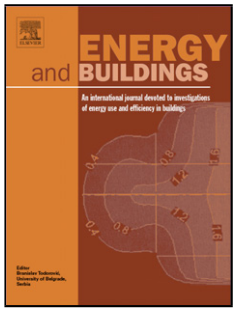

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PII: S0378-7788(15)30026-8
DOI: http://dx.doi.org/doi:10.1016/j.enbuild.2015.05.051
Reference: ENB 5899

To appear in: *ENB*

Received date: 20-2-2014
Revised date: 26-5-2015
Accepted date: 30-5-2015

Please cite this article as: <doi>http://dx.doi.org/10.1016/j.enbuild.2015.05.051</doi>

Heat transfer and air movement in the ventilated air gap of passive solar heating systems with regulation of the heat supply

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Abstract. The article describes the heat transfer and air movement that occur in the ventilated air gap of a building's passive solar heating system under winter and summer conditions. The physical and mathematical models of these processes are presented for the Trombe wall with and without venetian blinds arranged in the air gap. The mathematical models allow for the determination of the heat and air stream distribution and the surface temperature change of the constructive elements in both cases. The transfer of heat by radiation and convection are considered separately, making it possible to estimate in an analytical way the influence of constructive materials and covering properties on the heat flow distribution and regulate it.

The mathematical models were developed on the basis of the analysis of the heat transfer and air movement and therefore they can be complemented and improved depending on the constructive and climatic conditions. Examples of comparative calculations of the heat transfer and air movement in the air gap of the conventional Trombe wall and the Trombe wall equipped with a venetian blind for regulation of heat supply are presented. For the winter period the comparative calculations were carried out with a different intensity of solar radiation.

Keywords: Trombe wall, building's passive heating, mathematical modelling, ventilated air gap.

1. Introduction

Elements of passive heating design are applied in order to use alternative sources of energy, in particular solar energy, for building heating. The purpose of these elements is to collect solar