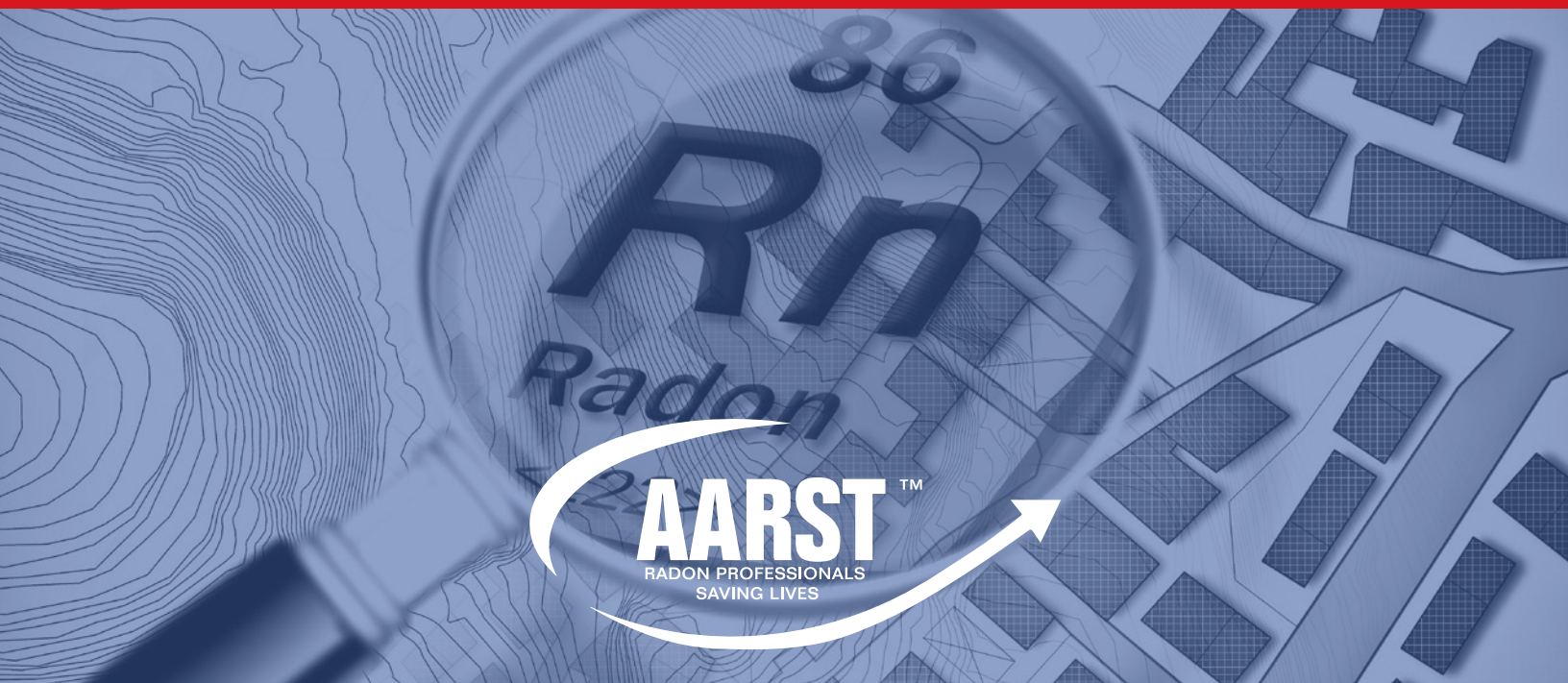


THE CERTIFICATION REPORT

The biennial report on radon certification in the US, NRPP's ISO certification process, changes in state laws, and successes shared

THE RADON REPORTER

PRACTICAL INFORMATION FOR YOUR SUCCESS



SUMMER 2019

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The International Radon Symposium™ and Trade Show September 9-11, 2019 Grand Hyatt Denver, Colorado

*"The warmth and friendship, the vitality,
the fun, AND the Night Out (Brilliant!!)"*

- Martin Freeman, PropertECO UK

*"Each time the exhibit hall
gets better and better."*

- Karen Claus, RKC Inspections

*"I liked the variety of speakers and topics best.
There was something for everyone
and I learned a lot."*

- Thomas Selgrade, Midwestern Radon Supplies

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AARST™, the American Association of Radon Scientists & Technologists, is a nonprofit, professional organization dedicated to the highest standard of excellence and ethical performance of radon measurement, mitigation, and transfer of information for the benefit of members, consumers, and the public at large. AARST's leadership is democratically elected by the members.

AARST represents your voice as we meet the wide range of challenges facing radon professionals and the community. Your membership and participation provide you a voice in the changes to come, and allows you to gain updated information, discover new techniques, learn about new problems before they occur, and hone your professional skills.

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Letter from The President

By David Daniels, President, AARST



After 20 years in the radon industry, you might believe I am secure in thinking I know it all. While I am confident, I am far from knowing it all; there is always more to learn.

I discovered years ago there is no greater opportunity for learning than The AARST

International Radon Symposium and Trade Show. I attended my first Symposium in Reno, Nevada back in 2002, and it was fantastic! Why? Because, I was able to meet people from all over the country who were also crazy enough to get into this business!

I met some of pioneers that helped start this industry and relished listening to all of their war stories. The attending vendors were showing new products and even sharing advice on how to improve my business. It was comforting to be around people that did not just want my money, but really seemed to care about helping my company thrive.

The Symposium educational offerings cover everything you need. Nowhere else will you learn so much in such a short period — sessions about testing, mitigation, public speaking, difficult homes, etc. Additional classes are even held on Sunday before the opening reception. Attendees who need

continuing education can earn credits by attending the Symposium sessions on Monday and Tuesday - included in the price of registration, not to mention Sunday's AARST-hosted CE courses. There is SO much to learn; I wish I could attend them all!

This year's event is in Denver, Colorado, one of my absolutely favorite places to visit. The scenery is gorgeous and there is plenty of fascinating stuff to see and do. I make a point of getting there a few days early so I can help a little getting the office set up, stuffing swag bags and enjoying the city on my own time.

The Symposium is the largest gathering of radon professionals in the world. Let that sink in! Participating will give you access to opportunities and connections that will last for years to come. Our AARST staff and the Symposium Committee (all volunteers) work tirelessly all year to bring you the best experience possible.

Make a point of going to meet new friends, see old friends, and learn, learn, learn. If you have been in the business for a while, reach out to the new people. Take some time to get acquainted and offer to be a resource for them. There will be plenty of time to interact, hear stories, and have a good time. Make a point to sit down to eat with people you do not know. Make an effort to network and meet your radon community. This is your trade organization, your industry; do not miss out on the most important event of the year to grow your business. ●



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Executive Director



DALLAS JONES

Dallas Jones has over 30-years of experience in radon-related services including testing, mitigation, chamber operation, monitor manufacturing, quality assurance, curriculum development, and teaching. During that time he has been active as a radon-advocate, originating the American Radon Policy Campaign, co-founding Cancer Survivors Against Radon, and drafting the original Radon Awareness Act that Gloria Linnertz successfully promoted through the Illinois General Assembly. You can find him leading volunteer groups to remote places in the Caribbean and South America to help orphaned and abandoned children. The volunteers make improvements to the orphanages, provide medical assistance, and education.

National Policy Director



JANE MALONE

As National Policy Director for the past 4.5 years, Jane supports the efforts of the Board, chapters, and members to ensure radon risk reduction and consumer protection are implemented in federal, state, and local policies. Her (part-time) job involves researching, writing, presenting, meeting, strategizing, coaching, and cajoling, along with some confronting. Jane has more than three decades of experience in public interest advocacy, mostly with housing-related concerns. Her work at the national level, including Congress and executive branch agencies, began in 1998 when she joined the Alliance to End Childhood Lead Poisoning. She resides with her husband, Dean Snyder, at a six-acre farm on Maryland's Eastern Shore where they raise vegetables, fruit, and poultry.

