

The Health of our Educational Facilities...

# pass or fail?

The grades don't lie.  
The truth may surprise you.

- AIA/CES COURSE
- GBCI COURSE
- IDCEC CEU



creating better environments



A red apple is positioned on the left side of the image, resting on a stack of several books. The background is a dark, textured surface, possibly a chalkboard. The text 'student learning objectives' is written in a white, stylized, hand-drawn font on the right side of the image.

# student learning objectives

- [ **Objective 1:** Identify and recognize the current state of educational facilities.
- [ **Objective 2:** Investigate the human impacts of toxins found in common building products used in school and educational buildings.
- [ **Objective 3:** Assess the current tools available to help design professionals and others gain transparency into the make-up and toxicity of building products.
- [ **Objective 4:** Specify products for educational facilities that are healthier, more sustainable, and cost effective over the life cycle of the building.



Almost one-third of the U.S. population spend a significant portion of their waking hours in an educational setting.





**U.S. expended nearly \$550 billion for public school construction during “Bond Era.”**

# Current State of Schools



Without adequate funds, school buildings are maintained as part of a "run to fail" system.

**Deferred maintenance is the practice of postponing maintenance activities.**



# The Potential Impacts of Deferred Maintenance



**Detroitteach**  
@teachDetroit

Follow

In case the legislature has forgotten. This is the current situation. Time to try democracy.  
[#supportDPSteachers](#)



**Jelmer Evers** @jelmerevers · Jan 17

Appalling conditions. Support [@teachdetroit](#) in their fight for good education for all [#supportDPSteachers](#)



23



7



# THE STATE OF OUR SCHOOLS

## THE SCOPE

	6.6B GROSS SQ FT of public PK-12 school / building space <sup>1</sup>
	Nearly 100,000 public schools <sup>2</sup>
	50M public school students <sup>1</sup>

15,000 SCHOOLS have air that's unfit to breathe <sup>4</sup>

### ALL SCHOOLS SHOULD:<sup>4</sup>

- Comply with laws
- Be accessible to all students
- Be safe and healthy
- Improve learning, teaching and morale

That's enough to hire 35,845 new teachers.<sup>11</sup>

Energy improvements could save 25%, or \$2B NATIONALLY <sup>8</sup>

Energy costs in K-12 schools total approximately \$8 billion annually nationwide <sup>10</sup>.

PERSONNEL COSTS

ENERGY COSTS

the second highest expenditure after personnel costs. <sup>11</sup>

### TO COMPLY WITH LAWS <sup>3</sup>

\$271B

Public schools in the U.S. need an estimated \$271 billion to be brought to working order. <sup>3</sup>

an average of \$5,450 PER STUDENT<sup>12</sup>



### TO COMPLY WITH LAWS AND MODERNIZE <sup>13</sup>

\$542B

Double that amount is likely needed to modernize all schools, for a total of \$542 billion over the next 10 years. <sup>13</sup>



The last time the U.S. government did a study on the condition of school facilities was in 1995. Given that the information contained in the report is now 18 years old, we lack a comprehensive understanding of the state of our school buildings today. What we do know is that school buildings have continued to deteriorate and that many impair the health, safety and education of our students and staff, and waste precious public tax dollars. The Center for Green Schools at the U.S. Green Building Council and its partners are calling for an updated survey on the condition of America's schools, because all students deserve to learn in a healthy, safe and efficient school that enhances their ability to learn and thrive.

1 2 3 4

Teachers in Washington, D.C. and Chicago reported missing an average of four days annually because of health problems caused by adverse building conditions.<sup>6</sup> The true costs of teacher absenteeism to school districts include healthcare, lost hours of instruction and expenses related to substitute teachers, staff retention and recruitment.

More than 40% of surveyed school nurses report that children and staff are adversely impacted by avoidable indoor pollutants. <sup>7</sup>

40%

7.1 million children under age 18 suffer from asthma, the leading cause of school absenteeism due to chronic disease.<sup>7</sup> Approximately 14 million school days are missed each year due to asthma. <sup>8</sup>

## THE HEALTH IMPACT

## THE MONEY IMPACT

The total direct and indirect annual cost of asthma for children is \$2.8 billion nationally. <sup>9</sup>

\$2.8B

90%



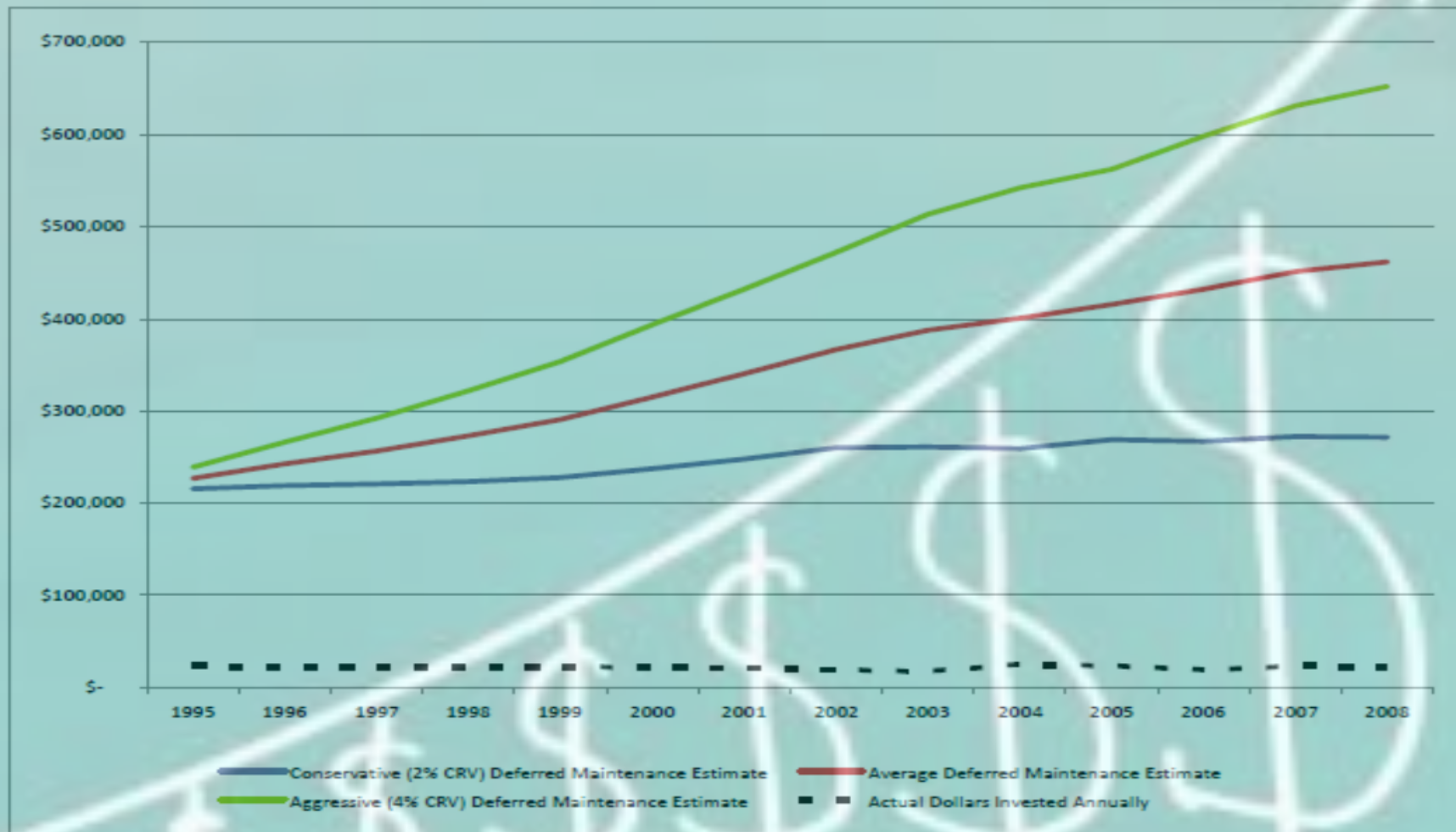
9 out of 10 surveyed school administrators believe their investments to make schools environmentally responsible, profitable and healthy improve the well-being of students. <sup>14</sup>

