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CFD Analysis of Indoor Thermal Environment Supplying Air at Floor Level.

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ABSTRACT

The study of paper on concept of floor level air distribution system is not fresh; however changes in workplace space usage, sustainable design and indoor air quality issues have substantial recent notice in the concept. With a ceiling-based system, the room air temperature is considered to be uniform from floor to ceiling. With FLOOR LEVEL AIR SUPPLY, there is temperature stratification within the space, with heat and pollutants concentrated in the upper levels. The occupants' thermal ease in a workplace structure assisted by means of an FLOOR LEVEL AIR SUPPLY system be necessary be present measured using a number of dissimilar approaches: field survey, physical in addition particular dimensions, and computational fluid dynamics (CFD) study.

KEYWORDS :

Introduction -The occupants' thermal ease in a workplace structure assisted by means of an FLOOR LEVEL AIR SUPPLY system be necessary be present measured using a number of dissimilar approaches: field survey, physical in addition particular dimensions, and computational fluid dynamics (CFD) study. Thermal stratification of direct heat transfer is definitely exaggerated by multiple factors such as geometrical arrangement and working condition. Associated planning in detail is introduced from model analysis and commercial software. Thermal stratification i.e. the properly arranging of heat of air in terms of underfloor air distribution system can be affected by ceiling height. The influencing feature consists of inlet and outlet situation, static or dynamic in service conditions.

Methodology used -As to study the indoor thermal environment for floor air supply we predict the numerical method i.e. the computational fluid dynamics (CFD). In our present work we have used CFD to simulate the indoor thermal environment. In this work temperature and velocity distribution in a room of 5m wide and 4m height is obtained while conditioned air supplied at various velocity and 20°c temperature. Computational Fluid Dynamics (CFD) make available a qualitative (in addition every so often even quantitative) prediction of fluid flows by means of

- Mathematical modelling (partial differential equations)
- Numerical methods (discretization and solution techniques)
- Software tools (solvers, pre- and post-processing utilities)

Boundary conditions are

- At inlet: Velocity inlet
- Outlet: Pressure out let
- Viscous model k-epsilon Standard
- Pressure velocity coupling: SIMPLE

Three cases were studied

	Velocity at inlet	Temperatures				
		Inlet	Roof	Floor	Left wall	Right wall
Case 1	0.2 m/s	293	300	295	305	305
Case 2	0.25m/s	293	300	295	305	305
Case 3	0.3m/s	293	300	295	305	305

SPECIFICATION AND CONFIGURATION OF ROOM

Room size: Width 5 m X height 4 m

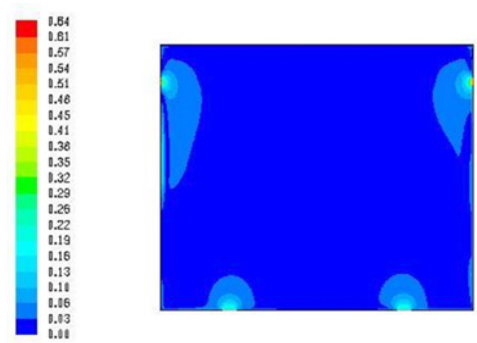
There are two inlets of conditioned air at a distance of 1m from both corners of the room at floor level and are 0.2 m wide.

Two exits are placed at a height below 0.5m from roof and are of 0.1m wide.

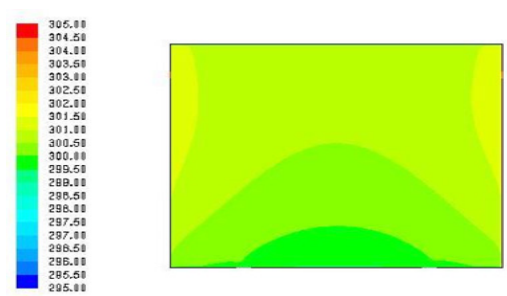
Result and analysis

Temperature and velocity contour- velocityand temperature contour shown below indicates as fallow:

- **Velocity contour** show that there is the little fluctuation of velocity near the inlet and outlet. Inside the room the velocity is constantly maintained at zero velocity.
- **Temperature contour** show that the temperature inside the room is maintained at 26°c-27°c though the little variation is seen near wall.
- **The case 2 i.e. the inlet supply air velocity 0.25m/s found to be more uniform as compare to other two case as the temperature and velocity contour show more uniformity in case 2. As shown in contour figure below.**



Temperature contour for case 2



Velocity contour for case 2

On comparison of x-y velocity plots of three points L1, L2, L3 it is found that the maximum fluctuation is seen in the location of the point near the wall i.e. L1 . Were as the velocity contour also show that the fluctuation is near inlet and outlet as well as near the wall.

On comparing the temperature plots of three points L1,L2,L3 we find that the temperature is maintained uniformly inside the room and all the test point also have nearly same result though little variation is seen in point L1 i.e. near wall.

Conclusion:under the CFD analysis of indoor thermal environment for supplying air at floor level with three cases i.e. according to inlet velocity as 0.2m/s, 0.25m/s ,0.3m/s respectively whereas for each case there is three test points as L1,l2,L3 so on undergoing though these case and test point the following conclusion can be given:

- The case 2 i.e. the inlet supply air velocity 0.25m/s found to be more uniform as compare to other two case as the temperature and velocity contour show more uniformity in case 2.

- In comparing all three cases we found that there is negligible fluctuation in temperature and velocity inside the room but the fluctuation of both temperature and velocity are more near the walls.

- In the comparison of the test points in all the cases the common discussion came out as there is more non-uniformity of temperature and fluctuation of velocity near the wall i.e. the test point L1 which is near the wall and at 0.5 m away form right wall.

Future scope:
CFD analysis of indoor thermal environment for supplying air at floor level have found that in that there is negligible fluctuation in temperature and velocity inside the room but the fluctuation of both temperature and velocity are more near the walls. Also the velocity of supplying air is a feature by which uniformity of comport inside the room depend. Further this research work can be done in large configuration i.e. in building or hall for more condition can be applied and examined. Also by changing diffuser position and type various other analysis can be calculated.

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