AARST
RADON PROFESSIONALS SAVING LIVES

December 2021

THE RADON REPORTER™

Practical Information for Your Success

THE 2021 STANDARDS REPORT

plus

NRAM RESOURCES | EARTH STUDY UPDATE
NEW SIMULATION TOOL | MITIGATION SURVEY RESULTS

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Please submit content, comments, or questions to editor@aarst.org

AARST™, the American Association of Radon Scientists and 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 allow you to gain updated information, discover new techniques, learn about new problems before they occur, and hone your professional skills.

Welcome Back!

Kyle Hoylman, AARST President

As our organization wraps up its 2021 International Radon and Vapor Intrusion Symposium, the immediate thought that comes to mind is – welcome back! Kudos to the numerous volunteers and AARST staff members who planned and executed our return to some sense of normalcy. The global pandemic will continue to impact our lives and create additional challenges, but our community is strong, and we will persevere.

Our annual election resulted in you choosing a board of directors dedicated to leading our association in this time of tremendous opportunity. For those of you who voted in the election, thank you – your voice was heard. Congratulations to the newly elected members of the AARST Board of Directors:

- Dave Hill (Vice President)
- Dan Potter (Treasurer)
- Jan Fisher (Secretary)
- David Gillay (Nationally Elected Director)
- Dawn Goard (Nationally Elected Director)
- Dave Kapturowski (Nationally Elected Director)
- Eric Lewandowski (Nationally Elected Director)
- John Mallon (Nationally Elected Director)

The previous board of directors worked tirelessly to position our association to take advantage of the opportunities that are before us. A special thank you goes out to the members of our board who are stepping down - Chad Robinson (Vice President), Crystal Lytle (Past President), Darioush Ghahremani (Secretary), and Angel Price, Jill Newton, and Thomas Selgrade (Nationally Elected Directors).

I am humbled by your vote of confidence in electing me to serve another term as your president, and I look forward to working with all of you to continue to execute the strategic plan of our association. As we move into the new year, members of your Executive Committee and Board of Directors, working alongside the AARST staff team, renew our commitment to implementing and executing the realigned strategic plan developed in 2020, which relies on the association's four pillars and supporting foundation:

POLICY	PROFICIENCY	STANDARDS	ADVOCACY
AARST MEMBERS AND CHAPTERS			

The 35th International Radon and Vapor Intrusion Symposium included, for the first time, the words 'vapor intrusion'. In addition to our association's commitment to continuing to implement and execute our realigned strategic plan, we continue our work to harmonize the radon and vapor intrusion communities through the development of standards and credentials. Thank you to the vapor intrusion professionals who are driving this important effort. The vapor intrusion community has found its home – welcome!

In closing, as a member of our association, I encourage you to join our efforts by becoming active in your chapter or volunteering to join one of our national committees. The year 2022 promises to be one of tremendous growth and opportunity – join me in making this year one of our best.

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and we want our radon professionals to join us in spreading the word about the hazards of elevated radon levels.

Help Protect Your Community.

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1

2

3

Do You NRAM?

January is National Radon Action Month. Get ready now to participate in NRAM!

VISIT aarst.org/nram. The AARST Advocacy Committe has assembled several NRAM resources just for you!

DOWNLOAD resources like multi-language consumer guides, proclamation templates, door hangers, post cards, social media posts, & more!

SAVE LIVES! Use NRAM resources throughout the year to spread awareness in your community.

aarst.org/nram

https://aarst.org/nram/

2021 International Radon and Vapor Intrusion Symposium™

OCTOBER 11-13, 2021 ★ BETHESDA, MARYLAND

The 2021 AARST International Radon and Vapor Intrusion Symposium surpassed the expectations of attendees and exhibitors. From October 11-13, close to 300 radon professionals connected at the 35th annual Symposium in Bethesda, Maryland. Over 50 speakers presented on innovative technology, building science, radon testing, mitigation policy updates, ANSI-AARST Standard updates, and much more. Attendees and organizers alike made every effort to keep the in-person gathering as safe as possible in the middle of the pandemic.

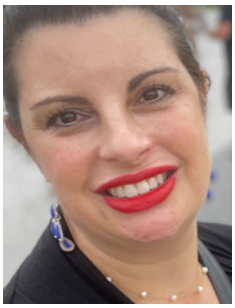
This year AARST featured 12 new exhibitors among 50 booths. Exhibitors and sponsors are significant contributors to the Symposium. Exhibitors presented Learning Labs, 30-minute quick demos, and tip sessions to show off new products to attendees in a more intimate environment than the exhibit hall.

The annual Symposium is held as a joint conference with the Conference of Radiation Control Program Directors, Inc. (CRCPD) and the state radon programs. The two conferences share a Joint Day of programming, and all attendees are welcome to attend any session and all exhibits. This year, COVID precautions prevented most state staff from traveling, and CRCPD held its training virtually. The Joint Day was aired live so CRCPD attendees could watch and listen remotely.

While nothing replaces the person-to-person interaction of casual conversations and hallway networking, coping with a pandemic has made it clear that a remote option is a must. Every session at this year's Symposium was recorded. AARST will be launching an on-demand ticket for those interested in learning remotely.

The Planning Committee collaborated with staff to bring together the most current educational program. Sessions are peer-reviewed and considered based on the association's objectives, current trends in technology, certification training, research, studies of radon exposure, and studies conducted by countries beginning their journey into the world of radon reduction to save lives. The Planning Committee and workgroups had over 40 proposals to evaluate. A vapor intrusion (VI) track was added to the first day to further integrate VI into the radon community. For extra education choices, AARST hosted training sessions on the Sunday before the Symposium's start. Of the eight courses available, six were developed to be conducted for the first time. In all, 60 speakers presented 78 topics over three and a half days.

AARST relies year after year on a trusted cadre of volunteers to supplement its small staff in convening the Symposium. AARST wishes to acknowledge those dedicated radon professionals who care enough to contribute their time to create a successful program for all.



