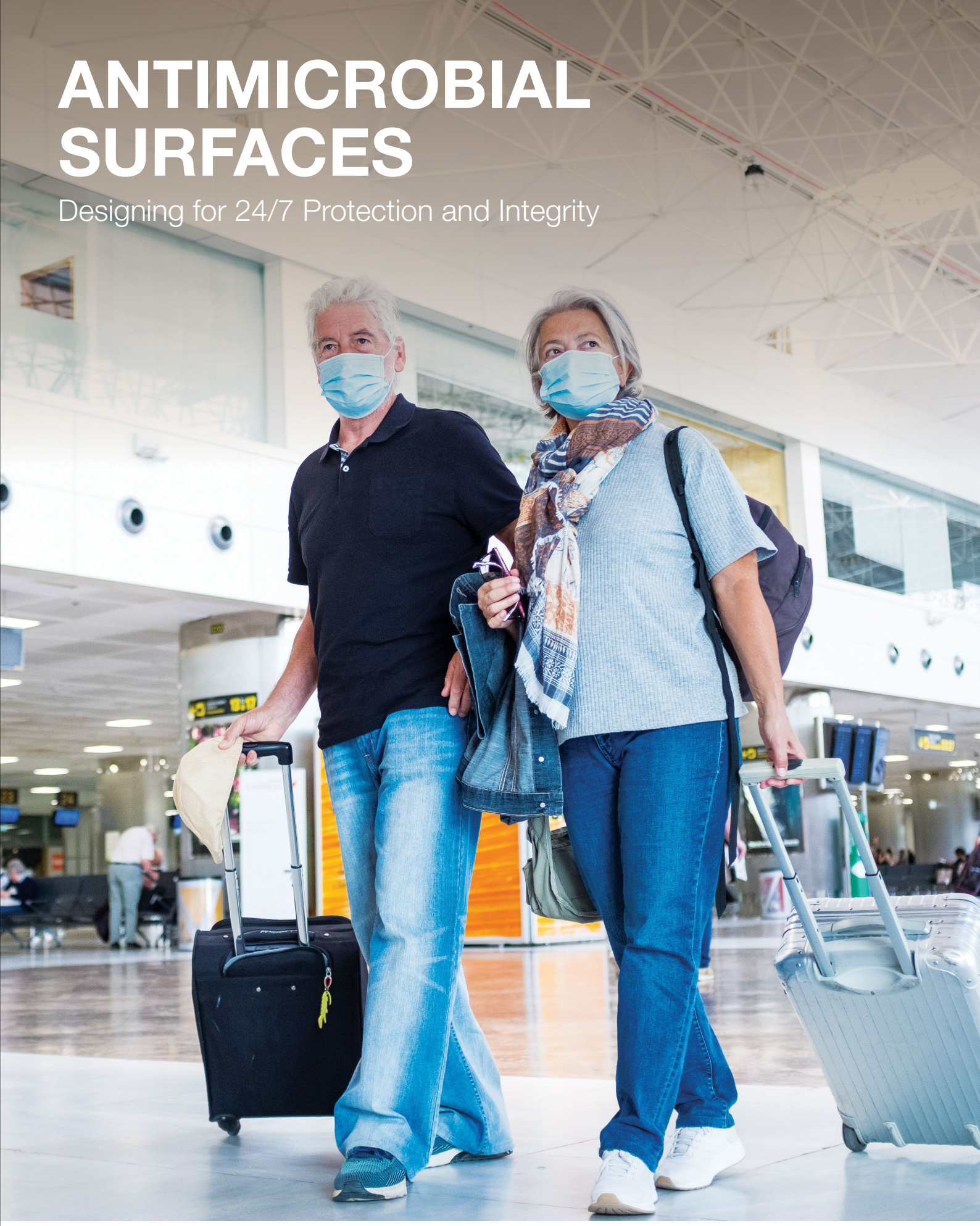
ANTIMICROBIAL SURFACES

Designing for 24/7 Protection and Integrity



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INTRODUCTION

It is said that there are more bacteria on one human hand than there are people on Earth. While many are harmless, the threat of bacterial infection resulting in serious health complications and/or death is a real one. Approximately 5,000 Australians die every year from sepsis – a life-threatening illness caused by the human body's response to bacteria entering the bloodstream.[1] This death rate exceeds the annual road toll and is greater than the deaths attributed to breast, prostate and/or colo-rectal cancer.[2]

To reduce the death rate caused by bacterial infection, we must reduce the spread of bacteria. Bacteria is commonly spread from contaminated surfaces to hands from which they can contaminate other surfaces and food, or be passed to another person. Accordingly, the design and material specification of surfaces in the built environment is an important factor in minimising bacterial growth and spread.