For more information on the State of our Schools report, please visit [centerforgreenschools.org/stateofschools](http://centerforgreenschools.org/stateofschools)



# US Public School Building Maintenance, Repair & Renewal Expenditures and Deferrals, 1995-2008

(All values adjusted to 2008 dollars and show in hundreds of thousands)



# Are our Schools making us sick?



"It's your school."



# Model School Environmental Health Program

## COMPONENT 1:

Practice Effective  
Cleaning  
& Maintenance

## COMPONENT 2:

Prevent mold  
& Moisture

## COMPONENT 3:

Reduce Chemical &  
Environmental  
Contaminant Hazards

## COMPONENT 4:

Ensure Good  
Ventilation

## COMPONENT 5:

Prevent Pests &  
Reduce Pesticide  
Exposure

Schools can also take actions to improve the health of the school environment by conducting construction & renovation projects; improving classroom comfort (e.g., lighting, acoustics, ventilation, & temperature control); & becoming more energy & water efficient.




**According to the US Environmental Protection Agency (EPA), at least half of the approximately 53 million students and five million staff “may be exposed to polluted indoor air, lead, asbestos, chemical fumes, pesticides, molds and other toxins.”**

Getting to the Root Cause of

# Mold in Schools

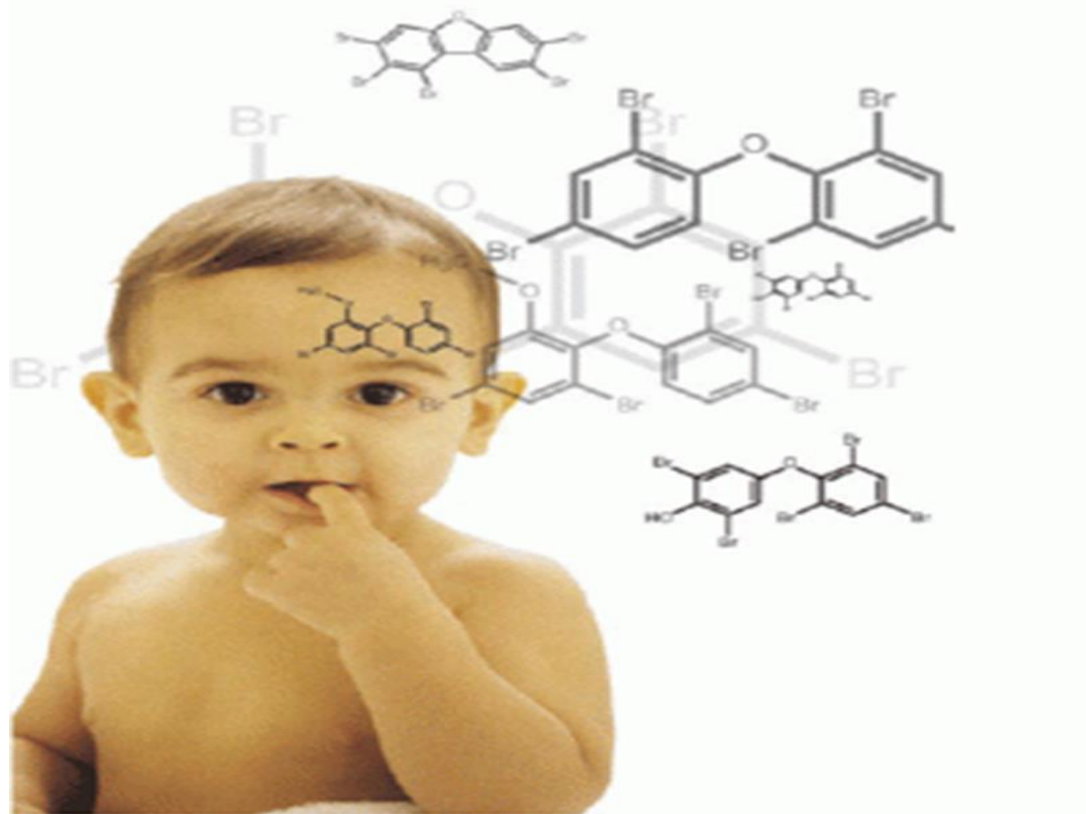


A group of diverse young children, including a girl with curly hair in the center, are sitting on a blue carpeted floor. They are looking towards the left side of the frame with various expressions of curiosity and focus. The children are wearing colorful clothing like a yellow shirt and a purple shirt. The background is a plain, light-colored wall.

