

# Healthy Building Syndrome

Porcelain panels that are good for your health

MAXIMUM

ACTIVE™  
CLEAN AIR & ANTIBACTERIAL CERAMIC

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## Porcelain panels that are good for your health

We spend so much of our lives inside buildings – houses, offices, schools, shopping centres – but, while these structures do a good job of protecting us from the elements, they also expose us to a range of chemicals that can have a significant impact on our health. Heating and air conditioning systems bring in pollution with outside air, while furniture, paint, building materials and cleaning products release volatile organic compounds (VOCs), and harbour mould and bacteria. The phenomenon is known as Sick Building Syndrome (SBS) and, for unfortunate building occupants, it manifests in symptoms ranging from irritated eyes and skin to headaches and

nausea, and more serious conditions. Products like VOC-free paint and natural floorcoverings have gone some of the way to reducing the prevalence of SBS, but only now has a building product been designed that actively removes air contaminants from indoor spaces.

ACTIVE 2.0 is fused to MAXIMUM panels acting in a photocatalytic process removing toxic nitrogen oxides from the air, killing harmful bacteria and viruses, including MRSA and H1N1 swine flu and reducing concentrations of dangerous VOCs. ACTIVE 2.0 also has anti-odour properties, and is self-cleaning.



Lobby Walls

Calacatta

Campbell Parade Apartments by Tzannes Architects

## Antiviral properties of Active 2.0

Active 2.0 is the only product on the market certified\* as antiviral. Titanium dioxide in micrometric form is fused to porcelain surfaces at high temperature and pressure, forming a fine skin that can kill different types of viruses. Producing antiviral surfaces requires a fine level of precision because virus particles are smaller than bacteria. As such, inferior products on the market have only antibacterial properties.

These properties make Active 2.0 an ideal choice for internal, external, floor and wall usage in a variety of commercial projects. Active 2.0 is of particular benefit in hospitals and medical centres, where it reduces cross contamination, and the antiviral, self-cleaning, anti-odour and antipollution action improves indoor air quality. Active 2.0 provides a non-toxic, easy-to-maintain surface for interiors of offices, hotels and residential buildings, and meets the demand for sustainability and wellbeing in the sector. Its 100-per-cent natural composition is free of toxic resins and chemical binders used in engineered stone, and its aesthetic beauty mimics natural stone, marble, concrete and more.

### \* Test certification disclaimer

Active 2.0 was tested with two viruses, using two different ISO testing regimes: H1N1 (2009 swine flu pandemic) and Enterovirus 71 (hand, foot and mouth disease). It is not currently possible to test with COVID-19 as this virus is not allowed to be used in laboratories at the date of publication. The two viruses tested are considerably more infectious than COVID-19. It may be assumed Active 2.0 will have the same effectiveness on COVID-19 but data is not currently available to confirm this.



Internal Floors  
Calacatta  
St Vincent's Hospital, Sydney by Hassell

Certifications for H1N1 and Enterovirus 71 are available on request:

- o ISO 21702:2019 – Antiviral test in the dark  
H1N1: 99.13%  
Enterovirus 71: 61.12%
- o ISO 18061:2014 – Photocatalytic antiviral test  
H1N1: 99.91%  
Enterovirus 71: 71 99.92%

## Removing toxic nitrogen oxides from the air

Nitric oxide and nitric dioxide (commonly known as NOx) are air pollutants produced by cars, coal-fired power stations and industrial combustion processes. On their own, they can cause respiratory problems, but they're also highly reactive with other chemicals in the environment, creating an array of dangerous vapours and particles. ACTIVE 2.0 puts the reactive nature of NOx to good use, however, through a photocatalytic process that decomposes the NOx on contact, removing it from the air.

Of course, as with all building products, the manufacture of MAXIMUM itself leads to NOx emissions. But after only two years, each MAXIMUM ACTIVE 2.0 panel will have removed an amount of NOx equivalent to that created by its production. From then on, it works purely for the benefit of general air quality. So MAXIMUM ACTIVE 2.0 panels aren't just NOx neutral, they're NOx negative! As you can see in the chart below, other popular building materials just can't compare.

## Reducing concentrations of dangerous VOCs

Not all VOCs are harmful to humans, but two of the worst are found in high concentrations in indoor air. Benzene, released from cars, plastics and resins, is a known human carcinogen. Formaldehyde, which is emitted from paints, adhesives and furniture, and chlorine derivatives, produced by cleaning products, have also been linked to cancer. Removing these from the air should be a priority in every modern building.