Dawn Oggier, Symposium Chair, worked tirelessly and enthusiastically to lead the Bethesda Symposium

Symposium Planning Committee: Dawn Oggier (Chair), Wes Hodgden (Tech Sessions Lead), Jan Fisher and Laurie Chilcote (Exhibitor Leads), Brent Ulbert (Social Events Lead), Ashley Falco (Marketing Lead), Kirsten Schmidt (Volunteer Lead), Shannon Cory (AV Lead), Kyle Hoylman (AARST President)

Tech Sessions Work Group: Crystal Lytle, Owen Reese, Bruce Snead, Dr. Phil Jenkins, Tony McDonald

Science & Research/Proceedings Review Committee: Dr. Mike Kitto (Science and Research Chair/ Proceedings Editor), Dr. Uttam Saha, Dr. Phil Jenkins, Kevin Stewart, Dr. Leo Moorman

Onsite Volunteers: Marcey Vescio, David Gillay, Vicki Bhatt, Kathy Smit, Shad Evans, Matt Hendrick, David Metzger, ReveAnn Ellrott, Jim Emanuels, Chad Robinson, George Schambach, Dr. Darioush Ghahremani, Brian Hanson, Kristina Snyder, Laura Wallace, Carolyn Koke, Dave Kapturowski, Christopher Ferguson. (Our sincere apologies if we missed anyone).

View the photo gallery at https://aarst.org/2021-symposium-wrap-up-and-gallery/

Evaluating and Assessing Radon Testing in Multifamily Housing (The EARTH Study)

Michael Kitto, Calvin Murphy, Sherry Dixon, Jonathan Wilson, David Jacobs, and Jane Malone

Prior to 2018, radon testing of multifamily buildings ranged from 10% to 25% of ground-contact residential units for principle federal agencies, to 100% for radon testers credentialed by AARST-NRPP and most regulated states. This study examined the probability of failing to identify a unit containing elevated radon when all ground-contact units in multifamily buildings are not tested.

All radon results were received from measurement professionals certified by either the NRPP or NRSB, and (when applicable) credentialed by a state radon program. Participation and contributions were voluntary, and preference was not given to data from any state. All data used in this study came from measurement projects that employed a 100% ground contact testing protocol, although occasionally access to a unit.

Ground contact radon levels were obtained from 29 US states for 7892 ground-contact units in 687 multifamily buildings of various sizes (primarily 5-26 units per building). Overall, about 15% of the units had radon ≥4 pCi/L (the EPA action level), and 59 units had radon levels ≥20 pCi/L, with a maximum of 96 pCi/L. Over 25% of the radon results exceeded the WHO action level of 2.7 pCi/L. The arithmetic mean of 2.36 pCi/L was greater than the EPA average of 1.25 pCi/L (NRRS)[1]. Of the 687 buildings, 42% of buildings had at least one unit with radon ≥4 pCi/L. Buildings that contained 10 or fewer units comprised 58% of the total.

For building sizes of 5-26 ground-contact units, the testing protocols that required testing of 10% and 25% of ground contact units in each building failed to identify 47-69% and 32-46% of the units, respectively, with the range dependent on building size (Fig. 1). Even 75% testing of ground contact units would miss 5-8% of unmeasured units with elevated radon. Measurement of at least 90% of the ground contact units in buildings with 5-26 units would still result in 2-3% of the units with elevated radon being missed. To achieve 95% confidence that no units in the building have radon ≥ 4pCi/L in buildings up to 20 units, 100% sampling is required. For the vast majority of multifamily building sizes, all ground floor units in multifamily buildings should be tested for radon.

FIGURE 1. AVERAGE PROBABILITY (%) OF PARTIAL SAMPLING MISSING A UNIT IN A BUILDING WITH≥4 PCI/L.

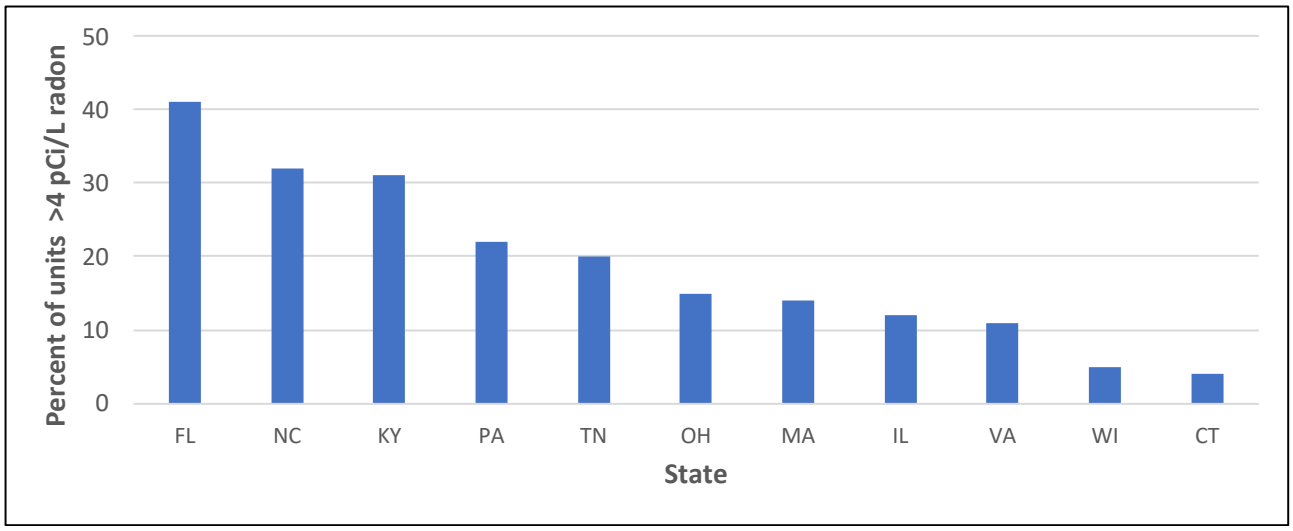
Number of ground contact units	Number of buildings	10% sampled	25% sampled	50% sampled	75% sampled	90% sampled
05-06	45	58	34	19	4.7	0.0
07-08	71	55	36	15	4.6	0.0
09-10	40	65	39	24	8.5	3.8
11-12	37	52	41	21	8.1	2.8
13-14	14	51	35	20	7.4	2.2
15-16	20	47	32	15	5.0	1.3
17-18	15	59	39	21	8.1	1.9
19-20	12	69	46	23	8.9	2.6
21-26	22	52	34	18	6.7	2.3
All	276	58%	38%	19%	6.5%	1.7%

Ground contact units only. Includes building with at least one unit ≥4 pCi/L. Note that for 90% sampling all units are tested for buildings with 9 or fewer units.

1 NRRS. U.S. EPA Office of Radiation Programs. National Residential Radon Survey, Statistical Analysis, National and Regional Estimates, Volume I, 1991.

