



Show Number: 723

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**Enhanced Indoor Air Quality in Commercial and Institutional Buildings
ASHRAE Guideline 42-2023**

Good Day and welcome to IAQ Radio+ episode 723 blog. This week we welcomed Tina Brueckner, Dr. Elliot Horner and Don Weekes for a show about ASHREA Guideline 42-2023 Enhanced Indoor Air Quality in Commercial and Institutional Buildings.

Guest Bios:

Tina Brueckner is the Senior Engineering Manager for the Engineering Development for Energy Systems Group's Federal Business Unit. She oversees the team that provides schematic and detailed design submittals, scopes of work and measured and verified savings for the technical solutions on performance contracts. Tina is the Subcommittee Chair for Guideline 42. She has a BS Electrical Engineering from Milwaukee School of Engineering and is a Certified Energy Manager and LEED Accredited Professional.

Dr. Elliott Horner, Lead Scientist at UL Solutions has worked in the IAQ field for over 30 years, conducting research and field investigations, providing training, disaster response and litigation support and was director of an IAQ laboratory. He is a recognized expert on fungal allergens and the impact of moisture in buildings, and has published over 50 research papers and book chapters. Dr. Horner was also along for the full Guideline 42 marathon.

Don Weekes has over forty-eight (48) years of comprehensive consultation expertise and project experience in the implementation and management of inspections for hazardous materials in numerous buildings throughout Canada and the United States. During the course of Mr. Weekes' career, he has served in numerous senior management positions in both the consulting and insurance industries. As a Certified Industrial Hygienist (CIH) and a Certified Safety Professional (CSP), Mr. Weekes has

served as an environmental health and safety professional for various international corporations.

OUTLINE

Enhanced Indoor Air Quality in Commercial and Institutional Buildings

ASHRAE Guideline 42-2023

The purpose of this guideline is to recommend measures that exceed minimum requirements for improving indoor air quality (IAQ) in commercial and institutional buildings. These measures are intended to provide enhanced IAQ that is acceptable to human occupants and that minimizes adverse health effects.

ASHRAE Guideline 42 is intended for a global audience of engineers, designers, hygienists, air quality practitioners, and building owners and provides a roadmap of varied best practices for improving ventilation and acceptable IAQ.

The sections of Guideline 42 are purposefully organized to reflect the path of air, beginning outside the building and moving through the building envelope, systems, and equipment to the indoor space. Enhanced IAQ is a function of interacting building systems and occupant activity. Highlighting the air path, and arranging subsections accordingly, creates a logical framework for future revisions.

Outdoor Air Quality
Buildings
Systems and Equipment
Indoor Air Quality
Procedures
Construction, System Start-Up, and Commissioning
Operations and Maintenance
References
Informative Appendix A: Health Impacts of Air Pollutants
Informative Appendix B: Humidity and Indoor Air Quality
Informative Appendix C: Carryover in Energy Recovery Units
Informative Appendix D: Case Studies
Informative Appendix E: Informative References and Bibliography

Questions, Discussion Points & Comments

Tina, please tell our audience a little more about your work and why you wanted to be part of this effort? Tina was involved in performance contracting with a focus on energy. Early in her career she learned what happens when buildings are tightened. She's been involved with ASHRAE for a long time. She became interested in contributing to a new document that goes above and beyond exceeds the minimum standards found in ASHRAE 62.1.

Don, why the new document important? The industry needed information and guidance beyond what is provided in ASHRAE 62.1. The new document is a useful tool for going beyond the minimum standards of 62.1. The new document builds upon 62.1 and lands between minimum standards and best practice. The new document looks at humidity differently. In the new document Dew Point replaces Relative Humidity. Looking at moisture through the lens of RH is about comfort and mold. Looking at moisture through the lens of Dew Point focuses on what's happening on surfaces which provides a better indication of what is happening on the building. Lew Harriman is credited with raising awareness of value of dewpoint over Relative Humidity.

