

# Making the Grade: Healthy Schools Nurturing Healthy Kids



GREENGUARD Environmental Institute is an industry independent non-profit organization focused on helping you create healthy indoor environments.

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## GREENGUARD Environmental Institute



**EDUCATION PROVIDER**

is a USGBC Education Provider committed to enhancing the professional development of the building industry and LEED Professionals through high-quality continuing education programs.

As a USGBC Education Provider, we have agreed to abide by USGBC-established operational and educational criteria, and are subject to course reviews and audits for quality assurance.

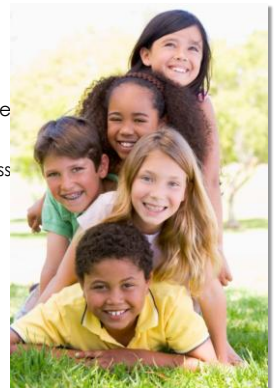
Course Name : **Making the Grade: Healthy Schools Nurturing Healthy Kids**



Approved for **1** GBCI CE Hours for LEED Professionals.

## Overview

- What could be in the air we breathe?
- What factors contribute to the quality of our schools' air?
- Air Quality and Student Success
- Enhanced Indoor Air Quality
- Poor Indoor Air Quality
- Mold
- Green Cleaning
- Helpful Resources



## What are We Breathing?

- Volatile Organic Compounds (VOCs)
- Inorganic Particulates
- Organic Particulates
- Formaldehydes/Aldehydes
- Inorganic & combustion gases
- Mold and Mildew



## Everyday items in the classroom contribute to the problem:



Toluene



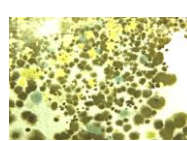
Formaldehyde



Acetone



Acetaldehyde



Mold & Mold spores



Allergens & Pollen

## Pollutants' Effects Magnified in Children

- Breathe 5x the volume of air that adults do
- Lower to the ground
  - Exposed to more particulates and allergens
- 80% of brain development occurs after birth



## Children and Asthma

- Common
- Increasing
- Missed School Days
- Leading cause of hospitalization
- Increase health care costs



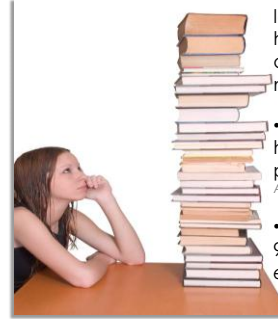
## Starts to Add Up

*The statistics can work against the school:*



- 73 million people including 68.5 million children attend 120,000 schools (Department of Education)
- Over 50% of U.S. schools were built before 1960, and the average school may go 42 years between renovations! (Turner Construction, 2005 Survey of Green Building)
- "Few states regulate indoor air quality in schools...Not surprisingly, a large number of studies have found that schools across the country are unhealthy." (Gregory Kats)

## And Keeps Going...



- TVOC and other pollutant levels can measure 2-10x higher in schools than outside, and up to 1000x higher in newly constructed schools!
- Over half of these schools have indoor air quality problems (U.S. Environmental Protection Agency)
- Children today spend up to 90% of their time in these environments.

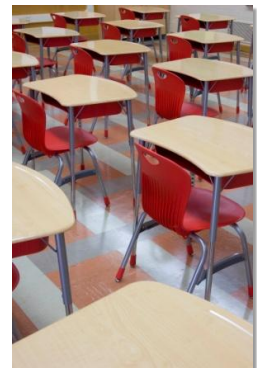
## How many schools are really in danger of poor indoor air quality?



- 200-500  $\mu\text{g}/\text{m}^3$  is considered the recommended level of TVOC for a habitable space
- The average VOC level taken was at 4600  $\mu\text{g}/\text{m}^3$ ; **23x** higher than recommended levels for habitation

## Levels have an Affect on Schools

- Higher Absenteeism
  - Decreased productivity
  - Decreased motivation
  - Slower learning
  - Lower test scores
  - Increased respiratory ailments
  - Headache; nausea; fatigue eye, nose, and throat irritation
  - Increased medical costs
- (“Greening America’s Schools”, Gregory Kats)



## Putting Schools to the Test



Achieving Enhanced Indoor Air Quality in schools is easy with the balance of three techniques:

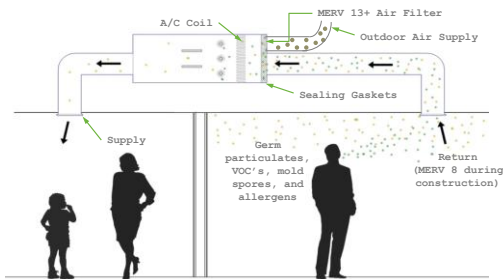
1. Proper Ventilation
2. Air Cleaning
3. Source Control