Climate zones classified as "hot" contained the largest percentage of units ≥4 pCi/L with units in the cooler climates having less elevated radon. The highest percentage of multifamily units with radon ≥4 pCi/L (Fig. 2) occurred in EPA's radon Zone 3 (FL and NC) and in Zone 2 (KY and TN) states. Although the EPA radon map generally equates these areas with having low or moderate radon potential, the demand for cooling and thus "tight" housing likely results in lower fresh-air exchange and a greater probability for elevated radon levels.

FIGURE 2. STATES WITH THE GREATEST PERCENTAGE OF UNITS WITH ELEVATED RADON (MINIMUM OF 4 PROPERTIES MEASURED).



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Chris Kling
John Gutowski
Clay Hardwick
Michelle Warren
Daniel Simas
Rebecca Colligan
Dennis Andrews
Robert Borgstrom
Ian Lyster
Sarah Wilhoite
John Lutz
Steven Truesdale
Chase Freeland
Matthew Wright
Debbie Riexinger
Salina Murton
Deontae Dodd
Steve Leslie
Gregory Holt
Thomas Cook Jr
Jessica Petschauer
Timothy James
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Joseph Gould
Adam Greenup
Drewe Hansen
Peter Foller

Addie Woodruff
Emily Condos
Peter Ruchti
Andrew Kain
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Henry Schuver
Ryan Dahlvang
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Steven Grigson
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Suzanne Schaff
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Kimberly McGeorge
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Daniel Reid
Luke Moritz
Trevor Moyer
Danni Herrick

Nathan Cowan
William Stubbs
Donald Brown
Patrick Hupp
Zachary Probus
Gerald Russell
Jacob Bird
Justin Clark-Bailey
Kurt Mickelwait
Brandon Woolridge
Collin Seigle
Jacob Hartley
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Kim Mason
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Mark W McDonough
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Dean Crickenberger
Eric Mueller
Fred Ellrott
Ken Tomczak
Nicholas Rak

THE 2021 STANDARDS REPORT

Two Decades of Progress

An Important Achievement by America's Radon Professionals

This reflection is dedicated as a thank you to the volunteer leaders of AARST for their vision in forming the AARST Consortium on National Radon Standards.

In 2001, the AARST Board of Directors made a crucial decision with far-reaching implications: to prioritize the development and publication of national standards for the radon profession. Until that point, the fledgling radon profession in the United States relied on initial measurement protocols and a radon mitigation standard developed by the US Environmental Protection Agency (EPA) to initiate the foundation and development of radon standards. EPA standards were poised to anchor EPA's Congressionally mandated credentialing of radon professionals to address the newly recognized environmental threat of low-level ionizing radiation in homes and other buildings. That infrastructure began to change when EPA's federal radon proficiency program was discontinued, and the private sector and many states took a front seat in professional radon credentialing.

Yes, there were naysayers about AARST's decision to become a standards developer. AARST board members were advised that the association did not have the staff nor resources to do this task, that it would cost half a million dollars annually to fund a legitimate standards effort, and even that it was "a legal conflict of interest" for AARST to have a role in writing standards.

This latter objection was the most perplexing statement that the association faced at the time. Perplexing especially because it was totally and completely wrong: America's industries innovate and create standards that foster vibrant, solution-oriented marketplaces on a regular basis. In fact, US law since 1996 expressly supports and strongly promotes industry-developed standards. The National Technology Transfer and Advancement Act (NTTAA) made clear that federal agencies should rely on the private sector to bring technology and industrial innovation to the marketplace, and, more importantly, that federal agencies shall recognize (barring any immediate public emergency) industry standards provided those standards are developed through a consensus process. In 1998, the White House Office of Management and Budget's Circular A-119 affirmed the use and recognition of national consensus standards, directing agencies to comply with the NTTAA. During the years that followed, a major shift in standards practices increased collaborative efforts between existing standards developers and welcomed more participation by private and public sector interest groups.

Twenty years ago, AARST took the initial steps to begin writing radon standards using the consensus process involving and recognizing the contributions made by various types of key stakeholders, including consumer groups, other affected professions and industries as well as state and federal agencies. All are welcome at the table.

With limited resources available, AARST decided to go the extra mile to develop a nationally recognized standards consortium that would (1) be a program owned and supported by AARST and (2) be the consensus body that develops the substance of radon standards independent of the AARST Board of Directors.

AARST is accredited by the American National Standards Institute to administer its Consortium on Nation Radon Standards. ANSI is the organization in the United States that oversees and accredits most standards developers. Accreditation is an ongoing process of oversight that involves ongoing audits by ANSI to ensure that the consensus process is adhered to and continuously improved. It is arduous work to obtain and maintain ANSI accreditation, and a major achievement to be accredited as a Standards Developer. Not every industry accomplishes this.

The standards process remains independent of the AARST Board.

The work product achievements of the AARST Consortium have been remarkable. Today, thanks to AARST's Consortium, there are 12 consensus radon standards that address not only single-family homes but multifamily housing, schools and large buildings, various modes of radon resistant new construction, procedures for measurement of radon in water, and measurement quality assurance. With each new standard come new levels of risk reduction and new opportunities, as proven by the HUD multifamily program's recognition of ANSI-AARST standards. AARST Consortium standards are ever evolving, ever changing, and thanks to association member support, we maintain standing committees that continue to work on these "living documents." These standing committees include stakeholders who represent various interest groups that are involved directly in radon or are otherwise affected by radon standards. Additional stakeholders review and comment on the standards in a process that is open and transparent in accordance with ANSI guidelines.

In recent years, another amazing decision by AARST was to make the standards available for free in a read-only format, 24/7. Anyone who wants printed or electronic copies can obtain them directly through ANSI or AARST.

The standards deserve wide promotion to public officials at the state and county level across the US. If radon in schools gains recognition as a problem for a state or locality, a state legislature does not have to set up a committee or instruct an agency to write standards for schools (or homes or hospitals or other public buildings and workplaces): the standards to measure and mitigate such buildings safely already exist.

This special report in the Radon Reporter is an overview dedicated to that sustainable process, a nationally recognized program, and a work product that is the best of the radon profession's innovation and knowledge. This Consortium is ever evolving and improving and is successful mainly because of many dedicated professional volunteers and staff. The achievements of the Consortium on National Radon Standard are many, and the industry today stands on the shoulders of those who made such vital decisions two decades ago.