One of ACTIVE 2.0's chemical properties is that it can directly oxidise organic compounds, so VOCs that come into contact with it are effectively destroyed, not just in UV light but under LED lights too. And because it acts as a catalyst in these VOC-destroying reactions, ACTIVE 2.0 is unaffected and won't "wear out" over time.

<b>Building Materials</b>	<b>Emission of NOx to produce 1m<sup>2</sup></b>	<b>Years to make up for the NOx emission</b>
Parquet	22 g	No compensation
Cement Tiles	28 g	No compensation
Traditional ceramic tiles	32 g	No compensation
Active 2.0	33 g	2 years*

Fig. 1

## The multiple benefits of self-cleaning, anti-odour building materials

Another powerful behaviour exhibited by ACTIVE 2.0 is hydrophilicity, or extreme attraction to water. As you can see in the diagram, this creates a very low “contact angle” between water and the ACTIVE 2.0 surface, so water flows readily across the surface rather than beading into droplets.

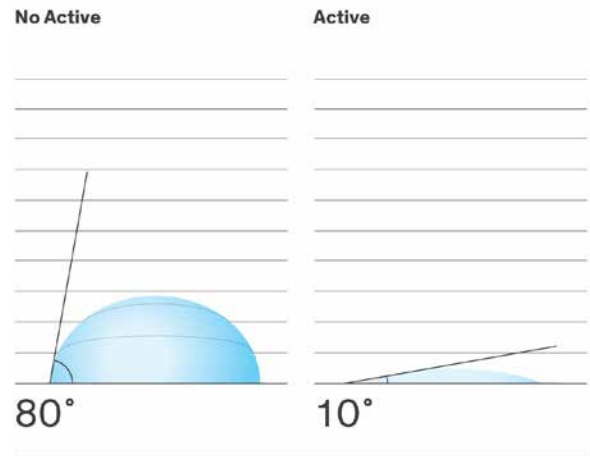


Fig. 2



Kitchen Bench tops & Splash back

Pietra Grey

Soko Sky Homes penthouse by Cottee Parker and Spyre Group



Internal Floors and walls  
Calacatta & Travertino  
St Vincent's Hospital, Sydney by Hassell



Combined with the photocatalytic destruction of organic material described above, it means that MAXIMUM ACTIVE 2.0 panels are essentially self-cleaning, and therefore require a much smaller amount of mild detergent for regular maintenance, compared to other building materials. This has benefits other than saved time and money. As we've mentioned, cleaning products are a major source of indoor VOCs. Typically, the more aggressive the detergent, the more VOCs are released into the air. So ACTIVE 2.0 not only removes VOCs from indoor air, it reduces the degree to which they're introduced in the first place. A parallel effect plays out with regard to indoor odours. Because the majority of odours, pleasant

or otherwise, are actually VOCs, ACTIVE 2.0's photocatalytic reactivity directly removes them from the air. Being able to specify an anti-odour building material is valuable in itself, but it comes with an added benefit – it reduces the need for air freshener, which is another significant contributor to indoor VOC levels. So again, ACTIVE 2.0 directly reduces VOCs while also limiting the amount introduced through routine building maintenance.

This anti-odour performance will yield benefits in a wide range of applications and building types, from bathrooms and toilets, to kitchens, to hospital wards and waiting rooms, to shopping centre food courts.

## The anti-odour effect of ACTIVE 2.0

The below graph illustrates the dramatic effect ACTIVE 2.0 has on alpha-pinene, commonly used for pine-scented deodourising products. In a laboratory, alpha-pinene was introduced into a space with ACTIVE 2.0 surfaces and after only one hour, the chemical was almost completely degraded.

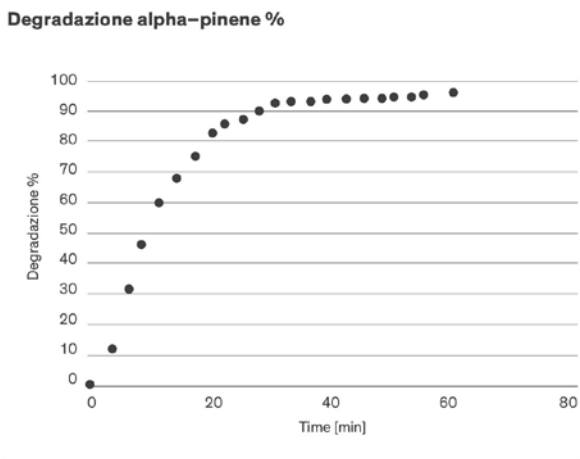


Fig. 3



External Facade  
Calacatta  
Franklin Road House by Jack McKinney

## Preventing the spread of bacteria

Two of the bacteria most often linked to human illness are E. Coli, a common cause of food poisoning, and MRSA, an antibiotic-resistant bacterium that can cause serious and difficult-to-treat infections throughout the body. Testing has revealed that ACTIVE 2.0 reduces levels of both E. Coli and MRSA by between 99.6% and 99.9%, not only in UV and LED light but in the dark too. This not only mitigates the risk of infection, with all of the trauma that entails, it reduces the need for intensive

antibacterial detergents, again limiting the amount of VOCs released into the air.

