



Wall Building Bibliography

building advisory service and information network

Selected Bibliography on Brickmaking in Developing Countries

Introduction

Fired clay bricks are produced by many small and medium-scale enterprises in a process consisting of clay extraction, clay preparation, brick moulding or shaping, brick drying and firing stages.

Brickmakers are faced with the challenges of producing bricks of satisfactory quality efficiently, economically and sustainably, and with particular regard to mitigating environmental damage. Of special relevance with regard to sustainability of artisanal brick production and the environment is the promotion of renewable fuel sources, particularly those from waste materials, as alternatives to the seemingly ubiquitous use of wood, often from indigenous forests.

This bibliographic leaflet is primarily intended as an information resource on current documents on brickmaking for small and medium-scale brickmakers and organisations working with them. Some of these documents, especially those produced by GATE (the German Appropriate Technology Exchange) / GTZ, are also available on the World Wide Web, and progressively more and more documents are now becoming available via this medium.

The bibliography is divided into specific sections - General, Clay Extraction and Preparation, Moulding and Drying, Kilns and Firing, and Fuels and Energy Efficiency. A rating of the relevance of each source for the brick producer is given, ranging from five stars for documents which are particularly useful, in depth and informative, to one star for documents which only contain limited relevant details. Note that this is not a rating of the overall quality of the document, only of relevance. basin Keywords on brickmaking are provided in a separate paragraph at the end of the bibliography. The more highly rated documents also have a short abstract. In each section, the documents are listed in order of the main author's surname.

Brickmaking General

1. Village-Level Brickmaking;

by Beamish, Anne & Donovan, Will; Friedr. Vieweg & Sohn (Aus der Arbeit von GATE), Braunschweig / Wiesbaden, Germany, 1989, pp. 124; ISBN 3-528-02051-2. ****

This manual provides easily understandable basic information on small-scale low capital rural brick production. The document is extensively illustrated, and especially useful on brick-making practice, including planning the brickmaking site, mak-



Fig 1: Brickmoulding at Mupfure in Zimbabwe.

ing a manual brick mould, kiln firing, organisation of production and commonly encountered problems with solutions. (Complete document to be available on the Internet soon, accessed through basin Website)

2. Manufacturing, Classification, and Selection of Brick;

Brick Institute of America; Technical Note 9 - Part 1, Manufacturing, March 1986, pp. 5 (<http://www.bia.org/BIA/technotes/t9.htm>); Part 2, Classification, June 1989, pp. 11 (<http://www.bia.org/BIA/technotes/t9a.htm>); Part 3, Selection, December 1995, pp. 9 (<http://www.bia.org/BIA/technotes/t9b.htm>).*** Part 1 describes some of the processes used in brickmaking on any scale. Brick forming details are mentioned. Part 2 describes the characteristics sought in bricks for different applications, and brick selection guidelines for particular applications are provided in Part 3. Document relates mostly to the United States, but is also of interest for other countries.

3. Bricks and Blocks for Low Cost Housing;

by Carroll, R.F.; OBN 197, Building Research Establishment, Watford, UK, pp. 14 *

4. Manufacture of Bricks by a Semi-mechanised process: Including high draught kiln;

Central Building Research Institute (CBRI), Roorkee, India; Project proposal No. 19, May 1989, pp. 19. **

5. Small and Medium Scale Brick and Tile Production in Ghana -

No. 1 - An overview

No. 2 - Technology alternatives

No. 3 - Energy alternatives;

by Hammond, A.A.; basin / GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1997, 4pp each. ***

The three case studies between them give an overview of the development of burnt clay brick and tile production in Ghana, describe the production technologies and provide comparison on the different types of fuel used for firing.

6. Bricks and Brickmaking;

by Hammond, Martin; Shire Publications Ltd., Princes Risborough, England, 1990, Shire Album No. 75, pp. 32, ISBN 0 7478 0067 7.***

This is a historic account of brickmaking in Britain up to about 1950, covering both artisanal and industrial scale production, but in parts is still relevant today. A selection of historic photographs and an explanation of brickmaking terms is included.

<http://www.shirebooks.co.uk/Industrial/industrial-bl.htm#bri>

(for more detailed abstract);

<http://www.shirebooks.co.uk/> (for Shire Publications Homepage)

7. Status and Development Issues of the Brick Industry in Asia;

by Koopmans, A. & Joseph, S.; Regional Wood Energy Development Programme in Asia, GCP/RAS/131/NET Field Document No. 35; Food and Agricultural Organization of the United Nations, Bangkok, April 1993, pp. 69. ***

Country statistics and profiles of the brick industry in several Asian countries are presented along with technological, environmental, financial and market aspects as a precursor to establishing regional policies and programmes for industrial development.

