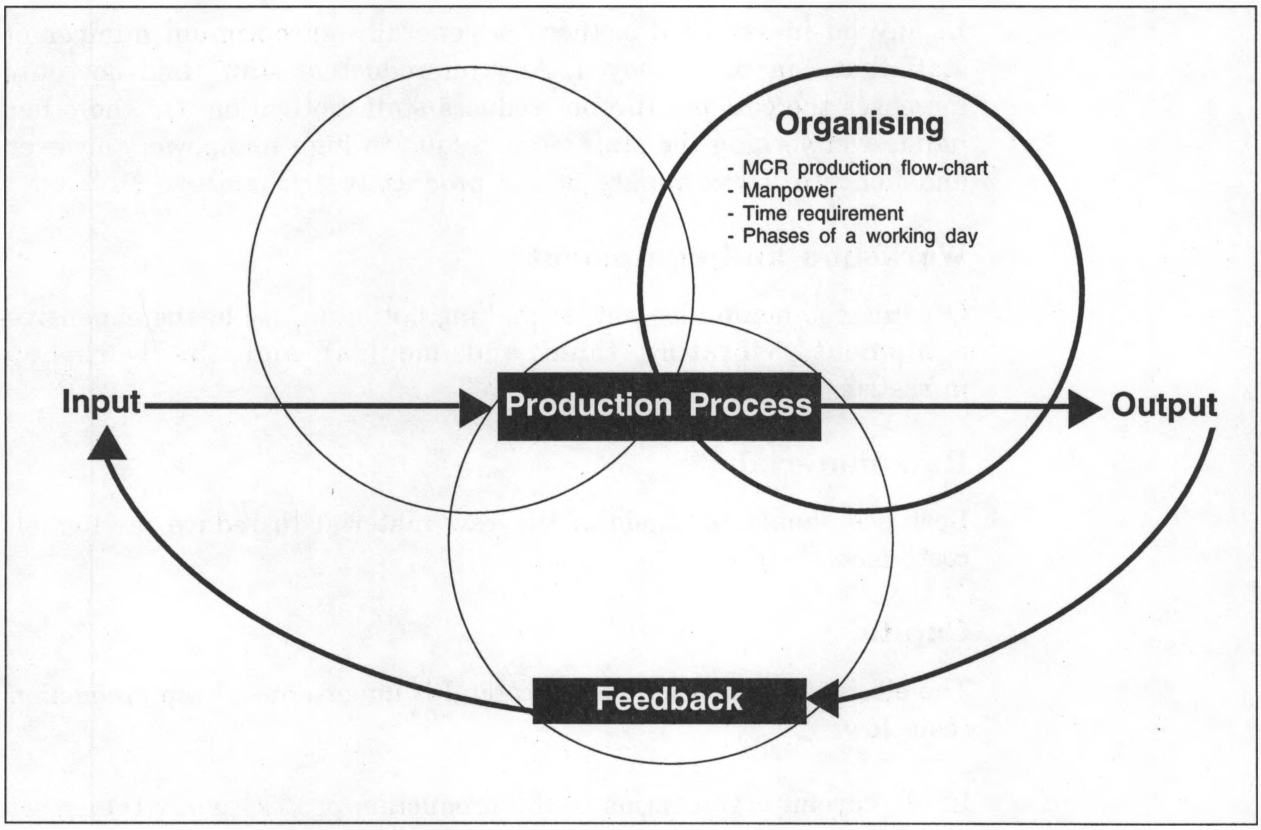
Records

It is advisable to keep daily records of the stock.
Information should be compiled regarding:

- Quantity, per item
- Incoming quantity from air-curing
- Outgoing quantity (deliveries)
- Balance

This record should be measured against the production planning, and discrepancies should be duly adjusted.

3. Organising



3.1 Elements of Organisation

The long-term planning decisions have been covered in Chapter 2. We now turn to the short-term, day-to-day, month-to-month decisions for the operations' planning of the MCR tile enterprise.

"Getting the job done" is the main responsibility of the MCR tile entrepreneur. He must provide the leadership needed to produce first-class MCR tiles for his customer.

The MCR tile production process should be organised so that it makes best use of the means of production, such as:

- the staff
- the workshop infrastructure
- the equipment

- the raw material
- the capital

Staff

In any business venture, there is generally an optimum number of staff that can be employed. Any unproductive staff time not only increases the cost per tile but reduces staff motivation. On the other hand, overworking the staff often results in high manpower turnover and hence a lower quality of the product (see Chapter 3.3).

Workshop and equipment

Organising should also aim at making optimum use of the expensive equipment (vibrating table and moulds) and the workshop infrastructure.

Raw material

Best use should be made of the raw material to reduce production costs (see Chapter 4.2).

Capital

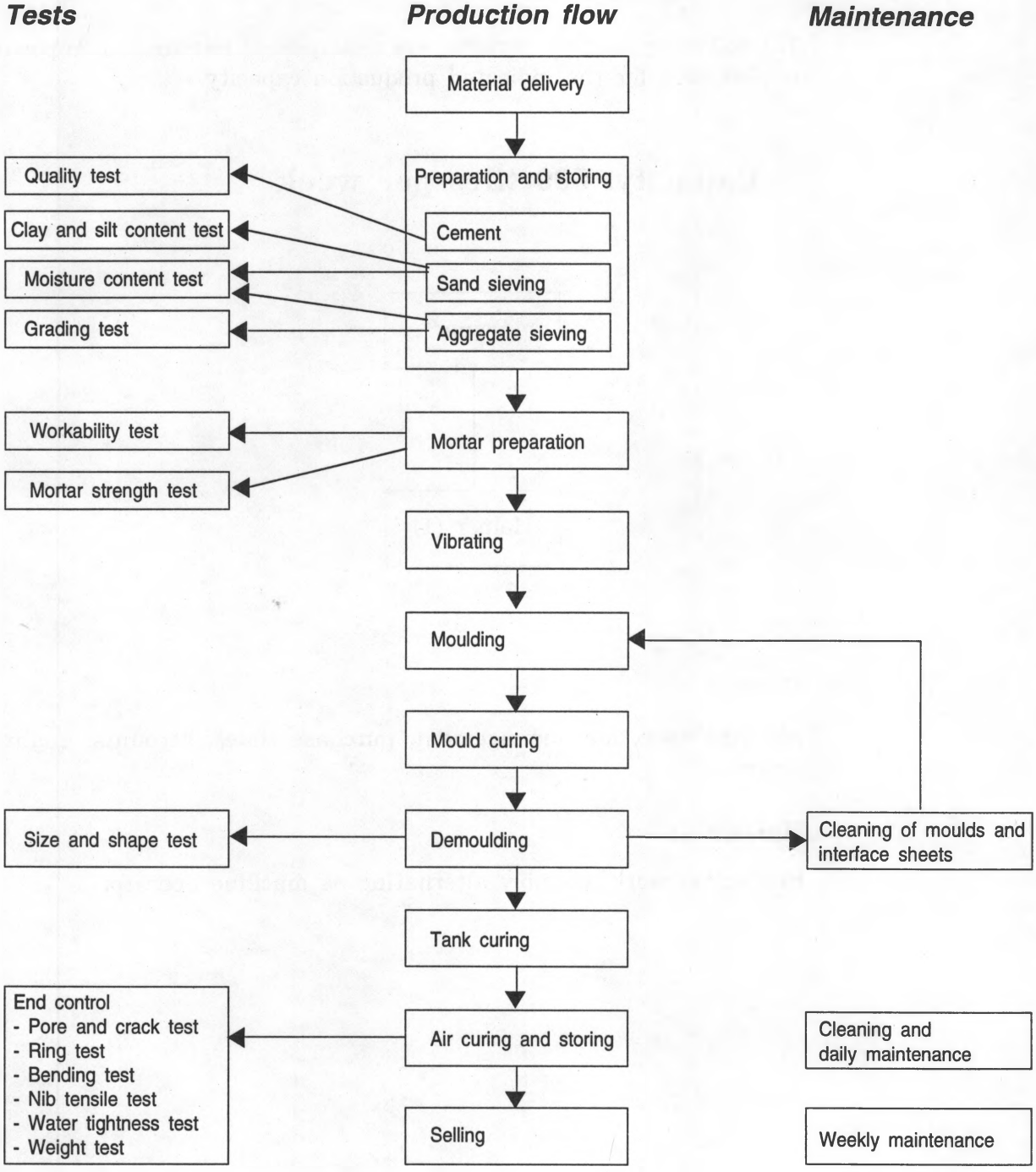
The efficient use of the invested capital is important to keep production costs low.

