

The Intersection of Indoor Air Quality and Energy Efficiency

October 17, 2024 | Session Overview

Speakers

William “Bill” Bahnfleth, PhD, PE, Professor, Architectural Engineering, The Pennsylvania State University

Nathan Stodola, Chief Engineer, Standard Development, International WELL Building Institute

Seema Bhangar, Principal, Healthy Buildings and Communities, Innovation and Research, U.S. Green Building Council

Dr. John McKeon, Principal, iAIR Institute, and CEO, Allergy Standards Ltd.

Moderator

Anne Law, Senior Vice President, Professional and Government Affairs, National Institute of Building Sciences

Indoor Air Quality and Energy Efficiency Overview

Public awareness of the need to improve indoor air quality (IAQ), ventilation, and air filtration in buildings greatly increased during the COVID-19 pandemic.

Post-pandemic, several things have taken place: The Biden Administration announced the Clean Air in Buildings Challenge in 2022, held a White House Summit on Sustainable K-12 School Buildings and Grounds, and released a toolkit this past spring. In June 2023, ASHRAE finalized Standard 241, Control of Infectious Aerosols, a pioneering consensus-based standard that provides explicit requirements for airborne infection risk management, which have been absent for a century from IAQ standards. In July, Congressmen Paul Tonko (D-NY) and Brian Fitzpatrick (R-PA) introduced the Indoor Air Quality and Healthy Schools Act.

The Environmental Protection Agency refers to IAQ as the air quality within and around buildings and structures, especially

as it relates to the health and comfort of building occupants.

The U.S. Department of Energy defines energy efficiency as “the use of less energy to perform the same task or produce the same result.” As buildings use less energy, we need to know how indoor air quality is affected by ventilation, insulation, building materials, energy-efficient appliances, and control systems and operations.

On October 17, 2024, NIBS hosted a webinar with subject matter experts William “Bill” Bahnfleth, PhD, PE, Professor, Architectural Engineering, The Pennsylvania State University; Nathan Stodola, Chief Engineer, Standard Development, International WELL Building Institute; Seema Bhangar, Principal, Healthy Buildings and Communities, Innovation and Research, U.S. Green Building Council; and Dr. John McKeon, Principal, iAIR Institute, and CEO, Allergy Standards Ltd.

The panel discussed how balancing IAQ and energy efficiency is crucial to create healthy, comfortable, and sustainable

buildings. It discussed strategies for integration, including whole building design, performance monitoring, education, and workforce training.

Anne Law, Senior Vice President, Professional and Government Affairs with the National Institute of Building Sciences, served as moderator for the webinar.

Building for People

William “Bill” Bahnfleth, Architectural Engineering Professor at The Pennsylvania State University, framed key issues, including the purpose of buildings, sustainability goals, workforce development, and research and regulatory gaps with regard to IAQ.

He opened the webinar by noting that while building energy use is important, we make buildings “for people, not to save energy.” He pointed out that good health and well-being and climate action are both sustainability goals.

Bahnfleth argued that many tools are available today to provide better IAQ, while maintaining or reducing current levels of energy use. These include air cleaning technologies, sensors, and performance standards like the ASHRAE Standard 62.1 Indoor Air Quality Procedure.

He emphasized the unique opportunity to make gains in IAQ resulting from the COVID-19 pandemic and the importance of capitalizing on it. Bahnfleth highlighted workforce development, research, and especially improved regulation of design and operation as critical elements of a path forward.

National standards have the same potential to improve IAQ as they have already done for energy efficiency.

Why Indoor Air Quality is Important

Dr. John McKeon, Principal with the Indoor Air Innovation & Research (iAIR) Institute and CEO of Allergy Standards Limited (ASL), explained that his work in improving IAQ was sparked by his experience as an emergency room doctor, where he treated young patients suffering from asthma and allergies.

He recounted how parents sought guidance on the management of indoor asthma and allergy trigger factors.

This experience prompted him to move to a more proactive, ‘upstream’ approach, centered on patient education and environmental control in creating healthier indoor environments.

Dr. McKeon highlighted some of the impacts of poor IAQ on health and wellbeing, both acute and chronic, including cognitive functioning, asthma, cancer, and cardiovascular disease.

Dr. McKeon highlighted key potential drivers behind the increasing focus on IAQ and the ‘air-aware’ paradigm, for example changes in attitudes and behavior as a result of the recent pandemic, advancements in technologies, and recent changes in policies and standards.

Barriers and Solutions

Seema Bhangar, Principal, Healthy Buildings and Communities, Innovation and Research, U.S. Green Building Council (USGBC), covered barriers to achieving both energy efficiency and indoor air quality in buildings, and approaches for overcoming them.

The gap is not a lack of knowledge or technical capability, Bhangar said.

“We have knowledge on strategies and actions related to source control, ventilation, filtration, and envelope management to effectively co-manage energy and indoor air quality, and we have real buildings in which we have demonstrated their successful application,” she said.

So why isn’t this already happening in all buildings? Barriers that she cited include insufficient mechanisms for accountability, split incentives, and practical complexities related to retrofitting existing buildings.

Solutions to overcome these barriers include intentional planning and design, adoption of minimum performance standards, and regular monitoring and verification to make sure buildings work as designed. She discussed two mechanisms through which green building organizations like the USGBC effect the change we want to see at scale.

One is by incentivizing action through recognition. Voluntary standards like LEED, WELL, and Fitwel offer a mechanism to

overcome the chicken-and-egg problem, where innovations can't be adopted into code until their feasibility and value are proven, but need to be widely adopted for that to happen.

A second is training and workforce development. For instance, USGBC's Center for Green Schools, with U.S. EPA funding, is building capacity among school district staff to ensure a larger proportion have experience with successful IAQ management and greenhouse gas emissions planning.

Air Quality and Energy

Nathan Stodola, Chief Engineer, Standard Development, International WELL Building Institute, presented on how WELL applies the science of how physical environments affect human health, well-being, and performance.

These include access to daylight and outdoor views, access to filtered drinking water, and use of indoor plants.

"Some health-focused strategies have an energy benefit, such as managing mold on cooling coils with UV lights, and even for those that have an energy cost, this cost can be minimized through proper design, such as selecting outdoor air filters appropriate for the local ambient air quality," Stodola said.

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