

SMOG-EATING TILE

A Real-World Product for Reducing the Harmful Health Effects of Contaminated Air

By John Renowden, CEng, FIMechE

Shelter is one of our basic human needs, and the roof is the most important element of any shelter. Throughout time, there have been many different materials used for roofing,

and tile has been the most enduring. Tile has provided the unique combination of form and function, being both aesthetically pleasing and highly durable. Rarely, however, has it been associated with preventive health measures and increasing human lifespan.

Currently, a key topic in the roofing industry is sustainability, and it has taken center stage with both builders and consumers, as well as with the architects and contractors who support them. And while the use of eco-sound materials in roofing technology can be seen as nothing less than good for the planet, it is hard to see a direct correlation between the use of these earth-friendly materials and the potential for improving health.

In 2010, Boral Roofing sought to make that correlation when it introduced the Boral Pure roof technology to the United States builder and consumer markets. Often referred to as “smog-eating tile,” this revolutionary concrete tile roofing system

employs a photocatalytic technology that helps to clean the air.

HOW IT WORKS

The first and only product of its kind in the U.S. roofing industry, smog-eating tile

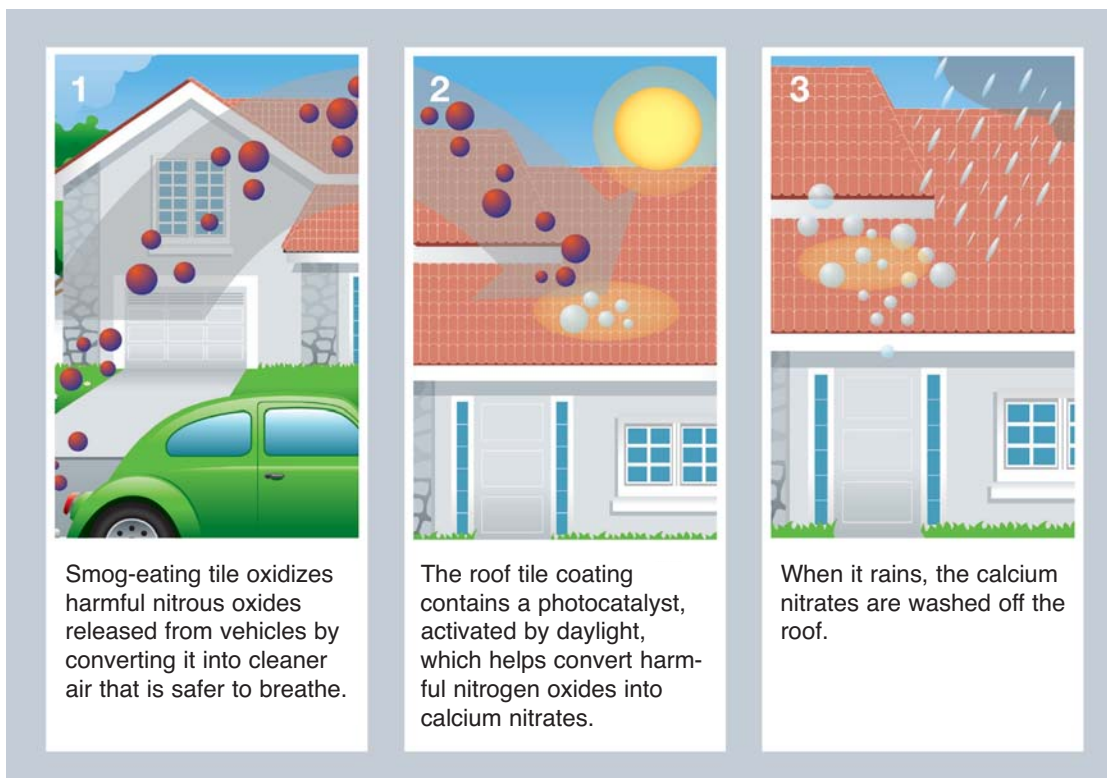


Figure 1 - How it works.

integrates titanium dioxide (TiO₂) into a micromortar coating over the upper tile body. Safely embedded in the coating, titanium dioxide is found in many consumer and industrial products; and when exposed to sunlight, it speeds up the oxidation process of nitrogen oxide (NO_x), a major component of smog that is found in high levels in major metropolitan regions where cars and freeways are prolific.

Smog-eating tile oxidizes harmful NO_x molecules released from vehicles, helping to make air safer to breathe. The roof coating contains a photocatalyst, activated by daylight, which helps convert harmful nitrous oxides into calcium nitrates. When it rains, the calcium nitrates are then washed off the roof.

Some major health problems are directly attributable to the NO_x formed during any burning process. Over one year, 2,000 sq. ft. of the tile can oxidize as much NO_x as a car produces from being driven up to 10,800 miles.¹ Thus, the tile's air-cleansing process represents one real way that builders and homeowners alike can reduce smog and the occurrence of the health problems it causes.