ANSI-AARST Radon Standards 2021

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<tr><td rowspan="2">Measurement</td><td>MAH: Protocol for Conducting Measurements in Homes</td><td>MALB: Protocol for Conducting Measurements in Schools and Large Buildings</td><td>MAMF: Protocol for Conducting Measurements in Multifamily Buildings</td></tr>
<tr><td colspan="3">MS-PC: Performance Specs for Instrumentation Systems
MS-QA: Quality Assurance for Radon Measurement Systems
MW-RN: Protocol for Collection, Transfer and Measurement of Radon in Water</td></tr>
<tr><td>New Construction</td><td>CCAH: Reducing Radon in New Construction

RRNC: Rough-In</td><td colspan="2">CC-1000: Radon Reduction Systems for New Construction of Buildings</td></tr>
</table>

THE AARST CONSORTIUM ON NATIONAL RADON STANDARDS

The mission of the Association's standards consortium, the AARST Consortium on National Radon Standards ("the consortium"), is to establish and maintain a continuous consensus process for writing and amending voluntary radon standards. This is to ensure that all resulting standards are technically proficient and functionally viable in a manner to achieve universal acceptance and utilization in the United States. Incumbent upon this mission is a duty to seek a consensus process that is balanced, open, and capable of addressing standards in a timely manner.

AARST's goal and process in writing standards also conform with US law and with the intent of the US Congress to require federal agencies to recognize industry standards when they are created using a consensus process. The consensus consortium system that AARST utilizes was originally created by the American National Standards Institute (ANSI) and ANSI has accredited AARST as a Standards Development Organization.

Extensive deliberations by volunteers in consortium committees (buoyed by constructive comments during public review periods) have built twelve ANSI-AARST Standards developed and maintained by the AARST Consortium on National Radon Standards.

Structure of the Consortium

The Consortium's Executive Stakeholder Committee (ESC) establishes operating procedures and priorities for standards action, creates subcommittees for standard action, causes audits of resulting documents for assurance of due process, and ensures coordination and harmonization.

The Standards Management Council (SMC) provides resources for standards work, including identifying Executive Stakeholder Committee and Standards Committee participants and other resources for standards committees and approves submission of standards after final review. The SMC has limited authority to make decisions in resolving disputes. Per the AARST bylaws, its members are the SMC chair (appointed by the AARST Board), the AARST Treasurer, chairs of the Technical and Science Committee, Professional Ethics and Membership Committees, and the Executive Director.

The Standards Committees oversee more than one standard, which facilitates harmonization and consistency. There are five Standards Committees: Measurement, Devices/Quality Assurance, Mitigation, New Construction, and Radon in Water.

AARST Staff Gary Hodgden, Rebecca Turek, and Cindy Van Gorder support the ESC, SMC, and the standards committees.

Balance in the Consortium

To achieve balanced participation by primary stakeholders in the Consortium, the Executive Stakeholder Committee and each standards committee include representatives of stakeholder interest groups: educators, regulated states, non-regulated states, proficiency program, EPA, HUD, consumer advocate, public health, mitigation, measurement. Additional subject matter expert stakeholders are included in standards committees as needed: home inspectors, testing professionals, mitigation professionals, large building, laboratory, vapor intrusion, scientist, radon chamber, due diligence, builder.

ANSI Accreditation and Standards Approvals

On the Consortium's behalf, AARST is accredited (and routinely audited) as a standards development organization (SDO) by ANSI. The Consortium's voluntary consensus standards procedures have met ANSI's requirements for developing, publishing, maintaining, updating, and withdrawing standards, and the Consortium complies with ANSI's requirements and oversight, including audits. ANSI approves a standard only after the SDO successfully demonstrates that consensus has been achieved and the standards' development complied with ANSI's essential requirements as well as oversight. In accordance with the US Standards Strategy, the relevance of a standard is not determined by who developed it, but rather by market/societal need and compliance of the developer's process with recognized principles of open and equitable voluntary standards development, as found in ANSI's Essential Requirements. ANSI's system allows all interested parties to engage fairly in standards development activities while maintaining the integrity of the ANSI designation and avoiding duplicative or conflicting standards whenever possible.

How Does the Standards Consortium Process Work?

Consortium Standards Committees

All committees are assembled to include a voter from each stakeholder interest group that has a unique vantage point of experience in dealing directly with the public on radon and related issues. In other words, among those seated from around the country are experienced measurement, mitigation, and health professionals both from the private and public sectors. Stakeholder interest groups not dealing directly with the public are also provided a vote if relative to the specific topic of a standard. Alternate voters for each stakeholder interest group are sought and join meetings with equal rights during discussions.

Therefore, most standards committees currently have more than 12 unique stakeholder interest group voters and, with alternate voters, more than 18 participants. Committees are open to new volunteers; apply at https://standards.aarst.org/participation-in-aarst-consortium-radon-standards/.

Standards Committee Decisions

All decisions on policy and document content are verified by letter ballots to document the vote of each stakeholder interest group. To retain voting balance and prevent any one interest group from dominating the vote, only one vote from each stakeholder interest group is counted in final decisions. Formal committee motions pass by ≥60% of all stakeholder interest group voters, after attempts to resolve all concerns. The chairperson and staff have no vote.

How Change Happens: Process and Public Participation

With committee webinar meetings every two weeks during active development or maintenance deliberations, all proposed content and concerns are reviewed and updated until passing a formal vote to send the work out for public review. Public review, change requests, and requests for interpretations are tools that open the review of content to the general public. Both within the committee and for submissions from public review, change requests, and requests for interpretations, ANSI processes require a documented attempt to resolve expressed concerns. Unlike some consensus forums, all public comments are reviewed and responded to after consensus of the full committee is achieved.

Publication

All existing ANSI-AARST standards are currently updated under what is called "continuous maintenance." This means that improvements can be considered at any time. Once improvements have been publicly reviewed with comments resolved and prior to publication, the Executive Stakeholder Committee and Standards Management Council review the work product. ANSI conducts independent audits every five years to ensure fair due process occurred in voting and in attempts to resolve comments.

Publication Schedules

The goal for completing a new round of review and revision is every three years for measurement and mitigation standards with incremental updates in between, only as needed. Typically, immediate use of revised provisions is ideal, but standards may state an effective compliance date of six months after each publication.

Harmonization

To ease consistency and clarity for users of the standards, words that specify the same basic task in multiple standards have been or are being harmonized to be identical.