In all, careful organisation of the production process is a vital aspect of any successful business.

3.2 MCR Tile Production Flow-chart

The product-oriented layout of the MCR tile production permits the design of a simple production process flow-chart. This flow-chart can be used in many aspects of the MCR tile enterprise. First, it is a tool to ensure that all production steps are well-designed and organised to result in a good quality product. Second, it allows responsibilities to be clearly allocated to different production activities. Third, all production steps must pass quality control criteria that are well-defined (see *Element 23, Quality Control Guidelines*). This quality control should help the MCR entrepreneur to produce only the best quality MCR tile.

Flow-chart of MCR production process

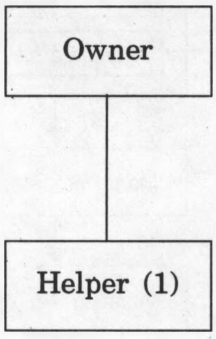


3.3 Manpower

3.3.1 Staff organisation patterns, assignments and qualification

The following staffing patterns are examples of minimum manpower requirement for the indicated production capacity.

Capacity: 500 tiles per week



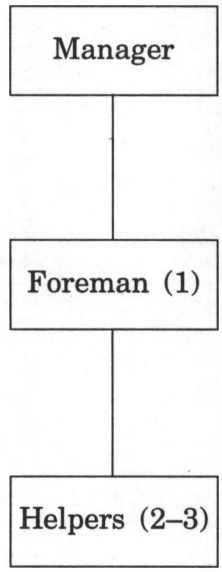
Owner

Machine operation, management, purchase, sales, accounts, quality control

Helper

Production work, possibly alternating as machine operator

Capacity: 1,000 tiles per week



Manager

(owner of the business or a hired professional) purchasing, sales, accounts

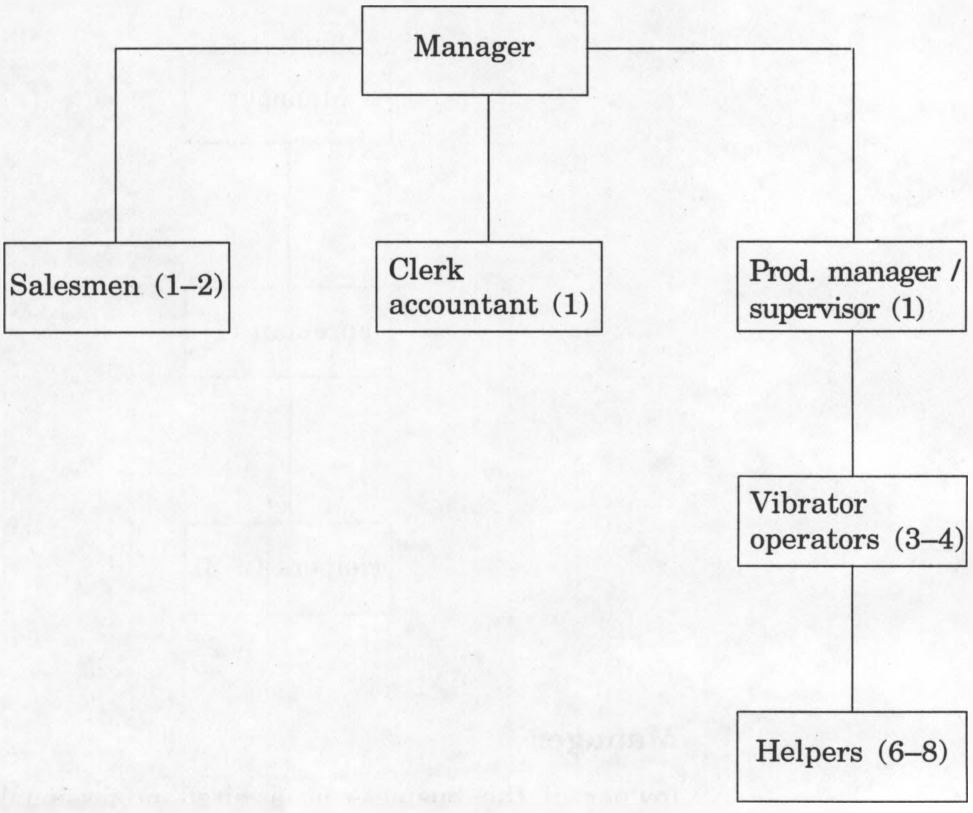
Foreman (1)

Machine operation, production data collection, quality control (preferably possessing carpentry skills to perform installation services)

Helpers (2–3)

Production helpers (subsequently trained to alternate as machine operators)

Capacity: 4,000 tiles per week



Manager

(possibly someone on the board of stockholders)
Production monitoring

Production manager / supervisor (1)

Production planning and control (preferably a highly trained technician who can provide advisory and/or tile installation services)

Clerk / accountant (1)

Office administration, purchasing, production data collection, book-keeping

Salesmen (1–2)

Sales, collection of market study data and customers' feedback

Machine operators (3–4)

Vibrator operation and quality control (preferably possessing carpentry skills so as to perform installation services)

Helpers (6–8)

Production work, housekeeping

3.3.2 Selection of staff

The staff running a MCR tile business certainly makes up the most important resource. The success of the business may largely depend on recruiting the appropriate personnel. Therefore, utmost consideration should be given to it.

Qualification

While selecting the staff, the following criteria should be considered:

- Practical skill
- Theoretical skill
- Personality
- Cooperation, ability to work in a team
- Motivation, creativity
- Willingness to learn

Wages

Good wages are a motivation for high performance.
Wages should certainly be in keeping with the local situation.

Underpayment will save money initially but will in the long run harm motivation and performance. Good personnel are likely to leave at the first opportunity of better pay elsewhere.

Overpayment will increase production costs and harm the business.

- **Piecework**

Employing staff on a piecework basis often results in higher output as workers are made to work under constant pressure. But it can result in inferior work, so adequate supervision is needed to ensure good workmanship.

- **Daily wages**

Payment on daily or monthly basis can increase production costs, but it can also improve quality. Good personnel can be given permanent employment.

Only experience and knowledge of the local practices and circumstances can help the entrepreneur in choosing an appropriate system of payment.

Finding personnel

- **Informal**

Personnel can be recruited by informal means, such as by talking to local people and possible candidates.

This method may be adequate in staffing smaller workshops in rural areas and small communities.

- **Advertisement**

To recruit a larger number of staff or in larger communities, it may be effective to advertise in the local media.

- **Head hunting**

In urban areas it may be advisable to use the services of specialised agencies that search and preselect personnel.

Number of staff

To determine the required manpower, it is essential to define the targeted production capacity of the workshop. This capacity has to be carefully planned. (See Chapter 2.1.3, Capacity Planning).

