

Report:

3rd Residential Construction Market Stakeholder Workshop

December 7, 2025
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Prepared for:
ASHRAE Technology Council

Prepared by:
Residential Building Committee

Executive Summary

On December 7, 2025, ASHRAE's Residential Building Committee convened a third stakeholders' workshop to assist in expanding our understanding of the residential building industry and ways ASHRAE might further its mission in this critical market sector. For one day, roughly 30 stakeholders representing a diversity of interests met and discussed an array of topics, sharing their insights and observations about the residential buildings marketplace, as well as discussing various ways ASHRAE might effectively participate in, and support, that marketplace.

Interests represented in the workshop included residential new construction, existing buildings, HVAC, lighting, federal agencies, national laboratories, efficiency advocates, indoor environmental quality professionals, manufacturing interests and many more.

The workshop began with the keynote address from guest speaker Bryan Orr of Kalos Services. Following the keynote address, attendees participated in breakout sessions based on the four key initiatives (Relevance within ASHRAE, Decarbonization, Indoor Environmental Quality, Resiliency) from the 2024-2029 RBC Strategic Plan. Attendees reconvened to share their thoughts with the entire assembly at the end of the day.

Based on the input from the stakeholders, targeted action items and priorities for ASHRAE included:

- Continue strengthening ASHRAE's role as a "trusted source" for key issues of residential building performance, including energy efficiency and indoor environmental quality.
- Continue strengthening collaboration between public and private sector entities seeking to shape the residential building marketplace to address affordability for high performance building technologies.
- Continue identifying and addressing the research needs on various aspects of residential building performance, including IEQ and resilience topics.

- Help to translate existing technical information on key topics of residential building performance for multiple end users – from consumers to builders to financial institutions.
- Identify where ASHRAE might assist industry in strengthening and training the residential building labor workforce.
- ASHRAE should consider developing an integrated framework for residential resilience that sets clear survivability standards, incorporates risk and insurance data, and leverages post-disaster insights. This effort should also include hardened (withstand extreme events) HVAC equipment standards, support for research on extreme heat impacts, and incentives to drive adoption of resilient practices.
- ASHRAE should help industry reframe energy efficiency messaging to emphasize comfort, health, and long-term value while aligning with consumer priorities like utility savings and emotional decision-making. Additionally, ASHRAE should work with key industry stakeholders to foster holistic approaches that integrate trades, real estate, insurance, and broader benefits beyond simple payback to overcome adoption barriers.
- Engage with insurance and underwriters associations to find common ground for improving the resilience of the built environment and for ASHRAE to provide technical rationale for valuing higher performing and healthier residences.
- Recommend hosting stakeholder workshops at the chapter level to gain feedback from a wider audience. Many parts of the world have differing needs for the residential built environment. Providing a forum at a local level will allow a more diverse set of opinions. This would also provide a feedback loop to ASHRAE Society for action.

Following the Stakeholders Workshop, notes from each breakout session were uploaded to the RBC Basecamp. The Residential Building Committee and RBC Staff Liaison met and reviewed the efforts of the workshop. Stakeholder input will be used to help shape the ongoing work and priorities of the RBC and their recommendations to ASHRAE.

A detailed report of the workshop follows this Summary.

Respectfully submitted,

Carol Marriott
Chair
ASHRAE Residential Building Committee

Report

This report is organized as follows:

- Section 1: Workshop Overview/Structure
- Section 2: Results from Breakout Session 1 (Energy Affordability and Consumer Choice)
- Section 3: Results from Breakout Session 2 (Energy Reliability and Resilience)
- Section 4: Results of Breakout Session 3 (Indoor Environmental Quality)
- Appendix A: List of Attendees
- Appendix B: Workshop Agenda
- Appendix C: Stakeholders Input from All Three Sessions
- Appendix D: Recommendations for Future Stakeholder Events

SECTION 1: Workshop Overview/Structure

The third ASHRAE Residential Stakeholders Workshop was held at the 2025 Building XVI Conference in Clearwater, Florida. Invitations were extended to organizations currently listed in the RBC Strategic Plan. Twenty-four stakeholders attended the workshop. A list of attendees is included in Appendix A [Editor's Note: some participants came and went throughout the day and thus attendance fluctuated between 24 and 30 throughout the day].