Requirements vs. Guidance

Initial publications focused on field professionals with both requirements and guidance intertwined in almost equal proportions down through the standard. However, it is recognized that stakeholders who adopt standards into codes and regulations cannot continuously arbitrate nuances associated with guidance statements. The absolute requirements in each standard must be clear to both field professionals and untrained laypersons. In the future, guidance will be published in companion guidance and not within the body of the standard.

Evidence Base

The vast amount of experience in the field across the last 30 years has taught useful lessons. The initial science and resulting training have grown to distill a multitude of intangible concepts into hard facts. Virtually all aspects of the measurement process, mitigation system design, and possible mitigation methods have been scrutinized.

Seasonal variability. Both measurement results and mitigation effectiveness are impacted by local seasonal changes. Based on building science combined with lessons learned in the field, work to improve reliability of methods has been successful.

Mitigation design controversies. Several dozen questions caused debates among radon professionals for almost three decades. Building science and lessons learned in the field have resolved most of those debates. Searching for answers to unanswered questions will continue as needed.

100% ground contact unit measurement. Since MAMF was first developed, three research studies have confirmed the necessity of measuring each ground contact unit.

Recent Developments and Priorities

Vapor intrusion. Soil gasses include radon, created by radium in soil, and chemical vapors, created by hazardous chemicals in soil. The science for protecting occupants against soil gas hazards is virtually the same for both. So, a wide number of radon mitigation professionals have engaged, or have been approached to engage, installation of mitigation systems for the purpose of mitigating chemical vapor intrusion. As such, in 2015, AARST began an effort to include vapor intrusion in mitigation standards to protect both installers and occupants being exposed to hazardous vapors in homes. SGM-SF was published in 2017.

While the science of the vapor intrusion industry and client needs commonly focus on how to remove pollutants from soil, the radon industry revolves around building science, air movement within a building, and the permeability of soils that adjoin the building foundation. The continuing effort seeks to bridge the gaps that cause occupants to be left unnecessarily at risk. The consortium has filed several relevant project initiation notifications with ANSI.

New Construction. In 2017 with a revision in 2018, the first standard to set minimum requirements on new construction of large buildings was published. ANSI-AARST CC-1000 addresses all buildings larger than single-family homes, duplexes, and townhouses. In 2020, an updated version of ANSI-AARST CCAH (new construction of one- and two-family homes) and a new standard ANSI-AARST RRNC (CCAH trimmed to only cover rough-in construction methods) were published. Work will soon begin on improving and harmonizing these standards.

Test Device Quality and Quality Control. In 2015, AARST published ANSI-AARST MS-PC, which for the first time in a US standard, defined minimum requirements for professional radon measurement methods. In 2019, ANSI-AARST MS-QA defined minimum quality control requirements for both field professionals and laboratories that conduct measurement services.

Radon in Water. In 2019, AARST published ANSI-AARST MW-RN to define minimum requirements for water sample collection practices and laboratory analysis. A sibling document for mitigation of radon in water is planned.

Operation, Maintenance, and Monitoring (OM&M): Work is underway on a standard that sets minimum requirements for OM&M stewardship of ongoing measurement and mitigation systems. Where adopted by an authority or by contract, this standard would bring requirements that protect occupants that currently can only be recommended by professionals.

Proficiency and Standards

Effective proficiency programs of any type are centered around compliance with published standards. Knowledge of the core ANSI-AARST measurement and mitigation standards is the key component for obtaining a certification from the National Radon Proficiency Program and a state license or other credential in ten states, and required for measurement, mitigation, or multifamily work in three more states. Radon professionals' compliance with the standards is essential, not only from a licensure or certification vantage point, but also to facilitate the reliability and resilience of radon services after the initial work is completed. ANSI-AARST measurement and mitigation standards are focused on uniform practices that will deliver protection to building occupants.

Adoptions of the ANSI-AARST Radon Standards

STATE	ANSI-AARST	EPA, ASTM, other
California, Colorado*, Connecticut, Indiana, Kentucky, Minnesota, Rhode Island, West Virginia	All	
Florida, Kansas, Nebraska, New Jersey	(rule change under review)	All
Maine, Ohio, Virginia		All
Illinois, Pennsylvania	Multifamily	Single Family
Iowa	Measurement	Mitigation
New Hampshire, Utah	Mitigation	

FEDERAL/NATIONAL	ANSI-AARST	EPA, ASTM, other
ASHRAE 189.1 (Addendum bo 2020)	CC1000, MALB, RMS-LB, MAMF, RMS-MF	
Collaborative for High Performing Schools	MALB, RMS-LB, CC1000	
Fannie Mae / Freddie Mac	(policy proposal in development)	
HUD MAP Guide	MAMF, RMS-MF, CCAH, CC1000	
IgCC - International Green Construction Code 2021	MALB, RMS-LB	

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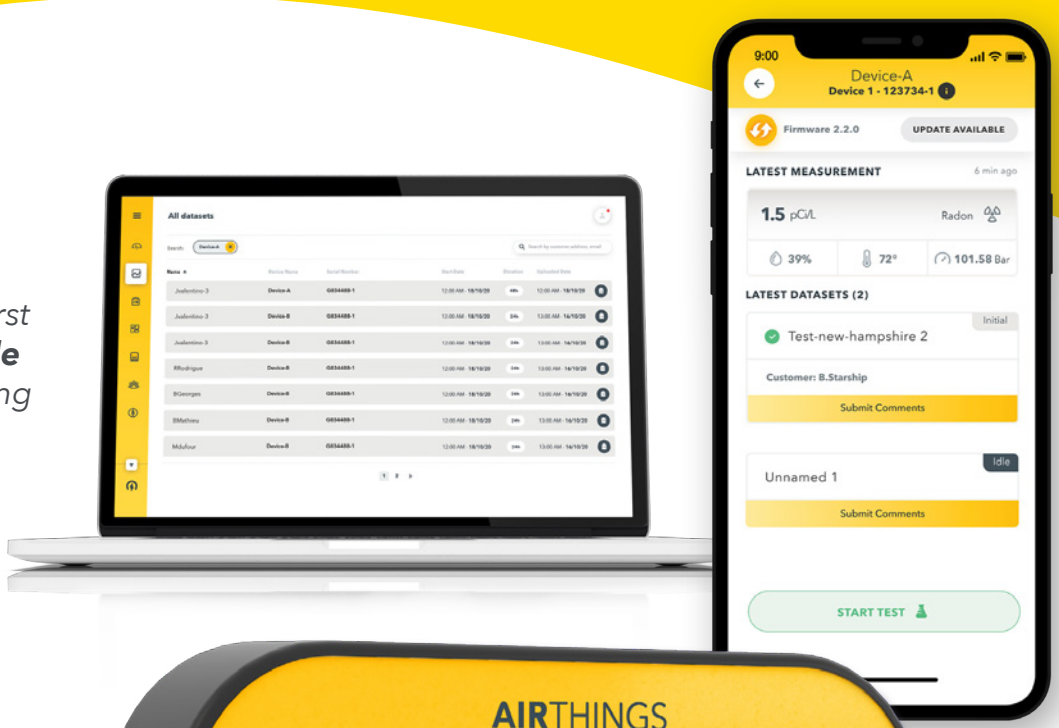