3.3.3 Staff requirement

Once the targeted production capacity is determined, it is possible to work out the number of staff required.

The following table serves as a general guideline.

Production capacity per week	Type of staff	No of staff
1,000 tiles per week	Manager	1
(1 table)	Table operator	1
	Helpers	2–3
2,000 tiles per week	Manager	1
(2 tables)	Table operators	2
	Helpers	4
3,000 tiles per week	Manager	1
(3 tables)	Salesman	1
	Clerk	1
	Table operators	3
	Helpers	6
4,000 tiles per week	Manager	1
(4 tables)	Production manager	1
	Salesmen	1–2
	Clerk	1
	Table operators	3–4
	Helpers	6–8

3.4 Time Requirement

The time required for individual production steps varies from case to case, depending on the working skill and speed, equipment quality, and on the workshop setup.

To work out a detailed timetable, the values provided in the table below can be taken as a general guide. However, it is essential for each MCR entrepreneur to adjust those values to the conditions of his workshop.

Step		**estimated time**	
		seconds per tile	**hours per table**
Raw material preparation, testing and storing	Sand (and aggregate) sieving Preparing fixing device	60	
Mortar preparation	Batching and mixing Workability test	60	
Vibrating	Vibrating and nib Maintenance vibrating device	80	
Moving to first curing		10	
Demoulding	Thickness test	30	
Moving to tank curing		20	
Moving to additional curing		10	
General end control	Pore and crack test Ring test	20	

Step		estimated time	
		seconds per tile	hours per table
Specific end control	Bending test Nib tensile test Water tightness Weight test		1
Maintenance moulds and sheets		50	
Daily maintenance	Battery Vibrating device Tools Workshop		2
Weekly maintenance	Level vibrating table Checking the scale Changing water in tanks		2

Based on this data, the phases of a working day can be planned.

3.5 Phases of a Working Day

Cycles of production

The production flow-chart may appear to suggest that work planning can be based simply on a linear flow of activities. However, this is not so as, more often than not, the work follows certain cycles. Some operations are continually repeated during the production time, while others need to be carried out twice a day, daily, or weekly only.

Continually recurring tasks

Mortar preparation, workability test, vibrating, moulding.

Tasks recurring twice-a-day

Demoulding, maintaining interface sheets and moulds, size and shape test, moving tiles to tank-curing, cleaning vibrating table.

Daily tasks

Moving tiles to air-curing, cleaning workshop.

Weekly-tasks

Preparing and testing raw material, moving tiles to sales stock, end control tests, weekly maintenance.

Timetable

Work planning must include setting up a timetable which assigns responsibilities to each worker. Next are some examples.

Example of a timetable for a workshop with:

1 vibrating table, 3 workers, and a production of 200 tiles per day

<table>
<tr><th>Time</th><th>Worker 1</th><th>Worker 2</th><th>Worker 3</th></tr>
<tr><td rowspan="2">8.00</td><td>Demoulding yesterday's tiles and moving to water-tank for curing</td><td>Cleaning moulds and sheets</td><td>Moving the 5-7-day-old tiles from the water-tank to the air-curing area.</td></tr>
<tr><td>Mortar preparation</td><td></td><td></td></tr>
<tr><td>9.00</td><td rowspan="5">Vibrating

Moulding</td><td>Demoulding
Moving to tank-curing</td><td>Cleaning moulds and sheets</td></tr>
<tr><td rowspan="2">10.00</td><td>Mortar preparation</td><td></td></tr>
<tr><td>Demoulding
Moving to tank-curing</td><td>Cleaning moulds and sheets</td></tr>
<tr><td>Mortar preparation</td><td></td></tr>
<tr><td>11.00</td><td>Demoulding
Moving to tank-curing</td><td>Cleaning moulds and sheets</td></tr>
<tr><td></td><td>Maintenance</td><td>Cleaning vibrating table</td><td>Cleaning tools</td></tr>
<tr><td>12.00</td><td colspan="3">Lunch break</td></tr>
<tr><td>13.00</td><td colspan="3">Mortar preparation</td></tr>
<tr><td></td><td rowspan="3">Vibrating

Moulding</td><td>Demoulding
Moving to tank-curing</td><td>Cleaning moulds and sheets</td></tr>
<tr><td>14.00</td><td>Mortar preparation</td><td></td></tr>
<tr><td>15.00</td><td colspan="2">Preparing raw material</td></tr>
<tr><td>16.00</td><td colspan="3">Daily maintenance</td></tr>
</table>

Example of a timetable for a workshop with:

2 vibrating table, 5 workers, and a production of 400 tiles per day

<table>
<tr><th>Time</th><th>Worker 1</th><th>Worker 2</th><th>Worker 3</th><th>Worker 4</th><th>Worker 5</th></tr>
<tr><td rowspan="2">8.00</td><td colspan="2">Demoulding
Moving to tank-curing</td><td colspan="2">Maintenance of moulds and sheets</td><td>Moving to air-curing</td></tr>
<tr><td colspan="3">Mortar preparation</td><td rowspan="2"></td></tr>
<tr><td>9.00</td><td colspan="2" rowspan="4">Vibrating

Moulding</td><td colspan="2">Maintenance of moulds and sheets</td><td rowspan="4">Demoulding

Moving to tank-curing</td></tr>
<tr><td>10.00</td><td colspan="2">Mortar preparation</td></tr>
<tr><td>11.00</td><td colspan="2">Maintenance moulds and sheets</td></tr>
<tr><td colspan="3">Maintenance Cleaning vibrating table</td><td>Cleaning tools</td></tr>
<tr><td>12.00</td><td colspan="5">Lunch break</td></tr>
<tr><td rowspan="2">13.00</td><td colspan="3">Mortar preparation</td><td rowspan="2">Maintenance of moulds and sheets</td><td>Demoulding

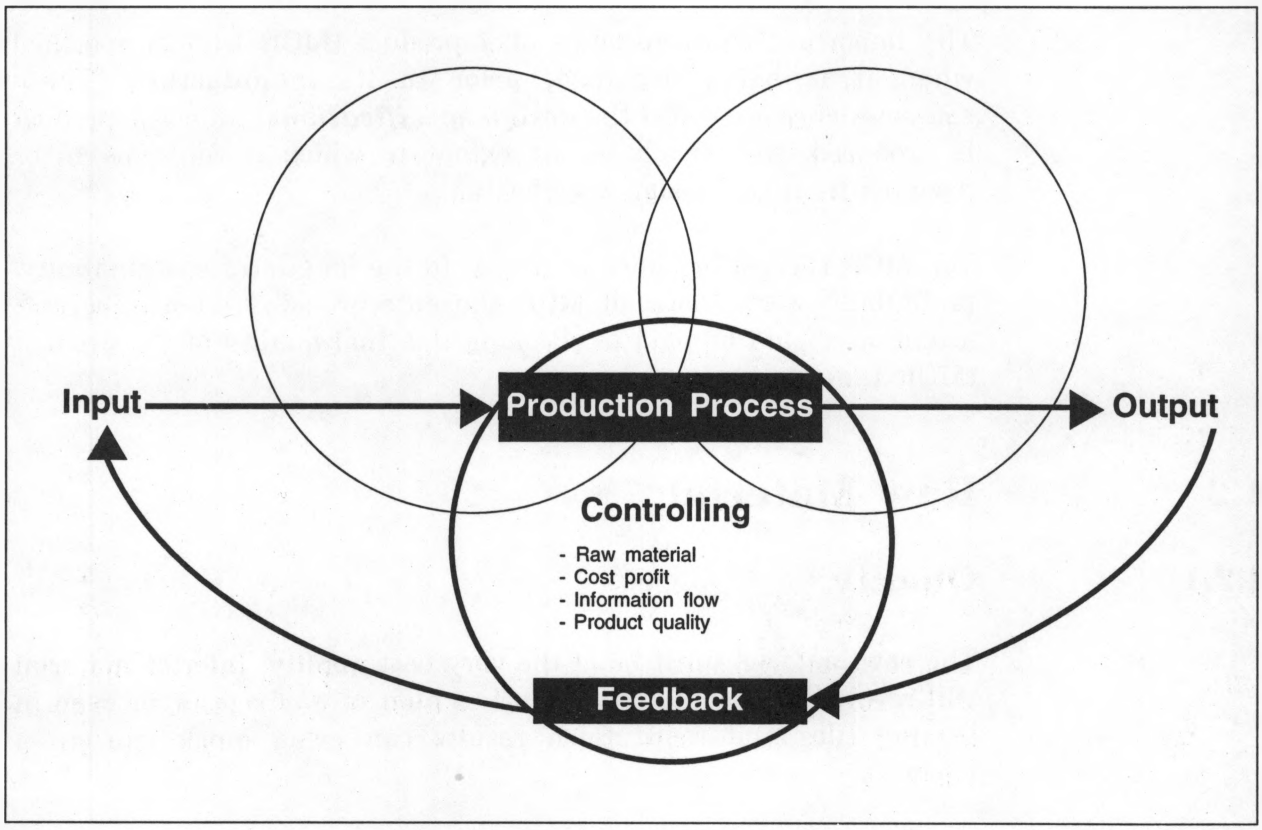
Moving to tank-curing</td></tr>
<tr><td colspan="2" rowspan="3">Vibrating

