POLITECNICO DI TORINO
FIRST SCHOOL OF ARCHITECTURE
Master of Science in Architecture (Construction)
Honors theses

CE(P)B. Compressed earth and plastic bricks for housing modules in Anyama-Adjamé, Ivory Coast

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This study arises from the interest in developing countries, in the environmental problem relating to plastic waste disposal, in architectures and traditional materials of poor housing.
The research develops into two parallel fronts:

1. Working-out and characterization of CE(P)B (compresses earth and plastic bricks);
2. Projecting self-constructable housing modules

Working-out and characterization of CE(P)B (compresses earth and plastic bricks)

In the site located for the working-out of economical self-constructable houses, the village of Anyama-Adjamè the region of Anyama in Ivory Coast in the suburbs of the capital Abidjan, the traditional more used building material is raw hearth sometimes associated with other natural materials they can locally find.
The “banco”, which makes use of bamboo-wood structures covered with mud, was until recently, the more used building traditional technique. Now it is considered a too poor and without a sufficient durability and resistance technology.
Concrete perforated bricks are replacing the traditional raw earth ones, even if they are expensive, not sustainable and of lower quality than ours in the West. Moreover this technique plays the symbolic role of an economical and social emancipation.
The dramatic African situation of plastic waste left everywhere around, the so called “flowers of Africa”, that are responsible for the drying of soils, the water-bearing layers pollution and the suffocation of grazing animals, is particularly significant near big cities suburbs.

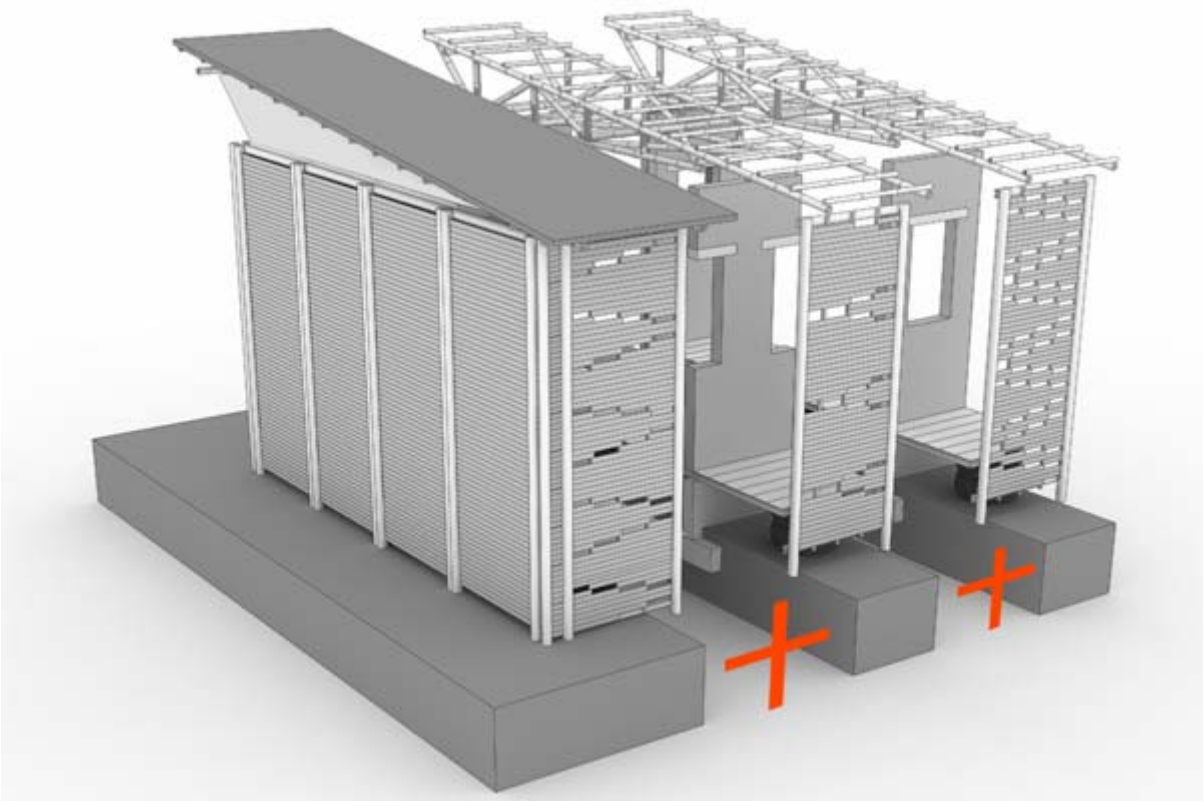
Traditional houses and the “flowers of Africa”

The idea of realizing a new moulded pressed brick has been one of the most significant targets of this research. They had to be economical, aesthetically appreciable, sustainable and easy to be assembled.
By means of the press invented by Prof. Mattone (Laboratory of materials and components testing at the Politecnico in Turin) and widely experimented by his working group during the realization of self-constructable houses in emerging countries, it has been possible to create compressed earth bricks that have been stabilized by using a little concrete additives of plastic filaments obtained by cutting common low-density polyethylene (LDPE) shopping bags.
This part of the research has been developed in three times: analysis of the earth imported by Ivory Coast through the individuation of granulometric fractions, determination of the Atterberg Limits and difractometry of X-rays and producing bricks with different mix designs and different sizes of plastic cuttings and the physico-mechnical characterization of the blocks by erosion tests, contact angle measure and compression tests.
The results have been interesting: the plastic filaments in the blocks act as natural fibres able to increase the resistance to traction and the resistance to plastic contraction during the desiccation phase and at the same time to reduce the earth-water contact angle by hydrophobizing the blocks.

Realization and test of the brick

Projecting autobuildable housing modules

The architectonic project originates from the building tradition and from the housing needs of the natives that have been studied by a questionnaire. Both the planimetric organization and the distribution of openings and ambients were based on bioclimatic remarks (Mahoney method) and wanted to improve the comfort of modules. In the architectonic project the plan chiefly develops along the east-west axis and the openings are facing north and south to favour the natural ventilation blowing there from south to north. The raphia panels setting up the veranda, become closed elements along the other walls in order to protect the rearward masonery in CE(P)B from the atmospheric agents. To obtain an airy floor and to improve the house salubrity, especially during the rainy season, the structure is raised from the ground by recycled tyres filled up with earth and concrete. A reticular bamboo structure is suggested as a roof because it is a resistant material easy to find and not difficult to assemble.



Assemblage of modules

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