It's important to note that ACTIVE 2.0 doesn't just stop bacteria multiplying, it kills bacteria. And it does it in all of the common lighting conditions – in sunlight, under artificial UV and LED light, and in complete darkness.

## The global fight against antibiotic-resistant bacteria

The importance of finding ways to limit the spread of antibiotic-resistant bacteria like MRSA can't be understated. Currently it's estimated that more than 700,000 people are dying every year as a result of antibiotic resistance in a range of illnesses. And it's a truly global problem. In soil samples from a remote site just 300 kilometres from the North Pole, a team from England's Newcastle University has found more than 100 antibiotic resistance genes associated with nine major antibiotic classes. They're still exploring theories on how the bacteria could have spread so quickly to

such a sparsely populated location.

Without new forms of intervention, the future impact of these superbugs could be devastating. According to the Review on Antimicrobial Resistance, commissioned by the UK Prime Minister, their total cost to the global economy by 2050 could be as high as £64 trillion, or approximately A\$118 trillion. The review also estimated that by the middle of the century, 10 million people a year could be dying from infections that are currently treatable with antibiotics.



External Cladding  
Travertino  
Bay House by Tim Roberts Design



## The antibacterial effect of ACTIVE 2.0

To meet the requirements of ISO 27447, bacteria placed on ACTIVE 2.0 was exposed to UV light at 0.25 W/m<sup>2</sup> for eight hours. Escherichia Coli (E. Coli) levels were reduced by 99.99% and Staphilicoccus Aureus MRSA levels were reduced by 99.98%.

For ISO 22196 compliance, bacteria placed on ACTIVE 2.0 was left in the dark for the same period of time. Escherichia Coli levels were reduced by 99.99% and Staphilicoccus Aureus MRSA levels were reduced by 99.61%.

There's no ISO for antibacterial properties under LED light, but with consideration for the increasing popularity of LED lamps, ACTIVE 2.0 was tested under LED at 1000 lux for eight hours. Escherichia Coli levels were again reduced by 99.99%.



Lobby Wall

Calacatta

The Moreton Residential Development. Bondi for Mirvac by Smart Design Studio

## A unique answer to Sick Building Syndrome

The “healthy building” benefits of ACTIVE 2.0 come on top of the wide range of advantages offered by MAXIMUM porcelain panels, including their 100% natural composition, free of the toxic resins and chemical binders used in engineered stone. And of course, their aesthetic beauty, with colours and markings matched to natural stone, marble, concrete and more.

The benefits also extend to the production of MAXIMUM ACTIVE 2.0 panels: the process itself is fused in microparticles rather than nanoparticles, and the particles are fused at high temperatures, so no dangerous adhesives or polymers are required.

This makes for a safer manufacturing process, and it also results in a superior product. A polymer would be destroyed by the photocatalytic process, meaning that the antibacterial and antipollution properties would wear out over time, whereas ACTIVE 2.0 is permanent.

So from the production plant to installation in an architectural project, MAXIMUM ACTIVE 2.0 offers a true antidote to Sick Building Syndrome. For business owners, it means less sick leave, greater productivity and greater profitability. And for all of us, it means a greater sense of wellbeing and a healthier life.



Bathroom Floors and Walls  
Statuario  
Two Wall House by Woods Bagot



## De Castilia 23 office building

De Castilia 23, the new Milan headquarters of insurers Gruppo Unipol, has been designed by architects Progetto CMR with a prismatic facade that includes 6,000m<sup>2</sup> of panels treated with ACTIVE 2.0. To measure the real-world impact of this material choice, scientists from the University of Milan completed a set of laboratory tests on the same material in matching colour and finish. They found that 69kg of NO<sub>x</sub> would be degraded every year, an amount of NO<sub>x</sub> equivalent to that which would be removed by 200,000m<sup>2</sup> of green space, or by

having 30 fewer cars on the road for the entire year cancelling the pollution for 600,000km of driving each year.

The panels on the building look beautiful, but they're also working hard to make it a healthier space for all who visit or work there.