Moulding</td><td>Preparing raw material</td><td rowspan="2"></td></tr>
<tr><td>14.00</td><td colspan="2">Mortar preparation</td></tr>
<tr><td>15.00</td><td colspan="3">Preparing raw material</td><td rowspan="2"></td></tr>
<tr><td>16.00</td><td colspan="3">Daily maintenance</td></tr>
</table>

4. Controlling

Purpose of controlling

The purpose of the control process is to force the system to perform according to the set goals and objectives of a MCR tile manufacturer.



4.1 Elements of Controlling

Raw materials

Raw materials are equal to money. Thus, as an accountant keeps a record of finances, the MCR tile entrepreneur should keep a record of all raw materials.

Cost/profit

MCR entrepreneurs are responsible for controlling the cost of tile production. One critical cost of operation is the investment in raw materials. Managers or entrepreneurs must monitor output, compare actual against planned output, and take corrective action on the basis of feedback.

Information flow/forms

An appropriate information flow is essential to a control system; indeed, without one, a system simply cannot function. Information on the output of the MCR tile production process is transformed and fed back into the input of the MCR tile production process. In this way, the MCR entrepreneur is able to constantly compare actual production with the planned target.

Product quality

The important characteristics of a product (MCR tile) is specified when it is being designed, prior to its manufacture. These characteristics are called the ***design specifications***. After the product is produced, we can check the extent to which it conforms to or deviates from the design specifications.

Top MCR tile performance is crucial to the long-term sustainability/ profitability for almost all MCR tile entrepreneurs. Hence, serious attention should be paid to checking the final quality of the product (MCR tile).

4.2 Raw Material

4.2.1 Quality

The raw material must be of the very best quality. Inferior material will result in a low quality product, a high rate of rejects, or even in leaking tiles and roofs. Such results can bring quick ruin to a business!

Specifications

The materials should comply with the standards of the area/country. (See FCR/MCR Toolkit *Element 4, Standards' Guidelines*.)

Testing the sources

When selecting the supply sources, the quality of the materials should carefully be tested according to FCR/MCR Toolkit *Element 23, Quality Control Guidelines.*

Testing the deliveries

Each delivery should also be tested immediately. Complaints should be addressed to the supplier, with a demand for replacement.

4.2.2 Quantity

Many factors have to be considered when determining the quantity of material to be ordered at a given time.

Discount on bulk order

Some suppliers grant a discount for bulk orders. Buying in bulk should be considered to reduce production costs.

Seasonal price fluctuation

The prices of many construction materials fluctuate with the season, depending on the demand, climate constraints, supply situation and other factors. Buying large quantities during times of low rates can be advantageous.

Investment

Stocking material always implies investing money. An excessively large stock freezes up capital. If it is the entrepreneur's own money, interest earnings are lost; if it is borrowed money, it costs interest. Thus, avoid having a too-large stock.

Price escalation

Often large stocks come about when there is a risk of price escalating. Large stocks make sense only when the rate of price escalation is expected to be higher than the interest earned from putting money in the bank.

Capacity of storerooms

Large storing space may be expensive or not available, a factor which should also be considered.

Durability of materials

Some materials cannot be stored for an indefinite period. For instance, cement should never be stored for more than one month, and some chemicals are good only for a certain period. Thus, the durability of the material should be considered when placing an order for it.

4.2.3 Time of order

Material must be ordered on time. Avoid having to interrupt the production process on account of a shortage of material in storage. During production, the stock is continuously decreasing. By recording consumption, it is possible to determine when the entire stock will be used up. You should never have to order material on the day of need as that would cause an interruption in production.

The order should be placed early, leaving sufficient time for delivery and extra time as security against a number of factors—the supplier's reliability, the transport situation, and other unforeseen events. For more details, also refer to Material Requirement Planning, Chapter 4.2.6.

Stock

For a MCR tile production business, a raw material stock sufficient for three weeks of tile production is recommended.

4.2.4 Selection of supplier

Contracted supply or direct supply

Sometimes, it may be possible to buy materials directly from the source (quarry, factory, etc.). At such times, the price is lower but more time is spent in making the purchase, and the risk could also be higher.

Another possibility is to secure the raw material through a contractor, in which case the contractor should be held responsible for the supply. For instance, in the event a source is not in a position to supply, it is the contractor's responsibility to search out alternative sources.

Selection of contracted supplier

In general, there is more than one supplier for any goods in the market. In selecting a supplier, the following points should be considered:

Quality

The supplier must have access to the right quality of the material. Thus, the material must be tested.

Reliability

A supplier should be reliable and enjoy a good reputation. He should be able to present references and be vouched for by independent knowledgeable persons.

A supplier should also have access to a reliable material source. In certain cases, it is advisable to insist that he have a long-term contract with his source.

The supplier's source must be reliable. He should have sufficient reserves of the right quality of material, all-weather access to the material, and a stable manpower situation.

Reputation

It is risky to work with a supplier who requires payment in advance. Were he to fail in fulfilling his obligations, the advanced payment would be lost. Every effort should be made to deal with a supplier having a good reputation in this respect.

Distance

For logistical reasons it is advisable to select a supplier who is nearby. It would make orders easier to follow up on and also reduce transportation costs.

Price

To find out the right price, it is necessary to ask for written quotations from several suppliers and to negotiate for discounts. After checking all criteria, select the most favourable offer.

Written contract

After a supplier has been selected, a written contract should be made.

The main points of the contract should include:

- Quality, specifications
- Quantity
- Time schedule
- Price, including transport, unloading, taxes, etc.
- Mode of payment
- Guarantee (in case of delayed or substandard supplies)
- Causes for cancellations due to conditions beyond the customer's control
- Agreement on replacing aggregates that are rejected.

4.2.5 Raw material record

It is essential to keep a tight control over the stock of raw material. Unexpected unavailability of material can interrupt production, causing labour to lie idle and a failure to fulfill commitments to customers.