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New Mitigation Simulation Training Tool

Adam Salam, AARST Intern, Kennesaw State University, Computer Game Development

Nine months ago, AARST hired me as an intern to develop a simulation tool, a means for virtual learning and evaluating mitigation candidates to see if they have the applicable knowledge to be certified mitigators. The Mitigation Practicum Committee, a group of volunteers that includes some of the most experienced radon mitigators and trainers in the country, was appointed by the NRPP Certification Council to manage the project.

The tool focuses on acquiring mastery of the diagnostic phase of active soil depressurization (ASD). Some of the simulation features could be used by more than just traditional radon mitigators. For example, a homeowner who initially knows little about radon mitigation would be able to educate themselves on the process by interacting with a tool such as this one.

The primary objective of the tool is to provide a cost-effective, efficient, and standardized way to train and assess the proficiency of radon mitigators. The possibilities with virtual radon diagnostic testing are endless. Any scenario is possible for users to traverse; different foundation types, varying sub-slab conditions, air leakage, pipe layout, anything. Using the tool will exponentially reduce the time to gain experience with ASD diagnostics and mitigation system design.

One of the challenges in creating a computer simulation tool has nothing to do with the technical or complexity of the development, but rather working around the limitations potential users will have when it comes to system hardware: working with "regular" laptops without dedicated graphics cards. Such computers process graphics internally with the central processing unit (CPU). Additionally, a relatively small amount of computer memory (RAM) could be an issue when running a video simulation.

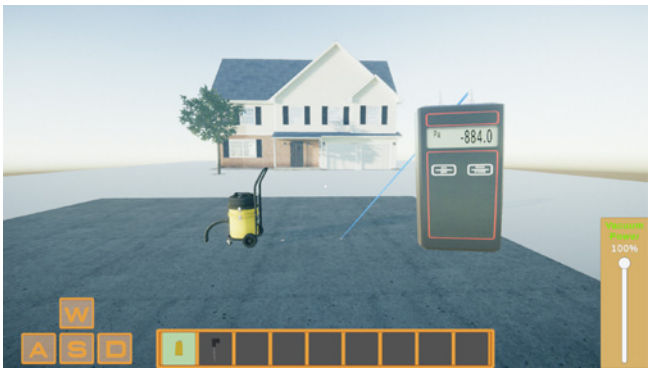
Most users of this simulation will face such limitations. The solution to these challenges will likely be cloud computing, where the primary computer is the interface to play and visualize the simulation but the processing required for playing the simulation is happening on servers elsewhere. As the data are communicated via an online network, the user's system requirements are less of an issue.

Of course, the big challenge to overcome was my learning curve for becoming savvy at sub-slab diagnostics and fan sizing. To assist with my education in this area, AARST sent me to an onsite Advanced Diagnostics class. This education provided me with useful information and inspired my development of tool attributes and broader applications.

We have more work to do, but our goal is to begin beta testing in early 2022 and have the initial version available to all NRPP training providers before the end of 2022.

"This simulation tool will allow training providers to assess how well their students can demonstrate pressure field extension diagnostics and final system design without having to bring the participants into the field and poke holes in people's basements. Participants will need to pass the final practicum to sit for the exam, and we are developing multiple scenarios for students to learn from."

-Bruce Snead, Chair, NRPP Mitigation Practicum Committee, Certification Council member.



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WTH Did They Just Say?

Amy Morris, AARST Media/Publications Manager

Communicating your ideas clearly and skillfully to a group of colleagues can be challenging under the best of circumstances. But if you are new to the radon industry, you may have been in a conversation with an old-timer and had no clue who or what they were talking about.

To save time while messaging, millennials have the digital world well-stocked with acronyms; short letter combinations used as placeholders for phrases - PAW, JK, IDC, JLMK, TTYL, etc. But acronyms are not just for millennials. Radon professionals can have entire conversations referencing government entities, building types, policies, etc., adeptly exceeding any normal amount of acronym usage, LOL! And when speaking to each other, they actually understand WTH the other is talking about. But some new to the field and stakeholders may have trouble translating.

Let's demystify those seemingly secret chats by defining some industry abbreviations.

Radon Industry

ARPC- American Radon Policy Campaign
ASD- Active Soil Depressurization (mitigation system)
CRM- Continuous Radon Monitor
LB- Large Buildings
MAH- Measurement of Homes
MAMF- Measurement of Multifamily Buildings
MALB- Measurement of Large Buildings
MF- Multifamily
MSQA- Radon Measurement Systems Quality Assurance
NRAM- National Radon Action Month
NRAP- National Radon Action Plan
NRPP- National Radon Proficiency Program
NRSB- National Radon Safety Board
OM&M- Operation, Maintenance and Monitoring
QA/QC- Quality Assurance/Quality Control
PFE- Pressure Field Extension
Radon PAC- AARST's Radon Political Action Committee
RMFT- Radon Measurement Field Technician
RMI- Radon Mitigation Installer
RMP- Radon Measurement Professional
RMS- Radon Mitigation Specialist
RRNC- Reducing Radon in New Construction
SF- Single Family
SGM-SF- Soil Gas Mitigation
VCS- Voluntary Consensus Standards
VI- Vapor Intrusion

Government

CDC- US Centers for Disease Control and Prevention
EPA- US Environmental Protection Agency
FHA- Federal Housing Agency (within HUD)
FHFA- Federal Housing Finance Agency
FHLMC- Freddie Mac- Federal Home Loan Mortgage Corporation
FNMA- Fannie Mae- Federal National Mortgage Corporation
HUD- US Department of Housing and Urban Development
NRC- Nuclear Regulatory Commission
OSHA- Occupational Safety and Health Administration

