

# sustain

Health issue 2015 - Spring



FLOORING SYSTEMS

creating better environments

The Health of our Educational Facilities...

## pass or fail?

The grades don't lie.

The truth may surprise you.

*Halls of Academia –  
a Hotbed of Hazards?*

*Toxic Chemicals in Buildings*

*Our Children are at Risk*

*The Facts on Flooring:  
What You Can Do*

### TOXICITY HEALTH LEVEL FACTS

	Baseline	Change	Grade
Ecotoxicity			
Human toxicity, Cancer			
Human toxicity, non-C			
Pesticides/Biocides			
Indoor air Quality			
Phthalates			
Formaldehyde			
Phenol			
Polyvinyl chloride			

### GROTH AND PR

Hazardous
Antimicrobia
Biocide free
Glycol Ethe
Triclosan

## Educational Facilities Report Card

*Jack Ryan*  
Facility Manager

*Dr. Susan Foster*  
Superintendent

*Alan Brown*  
School Board President

S-Satisfac

Americans take for granted that our schools are safe, healthy, and productive environments in which children can learn, grow, and develop into the next-generation of leaders who will proudly carry our nation forward.

As the foundation of American society, our nation's 100,000+ public and private K-12 schools and 5,000 colleges and universities are central forces in the lives of some 60 million pre-K, elementary, middle, and high school-age kids, 20 million college students, and 13-15 million



faculty members and support staff -- more than one-third of the U.S. population at any given time.

But within this institution central to our nation's very ideals and cultural fabric, however, solid scientific evidence is increasingly linking the epidemic rise in serious health issues among our nation's youth to exposure to toxins emitted by what have been considered "standard" school building construction materials, cleaning products, and maintenance practices.

The alarming reality is that our hallowed halls of education may in fact be a hotbed of hazards that are compromising the health of their occupants and our children's ability to learn.

**Are our halls of academia**

**a hotbed of** **tox**

LONG



# ic hazards?

## A Flawed Foundation

The dramatic rise in the incidence of chronic illnesses such as asthma, autism and other developmental disabilities, ADHD, and a variety of endocrine-related disorders among our nation's children has been linked to exposure to toxic chemicals emitted by certain noxious building materials, as well as to the presence of allergens such as mold and mildew. School settings are among the key culprits behind this disturbing trend, based on the use of certain hazardous building and cleaning products, less-than-optimal maintenance procedures, a historic

The unwitting employment of toxic hazards in schools is often based on misinformation and lowest-first-cost decisions, but at what price to the health and welfare of America's school children? For the sake of our students and teachers, the use of safer and more sustainable products and maintenance procedures in schools is a valuable lesson to learn.

## sus·tain·a·bil·i·ty

the ability to meet the needs of the present generation without compromising the ability of future generations to do the same

disconnect between school capital and operating budgets, and school building construction practices that promote moisture and/or the retention of heat.

The troubling truth is that the nation's educational environment may be threatening the health and welfare of the very consumers our schools are designed to embrace, support, and nurture.

## The Cost to our Children

According to a recent study by the Mount Sinai School of Medicine and the National Children's Study New York-Northern New Jersey Center, childhood health issues caused by environmental hazards such as air pollution and exposure to toxic chemicals cost the U.S. \$76.6 billion in 2008 and are on the rise, up 40% from \$54.9 billion nearly a decade earlier.<sup>1</sup>

*Touching the lives of 100 million students, faculty, and staff – over one-third of the U.S. population – at any given time, schools may be unknowingly exposing these individuals to toxic building materials and mold on a regular basis*



