



Making Green Buildings Healthy Buildings:

An Industrial Hygienist's Perspective

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- Paleontologist
 - Geology
 - Zoology
- Industrial Hygienist
 - Asbestos (a mineral! Yay, Geology!)
 - Mold (a critter! Yay, Zoology!)
 - IAQ
- How did that happen?
 - Paleontologists look at effects of environment on critters
 - IHs look at effects of critters on environments—indoors, at least
 - Buildings are big hollow mountains waiting to be sampled, mapped, and interpreted

- Environmental Consulting Firm
 - Internationally
 - Infrastructure design/build
 - Commissioning
 - Decommissioning
 - Nationally
 - Geoengineering
 - Wetlands biology
 - Materials testing
 - Industrial Hygiene

- What's a green building?
- Indoor Air Quality (IEQ/IAQ) and Industrial Hygiene
- Green building challenges (regarding IAQ)
- LEED IAQ requirements

- What's a green building?

Hopefully, not this...



- Or this...



- Green buildings strive to meet standards of energy efficiency
- One standard, of concern today, is LEED (Leadership in Energy and Environmental Design)

- The main design criteria in LEED cover
 - Sustainable sites;
 - Water efficiency;
 - Materials and resources;
 - Innovation and design; and
 - Indoor Air Quality (IAQ)

- Efforts to increase energy efficiency from the '70s to the '90s included:
 - Insulation
 - Sealing openings
 - Limiting air flow
- The result?
 - The wrong kind of “green” building
 - Self-composting buildings
 - IAQ complaints
 - Perception of occupants/morale
 - Reconstruction costs
 - Lawsuits
 - Insurance challenges
 - Legislation

- Industrial Hygienists strive to:
 - Anticipate;
 - Recognize;
 - Evaluate; and
 - Control...
Hazards in the work place
- Often, this work takes place in the confines of a building

- Buildings contain physical systems that an IH must understand in order to do their job:
 - Heating and ventilation
 - Water
 - Structure

- We don't have to be engineers to perform our jobs well

- Most of our work places are indoors, where we spend 90% of our time
- Our indoor environments are impacted by:
 - Carbon dioxide
 - Carbon monoxide
 - Dusts (mold, asbestos, lead)
 - VOCs
 - Chemicals
- IHs are in a position to evaluate indoor environments and exposures
- IHs often are called in to evaluate IAQ issues and, as such, we see the effects of poor risk management decisions during construction

■ Costs of IAQ problems

- Respiratory disease (\$6-14 billion)
- Asthma and allergies (\$2-4 billion)
- Sick Building Syndrome (\$10-30 billion)
- Reduced worker performance unrelated to health (\$20-160 billion)

“Recent studies have shown that costs of poor indoor environment for the employer, building owner and society as a whole are often considerably higher than the cost of the energy used in the same building”

– BSI EN15251:2007

From Elia Sterling, Theodor Sterling and Assoc.

■ Business costs:

■ \$ Maintenance	1%
■ \$ Utilities	1%
■ \$ Taxes	1%
■ \$ Rent	9%
■ \$ Salaries	88%

➤ If a business pays \$20 million per year in salaries, a 1% decrease in productivity due to poor IAQ is worth **\$200,000 per year**

From Elia Sterling, Theodor Sterling and Assoc.

- Sources of IAQ challenges
 - HVAC system design, operation and maintenance
 - Materials and product off-gassing
 - Indoor (tenant) activities (printing, forklifts, industrial processes etc)
 - Ambient air & sub-surface soil contamination
 - Recent convergence of IAQ-related mould and/or moisture problems with building envelope and HVAC system failures
 - Morale
 - Lack of environmental control

From Elia Sterling, Theodor Sterling and Assoc.

<u>Causes of IAQ-related problems</u>	<u>Frequency</u>
■ Ventilation	36%
■ Thermal Control	19%
■ Ventilation Infiltration	10%
■ Cross-contamination	11%
■ Indoor Sources	9%
■ Microbial Contamination	7%
■ Site Infiltration	2%
■ Undetermined Cause	6%

- * Source: IAQ Investigations conducted since 1981 by Theodor Sterling Associates Ltd.

There is no international consensus for a 'Green' building rating method, but there are many competing brands, including:

- LEED™ in the US, Canada, India and under development in China, and the Philippines
- Go Green and Green Globes in North America
- BREEAM in the UK
- BEAM in Hong Kong
- Green Star in Australia
- CASBEE in Japan
- Green Mark in Singapore

From Elia Sterling, Theodor Sterling and Assoc.

IAQ Requirements for LEED™ Buildings - Credits

Sustainable Sites	14 points
Water Efficiency	5 points
Energy & Atmosphere	17 points
Materials & Resources	14 points
IAQ	15 points
Innovation and Design	2 points

Note: *It is possible to obtain 52 Credits and highest LEED™ platinum certification without qualifying for any IAQ Credits*

From Elia Sterling, Theodor Sterling and Assoc.

- To obtain the IAQ Performance Credit, IAQ testing is not required

- Options
 - Building flush prior to occupancy
 - Building flush overlapping with occupancy
 - IAQ testing prior to occupancy

- The costs of a flush-out can be large, but the costs of testing can also be large.

- Project example

- An important note about IAQ testing:
 - May be architect or owner driven
 - Review the applicable specifications to determine if they are current and relevant prior to agreeing to them
 - Determine the testing parameters
 - Determine the acceptable limits
 - Have a plan for what to do if the samples don't pass muster (usually, this response is a flush out)
 - Consider conducting regular, proactive IAQ monitoring and occupant surveys to confirm that the building is operating effectively

- An IH can help with these issues
 - Specification review
 - Sample planning
 - Cost estimation
 - Sample interpretation
 - Operations and Maintenance plan development
 - Etc.

- LEED is not the answer to IAQ challenges
- Good building blocks do not make a good building
- Consider the costs of poor IAQ for building owners and occupants when making construction decisions

- Today, we will learn from the experts:
 - The benefits of good building envelope design
 - The need for Sustainable Master Planning for the creation of healthy communities
 - What we learned from our first generation of green buildings
 - An overview of risk management in green construction
 - The value of green labels for buildings and thoughts on measuring sustainability

Comments/Questions?



- Thank you!