



# Eco-efficient Masonry Bricks and Blocks

Design, Properties and  
Durability

Edited by F. Pacheco-Torgal, P. B. Lourenço,  
J. A. Labrincha, S. Kumar and P. Chindaprasirt

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# Foreword

Brickwork and blockwork are very usual construction systems, mainly for houses and apartment buildings. These construction technologies are extensively employed worldwide both in developed and developing countries, sometimes due to strong cultural aspects, long time tradition or even as a symbol of solid construction. Moreover the good performance of masonries is well known by the users, including its strength, thermal and acoustical properties. In developing countries besides the former reasons, brickwork or blockwork are the only suitable methods for self-construction in non-industrialized circumstances.

However the traditional masonry units are usually non-eco-friendly products, mainly because of their high energy consuming components due to their production method (fired-clay bricks) or their compounds (high Portland cement consumption in the concrete or earth-based blocks). That is why for a sustainable construction these traditional and usual building systems are avoided. Nevertheless sustainability is not restricted to environmental aspects, it has to take into account the social requirements and economic feasibility. Therefore the search for eco-efficient masonry units is of utmost importance for the building industry. For this reason this book fulfills an important gap in the building knowledge and provides the designers, architects and engineers with important up-to-date information to re-establish the masonry as a suitable system for eco-efficient buildings.

This publication analyzes the subject in a very comprehensive approach. The traditional masonry units, fired-clay bricks and concrete blocks, are intensively studied in 10 chapters, including the optimized concrete design for the blocks and highly perforated shape for the bricks, paying attention for their thermal performance and pointing out the possibility of using industrial and agricultural wastes as replacement for the raw materials, with emphasis on the fly-ash to the bricks and pozzolana to the blocks. The lightweight concrete blocks have also been considered, mainly those produced with autoclaved aerated concrete. In addition, the millenary adobe blocks are evaluated as suitable products for masonry in the present days, adopting modern techniques for production and of course with much care for their durability. The possibility of the use of PCM (phase change materials) into building envelop has been discussed, mainly for the thermal performance of the masonry.

Geopolymeric blocks, considered a new family of masonry units, have been presented extensively, as they can consume large amount of residues such as fly-ash, mine-tailings, red-mud, blast furnace slag, silica fume and metakaolins.

Theoretical aspects are also presented, primarily regarding the optimization of the topology of the units and their environmental performance, mainly for the energy assessment and carbon dioxide production during the manufacture of the units.

In my opinion, this publication is an important tool for the revival of masonry in several countries where the environmental constraints have restricted their use not in favor of the consumers' wishes. It provides significant collaboration to the society as it gives the professionals of the building industry enough confidence that the use of masonry can be as eco-efficient as other products developed during the last decades that are already available in large scale for the use in buildings and constructions.

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