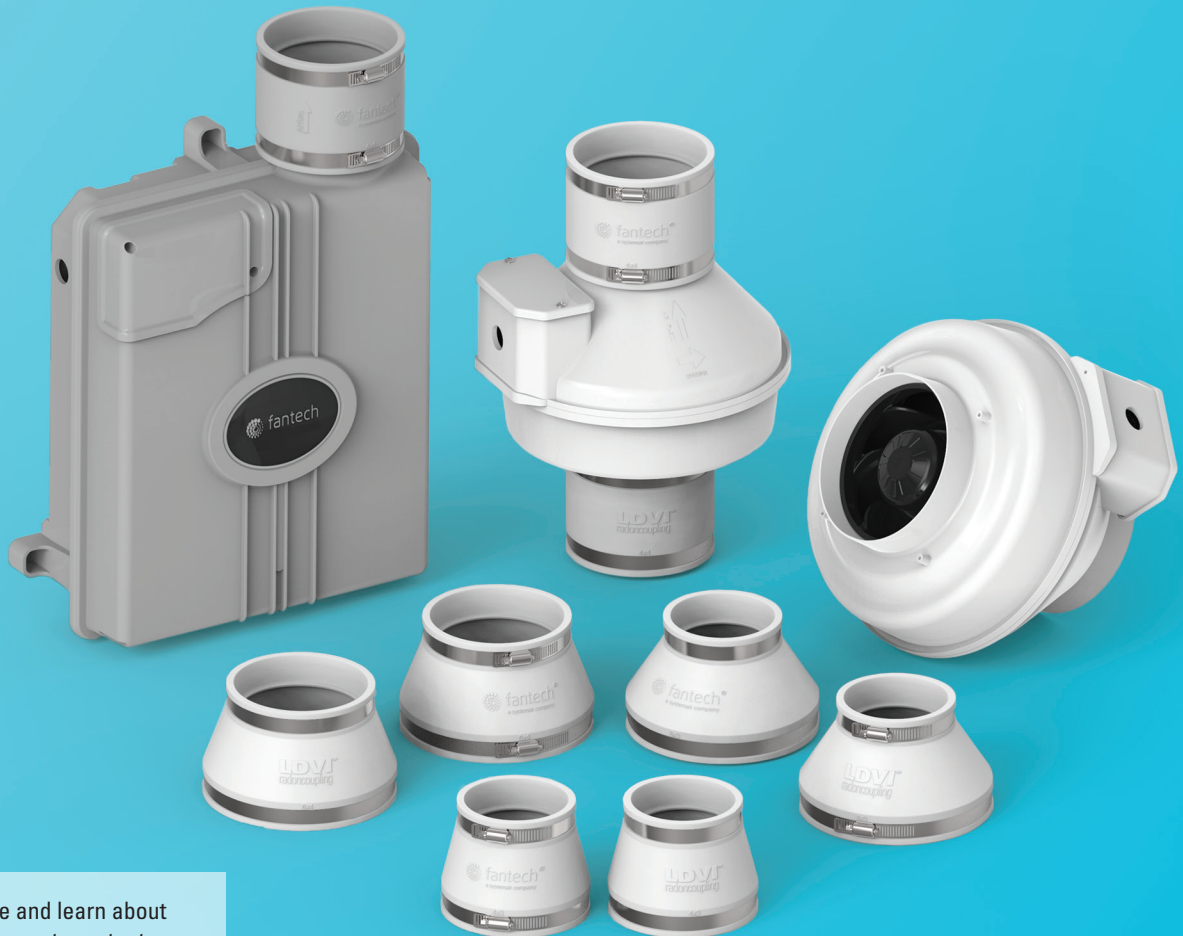
Executive Vice President



PETER HENDRICK

Peter Hendrick works for AARST on public policy initiatives and advising the AARST Executive Director on all the good things AARST does. Peter is AARST's former Executive Director and served for 15 years before retiring and becoming part-time. He has spent over 35 years in the environmental services sector, running small and large businesses, and working on environmental public policy in North America. He likes going very fast, very close to the ground, on skis or bicycles, especially in bad weather! Other than that, directing and writing plays, live theater, and teaching acting to adults.

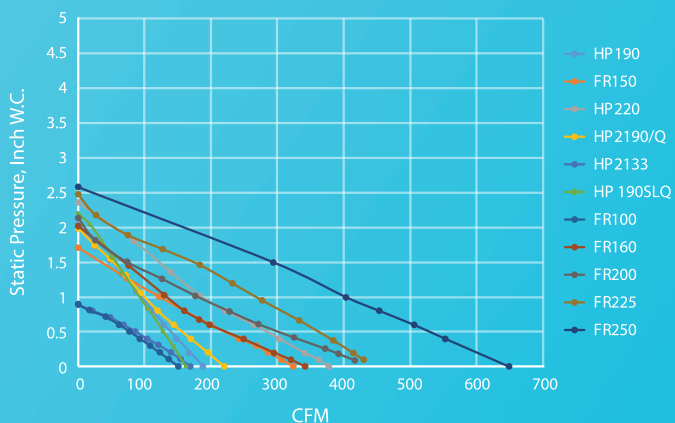
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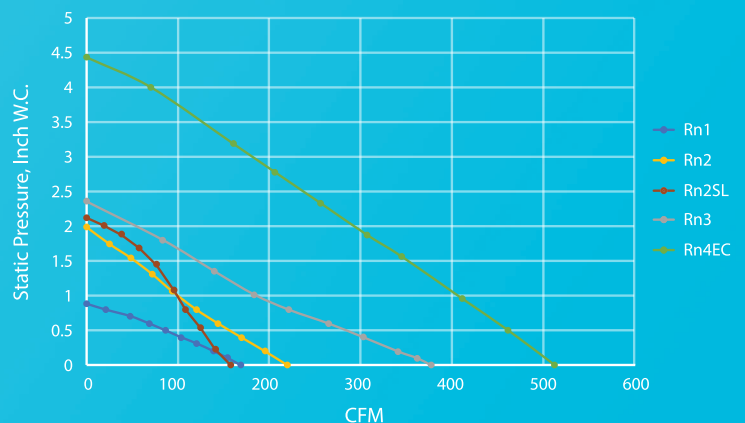
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Communications Director/ Symposium Manager



NICOLE CHAZAUD

Nicole Chazaud has ten years of experience working for AARST. She finds helping our professionals problem-solve the most rewarding. Before working for AARST, she worked as a Design Director for a Fortune 500 company with projects in the US and Europe. She is an artist, trained and practiced in many mediums, and presently interested in printmaking. Nicole lives in New Hampshire with her husband Tom, and their Instagram-loving dog named Buddy @ happybuddydog!

Office Administrator/ Accreditation Specialist



JOHNNA MCNAMARA

Johnna McNamara has worked at AARST for seven years. With a degree in Accounting, she has a varied background doing statistical research, audits, and obtaining compliance for the accreditation process in the health care industry. She is well acquainted with the criteria that AARST will need to maintain in the years to come once ANSI accreditation is achieved. Johnna enjoys getting to know individuals from all around the country. She is an avid sports fan, enjoys scrapbooking, reading, and working backstage for theatrical performances.

NRPP Credentialing Coordinator



CHRISTINA JOHNSON

Christina Johnson has a Bachelor of Arts in Mass Media Communications and has worked with AARST for nine months. Her previous experience as the communications manager of a credentialing organization, The Loss Prevention Foundation, has allowed her to understand the professional certification process. She enjoys helping/assisting people with what is important to them, their professional certification. Additionally, she has 15+ years of administrative office experience, marketing, and public relations efforts. Christina has a 7-year old son and a kitty named Nova. Her hobbies include painting, upcycling/repurposing crafts, hiking, kayaking, and interior design.

The Low Voltage Revolution is HERE!

The future is here: Gasoline cars are being replaced with electric cars. Light bulbs are being replaced with LED bulbs. And... traditional radon fans are being replaced with low voltage fans. Why is all this happening? There are two reasons: Better performance and better efficiency.

WHAT'S GOING ON?!

It seems like every radon fan manufacturer has introduced new low voltage products this year. The advantages are clear. More and more municipalities are "cracking down" on radon contractors for performing 110-volt wiring without an electrical license. This problem is only going to get worse as statutes continue to be implemented to impose penalties, and in some cases criminal action against anyone performing electrical work without being licensed. There are only two solutions to this problem: You can either hire a licensed electrician to do all your wiring, or you can switch to low voltage radon fans. In many states, an electrical license is not required for low voltage systems.

WHAT ARE THE ADVANTAGES OF USING LOW VOLTAGE SYSTEMS?

There are many advantages to direct current (DC) motors over alternating current (AC) motors. The performance capabilities of DC motors are far superior simply because higher motor speeds can be achieved. Most traditional radon fans use AC motors, which have maximum speeds of about 3000RPM. Anything more than that will result in excessive heat, noise, and premature failure. However, DC motors are computer-controlled to regulate the power draw to maximize the motor efficiency based on the current operating conditions. This allows DC motors to safely run at speeds exceeding 5000RPM! The advantages of this technology is clearly demonstrated when PressureTech unveiled the PT8 radon fan at the 2018 AARST Symposium. Thanks to DC motor technology, the PT8 can achieve over 8-inches of suction at 24-volts and under 100 watts. Prior to the PT8, those numbers were unheard-of in the radon industry.

ADDITIONAL BENEFITS OF LOW VOLTAGE RADON FANS:

SAFETY Your workers simply cannot get shocked by a low voltage current, even if they were to directly touch the "live" wires.

