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Control Algorithms for Rooms with Displacement
Ventilation System.

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ABSTRACT

A test room with a Displacement Ventilation System was built. Temperature control was provided with a DDC (Direct Digital Control) System, controlling the air volume and the air inlet temperature. Air velocity and temperature profiles were measured at different locations in the room for various internal loads.

The aim of the control was not only to provide a constant temperature but also comfortable conditions. The temperature gradient, the air velocity and the radiant heat exchange were taken into consideration for the comfort condition in the space.

It is found that the influence of the building structure is more important for displacement systems than for mixing systems. Tests were carried out with various thermal masses of the room. Due to the vertical temperature distribution especially the mass of the ceiling has a great influence on the storage capacity.

For displacement systems, VAV proved to be very efficient over the whole range of the load. There is satisfactory air movement in the room even with a reduced air change rate of 1 to 2 per hour.

Adapted control algorithms allow to reduce the energy consumption of the ventilation system. Further investigations will consider the optimization of the use of energy.