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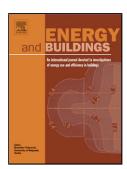
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Heat transfer and air movement in the ventilated air gap of passive solar heating systems

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

Page 1 of 21

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