FLOORING SYSTEMS



## Consider the Following Facts about our Nation's Schools:

- According to the National Center for Education Statistics, the typical American school was built in the 1950s-1960s, is an average of 50-60 years old, and is often a rundown facility hosting outdated building products and maintenance procedures that could increase the risk of toxic exposure for students.
- A 2008 21st Century School Fund study conducted in conjunction with *American School & University's 36th Annual Maintenance & Operations Cost Study for Schools* revealed that U.S. public schools spent only about \$5 per square foot per year to maintain and operate the school.
  - Furthermore, the average school reportedly spent less than half of the money on maintenance, repair, and capital renewals than would be necessary to bring it into a state of good repair and optimal environmental conditions for students.
  - With only this amount to spend on building maintenance, schools would be wise to invest in products that require minimal maintenance and post-installation outlay. However, growing financial pressures and a historic disconnect between capital and operating budgets, especially in the K-12 arena, have often driven less-than-optimal investment decisions involving building materials and cleaning and maintenance practices and supplies.
- According to the EPA study *Indoor Air Quality Tools for Schools: Actions to Improve Indoor Air Quality*, up to half of our nation's schools have problems associated with indoor air quality, most notably from the growth of mold and mildew created by damp indoor environments. The presence of these hazards is further exacerbated by school buildings that are tightly sealed and/or poorly ventilated (a condition prevalent in both old as well as newly-constructed facilities).



## The State of our Nation's schools...



*With more children  
(23.5 million) eligible for free or  
reduced meals, kids are  
spending more time in school  
buildings than ever before*

**Children spend:**

**35-40 hours per week,**

**9-10 months per year,**

**Up to 3 years of their formative lives  
in school buildings with potential  
toxic exposure**

*Children are at greater risk  
of breathing in or ingesting  
toxic chemicals from  
suspect building and  
maintenance products*

# and School Kids

## Children at Greater Risk for Toxicity

A number of factors render children especially vulnerable to chemical toxins emitted from building construction materials, cleaning and maintenance products, and school/office supplies:

- Studies confirm that children consume more food, liquid, and air for their size and body weight than adults, making them more susceptible to the absorption of chemicals – and potential harm to their still-developing immune systems, brain functions, metabolisms, endocrine systems, etc. – than their older counterparts.
- Based on their highly tactile and oral nature – e.g., sitting on, playing with, touching, or even tasting objects or surfaces containing toxic substances – children are at greater risk of breathing in or ingesting toxic chemicals emitted by suspect building materials, maintenance products, and school supplies.<sup>2</sup>
- Compounding this vulnerability is the fact that children are spending more time in school buildings than ever before. At 35-40 hours per week for 9-10 months per year, along with an increasing amount of time spent in school settings for after-school activities, day care, meals, and community events, children are

spending the equivalent of 2-3 years of their formative lives in school buildings with potential toxic exposure.

Overall, said author Aviva Glaser in her 2005 report for the National Coalition Against the Misuse of Pesticides, “Children’s developing organs create early windows of great vulnerability during which exposure to toxins can cause great damage.”<sup>3</sup>



FLOORING SYSTEMS

**The Fallout:  
School Kids Experiencing  
an Epidemic Rise  
in Health Problems**

Since (and despite) the enactment of the Toxic Substance Control Act of 1976, over 80,000 potentially harmful chemicals are currently allowed for use in the U.S., the overwhelming majority of which don't require testing and less than five of which have been regulated or banned under this law.<sup>4</sup>

# Chemicals

in buildings

**directly link to:**



*A dozen chemicals  
commonly used in  
building products can  
impair the development  
of the lungs and  
immune system.*

*Bill Walsh,  
Executive Director,  
Healthy Building Network*

Highly-respected medical and scientific organizations worldwide – including the U.S. National Institutes of Health, the Harvard School for Public Health/Harvard Medical School, the Healthy Building Network, the U.S. Green Buildings Council (USGBC), the Center for Health, Environment & Justice (CHEJ), the Asthma Regional Council of New England (ARC), and the state legislatures of California, New York, and others -- have begun tracking the impact of exposure to toxic chemicals such as those found in certain school

building materials, cleaning and maintenance products, and school supplies on adults and children. They have revealed the following findings concerning the rising incidence of health concerns among children:

**Cases of autism spectrum disorders** increased by 78% since 2002 and currently affect 1 in 88 children, a number still on the rise. A 2009 study found a statistically significant link between polyvinyl chloride (PVC) and



phthalates in building materials and school/office supplies and the incidence of autism spectrum disorders, concluding that children continuously exposed to these toxins may be twice as likely to have autism.<sup>5</sup>

**The prevalence of asthma among children nearly doubled** between 1980 and 1995 and currently affects

**The number of children classified with learning disabilities increased** by 191% between 1977 and 1994; today, as many as 1 in every 6 children is believed to have a learning or developmental disability of some kind.