Radio Joe pulled this from the document and likes how it is worded. "To avoid microbial growth, the building and its contents must remain dry. To accomplish that goal, ANSI/ASHRAE Standard 62.18 requires that the indoor dew-point temperature remain at or below 60°F keep the indoor air dry enough to reduce the potential for surface moisture absorption that leads to persistent dampness. Damp materials allow microbial growth that can increase the probability of negative health effects. Although bacteria and fungi are present in all buildings and on all surfaces, their presence is generally without negative consequences for air quality or health until surfaces absorb enough moisture for a long enough period to allow growth and reproduction."

Elliot, please update our listeners on your current activities and your reasons for wanting to be part of this project? Elliot started at UL in 2011, when UL purchased Air Quality Sciences. UL is now known as UL Solutions. Elliot is working on chamber testing, particle measurement and standards development.

Elliot, the document changes the way we look at unoccupied buildings. Many problems are caused when systems are shutdown when buildings are unoccupied.

Tina, the document recognizes the important role of systems and equipment; the guideline follows the air in the building.

Don, outdoor air quality is improving, however outdoor air quality is often geographically dependent. According to WHO there have been significant reductions in outdoor air contaminants.

Tina, Outdoor air is a mixed bag. It's about bringing in the right amount of air from the right place with consideration of energy. There is often tension between those who wish to improve IAQ and those who wish to reduce energy consumption. There is a greater use of building management

systems and reliance upon sensors. Dew point sensors require more maintenance than other types of sensors.

Elliot, Particle sensors have evolved and improved. More low-cost sensors are available now; some are good and some are not so good. When using dew point sensors for managing indoor air infrared cameras can be a valuable tool. Mold cares about the surfaces, Mold doesn't care about the air. Keeping surfaces 5° to 10° degrees above the dewpoint is what is recommended. Low-cost particle sensors commonly measure particles in micrograms per cubic meter. When using low-cost particle sensors, Elliot recommends relying upon particle counts only and not using the conversion function. Because math conversion assumptions done by these devices are never true. Look at counts, aim for cleaner air, there is no bottom end to lowering particles. Particle measurement is practical and feasible. Some sensors have been validated. The American Association for aerosol research has published multiple papers on building management systems using particle counting in schools and hospitals.

Elliot, Microbes are all around us. We shouldn't be concerned about how many microbes there are rather we should be concerned about what they are doing. This is like having teenagers in your basement, we aren't concerned about how many there are we are concerned about what they are doing.

Tina, Unintended air flow equals unintended consequences.

Stopping air leaks saves energy and can prevent entrainment of exhaust air. Tactics include: Air sealing and Management of air flows. Note: It is harder to manage air flows in older buildings.

Environmental tobacco smoke.

Tina, ETS management is dependent upon the state and the area. Some buildings such as casinos and cigar bars permit indoor smoking. Buildings which do not allow smoking indoors may offer outdoor smoking, in situations where outside smoking is permitted, distance away from the building is important.

Don, International standards on environmental tobacco smoke vary. Some countries are less restrictive and permit smoking in buildings. There are geographic considerations to environmental tobacco smoke in buildings, smoking indoors is permitted in Asia, etc.

Systems and Equipment

Tina, Outdoor air intakes need to be in the right position to prevent exhaust re entrainment. Some hospitals had good intentions but didn't think about the need for fresh air early enough.

Don, while surveying a roof he found roof mounted air conditioning units were located within 10 feet of space HVAC units. This situation was improved during renovation with the installation of new HVAC systems.

Options for improved cleanliness and access

Don, 80% of buildings don't have a problem, when 20% or more have a problem, it becomes an issue. The new guidelines promote higher levels of HVAC system cleanliness. Our committee talked

about ideas that were percolating among committees and went beyond. This was quite an effort and total agreement was not achieved. This is a starting point for an improved multidisciplinary approach to improving IAQ. Our committee responds to comments and questions. We meet quarterly. The document is on a 3–5-year revision schedule.

Tina, The document wasn't about cleaning. We could have searched wider and found more references on cleaning and access. We can only cover so many subjects at once.

Elliot, 62. 9 is a design guideline for designing new buildings.