WHY DOES IT MATTER?

Smog taints the skylines of many of the world's great cities, covering blue skies with a brown haze. While unattractive to view, the harm in smog runs much deeper. The World Health Organization recently estimated that 2.4 million people worldwide die annually from causes directly attributed to air pollution. Weighing in closer to home, the American Lung Association, in its prominent 2011 "State of the Air" study, found that more than 154 million people (over half the nation) still suffer pollution levels that are often dangerous to breathe.²

The American Lung Association cites numerous health concerns and conditions caused by smog. They include premature births, infant deaths, chronic obstructive pulmonary disease, allergies, asthma, reduced lung function, premature death, lung cancer, heart disease, and heart attacks. These diseases and conditions can often be fatal. The bottom line is that when you reduce the levels of smog in the air, you raise the life expectancy of people breathing that air.

TITANIUM DIOXIDE – IS IT SAFE?

Titanium dioxide, the photocatalyst that instigates the smog-eating tile's air-

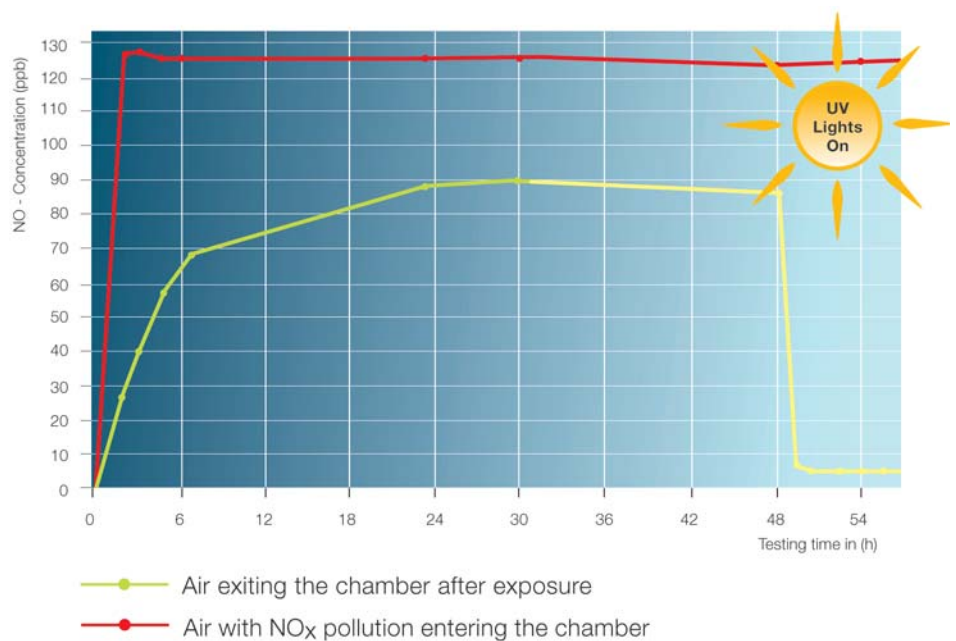


Figure 2 - The Franhofer Institute set up a test cell that shows how smog-eating tile causes a significant decrease in air pollution when exposed to UV lighting. The UV rays actually encourage smog reduction with a photocatalytic action.

cleaning process, is a proven depollutant that is both naturally occurring and safe for humans. The compound is commonly found in a number of items that we interact with



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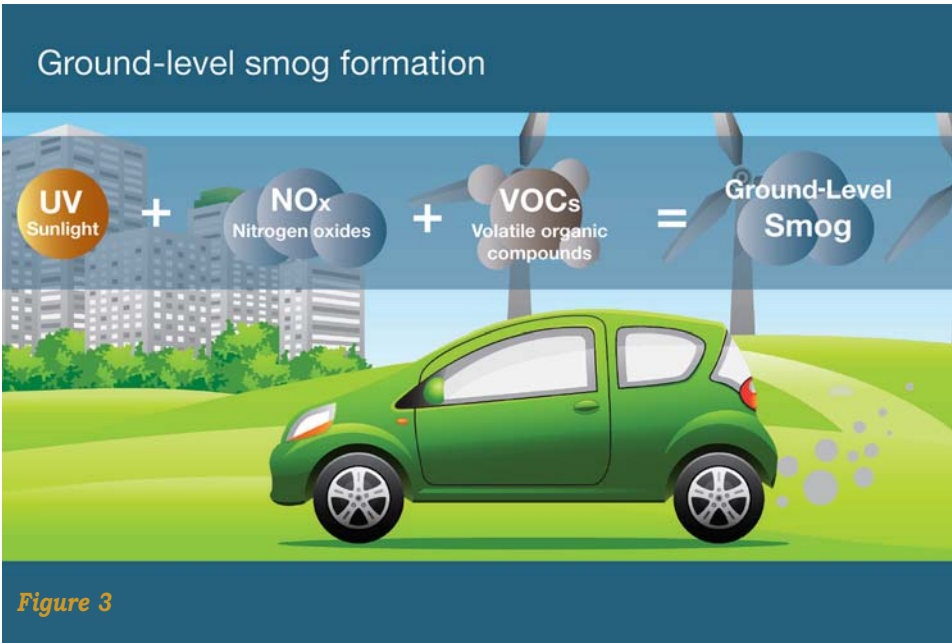