**Exposure to phthalates** has been linked to the rise in attention deficit hyperactivity disorder (ADHD), which

**Leukemia, brain cancer, and other childhood cancers** have increased by more than 20% since 1975 and early puberty and other signs of endocrine-related disruption is now experienced by 1 in 10 girls, a condition which poses a risk factor for breast cancer later in life.

**Asthma** among children nearly doubled between 1980 and 1995

**Autism** increased by 78% since 2002

Exposure to phthalates has also been linked to **Obesity**

1 out of 6 Children have **Learning Disabilities**

**Childhood Cancers** increased by more than 20% since 1975

Phthalate exposure linked to **Drop in IQ scores**

**ADHD** increased six-fold between 1985 and 2000

7 million children, or 1 in every 13. Considered the #1 chronic childhood illness, asthma is a leading cause of school absenteeism, with some 14.7 million school days missed each year due to this condition.

**A Healthy Building Network study identified** a dozen chemicals commonly used in building products, foam insulation, paints, adhesives, floors, and carpets that can lead to the development of asthma in children, especially the presence of phthalates, which can impair the development of the lungs and immune system.<sup>6</sup>

has increased six-fold between 1985 and 2000 and may affect as many as 1 in 6 children today.<sup>7</sup>

**Exposure to phthalates** has also been linked to obesity, which currently affects 16-33% of U.S. children and teenagers.<sup>8</sup>

**A recent South Korean study** found that children with higher concentrations of two common phthalates in their urine had lower IQ scores than their peers.<sup>9</sup>

Along with exposure to dangerous mold and mildew, says Frances Gilmore of the Asthma Regional Council of New England, "VOCs may contribute to any of a full range of health effects, including triggering an asthma attack in someone who already has asthma, gradually leading to the development of asthma in someone who doesn't have it, or contributing to health effects ranging from minor irritation to cancer."<sup>10</sup>



FLOORING SYSTEMS

## The Chemicals and Hazards of Concern

Experts worldwide confirm that a variety of toxins known as volatile organic compounds, or VOCs – which include substances such as formaldehyde and glycol ethers as well as plasticizers known as polyvinyl chloride (PVC) or phthalates, which are often used in everything from vinyl flooring, carpets, building materials, floor strippers/finishes, and school