EFFICIENCY Low voltage fans simply use less electricity than traditional radon fans. Alternating current is much less efficient than direct current. This is the same principle that allows an LED light bulb to put out more light than an incandescent light bulb, while using less electricity.

FLEXIBILITY Direct current motors are speed controllable with incremental efficiency gain as motor speed is reduced. When attempting to control the speed of a traditional (alternating current) radon fan, efficiency is often compromised by capacitor overload and audible humming can occur. This does not happen when controlling the speed of a DC fan.

DURABILITY Low voltage motors are expected to last longer than traditional fan motors simply because they run at lower temperatures. Since the motors only draw enough current to meet the specific conditions of the operating environment, there is not excessive heat buildup like there is with 110-volt motors which often leads to premature failure.

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Welcome to AARST! New Members Since 2019

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Rodney Whitehouse (SC)	Steve Bossard (NY)
David Kosanke (MO)	Scott McIntyre (IN)
Ryan Cramer (VA)	Dan Herring (IL)
Christopher Gibson (KY)	Alessandra Anteau (MI)
John Pelkey (FL)	Bain Beston (NY)
Pete Gibson (KY)	Justin Fulbright (NE)
Ron Fast (OH)	Alicia Fulbright (NE)
Adam Moeschberger (IN)	Steve Pollard (NE)
Erik Heine (WI)	Keith Carpenter (PA)
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Colin Chres Jensen (CO)	Jordan Bird (MD)
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Amy Kleptach (OH)	Greg Orr (IN)
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Brian Bacchus (PA)	Matt Boisen (CO)
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George Gabbert (CO)	Jacob Nelson (MO)
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THE BIENNIAL REPORT ON RADON CERTIFICATION

NRPP PLANS FOUR INITIAL CERTIFICATIONS

We all gathered in scenic Leesburg, Virginia on May 7th and 8th. With me were nine NRPP radon measurement professionals, nine radon mitigation professionals, the NRPP Accreditation Specialist, Johnna McNamara, two psychometricians, and their administrative assistant. The purpose was a workshop to write certification exam items.

The completion of several to-do items occurred before being able to arrive at this juncture in NRPP's pursuit of ANSI/ISO 17024 Accreditation for Personal Certification Bodies.

First, subject matter experts (SMEs) participated in the Certification Scheme and Job Task Analysis (JTA) in Indianapolis late last August. The SME's determined the need for four initial certifications: two for residential radon measurement and two for residential mitigation. They are:

- Radon Measurement Field Technician
- Radon Measurement Professional
- Radon Mitigation Installer
- Radon Mitigation Specialist

The Measurement Field Technician and Mitigation Installer are entry-level or employee certifications, specifically designed to assure the competency of persons doing specific onsite tasks; persons with these certifications must work under the general supervision of a Measurement Professional or a Mitigation Specialist. In addition to providing oversight, the Professional and Specialist would be responsible for implementing and documenting direction, quality assurance procedures, system design, and final reports.

The Job Task Analysis also determined the need for Endorsement Certifications for specialized projects like Multifamily Measurement or Mitigation, Schools and Large Buildings, Radon in Water and perhaps Vapor Intrusion Prevention.

During the JTA workshop, the production of a set of job task domains, sub-domains, and knowledge, skills, and abilities (KSAs) statements for each of the proposed four certification levels was completed.

After receiving approval of the scheme and JTA by the NRPP Certification Council, our consultants at Dainis and Company conducted an online survey of certified professionals asking participants to weight the domains and subdomains by their relative importance for a worker to be considered competent to perform those job tasks. Almost 400 certified professionals responded. With those responses, Dainis created four

exam blueprints. In April, our psychometrician consultants hosted a webinar to familiarize the experienced field practitioners recruited to help with exam writing on the fundamentals of creating fair and valid test questions.

A psychometrician is someone who practices the science of educational and psychological measurement, or in other words, testing. Psychometricians measure the validity, reliability, and fairness of an exam program, and are an integral part of the process of creating valid and reliable language tests. We involved them in the development of the test specifications, and the item writing process. The value of the psychometrician is ensuring that each part of the processes conforms to testing industry standards (such as those in the Standards for Educational and Psychological Testing, considered the primary source for test publishers, test takers, and test users).

Psychometrician consultants led the May exam writing workshop. Participants were schooled in the most critical element of test development: statistical equivalence. Candidates should not be penalized for taking harder versions of an examination, nor rewarded for taking an easier version. Test developers can control for statistical equivalence when constructing exams by careful selection of the items.

They also learned how to construct objective effective test questions and answers, using basic principles such as:

- The correct answer must be technically correct and accurate, with no room for debate. Part of the process is to eliminate ANY possible way someone could argue for an answer other than the one you deem correct.
- Questions must be meaningful, job-related, and stick to the exam blueprint. Items should match the objectives in the blueprint and not use jargon, slang, or cultural references.
- No trick questions! We want to test someone's skills or knowledge, not send them on a mental roller coaster ride.
- Questions should not contain extra wording. (They should be fair to those candidates for whom English is a second language.)
- Item writers must avoid showing what THEY know instead of trying to find what the candidate knows.
- The stem or scenario must not give a clue to the answer, but the item must include all information required to answer the question. Candidates

THE BIENNIAL REPORT ON RADON CERTIFICATION

NRPP PLANS FOUR INITIAL CERTIFICATIONS

should be able to answer based on the information provided and make no assumptions.

- Good exams avoid using compound answers. An example of this would be “red and blue” or “menus and radio buttons.” If this is a “choose two” question, for example, a candidate could argue that by choosing “red and blue,” they chose two answers.
- Writers should avoid “not” questions or negative phrasing in the scenario or stem. This is like tossing out a mental hand grenade or a speed bump at the candidate. Instead of asking, “Which feature is not supported?” turn it around and ask, “Which three features are supported?”
- No trivia questions! A technical professional knows how to find information in a manual or technical standard or use a help file. We need to ask about something one should know to perform the job.

In summary, the ANSI Accreditation process requires our exams to be professionally evaluated using these methods and approaches. While our existing exams were written by well-intentioned, knowledgeable subject matter experts, for NRPP to earn ANSI accreditation, the use of third-party psychometricians is required to make sure every question is fair, impartial and well written.

WHAT'S NEXT ON THE EXAM FRONT?

Assemble and Deliver Beta Exams - Once reviewed, edited, and approved, items are placed in the item pool. The item pool or item bank is a depository of all items that are viable candidates for the examination. Beta examinations are conducted during a limited period. A main goal of the beta exam is to field test the entire item bank. While this may require multiple beta exam forms, it will provide us as many items as possible to use when developing the operational forms.

Analyze Beta Exam Results - Item data are reviewed to see if they performed as intended. At a minimum, statistics are reviewed from a psychometric perspective to determine item difficulty and item discrimination.

- Item Difficulty is measured by the proportion of candidates who answer the question correctly. In other words, the correct response option for an item should be chosen more frequently than the incorrect options.
- Item Discrimination is measured by distinguishing responses between low scoring candidates and high scoring candidates. If low scoring candidates are getting an item correct, while the high scoring

candidates are missing it, there may be a problem. For example, perhaps the wording of the item results in higher scoring candidates misinterpreting the question and selecting the incorrect response, while lower performing candidates answered it correctly. This case is called negative discrimination. The goal is to have positive discrimination where higher performing candidates answer the question correctly while lower performing candidates miss it. As a result, the question has the predictive ability of total exam performance.

Construct Equivalent Exam Forms - While designing the exam to meet the specifications of the test blueprint, our psychometricians strive to maximize the reliability of the examination. This assures that the same results could be replicated if the same candidates were tested again under similar circumstances.

For many test security reasons it is necessary to have multiple forms of an exam, making it critical that the exams are operationally equivalent from both a content and statistical perspective, as well as being reliable measures. In other words, no matter which form a candidate receives, the candidate will have the same number of questions on a topic as a candidate receiving a different form.

We also must ensure statistical equivalence, so candidates are not be penalized for taking harder versions of an exam, nor rewarded for taking an easier version. Our psychometricians can control for statistical equivalence by carefully selecting questions using the beta test results.

Establish the Passing Scores - After the exams are constructed, the passing score for each exam must be determined. In accordance with testing guidelines, pass/fail standards must be established in a manner that is generally accepted as being fair and reasonable, rather than arbitrarily set.

