

IRC finds study opportunity on its doorstep

Until 1995, suitable research facilities for the study of total indoor environmental quality (TEQ) simply did not exist. With construction of the Indoor Environment Research Facility (IERF), however, IRC became one of the most comprehensive indoor environment research centres in the world.

But the IERF contributed to IRC's research data long before it began operating. Researchers realized that the construction process itself offered an ideal opportunity to measure TVOC (Total Volatile Organic Compound) concentration levels resulting from the various materials and processes used.

As expected, TVOC levels spiked during key activities, including drywall installation, painting of ducts and floors, and carpet-laying. Nightly shutdown of the HVAC system also led to an increase in TVOC.

With construction complete and the assembly and installation of workstations and office equipment finished, TVOC levelled off and remained largely constant in the subsequent eight months.

Data gathered during construction of the IERF will form part of IRC's five-year study of material emissions characteristics. (See adjacent article.)

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Research on air-diffuser layout indicates greater freedom possible in office design

Ventilating a building meets two distinct goals — it distributes outdoor (ventilation) air to occupied zones, and removes indoor contaminants from those zones. Achieving both goals increases not only indoor air quality, but occupants' good health, comfort and satisfaction as well.

In striving to identify the most effective ventilation design possible, IRC has found that air-diffuser layout may be more flexible than originally believed. This in turn would allow for more choices in terms of open-concept workstation placement, enabling businesses to make better use of existing floor space.

Ventilation system performance is measured by its efficiency in delivering the appropriate amount of ventilation air to the occupied area, and its effectiveness in contaminant removal. In a 1993 study, IRC researchers tested seven different layouts using two types of air diffusers to compare their ability to distribute ventilation air to a workstation located inside an enclosed office.

The results indicated that all seven diffuser layouts distributed the supply air within the workstation and in the surrounding area equally well.

The researchers could find no evidence that one layout was better than another. In addition, tests conducted on gap heights at the base of workstation partitions found they had little effect on air-distribution patterns in the workstation. Researchers did discover, however, that contaminant-removal effectiveness was improved for layouts that directed the supply air toward the contaminant source.

The study revealed the importance of further experimental research, which IRC recently undertook jointly with Concordia

University. In this work, the impact of various parameters — diffuser type (square vs. linear), diffuser positions, return-air grille positions, heat sources, furniture, partition-bottom gaps, total supply-air flow rates and ventilation-air flow rates — on air distribution, mean age of air (mean age is an indication of how quickly the ventilation air travels to the occupied area), and contaminant-removal efficiency were examined.

The findings reinforced IRC's previous research: none of the above factors had a significant influence on air distribution. As might be expected, however, the ventilation-air flow rate strongly influenced the mean age of the air. The diffuser type, location, supply-air flow rate, heat source and furniture did not. Contaminant-removal efficiency, meanwhile, was affected by the type of diffuser, ventilation-air flow rate, heat source, furniture and partitions.

The results of these two research initiatives indicate that if a single ceiling air diffuser is used, it is not necessary to place it at the centre of the workstation to achieve maximum air distribution efficiency. The ceiling-mounted air diffuser can be located anywhere within the workstation.

While IRC emphasizes that the results may apply only to the configurations tested, the findings are encouraging, allowing for the possibility of redesigning existing and future floor space to maximize its use — enabling business owners to do more in less space without sacrificing office indoor air quality.

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