

Out, Out, Brown Spot; or, Ceiling Tile Alternatives

Brian Yeoman & Linda Paisley

Every day in our profession, we make purchasing decisions on everything from office supplies, to service contract providers, to building materials. These product selections must meet current needs, but they also help shape future product offerings. In purchasing, we know that for any product we evaluate we should consider its utility, cost, and aesthetic, but also the impact of its production and use on manufacturers and users, and the consequences of its disposal at the end of its useful life. This column has advocated for consideration of “green” materials for a number of years and has tried to keep this issue before the membership by providing information, data, and opinion. We believe that an “holistic” product analysis enables us to understand the importance of our purchasing decisions much better, and helps us in designing and making wise choices. Unfortunately, in the rush of time and a dearth of green products, information like this has been a slow-uptake issue within our profession in the academic setting.

Educational institutions make large purchases of building materials and are entrusted with creating safe and healthy learning environments. Building material selections can have serious implications on the health and productivity of building occupants, as well as on the environment and community, and should be carefully scrutinized. In the last year, Brian has made two presentations to the National Academy of Sciences, Institute of Medicine, on the issue of the Built Environment and Health. The National Academy will be creating a roundtable to inform and enrich the knowledge of this issue. There are, as you can imagine, a myriad of considerations, but some materials stick out. One such material selection with a critical impact on health and indoor air quality (IAQ) is ceiling tile.

Among the relevant issues to consider in ceiling tile selection, in addition to functionality, cost, and aesthetics, are environmental issues and health issues such as materiality off-gassing, promotion of fungal and mold growth, and release of respirable airborne fibers. These health issues gained visibility as buildings became more airtight in the '60s and '70's to improve energy efficiency, and the incidence of Sick Building Syndrome (SBS) increased. In the now-infamous Texas court case, *Ballard v. Farmers Insurance*, the judge did not allow expert testimony on the causal relationship between mold and related health effects; however, the \$32 million jury award got the attention of both the insurance and building industries.

MINERAL FIBER CEILING TILES

Synthetic mineral fibers are fibrous, inorganic, glassy (silica-based) materials spun at high temperatures from molten minerals, primarily from rock, clay, slag, or glass.

Highly compressed mineral fibers combined with fiberglass wool are bonded with thermosetting resin for durability and mechanical strength, and then molded into fire-resistant ceiling tiles. Mineral fibers are one of the lowest-cost manmade fibers available today, and there is a vast economical source of the raw materials required, typically silica calcium, aluminum, and magnesium. Some of these ceiling tiles contain recycled cellulose from newsprint. Dimensional stability, especially in humid environments, is achieved through an additive, such as Armstrong's Humigard. Armstrong offers a 10-year warranty on its ceiling tile, 15 years if Armstrong's grid is used. The useful life of mineral fiber ceiling tiles is actually shortened to 4 to 10 years, because they are usually discarded for aesthetic reasons, such as stains, chips, or dirty appearance. The cost range for mineral fiber ceiling tiles is from about \$0.50 to \$1.75 per square foot.

Mineral fiber ceiling tiles are grey and are usually painted or coated white to achieve the reflectivity and aesthetic required. The white tile coating or paint tends to yellow over time, stains when exposed to water, and is vulnerable to chipping and scratching. The durability of the ceiling tiles is also compromised when exposed to water.

Mineral fiber ceiling tiles support the growth of mold, mildew, and bacteria in moist conditions. Cellulose, where present, provides food for mold, mildew, and bacteria. Laboratory tests of untreated tiles showed heavy growth of mold and mildew on more than 60% of each specimen. Additives are painted on ceiling tiles such as Armstrong's Bio Block, to retard mold and mildew growth, and Inersept antibacterial treatment, to inhibit odor- and stain-causing bacterial growth.

Many mineral fiber ceiling tiles were initially made with phenol formaldehyde binders, and off-gassing the poison into inhabited space is an issue. Most no longer



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contain the volatile organic compounds, but the more problematic health issue related to mineral fiber ceiling tile is the release of respirable fine airborne particulates. Recently, a Cornell University research study implicated mineral fiber ceiling tile as a source of small airborne fibers related to Sick Building Syndrome (SBS). The small irritating fibers may be attracted to the electromagnetic fields surrounding computers, increasing computer user exposure. Armstrong Mineral Fiber Ceiling Tile Material Safety and Data Sheet (MSDS) lists product ingredients as mineral wool fiber and fibrous glass. The International Agency for Research on Cancer (IARC) classified both mineral wool fiber and fiberglass wool as possible cancer-causing agents to humans. According to OSHA, there is insufficient evidence that synthetic mineral fibers cause respiratory disease in humans; however, results from animal experiments have led to conservative classification of certain synthetic mineral fibers as possible human carcinogens.

