

RBC Strategic Plan

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Prepared for:
Residential Buildings Committee

Prepared by:
Residential Buildings Committee

Executive Summary/Introduction

At the beginning of 2023, the Residential Buildings Committee (RBC) created a strategic plan to guide their involvement within ASHRAE for the next several years. To that extent, this document was created to address that need. The charter for RBC was not affected, but the topics of most concern were identified and match to ASHRAE Society's strategic plan in place at the time. Those topics include Decarbonization, Indoor Environmental Quality and Resilience. The goal of this document is to lay out the key foundational gaps the RBC has identified, and the overarching suggested resolutions that RBC can take within ASHRAE to close those gaps. One key element to remember is that RBC as a committee within ASHRAE has always struggled to emphasize their importance to the ASHRAE membership. As a result, that along with the suggested outcome, may be the largest gap that the committee needs to review and take on in the coming years.

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1. RESIDENTIAL BUILDING COMMITTEE CHARTER

The Residential Buildings Committee (RBC) is responsible for identifying major residential trends impacting the practice of HVAC&R, informing the ASHRAE leadership and membership of these trends and their potential impacts, and making recommendations on new activities and policies in response to these trends. The committee will identify, recommend and coordinate relationships with societies and organizations that focus on residential buildings.

1.1 RBC Vision

A healthy, sustainable and zero carbon built environment for all.
Drive a greater influence for ASHRAE on the residential built environment.

1.2 Values

- Excellence
- Commitment
- Integrity
- Collaboration
- Volunteerism
- Diversity

2. STRATEGIC PLAN AREAS AND INITIATIVES

2.1 Relevance within ASHRAE

Definition/Background

The majority of the ASHRAE membership is focused on commercial and institutional knowledge. For example, only four technical committees have the word residential in their scope. As the Residential Buildings Committee, we are charged with identifying major residential trends impacting the practice of HVAC&R, informing the ASHRAE leadership and membership of these trends and their potential impacts, and make recommendations on new activities and policies in response to these trends. This is a difficult endeavor when the reach of ASHRAE to the residential built environment is limited.

Opportunity/Gaps

The RBC is a small committee with only 18 members. ASHRAE only has four technical committees with the word residential in their scope, and none specifically dedicated to residential alone. ASHRAE Chapters struggle to get residential stakeholders to their meetings on a regular basis. RBC is limited in the ability to affect the residential built environment with a small committee and not enough members on the committee to do the work.

Direction/Desired Outcomes

- Enable a process within ASHRAE to develop, promote and share best practices within the residential built environment.
- Help ASHRAE to become the source of technical knowledge for residential issues affecting the industry.
- Increase ASHRAE's presence and importance in the residential built environment.

2.2 Decarbonization

Definition/Background

The pace of change in building design, development, construction, and operation is increasing rapidly, driven by increasing global challenges associated with increasing building-related GHG emissions. In alignment with ASHRAE's position document on decarbonization, by 2030, all residential buildings must be built to achieve net zero operational GHG life cycle emissions, with all existing residential buildings retrofitted to net zero GHG life cycle emissions by 2050. In order to achieve residential buildings zero emissions, energy efficiency is mandatory. ASHRAE must work with building industry partners to accelerate innovation, define global best practices, and develop technical guidance, standards, training, and other tools to support building decarbonization while assuring high levels of energy efficiency, indoor environmental quality, sustainability, and resilience.

Opportunity/Gaps

The largest gaps identified in decarbonization for residential topics were financial, lack of standards and tools, and knowledge/education down to the homeowner level.

Financial and Responsibility

- Need to prove it is financially viable
- How do we make a home user/owner care?
- How do you accomplish a retrofit while minimizing disturbances to building occupants

Standards

- No standardization around carbon measurements
- Lack of renovation standards to meet decarbonization goals
- Lack of Standards on reuse of materials

Tools

- What design and measurement tools are available and available to all?

Technical Knowledge/Education

- Lack of education down to the homeowner level

Direction/Desired Outcomes

The RBC seeks to resolve the gaps as it relates to decarbonization. Below are several of the high level actions that should be pursued over the next 5 years. While several issues have been identified, involvement from ASHRAE as well as education are paramount in the residential space. RBC needs to continue to bring awareness to other ASHRAE committees as to the importance of residential activities. This is perhaps the most important aspect of our strategic plan as ASHRAE has not always been the go to reference for residential activities. To continue to expand its influence on the residential building community, RBC must continue to work and promote awareness of its work through ASHRAE membership and society at large.

