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Nielsen, Peter V.; Jensen, Rasmus Lund; Rong, Li

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Diffuse Ceiling Inlet Systems and the Room Air Distribution

Peter V. Nielsen, Rasmus L. Jensen, Li Rong
Aalborg University, Denmark

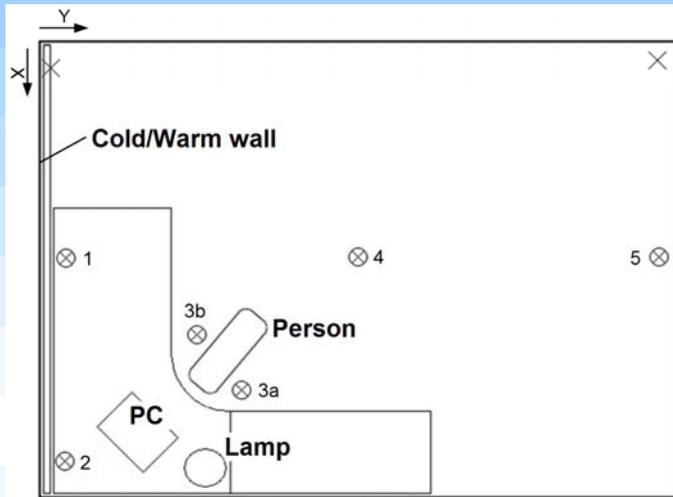


SUMMARY

A diffuse ceiling inlet system is an air distribution system which is supplying the air through the whole ceiling. The system can remove a large heat load without creating draught in the room. The paper describes measurements in the case of both cooling and heating, and CFD predictions are given for the heating case.

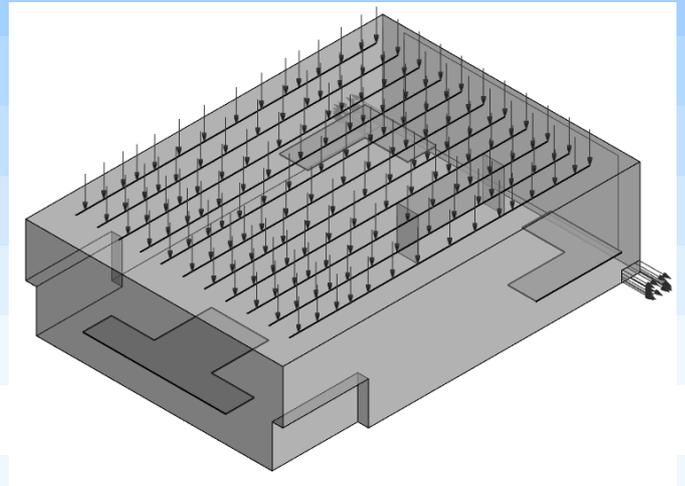
FULL-SCALE EXPERIMENTS

The system is tested in a full-scale room with the length, width and height equal to 4.1 m, 3.2 m and 2.45 m, respectively. Both cooling (in a general situation), and heating (for the night situation) are tested.

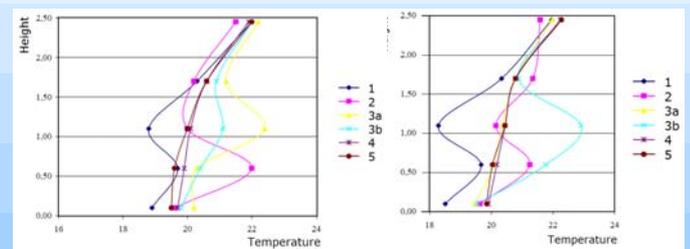


CFD

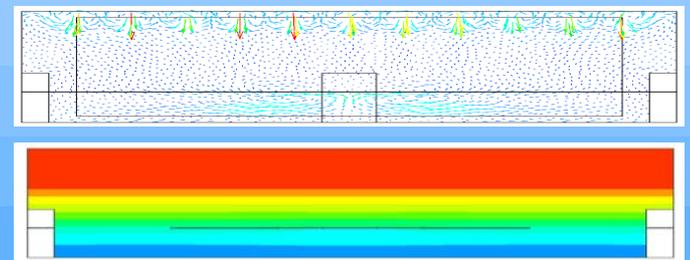
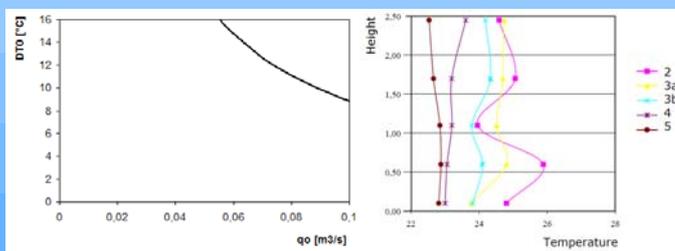
The full-scale room is only one quarter of the full room in the office building. The experiments are therefore extended by CFD predictions for the full room with the dimensions, length, width, height equal to 7.2 m x 10 m x 2.7 m. The CFD predictions are focused on the heating situation.



RESULTS - Heating



RESULTS - Cooling



CONCLUSIONS

The experiments show that the diffuse ceiling inlet system is working well in the case of cooling. There is no indication of any unstable flow situations, although cold air is supplied with a low momentum flow above warm air in the occupied zone.

The system is also working in a satisfactory way when it is used in the heating situation. Some low temperatures close to the cold surface in the experiments, and the indication of large vertical temperature gradients in the CFD predictions show that in this case areas with low temperatures may exist.

The smoke experiments show that a few heat sources generate sufficient mixing flow in the room to obtain thermal comfort and that the location of the return opening is of minor importance.