Though the first cost of mineral fiber ceiling tile is low, the cost of poor IAQ, and diminished durability and aesthetics over the ceiling tile's useful life make its life-cycle cost very expensive.

EUROSTONE

There is an alternative. Eurostone ceiling tile is manufactured from expanded volcanic perlite, ceramic clay, and an inorganic binder that gives it a unique, aesthetically pleasing, sculptured-stone look that is intrinsic to the material. This volcanic stone is formed and fired in specially designed kilns at 960°F using a special inorganic binder to bond the stone particles together. The material is inert, does not burn or give off toxic smoke, and does not off-gas or release any airborne fibers. Eurostone tiles have excellent dimensional stability, no measurable sag, and are unaffected by water or high humidity. They may be installed in high-humidity areas such as showers, exterior soffits, canopies, and entranceways throughout the Hot and Humid hygrothermal zone. Eurostone's color is integral throughout the tile, so cut edges have consistent color. The tiles will not stain when they do come into contact with water, so their useful life is not shortened by an unattractive stained appearance. Eurostone tiles are recyclable,

and if not recycled, they may be ground up and used as a soil additive.

The natural alkalinity of Eurostone tiles inhibits microorganism growth. Increasing evidence indicates that fungus contributes to Sick Building Syndrome, triggering allergies, infections, and, in extreme cases, toxicosis. While mold and fungal spores are ubiquitous, they must have moisture and a food source that promotes growth in the form of organic matter, such as cellulose. Because Eurostone tiles contain no organic matter, they do not support bacterial, mold, or fungal growth, even under high-humidity conditions. In fact, research at Texas Tech University Health Science Center Department of Microbiology and Immunology shows that these tiles actually inhibit the growth of fungi *Stachybotrys chartarum*, *Penicillium chrysogenum*, *Cladosporium cladosporioides*, and *Conidia*, all related to Sick Building Syndrome. Even when the tiles were contaminated with an external food source and high humidity levels were maintained, Eurostone tiles inhibited the growth of fungi. Eurostone tiles have multiple one-hour fire-resistance assembly ratings. They will not burn, emit toxic smoke, or contribute fuel in a fire, and help maintain indoor air quality in any acoustical ceiling application.

This alternative to the conventional ap-

proach can be purchased in the U.S. through The Chicago Metallic Company under the terms of a limited lifetime warranty and a recycling program at the end of the product's useful life. There may be other sources. At \$.98 – \$1.20 per square foot, Eurostone's first costs are comparable to high-end mineral fiber ceiling tiles. The tiles are a little more brittle than traditional ceiling tiles, may require more care during installation, and this possibly results in slightly higher installation costs. Life-cycle cost analysis (LCA), which takes into account the health benefits, improved IAQ, improved appearance, and longer product life, makes it an economical alternative to mineral fiber-based products as well as a more healthful choice.

A favorable reaction to this product evaluation will not cause you to turn into a "rock-sucking tree hugger," but it might be a good first step in greening the purchasing practices at your institution. We hope that you have enjoyed this baby step in gaining information on green products. Lest there be any questions, Paisley, Yeoman, and NAEB have no financial interest in any product described in this article. Remember that you, too, can do great things! To do those great things, all you have to do is to take the first step and become accountable to the great expectations you set for yourself.



Brian K. Yeoman, Director of Education and Development at NAEB, is the retired Associate Vice President for Facilities Planning and Campus Development at the University Texas Health Science Center at Houston. He received his B.A. and M.A. degrees from the University of South Dakota. He has been a public servant dedicated to "doing the right thing." He is author of numerous articles and lectures on a broad range of topics. As a futurist, Brian has a keen interest in the environment and sustainable development. He has written extensively on incorporating sustainability principles into business operations, the need for individual initiative as opposed to governmental programs, and as a proposed course of action. Brian has an interest in Change Management, Continuous Quality Improvement, and Principle-Centered Leadership. He has served as a consultant on the automation of purchasing, facilities management, sustainable development, and other business functions for public-sector institutions, private-sector firms, and not-for-profit organizations in the United States and Canada. e-Mail: byeoman@naeb.org.