Effective Design of Handwashing and Drying Facilities

Enhancing Hygiene Standards in Public Spaces

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INTRODUCTION

Hygiene management in public spaces is paramount for preventing and controlling the transmission of communicable diseases. Public bathrooms, in particular, are identified as high-risk environments due to the presence of airborne contaminants, frequently touched surfaces, and the potential for mould and mildew growth. The intensive use and constant turnover in these facilities heighten the challenges of maintaining sanitary conditions, necessitating advanced design and maintenance strategies to effectively mitigate health risks.

The COVID-19 pandemic highlighted the necessity for rigorous hygiene practices. This unprecedented health crisis reinforced the importance of robust public health measures as well as smarter architecture and design strategies, especially within shared facilities where the risk of infection transmission is inherently higher. The importance of hand hygiene in preventing the spread of disease, in particular, is one aspect that has been ingrained in the public consciousness.

In this paper, we discuss the key hygiene risks in public bathrooms and what architects and designers need to do to elevate hygiene standards in such spaces. A focal point for this paper is the design of handwashing and hand-drying stations. Architects and designers must prioritise advanced drying technologies and optimal spatial designs to minimise exposure and cross-contamination, thereby enhancing overall public health outcomes.

Key hygiene risks in public bathrooms

Public bathrooms pose a variety of hygiene risks due to common sources of contamination, including airborne pathogens, high-touch surfaces, and mould growth. Poor ventilation in these spaces can allow airborne contaminants, such as bacteria and viruses, to accumulate, especially during toilet flushing, which can aerosolise harmful pathogens. Without adequate air circulation or filtration systems, these pathogens can linger, increasing the risk of transmission.

A global study on bacterial and viral transmission in public bathrooms revealed that bioaerosols can spread through an entire multi-storey building due to faulty plumbing systems.[1] Additionally, when toilet lids are left open after flushing, contaminated droplets can be dispersed over a distance of more than a metre.[2] In fact, research has demonstrated that even after multiple flushes, toilets can still release contaminants into the air.[3] This means that someone carrying a virus could potentially continue to spread germs in the bathroom for several hours after their visit.

High-touch surfaces are another hygiene risk in public bathrooms. Areas like door handles, toilet flush buttons, taps, and hand dryers are frequently touched, making them prime spots for bacteria and viruses to spread. Without regular cleaning and disinfection or the implementation of touchless technologies, these surfaces can rapidly become sources of cross-contamination.

The naturally humid environment of public bathrooms also encourages the growth of mould and mildew, especially in spaces with poor drainage or ventilation. Mould buildup not only compromises the cleanliness of these areas but can also contribute to health issues such as respiratory problems for users.

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Importance of hand drying

Handwashing and drying play a crucial role in maintaining hygiene and preventing illness, particularly in public spaces. Proper handwashing can reduce the incidence of diarrhoea-related sickness by around 30% and respiratory infections by 20%.[4] However, drying hands is an equally important step in this process, as the risk of bacterial transmission is greater from wet skin than dry skin.[5]

The simple act of drying hands thoroughly after washing significantly reduces the risk of contamination. Using an air dryer or paper towel after washing hands effectively reduces the number of bacteria that remain on the skin. Studies show that simply shaking hands dry does not achieve the same level of hygiene, as moisture left on the skin can still carry microbes.[6]

While hand dryers are effective in removing moisture, their use of forced air can circulate bacteria in the immediate area. Research has shown that hot air dryers can significantly increase the number of airborne bacteria around the user.[7] This highlights the importance of preventing bacteria from becoming aerosolised in the first place, such as ensuring toilets are flushed with the lid closed to reduce the spread of contaminants in the air.

Though paper towels are often perceived as a more hygienic alternative, they also come with drawbacks. While they absorb water from the skin, they also carry the removed contaminants into the waste bin, where they can continue to pose a risk if not properly managed. Additionally, paper towels need constant replenishment and disposal, leading to higher costs and environmental waste, making them a less sustainable option for public restrooms.

UV light as a disinfectant

The use of UV light as a disinfectant is not a new concept, but its role in hand hygiene has gained renewed attention, particularly following the COVID-19 pandemic. Health organisations are now exploring the potential of UV light to become a standard tool for disinfecting public spaces, including its application in hand-drying solutions.