Children are not “little adults” as their developing brains and bodies, as well as their metabolism and behaviors make them uniquely vulnerable to harm from toxic chemicals such as phthalates, dioxin, and flame retardants.

Toxic Chemicals in Products and Building Materials  
Purchased by New York Schools and Government Agencies  
Center for Health, Environment & Justice Environmentally Preferable Purchasing Factsheet

# Where are Chemicals of Concern Hiding in Your Products or Building?



- [ PVC, phthalates, vinyl chloride and halogenated flame retardants are found in many building materials and products in schools and other buildings.
- [ Safer and cost-effective alternatives are available to these hazardous chemicals and materials of concern.

# Indoor Air Quality

## CAFETERIA

- textiles
- composite tile
- gypsum board
- insulation
- paint
- tables
- seating

## GYMNASIUM

- wood flooring
- acoustic ceiling tile
- bleachers
- insulation
- gypsum board
- paint

## LIBRARY

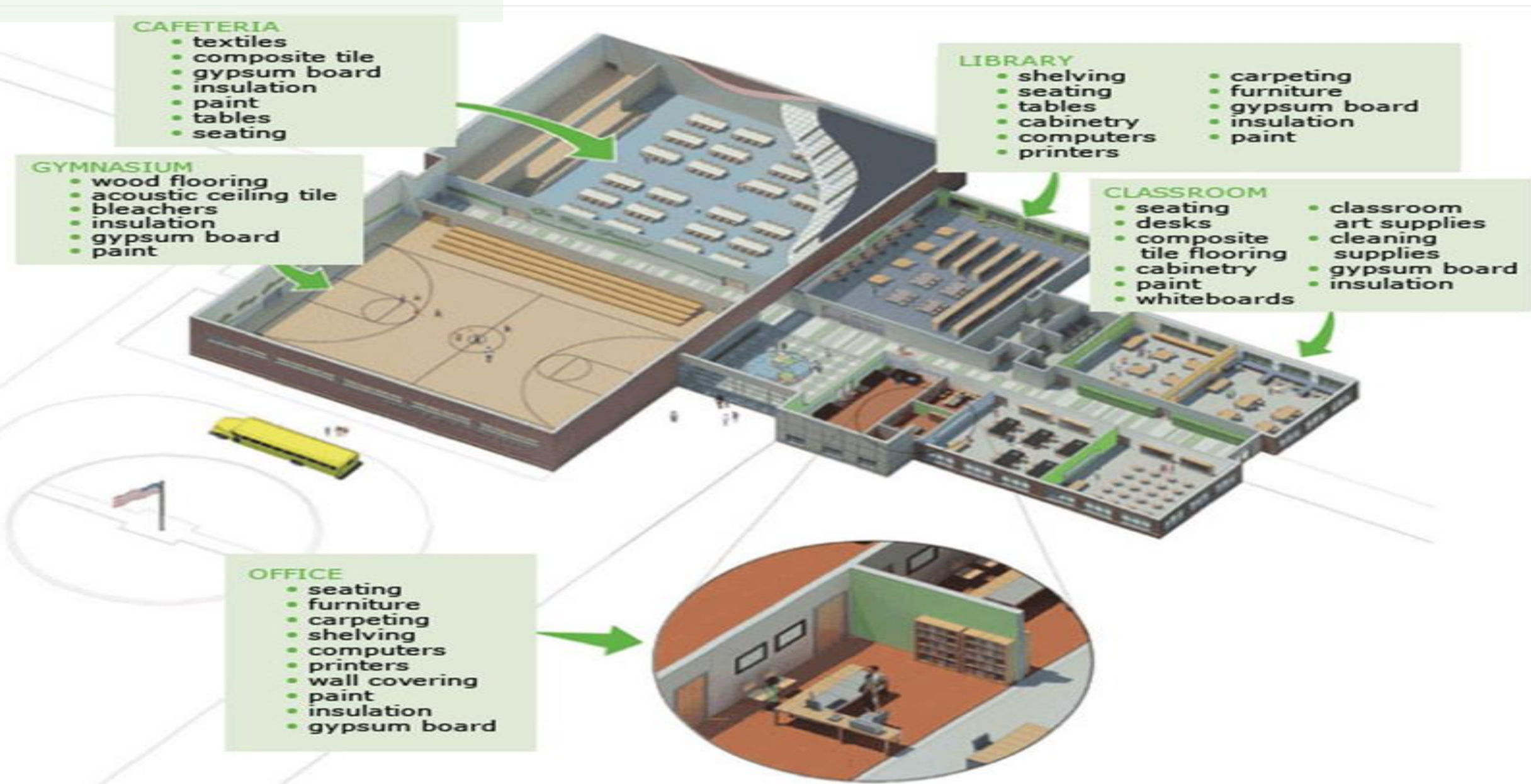
- shelving
- seating
- tables
- cabinetry
- computers
- printers
- carpeting
- furniture
- gypsum board
- insulation
- paint

## CLASSROOM

- seating
- desks
- composite tile flooring
- cabinetry
- paint
- whiteboards
- classroom art supplies
- cleaning supplies
- gypsum board
- insulation

## OFFICE

- seating
- furniture
- carpeting
- shelving
- computers
- printers
- wall covering
- paint
- insulation
- gypsum board