Keeping record

For this reason, a thorough record should be maintained of the raw material stock in the workshop.

It is recommended to have a form for each material item such as: cement, sand, fibre, aggregate, fixing device, colourants, chemicals, etc.

The form should provide the following information:
order, delivery, consumption, balance, highest and lowest acceptable balance (maximum, minimum), etc.

The records should clearly indicate which materials should be ordered immediately to avoid any interruption in production.

Note:

The simplicity and number of records to be kept depend on the production capacity of the workshop. At smaller production sites, some records may be simplified or combined.

4.2.6 Material requirement planning

Material Requirement Planning (MRP) is a system of planning and scheduling the time-phased material requirements for an uninterrupted MCR production. As such, it is geared towards meeting the planned output scheduled in the Production Plan. (See the Forward Scheduling example.)

The main objectives of the Material Requirement Planning are:

- To reduce the raw material inventory, thereby avoiding unnecessary cost.
- To avoid delays in MCR production and delivery lead times by timing the correct quantity of raw materials.
- To make realistic commitments and enhance customer satisfaction by considering the raw material supply situation (material shortages, climate-related supply constraints, etc.).
- To increase production efficiency by keeping all workers fully utilised.

MRP system components

To implement the MRP system properly, three main sources of information are essential, namely:

- Master production schedule
- Raw material inventory status
- Bill of materials

Master production schedule

As already mentioned in Chapter 2.2.2, the Master Production Schedule (MPS) is arrived at on the basis of orders from customers and/or forecast of demand.

The MPS is an input to the MRP system. The MPS indicates the quantity of MCR tiles and when they need to be produced. Thus, the MPS provides all essential information for the Material Requirement Planning system.

Raw material inventory status

The MRP system needs detailed updated information on each required raw material. The status of the raw material inventory file indicates the quantity on hand, and the safety stock level and procurement lead time of every item required for the production of the MCR tiles. (See Production Monitoring Logbook, Form 4).

Bill of materials

The Bill of Materials (BOM) identifies the quantity and quality of each material required for the production of MCR tiles, such as cement, sand, aggregate, colourant, wire, etc.

Practical example

The following practical example of MRP is based on the Master Production Schedule shown in Chapter 2.2.2.

Planning assumption

A) 1 MCR roman tile of 8 mm requires:
859 gm cement
1050 gm sand
550 gm aggregate

B) Three weeks of cement, sand and aggregate stock are maintained to bridge any unforeseen material supply shortage.

C) Cement has one week of procurement lead time, while sand and aggregate have two days' procurement lead time.

D) There is no raw material inventory.

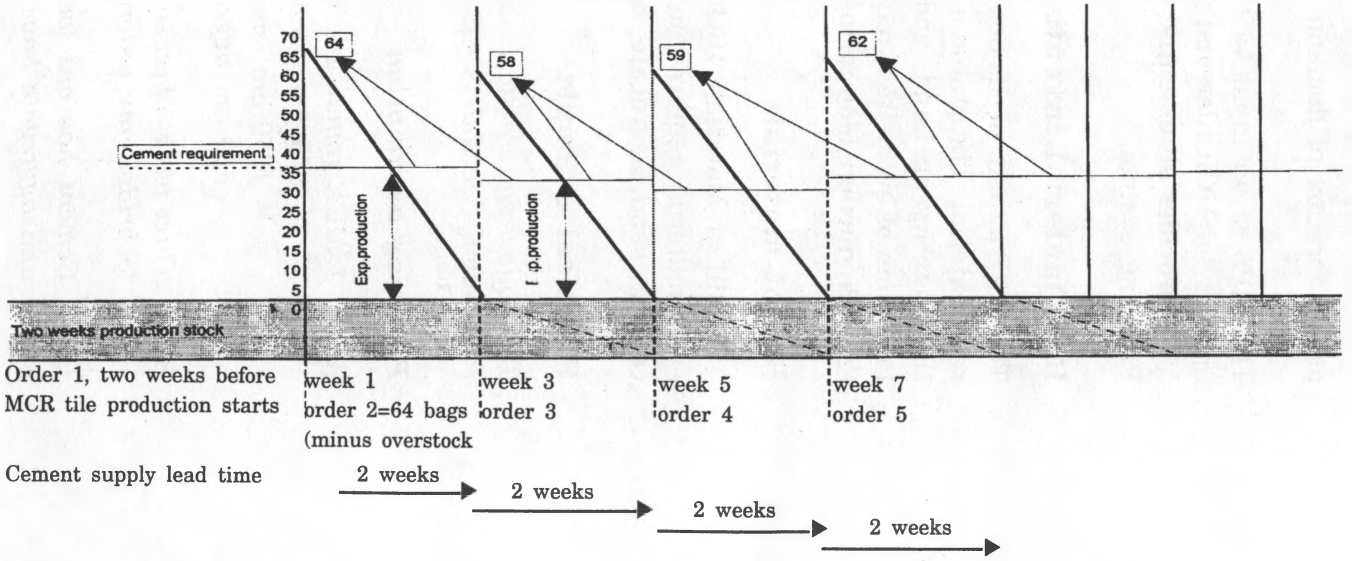
WARNING !!

The above figures are not representative and will differ from place to place. It is up to each MCR tile entrepreneur to determine his situation in relation to local circumstances.

Material Requirement Planning Chart

Week	1	2	3	4	5	6	7	8	9	10	11	12
Weekly planned production	1000	1000	900	850	900	700	950	900	1000	850	900	1000
Cement consumption (bg/50kg.)	17	17	16	14	16	12	16	15	17	14	15	17
Sand consumption (kg.)	1050	1050	945	893	945	735	998	945	1050	893	945	1050
Aggregate consumption (kg.)	550	550	495	468	495	385	523	495	550	468	495	550

Cement quantity requirement system



Note:
For sand and aggregate, the same formular should be made to determine the correct date and amount of order.

4.3 Cost/Profit

The objective of doing a MCR business is finally to earn a profit from the production of MCR tiles. The profitability of an MCR business is composed of various factors, of which the **Production and Operations' Management** is only one aspect.

Keeping a professional financial record is another important aspect, for which it is recommended to read the MCR Toolkit, *Element 30, Business Skills Guide.*

Overall performance control

A MCR entrepreneur should always know the level of workers' performance. For controlling the cost/profit, a **Manpower Monitoring Chart** can be very handy. An example of such a form was developed by the MSU-IIT MCR Workshop in Iligan, Mindanao, Philippines. (See Annex Manpower Monitoring Chart)

4.4 Information Flow

Any information that is not properly used to further improve the overall business is useless. Thus, it is important, first of all, to determine what type of information is required—and in which form—to improve the MCR business. RAS has created several information forms that could serve as a basis for the MCR tile entrepreneur's information requirement. However, it is important for each MCR tile entrepreneur to be critical in defining what information he requires for his business before using the RAS forms. Using too much information can be costly, while too little information can be the ruin of a MCR business.

RAS basic information forms

The RAS basic information forms is called **Production Monitoring Logbook**. The following forms are available in the Annexures of this publication.

1. Basic information
2. Daily production record

3A Financial record

3B Summary financial record

4 Daily stock record

5 Material record

It is advisable to keep a daily record of the production to determine if production goals are being met.

This record should be compared with the production planning.

Unexpected events may require that goals be revised to match overall performance with production objectives.

Production/sales data analysis

Together with the workshop's sales' performance, a simple graph can show valuable indicators such as;

- Rate of production (max., min., periods)
- Rate of sales (max., min., periods)
- Monthly inventory—difference between production and sales. (Also see Annexure Production and Selling Chart)

4.5 Product Quality

Operating philosophy

Product quality is not normally isolated nor restricted to the final product—the MCR tile. The product quality is linked with the company's operating philosophy and reflects the MCR entrepreneur's business **vision, values** and **guiding principle.** This may best be explained by the following example.