## Exposing our

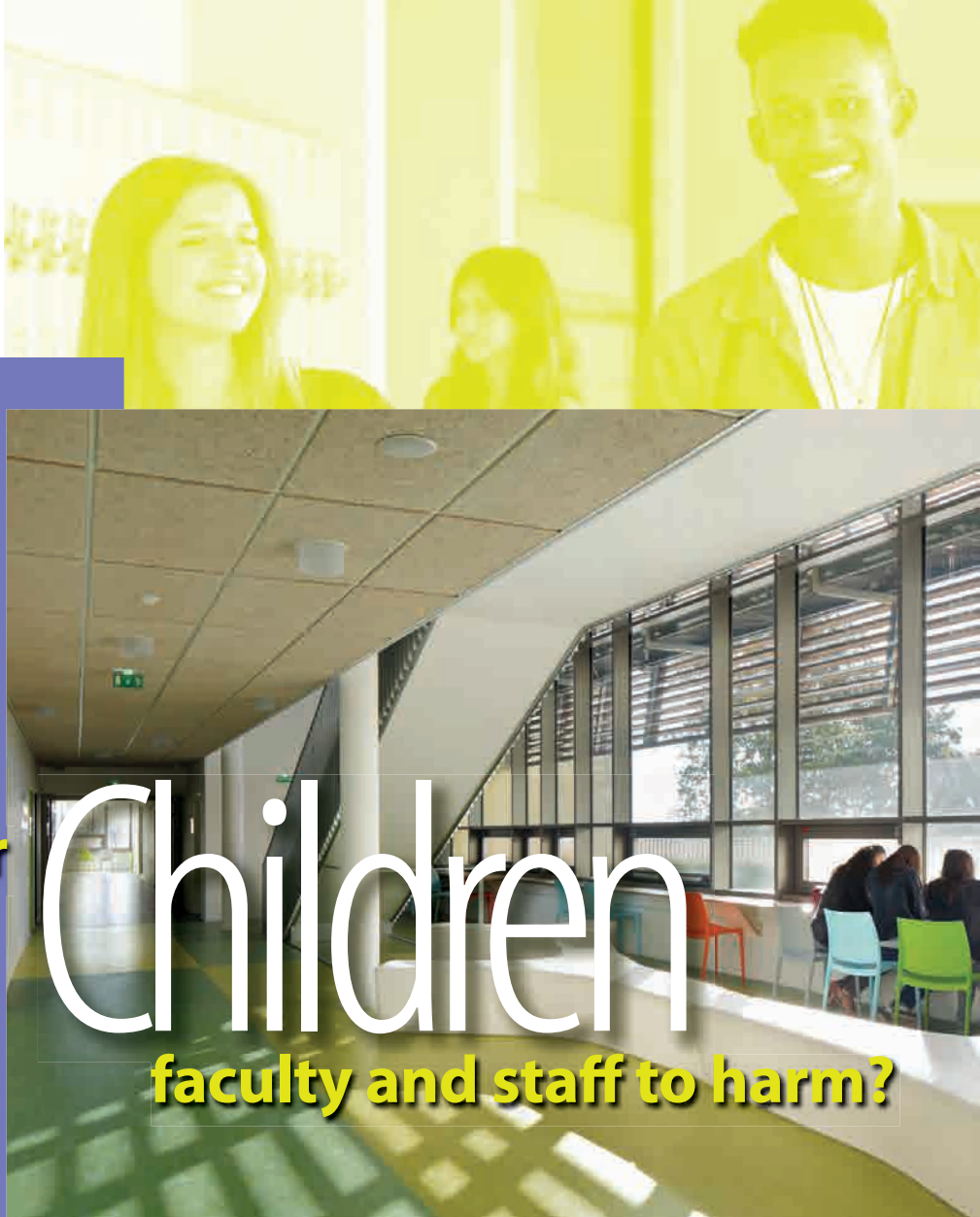
supplies such as binders, backpacks, lunchboxes, and laptops -- can be emitted from certain building construction materials, cleaning and maintenance products, or school supplies and absorbed through the respiratory system or through skin contact, leading to potential health hazards for those exposed.

The Healthy Building Network, an organization dedicated to transforming the market for building materials to advance the best environmental, health and social outcomes, confirms that the presence of mold and mildew caused by standing water or damp conditions in school environments increases the risk of chronic allergies and asthma among children. This moisture can further accelerate the emission of hazardous chemicals into the air from building materials -- all increasing the risk of serious health consequences for the children,

teachers, staff, and community members who use these facilities. Through their analyses of human exposure to air pollutants, EPA studies have officially confirmed that indoor levels of pollutants may be two to five times — and in some cases more than 100 times — higher than outdoor levels, resulting in indoor air quality that's more 'polluted' and concentrated with toxins than the air outside.

## Enhance School Environments for our Nation's Youth

The reality is that, because building materials are processed products, few are completely VOC-free and most contain ingredients possessing some degree of toxicity to those who are sensitive. For this reason, the real issue surrounding toxins in school buildings involves quantifying the toxic substances within building products and cleaning/maintenance supplies and determining an acceptable level of exposure for students and other building occupants.





*EPA studies confirm that indoor levels of pollutants may be over 100 times higher than outdoor levels*

## Toxicity Label Facts

How the product impacts your health

### USEtox as found in Forbo's EPD

Impact Category: USEtox	Units	Production	Transport	Installation	Use (1yr)	End of Life
Ecotoxicity	PAF m3.day	1.33E-03	8.40E-04	4.78E-04	8.69E-05	-2.59E-04
Human toxicity, Cancer	cases	2.02E-10	6.75E-13	1.47E-11	1.36E-11	-1.14E-10
Human toxicity, non-Cancer	cases	2.52E-11	2.90E-13	1.18E-10	7.45E-13	-2.15E-12

## Ingredient List

Complete list of what is in the product

### Ingredients of Marmoleum: (HPD)

Linseed oil, Gum resin, Tall oil, Wood flour, Calcium caronate, Reused Marmoleum, Titanium dioxide, Jute, Lacquer