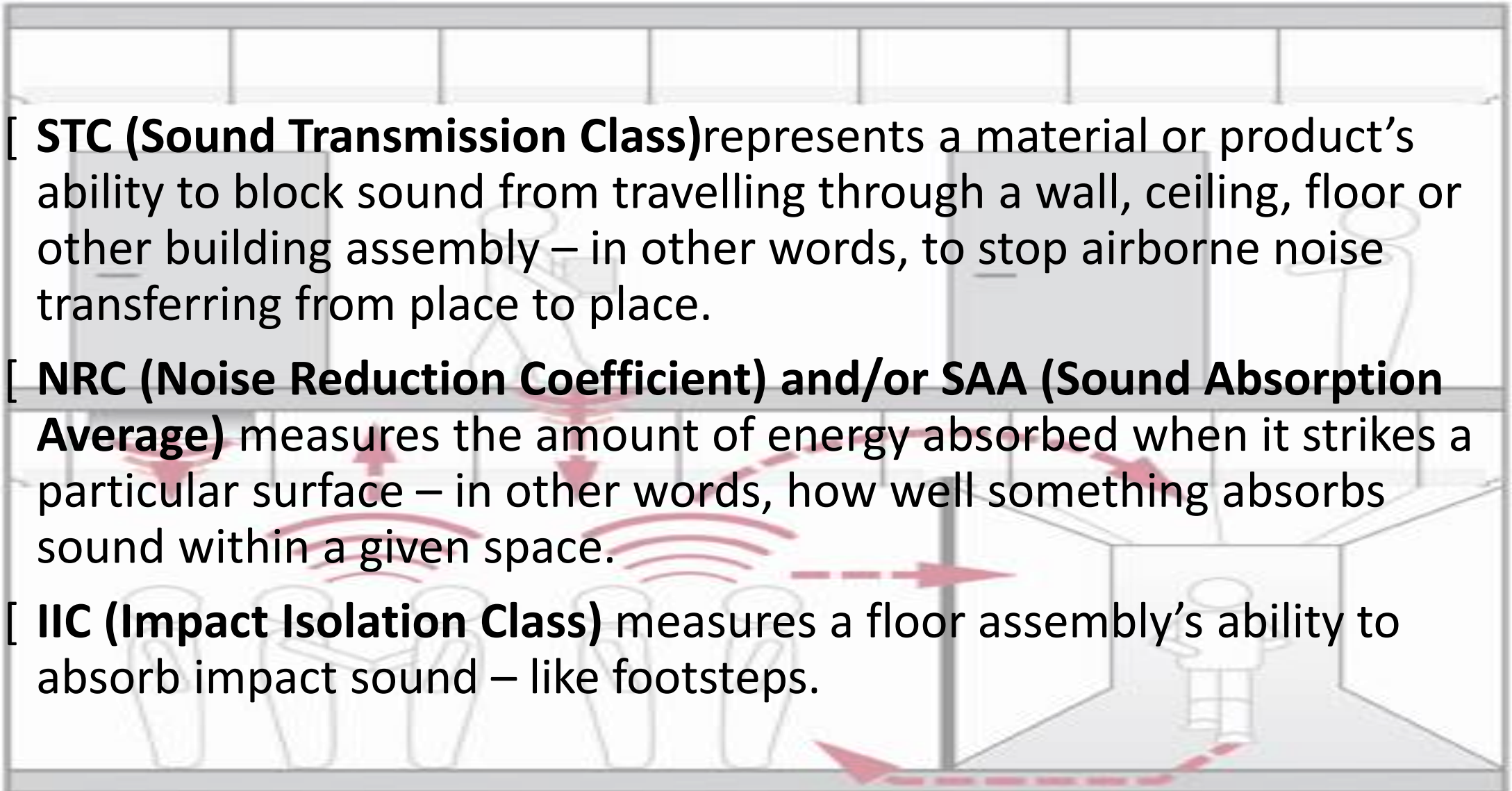


# ELEMENTS OF A POSITIVE LEARNING ENVIRONMENT

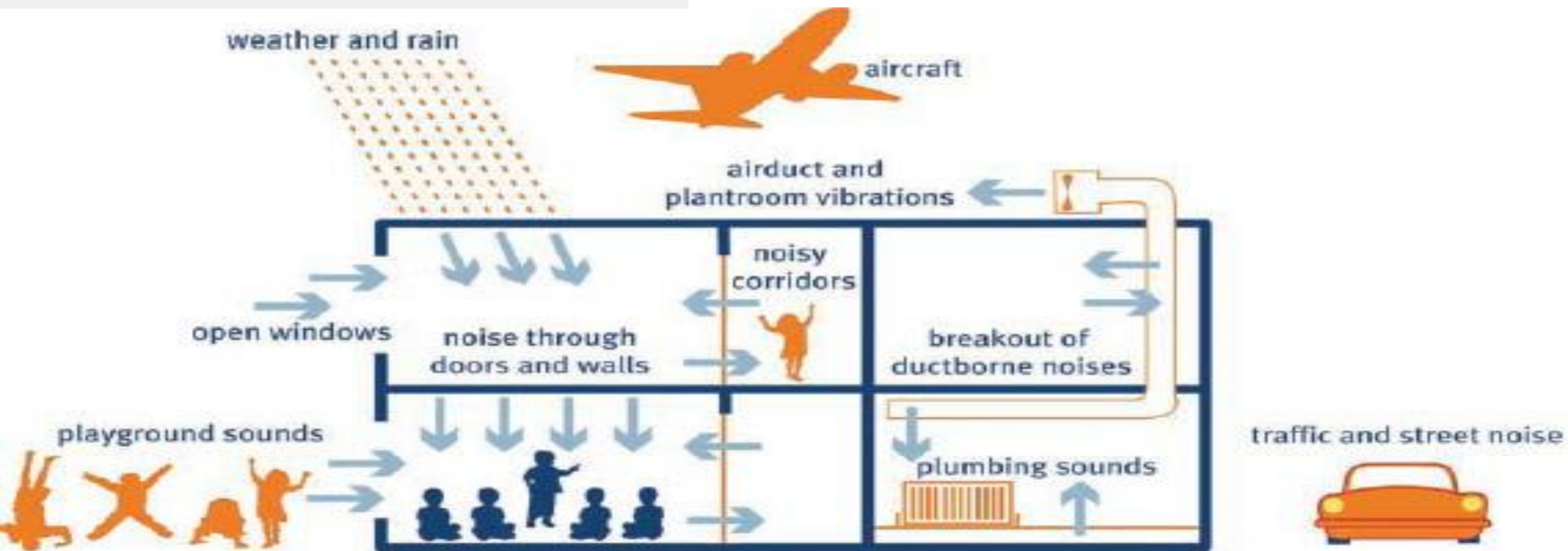
26 27 28 29 30



# Acoustics in the Built and Buildings

- 
- The diagram shows a 3D perspective of a room with a grid ceiling and a person standing on the floor. Red dashed arrows and concentric red circles represent sound waves reflecting off the walls and ceiling, illustrating sound absorption and transmission concepts.
- [ **STC (Sound Transmission Class)** represents a material or product's ability to block sound from travelling through a wall, ceiling, floor or other building assembly – in other words, to stop airborne noise transferring from place to place.
  - [ **NRC (Noise Reduction Coefficient) and/or SAA (Sound Absorption Average)** measures the amount of energy absorbed when it strikes a particular surface – in other words, how well something absorbs sound within a given space.
  - [ **IIC (Impact Isolation Class)** measures a floor assembly's ability to absorb impact sound – like footsteps.

