



# Creating a Worry-Free Environment

## Vinyl vs Polished Concrete Q&A

This question and answer reference document is related to the results found in the “Analysis of Bacterial Growth on Vinyl and Polished Concrete” white paper and will allow you to understand why choosing a flooring system with minimal permeability is imperative to maintain a worry-free environment.

### Main Take-Aways

- Flooring systems in schools, hospitals, and grocery stores need to be carefully chosen to reduce the spread of disease and infection.
- While concrete is not toxic and does not inherently contain bacteria viruses, contaminants, or toxins (pathogens), the use of concrete floors in these environments can allow pathogen contamination and produce chemical emissions.
- Polished and cleaned concrete can lead to more cracking and softening, therefore leading to more pathogen infiltration and growth.

### Question 1

Is the concrete toxic, will it hurt my employees, risk management?

### Answer 1

Although concrete is not toxic, the concrete composite acts as a hardened sponge due to the permeability of the permeability of the surface. This allows harmful pathogens to penetrate the surface and thrive in the body of the concrete. Pathogens continue to grow in the concrete body and can migrate back through the surface potentially causing harm to employees.

Risk management systems for concrete floors are comprised of extensive cleaning protocols. However, over time concrete cleaning procedures lead to a softer surface and increased cracking, creating additional pathways for pathogens to enter the concrete matrix.

### Question 2

Does concrete have bacteria in it? What kind? What types?

### Answer 2

The concrete matrix mechanism is similar to that of a hardened sponge. Unlike a petri dish that can be sanitized, concrete traps and binds materials that infiltrate it. Once pathogens penetrate the concrete surface, even extreme disinfection methods are unlikely to fully eradicate their presence.

Pathogen growth is a common problem in grocery stores, restaurants, schools, hospitals, and retail stores due to exposure to contaminated food, settlement of airborne bacteria, contact by shoes, and harmful substances from spilled/dripped human fluids (Lemmen, Hafner, & Lutticken, 2004). Human exposure to pathogens can cause severe food poisoning, strep throat, staph and skin infections, pneumonia, and blood poisoning.

In grocery stores, department like meat and dairy often lack the ability to maintain proper cleaning protocols due to the size, weight, and proximity of equipment. These areas are subject to substances such as animal blood and feces as well as bacteria including E. coli, salmonella, listeria, staphylococcus aureus, and more. In addition, gondolas and other large fixtures used in grocery stores make implementing proper cleaning protocols challenging.

Without the execution of proper cleaning procedures, pathogen contamination and growth are likely. The most probable method of pathogen transmission to humans from flooring systems is through direct contact. Other likely means of transmission include dropping and picking up merchandise, children crawling on the ground, stockers making contact with the ground and touching merchandise and food, taking off shoes upon returning home, etc.



As mentioned previously, fresh concrete does not contain pathogens but is susceptible to pathogen growth due to the nature of concrete composite. To combat this permeability, resilient flooring systems are typically required in hospitals, schools, restaurants, and grocery stores to minimize bacterial growth. This is due to the hydrophobicity, or ability to repel water, of the resilient flooring. These antiadhesive surfaces are used to protect the porous concrete and impede microbial attachment to the surface (Dancer, 2014).

When resilient flooring systems are not utilized, intensive disinfecting cleaning procedures must be followed. These harsh chemicals lead to abrasive wear on the concrete and ultimately a softening of the surface.

This softening of the concrete surface enhances pathogen penetration and growth throughout the entire body of the concrete.

### **Question 3**

Is there a gassing off process in concrete?

### **Answer 3**

Yes. Concrete composites release vapor and gas into the air through their service life.

To quantify the amount of moisture and subsequent risk to those exposed, ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride can be utilized. ASTM F 1869 measures the amount of moisture emitted from concrete flooring systems in pounds per 1000 square foot per 24-hour period (ASTM International, 2016). The amount of moisture emitted can be as high as 25 pounds per 1000 square feet in 24 hours. In this case, a 150,000 square foot grocery store would emit 3,750 pounds of moisture every day.

During concrete's curing and hydration period, chemical emissions are also released. These chemical emissions produce indoor air pollution leading to multiple dangerous side effects for humans. Depending on the chemical makeup

of the concrete used, these emissions can consist of Volatile Organic Compounds (VOCs) (Lindgren, 2010). In addition, concrete floor coatings like epoxy and sealant have been shown to exhibit higher levels of VOC emission than uncovered concrete. In treated concrete floors this mechanism produces imperfections in the surface of the floor's coating allowing bacteria and deleterious materials through the protective layer and into the concrete floors.

### **Question 4**

What is the likelihood of long-term effects from concrete on employees?

### **Answer 4**

As previously mentioned, there are medical risks associated with the emission of moisture vapor and Volatile Organic Compounds.

These risks include both long-term and short-term issues in both children and adults.

Damp concrete floors have been shown to lead to symptoms of asthma in adults. As the moisture exposure of the concrete increases so does the prevalence of asthma for those exposed (Norback, Wieslander, Nordstrom, & Walinder, 2000).

In addition, concrete contaminated with pathogens poses health and safety risks to employees and customers. Human exposure to harmful pathogens can cause severe food poisoning in humans resulting in nausea, vomiting, and dehydration. Death can even occur in humans with lowered immune systems to include the elderly and young children (Mayo Clinic).

### **Question 5**

What are your thoughts on polishing the concrete surface?

### **Answer 5**

To minimize pathogen contamination, it is imperative to densify the concrete to reduce permeability. Through laboratory testing it has been shown that polishing of the concrete surface does not result in a denser surface. In contrast, polished concrete that is not further coated or treated leaves the surface exposed and results in increased cracking.



This cracking leads to greater permeability, allowing harmful substances like bacteria and fungi to penetrate the surface, subsurface, and body of the matrix (Wang, Jansen, Shah, & Karr, 1997).

### Works Cited

ASTM International. (2016). ASTM F1869-16a. *Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride*. West Conshohocken, PA, US. Retrieved from [www.astm.org](http://www.astm.org)

Dancer, S. J. (2014). Controlling hospital-acquired infection: focus on the role of the environment and new technologies for decontamination. *Clinical microbiology Reviews*.

Lindgren, T. (2010). A case of indoor air pollution of ammonia emitted from concrete in a newly built office in Beijing. *Building and Environment*, 45. doi:<https://doi.org/10.1016/j.buildenv.2009.07.014>

Norback, D., Wislander, G., Nordstrom, K., & Walinder, R. (2000). Asthma symptoms in relation to measured building dampness in upper concrete floor construction, and 2-ethyl-1-hexanol in indoor air. *The International Journal of Tuberculosis and Lung Disease*, 4.

Wang, K., Jansen, D.C., Shahg, S.P., & Karr, A.F. (1997). Permeability Study of Cracked Concrete. *Cement and Concrete Research*, 27. Elsevier Science Ltd.