## Proper Ventilation



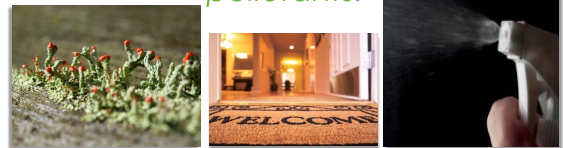
- Bring in and condition outdoor air
- Circulate air throughout the building
- Warm and cool air while maintaining a relative humidity level of 30-60% (ASHRAE 55)
- Know the difference between relative and absolute humidity

## Air Cleaning



Based on diagram provided by the U.S. Environmental Protection Agency, "Transmission of Viruses in Indoor Air", 2009

The U.S. Environmental Protection Agency and the American Lung Association agree that *source control is the only way to effectively eradicate indoor air pollutants.*



## Source Control

- Moisture Management Plan
- High performance cleaning systems



- Walk-off mats
- Low-emitting materials

## When should these techniques be employed?

Yesterday, Today, and Tomorrow

- Schematic Design
- Construction/Renovation
- Design Development
- Operations and Maintenance



## Schematic Design Design Development



## Construction Renovation



- Avoid "sink effect"
- Employ walk-off mats
- Subcontractors practice standard "housekeeping"
- If renovating, use MERV 8 filters at each return, and replace upon completion (LEED)

## Construction Renovation

- Building flush-out
- Test pollutant levels
- Low-emitting chemical cleaners



## Operations and Maintenance



- Green procurement guidelines
- Low-emitting chemicals and cleaners
- Moisture management plan
- HVAC maintenance plan
- Air quality testing

But most importantly...

## How do we design for and maintain healthy indoor air?

Educate, educate, educate...



## What benefits can you expect with enhanced indoor air quality?

A study by Gregory Kats revealed:

- 3-4% point increase in test scores
- Two schools in Illinois saw a 5% increase in attendance
- An Oregon Elementary school reported a 15% decrease in absenteeism



### What health benefits come with enhanced indoor air quality?



- 51% reduction of cold and flu-like symptoms (Carnegie Mellon)
- 38.5% decrease in asthma cases (Carnegie Mellon)
- A school of 900 students that incorporates positive indoor air quality can expect 20 fewer students a year to develop asthma ("Greening America's Schools", Kats)

### The Cost of Good Indoor Air Quality



- MERV filters
- Low-emitting school supplies, FFE, and cleaning products
- Educate occupants
- Maintain a low absolute humidity (dew point) and a relative humidity of 30-60% (comfort level)

### The Cost of Poor Indoor Air Quality

Washington Middle School  
 Everett County,  
 Washington



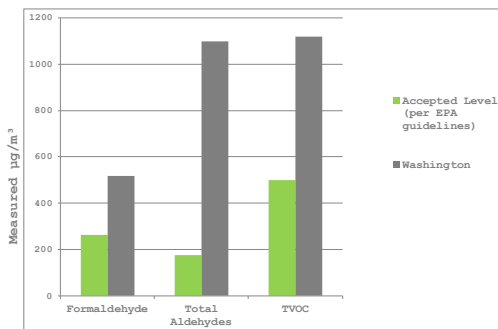
### Initial Occupancy

2 months post-occupancy ongoing complaints of:

- Increased asthma symptoms
- Eyes, nose, throat irritation
- Nausea
- Headaches
- Flu-like symptoms
- Fatigue



### Average Emission Levels



### The Cost of Poor Indoor Air Quality

- Replacement of all interior materials
  - Cost-over \$2 million
- Displacement of all students, staff, and school activities
- School closed for 6 months
- 120 families refused to return
- Negative publicity



## Final Building Costs at 1 year

Washington Middle School

Cost Breakdown: **\$150.12/SF**  
Commissioning: **\$0/SF**  
Total Cost/SF: **\$150.12/SF**  
IAQ Response: **\$2,000,000**  
Final Cost/SF: **\$162.62/SF**



## The Facts About Mold in Schools



## What is mold?



## Where does it come from?



## How Does it Affect Schools?



## The \$500,000 Chair of Oak Ridge Elementary



What just happened?