An MCR business entrepreneur has developed the following operating philosophy:

Vision:

My vision is to continually improve my MCR tiles and related services to meet customers' needs and to earn a reasonable profit.

Values:

People are the source of my strength. They make up the company's intelligence and energy.

The MCR tile is the end result of my efforts and should be of the best quality to serve the needs of my customers.

Profit is the indicator that my customers are served in an efficient and satisfactory manner. I need a profit to survive and grow.

Guiding principles:

Quality comes first in order to achieve customers' satisfaction.

I provide better MCR tiles and services than my competitors.

Satisfying my customers is possible by being attentive to every customer need.

Dealers and raw material suppliers are my partners.

With this operating philosophy, the product quality control is only one part. However, it is a very important part and requires the full attention of professionals.

Ongoing process

MCR tile quality control is an ongoing process, and for each production step there are defined quality control criteria. For MCR tile quality control specification, see MCR Toolkit, *Element 23, Quality Control Guidelines.*

Annexures

Further Reading

(E) = English; (F) = French; (S) = Spanish; (G) = German

MCR technology related literature

1. Brys, G.: "Tuiles en Fibromoritier: Procédé de production et pose en toiture," Dossier technique N°. 16, Genève, BIT, 1988 (F) + (E) 1992 N°. 6

2. "Building Technology Series: Technical Report," Ghana, Bangladesh, Sri Lanka, Tanzania, Philippines, Thailand, ILO.

3. Evans, Barrie: "Understanding Natural Fibre Concrete, Its Application as a Building Material," IT Publications, London, 1986 (E)

4. Gram, H.-E.; Parry, J.P.M.; Rhyner, K.; Schaffner, B.; Stulz, R.; Wehrle K.; Wehrli, H.: "FCR—Fibre Concrete Roofing. A comprehensive report on: The Possibilities of Fibre Concrete Roofing. The Limits of Application, and the State of the Art," SKAT, St. Gallen, 1986 (E)

5. Gram, Hans-Erik; Gut, Paul: "FCR/MCR Toolkit Element 22, Production Guide," SKAT/ILO, St. Gallen, 1992 (E)

6. Gram, Hans-Erik; Gut, Paul: "FCR/MCR Toolkit Element 23, Quality Control Guidelines," SKAT/ILO, St Gallen, 1991 (E)

7. Gut, Paul: "FCR/MCR Toolkit Element 3, Teaching FCR/MCR Technology," SKAT/ILO, St. Gallen, 1992 (E)

8. Gut, Paul: "FCR/MCR Toolkit Element 4, Standards' Guidelines," SKAT/ILO, St. Gallen, 1992 (E)

9. Gut, Paul: "FCR/MCR Toolkit Element 24, Roof Structure Guide," SKAT/ILO, St. Gallen, 1993 (E)

10. Gut, Paul: "FCR/MCR Toolkit Element 25, Roof Cover Guide," SKAT/ILO, St. Gallen, 1993 (E)

11. Heierli, Urs; Beck, Victor: "FCR—Fibre Concrete Roofing, Feasibility and Market Study Guides," SKAT, St. Gallen, 1987 (E)

12. Lola, Carlos R.: "Fibre Reinforced Concrete Roofing Sheets, Technology Appraisal Report," AT International, Washington, D.C., 1985 (E)

13. Müller, Heini: "Roof Construction training in Ghana, T.R. 14," ILO/SKAT, St. Gallen, 1991 (E)

14. Parry, John: "Fibre Concrete Roofing," Intermediate Technology Workshops, Cradley Heath, 1985 (E)

15. Parry, John: "Fibre Concrete Tiles, Users Manual," Cradley Heath (E)

16. Preiswerk, Susanne; Müller, Heini: "Introduction of Micro Concrete tiles in the Philippines, T.R. 17," SKAT/ILO, St. Gallen, 1991 (E)

17. "Serie Technologie et Construction: rapports techniques," Tchad, Burundi, Haïti, Burkina Faso, Côte d'Ivoire, BIT

18. SKAT: "The Basics of Concrete Roofing Elements, Fundamental Information on the Micro Concrete Roofing (MCR) and Fibre Concrete Roofing (FCR) Technology for Newcomers, Decisionmakers, Technicians, Field Workers and all those who want to know more about MCR and FCR," SKAT, St. Gallen, 1989 (E)

19. Stulz, Roland; Mukerji, Kiran: "Appropriate Building Materials, A Catalogue of Potential Solutions," SKAT, St. Gallen, GATE, Eschborn, IT Publications Ltd., London, 1988 (E)

20. Twigt, Fred Jan: "Fibre Concrete Roofing in Malawi, Kenya, Tanzania, Zambia and Uganda," FCR Advisory Services, SKAT/ILO, St. Gallen, 1988 (E)

21. Sarasin, C.: "FCR/MCR Toolkit Element 30, Business Administration," SKAT, 1994 (E)

22. M.S. Dimamay, D. Ikin, P.J. Boermann; MCR Toolkit Element 31, Marketing and Selling Guide, SKAT/ILO 1995 (E)

23. Müller Heini; P. Gut; MCR Toolkit Element 20, Workshop and Equipment, SKAT 1997 (E)

Audio-visual material

1. MacWhinnie, Ian: "An Introduction to FCR/MCR Production," A BASIN Video, ITDG/GTZ-GATE, Eschborn, 1990 (E)

Micro Concrete Roofing

Production Monitoring Logbook

1 BASIC INFORMATION

☆

2 DAILY PRODUCTION RECORD

☆

3A FINANCIAL RECORD

☆

3B SUMMARY FINANCIAL RECORD

☆

4 DAILY STOCK RECORD

☆

5 MATERIAL RECORD

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

Introduction

MCR producers are not usually known as being especially fond of bureaucracy. But there are a few reasons to keep records while producing MCR. It is useful to know costs, benefits and the efficiency of a MCR workshop. A realistic price can only be charged for any product, if its production costs are known. The production efficiency is a good indicator for all kinds of problems. With the records it is easier to decide where and how production has to be more efficient. Stock-keeping records make it easier to plan the ordering and to avoid misuse of materials.

Please read the following paragraphs carefully. Who knows, you may even start liking bureaucracy!

We hope this logbook will help you with your book-keeping or at least give you some ideas on how to handle it.

For more information, hints or questions, please contact

RAS

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

1 BASIC INFORMATION ON MCR ROOFING PRODUCTION UNIT

RAS REF NO. _____

COUNTRY _____

ADDRESS _____

_____

_____

☐ PRIVATE _____

☐ GOVERNMENT _____

☐ NGO _____

CONTACT PERSON _____

LOCATION OF PRODUCTION UNIT _____

TYPE AND SIZE OF PRODUCT ☐ SHEETS _____ cm x _____

☐ TILES _____ cm x _____

☐ _____

TYPE OF EQUIPMENT : _____

NUMBER OF TABLES : _____

RAW MATERIALS : TYPE (

MIXING

MEASU

FIBRES _____ WATER _____

NUMBER OF WORKERS : _____

DAILY PRODUCTION : NUMBE

Q.M OF ROOF _____

MARKET : ☐ RURAL ☐ URBAN

☐ PRIVATE

☐ NGO

☐ GOVERNMENT

☐ LOW INCOME (up to ..... per .....)

☐ MIDDLE INCOME (up to ..... per .....)

☐ HIGH INCOME (up to ..... per .....)