Increase awareness throughout ASHRAE membership

- Promote ASHRAE residential activities throughout ASHRAE Membership
- Bring awareness to other ASHRAE committees of residential's importance

Topics for promotion

- Social cost of carbon emissions
- Technical and financial resources for whole packaged solution for retrofit
- Cost effective strategies for energy efficiency that are easy to find and implement
- Building loans that consider energy efficiency
- Resources for addressing split incentive between owner and tenant
- Solutions for all building and system typology (in-unit, Centrale) and climates (including cold and extremely cold climates)

Promote new and existing guidelines and standards

- Promote
 - ANSI/RESNET/ICC 301-2022 which provides a standard for life cycle zero operational emissions
 - 90.2 which represents the highest standard for residential building efficiency that exists anywhere
- Recommend development of
 - ANSI Standard on residential embodied carbon calculation methodology
 - Maintenance guidelines to ensure operational carbon is measured over time
 - Joint standards with other standards-making bodies

Create training and tools to address the following needs in the residential built environment

- Training for workforce to design and build
- Contractors empowered to enable decarbonization in residential buildings
- Educational material about decarbonization and how to measure at an individual level
- Design tools that are easy to use and understand to easily design energy efficient zero carbon homes

Develop metrics that homeowner can easily measure

- Owners & Occupants will care about decarb performance if they have a way to easily measure, monitor, and estimate performance
- RBC needs to promote ways of how to accomplish this.

2.3 Indoor Environmental Quality

Definition/Background

The indoor environment is increasingly recognized as the leading priority for the built environment, with implications extending beyond simple acceptability of indoor conditions to its influence on productivity, learning and health. The indoor environment of the future identifies and optimizes interactions among air quality, thermal comfort, lighting and acoustics, based on a firm understanding of implications for occupants' health and wellness. Since most of people's time is spent in residences, ASHRAE convenes and collaborates with experts and stakeholders across the residential buildings industry to accelerate collective knowledge in the field.

Opportunity/Gaps

The largest gaps identified for indoor environmental quality for residential topics were lack of resources, technical understanding/awareness and financial.

Lack of Resources

- Many standards, but they are standalone
- Need adoption of standards by AHJ (Authority Having Jurisdiction)
- Need high performance versus minimum code
- Lack of residential-specific comprehensive standard or guideline
- Tools to measure IEQ: availability and guidance on how to use correctly are needed

Technical / Awareness Challenges

- IEQ is not widely understood nor is a traditional topic for homeowners or single family home builders
- Are there readily available IEQ sensors
- How do we make a homeowner care when they can't 'see it' and the ill effects take time to show?
- Effects of poor IEQ are very personal whether it be IAQ, sound or other environmental effects

Financial

- Hard to make IEQ a priority when homeowners have many other financial obligations
- Special challenges can occur in multifamily buildings when occupants (who would derive IAQ benefits) are not owners who typically pay energy and first costs)

Direction/Desired Outcomes

Involvement from ASHRAE as well as education are paramount to the understanding and improvement of IEQ in residential spaces. RBC will need to serve a prominent role in promoting the education and understanding of IEQ. RBC will need to continue to stress the importance throughout ASHRAE and expand its influence on the residential building community and society in general.

Recommend setting and promoting key metrics for IEQ

- Particulate Matter (PM 2.5: <https://www.epa.gov/air-trends/particulate-matter-pm25-trends>)
- CO2
- Pollutants to indoor air
- VOCs (Volatile Organic Compounds) – For future considerations
 - organic compounds that have a high vapor pressure at room temperature. High vapor pressure correlates with a low boiling point, which relates to the number of the sample's molecules in the surrounding air, a trait known as volatility.
 - Examples: Nitrogen Dioxide, benzene, ethylene glycol, formaldehyde, methylene chloride, tetrachloroethylene, toluene, xylene, and 1,3-butadiene.
- Std 62.2 (Standard for Ventilation on Indoor Air Quality)
- WHO Ambient Air Quality Database, 2022 Update ()
- Source control of pollutants in house (e.g. candles, stoves, VOCs, etc.)