External facade, floors and columns  
Fiandre Core Shade Active in Cloudy and Sharp  
De Castilia 23 by Progetto CMR



## Larnaca General Hospital

Larnaca General Hospital in Cyprus incorporates 7,237m<sup>2</sup> of ACTIVE 2.0 tiles and scientists from the University of Milan have completed laboratory tests to model and evaluate the resulting photodegradation of airborne pollutants and antibacterial performance. The tests were on the same tile in matching colour and finish, and simulated 24 hours of continuous LED light corresponding to conditions in the hospital.

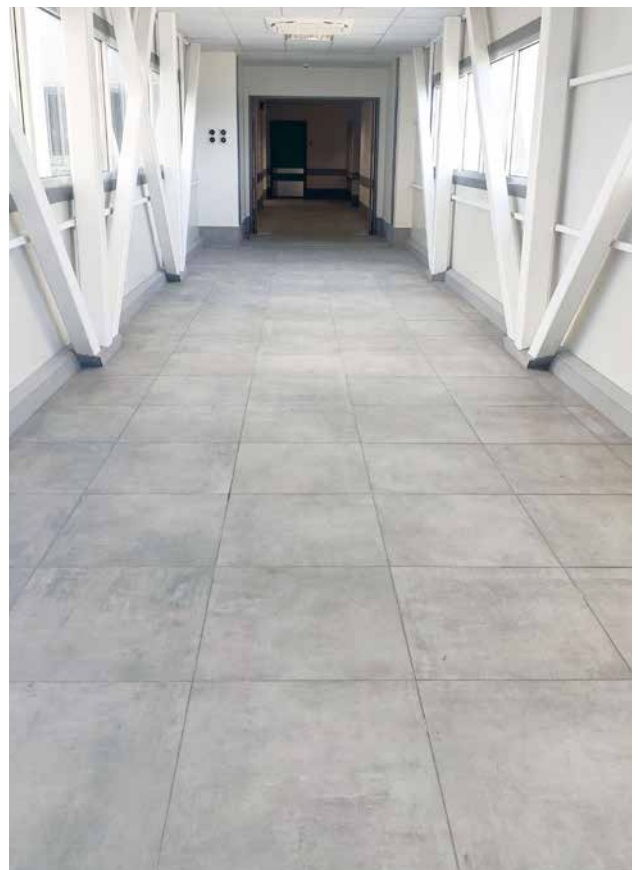
Their findings were that:

- 9.7kg of NO<sub>x</sub> would be degraded every year, which is comparable to the depolluting efficiency of 6,050 m<sup>2</sup> of green areas (NO<sub>x</sub> was the model pollutant, as requested by the World Health Organisation)
- the rate of bacterial reduction, including MRSA, was 99.99%
- the rate of bacterial reduction, including MRSA, in the dark was 99.99%

In any building, these results would be highly desirable; in a hospital environment, potentially lifesaving.



External Cladding and Internal Floors  
Fiandre Urban Active in Grey  
Larnaca General Hospital, Cyprus



## Developed by trailblazers in sustainability

MAXIMUM ACTIVE 2.0 is manufactured by Fiandre, a family-owned Italian ceramics company with a commitment to the environment that goes back more than half a century. Much of that commitment has come in the form of technological innovation to reduce the environmental impact of their products and production processes. In several cases, they've partnered with machinery manufacturers to develop proprietary production technology, and then released that technology for use by other parties, to help make the entire industry "greener".

This drive for innovation and passion for the environment defines Fiandre's business as much as the premium quality of its products. The company now produces more than 70 products that are made according to the parameters required for LEED certification. And across their production facilities, 100% of raw material and water wastes are recycled back into the production process.

But Fiandre has also looked to inspire change through

the wider community. In 1978, the company initiated an artistic protest action to encourage debate about humanity's impact of the environment. This trailblazing installation, called Pollution, involved the laying of ten thousand ceramic tiles in Bologna's Piazza Santo Stefano, with 26 artworks specially commissioned to give poetic and critical expression to the theme of environmental contamination. 46 years later, Fiandre aimed to bring these ideas back into focus, via Pollution 2018, a new installation and series of events at Biennale Architettura 2018.

MAXIMUM pressed porcelain panels, made from 100% natural materials, and ACTIVE 2.0 photocatalytic process, designed to remove pollutants from the air and reduce the need for chemical cleaning products, have been developed as a direct result of this will to make the world a better place.

Please note, ACTIVE 2.0 is offered in a standard range of MAXIMUM panels with no minimum order.



Internal Floors and Walls

Calacatta and Travertino

St Vincent's Hospital, Sydney by Hassell

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