UV light works by penetrating the outer layer of microbial cells and altering their DNA, preventing the cells from replicating. This process is highly effective at stopping the spread of infectious disease, with studies claiming it can reduce bacterial and viral transmission, including coronaviruses.[8] As a result, UV light has been integrated into high-speed hand dryers, providing an additional layer of sanitation during the drying process.

Research supports the effectiveness of UV-enhanced hand drying over traditional methods. A study found that using a hot air dryer equipped with UV light for 30 seconds was more successful at removing bacteria from stationary hands than paper towel drying.[9] This highlights the potential of new UV-enhanced solutions to reduce contamination in public spaces more efficiently than conventional methods.

Removing airborne contaminants

As noted earlier, the presence of bacteria in bathroom air largely results from lidless toilet flushing, which can aerosolise a mist of microbes, spreading them over a large area. This "fecal cloud" disperses harmful bacteria, potentially contaminating the surrounding air and surfaces.

While there is evidence that hand dryers can disperse bacteria onto hands and surfaces, research has shown that bacteria present in hand dryers mostly come from the air in the bathroom itself.[10] By equipping hand dryers with high-efficiency particulate air (HEPA) filters, most of the airborne bacteria are removed as the air passes through the dryer.

In one study, the use of HEPA filters reduced the bacteria on petri dishes by 75%.[11] Additionally, researchers found minimal bacteria on the nozzles of HEPA-filtered dryers.

What can designers do?

Designers can significantly improve hygiene in public bathrooms by incorporating touchless technology into handwashing and hand-drying solutions. By installing touchless tapware, soap dispensers, and hand dryers, the need for physical contact with high-touch surfaces is greatly reduced. Additionally, automatic flush mechanisms and hands-free doors can further limit points of contamination. These strategies eliminate one of the highest risks for cross-contamination—high-touch surfaces.

Air circulation also plays a crucial role in maintaining hygiene, and designers can address this by improving ventilation and air filtration systems. Enhanced airflow helps reduce the concentration of airborne pathogens, particularly bioaerosols that can spread during flushing. Proper ventilation systems should be designed to limit the movement of these particles, ensuring that airborne contaminants are removed quickly and efficiently.

Hand-drying options need careful consideration. While paper towels can effectively remove moisture and bacteria from hands, they also generate waste and require constant replenishment. UV-enabled hand dryers provide a more effective alternative by killing microbes during the drying process. Designers can also opt for hand dryers equipped with HEPA filters, which help remove bacteria from the air, reducing the risk of recirculating contaminants. Offering multiple drying options can ensure convenience, efficiency and hygiene in public spaces.

Lastly, the design of toilets and placement of handwashing stations are key. Toilets with lids should be prioritised to prevent the aerosolisation of pathogens during flushing. By ensuring that toilets are flushed with the lid closed, designers can help contain harmful particles. Additionally, positioning handwashing and drying stations away from the toilet area minimises the risk of contamination. Selecting antimicrobial, easy-to-clean surfaces for sinks and counters, combined with regular cleaning, will further enhance the hygiene of public bathrooms.

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Enhance hygiene standards with Dolphy hand dryers

Dolphy provides a comprehensive solution for enhancing hygiene in public spaces with its range of advanced hand dryers, featuring built-in HEPA filters, UV light sterilisation and touchless activation. The inclusion of HEPA filters ensures that up to 99.75% of airborne bacteria are captured, making Dolphy hand dryers an ideal choice for environments such as hospitals, aged care centres, and offices where hygiene is paramount. By reducing airborne contaminants, these dryers contribute significantly to maintaining cleaner, safer spaces for users.

Moreover, Dolphy hand dryers are environmentally friendly, offering a sustainable alternative to paper towels. The DAHD0063 Supercharge Hand Dryer, for example, uses an 800W motor and air speeds of up to 85 m/s to quickly remove moisture from hands, achieving complete drying in less than 12 seconds. This not only reduces paper waste but also cuts operational costs, with running expenses up to 70% lower than other hand dryers and 98% less than paper towels. By combining fast, hygienic drying with energy efficiency, Dolphy hand dryers deliver both cleanliness and cost savings.

With robust construction, including a 304 stainless steel body, high-quality infrared sensors for automatic activation, UV sterilization for enhanced hygience and a seven-year warranty, Dolphy hand dryers offer durability and reliability for long-term use. Their compact design, along with features like water splash protection and low running noise, makes them an ideal choice for a clean, hygienic, and cost-effective bathroom environment.

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All information provided correct as of November 2024