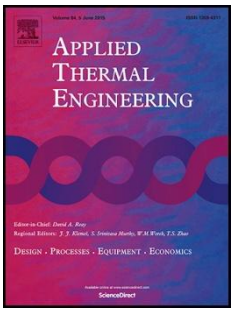
Accepted Manuscript



Title: Dynamic thermal performance of three types of unfired earth bricks

Author: Fayçal El Fgaier, Zoubeir Lafhaj, Emmanuel Antczak, Christophe Chapiseau

PII: S1359-4311(15)00929-1
DOI: http://dx.doi.org/doi:10.1016/j.applthermaleng.2015.09.009
Reference: ATE 7001

To appear in: *Applied Thermal Engineering*

Received date: 18-6-2015
Accepted date: 4-9-2015

Please cite this article as: Fayçal El Fgaier, Zoubeir Lafhaj, Emmanuel Antczak, Christophe Chapiseau, Dynamic thermal performance of three types of unfired earth bricks, *Applied Thermal Engineering* (2015), http://dx.doi.org/doi:10.1016/j.applthermaleng.2015.09.009.

Dynamic thermal performance of three types of unfired earth bricks

Fayçal El Fgaier[1]; Zoubeir Lafhaj[1*]; Emmanuel Antczak[2];
Christophe Chapiseau[3]

Ecole Centrale de Lille, Laboratoire de Mécanique de Lille (CNRS UMR 8107), Villeneuve d'Ascq, 59651 Cedex, France
[2] Université d'Artois, Technoparc Futura, 62400 Béthune, France
[3] Briqueteries du Nord, 9ème Rue, Port Fluvial, Lille, 59003 Cedex, France

*Corresponding author. Pr. Zoubeir LAFHAJ
Tel./fax: +33 320335365.
E-mail address: Zoubeir.lafhaj@ec-lille.fr

Highlights

- Dynamic thermal performances were examined as function of wall thickness.
- Earthen wall cannot achieve the required level of building insulation.
- The ideal thickness ensuring optimum thermal inertia is determined.
- An earthen wall can achieve the optimum thermal inertia with a 0.3 m of thickness.

ABSTRACT

The present work aims at studying the thermophysical properties of three types of unfired earth bricks through experimental investigation, and their dynamic thermal performance (thermal capacity, decrement factor and thermal lag) as a function of wall thickness. The objective is to to determine the ideal thickness of a raw earth wall, built by these bricks, to achieve the optimum values of thermal inertia. These bricks were industrially produced by the Briqueteries du Nord, which is a factory located in the north of France. The process used was the extrusion. The main difference between the three types of bricks is the origin of the soils, which were extracted from various quarries. It were characterized to determine their physical, chemical and geotechnical properties, and to identify its impact on development and production of unfired earth bricks.
This work has identified the optimum thickness of the wall built by these unfired earth bricks (It was 0.3 m for two types of bricks and for the other one was 0.4 m). These thickness ensure the greatest heat capacity and a thermal lag between 10 and 12 hours, while taking into account the quantity of bricks necessary for the construction of such a wall and the habitable area.