BOTTOM LINE

I was impressed with not only how hard the item writers worked, but how the psychometricians facilitated such an efficient procedure for maximizing the output. Administering properly developed, fair, and impartial exams is just one of many factors ANSI will audit and evaluate as we earn our ANSI 17024 Accreditation. Once we have that accreditation, ANSI will serve as NRPP's certification quality assurance provider, and candidates and certified individuals can count on every aspect of the program being administered according to the highest standards of excellence – with the third party documentation to prove it. ●

- Dallas Jones

THE BIENNIAL REPORT ON RADON CERTIFICATION

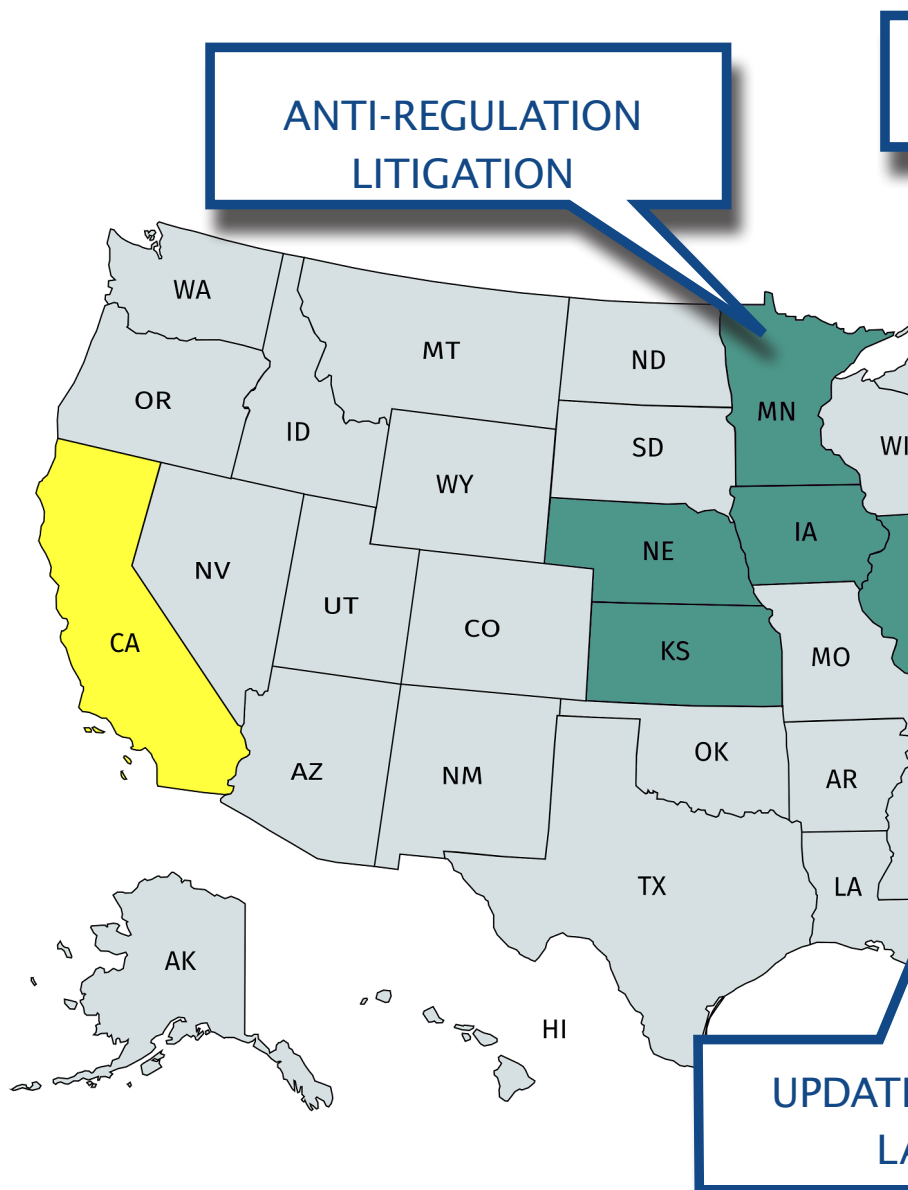
STATE CERTIFICATION AND LICENSURE LAWS

In response to a need to provide for accurate and consistent results in radon testing and to deliver effective radon mitigation to reduce radon levels, consensus-based professional standards and a cadre of trained certified professionals have emerged over the past three decades. There is little doubt that radon risk and exposure in dwellings and in the workplace presents a complex building problem demanding personnel who are appropriately trained and following recognized national standards.

In the United States, eighteen states (CA CT FL IL IN IA KS KY ME MN NE NH NJ OH PA RI VA WV) have laws or regulations in place that require some form of proficiency qualifications for professionals doing radon work in the marketplace. Eleven operate state-based licensing systems, through which state regulations define state-specific terms and conditions (rules) under which licensees will secure, renew and retain radon credentials. Seven other states offer licensing through certification, requiring that radon work be performed by persons who have earned certification from an EPA-recognized proficiency program (National Radon Proficiency Program and National Radon Safety Board). Some of the “licensure through certification” states offer a license or certificate that documents state oversight of the credential provided by the proficiency program.

States’ continuing oversight of professionals’ radon credentials is a central element of radon risk reduction. These regulatory structures encourage compliance with recognized standards of practice and ethical professional behavior to ensure citizen protection; when necessary, they enable enforcement, with consequences for non-compliance.

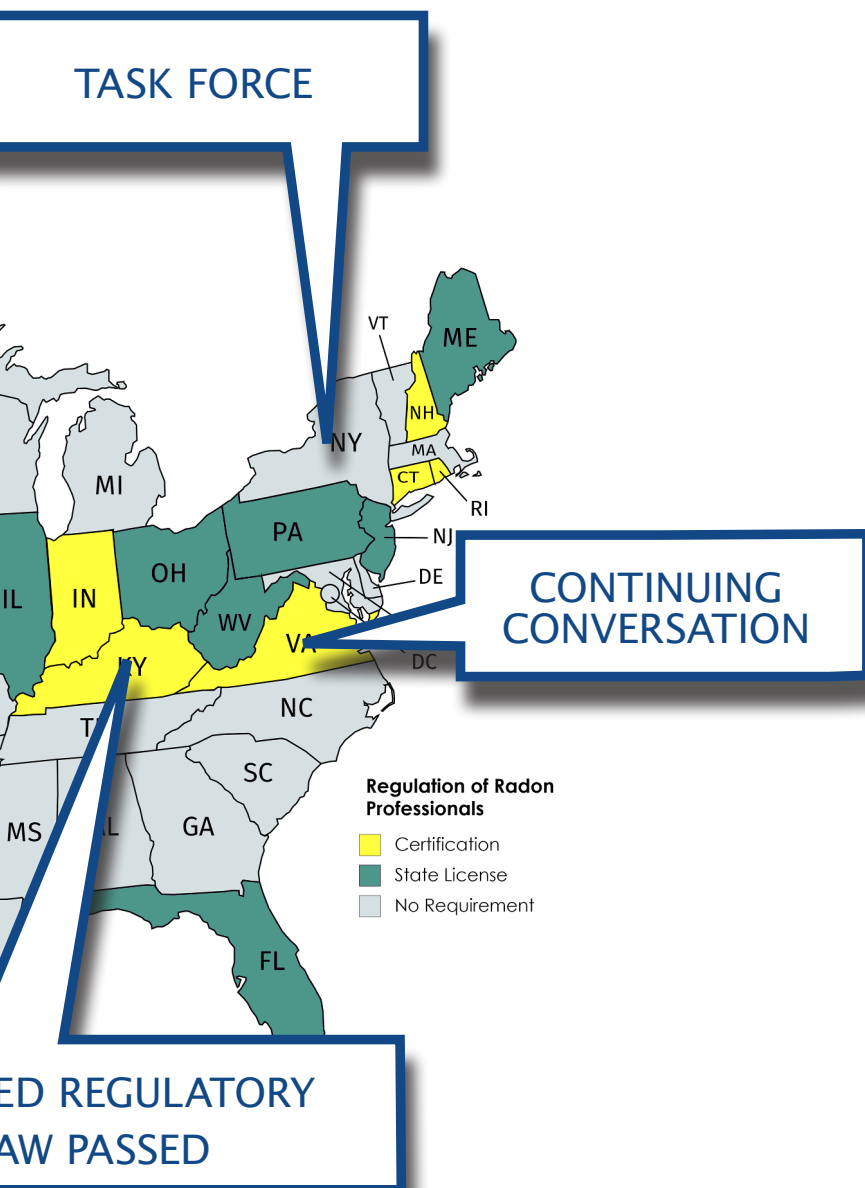
Although they don’t guarantee quality, when designed and administered properly, such regulatory programs will influence positively the effectiveness and reliability of radon services. This is no different from the professional oversight of other licensed professionals, be they doctors, engineers, barbers or occupational therapists. If necessary, state oversight of



STATE REGULATORY PROGRAMS, BOTH LICENSING AND LICENSURE THROUGH CERTIFICATION, HAVE BUILT THE REPUTATION AND CREDIBILITY OF

THE BIENNIAL REPORT ON RADON CERTIFICATION

STATE CERTIFICATION AND LICENSURE LAWS



LEGISLATED REGULATORY
LAW PASSED

PROPERLY TRAINED AND CERTIFIED RADON PROFESSIONALS AND, AS IT HAS IN OTHER LICENSED PROFESSIONS, WILL ENHANCE CONSUMER DEMAND FOR RADON SERVICES.

enforcement cases will let other professionals and the public know that radioactivity is a serious business.