REMARKS : _____

Basic Information / Form 1

This information is useful to exchange experiences with other MCR producers and to set up a network of MCR producers monitored by RAS. In this way you can be provided with useful information. Please fill this form in any case and send one copy to RAS.

Please send one copy to RAS

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

2 DAILY PRODUCTION RECORD OF MCR PRODUCTION UNIT

MONTH _____ YEAR _____ UNIT _____

(A) DATE	(B) WORKERS INITIALS	(C) USED CEMENT KG	(D) NO. OF TILES PRODUCED	(E) NO OF RIDGES PRODUCED	(F) NO. OF BREAKAGES	(G) OTHER ELEMENTS	(H) OTHER ELEMENTS	(I) REMARKS
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								
16.								
17.								
18.								
19.								
20.								
21.								
22.								
23.								
24.								
25.								
26.								
27.								
28.								
29.								
30.								
31.								
TOTAL		(K) _____	(L) _____	(M) _____	(N) _____	(O) _____	(P) _____	

Production Record / Form 2

This form is like a calendar. Column (A) gives the date. On the top, month and year can be entered by you. Put down records for each day, even if there is no production. In this case you can give the reasons in (I). (Remarks, for example, "holiday" or "no cement").
Column (B) shows the initiator (or total number) of workers.
Column (C) shows cement consumption in kg.
Column (D), (E), (G) and (H) show tiles (which means fresh tiles on the mould), ridge tiles or other elements produced that day.
In column (F) you write the total of breakages.
At the end of the month all columns are totalled.
You may wish to fill the total cost, which gives you an indication of the labour cost per produced element ((Q) ÷ (L) + (M) + (O) + (P)).
An additional check of the used cement is to compare the used bags and the used cement in kg ((K)).
Multiply the number of used bags by the quantity of one bag (in kg). The result should not differ too dramatically from the equivalent under (K).
A good indicator of workmanship and quality is the breakage percentage. Divide N by the total of (L) + (M) + (O) + (P) and multiply by 100.
Another useful information is the cement consumption per roofing element. Divide K by the total of elements ((L) + (M) + (O) + (P)). If this figure is high, you must check the measuring of raw materials or stock security.

(Q) TOTAL LABOUR COST

_____

BAGS OF CEMENT USED

_____ BAGS = _____ Kg

CEMENT USED PER TILE : $\frac{K}{L + M + O + P}$ = _____ Kg

BREAKAGES : $\frac{N}{L + M + O + P}$ x 100 = _____ %

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

3A FINANCIAL RECORD OF MCR PRODUCTION UNIT _____

PERIOD FROM _____ TO _____ IN OUT

DATE	RECEIPT / DESCRIPTION	AMOUNT	REMARKS
	TRANSFER FROM _____		
SUBTOTAL OF THIS PAGE / TRANSFER			
	TOTAL		

Production Record / Form 3A and 3B

In order to have complete knowledge of where the costs are going to and where the benefits come from, keep a financial record.
Take two copies of Form 3A. One is for expenses, on it you mark OUT on the top; one is for receipts, you mark IN. You fill the date, receipt number, description or your own number for reference. Then fill out the amount and add remarks. At the end of your financial record period (one year, one month) you add up all categories on Form 3A and transfer them to Form 3B.

3B SUMMARY FINANCIAL RECORD OF MCR PRODUCTION UNIT

PERIOD FROM _____ TO _____ UNIT _____

OUT

Ⓐ **SALARIES**

① PRODUCTION from payroll _____
② _____ _____
③ _____ _____
SUBTOTAL _____

Ⓑ **RAW MATERIALS**
Totals from Form 3B

① CEMENT _____
② SAND _____
③ AGGREGATE _____
④ WATER _____

Ⓒ **MAINTENANC**
totals from for

Ⓓ **FIXED COSTS**

Ⓔ **TRANSPORT**
totals from Form 3B

① RAW MATERIALS _____
② CR. ELEMENTS _____
③ _____ _____
④ _____ _____
SUBTOTAL _____

TOTAL OUT A + B + C + D + E = _____

On this form receipts and expenses are listed in detail.
Guidelines for the category "Fixed Costs" (D):
D 1 : Redemption Capital: You know how much you pay for repayment and interest on your capital if it concerns a loan. Calculate the total for the period you record.
D 2 : Buildings/Site Depreciation: You know the total cost of investment in buildings and curing tanks, etc. This amount is usually depreciated over a number of years. Calculate the amount over the period you record.
D 3 : Rent: If you rent a site or a building, calculate the total over the period you record.
You may have other fixed costs. Also fill them out under D.
We suggest you calculate your profit once a year. You can fill Forms 3A and 3B one time each year or once a month and add up the monthly calculations at the end of the year.

IN

Ⓕ SALES from Form 3B _____
Ⓖ TRANSPORT from Form 3B _____
Ⓗ INSTALLATION from Form 3B _____
Ⓘ _____ _____

TOTAL IN F + G + H + I = _____

TOTAL IN _____
TOTAL OUT – _____
PROFIT _____

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

4 DAILY STOCK RECORD OF MCR PRODUCTION UNIT

MONTH_____ YEAR_____ UNIT _____

PRODUCT _____

DATE	FOR TEST	REJECTS	TO STOCK	OUT FROM STOCK		BALANCE	REMARKS
					RECEIPTS NO.	(D)	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
27.							
28.							
29.							
30.							
31.							
TOTAL	(A)	(B)				(C)	
						TRANSFER TO NEXT MONTH	

Daily stock record / Form 4

For each type of MCR element you are producing, take one copy of Form 4.

Before an element is put to stock, it is tested. The first column shows how many pieces are tested.

The next column shows the number rejected: total for test – total rejected = total going to stock. In the next column you write the number of elements going out of stock. In column (D) you have the balance. Here you see how many elements should be in the stock. Transfer (C) to column (D) of next month.

It is useful to calculate the percentage of the rejected elements at the end of the month: divide (A) by (B) and multiply by 100. If significant oscillations occur or the percentage is too high, find out why.

It is advisable to check the stock regularly (every 3 or 4 months) to see if the figures on the paper and the actual stock are the same.

REJECTED : $\frac{B}{A}$ x 100 = _____%

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

5 MATERIAL RECORD OF MCR PRODUCTION UNIT _____

LEDGER CARD No. _____ MATERIAL _____

	IN		BALANCE		OUT	
DATE	RECEIPT No.	QUANTITY		DATE	RECEIPT No.	QUANTITY
	TRANSFERRED FROM CARD NO. _____				TRANSFERRED FROM CARD NO. _____	
	TRANSFERRED				TRANSFERRED	

TRANSFERRED TO LEDGER CARD NO. _____

Material Record / Form 5

This form is used to keep a record of your store. Give your card a number for reference and fill in what material (this may also include tools or spare parts) is concerned. All material that goes in or out you write either under IN or OUT noting its quantity (no. of bags, kg or whatever is applicable) and its number of reference.

The column "Balance" shows what is in stock. This tells you what material you need to order to prevent a break in production.

1 BASIC INFORMATION ON MCR ROOFING PRODUCTION UNIT

RAS REF NO. _____

COUNTRY _____

ADDRESS _____

_____

_____

☐ PRIVATE _____

☐ GOVERNMENT _____

☐ NGO _____

CONTACT PERSON _____

LOCATION OF PRODUCTION UNIT _____

TYPE AND SIZE OF PRODUCT
☐ SHEETS _____ cm x _____
☐ TILES _____ cm x _____
☐ _____

TYPE OF EQUIPMENT : _____

NUMBER OF TABLES : _____ POWERED BY : _____

RAW MATERIALS : MIXING RATIO : CEMENT _____ SAND _____ AGGREGATE ____ WATER

MEASURED BY : ☐ WEIGHT ☐ VOLUME

NUMBER OF WORKERS : _____

DAILY PRODUCTION : NUMBER OF ELEMENTS _____ = SQ.M OF ROOF _____

MARKET : ☐ RURAL ☐ URBAN

☐ PRIVATE
☐ NGO
☐ GOVERNMENT

☐ LOW INCOME (up to .....per .....)
☐ MIDDLE INCOME (up to .....per .....)
☐ HIGH INCOME (up to .....per .....)

