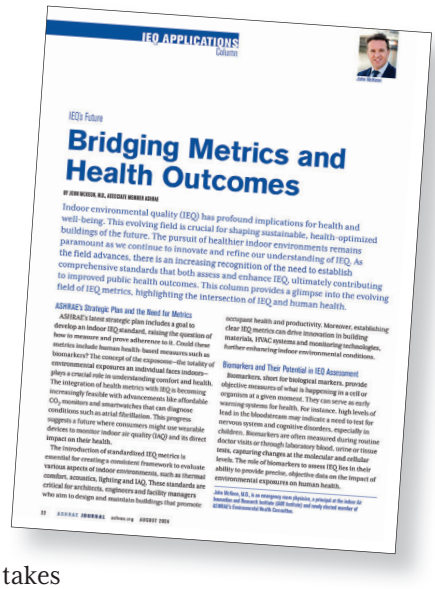
Responsible Use of Personal Data in HVAC


IEQ APPLICATIONS Column

IEQ's Future

Bridging Metrics and Health Outcomes

BY JOHN MCKEON, M.D., ASSOCIATE MEMBER ASHRAE

Indoor environmental quality (IEQ) has profound implications for health and well-being. This evolving field is crucial for shaping sustainable, health-optimized buildings of the future. The pursuit of healthier indoor environments remains paramount as we continue to innovate and refine our understanding of IEQ. As the field advances, there is an increasing recognition of the need to establish comprehensive standards that both assess and enhance IEQ, ultimately contributing to improved public health outcomes. This column provides a glimpse into the evolving field of IEQ metrics, highlighting the intersection of IEQ and human health.

ASHRAE's Strategic Plan and the Need for Metrics

ASHRAE's latest strategic plan includes a goal to develop an indoor IEQ standard, raising the question of how to measure and prove adherence to it. Could these metrics include human health–based measures such as biomarkers? The concept of the exposome—the totality of environmental exposures an individual faces indoors—plays a crucial role in understanding comfort and health. The integration of health metrics with IEQ is becoming increasingly feasible with advancements like affordable CO_2 monitors and smartwatches that can diagnose conditions such as atrial fibrillation. This progress suggests a future where consumers might use wearable devices to monitor indoor air quality (IAQ) and its direct impact on their health.

The introduction of standardized IEQ metrics is essential for creating a consistent framework to evaluate various aspects of indoor environments, such as thermal comfort, acoustics, lighting and IAQ. These standards are critical for architects, engineers and facility managers who aim to design and maintain buildings that promote occupant health and productivity. Moreover, establishing clear IEQ metrics can drive innovation in building materials, HVAC systems and monitoring technologies, further enhancing indoor environmental conditions.

Biomarkers and Their Potential in IEQ Assessment

Biomarkers, short for biological markers, provide objective measures of what is happening in a cell or organism at a given moment. They can serve as early warning systems for health. For instance, high levels of lead in the bloodstream may indicate a need to test for nervous system and cognitive disorders, especially in children. Biomarkers are often measured during routine doctor visits or through laboratory blood, urine or tissue tests, capturing changes at the molecular and cellular levels. The role of biomarkers to assess IEQ lies in their ability to provide precise, objective data on the impact of environmental exposures on human health.

John McKeon, M.D., is an emergency room physician, a principal at the Indoor Air Innovation and Research Institute (IAIR Institute) and newly elected member of ASHRAE's Environmental Health Committee.

The column "IEQ's Future: Bridging Metrics and Health Outcomes" by John McKeon, M.D., Associate Member ASHRAE, published in the August 2024 of *ASHRAE Journal,* raised some serious alarm bells for me. The idea of using bodily-generated control feedback in HVAC systems has concerned me since I first read about the potential application of wearable sensors over 15 years ago. The popularity of fitness trackers and the like has never ceased to amaze me. How could anyone be unconcerned about the collection and storage of such intimate data?

Some of the biomarkers the writer discusses reveal even more deeply personal information. He discusses recording data on heart rate and other vital signs as though they are nothing more than space temperature sensors. It takes little imagination to understand the ways that sort of information could be used for malicious purposes.

