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PRACTICAL RESEARCH BRIEFS

Study Shows Office Recarpeting Requires Continuous Ventilation

Canadian researchers have found that carpet adhesive gives off far more volatile organic compounds (VOCs) than the carpet itself, and that this requires continuous ventilation during recarpeting and for up to a week afterwards.

The researchers from Public Works Canada of Ottawa, Ontario, reported the results of their study at the *5th International Jacques Cartier Conference* in Montreal, Quebec, last fall.

The research project arose from the fact that Public Works Canada usually recarpets buildings while they are occupied, and this has resulted in numerous air quality complaints from occupants. Most of the recarpeting takes place at night when ventilation systems in many buildings are not operating. The project's goal was to monitor chemical emissions during and after carpet installation to justify continuous ventilation during the procedure and to determine how long ventilation should continue after installation.

The Recarpeting Project

The building used in the study is a 14-story office building in the Ottawa area. The study took place on the third floor, which, like the other lower floors, is a large, open area with privacy screens.

Workers installed about 300 square yards (230 square meters) of carpet each night and continued the work for 21 nights, eventually recarpeting about three-quarters of the total area. The carpet they used was nylon with a primary backing of polypropylene. The adhesive was a spray-on, water-based adhesive with 5%-10% mineral spirits.

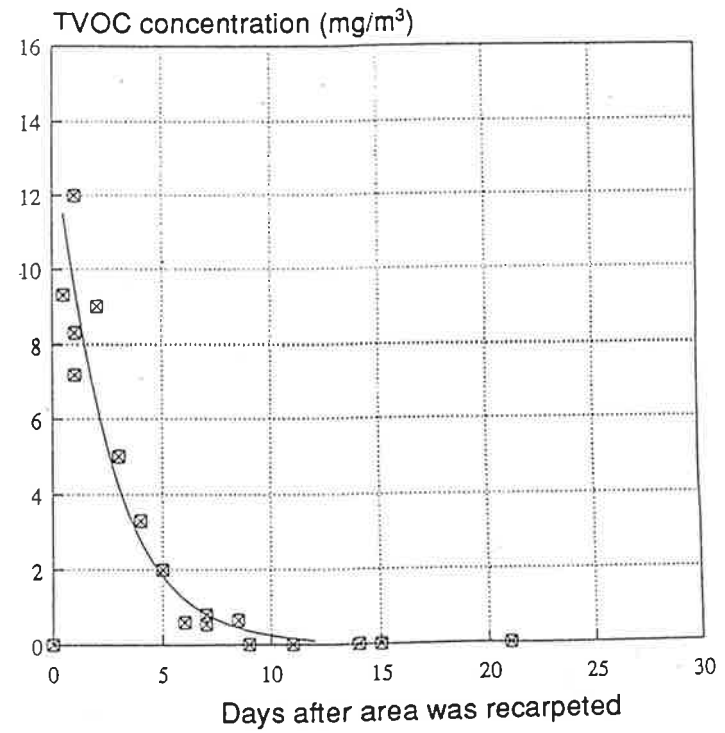
Researchers tested carpet samples separately for emissions in an effort to determine the relative contribution of carpet and adhesive during the installation. They also measured background VOC levels and found a significant contribution coming from the wet-process copiers. The researchers accounted for this in their calculations.

The team also used carbon dioxide concentration measurements to calculate the amount of outside air in the ventilation air being supplied to the area in question. The researchers determined that the area being recarpeted was experiencing an air exchange rate of 1.5 air changes per hour. Ventilation continued around the clock during and after the carpet installation.

The carpeting process, according to the researchers' measurements, produced VOC emissions at the rate of 33 milligrams per square meter per hour ($mg/m^2/hr$). Because this was significantly higher than the emission rate from the carpet alone, which was measured at 0.43 $mg/m^2/hr$, the researchers concluded that the adhesive accounted for most of the emissions.

Exponential Decrease in Emissions

Data also indicated that carpet emissions were highest the first day, as could be expected, then decreased in an exponential fashion over the next week, until total VOC (TVOC) measurements were at or near the background levels measured before the recarpeting began (see Figure 1).



Note: Background concentrations subtracted
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Figure 1 — Decrease in VOC emissions after recarpeting

Building occupants received questionnaires shortly after the recarpeting was completed. These sought information on any symptoms that the respondents experienced during the installation, including how long the symptoms lasted.

Of the 244 persons surveyed, about half responded, and of these 75 reported that they had suffered symptoms including headaches; tiredness; eye, nose, and throat problems; and nausea. The incidence of symptoms correlated with the emission levels that researchers had measured in the building.

Most people experienced symptoms for between one and three days, while some reported the symptoms for three to five days. The number of people experiencing symptoms remained constant over the first three days, decreased by the fifth day, and was small after seven days.

The researchers concluded that because building occupants in this study experienced symptoms, despite the fact that the building received constant ventilation during and after the recarpeting, it is advisable to use continuous ventilation any time carpet is installed.

They noted, however, that VOC emissions in other buildings could vary, depending on the type of adhesive used, the method of installation, and the amount of outside air being brought into the building.

For more information, contact G. Kerr, Public Works Canada, Ottawa, ON K1A 0M2, Canada.

Some Dry Eye Complaints May Come from VDT Use, Not from IAQ

Many complaints about office environments include references to dry or irritated eyes and workers unable to tolerate wearing contact lenses for any length of time. While this has often been attributed to indoor air quality, two Japanese researchers have recently raised the question of whether the phenomenon can also be attributed to using video display terminals (VDTs).

In a letter to the *New England Journal of Medicine* (February 25, 1993), Kazuo Tsubota and Katsu Nakamori reported on studies they have conducted on 104 healthy office workers. They noted that the subjects blinked 22 (±9) times per minute under relaxed conditions, 10 (±6) times per minute while reading, and 7 (±7) times per minute while looking at text on a VDT.

VDTs could cause workers to blink less, causing dry eyes.

The researchers also noted that those subjects who were reading from a book could look down, partly offsetting the effects of decreased frequency of blinking. While looking at a VDT, however, they tended to keep their eyes wide open.

The larger exposed surface area contributed to a greater rate of tear evaporation from the eyes of the workers using VDTs. This and the reduced blinking rate can both contribute to dry eyes.

To combat the problem, the researchers suggested artificial tears and, in severe cases, special spectacles. Another suggestion was to place the VDT at a lower height with the screen tilted upward.

In many offices where furniture is not designed for computer use, VDTs are placed wherever there is room for them. Often, the VDTs for microcomputers are placed on top of the computers themselves, raising them to eye level or above. This has been blamed for many ailments, including neck and back strain.

While adjusting computer screens may not solve every complaint of dry eyes, it may answer some questions in what appear to be IAQ complaints.

For more information, contact Kazuo Tsubota, MD, Tokyo Dental College, Chiba 272, Japan.

Computer Simulation Measures Energy Cost of Ventilation Increase

The city of Montreal, Quebec, Canada, is considering a by-law that would increase the required outdoor air ventilation rate from the present 3.5 liters per second per person (l/s/p) to the ASHRAE standard of 10 l/s/p. A group of Canadian researchers has conducted a computer simulation that indicates the move could increase energy costs even more than previously estimated.

The group from the Center for Building Studies at Concordia University in Montreal reported