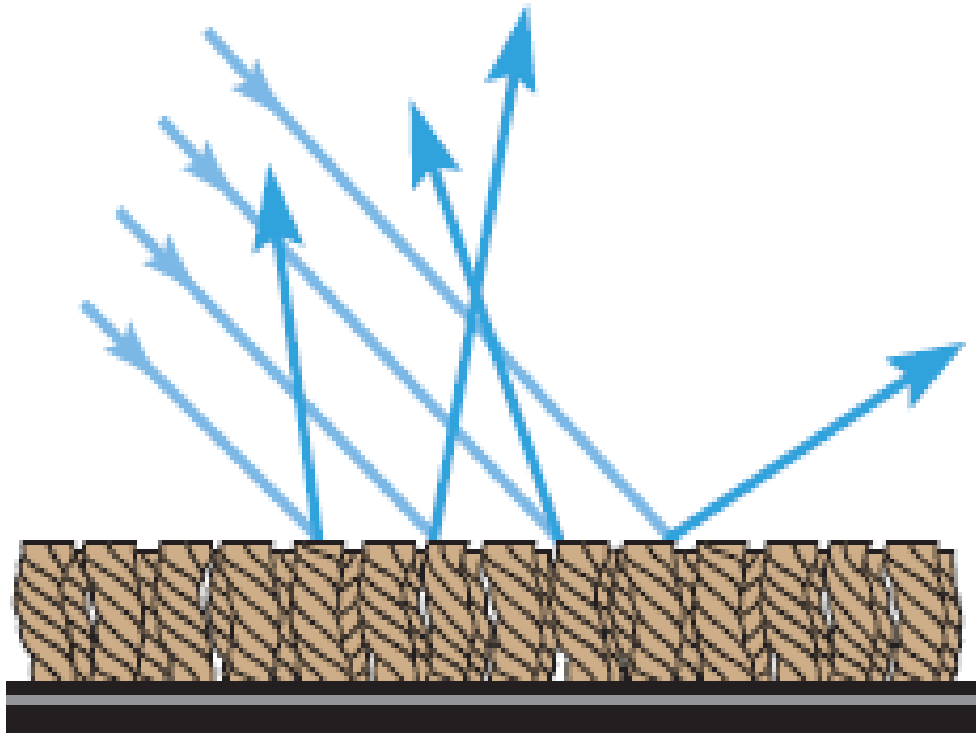
# Acoustics in Education



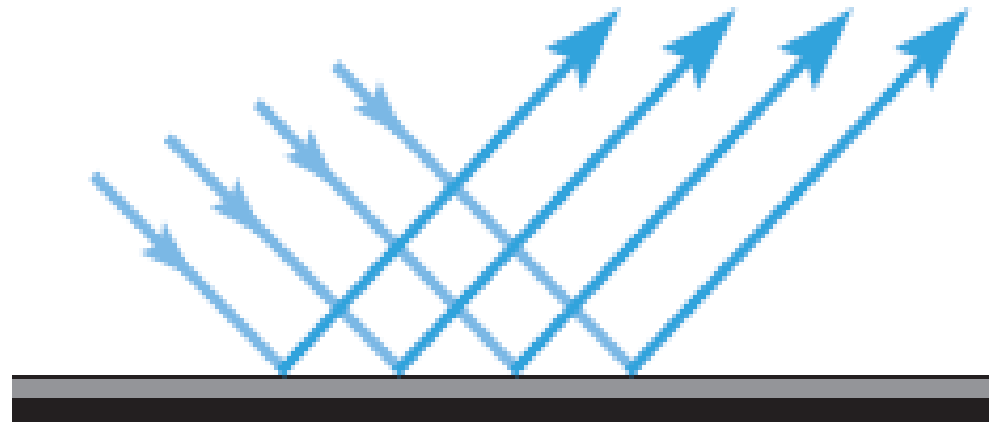
[ Education professionals claim that 75-80% of activity within a classroom revolves around vocal communication. It is thus important that within any room used for teaching, the acoustics are optimal.

A variety of lighting & values from light to dark within a space will be the most pleasing to the eye. Task areas require higher levels of light; conversely, lower levels offer a place for the eye to rest.





**Carpeting**  
**Diffuse Reflection**



**Resilient Flooring**  
**Specular Reflection**

Less Directional,  
Less Efficient



More Directional,  
More Efficient

# Classroom



You wouldn't buy food without knowing what's in it, and how it affects your health. Why buy building products without the same information?



## LEED 2009

- materials & resources credit 4 – recycled content
- materials & resources credit 6 – rapidly renewable materials
- low emitting materials (flooring systems) credit 4.3 – indoor environmental quality



**60%** of construction waste recycled

**50%** reduction of irrigation needs

**37%** reduction in water consumption

### LEED FACTS

IS&TB I  
Tempe campus  
LEED for New Construction  
Certification awarded  
3/29/2007

**Gold**

**39\***

Sustainable Sites

**9/14**

Water Efficiency

**3/5**

Energy & Atmosphere

**7/17**

Materials & Resources

**5/13**

Indoor Environmental  
Quality

**10/15**

Innovation & Design

**5/5**

\*Out of a possible 69 points.



# LEED v4

## MR Credit Building Product Disclosure and Optimization

- [ Environmental Product Declarations

  - [ EPD (Dependent on Manufacturer)

- [ Sourcing of Raw Materials

  - [ Option 1. Raw Material Source and Extraction Reporting (1 point)

    - [ (Dependent on Manufacturer)

  - [ Option 2. Leadership Extraction Practices (1 point)

    - [ Bio-based materials

    - [ Recycled content

- [ Material Ingredients

  - [ Option 1. Material Ingredient Reporting (1 point)

