Vapor Barriers: Chemical Compatibility, Testing, and Advancements in Materials Science

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Site development often requires the use of a contaminant vapor barrier to inhibit volatile organic contaminants remaining on-site from migrating into the newly constructed buildings, potentially impacting indoor air quality. Historically plastic sheet materials such as polypropylene and polyethylene, known for chemical resistance, have been applied as contaminant vapor barriers. The use of these materials, however, requires labor-intensive cutting and seaming to ensure a continuous and cohesive barrier to vapor migration. This installation process can be intensive and costly when applied to areas with multiple penetrations (piping, electrical, etc) and construction details.

In recent years "spray applied" latex/asphalt membrane-type waterproofing materials have been widely promoted for Brownfield vapor barrier use. While easy to apply and proven to retard water migration through concrete, the use of these latex/asphalt materials for repelling volatile organic constituents such as benzene and chlorinated solvents is suspect. It is widely recognized that asphalt/latex-based products are, in fact, highly susceptible to dissolution and/or penetration by volatile organic compounds, particularly chlorinated dry cleaning-type solvents. A survey conducted of latex/asphalt products purporting to behave as contaminant vapor barriers indicated that performance claims centered primarily on ASTM D543. This method is used to determine the amount of contaminant sorbed by the barrier itself, as a percentage of the barrier material weight.

In an effort to verify the sorption characteristics of various latex/asphalt vapor barrier products, the relative uptake of volatile organic contaminants were determined by the ASTM method cited. Results indicate that within the 7 day time of testing, latex/asphalt vapor barrier products gain between 1%-19% of their weight in the form of sorbed contaminant. These results verified that in fact the latex/asphalt was not resistant to the contaminant vapors but rather sorbed the contaminant. Furthermore, the use of this method for validating performance of vapor barriers appears flawed in that it does not indicate any capacity for the barrier to inhibit transmission of contaminants. The method ignores the mass of contaminant that may have passed through the barrier during the testing period and the mass of sorbed contaminant vapor that will pass through the membrane over time.

An effort was undertaken to develop a composite membrane system that offers exceptional chemical resistance for use as a vapor barrier at Brownfield sites. Data generated in controlled laboratory conditions indicate that the amount of volatile organic compound sorption in the composite membrane is less than 10% of that observed in spray-applied latex/asphalt vapor barriers. More importantly, data generated under gas permeability tests indicate that the new composite membrane system inhibits the transmission of volatile organic vapors. Data is presented from controlled laboratory studies as well as from actual full scale field applications of the composite vapor barrier material.

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Mr. Herrington provides engineering design and oversight services to Regenesis clientele in the southern and western U.S. Mr. Herrington has over 11 years of environmental remediation experience. He began his career in bioremediation as a research scientist at the U.S. EPA in Cincinnati where he developed oil-spill bioremediation technologies and he co-patented an oil-spill bioremediation amendment. Mr. Herrington served as a project manager for Parsons Corporation where he specialized in low-cost in situ remediation technologies for fuels and chlorinated solvents. Mr. Herrington contributed to the detailed protocols published by AFCEE (1995 and 1997) for assessing natural attenuation at fuel hydrocarbon and chlorinated solvent sites, respectively. Mr. Herrington earned his B.S. in Civil Engineering from Colorado State University and his M.S. in Environmental Engineering from the University of Cincinnati. Mr. Herrington is a registered P.E. in his home state of Colorado.

Peter Grant

Prior to developing Land Science Technologies, Peter spent over 5 years with CETCO Liquid Boot Company (CLB) as a Technical Sales Manager for the West Coast Division. While at CLB Peter oversaw and managed hundreds of Brownfield development sites where engineering controls were implemented, including single family homes over VOC impacted groundwater plumes and landfill redevelopments. In addition to overseeing the specification development and implementation of the Liquid Boot® Gas Vapor Barrier, Peter also negotiated product approvals with local and regional regulatory agencies, including the Department of Toxic Substances Control, the Regional Water Quality Control Board, and the California Integrated Waste Management Board. Obtaining agency approval for VOC sites would have not been possible without the VOC diffusion testing Peter developed and oversaw in conjunction with the testing laboratory. While at CLB, Peter has delivered presentations to the US NAVY, Chevron Cooperation, Wal-Mart, EPA Regions 9 and 10, and the nation's largest environmental companies.