The Collaborative for High Performance School's (CHPS) Operations Report Card™, which utilizes the California Standard Section 01350 Specification, was among the first science-based standards designed to measure the health of schools' indoor air quality. But, even this progressive initiative reflected a flaw in testing. It measured phthalate emissions in a dark chamber under 'controlled' conditions of 23°C (75°F) room temperatures. In reality, during warm weather months and especially in the summer, when schools tend to be closed up, temperatures can soar well into the 90-100°F range and this hot air can stagnate within tightly

sealed and/or poorly ventilated buildings. This is a significant concern in light of the fact that studies<sup>11</sup> have further shown that the emission of PVCs is accelerated in the presence of heat, with every 10°C rise in temperature driving a 10-fold increase in phthalate emissions. Products that may have once passed the well-meaning CHPS toxicity standard may in fact fail under real-life building conditions, exposing students to untold toxic hazards in the normal operating cycle of the average school.

As a result, the building industry is moving towards the use of Health Product Declarations (HPDs) and

Environmental Product Declarations (EPDs), open standards by which manufacturers or third party testers can report on the health or environmental impact of products to help quantify and communicate their degree of toxicity or safety. The increasingly popular USEtox® standard represents yet another science-based tool used to characterize the impact of chemicals on humans and the environment. It is similar to a nutritional label for food.



FLOORING SYSTEMS

***The Facts  
on School Flooring***

*Considered among the most toxic chemicals in the school setting, polyvinyl chloride (PVC) is largely found in vinyl flooring, the adhesives used in its installation, the supplies used to clean, and by the processes employed to maintain vinyl floors.*

**Are  
the  
sources  
of the  
problems**

**Out of**

*A recent study of over 10,000 children confirmed that the presence of floor moisture and PVC significantly increased the risk of asthma.*



# Sight ... and out of mind?



## Seething Below the Surface

While it's believed that the 'normal' emission of VOCs from vinyl flooring products under standard use and maintenance can pose significant health risks to occupants, recent studies show that the presence of excessive water or heat can further accelerate those emissions and expose occupants to even greater levels of toxicity. For example, the use of lower-quality adhesives and/or outdated application practices can create airspaces and ridges that promote the collection of dirt and water and subsequently foster the growth of dangerous mold and mildew under the surface. In addition, water pooling under impermeable surfaces such as vinyl flooring can potentially pop the flooring, leading to emission of PVC from sub-floor adhesives.

Further highlighting the hazards created by these conditions, a recent study of 10,851 children confirmed that the presence of floor moisture and PVC significantly increased the risk of asthma.<sup>12</sup>

## PVCs – Too Hot to Handle

Heat has also been found to accelerate the emission of VOCs from vinyl flooring and its related products. According to a 2013 study,<sup>11</sup> the emission of phthalate plasticizers from vinyl flooring increased 200-fold as ambient temperatures in the

test setting rose from 20°C to 60°C (68°F to 140°F), confirming that temperature has a strong influence on phthalate emissions. This reality poses an increased risk to students and other occupants during warm-weather months as well as in areas of buildings that rely on daylighting for illumination or during the winter, when the school operates its heating system.

Further compounding the already-hazardous presence of damp and hot conditions in schools is the fact that, in an effort to drive enhanced energy efficiency, modern construction practices incorporate the use of greater levels of insulation than in the past, creating facilities that are more tightly-sealed and less well-ventilated than ever before. Ironically, based on this trend, the much-publicized 'back to school' time at the end of each summer – after the nation's schools have been closed up for the hottest months of the year – may in fact be the most toxic environments we could be exposing our students and faculty to all year.



FLOORING SYSTEMS



**Grounded in Fact:**

# the Truth on Flooring

## Flooring Economics: Revealing the Great Misconception

Although vinyl flooring appears to deliver a lower first-cost than other flooring options, the occupancy-ready and total life cycle cost of this product is, in fact, much higher than Marmoleum sheet or tile (MCT). This is due to the expense of the products prescribed to clean, seal, and maintain vinyl flooring from initial installation through its life, which ironically, is significantly shorter than other options.

The following economic analysis, based on a landmark study by the University of Florida<sup>13</sup> as well as current cost information, confirms that vinyl flooring carries a higher lifetime cost compared to linoleum.

