

Fiche Projet CNEREE

I. Descriptif du projet

1. Intitulé du projet- Référence- Programme

Solar Passives Systems for Air refreshment in Buildings

Acronym: RafriBat

Funding authority: **Hassan II Academy of Sciences and Techniques,**

Running Period : 2012-2018

2. Budget Global

3 000 000,00 MAD

3. Résumé du projet

In Morocco, the operating power cost of air conditioning systems for buildings may account for more than 30% of the total electricity power bill. Furthermore, the impact of air conditioners usage on electricity demand is an important problem as peak electricity load increases continuously, forcing the National Electricity Authority (www.one.org.ma) to build additional plants. In parallel, serious environmental problems are associated with the use of air conditioning. In the Moroccan traditional way of life, people developed empirical solutions (architectural, but also behavioral) to reach a minimal level of thermal comfort. However the standardization of the construction and the rapid growth of family income induces higher comfort requirements, which is mostly achieved through the use of electric air-conditioning equipment, especially in modern houses. This leads to a significant increase in energy consumption and consequently in greenhouse gas emission.

This project aims at studying the use of passive and hybrid systems in buildings for natural refreshment and heating. The project focuses on the building envelope in order to point out the synergy between an adapted envelope and the use of the passive/hybrid systems for cooling/heating. Specifically, two existing buildings with some passive systems for cooling/heating will be monitored and simulated. One of these building is a residential one, while the second is an office building. In the second part of the present project, the passive systems for cooling/heating will be tested individually in outdoor test-cells. The performance of these systems will be also calculated by means of dynamic thermal simulation. The comparison of the monitoring results and the dynamic calculations will produce an efficient and well-validated simulation tool. This tool may be used for in order to design energetically efficient buildings in an arid climate such as that of Marrakech. The final objective, of this project is to accompany the national energy efficiency strategy and the elaboration of the building energy efficiency code.

4. Objectif général

The main objective of the RafriBat project is to assess the thermal performance of some passive techniques for heat/solar protection, heat modulation and heat dissipation.

5. Objectifs spécifiques

- Assess thermal performance of passive techniques in existing buildings by means of dynamic simulation & monitoring of three existing buildings: EAHX, thermal insulation, overhang, ground coupling, cavity wall, thermal inertia.
- Assess thermal performance of heat/solar protection passive techniques for the roof in outdoor TEST CELLS: white painting, shading, thermal insulation using natural materials.
- Characterize natural fibers based composite construction materials.
- Incorporate PCM in building's envelope: measure the heat transfer coefficient in a laboratory prototype, enhance the PCM conductivity by means of nanofluids.

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6. Principales activités prévues ou réalisées

- Assessment of passive techniques thermal performance in existing buildings by means of dynamic simulation & monitoring in four existing buildings: AMYS, NASSIM, ZITOUNE, ADAM (6 Doctorate thesis).
- Assessment of thermal performance of heat/solar protection passive techniques for the roof in outdoor TEST CELLS: white painting, shading and thermal insulation using natural materials (1 Doctorate thesis & 1 Master thesis).
- Experimental characterization of composite construction materials made with natural fibers: measurement of thermal & mechanical properties (1 Doctorate thesis)
- Incorporation of PCM - Phase Change Material - in building's envelope: experimental determination of the PCM-wall/air heat transfer coefficient, enhancement of the PCM conductivity by means of nanofluids, experimental characterization (2 Doctorate thesis)

II. Partenaires du projet

▪ Coordination du projet :

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▪ Partenaires académiques & industriels

- Faculty of Sciences Semlalia, Marrakech, Cadi Ayyad University
- Faculty of Sciences & Techniques, Marrakech, Cadi Ayyad University
- Faculty of Sciences Ain Chock, Casablanca, Hassan II University.

▪ Partenaires académiques & industriels

- Elie Mouyal, Architect, Marrakech
- ISTICHAR Engineering Office, Marrakech
- GMTA, Private Company for Air conditioning installation.