The specific goals for the workshop included:

1. **Update Stakeholders:** Share progress on ASHRAE initiatives implemented since the last workshop, reflecting stakeholder input.
2. **Highlight Achievements:** Provide stakeholders an opportunity to present recent advancements in residential building performance.
3. **Collaborate on Future Actions:** Engage attendees to identify actionable steps ASHRAE can take to address market needs, including energy efficiency, indoor environmental quality, and workforce development.

Building on outcomes from the previous workshop, the discussion focused on:

- Strengthening ASHRAE's role as a trusted source for residential building performance.
- Defining what constitutes "high performance" residential buildings.
- Developing tools for assessing residential energy efficiency and economic viability.
- Leading efforts in codes, standards, and design guides for multi-family residential buildings.
- Enhancing collaboration between public and private entities in the residential sector.
- Addressing research gaps and translating technical information for diverse stakeholders.
- Supporting workforce development and training to meet residential building needs.

This workshop provided a platform for engagement, knowledge-sharing, and actionable planning to advance solutions for residential building performance.

To accomplish these objectives, the workshop format included a keynote speaker and three breakout sessions on the topics of Energy Affordability and Consumer Choice, Energy Reliability and Resilience, and Indoor Environmental Quality. The workshop concluded with a wrap-up and summary discussion on the priorities identified by attendees and speakers and suggestions for possible next steps.

The keynote speaker for the workshop was Bryan Orr, Vice President of Service at Kalos Services and host of the HVAC School Podcast. Bryan's keynote address explored the challenges and opportunities in workforce development for high-performance residential construction and retrofits. With insight grounded in years of hands-on experience, he focused on how to attract, train, and retain skilled workers to meet the evolving needs of the residential sector. Bryan identified gaps and challenges, laying the foundation for meaningful breakout discussions on how workforce engagement can drive innovation and elevate residential building performance.

Members of the RBC acted as recorders and facilitators for all three breakout sessions. Members of the committee were assisted by ASHRAE RBC Staff Liaison Derrick Nesfield from Peachtree Corners Headquarters, in organizing and conducting a most effective event.

The RBC met following the workshop to continue honing the input and recommendations from the workshop. Notes from the workshop are included in this report (Appendix C).

SECTION 2: Results from Breakout on Energy Affordability and Consumer Choice

ASHRAE Residential Buildings Committee (RBC) Workshop for Workforce and Industry Engagement was conducted as part of the Buildings XVI Conference. The workshop focused on energy affordability and consumer choice, energy reliability and resilience, indoor environmental quality (IEQ), workforce development, and equity considerations in residential buildings.

Stakeholder discussions highlighted that homeowners respond more strongly to messaging around comfort, health, reliability, and affordability than to energy efficiency metrics alone. Participants emphasized that consumer decision-making is emotional and shaped by socioeconomic conditions, geographic location, and perceived value.

Workforce development emerged as a cross-cutting theme, reinforcing keynote insights on the need to bridge technical expertise with real-world residential practice. Participants identified gaps in training consistency, limited field-based education, and misalignment between codes, standards, and climate-specific realities.

Equity, affordability, and access were repeatedly cited as foundational challenges. Stakeholders encouraged ASHRAE to strengthen its leadership role by advancing practical guidance, tools,

and standards that integrate energy efficiency, resilience, indoor environmental quality, and workforce readiness while addressing non-energy benefits such as health, comfort, and durability.

Energy Affordability & Consumer Choice – Key Themes:

Barriers to Consumer Adoption of Energy Efficiency

- Selling energy efficiency alone is ineffective.
- Comfort and health are not emphasized enough in messaging.
- Consumers focus on utility bills; efficiency must be framed from this perspective.
- Customers care more about 'energy effectiveness' than 'energy efficiency.'
- Energy efficiency is not perceived to increase home value.
- Trades are overly siloed; holistic approaches are needed.
- No clear market triggers motivate consumer investment.
- Standards often rely on simple payback rather than broader benefits.
- Limited coordination with insurance, realtors, and underwriters.
- Barriers vary by socioeconomic status and geography.
- Low energy costs reduce motivation for upgrades.
- Household decisions are emotional.
- Programs often do not substantiate payback claims.