### VCT

**vs**

### MCT

All cost based on (\$/SF)

Material Cost	\$.85
Adhesive Cost	\$.07
Installation Cost (National Average)	\$.63

#### Occupancy Ready Costs

Initial Clean	\$.15
2 coats after installation	\$.50
Scrub for next coating	\$.25

3-7 coats for Commercial Use  
@ 25¢ per coat = \$.75 — \$1.75

**Occupancy Ready = \$3.20 – \$4.20**

Material Cost	\$2.25*
Adhesive Cost	\$.25
Installation Cost (National Average)	\$.75

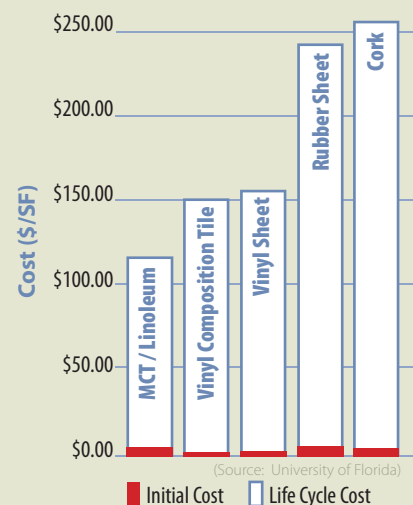
#### Occupancy Ready Costs

Initial Clean	\$.15
---------------	-------

\* Call for current prices

**Occupancy Ready = \$3.40**

Initial Cost Versus - 50 Year Life Cycle Cost



### Total First Cost

In many instances Marmoleum/linoleum carries a lower Total First Cost and has been proven to carry a lower lifetime cost than vinyl and other flooring materials. In addition to being free from toxins, Marmoleum represents a smarter, healthier investment for schools in terms of the comprehensive benefits it delivers to students, faculty, staff, and the environment. Savings achieved from the use of lower maintenance and more environmentally-friendly flooring options can then be redirected to support other critical needs facing our schools.

## Best in Class – a Real-World Lesson

*“When I started at Kenton County, our staff was stripping and reapplying seven coats of wax, year in and year out.*

*We were slaves to the floor.”*

*Rob Haney  
Executive Director of  
Support Operations*

Rob Haney, Executive Director of Support Operations for a Kentucky-based school district and a key decision maker in the Kenton County building programs, revealed that “our staff was stripping and reapplying seven coats of wax, year in and year out.” The additional cost of strippers and floor finishing products necessary to clean and maintain the vinyl floors were also taxing the school system’s constantly challenged operating budgets. “We were bringing in stripping agents and floor finish by

Thanks to the school’s use of Marmoleum Composition Tile (MCT) by Forbo, made of durable, 100% BioBased and natural antimicrobial ingredients in classrooms and hallways, the school enjoyed significant costs savings, reduced maintenance requirements, freedom from the environmental toxins associated with vinyl flooring, and received nationwide recognition for its commitment to environmental sustainability and the health and welfare of its occupants.



## An Ounce of Prevention

Research has proven that indoor air quality issues resulting from the use of hazardous products and poor maintenance practices can not only threaten the health of its occupants, but can lead to excessive facility costs. According to a 1999 EPA report entitled Indoor Air Quality Tools for Schools: Actions to Improve Indoor Air Quality, one study of an elementary school showed that if \$8,140 had been spent over 22 years on preventive maintenance, \$1.5 million in repairs could have been avoided.

the semi-truck load, which was a tremendous cost in material as well as labor,” Haney said, adding that the burden was multiplied by difficulties connected with safe disposal of spent floor care chemicals. Concerns over health hazards to students and faculty as well as to the environment from the use of vinyl flooring created even more compelling reasons for the proactive school system to investigate their alternatives. “In education, striving for the healthiest possible environment is a given,” noted Andrew Piaskowy, AIA, of PCA, the architecture firm that designed the county’s high performance schools, Caywood Elementary and Turkey Foot Middle School.

“I’m excited about all the ways this process has paid off for our district, for the parents and kids, as well as for the staff and community,” concluded Haney of their new environmentally-friendly Forbo flooring, the installation of which helped contribute to such savings that the district was able to present its teachers with a pay raise.



FLOORING SYSTEMS



## Tips for Creating Healthier School Environments

**Tools for Schools** – When it comes to improving the health and safety of educational settings, a great first step is to analyze the health of a school environment using resources such as the HPD, EPD, and USEtox tools.