Recommend promoting better filtration with IEQ

- See Appendix for suggested topics

Promote financial viability of IEQ

- The cost of IEQ is about the same or less than current solutions
- IEQ is available to all at a reasonable cost
 - Through inclusion during design
 - Through inclusion after occupancy

Promote tools and knowledge on how to achieve proper IEQ and detect issues

- Ventilation systems are a part of every residence (new construction and retrofit)
- Identification of fresh air content of all human occupied spaces
- Access to knowledge base for IEQ is easily available
- IEQ is well understood and tracked by homeowner like they do with their bank account
- ASHRAE has ability to reach everyone in the residential building to share their knowledge on IEQ
- Sensor technologies that measure PM 2.5 and CO2

2.4 Resiliency

Definition/Background

Working to address challenges posed by climate change, natural disasters, accidents, disease and terrorism. ASHRAE must stimulate innovation and exploration related to these challenges, and promote best practices that enable passive survivability, adaptability, resilience and recovery of residential buildings and communities.

Opportunity/Gaps

Lack of Resources

- Lack of guidelines/standards
- Lack of actionable information for residential buildings

Awareness/Responsibility

- How do you motivate people to take action for long and short term?
- Are we even aware of need for resilience in residential buildings?

Intersecting Factors

- Competing priorities e.g., fossil fuel back up generators
- Sustainability and resiliency are closely linked

Direction/Desired Outcomes

Promote systems that enhance reliability

- Battery Storage for PV systems
- Electric Vehicles
- Switch off air intake system in case of outdoor air quality issues
- Close off mechanical ventilation
- ASHRAE Standard 241

Recommend Guidelines/Standards

- ASHRAE standards that allow us to specify and measure resilient behaviors
- clear actionable guidelines for resilient residential buildings and communities

Recommend and promote financial incentives

- Lower insurance costs
- Cost of resilience would be equivalent to what we spend now with improvement in performance

Develop education and understanding of resiliency and benefits

- See Appendix for list of suggested topics

Recommend how to set priorities

- Widespread adoption of effective resilience strategies
- Clear ways to determine priorities with energy efficiency (ie; use gas powered generator)

Address impacts of wildfire smoke on residents

- Guideline 44P is being developed by ASHRAE (ASHRAE Guideline 44P, Protecting Building Occupants from Smoke During Wildfire and Prescribed Burn Events) but currently no residential equivalent
 - Basecamp Link:
<https://3.basecamp.com/3106353/buckets/1154136/uploads/3957589261>

3. APPENDIX A1 – LIST OF STAKEHOLDERS

Stakeholder Category

Construction

- National Association of Home Builders
- Leading Builders of America
- National Multi-Family Housing Council
- National Apartment Association
- National Association of the Remodeling Industry
- Building Owners and Managers Association
- Restoration Industry Association

Trades

- Air Conditioning Contractors of America
- Sheet Metal and Air Conditioning Contractors National Association
- National Air Duct Cleaners Association
- Plumbing-Heating-Cooling Contractors Association
- Residential Heating Ventilation Contractors Association
- National Electrical Contractors Association
- National Tile Contractors Association
- The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI)
- The Canadian Institute of Plumbing & Heating (CIPH)
- Thermal Environmental Comfort Association (TECA)

Codes and Standards Developers

- International Code Council
- National Fire Protection Association
- Residential Energy Services Network
- Building Performance Institute
- ASTM International
- US Green Building Council
- NATE
- ANSI
- The International Association of Plumbing and Mechanical Officials

Energy Suppliers

- Edison Electric Institute
- American Gas Association
- American Propane Gas Association
- American Public Gas Association
- National Rural Electric Cooperatives Association
- Utility Regulators (State/Federal)- FERC

Individual Utilities (Public, Private, Co-op, etc.)
National Association of Regulatory Utility Commissioners
American Public Power Association
Consortium for Energy Efficiency
Electric Power Research Institute
Gas Technology Institute

Code Enforcement

International Code Council
International Association of Building Officials
National Association of State Energy Officials

Material Suppliers- Energy Efficiency

North American Insulation Manufacturers Association
National Insulation Association
Spray Polyurethane Foam Alliance
Polyiso Insulation Manufacturers Association
Window and Door Manufacturers Association
Air Barrier Association of America
American Chemistry Council
National Electrical Manufacturers Association
Structural Insulated Panel Association
Association of Home Appliance Manufacturers
National Fenestration Rating Council
Glass Association of North America
Foam Sheathing Committee
Exterior Insulation Manufacturers Association
AHRI

