#6758

smokers tend to eat more leafy vegetables than do smokers.

Any credible study that uses cotinine as a biomarker for ETS exposure must consider the effect of diet.

Elia Sterling
President
Theodor D. Sterling and Associates Ltd.
Vancouver, British Columbia, Canada

INFORMATION EXCHANGE

Swedish Book Outlines Problems with Building Materials Emissions

A publication from the Swedish Council for Building Research tackles the question of building materials and how they relate to IAQ problems.

Included in the book — *Building Materials Identified as Major Sources for Indoor Air Pollutants* — are 24 case studies that demonstrate the pollution potential of such common materials as vinyl flooring, paints, carpets, linseed oil-based products, self-leveling compounds, and even timber.

After discussing the cases, which come from various countries, the report concludes that the most practical and efficient way to deal with the problem is a two-pronged attack to develop products with lower emissions and to remove high-emission products already in buildings.

Types of Emissions

According to the report, various types of materials contribute to indoor levels of volatile organic compounds (VOCs), among them polymer materials, concrete and self-leveling compound, floor adhesives, alkyd paints, and linoleum. It also talks about the contribution that moisture makes to IAQ problems.

In materials based on petroleum hydrocarbons, the polymer itself is not volatile, due to its molecular weight, but some of the raw materials can remain in the material as residual monomers and can enter the indoor air.

Also of concern is the decomposition of phthalate plasticizers, which can also contain small traces of alcohol components.

Because damp concrete and some of the self-leveling compounds used in concrete are highly alkaline — some with pH values as high as 14 — moisture damage from alkaline hydrolysis is also possible.

Some concrete floor slabs cast directly on the ground can take several years to properly cure. The report states that the drying-out time is proportional to the square of the thickness of the slab.

Depending on the composition of the compounds, amines can result from their breakdown and are responsible for a variety of amine-based substances in the air.

Products that are based on linseed oil — linoleum and paints and varnishes that dry by oxidation — can produce other pollutants. According to the study, linseed oil contains several carboxylic acids with double bonds such as oleic acid, linoleic acid, and linolenic acid.

Linseed oil hardens by forming cross bonds between the high molecular acids, but even after the main hardening, small quantities of acids with unreacted double bonds still remain. These can produce aldehydes due to oxidation at these bonds.

In one case cited in the study, paint applied to a radiator released aldehydes with a range of molecular weights. The report hypothesizes that the heat from the radiator probably accelerated the oxidation of the aldehydes to carboxylic acids.

The report notes that the same can probably happen to linoleum floor covering. In another case, such a floor covering gave off strong smells when the sun was shining on it.

Another concern is the dust that collects in ventilating systems. This can adsorb and release chemicals over a period of time. In one study in a 16-year-old office building, all air was recirculated for a trial period. VOCs from the ventilating system were four times higher than those emitted by the premises.

Case Studies

The study presents 24 cases of varying lengths, showing the effects various building materials

can have in real situations. One illustrative case involved a newly built school, in which students and staff noticed unpleasant smells. Measurements in the parts of the school where the odor was the strongest indicated ethylexyl acrylate and other substances at concentrations of about 30 micrograms per cubic meter ($\mu g/m^3$).

Samples of floor covering taken from the floor and from an unused roll in a storeroom were releasing octanols, as well as various solvent substances.

The investigators noted that the smell of decomposed plasticizer was noticeable throughout the building and they also noted that the floors had been leveled with an unapproved self-leveling compound. Tests indicated ammonia underneath the floor covering.

The conditions were complicated by the fact that the ethylexyl acrylate was also detected in lower concentrations in the outdoor air in a ventilation duct on the roof of the building, most likely due to reentrainment from a nearby exhaust.

In order to get rid of the smell, school workers removed the floor coverings. Ethylexyl acrylate levels dropped by about a factor of 100, but detectable odors persisted, prompting officials to grind away several millimeters of the self-leveling compound to remove adhesives and any other substances that might have migrated into the compound.

Follow-up measurements indicated low concentrations of VOCs, with no particular substances dominating.

Coping With Material Emissions

The study recommends that source control is the most practical way to deal with VOC emission from building materials. The most obvious method of dealing with high-emission materials, as the report notes, is to remove them. Where this is impossible or difficult, as with load-bearing structures, encapsulation is another option.

While increasing ventilation is an option, the report notes that "It is hardly sensible to design mechanical ventilation systems on the basis of the capacity to control emissions. The various ways in which problems can arise can probably best be dealt with by removing the source of emissions and replacing it with new chemically stable and low-emission materials."

Chamber studies can show the emission potential of building materials and can help manufacturers determine how to reduce the total emissions during product development.

The study also briefly discusses existing emission controls in Nordic countries.

The 72-page book is available for SEK 80 (US $10.50) by writing to Svensk Byggtjänst, S-17188 Solna, Sweden.

ISIAQ to Make Debut at *Indoor Air '93* in Helsinki, Finland

The newly formed International Society of Indoor Air Quality and Climate (ISIAQ) has designated *Indoor Air '93*, July 4-8, in Helsinki, Finland, as its first major conference (see ***IAQU***, March 1993). For those who wish to extend the conference, ISIAQ will also cosponsor a satellite conference in St. Petersburg, Russia, following the Helsinki meeting.

ABOK, the Russian society for ventilation and building environments, will be the other sponsor for the symposium, *Moisture Problems, Thermal Comfort, and the Indoor Environment*. The four-day program is designed to combine business and pleasure.

Those who are attending the satellite symposium will leave Helsinki by bus in the morning of July 9 and travel to St. Petersburg. Dinner and a "White Nights" boat cruise will follow.

Daily sessions will include technical discussions, workshops, a visit to the Laboratory of Industrial Ventilation, Air Conditioning, and Purification, and a tour of an HVAC manufacturing plant.

Sightseeing opportunities include the Admiralty, the Hermitage, St. Isaac's Cathedral, the Russian Art Museum, and the Summer Palace. Participants will leave for Helsinki by bus on the evening of July 12, arriving early the following morning.

Cost of the symposium is FIM 2,750 (US $475) for delegates and FIM 1,750 (US $300) for accompanying persons.

For more information, contact Travel Experts, Indoor Air '93, P.O. Box 130, SF-00161 Helsinki, Finland; Fax: +358 0 611 188.