Workforce Issues

- Existing workforce lacks direction on new technologies.
- Training is inconsistent and not field-based.
- Codes and standards are misaligned with climate realities.
- Most upgrades occur after emergency failures.
- Training is often theoretical rather than practical.

Equity, Affordability, and Access

- Many households cannot afford efficiency upgrades.
- Upfront costs are a major barrier.
- Limited access to trustworthy resources and financing.
- Energy efficiency and carbon reduction measures feel inaccessible.

SECTION 3: Results from Breakout on Energy Reliability and Resilience

RBC Workshop focused on energy reliability and residential resilience in the face of extreme weather events, including wildfires, hurricanes, heat waves, flooding, and extended power outages. Participants examined what fails during disasters, what matters most for occupant safety and continuity, and how residential buildings can be designed and retrofitted to improve survivability.

Key themes included the critical role of the building envelope, ventilation, backup power, water

management, and hardened HVAC systems. Stakeholders emphasized the need to define and standardize concepts such as passive survivability, resilience, and hardened residential construction in ways that are measurable, actionable, and scalable.

Participants identified significant gaps in codes, standards, insurance alignment, and workforce coordination. They encouraged ASHRAE to lead efforts in developing survivability metrics, integrating resilience into standards and guidance, supporting research for extreme conditions, and coordinating across industries to improve residential outcomes during and after disasters.

Energy Reliability and Resilience – Key Themes:

Wildfire and Smoke Events – What Fails

- Envelope failures leading to smoke infiltration and poor indoor air quality.
- Loss of power resulting in cascading system failures.
- Mechanical ventilation systems unable to operate during outages.
- Structural vulnerability to fire exposure.

Wildfire and Smoke – What Matters

- Clear escape paths and evacuation readiness.
- Maintaining acceptable indoor air quality during smoke events.
- Fire detection and alarm systems.
- Community sheltering options and backup power availability.

Key Stakeholders

- Homeowners
- Builders
- First responders
- Emergency management agencies
- Insurance providers
- Utilities
- Local government leaders

What Can Be Fixed at Scale

- HVAC, building envelope, and passive design strategies.
- Simple, clearly defined emergency or evacuation operating modes.
- Insurance and finance alignment using fire risk mapping and home labeling.
- Clear definitions of infrastructure and water security risks.
- Addressing gaps in codes and standards at the local government level.

Defining Resilience

- Ability of a building to survive with minimal damage during disasters.
- Maintenance of value and functionality over time.
- Low operational cost during extreme weather events.
- Ability to withstand fire, heat, flooding, and other hazards.
- Passive survivability during extended power outages.
- Durability and resistance to damage.

Hurricane and Flooding Events – Common Failures

- Roof and structural failures.
- Loss of power, water, gas, and refrigeration.
- Window and envelope failures.
- Breakdown of communication systems.
- Disruptions to transportation, fuel, and food supply.

Resilience – What Matters Most

- Backup power systems.
- Fortified structural systems including roof strapping and anchoring.
- Preparedness measures for food and water.
- Flood mitigation strategies such as sandbags, elevated structures, and pumps.
- Hardened HVAC equipment and elevated outdoor air intakes.
- Strong building codes and effective enforcement.
- Floodwater management including cisterns.
- Limits on impermeable surfaces.
- Use of thermal mass to maintain indoor temperatures.

Potential ASHRAE Actions

- Develop standards and metrics for residential survivability and resilience.
- Integrate resilience metrics with insurance data and risk analysis.
- Address codes and standards for existing homes and aging materials.
- Use post-disaster forensic data to inform future codes.
- Support research on products for extreme heat and health outcomes.
- Encourage incentives that promote residential resilience.
- Improve coordination of qualified construction trades.
- Develop standards for hardened and resilient HVAC equipment.

Section 4: Results of Breakout on Indoor Environmental Quality

RBC Stakeholder Workshop focused on indoor environmental quality (IEQ). Participants examined what IEQ is, its impact on everyday life, codes and standards that address IEQ, and knowledge gaps that need to be addressed.

Participants identified what impacts IEQ, who should be included in the overall IEQ conversation, and what actions ASHRAE can take to address these issues.

Indoor Environmental Quality - Key Themes:

What is IEQ?