8. Energy Efficiency in Small-Scale Brickmaking: Experience of the Intermediate Technology Development Group (ITDG) in Zimbabwe;

by Mason, Kelvin; in Science, Technology and Development, Vol. 15, No. 1, April 1997, pp. 162-173, Frank Cass, London (reprints available from ITDG). ***

This paper presents a case study of the experiences of ITDG's work with small-scale brickmakers in Zimbabwe, chronicling the development of ITDG's extension or "outreach" programme to help small brickmakers adapt and improve production techniques. Information is included on improved clamp kilns and the use of boiler ash waste as fuel.

9. Basic know-how for the Making of Burnt Bricks and Tiles;

by Merschmeyer, Gerhard, Misereor, Aachen, Germany, November 1989, pp. 164. *****

This book, based on the author's own many years of experience, provides basic practical guidelines suitable for village brickmakers. Particular attention is given to cost effective means to improve the quality of the bricks and increase efficiency in small-scale production. Consideration is also given of alternative fuels, based on agricultural wastes, for kiln firing. A second edition is planned and the complete document would then also be available on the basin Website.

10. Appropriate Building Materials - A catalogue of potential solutions;

by Stulz, R. & Mukerji, K.; pp. 37 to 46 (Fired Clay Products), IT Publications, London, ISBN 1 85339 225 1.***

This section gives a brief overview of the brickmaking process together with the advantages and disadvantages of bricks for building compared with other building materials. See IT Publications Website for ordering information: <http://www.oneworld.org/itdg/publications/about.html>.



Fig 2: Building with burnt bricks in Zimbabwe.



Fig 3: Demoulding clay bricks by hand in Cajamarca, Peru.

11. Small-scale Manufacture of Burned Building Brick;

by D. Thomas; Volunteers in Technical Assistance (VITA), 1600 Wilson Boulevard (Suite 710), Arlington, Virginia 22209, June 1989, ISBN 0866-19312X, pp. 14 (also available in French, Spanish and Portuguese). ***

This guide provides an outline of the brickmaking process on a small-scale, including brick moulding and kiln construction details. Illustrations are included. See the VITA publication catalogue for ordering information:

<http://www.vita.org/publications/pubcat.htm>

An abridged version of the manual, entitled "Understanding Small-Scale Brick Making", also by the same author, is available on the VITA Website:

<http://idh.vita.org/pubs/docs/book16.html>

12. Hands On - Energy Efficient Brick Making;

Intermediate Technology Development Group: Hands on Project (in collaboration with TVE International), 1998, pp. 5. **

Clay extraction and preparation

1. Soil Preparation Equipment - Product Information;

by Mukerji, K.; Wörner, H.; et al; GATE/GTZ, 1991, pp. 18. ***

This, slightly out-dated product information folder provides information on soil preparation equipment available on the market, for use either for preparing soil for building use on its own, or for making bricks for firing. A basin GATE/GTZ Technical Brief on "Clay Preparation" will soon be available.

Brick moulding and drying

1. Clay Brick and Tile Moulding Equipment - Product Information;

by Mukerji, K., Wörner, H. & Merschmeyer, G.; GATE/GTZ, 1991, pp. 16.***

This product information folder gives basic details on fired clay brick and tile production, specifications and data on small and medium-scale moulding equipment available on the market, as well as providing guidelines for equipment purchasers.

Kilns and firing

1. The Basics of Brick Kiln Technology;

by Jones, T.; Vieweg & Sohn, Braunschweig, for GATE/GTZ, Germany, 1996, ISBN 3-528-02085-7, pp. 36. ****

This brochure provides brief descriptions of brick kilns ranging from basic clamps to medium-scale continuously operated industrial kilns and includes advantages and disadvantages of each kiln type. Emphasis is given to improving kiln efficiency and reduced production wastage, as well as to ease of operation.

2. Brick Clamps;

by Jones, T.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1995, 4pp. ***

The technical brief describes the structure and layout of brick clamps, compares wood and coal fired clamps, shows the advantages and disadvantages of brick clamps and also how their efficiency can be improved:

<http://www.gtz.de/basin/gate/brickclamps.htm>

3. Hoffmann Kilns;

by Jones, T.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1995, 4pp. ***

This technical brief contains a description of the layout and operation of the industrial-scale continuously operated Hoffmann type of kiln for firing bricks:

<http://www.gtz.de/basin/gate/hoffmannkilns.htm>

4. The Vertical Shaft Brick Kiln;

by Jones, T.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1995, 4pp. ***

This leaflet describes the development of the vertical shaft brick kiln in China, outlines its advantages and disadvantages compared with other types of kilns and relates its difficult introduction in other Asian countries:

<http://www.gtz.de/basin/gate/vertical.htm>

5. The Vertical Shaft Brick Kiln - A problematical introduction into Pakistan;

by Jones, T.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1995, 4pp. ***

This case study describes conventional firing of clay bricks in Pakistan, the introduction of the VSBK in the country, the problems encountered and the lessons learnt.

