

THERE'S MERCURY IN THOSE RUBBER FLOORS

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US EPA reports that certain polyurethane flooring materials installed between 1962 and today contain mercury. Although these floors are most often found in sports settings (e.g., gymnasiums, multipurpose rooms and on running tracks), they were also marketed for use at industrial plants, hospitals, zoos, kitchens, wherever a durable, cushioned, all-weather, non-slip surface would be needed.

Polyurethane flooring is manufactured by combining two liquid resins to form a durable, resilient surface. This material can be factory produced in sheets and rolls or installed in situ (as a liquid to level and cure in place). Polyurethane surfaces are generally installed over portland cement subfloors. Thickness of polyurethane flooring ranges from 1/4" to 1" with majority of floors in Ohio installed to a 3/8" specification.

Mercury was a catalyst for the chemical reaction between the two liquids that allowed the material to harden. Since this catalyst is not entirely bound within the flooring matrix, some of these floors emit mercury vapors that are absorbed and re-emitted by furnishings and equipment such as floor mats, stage curtains, and even basketballs. Mercury vapor emitted by the floors, furnishings and equipment might be at high enough levels to be considered a health hazard.

A well-known brand of polyurethane flooring material is Tartan, which 3M manufactured and sold in the 1960's and 1970's. 3M marketed this product to schools, universities, and recreation and athletic centers. 3M has acknowledged that it used mercury and other heavy metals as catalysts, pigments and additives in their product. Other manufacturers of polyurethane flooring products include, but are not limited to: Robbins; Mondo; Athletic Polymer Systems (APS); Selby, Battersby & Co.; Crossfield Products; Dynamit Nobel; and Pitzer. It is not clear that these other companies used mercury in their polyurethane flooring products. Tests of floors show that mercury is not always present. It is important to test suspect flooring materials before concluding that they contain mercury.

Advantageous characteristics of these floors, used by manufacturers as selling points, help to identify installations that might be problematic. Polyurethane flooring material is resilient. It resists water. It is spongy enough to absorb the shock and pounding of falling feet and tumbling bodies, reducing the chance for injury. When poured in place, the material is seamless. When installed as roll or sheet goods, the seams are solvent-welded together, creating a smooth, uniform surface. The finished floor is uniform in color, although game lines are often applied to the surface.

3M has recommended that owners of polyurethane flooring materials conduct tests of these materials before disposing of them. 3M recommends that owners have a laboratory conduct the toxic characteristic leaching procedure (TCLP) to determine if mercury is present, and whether it is prone to leaching from the material. The federal

Resource Conservation and Recovery Act (RCRA) sets standards for disposal of materials as hazardous waste. If the TCLP test for the flooring material exceeds RCRA standards, the material must be disposed as hazardous waste. In fact, 3M recommends that mercury-containing material be disposed in a lined landfill even if TCLP levels do not exceed RCRA standards.

The Ohio Environmental Protection Agency (OEPA), which has been delegated the authority to interpret and enforce RCRA standards for hazardous waste disposal in Ohio, has taken a curious position in respect to disposal of polyurethane flooring materials. OEPA has determined that polyurethane flooring materials removed as part of a renovation project should be disposed as hazardous waste if TCLP test results for the flooring exceed RCRA standards. But when a building is demolished, OEPA allows the building owner to include subflooring material in samples to be tested. For example. If 3/8" of polyurethane sits atop 6" of concrete, the sample would be a core of the entire 6-3/8" of polyurethane and concrete. If this composite sample does not contain enough mercury to exceed RCRA standards, it can be disposed in a construction and demolition debris landfill.

This approach for demolition work is ill advised. Polyurethane flooring that sits atop 6" of concrete contains no less mercury, and will not leach mercury into the environment at a lesser rate, simply because it is adhered to concrete. Disposal of mercury in construction and demolition debris landfills may result in environmental contamination, and serious Superfund liability under the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) for those who do so.

Perhaps more distressing than the potential for environmental contamination from disposal of this type material is the potential health hazard posed by emission of mercury vapor from the material as it sits in place. Mercury is a persistent bioaccumulative toxic chemical. At room temperature, this heavy metal is a liquid that readily emits vapor, and mercury vapor is a potent neurotoxin. The United State Environmental Protection Agency has set a minimum risk level (MRL) of 0.3 micrograms of mercury vapor per cubic meter of air. This MRL establishes the daily level of exposure at which there is no appreciable risk of adverse health effects.

The Agency for Toxic Substance and Disease Registry (ATSDR) has set an action level of 10 micrograms of mercury vapor per cubic meter of air in a residential setting. That is, if a home has mercury vapor levels of 10 micrograms per cubic meter or above, occupants should leave until the mercury is cleaned up. ATSDR has set a clearance level of 1 microgram of mercury vapor per cubic meter of air for residential settings. That is, occupants of the house can move back in when the clean up efforts have lowered the mercury vapor level to 1 microgram per cubic meter of air or less. In contrast, the Occupational Safety and Health Administration (OSHA) has set an amazingly high level of 50 micrograms per cubic meter for workplace exposure to mercury vapor.

Many of these mercury-containing polyurethane floors can be found in schools. The Ohio Department of Health (ODH) has acknowledged that many school occupants may be especially vulnerable to adverse health effects from exposure to mercury vapor.

ODH has stated that young children, with developing body systems, and who breathe heavily during physical exertion in gym classes and at athletic events, are at a greater risk to illnesses associated with mercury. Pregnant employees who regularly work in school areas with polyurethane floors might also be more vulnerable. ODH examined information pertinent to installations in one school district, and determined that removal of the polyurethane floors was an advisable precaution to reduce the risk of exposure of vulnerable populations to mercury vapor.

The Ohio School Facilities Commission (OSFC) has requested that its environmental consultants develop recommendations for testing and removal of polyurethane flooring from schools. One of these environmental consultants has procured samples for TCLP analyses from twelve installations of these floors. Six of the twelve installations failed to meet the RCRA toxicity limit (i.e., wastes from these six floors were determined to be hazardous). This same consultant measured mercury vapor levels in four of the facilities which failed the TCLP test, and two of those floors were found to emit mercury in excess of the 1 microgram per cubic meter residential clearance level established by ATSDR. All four of the floors emitted mercury in excess of the 0.3 microgram per cubic meter established by US EPA as the minimum risk level. Results of tests conducted by 3M in the 1970's show mercury vapor emission levels from three of their floors ranged from 5 to 22 micrograms per cubic meter of air. Furnishings and equipment used in conjunction with these floors often emit mercury at even higher levels than the floors themselves. One floor mat taken from an Ohio school gymnasium emitted mercury vapor (when tested in accordance with ATSDR methods) at a rate of 35 micrograms per cubic meter.

There is much that we do not know about mercury in polyurethane floors. While ATSDR has established guidelines for mercury vapor exposure in residential and commercial settings, there is no recommended health standard for the exposure of school children to mercury vapor emitted by athletic flooring surfaces. ATSDR's action and clearance levels were developed to assess risks associated with spills of mercury. Presumably, exposure from a spill will diminish with time as the mercury that remains after a cleanup volatilizes and dissipates. Exposures and resulting health hazards are different when dealing with polyurethane floors. Mercury vapor release from polyurethane flooring is continuous and vapor levels may increase as flooring deteriorates. With hundreds, and perhaps thousands of these floors in place throughout the United States, public health and environmental authorities, and the academic and scientific communities need to examine this issue with diligence and care. In the interim, building owners and school administrators need to identify suspect floors and implement testing and monitoring programs to determine mercury content and protect occupants.