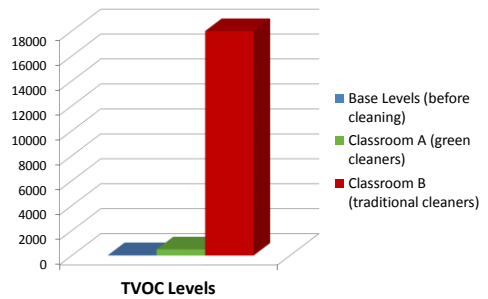


Environmental effects of cleaning



- Inside:
- Contributes to VOC emissions
  - Compound interaction  
*University of California, Berkeley*
  - Raised chemical levels after cleaning processes  
*Air Quality Sciences, Inc.*

Chemical levels measured in classrooms 2 hrs post-cleaning



**Environmental Working Group Study:**  
Greener School Cleaning Supplies = Fresh Air + Healthier Kids

Findings:

- Use As Directed
- 6 known asthmagens
- 11 probable cancer-causing carcinogens



## Special Considerations for Cleaning Our Schools



## Designed to be Clean

Green cleaning starts at the drawing the board!

- Custodial staff member should be part of the project team from the beginning
- Janitorial closets should be vented directly to the outside

Minimize the crevices!

## Designed to be Clean

• Material Choice:



## Systematic Green Cleaning



## Green Labels Focused on Human Health

LOGO	LABEL	PARTY	CERTIFICATION
	Design for the Environment (DfE) (EPA)	2 <sup>nd</sup> party	Harmful content minimization
	EcoLogo	3 <sup>rd</sup> party	Harmful content minimization
	Green Seal – GS-37	3 <sup>rd</sup> party	Harmful content minimization; GG cert for emissions opt.
	GREENGUARD Children & Schools Certified	3 <sup>rd</sup> party	Emissions-based criteria and testing

## High Performance School Certification Programs

Leadership for Energy and Environmental Design (LEED) for Schools

Collaborative for High Performance Schools (CHPS)

Green Globes

## Resources

- 

U.S. Environmental Protection Agency;  
IAQ Tools for Schools
- 

American Lung Association
- 

U.S. and State Departments of Education
- 

Healthy Schools Network, Inc.
- 

Healthy Schools Campaign
- 

Green Charter Schools Network



Thank You!

## GREENGUARD Environmental Institute



Improving public health and quality of life through healthy indoor air.

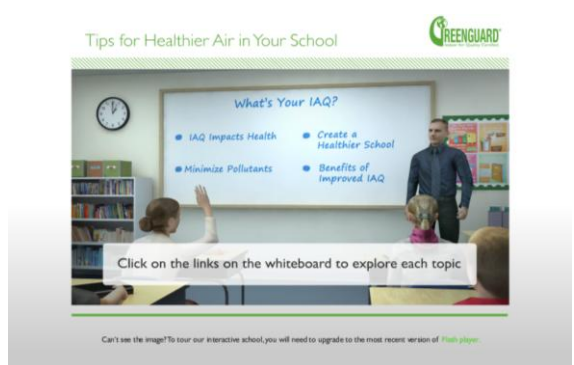
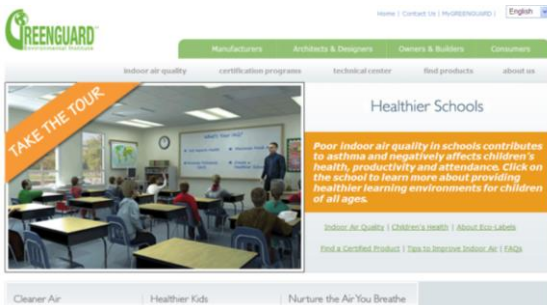


## GREENGUARD Environmental Institute



### Voluntary Certification Process:

1. Manufacturer contacts GREENGUARD
2. Product Profiling & Testing
3. Full Chamber Testing
4. Quarterly Monitoring and Annual re-testing of product



## Resources for Indoor Air Quality



[www.greenguard.org](http://www.greenguard.org)

[www.chps.net](http://www.chps.net)

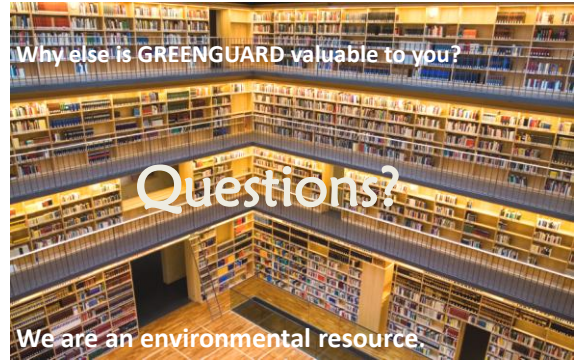
[www.aeris.org](http://www.aeris.org)

[www.epa.gov/iaq](http://www.epa.gov/iaq)

[www.lungusa.org/air/air\\_indoor](http://www.lungusa.org/air/air_indoor)

[www.usgbc.org](http://www.usgbc.org)

[www.blauer-engel.de](http://www.blauer-engel.de)



[www.greenguard.org](http://www.greenguard.org)

For the world's largest online, low-emitting product guide



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