In this increasingly data-driven world, the potential for misuse and abuse of data is a huge emerging problem. In the biometrics field, that data becomes more and more personal. It is not good enough to barrel along with the technology, assuming that any ethical considerations can be overcome by adjusting the privacy settings of the data. The truth is that this sort of data should never exist. It should never be stored, it should never be collected and it should never be measured. You can't hack or misuse data that doesn't exist, and it certainly shouldn't be used simply to control the air conditioning.

As has been noted elsewhere, the data we are creating also requires increasing power demands to store and process it. That's not very energy efficient, particularly since, in my opinion, much of that data is simply unwanted and unnecessary, certainly in the view of the general population at least.

Many technology fields are charging ahead at full speed without consideration of whether we should be going there, let alone how. I believe ASHRAE needs to take a step back and have a long think and open discussion about the ethics of data and of the things that people are proposing it be used for before we blindly charge headlong into the abyss. Perhaps these are questions we should all be considering in our work.

Jonathan Foster
Member ASHRAE
Wellington, New Zealand

MCKEON RESPONDS

Thank you for your thoughtful response. It is encouraging to see that the piece has sparked such a meaningful and important debate on the topic of data privacy, ethics and the future of technology as it relates to health and well-being in the indoor environment.

The column was intended as a future-focused, thought provoking piece, aiming to explore the possibilities that technological advancements could bring to our industry. It does not make recommendations for implementation, but rather highlights the potential future directions and the need for the industry to be well-informed about these possibilities. The idea of using biometric data for optimizing HVAC systems is indeed a provocative concept, and the intention was to stimulate discussion and reflection on these emerging and converging technologies.

We fully acknowledge the significant ethical concerns and data privacy issues associated with the collection and use of biometric data. This issue was indeed highlighted in the column, as we believe it is crucial to approach such advancements with a careful consideration of the potential risks and implications. The safeguarding of personal data, particularly when it involves sensitive health-related information, is paramount, and we agree that any future developments in this area must prioritize privacy and security.

As you know, ASHRAE is currently exploring standards and metrics for buildings as it relates to

health and well-being. Any exploration of a credible standard must involve identifying appropriate metrics to measure various aspects of occupant health and comfort. It is a challenging area, but one that requires our attention as we strive to improve the built environment for all occupants.

This issue was also a topic of discussion at the ASHRAE Annual Conference in Indianapolis. Members engaged in a robust debate about the ethical aspects of these emerging technologies and the culture and policy shifts in a post-pandemic world. The consensus was that while innovation is important, it must be pursued responsibly, with a clear understanding of the potential consequences.

Thank you once again for sharing your concerns and contributing to this vital conversation. We are delighted that the column has prompted such serious reflection and debate on the important issue of health and well-being in the built environment.

Your input is invaluable as we continue to navigate these complex and evolving topics.

John McKeon, M.D.
Associate Member ASHRAE
Dublin, Ireland

Resources For Dust Collection Systems

It was nice to see the column "Creating a Clean, Safe, Productive Workspace: Dust Collector Design Demystified" by Chris Jester in the August 2024 edition of *ASHRAE Journal*. As a retired air filter sales engineer who sold dust collectors for over 40 years, I felt the column gave a great overview for the proper selection of a dust collection system. I would, however, like to add some useful resources and comments.

A valuable engineering guide for dust collection is *Industrial Ventilation: A Manual of Recommended Practice for Design*, published by the American Conference of Governmental Industrial Hygienists. It has been published since 1951 and is in its 31st edition. Other resources for design would be SMACNA guides for duct design and the use of literature from prefab duct companies that provide great knowledge on proper duct design and offer prefab, snap together duct good for partial or full system use.

For more information on explosion-proofing guidelines, the NFPA standards along with literature from vendor sites provide great insights.

A good understanding of electrical NEMA standards for weatherproofing and AMCA standards for explosion resistance on blowers is essential.