    - [ Manufacturer Inventory, Health Product Declaration, C2C, Declare

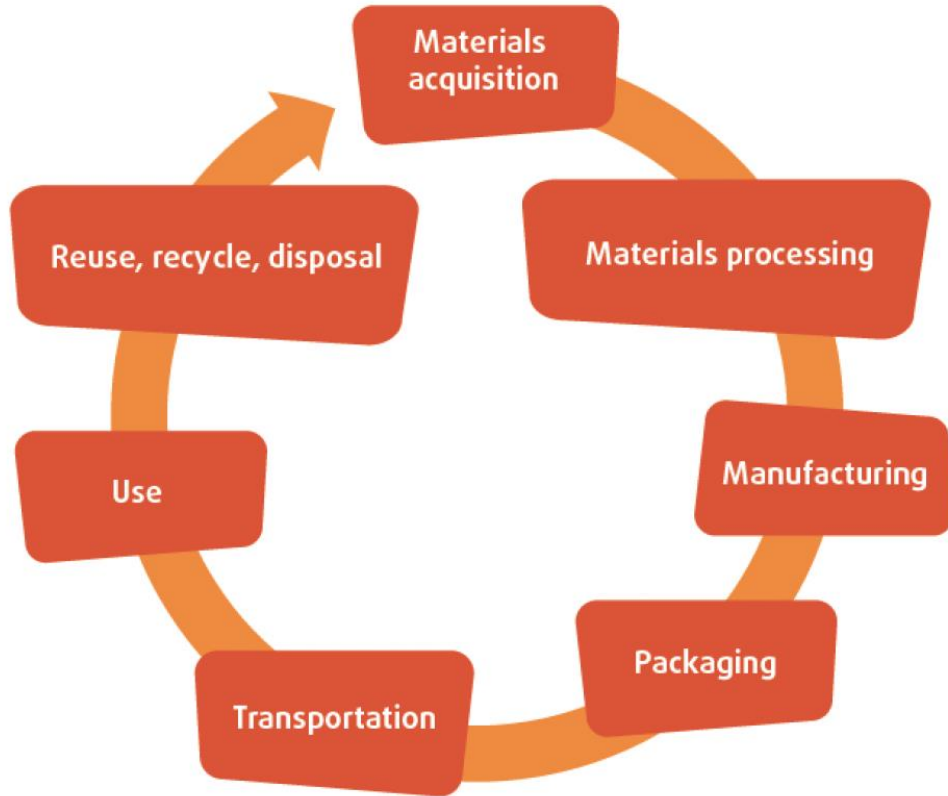
  - [ Option 2. Material Ingredient Optimization (1 point)

- [ EQ Credit Low-Emitting Materials



LEADERSHIP IN ENERGY AND  
ENVIRONMENTAL DESIGN

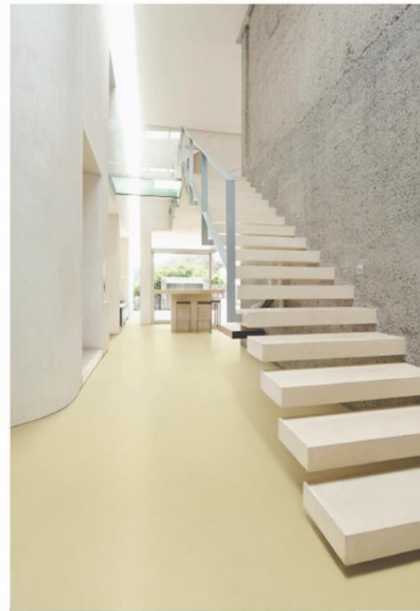
# Path to Compliance



## ENVIRONMENTAL PRODUCT DECLARATION

### MARMOLEUM 2.0 AND 2.5MM

FORBO FLOORING SYSTEMS  
RESILIENT LINOLEUM FLOOR COVERING



Marmoleum  
Color 3566 "Silent Sulphur"



FLOORING SYSTEMS

Marmoleum the most globally used brand of linoleum has been manufactured by forbo for more than 150 years. Marmoleum is produced having low environmental impacts as a result of the combination of natural renewable materials and high recycle content.

Forbo was the first flooring manufacturer to publish a complete Life Cycle Assessment (LCA) report verified by CML in 2000. In addition Forbo is now to publish Environmental Product Declarations (EPD) for all products including full LCA reports. This EPD is using all recognized flooring Product Category rules and is including additional information to show the impacts on human health and eco-toxicity. By offering the complete story we hope that our stakeholders will be able to use this document as a tool that will translate the environmental performance of Marmoleum into the true value and benefits to all our customers and stakeholders alike.

For more information visit:  
[www.forbo-flooring.com](http://www.forbo-flooring.com)



## Declare.

### Marmoleum Sheet Forbo Flooring Systems

Final Assembly: Assendelft, Netherlands  
Life Expectancy: 30 Years  
End of Life Options: Recyclable (100%)

#### Ingredients:

**Binder:** Tall Oil Rosin Ester (USA), Gum Rosin (Indonesia), Linseed Oil (Canada); **Filler:** Cellulose (Germany), Limestone-Calcium Carbonate (Germany); **Backing:** Jute Fiber; **Pigment:** Ferric Oxide, Iron Oxide, Ferric Oxide Yellow; **Finish:** Polyurethane, Acrylic Copolymer

#### Living Building Challenge Criteria:

FRB-2001	EXP. 01 MAY 2018
VOC Content: N/A	VOC Emissions: CDPH Compliant
Declaration Status	<input checked="" type="checkbox"/> LBC Red List Free
	<input checked="" type="checkbox"/> LBC Compliant
	<input checked="" type="checkbox"/> Declared

FORBO FLOORING SYSTEMS IS A MEMBER OF THE INTERNATIONAL LIVING FUTURE INSTITUTE™ [www.livingfutureinstitute.com](http://www.livingfutureinstitute.com)





PORTICO



# MISSION: GREEN SCHOOLS WITHIN A GENERATION

Some 22 million students spend their days in schools that barely meet code. They are uncomfortable, hot/cold when being expected to last for 60 years or more, but they don't provide the comfortable and productive work resources that encourage learning. Schools with poor air quality and a lack of proper ventilation often produce unhealthy conditions, which contribute to an increase in respiratory illness, absenteeism and lower test scores. Below is the kind of school we'd like all children to be able to attend.

**WATER EFFICIENT**  
Low-flow toilets, showers, sinks and dual flush toilets reduce total water use by as much as 50%. Schools that use low-flow automatic faucets at public water fountains also reduce water use. Schools that use low-flow faucets at public water fountains also reduce water use.

**LEED® CERTIFICATION**  
LEED® certification certifies that the building meets high standards for the highest performance standards.

**ALTERNATIVE TRANSPORTATION OPTIONS**  
Alternative fuel buses reduce CO2 emissions and reduce idling and ground-level ozone. Bike racks and safe bike paths and sidewalks encourage an active lifestyle and decrease emissions.

**SOLAR PANELS**  
Solar panels only generate low-cost, clean energy and provide a great source for the school and provide excellent opportunities for hands-on learning.