Codes and Standards

ANAB-ANSI National Accreditation Board
ANSI- American National Standards Institute
ASHRAE- American Society of Air-conditioning, Refrigeration and Heating Engineers
IBC- International Building Code
ICC- International Code Council
IgCC- International Green Construction Code
IRC- International Residential Code
ISO- International Organization of Standardization
ISO 17024- ISO Standard for Conformity Assessment for personnel certification bodies

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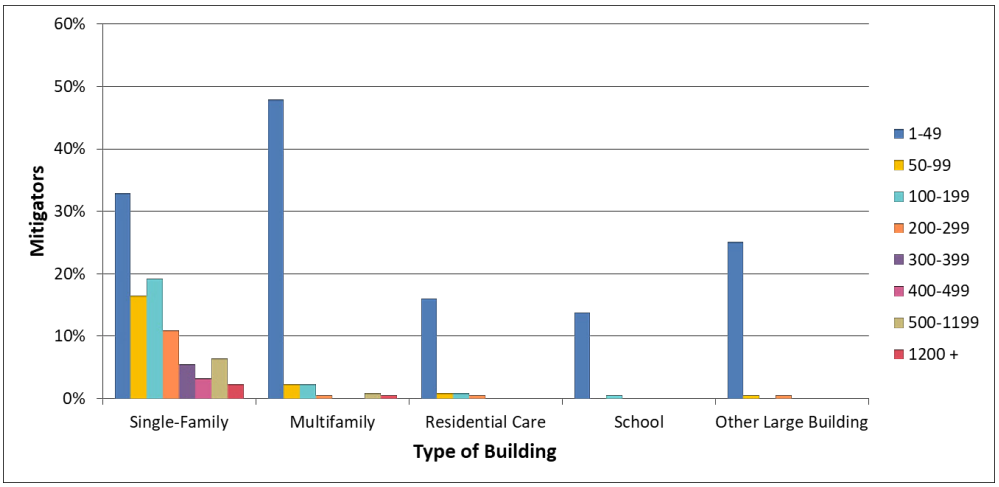
Radon Mitigator Survey

AARST conducted a survey of mitigators to begin to fill gaps in data – post-mitigation radon levels, mitigation systems installed, fans installed. AARST reached out to all mitigators who were NRPP-certified, NRSB-certified, and state-certified or licensed to ask about their mitigation work in calendar year 2020. The survey was open May 3-24, 2021.

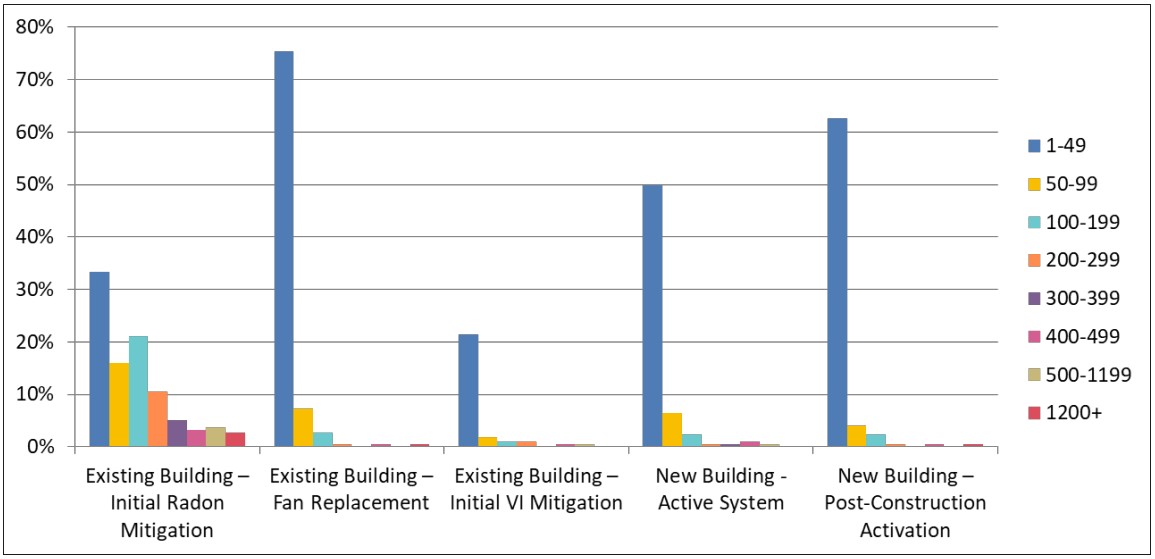
The survey asked mitigators to report the quantity of mitigation system and fans installed in 2020 through multiple choice of ranges of numbers (0, 1-49, 50-99, 100-199 etc. through 1200+) to simplify and therefore expedite responses. Data on the charts below express the percentage of mitigators reporting. Responses of zero are excluded. Each group of vertical bars covers the same installation type or purpose, with each bar displaying the percentage of mitigators who installed the number of systems indicated by the range for that color.

FIGURE 1. MITIGATION SYSTEMS INSTALLED BY TYPE OF BUILDING



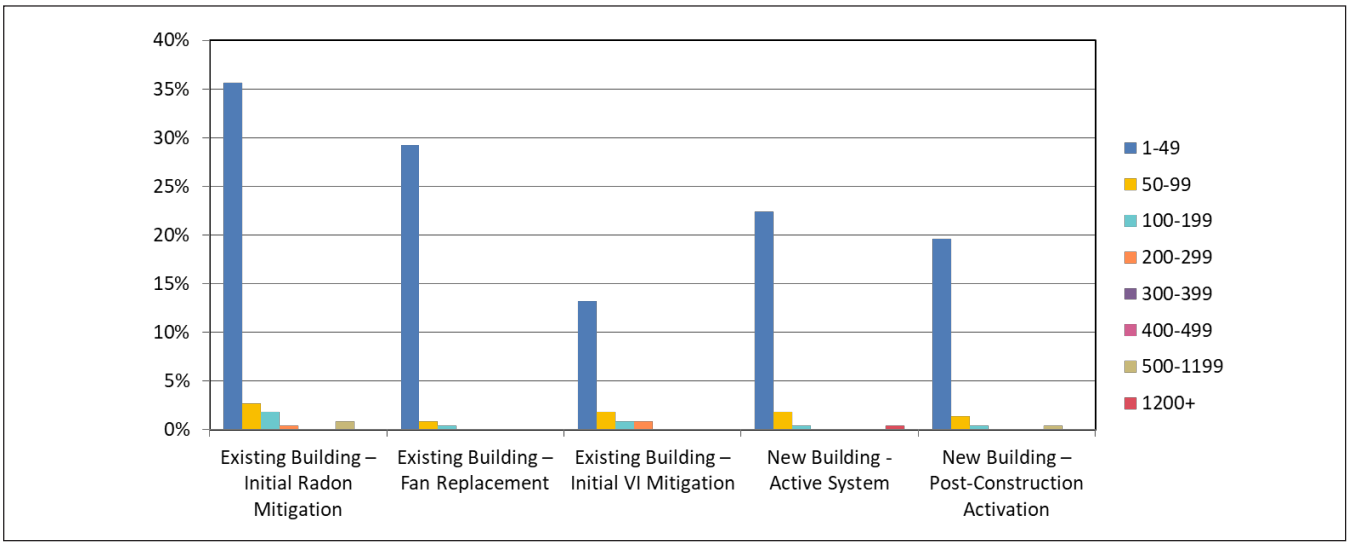
For mitigation systems installed (Fig. 1), nearly all mitigators reported completing single-family mitigations, 54% reported completing multifamily mitigations, 26% other large building mitigations, 18% residential care facilities and 14% schools.