Some of the trouble spots for state regulatory programs can be statutory and regulatory references to outdated standards, failure to ensure that multifamily projects comply with 100% testing of ground floor units as required in the ANSI-AARST standard, and the absence of requirements pertaining to approved radon measurement devices and/or quality control. Such matters require ongoing discussion and dialogue between radon professionals and state radon policy makers to ensure policy keeps up with industry best practice.

In states with no regulatory program in place, there appears to be a growing vacuum of public accountability for compliance with professional radon standards. While the EPA-funded radon program requires funded states to publicize listings of radon professionals credentialed by EPA-recognized proficiency programs (NRSB and NRPP), in the non-regulated states untrained personnel have unlimited access to unsuspecting consumers. The absence of proficiency requirements in these states allows unqualified personnel to conduct radon-related services and enables entities not recognized by EPA to issue unproven credentials. The value of certification and licensing programs is paramount in the competitive marketplace, especially when dealing with radioactivity. Once the real estate community and consumers experience unsatisfactory radon results from fly-by-night, untrained professionals, the public image of properly trained and certified radon professionals and the value of their skilled services are in danger of becoming diminished.

To counter this trend, AARST Chapters and professionals have been working to secure recognition of national standards and licensure through recognized private certification programs that require adherence to such standards. ● -Jane Malone

THE BIENNIAL REPORT ON RADON CERTIFICATION

EMERGING STATE RADON CERTIFICATION/LICENSURE

The **Kentucky** legislature has completed an overhaul of its 2011 radon certification law. The Kentucky Association of Radon Professionals was instrumental in providing input and accomplishing the revisions.

Previously, the Kentucky legislature the law established a freestanding state-operated radon certification program. The revision (Chapter 159 of 2019) creates state registration certificates which will be issued only to radon measurement and mitigation contractors who possess certification through a proficiency program, defined as NRPP or NRSB.

The new law exempts from the certificate requirement persons who assist measurement and mitigation contractors and are under their supervision. Measurement, mitigation, and lab analysis must be conducted in accordance with standards established by an accredited American National Standards Institute development organization. Measurement professionals may only use devices approved by the proficiency program. Contractors and labs must complete a registration process and have general liability insurance.

Discussions in **Virginia** between radon professionals and others prompted the Virginia legislature to first direct the state Department of Health to conduct a study in 2018 and then to enact a law (Chapter 279) in 2019 relevant to radon certification.

Currently Virginia law states that no person “shall conduct or offer to conduct any radon screening, testing, or mitigation ... unless (i) listed as a professional by either the National Radon Proficiency Program or the National Radon Safety Board or (ii) meets any other proficiency measures deemed acceptable by the U.S. Environmental Protection Agency or the Board of Health for the purpose of offering such screening, testing, or mitigation.”

Although the introduced bill (H1885) required the state to establish a program for regulating radon testing and mitigation professionals, including certification requirements, the bill was amended to merely continue to require public access to lists of certified radon professionals. In the previous year, a

bill (SB460) requiring a home inspector performing radon measurement to possess certification or be otherwise qualified was introduced but not enacted.

As a result of advocacy by the **New York** Chapter of AARST, in 2018 the New York legislature established a Task Force to examine the need for training, education and possible licensing of radon professionals. The legislature passed another bill in April 2019 to extend the time frame for results to November 1, 2020. The task force, which includes the President of the Chapter, is having its first meeting in June.

Several attempts have been made to reverse the 2015 **Minnesota** law (MN Statutes 144.4961) requiring licensing of radon professionals. Litigation has delayed implementation for mitigation. Bills (S1559, H1646) were introduced in 2019 to prohibit requiring radon credentials for mitigation performed by building contractors. Both AARST and CanSAR leaders presented objections at the Senate hearing; the bill did not pass, but was held over for next year.

Other states are reviewing their requirements, including **Indiana, New Jersey, Ohio, and Pennsylvania.** ● -Jane Malone

AARST stands ready to assist AARST chapters, members in states without chapters, and state agencies and legislatures with securing new regulatory requirements and strengthening existing requirements.

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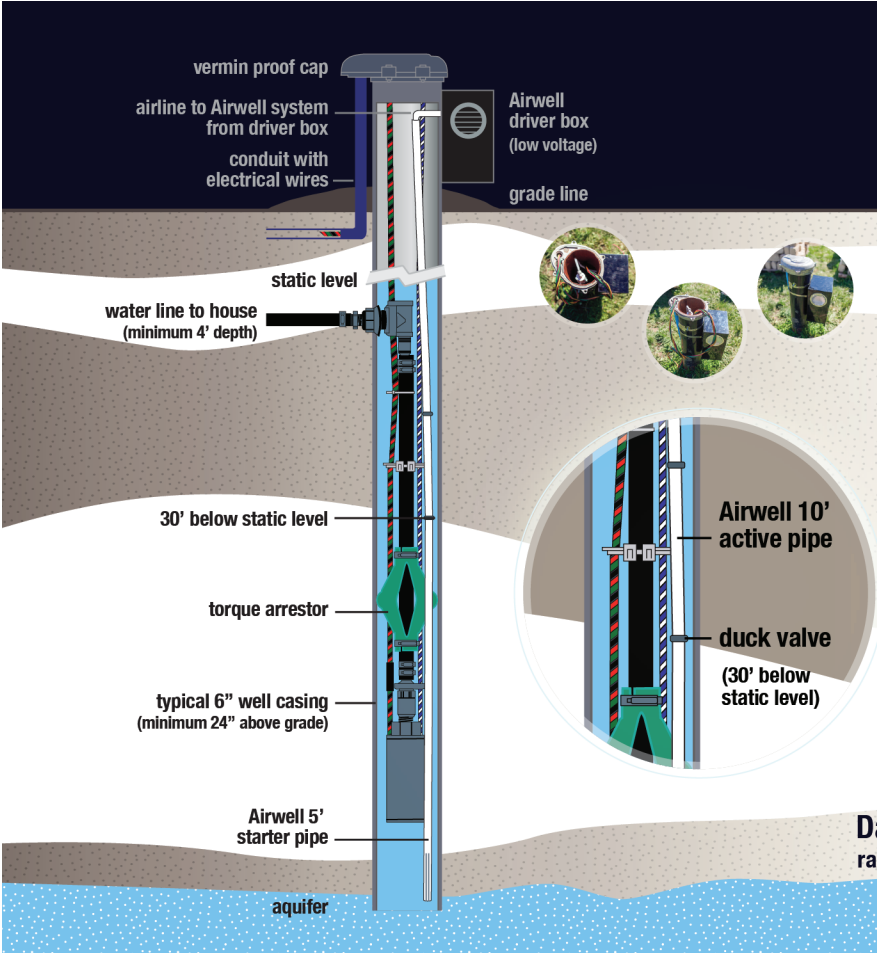
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Marketing Tips for Business During the Summer

Sponsor Your Local Little League or Soccer Team

Are you scratching your head wondering how to stay connected with your market during the summer? Give back to your local community by sponsoring an organization or community group that has a youth sports team. Brent Ulbert mentions this as one of his marketing tactics in the Radon Connection podcast episode "Small Business Marketing." Offer to outfit a team in exchange for prominent logo placement. Make it an annual tradition so you can become a proud sponsor over the years. If you have enough personnel to field a team of your own, host a fund-raising event for good-spirited competition and donate to a local charity. Make sure you contact the local media, so they create an article showcasing your event. ●



Photo Credit: UnitingNC

Summer Volunteer Opportunities

Spread the word about what you do! Involvement with local causes helps give you public clout. Summertime can be an ideal time for meeting your community members as many are on a more relaxed schedule.

Make time to volunteer within the community. Calendars are filled with special events for causes that need support. You can partner with churches, homeless shelters or Habitat for Humanity builds, or get a team together to participate in a 5K run. Your company name will be a regular mention among neighbors, the more you put yourself out there. ● -Nicole Chazaud

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Membership Coordinator/ Integrated Media Manager



AMY MORRIS

Amy Morris has worked as an AARST contractor since 2017 and recently became a full-time staff member. She loves getting to know and working with AARST members from around the country. Her previous experience as a photo-journalist for a large digital media publication gives her the skills to assist AARST in growing their digital presence. She has a BS in Psychology, is certified in Graphic Design, Print Media Technology, and will complete her PMP this year. She is an award-winning photographer and has been featured in multiple publications. Amy loves to travel and cook, but most of her free time is spent encouraging her three children with their different activities.