Designing for hygiene and infection control fulfils an important public health function. It protects immunocompromised people and young children from potentially deadly infection from common forms of bacteria, such as Escherichia coli, Klebsiella pneumoniae and Staphylococcus aureus, which could otherwise put a strain on hospital resources, increase mortality rates and come at a great cost to the Australian economy.

In this whitepaper, we discuss the most common types of bacteria, along with design and material considerations that will help stop their transmission.

WHAT ARE THE MOST COMMON TYPES OF DEADLY BACTERIA?

Bacteria are found everywhere. They play a role in maintaining our environment, and the majority of microbes in the human body contribute to health and wellbeing. Only a relatively small percentage of the world's bacteria cause infection and disease, but they are easily spread to people from seemingly innocuous sources. Once bacteria enter the human body, they increase in number, causing a reaction in the body that could lead to serious health complications. While traditionally easy to treat, emerging types of antibiotic-resistant bacteria are a rapidly growing problem.

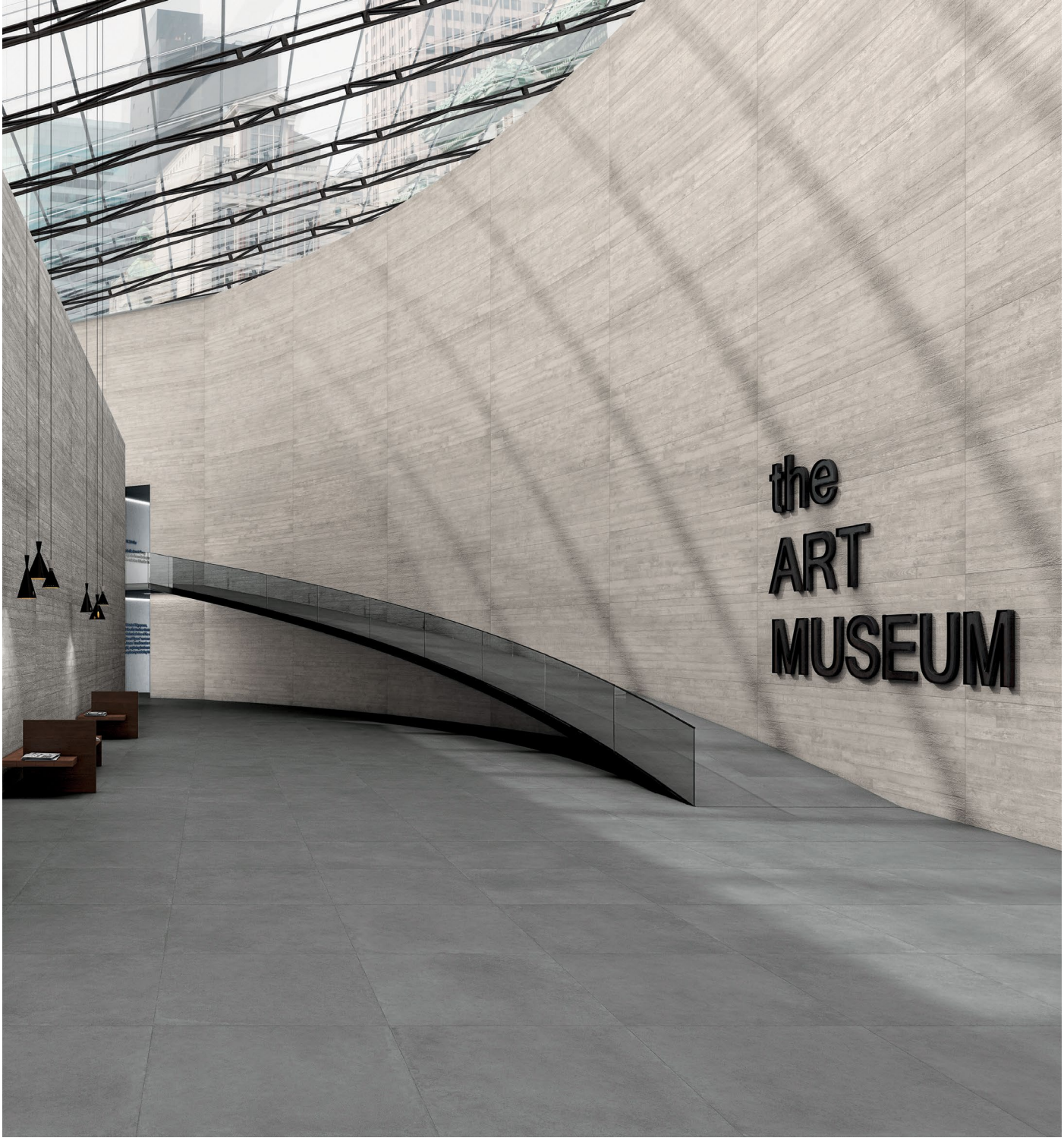
Following are some of the most common types of deadly bacteria.