**EFFICIENT LIGHTING**  
Energy-efficient lighting, including LED lighting, reduces energy use and improves indoor air quality. Schools can also use natural light to reduce energy use.

**ACCOMMODATIONS**  
Accommodations can be achieved with minimal cost. For example, using low-cost, energy-efficient materials and equipment can reduce costs. Schools can also use natural light to reduce energy use.

**THERMAL COMFORT**  
Thermal comfort is the most important factor in determining whether students learn. Proper thermal comfort can be achieved with minimal cost. Schools can also use natural light to reduce energy use.

**WASTE PREVENTION**  
Recycling, composting, and other waste reduction practices can reduce waste and save money. Schools can also use natural light to reduce energy use.

**WASTE USE OF RESOURCES**  
By making better use of resources, schools can save money and reduce their environmental impact. Schools can also use natural light to reduce energy use.

**RECYCLING**  
Recycling programs that include separate bins for each type of material can reduce waste and save money. Schools can also use natural light to reduce energy use.

## Financial Benefits of Green Schools (\$/ft<sup>2</sup>)

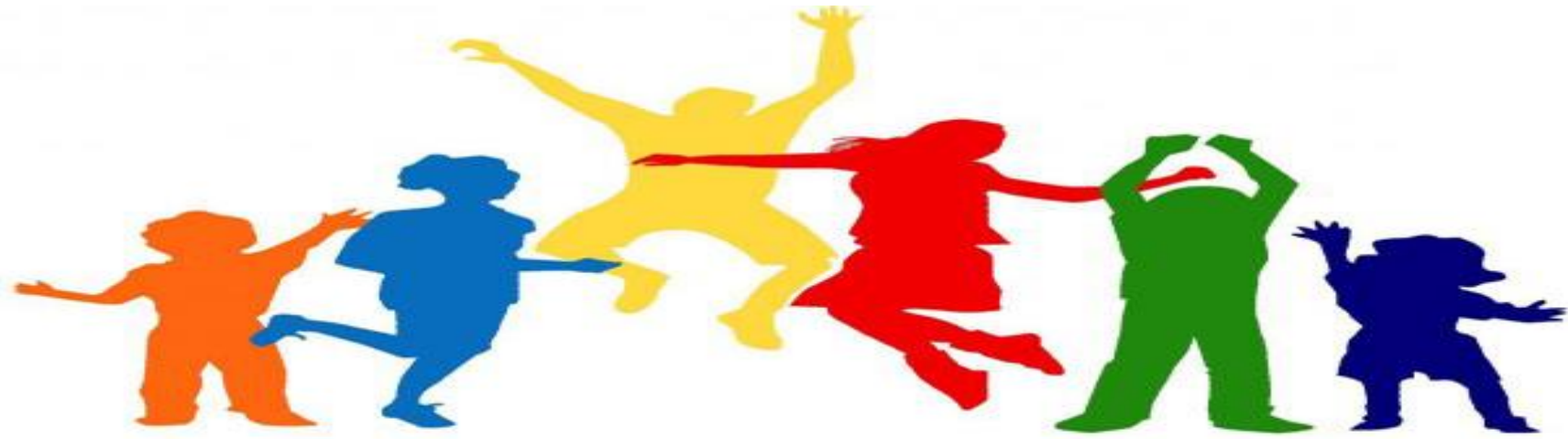
Energy	\$9
Emissions	\$1
Water and Wastewater	\$1
Increased Earnings	\$49
Asthma Reduction	\$3
Cold and Flu Reduction	\$5
Teacher Retention	\$4
Employment Impact	\$2
<b>Total</b>	<b>\$74</b>
<b>Cost of Greening</b>	<b>(\$3)</b>
<b>Net Financial Benefits</b>	<b>\$71</b>





THE IMPACT OF GREEN BUILDINGS ON  
**COGNITIVE FUNCTION**

SOMETIMES YOU JUST NEED A  
SILVER LINING



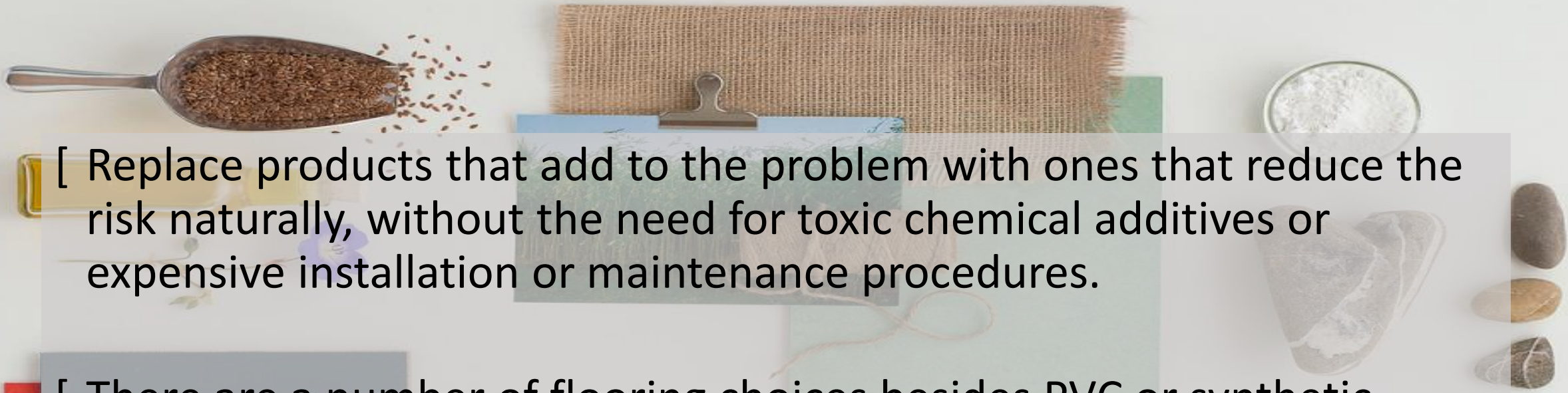
**H e a l t h y** S c h o o l s

# LVT isn't very Durable




While high-performance luxury vinyl tile (LVT) products have started to replace VCT and other traditional floorcovering materials in schools around the country, its use is generally limited to lower traffic areas.

# Focus on Natural Alternatives



[ Replace products that add to the problem with ones that reduce the risk naturally, without the need for toxic chemical additives or expensive installation or maintenance procedures.