6. Vertical Shaft Brick Kiln - Technology Transfer, Indian Experience, Nos. 1 & 2;

by Lakshimikantan, K.R.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1998, 4pp each. ***

The two case studies relate the experience of Development Alternatives (DA) in introducing vertical shaft brick kiln technology, originally developed in China, into India. DA's experiences of the technology transfer process, the problems overcome and the lessons learnt are outlined.

7. Bull's Trench Brick Kiln;

by Norsker, H.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1995, 4pp. ***

This Technical Brief describes the development and functioning of the Bull's trench continuously operated kiln, including its advantages and disadvantages compared with other kiln types.

<http://www.gtz.de/basin/gate/bull.htm>

8. Igloo Type Brick Kilns in Zimbabwe;

by Tawodzera, P.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1997, 4pp. ***

The case study describes beehive kilns which are used in Zimbabwe for firing refractory, facing and industrial bricks, and other ceramic products and includes information on construction and operation and energy aspects.

Fuels and energy efficiency

1. Utilization of Bagasse in Brickmaking - R & D in Sudan;

by Bairiak, J.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1999, 4pp. ***

This case study describes the result of research undertaken in Sudan on the use of bagasse, a by-product of the sugar industry, as fuel in brickmaking. With this fuel brick quality can be maintained or improved and savings on the use of wood for fuel can be made.

2. Utilization of Cow-Dung in Brickmaking;

by Bairiak, J.; GATE Wall Building Case Studies, GATE/GTZ, Eschborn, Germany, 1999, 4pp. ***

The case study describes experiments to replace a proportion of wood as fuel for firing bricks by cow-dung mixed into the bricks themselves. In this way the energy cost can be significantly reduced.

3. Brick and Lime Kilns in Ecuador - An example of woodfuel use in Third World small-scale industry;

by Barriga, A. et. al.; Energy, Environment and Development Series - No. 13, Stockholm Environmental Institute, ISBN 91 88116 48 4, pp. 35. ***

This is the only published comprehensive study to date critically examining the efficiency of small-scale brick kilns. Part 1 of the report, which covers brick kilns, outlines the methods which were developed to assess fuel efficiency and presents a comparison between different field kilns in Ecuador.

Note:

3 more Technical Briefs on clay preparation, moulding and drying are in preparation for the basin/GATE series.



Fig 4: Filling a pugmill with clay.

Text by and further information from:

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Fig 5: Stacking bricks for firing in a permanent brick clamp in Sudan.

basin KEYWORDS - relevant to at least one of the above documents :

APPROPRIATE	SOIL	dissemination	medium-scale
BASICS	TECHNOLOGY	drying	mixing
BUILDING MATERIAL	WALL	dung	mould
COMPONENT	admixture	earth	problem
CONSTRUCTION	animal	efficiency	product
DC	ash	employment	production
DEVELOPMENT	assistance	extruded	properties
ECONOMICS	bagasse	factory	quality control
ENERGY	biomass	firing	saw-dust
ENVIRONMENT	block	fuel	small-scale
EQUIPMENT	brick	grinding	stacking
INDUSTRY	burnt	hollow	test
NGO	case study	information	tile
PLANNING	ceramics	kiln	transfer
PROCESSING	clay	manual	waste
PROJECT	compressed	manufacturing	
RAW MATERIAL	coffee husk	marketing	
RURAL	cost-effective	masonry	
	dimensioning	mechanized	

What is basin?

The building advisory service and information network (**basin**) - of which GATE/GTZ is one of the founding members - was set up in 1988 to provide information and advice on appropriate building technology and to create links with know-how resources in the world for all those in need of relevant information.

basin attaches importance to giving individual specialised support to its clients whilst balancing this with the comprehensive view that comes from the long and diverse experience of its partner organisations.

basin provides a comprehensive range of expertise, experience, knowledge and skills for the support of new initiatives in the low-cost building sector.

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 feed-back. Any publications, information, personal experiences, etc. that can be made available to **basin** are always welcome and will help **basin** to help others.

For more information on **basin** contact GATE/GTZ or »<http://www.gtz.de/basin>«.

Published by **gate**

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