Escherichia coli (commonly referred to as "E. coli") is a type of bacteria associated with food-borne illness and food contamination. In Australia, E. coli is one of the most common causes of bacterial infection with reports showing a rising number of antibiotic-resistant strains.[3] E. coli infection can result in minor illness (e.g. diarrhea, fever, and stomach pain) as well as serious, life-threatening illness (e.g. pneumonia, gallbladder inflammation, and haemolytic uraemic syndrome).

Klebsiella pneumoniae (also known as "K. pneumoniae") is bacteria that can cause a variety of infections including urinary tract infections, liver abscesses and pneumonia. Infection from K. pneumoniae can have serious health complications for immunocompromised people, as well as those who are relatively healthy. The rising prominence of K. pneumoniae can be explained by the growing number of severe strains showing resistance to antibiotic treatment. In the United States, 8,000 reports of multidrug-resistant Klebsiella pneumoniae were made in 2013, with a death rate of a staggering 50 per cent for bloodstream infection cases.[4]

Staphylococcus aureus bacteria (also known as "Golden staph" or "SAB") is a pathogen causing skin infections and more serious bloodstream infections. Over half of all SAB infection cases occur in major hospitals.[5] In 2018-19, 1,573 cases of SAB infections were reported in Australian public hospitals.[6] Bloodstream infections of the Methicillin-resistant Staphylococcus aureus (MRSA) strain is responsible for a mortality rate of around 35% as there are fewer treatment options available.[7]

Infectious bacteria may be spread via air droplets, food or another infectious person, but is commonly spread to a person from a contaminated surface. Accordingly, poor surface specification can increase the risk of that surface becoming a reservoir for pathogenic organisms.



CONTRIBUTING FACTORS TO THE SPREAD OF BACTERIA

The principal mode of transmission of bacterial infections is through direct or indirect contact with infectious bacteria. Infectious bacteria may be spread via air droplets, food or another infectious person, but is commonly spread to a person from a contaminated surface. Accordingly, poor surface specification can increase the risk of that surface becoming a reservoir for pathogenic organisms. Environmental surfaces that are not fit-for-purpose may become damaged, allowing bacteria to grow in cracks, scratches and crevices.

Poor hand hygiene is another factor contributing to person-to-person and person-to-surface transmission of infectious disease. According to the World Health Organization, microbes of MRSA or K. pneumoniae can be present on skin in numbers ranging from 100 to 1,000,000 per square cm.[8] Studies have demonstrated that bacteria can survive on human hands for hours, during which they can spread to surfaces, people and food.[9]

Cleaning and maintenance procedures are also a major component in the spread of bacterial infection. While most public spaces undergo regular cleaning, even the most thorough and routine procedures are not foolproof. Cleaning is labour intensive, subject to cost cutting and can be conducted to varying levels of quality depending on the individuals responsible. Cleaning equipment can also be poorly maintained and become contaminated, spreading bacteria across the surface rather than eliminating it.

HIGH RISK ENVIRONMENTS

In general, spaces that are subject to high levels of traffic are at greater risk of spreading bacterial infection. Healthcare environments are among the most susceptible given the presence of immunocompromised patients. The estimated incidence of healthcare-associated infections (HAIs) in Australia is about 165,000 cases annually.[10] Not only causing great pain for the patient, HAIs lead to extended recovery periods, excess healthcare costs and increased mortality and morbidity. In Australia, HAIs account for approximately two million hospital bed days per year.[11]

As spaces where large numbers of people have physical contact, childcare institutions and schools have also been proven to be places in which infection can spread effectively. Younger children are prone to unhygienic behaviours and have underdeveloped immune systems less equipped to combat infection. Studies have shown that children in childcare settings have over 50% more episodes of infection than children cared for at home.[12] The increased incidence of childhood illness leads to excess healthcare costs and school absenteeism, which in turn can lead to a reduction in academic performance.

Food preparation areas are also susceptible to the spread of illnesses. According to the Food Safety Information Council, there are over four million cases of food-borne illness across the country annually. The public health and economic impact of food-borne illness is staggering with cases resulting in approximately 120 deaths, 1.2 million visits to doctors, 300,000 prescriptions for antibiotics and 2.1 million days of lost work each year.[13] On an annual basis, food-borne illnesses cost the Australian economy an estimated $1.25 billion.[14]

HOW DOES THIS IMPACT DESIGN AND MATERIAL SPECIFICATION?