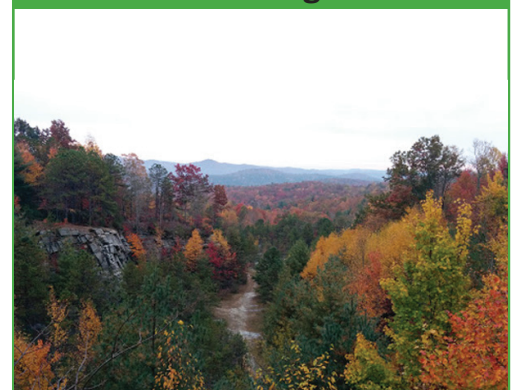
Exam Coordinator/Standards Operations Coordinator



MARILYN PATRICK

Marilyn Patrick has worked with AARST for one year. She is a graduate of the University of Florida with a BS in Public Relations. Her background includes marketing, project management, administration, and public relations. She loves spending time with her family and working with them at a local food pantry, reading, decorating, crafts, and hiking.

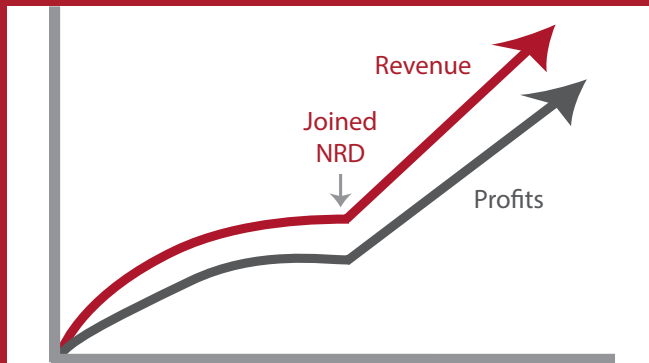
IT Department Manager and Software Engineer



MIKE DEVAYNES

Mike Devaynes has worked for AARST full-time for the past five years and previously as a private contractor since 2000. He has 32 years experience in the radon industry, solving a variety of design, manufacturing, management, and software customization needs. Mike plays guitar, enjoys wood carving and flint knapping, but is also an avid hiker. He has hiked 1000 miles in 100 days from the tallest mountain on the east coast (Mt Mitchell, TN) to the ocean shores at the coast of North Carolina (Jockey's Ridge, NC).

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Finance Director



CALVIN MURPHY

Before becoming self-employed and ultimately assuming the AARST Finance Director position, Calvin had fifteen years of experience in financial positions with Fortune 500 companies and holds a BSA in Accounting. He is responsible for creating the AARST annual budget, recording expenses, and reporting monthly to the Executive Committee and Board of Directors. Calvin plans to retire from AARST at the end of 2019. He will continue to enjoy his cycling and participate in at least one week-long bicycle ride every year.



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STATISTICAL SAMPLING CONSIDERATIONS IN MULTIFAMILY HOUSING

By David L. Wilson, Research Staff, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Over the past 30 years, some governmental agencies and private-sector owners of multifamily housing properties have limited radon testing to partial screening (e.g., the testing of a subset of the multifamily housing dwelling units). Although sampling approaches have differed, most have required that if any one unit was found to be “positive,” or have radon levels ≥ 4 pCi/L, all remaining untested housing units would be tested (i.e., trip-wire approach).

In performing a screening on a scientific basis, one typically first establishes statistical confidence, which includes establishing a numerical qualifier that defines the number of untested units with elevated radon that might be missed in the screened homes. Typical wording would be “the screening has a 90% confidence that no more than one untested unit within the unsampled dwellings will have elevated radon levels.” This decision, in turn, would provide an estimate for the minimum number of units that must be screened to meet the sampling objective. In the planning stages of such a statistical screening approach, an assumption must be made as to the suspected frequency of elevated radon among the dwelling units (e.g., 1%, 5%, 10%). Using this expected frequency, one can consult statistical tables at the desired confidence interval and obtain the minimum number of units to be tested based on the total number of testable units. However, this approach should only be applied in cases where the frequency of a problem or occurrence is well defined to a high degree of certainty. In other words, if the estimated frequency of a problem or occurrence within the cohort

Table 1. Overview of four multifamily housing complexes

Population	Number of units	Type building	EPA Radon Potential Zone	Number of units ≥ 4 pCi/L	Average radon level (pCi/L)	Standard deviation	Highest result (pCi/L)
1% positive units	104	4-Plex	2	1	0.6	0.8	4.5
2% positive units	144	6-Plex	2	3	1.4	0.8	5.3
3% positive units	156	6-Plex	2	4	1.4	1.0	7.9
10% positive units	100	4-Plex	1	10	1.4	1.5	7.5

Table 2. Number of random samples collected for each single simulation

Percentage of units sampled (%)	1% positive number of units sampled ^a	2% positive number of units sampled ^a	3% positive number of units sampled ^a	10% positive number of units sampled ^a
10%	11	15	16	10
25%	26	36	39	25
50%	52	72	78	50
75%	78	108	117	75
90%	94	130	141	90
95%	99	137	149	95
100%	104	144	156	100

^a - Any fractional samples were rounded up to the next whole number.

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is estimated too high, there is a good chance that an invalid conclusion would be reached (i.e., not enough units will be tested to provide the assumed degree of confidence).

To evaluate the premise that assuming too low an elevated radon frequency among untested units may lead to an erroneous conclusion, radon data sets from four multifamily complexes with different elevated radon frequencies were selected (Table 1). Within each complex, all the units were identical, built at the same time, built by the same contractor, and tested using the same detectors during identical time intervals. Although there are many statistical methods to evaluate existing radon data sets, perhaps the simplest method to perform and interpret is the

Monte Carlo method. In the Monte Carlo method, the data set is sufficiently randomized such that the results selected for further analysis are representative of a purely random selection in the field. Then the desired number of results are selected and analyzed. This randomization and selection process is repeated a number of times to reach the desired level of certainty. The greater the number of simulations, the greater the overall statistical confidence in the conclusions.

Using the random number feature in Microsoft Excel, each individual measurement in all four data sets was assigned a random number. This allowed the measurements to be sorted by increasing random number and the desired number of measurements to

Table 3. Statistical summary of 100 simulated surveys using existing radon results

Percentage of units tested	1% positive simulation with 1 unit ≥ 4 pCi/L	2% positive simulation with at least 1 unit ≥ 4 pCi/L	3% positive simulation with at least 1 unit ≥ 4 pCi/L	10% positive simulation with at least unit ≥ 4 pCi/L
(%)	(%)	(%)	(%)	(%)
10%	10	30	39	73
25%	18	63	83	95
50%	42	88	100	100
75%	71	99	100	100
90%	82	100	100	100
95%	91	100	100	100
100%	100	100	100	100

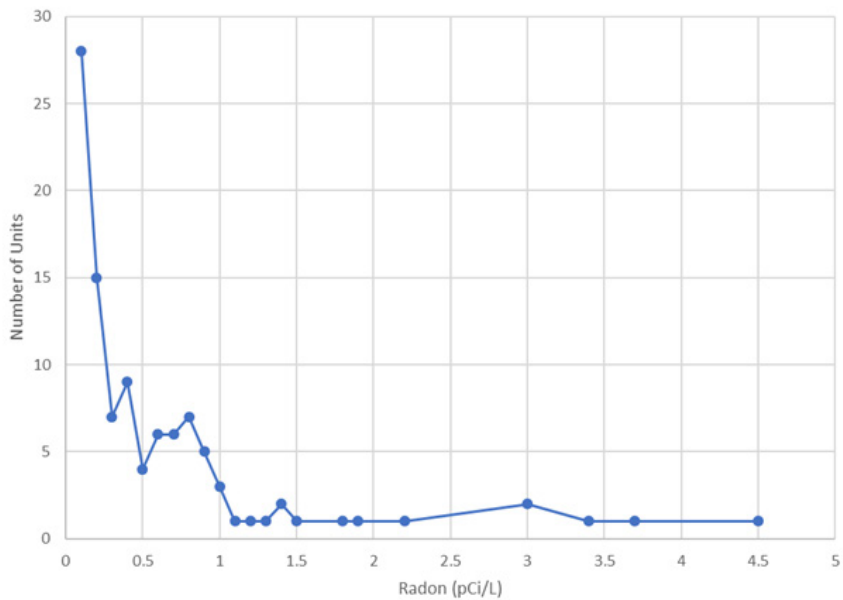
be collected (Table 2). This process, including the reassignment and sorting of the individual measurement random number, was repeated 100 times for each of the desired six sample intervals (10, 25, 50, 75, 90, and 95% tested). For each of these 100 simulated tests/sample frequencies, the highest individual result was collected and the number of simulations with a result of ≥ 4 pCi/L was counted. In this analysis, tabulation of the number of results per simulation that were ≥ 4 pCi/L was not required since one result with elevated radon levels presumably would result in the testing of all the remaining untested units.