FIGURE 2. SINGLE FAMILY HOMES: FANS BY INSTALLATION PURPOSE



Mitigators' reports of fans by installation purpose for single-family homes (Fig. 2) are presented above.

FIGURE 3. COMMERCIAL BUILDINGS: FANS BY INSTALLATION PURPOSE



Mitigators' reports of fans by installation purpose for multifamily, school, residential care, and other large commercial buildings (Fig. 3) are presented above.

Continued on page 26

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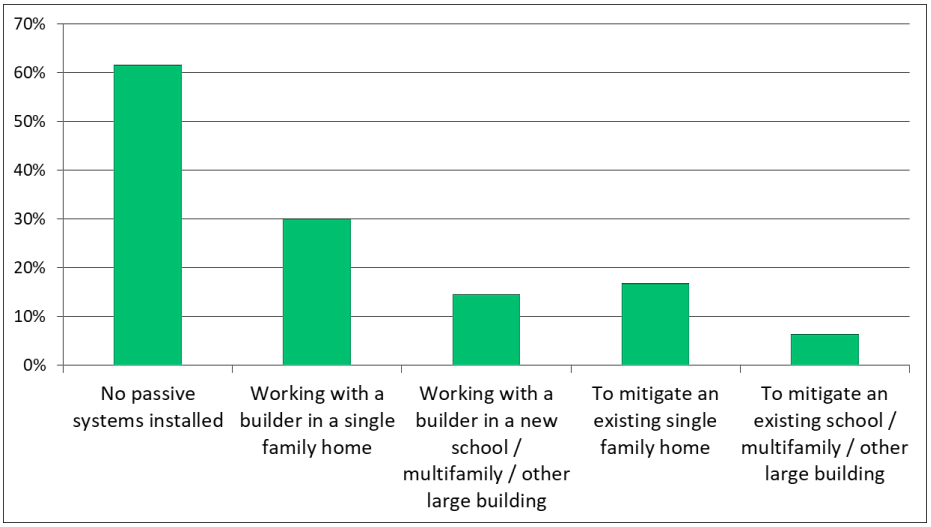
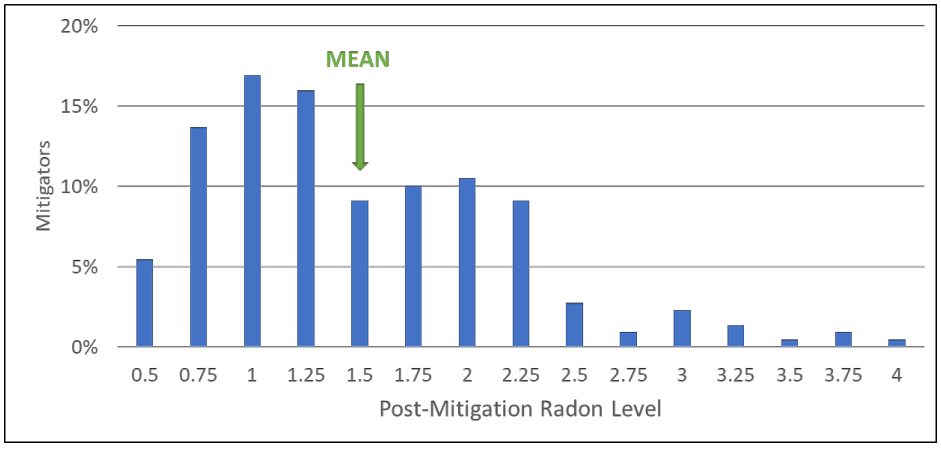
With the mitigation and fan response options structured as ranges of numbers, data aggregation also provides ranges. The credentialed mitigators surveyed completed 34,000 - 71,000 mitigation systems in 2020. They represent 11% of the credentialed mitigators (n=1899). Multiplying their mitigations by eight translates to an estimated 275-572,000 mitigation systems industry-wide. The mitigators installed 34,000 - 98,000 fans in 2020; multiplying their fan installations by eight translates to an estimated 272-789,000 fans installed across the industry in 2020.

FIGURE 4. PASSIVE SYSTEMS INSTALLED IN 2020



Most mitigators (62%) reported that they did not install passive systems (Fig.4). The most common circumstance reported for a passive system was new construction of a single-family home (30%), followed by passive mitigation in an existing single-family home (17%), and new construction of a commercial building (15%).

FIGURE 5. AVERAGE POST-MITIGATION RADON LEVEL IN 2020



For mean radon level, the survey provided a multiple-choice response with ranges for each ¼th of one picocurie through 4, such as .75 to .99. For this report, in order to be most conservative, we present results for the upper end of the ranges. Also to simplify the presentation we rounded up, so levels from .75 to .99 are reported as 1, etc.

Results for the upper end of each range, rounded, indicate that mitigators achieved a mean post-mitigation radon level of 1.5 pCi/L (Fig. 5). The mean was the same whether the work volume was 100+ systems or fewer, and whether or not multifamily mitigations were in the portfolio.

Thank you to the 219 mitigators who took time from their busy lives to respond to the Radon Mitigator Survey (and to the state radon programs that helped inform radon professionals about the survey).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