- Indoor Environmental Quality (IEQ) is the overall condition of a building's interior, encompassing air quality, lighting, thermal comfort (temperature/humidity), acoustics, and overall occupant health and well-being, affecting productivity and comfort through factors like ventilation, pollutant control, natural light, and moisture management. Good IEQ, achieved through good HVAC, proper daylighting, moisture control, and low-emission materials, boosts health, focus, and building value, while poor IEQ stems from pollutants (VOCs, mold, dust), stuffiness, and bad lighting.

What influences IEQ?

- Neighbors
- Contractors
- Google
- YouTube
- Media Creators
- Homeowners/Occupants/Building Owners/Tenants
- Designers and Trade People
- Manufacturers
- Installers
- Pets
- Children
- HVAC Technicians
- IAQ monitors
- Better Business Bureaus
- Medical Professionals

Most Valued IEQ Factors (ranked most valued to least valued)

- Comfort
- Light
- Air Quality
- Sound

What data are we missing? (ranked highest to lowest)

- Health Impact Data

- Consumer Valuation of IEQ
- Other
- IAQ Field Data

What are ASHRAE's strengths related to IEQ?

- Experts in the organization
- Standard 55
- Existing IAQ and comfort standards
- Creating standards that carry weight
- Expertise in standards writing
- Strong connection to HVAC equipment manufacturers
- Manufacturer alliances
- Recognized reputation for integrity and science
- Ability to research and evaluate research
- Existing IEQ-related standards to build off of
- The ability to convene workshops around the world

Who should ASHRAE engage for the highest impact?

- Insurers/Underwriters
- Realtors
- Architects/Engineers
- Homeowners
- Manufacturers

Potential ASHRAE Actions

- Recruit different stakeholders to participate on committees
- Create events to engage different stakeholders
- Create new standard or expand scope of Stds 55 or 62
- Research?

What can be done immediately?

- More fieldwork and/or connecting fieldwork to the meeting rooms.
- Translate best practices to easy answers/best practices and illustrations.
- Ask questions of occupants and listen to answers.
- Research what exists globally about the subject.
- Connect ASHRAE with contractors that are willing to work alongside ASHRAE to connect the dots.
- Do ideation meetings locally and capture insights.
- Coordinate with local chapters.
- Create standards and regulations around product VOC levels.
- Consider an "ASHRAE Answers" series that regular people can use for (free?) advice and answers to home-related questions.
- Enroll interesting communicators/new media outlets.

- Explore HVAC as a service business model.
- Connect ASHRAE with community colleges that have a building science curriculum.
- Look at existing research from other organizations and see what gaps exist around IEQ.
- Keep the conversation going.

Appendix A: List of Attendees [Editor’s Note: some participants came and went throughout the day and thus attendance fluctuated between 24 and 30 throughout the day]

Name	Organization
Alice Rosenberg	Consortium for Energy Efficiency
Amy Royden-Bloom	USDOE
Asa Foss	USDOE
Xudong Wang	AHRI
Robin Vieira	FSEC
Sam Rashkin	ORNL
Michael Lubliner	ORNL
Jonathan Bean	University of Arizona/SBSE
Iain Walker	LBNL
Urmilla Jokhu-Sowell	National Glass Association
Cardice Howard	RESNET
Doug Cochrane	DL
Walter Robison	Air Duct Council
Martin Dieryckx	Daikin Europe NV
Eric Kaiser	Tru Tech Tools
Stacey Rothgeb	NREL
Bryan Orr	Kalos Services
Ahmed Alqaisi	City of DeSoto - Development Services
Wahid Maref	Ecole de Technologie Superieure (ETS)
Olof Sven Mundt-Petersen	Swedish Federation of Wood and Furniture Industry & Lund University
Meghan Kathleeen Sylvia	Frontier Energy
Paulo Cesar Tabares Velasco	Colorado School of Mines
Andre Desjarlais	Oak Ridge National Lab
Andrea Giovanni Mainini	Politecnico di Milano
Abdulfattah Mohammed Almasehali	MUST
Husnain Alvi	Mirpur
Alexander Zhivov	USACE
Elly Trinh	King County
Ahmed Boubker Boudayah	University of Nottingham
Ahmed Sadek	Dar Al Handasah
Collin Olson	Energy Conservatory
Chrissi Antonopoulos	PNNL (RBC)
Darcy Carbone	Carbone and Associates (RBC)
Wes Davis	ACCA (RBC)
Jingjuan “Dove” Feng	2050 Partners (RBC)
Kimberly Llewellyn	Blue Rabbit Consulting (RBC)
Derrick Nesfield	ASHRAE Staff