**Choose the Right Flooring and Adhesives** – Among the most critical decisions for schools is the choice of flooring materials that utilize “low-VOC products and flooring surfaces less likely to exacerbate moisture/mold and allergen issues,” according to the Asthma Regional Council of New England. Based on an assumed lower cost, for example, vinyl composition tiles (VCT) are frequently chosen for school flooring. However, phthalates and other chemicals contained within these flooring materials, along with the commonly-prescribed adhesives and cleaning products used in their installation and maintenance, have been proven to significantly contaminate indoor air quality, particularly under conditions of moisture and heat.



**Now that you know...**

Schools are encouraged to replace products that add to the problem with ones that reduce the risk naturally, without the need for toxic chemical additives, expensive installation, or costly and time-consuming upkeep.

Support and use of HPD and USEtox toxicity disclosure tools by school administrators and procurement personnel not only enables schools to make the best and safest building product decisions for their students, but will also hold building product manufacturers increasingly accountable for the toxicity of their products and help drive industry improvement.

By choosing the right flooring product, a quality adhesive that doesn't allow moisture to accumulate under the flooring, and a proper maintenance regime, schools can enjoy safer, healthier, and longer-lasting flooring that further avoids the need for toxic finishes and harsh chemical cleaners.

**Understand the True Economics** – Today, many safer and more environmentally-friendly flooring alternatives can be highly cost-effective to install and maintain while making your facility safer and healthier. In addition, stronger connections between capital and operating budgets will help schools make more well-informed investment decisions up-front that take into account not only the quality and cost of initial building products themselves, but all financial and environmental considerations associated with their life cycle and maintenance. Given the budgetary challenges faced by the average K-12 school today, schools are wise to invest in quality, environmentally-friendly flooring that requires minimal maintenance and post-installation outlay.



## Proper Flooring and Adhesive Products

In a recent independent test of Forbo's Marmoleum Composition Tile (MCT) and Sustain 885M wet-set adhesive versus another resilient flooring product used with a traditional dry-set adhesive, the Forbo system achieved 100% contact between the back of the tile and substrate, creating a water-resistant layer that fully sealed all areas of the backing and filled all cracks and joints. When both tiles were exposed to water, the dry-set adhesive used with vinyl tile achieved only 50% adhesive contact, producing channels and tunnels that allowed water to travel and pool under the flooring, creating opportunities for the growth of mold and mildew.



**Marmoleum** – Forbo's Marmoleum sheet and tile floor coverings and 100% solvent free adhesive products are the ideal products for school applications and allow building occupants to enjoy healthier, safer, and longer-lasting flooring solutions with the following benefits:

- The lowest-toxicity flooring products in the marketplace thanks to Forbo's use of naturally antimicrobial, mold and mildew-resistant, toxin and biocide-free, and 100% BioBased and biodegradable ingredients
- Tighter, safer, and easier-to-install seams that require no welding
- No toxic, time-consuming, costly finish or maintenance required
- Fully guaranteed and occupancy-ready product and installation price of \$3.55 per square foot\* is more cost-effective to install and maintain over entire life cycle than other solutions
- Ideal for other school applications including furniture surfaces, walls, and bulletin boards

For more information on Forbo Marmoleum, visit [www.forboflooringna.com](http://www.forboflooringna.com).

\*visit website to download the full guarantee

## Sustaining the Health of Future Generations

As a company which has served the educational sector for over a century, Forbo understands and sympathizes with the challenges that schools face and the difficulties of managing rising costs in an era of increasingly tightening budgets and limited resources. For that reason, it's become even more imperative for schools to make the smartest choices possible on behalf of their students, faculty members, community, and environment.

*Stronger connections between capital and operating budgets are helping schools create healthier environments*

Through our dedication to creating better environments, the Forbo team is fully committed to creating innovative new products that help ensure the well-being of our children and grandchildren for generations to come. We invite you to join us in awareness, advocacy, and action as it relates to the investments we make in our children's future. The small changes we make today can create a world of difference tomorrow.