Antimicrobial surfaces, a design solution

In hospitals, aged-care facilities, childcare, schools and food preparation areas, cleanliness and hygiene must be considered the highest priority for designers and specifiers. Any surface that is subject to high levels of traffic must be designed to prevent infection. In such areas, the best choice for surface materials are those that have antimicrobial properties.

Antimicrobial surfaces contain an antimicrobial agent that inhibits the ability of microorganisms to grow on its surface. Copper and silver are commonly used due to their well-documented antimicrobial properties. Sometimes the antimicrobial agent is added via surface coating, or is integrated into the material itself. By inhibiting the growth of bacteria on surfaces, antimicrobial materials protect against infection by defeating infectious microbes before they can be transmitted to a person.

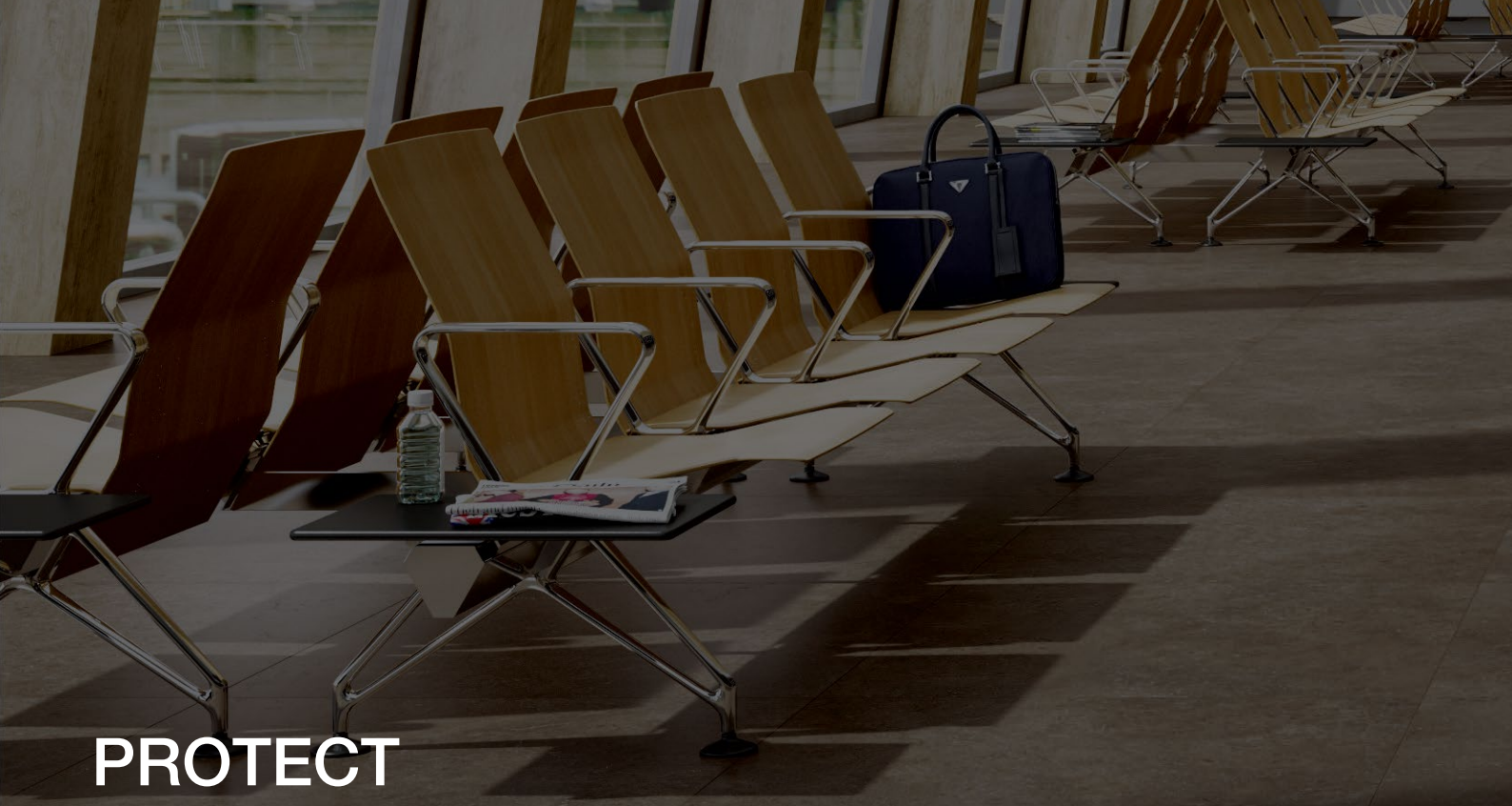
Antimicrobial technology makes cleaning and maintenance easier as they provide continuous protection between cleans and keeps a surface cleaner for longer. They also reduce variability in hygiene levels from inconsistent cleaning practices, and reduce the need for harsh cleaning chemicals that may be harmful to human health and the environment. These benefits can translate to reduced overall cleaning costs without compromising on hygiene or cleanliness.