Material Suppliers- General

The Gypsum Association
The Brick Industry Association
The Vinyl Siding Institute
APA the Engineered Wood Association
American Wood Council
Canadian Wood Council
Treated Wood Council
Structural Building Components Association
National Roofing Contractors Association
Asphalt Roofing Manufacturers Association
North American Wholesale Lumber Association
National Lumber & Building Material Dealers Association

International Association of Lighting Designers
Illuminating Engineering Society
American Iron and Steel Institute
National Kitchen and Bath Association
National Home Furnishings Association
Tile Council of North America
National Concrete Masonry Association
National Frame Buildings Association
Steel Framing Alliance
Concrete Foundations Association of North America
Portland Cement Association
National Wood Flooring Association
National Association of Manufacturers
Masonry Alliance for Codes and Standards

Home Sales/Inspections/Property Managers

American Association of Residential Mortgage Regulators
American Society of Appraisers
Appraisal Institute
American Insurance Association
Institute for Business and Home Safety
National Association of Realtors
National Association of Home Inspectors
National Association of Certified Home Inspectors
National Association of Residential Property Managers
Residential Landlords Association
CNT Energy

Designers/Engineers

American Institute of Architects
American Institute of Building Design
National Society of Professional Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
Association of Licensed Residential Architects
American Architectural Manufacturers Association
Association of Collegiate Schools of Architecture
Building Enclosure Councils
National Institute of Building Science
Association of Energy Engineers
Architectural Engineering Group

Air/Water Quality

Indoor Environmental Standards Organization
Indoor Air Quality Association
Water Quality Association
American Lung Association
National Sanitary Foundation

Healthy Homes

National Center for Healthy Housing
Green & Healthy Homes Initiative
Healthy Housing Solutions
Clinton Foundation

Federal Agencies

Department of Energy
Department of Housing and Urban Development
Environmental Protection Agency
Air Force
Army
Army Corps of Engineers

Building Research

PNNL
ORNL
NREL
FSEC
LBNL
Home Innovation Research Labs
Building Science Corp
IBACOS
NIST

Energy Advocacy Groups

Building Codes Assistance Project
Alliance to Save Energy
Responsible Energy Code Alliance
Regional Energy Organizations (NEEP, SEEA, SWEEP, etc.)
NEEP
SEEA
NEEA
MEEA
SPEER

SWEEP

National Association of State Energy Officials
Natural Resources Defense Council
ACEEE
Home Performance Coalition
NASCSP

Publishers

Fine Homebuilding
Home Energy
Journal of Light Construction
Green Homebuilder
Remodiling
Builder
Custom Homes
Research institutions
Universities
Homebuilding Research

Other Interested Parties

Homebuyers
Municipal Officials- NCSL
Society of Building Science Educators
California Energy Commission
Air Quality Management District
Home Ventilating Institute
National League of Cities
Air Distribution Institute
Canadian Home Builders Association
Cold Climate Housing Research Center
Canadian Mortgage and Housing Corporation
National Research Council of Canada
Refrigeration Service Engineers Society (RSES) <http://www.rses.org/>

4. APPENDIX A2 – TOPICS OF INTEREST

Develop education and understanding of resiliency and benefits

- Ability to be self-sufficient
- Able to function without concern for energy outages
- Occupants can stay in homes without power for some minimum number of days
- Buildings can assist other buildings (e.g., PV on one site supports other buildings)
- Occupant less dependent upon central utility grid
- Energy efficient solutions that reduce fire and structural risk
- Systems can survive and bounce back from extreme events
- Occupants have access to clean water for some minimum number of days without power
- Options to recover from disasters that are all acceptable and reduced inconvenience
- Recovery is easier and achievable, weathering a hurricane becomes similar to weathering a thunderstorm
- improvements to infrastructure that take care of high and medium risk events
- clear definition of resilience by climate available and important
- information is shared globally

Recommend promoting better filtration with IEQ

- Better IEQ through indoor filtration (Debunking Myths About MERV, Air Filtration From ASHRAE Journal Newsletter, December 8, 2020)
- Follow best practices for filter replacement
- Apply proper filtration devices (e.g.: MERV 13)
- Std 241 (Control of Infectious Aerosols) – Requirements for equivalent clean airflow rate - Combination of ventilation, filtration, and potential UV.
- Force HVAC system to run for proper filtration
- Automated controls can insure proper filtration through cycling of HVAC fans.
- Recommend standards/methods of test for indoor air filtration products