Figure 3

daily such as paints, cosmetics, aspirin, toothpaste, and white roof membranes. It is now also being used in hospitals on operating room walls for sterilization purposes.

Titanium dioxide's depolluting and de-soiling capabilities are proven. The notable European PICADA Project³ studies demonstrate the capabilities of TiO₂ as a key ingredient in coatings. Conducted by a consortium of leading European contractors, manufacturers, and research centers, the PICADA Project fully demonstrates titanium

dioxide's depolluting properties against nitrogen oxide and volatile organic compounds (VOCs), the key ingredients of smog.

"In the studies conducted in Europe where they actually applied [titanium dioxide] to roadways, the air was measurably cleaner," notes President Michael Chusid of Chusid Associates, a marketing and technical consultancy on building products. "It works."

ADDITIONAL BENEFITS OF TITANIUM DIOXIDE

In addition to its ability to reduce the formation of smog molecules, the titanium dioxide coating on the smog-eating tile adds another benefit to homeowners with this concrete

roof solution. It is a stay-clean technology that can break down organic substances that commonly accumulate on roof surfaces. Substances such as mold and algae are destroyed when UV light hits the roof surface. The visible organic materials on the roof then become transparent, maintaining the appearance of the structure.

CONCRETE TILE – A SUSTAINABLE, LIFETIME PRODUCT

While smog-eating tile provides health benefits with its coating, the base material of the tile also offers many efficiency and earth-saving benefits. Concrete tiles are made of locally sourced raw mineral materials—a mixture of sand, water, and cement. It is an energy-efficient solution that helps homeowners achieve up to 22% in energy savings.⁴ Concrete roof tile helps to keep a home cooler in summer months and warmer in winter months. These temperature-regulating qualities reduce a homeowner's need for heat and air conditioning, providing valuable energy cost savings.

Concrete tile is also a lifetime product requiring little maintenance.⁵ Concrete roofing protects against inclement weather and fire. And when a homeowner decides to




Figure 4 – Boral pure Barcelona, kern canyon blend, high profile.



Figure 6 – Boral Pure villa, goldenrod flash, medium profile.

Figure 5 – Boral Pure country slate, Whitney grey, low profile.

replace the roof for whatever reason, concrete tile can be recycled to create new structures and roads and to reduce landfill waste. And in an added commitment to the planet, Boral produces its concrete roof solutions in eco-conscious manufacturing plants.

With installation processes in line with other tile roof solutions and the sustainability, energy-efficiency, cost-savings, life-time-solution, and air-cleaning qualities, why wouldn't builders and homeowners turn to smog-eating tile? The benefits are too great to be ignored. 

REFERENCES

1. U.S. Environmental Protection Agency Vehicle Program, Tier 2 Standard. Daylight hours based on Los Angeles, CA. Laboratory air-purification performance testing per ISO 22197-1. Results may vary, depending on geographic location, weather, and other factors, including but not limited to NO_x concentration in the air.

2. American Lung Association, 2011 "State of the Air Report." www.lungusa.org.
3. PICADA: Photocatalytic Innovative Coverings Applications for Depollution Assessment, Europe, 2004.
4. "Steep-Slope Assembly Testing of Clay and Concrete Tile," Oak Ridge

National Laboratory, 2005. Results vary based on profile of tile installed.

5. Boral Roofing concrete tiles are covered by a limited lifetime, fully transferable, nonprorated product warranty. See www.boralna.com for full coverage details.

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John Renowden is vice president of product development for Boral Roofing, with more than 25 years in technology-based manufacturing. He serves as senior product manager, responsible for Boral's product portfolio, including new product development, installation practices, and building standards throughout the U.S. Renowden has also served as principal systems engineer, analyzing and providing recommendations for the company's manufacturing and production operations. He hails from the United Kingdom, where he held management and engineering positions at Redland Technologies, an international building materials company. With degrees in mechanical and electrical engineering from Bath University of Technology in Bath, England, he also holds two professional qualifications of chartered engineer (CEng) and Fellow of the Institution of Mechanical Engineers (FIMechE). John's webinar is available on demand in the GreenExpo365.com auditorium.