Elliot, ASHRAE 62.1 2022 has a list of design recommendations to balance against the testing of gas phase air cleaning devices. What companies should look for when developing these devices... Development of test methods for air cleaners other than carbon. ASHRAE 241 test procedure for gas phase air cleaners was developed at warp speed. ASHRAE 145 efficacy and safety test procedure for multiple pass air cleaning devices.

Tina, The document contains good information on air cleaning devices tested against COVID. Better planning to avoid future problems. Allowance for less fresh air when the building can show that less fresh air doesn't adversely impact IAQ.

Air Cleaning. ANSI/ASHRAE Standard 62.18 allows Class 3 and Class 4 air to be redesignated by following portions of the IAQ Procedure (IAQP) to demonstrate the reduction of contaminants. The reduction of contaminants below harmful levels allows Class 4 air to be redesignated as Class 3 air. The reduction of contaminants below significant levels allows Class 3 air to be redesignated as Class 2 air.

Procedures

ANSI/ASHRAE Standard 62.1 three procedures to design for indoor air quality
Ventilation Rate Procedure (VRP)
Indoor Air Quality Procedure (IAQP)

Natural Ventilation Procedure (NVP)

Don, Forced air HVAC systems are popular in North America. Natural ventilation is popular in other countries which is why information on natural ventilation has been included in the document.

Tina, These procedures offer three fundamental strategies for maintaining acceptable IAQ: dilution, extraction, and source control.

Radio Joe, In regard to Contaminants Introduced by Occupants –I did not notice any comments on personal care products or on having a program for how occupants can avoid causing IAQ issues?

Don, Nothing specific in the document on personal care products. Plants, pets tracked in soil, all have an effect on IAQ. Nova Scotia restricts use of excessive quantities of personal products. One suggestion is shoe removal. Our committee responds to comments and questions.

We meet quarterly. The document is on a 3-5 year revision schedule. 62.1 has recommendations and guidelines from California and elsewhere. Health of Occupants is addressed in Informative:

Appendix A. Tina, Carryover the impacts of air recovery and entrainment of exhaust case studies using the IAQ procedure.

Radio Joe-A class for O&M staff building managers etc could be developed from this document. It gives practical field-based solutions to problems. Are there any plans for this? Don, the document is well suited to a course, and a course is a great idea.

RoundUp-

Tina, On Construction & Commissioning. Is the system working as intended? If the system is not commissioned correctly there will be problems later.

Restoration Global Watchdog Pete Consigli-

- Industry awareness of the importance of dewpoint can be traced back to Munters and their Moisture Control Handbook written by Lew Harriman.
- The late Dr. Phil Morey, PhD also spoke of the importance of dew point and water activity.
- The restoration industry is and has been using very sophisticated temperature, humidity, dewpoint and equipment monitoring via sensors and cloud-based software.
- Pete remembers the battle in ASHAE 62 over whether 62 would be a health based or technical document.
- Carl Grimes is serving on an ASHRAE committee that is writing an IAQ paper to differentiate between Indoor and Outdoor Air Qualities.
- Factors affecting IAQ and IEQ include: VOCs (chemicals), Microbes (biologicals), Particulate, Heat, Noise & Light.
- Can and does the committee that Carl Grimes is working on communicate with other ASHRAE committees?

Elliott Horner-

1 – ASHRAE 62.1 and Guideline 42 are design documents. Although there is some information about operations they focus on the design of a building before people are in the building. That said, many principles of good design are helpful during the life of a building and Guideline 42 will be helpful throughout the lifetime of a building.

2 – ASHRAE 62.1 is a minimum standard. A minimum standard is the least needed to not fail. An algebra test or a history term paper earns a D- if it is just enough to not fail. Guideline 42 is supplemental to 62.1 for going 'above and 'beyond' the minimum. Going above and beyond 'not failing' is always a good thing and Guideline 42 has ways of doing that.

Don Weekes-

- Lan Chi Weekes is serving on the committee with Carl Grimes
- The ASHRAE Rule of The Board (ROB) opined that ASHRAE was comprised of engineers not health experts. The Rule of the Board was recently changed to now recognize health.

<https://www.techstreet.com/ashrae/searches/39736642> link to purchase the guideline

Z-Man Signing Off