Featured

Building Restoration and Indoor Air Quality

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Any restoration of a water-damaged building must result in a healthy indoor environment to be regarded as successful. A restored building being surface clean and dry is not good enough; people who reside in the building should feel secure that the indoor air, after the restoration, is clean and safe to inhale. Unfortunately, this is often not the case, even when all affected areas of the building have been dried thoroughly. Drying is necessary to stop moisture-driven degradations of materials of the building as well as continued mold growth, but it is not enough to secure clean indoor air, because the numerous chemicals that have been formed due to the action of water, or moisture, on the materials will still remain in the building construction. These chemicals will inevitably be emitted into the indoor air long after the restoration process, resulting in an unsatisfactory indoor air quality (IAQ). This may result in adverse health symptoms such as asthma, skin and eye irritation, and fatigue.

The formed chemicals mentioned that threaten our health and well-being result from hydrolysis and other reactions between water/moisture and materials of the building; they are numerous and their identities are largely unknown. Many are so-called volatile organic compounds (VOC), derived from paints or glue, plasticizers in PVC floorings, older linoleum carpets, etc., from which numerous chemicals such as different aldehydes, alcohols and ketones, have been identified. Chipboards and other materials may release formaldehyde, impregnation chemicals such as chlorophenols, or creosote may spread chloroanisole (with a characteristic moldy odor) and carcinogenic PAH, respectively, while microorganisms such as mold, bacteria and rot fungi will emit a range of different VOC as well as toxins such as mycotoxins. These chemicals, of which some are odorous and some nonodorous, will remain in the building construction even after it has been dried, and over time inevitably be emitted into the indoor air. Typical results of being exposed to such polluted air are adverse health symptoms and diseases leading to human suffering and high costs for the society.

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Figure 1: A surface emissions trap cloth (25 m x 120 cm x 1.9 mm)

An emissions barrier may offer efficient source control for emissions of VOC, including odors. Use of such a barrier in building restoration/remediation involves covering the indoor surfaces from where the chemicals are being emitted (floor, ceiling, walls) with the device, which stops the VOC, thereby preventing them from reaching the indoor air. When using the surface emissions trap (cTrap), a flexible four-layer laminate developed at Lund University Sweden, the VOC are not only stopped but also adsorbed. In the cTrap, the adsorption layer functions together with a hydrophilic polymer layer, making the adsorption virtually irreversible. The cloth is quickly and easily attached on the building surfaces indoors using an adhesive tape or a staple gun. Installation of the cTrap leads to an immediate disappearance of the building emissions, including any odor.

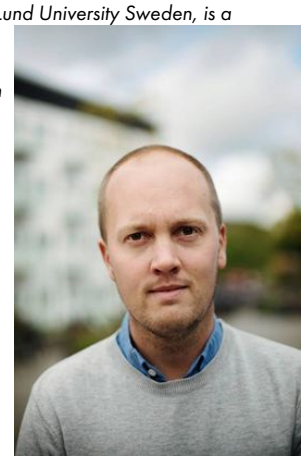
Figure 2: Personnel and children in this kindergarten exhibited symptoms such as cough and allergic reactions. It was found that emissions were spread from the floor. The odors and health complaints disappeared after the existing flooring had been removed and the surface emissions trap plus a new flooring had been installed.

We may spend up to 80-90% of our time indoors. More and more individuals suffer from compromised immune systems due to advanced age, long-term cancer treatments, etc. IAQ is therefore a matter of growing concern worldwide. An emissions barrier offers a solution when there's poor IAQ because of chemical/microbiological emissions from the building itself.

The device may be applied in buildings with chlorophenol-treated construction details where, due to water intrusion, chlorophenol has been converted to highly odorous chloroanisols. The chloroanisols are stopped, and the moldy odor disappears immediately following the cTrap installation. The same is true for all other VOC emissions (e.g., the carcinogenic PAH from creosote used for impregnation). If any visible mold is observed on indoor surfaces, it should first be removed by chemical or mechanical methods, then the surface is covered by cTrap to ascertain that no remaining mold products or traces of the aggressive chemicals that might have been used can escape into the indoor air. The cTrap "takes" all mold products, including VOC and mycotoxins. After the cTrap has been applied on a floor, a surface layer is installed on top of the cTrap cloth — a laminate, parquet or plastic flooring according to taste. When installed on walls or ceiling, the cTrap cloth is usually covered with a gypsum board, which is then painted or decorated with a wallpaper.

The cTrap does not contain any chemicals and is airtight but has virtually no resistance for water vapor: moisture goes right through the doth. This means that the moisture balance of the building will not be affected, thus there will never be any condensation of water on the cloth (which might lead to mold growth). The cTrap has such a large adsorption capacity that it will not become saturated during the lifetime of the building. When the building is being demolished, the cTrap cloth, containing the emitted chemicals, is simply sent for combustion. The device is currently being used in European countries as an integrated part in remediation of water-damaged buildings. There is comprehensive scientific evaluation of the cTrap, and it is patented in Europe and North America. For more information, go to www.ctrap.com.

Lennart Larsson, Ph.D., *(left) professor emeritus at Lund University Sweden, is a renowned researcher on indoor air quality, especially in relation to building dampness. He is the inventor of the surface emissions trap (cTrap), a unique adsorption cloth used to stop the spread of harmful microbial and chemical emissions from building materials into the indoor air.*



Johan Mattsson *(right) is the CEO of cTrap Ltd. He started the company together with Lennart Larsson in 2013 after working as a business developer at Lund University Innovation.*