FLOORING SYSTEMS

Forbo Flooring Systems is the global market leader in commercial floor covering solutions. Marmoleum, our flagship brand is the global leader in the linoleum market, while Flotex is the industry leader in the rapidly growing flocked textile market. In addition to linoleum-based products, Forbo develops, manufactures and markets a diversity of high quality vinyl and textile floor coverings, as well as Coral & Nuway entrance system solutions.



# marmoleum®



FLOORING SYSTEMS

1. Leonardo Trasade and Yinghua Liu, "The Staggering Cost of Environmental Disease in Children, Estimated at \$76.6 Billion in 2008", Health Affairs, no. 2011/ doi: 10.1377/hlthaff.1239
2. "PVC Flooring & Toxic Cleaning Products in Schools" PVC Factsheet published by Center for Health, Environment & Justice (CHEJ)
3. Aviva Glaser, "Asthma, Children and Pesticides: What You Need to Know," published by the National Coalition Against the Misuse of Pesticides, Vol. 25, No. 2, 2005
4. "The Health Case for Reforming the Toxic Substances Control Act: Executive Summary," published by Women's Voices for the Earth
5. Marla Cone, "Scientists Find 'Baffling' Link Between Autism and Vinyl Flooring," Scientific American, March 31, 2009
6. Sarah Lott and Jim Vallette, "Full Disclosure Required: A Strategy to Prevent Asthma Through Building Product Selection," published by the Healthy Building Network, December, 2013
7. "PVC-Free Schools," published by the Center for Health, Environment & Justice (CHEJ)
8. "Childhood Obesity Is Linked to Chemicals in Plastics" Jennifer Lee, New York Times April 17, 2009 article citing research by the Mount Sinai Medical Center
9. "Phthalates Linked to Lower IQ Scores in Children," published by Building Green and in the "Relationship between Environmental Phthalate Exposure and the Intelligence of School-Age Children" reported in Environmental Health Perspectives July, 2012
10. Frances Gilmore, "Health Considerations When Choosing School Flooring," published by the Asthma Regional Council of New England
11. "Emissions of Phthalate Plasticizers from Vinyl Flooring: The Impact of Temperature, Ventilation and Surface Sorption," published by Environmental Health Perspectives in conjunction with the National Institutes of Health, August 2013
12. "Our Health and PVC: What's the Connection?" PVC Factsheet, published by the Center for Health, Environment & Justice (CHEJ)
13. Helena Moussatche and Jennifer Languell, "Flooring Materials – Life-cycle Costing for Education Facilities" Facilities, Volume 19 – Number 1, 2001 (www.emerald-library.com/ft)

Additional resources and references include the following:

- "Creating Healthier Furniture and Building Materials by Minimizing Chemical Emissions," published by Underwriters Laboratories, 2013
- "Towards Healthy Schools 2015," published by the Coalition for Healthier Schools
- "Why Green Schools are so Important," published by the U.S. Green Buildings Council
- "Shaping Chemical Policy Reform: Public Health Advocates vs. the Chemical Industry," published by Safer Chemicals, Healthy Families
- Healthy Building Network, a 501(c)(3) founded in 2000. HBN can be found at <http://www.healthybuilding.net>

North American Headquarters  
Forbo Flooring Systems  
8 Maplewood Drive  
Humboldt Industrial Park  
Hazleton, PA 18202  
T: 1-800-842-7839  
570-459-0771  
F: 570-450-0258  
email: [info.na@forbo.com](mailto:info.na@forbo.com)  
[www.forboflooringna.com](http://www.forboflooringna.com)  
[www.floorcostcomparison.com](http://www.floorcostcomparison.com)

Canada  
Forbo Flooring Systems  
111 Westmore Drive  
Toronto, ON M9V 3Y6  
phone: 1-800-268-8108 (English)  
1-800-567-9268 (Francais)  
fax: 1-877-893-4680  
email: [info.na@forbo.com](mailto:info.na@forbo.com)  
[www.forboflooringna.com](http://www.forboflooringna.com)  
[www.floorcostcomparison.com](http://www.floorcostcomparison.com)

## More Information on this subject?

If you would like to quickly access the sources cited in this issue of SUSTAIN as well as nearly 50 other closely related resources, please go to [www.forboflooringna.com](http://www.forboflooringna.com). You will find a complete library of studies and papers on the subject.