As can be seen in Table 3, a high statistical confidence (e.g., $\geq 90\%$) can be achieved with a small number of samples (e.g., 25%) if 10% of the units have elevated radon levels. However, the same cannot be said for properties with elevated radon frequencies between 1 and 3%. Of particular concern is that at

1% elevated frequency and 25% sampling (i.e., 1 in 4 units tested), the correct conclusion is reached only 18% of the time. At the lower range of elevated radon frequencies (e.g., 1%), sampling 95% of the units is required to achieve a high statistical confidence (e.g., $\geq 90\%$).

Another option to screening identical multifamily housing is to take advantage of the fact that radon levels follow a distribution (Figure 1). Although 4 pCi/L is the accepted action level for radon, using a lower action level (i.e., the radon level in which all untested units would be sampled) could potentially provide an indicator that the potential for elevated radon levels may exist. To test this hypothesis, simulations using the Monte Carlo method were repeated at various action levels (1.5, 2.0, 2.5, 3.0 and 3.5 pCi/L) on the 1% positive multifamily housing unit data set. The simulation found that high statistical confidence (e.g., $\geq 90\%$) could be achieved with as

Figure 1. Radon data distribution for the 1% positive multifamily housing units.



little as 25% sampling provided the action level was set at 1.5 pCi/L (Table 4). At higher sample densities, progressively higher action levels could be employed to achieve similar high confidence (Table 4). For example, at a 50% sample density and using 3.0 pCi/L as an action level, the correct conclusion was reached 97% of the time.

In summary, to simply say that a screening methodology has a 90% confidence level is an

incomplete statement. The accompanying numerical qualifier (i.e., no more than X units of the unsampled units would contain elevated radon levels) more clearly defines the risk associated with this approach. At the lower range of elevated radon frequencies (e.g., 1%), to achieve a high statistical confidence (e.g., $\geq 90\%$), sampling 95% of the units is required. Because of the absence of an established method to estimate the elevated radon frequency of the untested units, selecting a defensible sample density and numerical qualifier is difficult if not impossible. As is shown in Table 3, the potential cost savings from not testing an additional 5% of the units (five units in this example) is presumably negligible—as a fraction of the cost of testing 95% of the units—compared with the potential health care costs associated with lung cancer. Using an action level ≤ 4 pCi/L demonstrated the possibility that reasonably high statistical confidence could be achieved with less than 100% sampling of the multifamily housing complex. Additional study is needed to determine whether this hypothesis is valid for more than this single example. ●

Table 4. 1% positive units' simulations with lower action levels

Action level a (pCi/L)	10% sampled number of surveys with at least one unit \geq action level	25% sampled number of surveys with at least one unit \geq action level	50% sampled number of surveys with at least one unit \geq action level	75% sampled number of surveys with at least one unit \geq action level	90% sampled number of surveys with at least one unit \geq action level
1.5	67%	94%	99%	100%	100%
2.0	46%	84%	98%	100%	100%
2.5	35%	75%	97%	100%	100%
3.0	35%	75%	97%	100%	100%
3.5	13%	42%	69%	89%	100%

a - Any fractional samples were rounded up to the next whole number.

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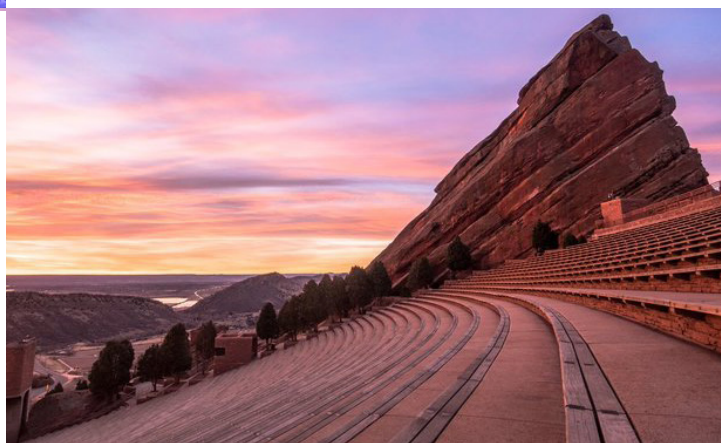
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As past attendees know, the symposium also offers a unique opportunity to engage with others, create meaningful connections, and build personal resources while having fun! Every symposium attracts dozens of experts in the fields of radon technology, health, and policy. Educators and leaders in the industry look forward to sharing the latest best-practices

and education. The Symposium Planning Committee (all AARST members) spends months reviewing abstracts and designing a program that is exciting, engaging, always new, and fun. For many years AARST has hosted the ONLY national radon trade show during the symposium. In the past 5 years our show's floor has doubled in size with almost 50 booths and welcomes several new vendors each year.

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AARST Symposium Keynote Speaker

Dr. Jonathan Samet, MD, MS

Keynote speaker, Jonathan M. Samet, a pulmonary physician and epidemiologist, is Dean of the Colorado School of Public Health and Professor in the departments of Epidemiology and Environmental & Occupational Health. His research has focused on the health risks of inhaled pollutants—particles and ozone in outdoor air and indoor pollutants including secondhand smoke and radon. His work on radon began in the late 1970s when he developed a still-ongoing study of New Mexico uranium miners. He led the radon component of the Biological Effects of Ionizing Radiation (BEIR) IV Committee, and chaired the National Research Council's Radon Dosimetry Report and the BEIR VI Committee. He has served on and chaired numerous committees of the National Academies of Science, Engineering and Medicine and also the Clean Air Scientific Advisory Committee (CASAC) of the U.S. EPA and the FDA's Tobacco Products Scientific Advisory Committee (TPSAC)

Accepted Science and Research Abstracts for 2019 Symposium

Antonelli, F. - Assessment of Hazard Index and Radium Activity of Two Granites in South of Brazil Through Gamma-Ray Spectrometry of Airborne and Ground Data

This work investigates the radium equivalent activity and the external hazard index of the Serra do Carambeí and Joaquim Murtinho granites, in the southern region of Brazil.

Conley, N. BA - Seasonality, Weather Conditions and Indoor Short-Term Radon Measurements

The purpose was to determine if temperature, precipitation and wind were predictive of observed home radon values.

Dean, JD, W. - Compartmentalized Radon Mitigation and IAQ Enhancement Fresh Air Retrofit in High and Low Rise Multihousing

A retrofit fresh air delivery alternative consists of a port cored from indoors through an exterior wall to maintain temperature and humidity comfort regardless of outdoor conditions.

Dean, JD, W. - A Radon Extraction System Retrofit for High and Low Rise Multihousing

Exterior curtain walls of porous concrete blocks have lots of surface area from which radon can emanate. If the exterior of the blocks is sealed, radon emissions are released only to the interior and into the space between the drywall and blocks.

Gregory, L. - Adding to Our Knowledge Base – Radon Decay Products: Particle Size Really Matters!

Radon gas levels can be a poor indicator of actual exposure and potential dose in environments with robust ventilation because equilibrium factors are greatly reduced due to increased RDP plate out.

Hahn, PhD, RN, FAAN, E.J., Haneberg, PhD, PG, W.C. - Transforming Public Health Systems to Integrate Radon and Tobacco Control

We describe a novel project to increase capacity for coordinated lung cancer prevention by integrating public health systems for radon and tobacco risk reduction.

Hahn, PhD, RN, FAAN, E.J., Conley, BA, N. - Youth as Citizen

Scientists to Promote Home Radon Testing in Appalachia

We will describe a citizen science project to empower high school students to promote radon testing and mitigation in rural Appalachia.

Innes, D. Mitigation of Radon in Well Water

Airwell is a new technology mitigation system for radon in well water. It is the only system on the marketplace that mitigates radon by using the water column in the well as the aeration chamber.

Kim, H.S. - Development of a High Efficient Alpha Spectrometer for Radon and Thoron Measurement

An alpha spectrometer using a semiconductor can separately detect radon and thoron by energy spectrum analysis of their progenies.

Kim, S.H. - A Study on Radon Exhalation Rate of Building Materials

This study was conducted to develop a suitable radon exhalation rate measurement process. Recent issues about thoron became an important trigger for radon-222 measurements in South Korea.

Lawrence, L. - Correlating Radon Activity with Carbon Dioxide Concentration in an Iowa

Reports of encountering “bad air” have occasionally resulted from humans entering cave passages with high levels of CO₂

Lee, Prof. C.M. - Concentration of Radon Emitted from Interior Building Materials in Korea

This study was part of research to assess the health impacts of radon exposure in Korea and establish plans for mitigation.