Choosing an antimicrobial surface

Not all antimicrobial surfaces are created equal. Some antimicrobial technologies, such as those based on titanium dioxide and use of sunlight and ultraviolet (UV) rays for activation do not protect against bacteria throughout the day and night. Other solutions are only applied as a surface coating and can wear off over time, while some only provide limited protection against specific types of bacteria. Durability and longevity are important considerations, particularly in demanding, heavy use applications.

When choosing an antimicrobial surface, consider the following factors:

- Is the effectiveness against bacteria independently tested and verified?
- Is the antimicrobial technology permanently integrated into the surface and not a surface coating that can wear off?
- Is the solution active 24/7 regardless of its environment?
- Is it a durable surface that is unaltered by wear and tear, and can withstand heavy use?
- Is it a non-porous surface that inhibits a reservoir of bacteria?
- Is it stain, scratch and chemical resistant?
- Is it UV resistant?
- Is it fire resistant?
- Is it easy to clean?
- Does it guarantee the elimination of 99.9% of bacteria on the surface?



PROTECT

Offering 24/7 protection with everlasting integrity

Microban® (the world leader in antimicrobial technology) and the Panaria Group Research Centre, have combined expertise to create the PROTECT line of porcelain stoneware tiles and slabs, that are not only beautiful and remarkably resistant, but a true antimicrobial shield built into the porcelain body that eliminates up to 99.9% of bacteria on the surface.

Silver is the base ingredient of this technology: integrated permanently into PROTECT porcelain tiles and slabs during the industrial firing phase, at over 1200 °C, making it constantly active, 24/7, day and night, throughout the life cycle of the product. When bacteria come in contact with the treated surface, Microban® technology acts by blocking their metabolism, interrupting the life cycle of bacteria and their ability to spread.

Unlike other technologies, such as those based on the use of titanium dioxide, the protective shield is always active, day and night, with or without sunlight and it does not need UV rays for activation. The permanent integration of PROTECT silver irons at the moment of firing means they are active throughout the life cycle of the product and always guarantee a high level of protection between cleaning operations.

The continuous antimicrobial action of the PROTECT line of surfaces prevents the formation of biofilms, colonies of bacteria that form a slimy coating on surfaces, which are difficult to clean and can compromise the tile itself by fading colours or adding resistant and smelly mildew. PROTECT technology is especially effective with bacteria such as Escherichia coli, Klebsiella pneumoniae and Staphylococcus aureus, very frequent in most environments.

Key Features:

- Compliance with safety regulations. PROTECT laminated porcelain and porcelain tiles are in full compliance with global regulatory bodies which govern the production applications and uses adopted by the market.
- Thoroughly tested applications. Panaria Group and Microban® also use external independent laboratories which are highly specialised at carrying out ISO 22196 or ASTM E3031-15 testing.
- Environmentally friendly and healthy. PROTECT antimicrobial surfaces, has a powerful action against bacteria but has no harmful effect on the environment nor human health and wellbeing.
- Eliminates substances that are not visible. PROTECT antimicrobial technology limits growth of invisible bacteria on floor and wall tiles, kitchen countertops, etc.
- Less bacteria, less odours. Reducing bacteria results is less odours.
- More hygienic and easier cleaning. The level of cleanliness of the product can be visibly improved with PROTECT antimicrobial technology allowing complete and easier cleaning.

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The extensive selection of porcelain surfaces available in Australia from Ceramic Surfaces Australia containing PROTECT technology now means you can achieve an architectural surface which is consistently protected, with high levels of hygiene, unalterable from wear and tear and climatic conditions.

So when you are designing your next residential, commercial or infrastructure project – consider human health when contemplating the hard surfaces to be used – contact Ceramic Surfaces Australia for the right advise. Both you and your clients will be exceptionally satisfied and have project surfaces that will continue to maintain their antimicrobial integrity forever.

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All information provided correct as of April 2021

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