Appendix B: Workshop Agenda**Buildings XVI ASHRAE Residential Buildings Committee
Workshop for Workforce and Industry Engagement****Event Overview:**

- Date: Sunday, December 7, 2025, from 8:30 AM – 4:00 PM EST
- Location: Beach Room (Lobby Level) at Clearwater Beach Sheraton Resort on Sand Key in Clearwater Beach, Florida (as part of the Buildings XVI Conference, Dec 8-11, 2025)
- Objective: Encourage robust discussion, foster meaningful relationships, and provide actionable insights on residential building challenges and solutions.

1.1.1 Workshop Schedule:

<i>Time</i>	<i>Activity</i>
8:30-8:45	Registration & Welcome Remarks
8:45-9:45	Keynote Address: Bryan Orr – Challenges and Opportunities for Home-Performance Residential Construction
9:45-10:00	Break
10:00-11:30	Session 1: Energy Affordability & Consumer Choice
11:30-12:30	Lunch
12:30-2:00	Session 2: Energy Reliability & Resilience
2:00-2:15	Break
2:15-3:45	Session 3: Indoor Environmental Quality
3:30-4:00	Wrap-up & Summary Discussions

Appendix C: Stakeholders Input from All Three Sessions

Session 1: Energy Affordability & Consumer Choice

Energy Efficiency:

- R&D on humidity control systems for low sensible load homes in humid climates (use results from 90.2, 62.2, etc.)
- Demonstrative and quantitative savings associated with upgrades, especially for in-field installations.
- ASHRAE Education training.
- Listen to people, techs, installers and crafts people who care.

Workforce:

- Clean house on standards.
- Training courses for new technologies.
- Awareness education training
- Make standards separate from guidance to achieve standards.[Editor's Note: the terms Standards and Guidelines are not well differentiated in the industry, and the language used in them is not always well understood]
- Create language and standards on field time, field outreach and hire more consultants from the field.

Equity, Affordability, and Access:

- Partner with organizations such as Habitat for Humanity to do low cost fixes to homes.
- Research on energy optimal levels for each climate zone.
- Guidance on impact in each climate zone.
- Education awareness
- Government Affairs
- Standards for non-energy impacts
 - Thermal comfort
 - IAQ
 - Quantification that programs can use in TRMS (more like 62.2)
- Show a real-life example besides data. Tell a story.
- Communicate and work with other standards organizations to make a unified process with a defined end goal.
- Encourage investment in building envelopes first then systems.
- RBC: validation of future AI-enabled code interpretation.
- Promote dew point and demand ventilation strategies regardless of energy.
- Research into delivering energy efficiency and decarb much more cost effectively.

Session 2: Energy Reliability and Resilience

- Develop standards and metrics for residential survivability and resilience.

- Integrate resilience metrics with insurance data and risk analysis.
- Address codes and standards for existing homes and aging materials.
- Use post-disaster forensic data to inform future codes.
- Support research on products for extreme heat and health outcomes.
- Encourage incentives that promote residential resilience.
- Improve coordination of qualified construction trades.
- Develop standards for hardened and resilient HVAC equipment.

Session 3: Indoor Environmental Quality (IEQ)

- Recruit different stakeholders to participate on committees
- Create events to engage different stakeholders
- Create new standard or expand scope of Stds 55 or 62
- Research

Appendix D: Recommendations for Future Stakeholder Events

- To achieve greater attendance, consider hosting at conferences more dedicated to the residential built environment for example;
 - New residential construction: EEBA <https://summit.eeba.org/>
 - Existing buildings: NHPC <https://building-performance.org/events/national/>
- Host local stakeholder workshops (regional or chapter) to gain a more diverse feedback from a wider audience. Many parts of the world have differing needs for the residential built environment. Providing a forum at a local level will allow a more diverse set of opinions [Editor's Note: Has been submitted for PAOE points]
- Update focus topics on current industry events as needed