Maloney, J. - Wisconsin Fish Hatchery – An Occupational Radon Exposure

In 2012 the oldest fish hatchery in the state of Wisconsin tested for radon and found levels over 200 pCi/L. This presentation walks through the strategy used to discover where the radon was

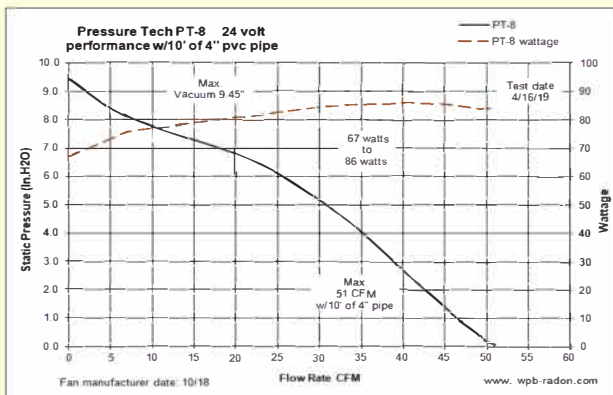
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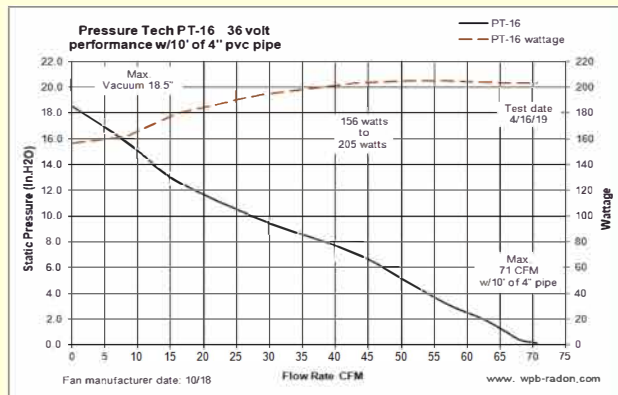


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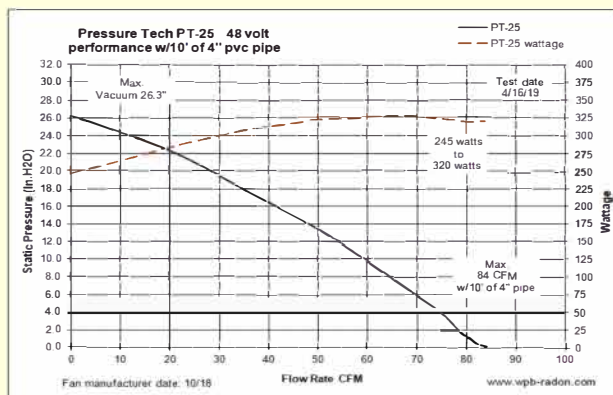
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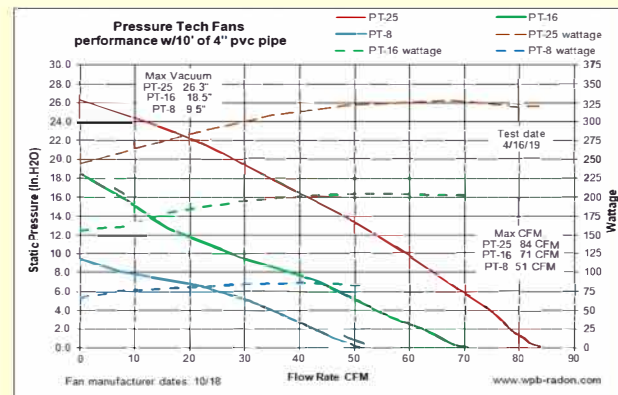
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A Celebration Of AARST Members

May 2019 saw the inaugural AARST Member Appreciation Month. To demonstrate how vital the AARST membership base is, the Membership Committee, chaired by Phil Rivas, implemented the month-long celebration. Lots of planning and preparation went into arranging the many bonuses offered during the month. Members could get the new perks in their Member Toolkits which included Facebook profile frames; discount code for Standards, and access to five newly produced episodes of a podcast series. Episodes featured different topics and special guests Brent Ulbert, Kimberly Buchmeier, the Membership Committee, Crystal Lytle, Jill Newton and Nicole Chazaud of the Symposium Committee, and AARST Executive Director Dallas Jones.

In late March, the Membership Committee planned and conducted an in-depth member survey receiving considerable participation. The committee will use the results to hone the AARST benefits package, learn where AARST may better focus on member retention and engagement and gain ideas that will encourage certified professionals to join the AARST community. Additionally, this information will help to identify where AARST may better serve its overall base.

Participants were eligible to be in a drawing for (4) \$50 gift cards. winners were posted weekly on the AARST Facebook page. Congratulations to Kate Berlyoung (GA), Doyle Price (TX), Robert Russell Clifford II (NC), and Gustavo Delgado (CA).

More giveaways were distributed on Fridays. Ten winners received a swag bag full of goodies including a stylish folio. Congratulations to the winners- Michael Jenneman (MD), Doug Stoll (CO), Karla Granger (KS), Cindy Segobiano (IL), John DeBusk (IN), Kirsten Schmidt (IL), Conor O'Donnell (NY), Daniel Stephenson (CO), Carly J. Hanna (IL), Brett J. Overmyer (IN). ● - Amy Morris

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Accepted Science and Research Abstracts for 2019 Symposium

coming from (the groundwater) and how it was eventually mitigated.

Martin, A. C. - Measurements of Natural Radioactivity At The Environmental Preservation Area Of Passaúna River, Brazil

This research is focused on characterizing the natural (background) radioactivity measurements in an environmental preservation region of the Passaúna River, at the edge of the Curitiba urban area in the state of Paraná, Brazil.

Pressyanov, Prof., D. - Highly Sensitive Passive Detectors for Short-Term Pre- And Post- Mitigation Measurements

As instantaneous measurements are affected by short term radon variations, few days pre- and post-mitigation integrated measurements of sufficient sensitivity might be preferred. Within the European MetroRADON project, novel detectors of sufficient sensitivity for that purpose were developed.

Saha, U. - Accuracy and Precision in Measurement of Radon in Water by Liquid Scintillation Counting

This paper discusses the experience of various exercises performed in our laboratory to ascertain these two milestones.

Souza, O. - The Brazilian Radon Risk Programme

To date, few studies have addressed either the medical consequences or environmental relation. The Geological Survey

of Brazil-CPRM and research center partners started a 10-year, fully integrated program.

Stewart, K. - Targeted Community Radon Testing: Results and Impact on Mitigations Performed

Comparison of rates at which mitigations were carried out in test-program communities and in non-targeted neighboring control communities found that mitigation rates increased.

Warkentin, P. Radon in Canada -Protecting Canadians in their Indoor Environment

This presentation will touch on unique aspects of the Canadian radon industry including techniques for radon mitigation in new construction and existing buildings and a comprehensive training and certification program to support those initiatives.

Wilson, D. - Radon Levels as A Function of Air Exchange Over Time

Upgrades to the building envelopes reduced the air exchange rate. Because of these envelope upgrades, previously mitigated homes were found to have high radon and other homes had significant, and unpredictable increases in radon levels.

Wilson, D. - Statistical Radon Testing Considerations in Multifamily Housing

Monte Carlo and other statistical sampling models have been applied to radon data collected within multi-family housing buildings containing 2, 4, 6, and 8 units. ●

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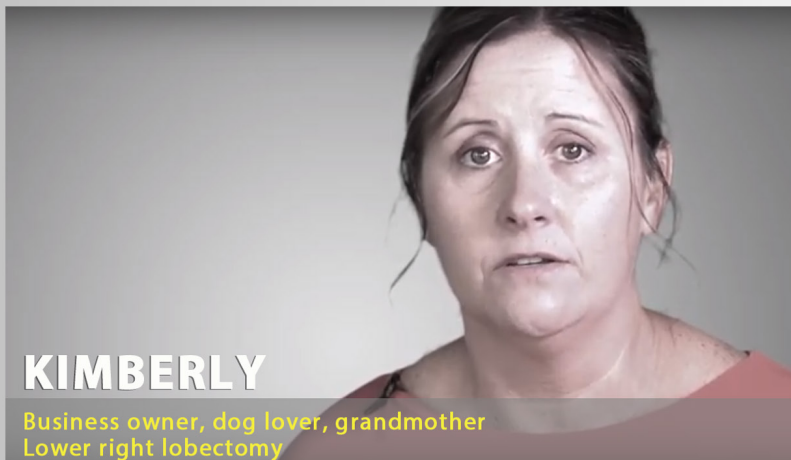
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