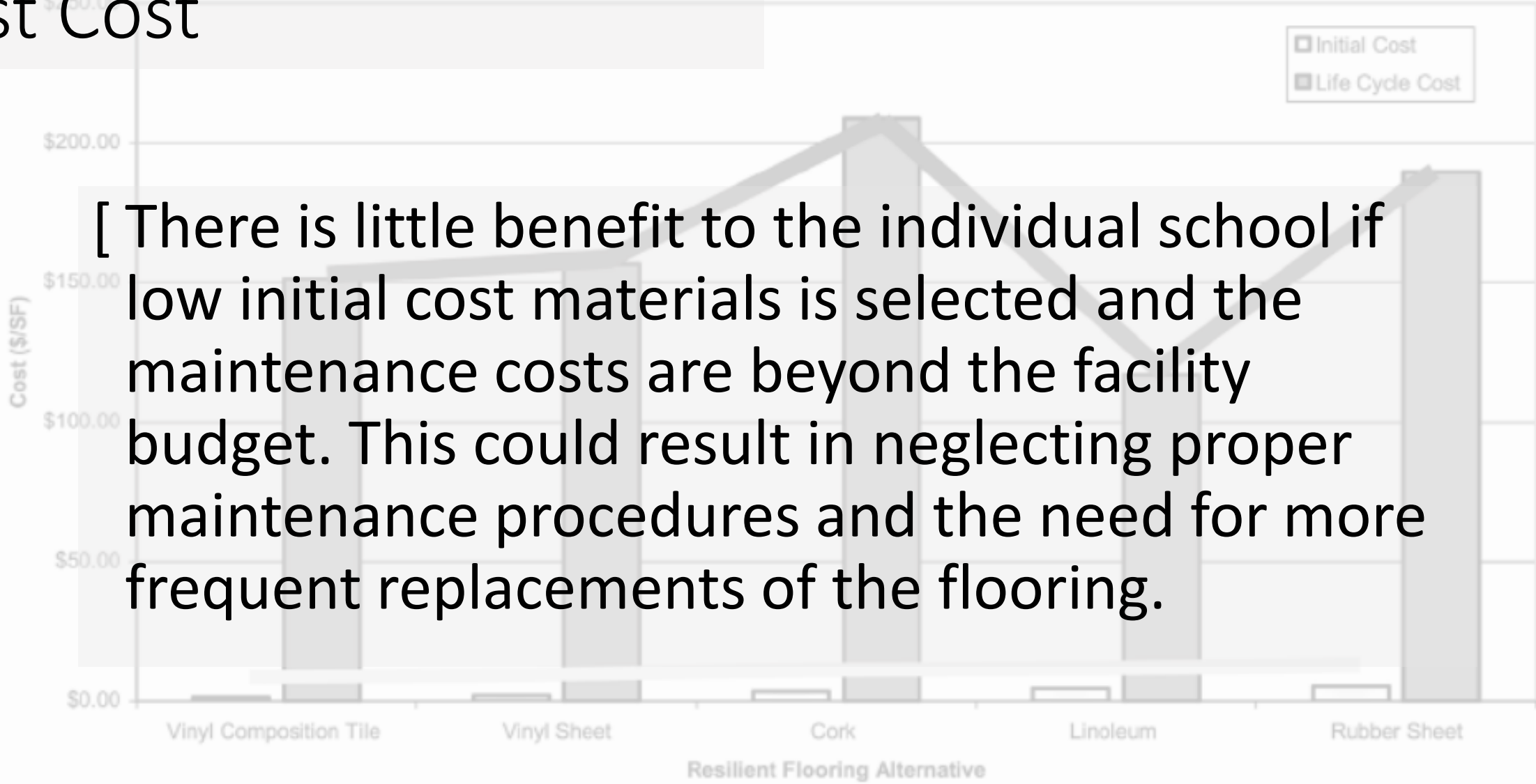


[ There are a number of flooring choices besides PVC or synthetic rubber products.



Figure 11 Initial cost versus LCC

# First Cost



[ There is little benefit to the individual school if low initial cost materials is selected and the maintenance costs are beyond the facility budget. This could result in neglecting proper maintenance procedures and the need for more frequent replacements of the flooring.

“When I started at Kenton County, we were slaves to the vinyl composition tile (VCT) floors,” recalled Rob Haney.



According to the maintenance staff at Edinboro University, a new VCT floor requires taking off the manufacturer’s seal, stripping it, adding three coats of wax, waiting 72 hours, then burnishing it before it’s good to go. **None of that has to be done with linoleum.**

# Create Healthier Educational Environments

A photograph of a modern school hallway. The floor is covered in colorful, patterned carpeting in shades of green, blue, and beige. The walls are a light, neutral color. On the left, there is a large mural of a field with tall grasses. The hallway is well-lit with recessed ceiling lights. The overall atmosphere is bright and clean.

[ By designing and specifying safe, healthy, indoor environments, we help ensure the well-being of the public, our children and grandchildren for generations to come.

- [ Examine the alternatives
- [ Look for the natural payoff
- [ Don't miss the easy opportunities

# Our Path Forward

- [ Use products with Low cost of ownership to help offset deferred maintenance.
- [ Install flooring systems 100% bonded to the substrate to prevent the intrusion of moisture and the potential for mold.
- [ Select occupancy ready products with warranted factory finishes to eliminate the need for toxic maintenance chemicals.
- [ Use floors that are naturally antistatic so that dust and allergens can be effectively removed.



**Declare.**

**Marmoleum Sheet**  
Forbo Flooring Systems

Final Assembly: Assendelft, Netherlands  
Life Expectancy: 30 Years  
End of Life Options: Recyclable (100%)

Ingredients:  
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 Declared

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# Thank you!

- [ **AIACES Course Number** – earning 1 HSW Learning Unit (LU) Hour  
The AIA credit is automatically issued through **Architectural Record** upon passing the online test.
- [ **GBCI Course Number**– 1 GBCI CE Hour for LEED Credential Maintenance. The GBCI credit must be self-reported. A certificate is emailed once the client passes the test that has the course/credit info on it for submission.
- [ **IDCEC CEU** – 1 CEU value  
Interior Design Continuing Education Council (IDCEC) for continuing education credits. Credit is accepted by the ASID, IIDA, and IDC. The credit is automatically issued through Architectural Record upon passing the online test.