That being said, I always tell customers that the best way to prevent fires or explosions is proper, timely maintenance. Simply put, no fuel, no fire. Keep the collector and ductwork clean, and emptying dust receptacles in a timely manner prevents accidents and is extremely cost effective, reducing downtime in the process.

Last, as engineers, in duct design, do not try to be overly exact, but rather be close with a reasonable safety factor. I find in dust collection, the design drawing and the "as-built" can be close, but rarely match. Available duct diameters, angles of entry on branches, sharp transitions, etc., will have a bearing on final duct resistance. The unit itself will vary depending on brand, cleaning settings, dust characteristics and dust loading and will vary with installation contractor selection.

Rich Areskog
Member ASHRAE
East Meadow, N.Y.

Combustibility of Dust

I wish to thank Chris Jester, the author of "Creating a Clean, Safe, Productive Workspace: Dust Collector Design Demystified," which ran in the August 2024 edition of *ASHRAE Journal*. It's an important technical topic, and the column provided some excellent information. I appreciate your educating the ASHRAE audience. I have a few observations I'd like to offer. The author refers to dust as "flammable." Dust is combustible, not flammable. NFPA 652, Standard on the Fundamentals of Combustible Dust, provides the definition for combustible dust. This is important because combustible materials and flammable materials need to be treated differently per building codes and NFPA.

The author indicates that 4,000 feet per minute air velocity is an "industry standard" for dust collection transport. While 4,000 fpm would certainly suffice in most cases, a velocity this high is not always necessary.

Industrial Ventilation, A Manual of Recommended Practice for Design, published by the American Conference of Governmental Industrial Hygienists (ACGIH), offers guidance on what duct velocity is needed based on the nature of the contaminant. Velocities range from 1,000 fpm to 4,500 fpm and up depending on the weight and moisture content of what is being conveyed.


HVAC FUNDAMENTALS
Creating a Clean, Safe, Productive Workspace
Dust Collector Design Demystified

I am also not sure I fully understand the author's comments on blast gates. The author states, "Another important consideration is the inclusion of blast gates at all dust collecting branches. Blast gates allow the branch to be manually closed off when not in use. This aids in maintaining proper air speed within the ductwork." I agree that including blast gates at all use points is important. They allow airflows to be balanced. However, if branch blast gates are closed, the result may be reduced velocity in the ductwork, which can be dangerous. In my dust collection designs, I prefer to locate the blast gates out of reach of the users and lock them down once the system is balanced. This ensures that the proper conveyance velocity is always maintained.

Kelley Cramm
Life Member ASHRAE
Lenexa, Kan.

Creating Spark Resistant Fans

I am writing in response to the August 2024 *ASHRAE Journal* column entitled "Creating a Clean, Safe, Productive Workspace: Dust Collector Design Demystified."

In this column, mention was made of an "explosion proof fan" as a means of reducing possibly dangerous conditions where fan motors could be a source of (dust) ignition.

As a fan vendor I know that fans are not and cannot be made "explosion proof" or even "spark proof."

According to the Air Movement and Control Association (AMCA), the governing body of the fan industry, certain fans can be constructed to one of three levels of spark resistance, in accordance with AMCA Standard 99-0401. These are AMCA-A, AMCA-B and AMCA-C. These standards were established by AMCA to mandate the materials and methods used in the construction of a fan to make it spark resistant and therefore suitable for use in a hazardous-classified environment, when equipped with an explosion-proof motor.

The only part of the fan that can be made explosion proof is the motor itself.

In addition, mention was made of "antistatic, shaft-grounded…" as a means of limiting ignition sources. (The writer of this response assumes that shaft-grounding mentioned here has to do with motor shaft-grounding).

The purpose of shaft-grounding a motor is to protect the motor bearings from static electricity generated by the use of a variable frequency drive. This static electricity can find its way into the motor via the shaft, causing damage to the motor's bearings. The shaft-grounding does not provide protection from environmental sparking hazards from any part of the fan.

Over the years we have provided many fans, built to one of the three AMCA spark resistant standards with non-shaft-grounded explosion-proof motors.

Greg Paulsen
Member ASHRAE
Lenexa, Kan.