REMARKS : _____

_____

_____

_____

_____

_____

Please send one copy to RAS

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

2 DAILY PRODUCTION RECORD OF MCR PRODUCTION UNIT

MONTH _____ YEAR _____ UNIT _____

(A) **DATE**	(B) **WORKERS** INITIALS	(C) USED **CEMENT** KG	(D) NO. OF **TILES** PRODUCED	(E) NO OF **RIDGES** PRODUCED	(F) NO. OF **BREAKAGES**	(G) OTHER ELEMENTS	(H) OTHER ELEMENTS	(I) **REMARKS**
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								
16.								
17.								
18.								
19.								
20.								
21.								
22.								
23.								
24.								
25.								
26.								
27.								
28.								
29.								
30.								
31.								
TOTAL		(K) _____	(L) _____	(M) _____	(N) _____	(O) _____	(P) _____	

(Q) TOTAL LABOUR COST

BAGS OF CEMENT USED

_____ BAGS = _____ Kg

CEMENT USED PER TILE : $\frac{K}{L + M + O + P}$ = _____ Kg

BREAKAGES : $\frac{N}{L + M + O + P}$ x 100 = _____ %

3A FINANCIAL RECORD OF MCR PRODUCTION UNIT_____

PERIOD FROM_____ TO _____ IN OUT

DATE	RECEIPT / DESCRIPTION	AMOUNT	REMARKS
	TRANSFER FROM _____		
SUBTOTAL OF THIS PAGE / TRANSFER			
	TOTAL		

3B SUMMARY FINANCIAL RECORD OF MCR PRODUCTION UNIT

PERIOD FROM _____ TO _____ UNIT _____

OUT

Ⓐ **SALARIES**

①	PRODUCTION from payroll	_____
②	_____	_____
③	_____	_____
	SUBTOTAL	_____

Ⓑ **RAW MATERIALS**
Total from Form 3B

①	CEMENT	_____
②	SAND	_____
③	AGGREGATES	_____
④	WATER	_____
⑤	G. I. WIRE	_____
⑥	ENERGY	_____
⑦	PLASTIC SHEETS	_____
⑧	PIGMENTS / COLOURANTS	_____
⑨	_____	_____
⑩	_____	_____
	SUBTOTAL	_____

Ⓒ **MAINTENANCE**
total from Form 3B

①	EQUIPMENT	_____
②	BUILDINGS / SITE	_____
③	_____	_____
④	_____	_____
	SUBTOTAL	_____

Ⓓ **FIXED COSTS**

①	REDEMPTION CAPITAL	_____
②	BUILDINGS / SITE DEPRECIATION	_____
③	RENT	_____
④	_____	_____
⑤	_____	_____
	SUBTOTAL	_____

Ⓔ **TRANSPORT**
total from Form 3B

①	RAW MATERIALS	_____
②	CR. ELEMENTS	_____
③	_____	_____
④	_____	_____
	SUBTOTAL	_____

TOTAL OUT A + B + C + D + E = _____

IN

Ⓕ	SALES from Form 3B	_____
Ⓖ	TRANSPORT from Form 3B	_____
Ⓗ	INSTALLATION from Form 3B	_____
Ⓘ	_____	_____

TOTAL IN F + G + H + I = _____

TOTAL IN _____

TOTAL OUT _____

PROFIT _____

Issued by **RAS** - ROOFING ADVISORY SERVICE c/o SKAT Swiss Centre for Development Cooperation in Technology and Management

4 DAILY STOCK RECORD OF MCR PRODUCTION UNIT

MONTH _____ YEAR _____ UNIT _____

PRODUCT _____

DATE	FOR TEST	REJECTS	TO STOCK	OUT FROM STOCK		BALANCE	REMARKS
					RECEIPTS NO.	(D)	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
27.							
28.							
29.							
30.							
31.							
TOTAL	(A)	(B)				(C)	
						TRANSFER TO NEXT MONTH	

REJECTED : $\frac{B}{A}$ x 100 = _____%

5 MATERIAL RECORD OF MCR PRODUCTION UNIT _____

LEDGER CARD No. _____ MATERIAL _____

	IN		BALANCE		OUT	
DATE	RECEIPT No.	QUANTITY		DATE	RECEIPT No.	QUANTITY
	TRANSFERRED FROM CARD NO. _____				TRANSFERRED FROM CARD NO. _____	
	TRANSFERRED				TRANSFERRED	

TRANSFERRED TO LEDGER CARD NO. _____

Manpower Monitoring Chart

for the month of

March

Practical example for information only !!

Man-hours used for: →							Tile production output →						
Date	Production	Painting	Loading	Installation	Others	Total hrs.	Tiles	D-Nib tile	Hip tiles	Ridge tiles	Reject	Total net	Remarks
1	28					28	115			15		170	
2	3					32	171			15		186	
3					16	16						0	Holiday
4						0						0	*Saturday*
5						0						0	*Sunday*
6	24			8		32	47					47	Battery problem
7		4	12		16	32						0	Battery problem
8	24	8				32	205			15		220	
9	24	8				32	190			16		206	
10	24	8				32		129		15		144	
11		4			12	16						0	*Saturday*
12						0						0	*Sunday*
13	20	8				28	169			17		186	
14	20	8				28	156			18		174	
15	24	8				32	184			15		199	
16	24	8				32	201			15		216	
17	24	8				32		115		15		130	
18		4			12	16						0	*Saturday*
19						0						0	*Sunday*
20	24	8				32	215					215	
21	16	8	2	8		34	96			16		112	
22	25	15				40	186			17		203	
23	26	14				40	129			16		145	
24	29.5	10.5				40		110		15		125	
25		8			8	16						0	*Saturday*
26						0						0	*Sunday*
27	30	10				40	169		7	9		185	
28	28	12				40	129		7	9		145	
29	21	10.5	0.5			32	150		7	9		166	
30	32	8				40	172	132	7	8		187	
31	32	8				40			8	6		146	
	532	**188**	**14.5**	**16**	**64**	**814**	**2724**	**486**	**36**	**261**	**0**	**3507**	**Total**

Manpower Monitoring Chart

for the month of

. . . . . .

Man-hours used for: → **Tile production output** →

Date	Production	Painting	Loading	Installation	Others	Total hrs.	Tiles	D-Nib tile	Hip tiles	Ridge tiles	Reject	Total net	Remarks
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													

Production and Selling Chart

(Cumulative end-of-the-month data)

	1994		1995		1996	
	Prod.	Sale	Prod.	Sale	Prod.	Sale
Jan			2000	500	3000	2000
Feb			4000	700	6000	4000
March			6000	4000	10000	10000
April			8500	5900	13500	12000
May			10300	8900	17000	13000
June	500		13000	12400	20500	14000
July	1000		15000	13000	24000	19000
Aug	1900	600	17500	15600	28000	25000
Sept	3300	900	19400	18500	32000	30000
Oct	5400	4000	21600	19000	36000	33000
Nov	7500	7000	23000	22200	40000	39000
Dec	10500	10000	26000	25800	44000	43000