Environmental Health Committee (EHC) Emerging Issue Brief

June 29, 2026

The Built Environment and Contamination by PFAS

What is the Issue?

Per- and Polyfluoroalkyl Substances (PFAS).

Over the past several years attention and research on PFAS as an environmental contaminant has grown, in part because of a better understanding of their very slow environmental breakdown (earning them the moniker "forever chemicals") combined with worldwide measurements of high levels of PFAS in soil, drinking water, and human and animal blood. PFAS are entirely synthetic chemicals, meaning that any occurrence in the environment is of anthropogenic (or human made) origin. Negative health outcomes from exposure to PFAS have been observed in both animal and human epidemiological studies and include impacts on fetal development, thyroid disease, immune system suppression, and increased risk of cancer.[1] Recent research has focused on quantifying risks associated with PFAS exposure as thousands of unique PFAS compounds can be found in concentrations that range over orders of magnitude throughout indoor and outdoor environments. Increased awareness of the sources of PFAS can help improve design and engineering of the built environment to decrease indoor and outdoor contamination and consequent exposure to humans.

Definition of PFAS.

To understand where PFAS originate it is important to define what PFAS are. Buck et al. (2011)[2] were the first to define PFAS as saturated carbon molecules where all hydrogen atoms have been replaced with fluorine to categorize classes of per- and polyfluoroalkyl substances manufactured for use in polymer and surfactant synthesis.[2] Since then, broader PFAS definitions have been developed for chemical, regulatory, and public health purposes. Recently, some scientists have advocated for a consensus on the chemical definition of PFAS provided by the Organization for Economic Co-operation and Development (OECD): "…fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom…".[3] Scientists argue that the OECD

definition should be widely accepted because it is unambiguous and includes chemicals, such as trifluoroacetic acid (TFA),, perfluoroalkyl dicarboxylic acids, and perfluorinated molecules containing aromatic rings, which had not been identified as PFAS following older definitions. Because PFAS are so diverse and chemically complex it is challenging to address all of their specific sources and effects on indoor and outdoor environments.

The Role of Ventilation as a Source and Sink for PFAS Indoors.

Emerging research points to important ways by which exposure to volatile PFAS can be mitigated in the built environment using ventilation and source control measures. Increasing outdoor air concentrations may lead to an increase in indoor air concentrations via outdoor air ventilation. Emission source control indoors is not only important for controlling indoor concentrations, but outdoor concentrations are also likely affected by indoor emissions.

What does this mean for ASHRAE?

A holistic strategy is needed to determine the impact of PFAS in indoor air and on PFAS in the atmosphere and vice versa, as well as to reduce PFAS emissions and exposure. Increased awareness of PFAS and specific actions by ASHRAE could help contribute to lowering the global burden of risk to human and environmental health posed by the ongoing production and use of PFAS.

- The sources of PFAS to and from the built environment deserve increased awareness by ASHRAE for two main reasons: (1) low global warming potential (GWP) refrigerants may be a source of environmentally persistent PFAS and (2) PFAS may be an indoor contaminant of concern to the public.
- Sources of PFAS are diverse and can include consumer products[4] and building materials and can accumulate in reservoirs such as dust. When developing standards/guidance for reducing or mitigating exposure to PFAS these diverse sources should be considered.
- Because PFAS are diverse in their chemical composition, sources, and physiochemical properties, ASHRAE must be consistent in the definition of PFAS when discussed as a general class of chemicals/contaminants. There needs to be increased awareness of specific PFAS (e.g., TFA, perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS)) and PFAS subsets (e.g., fluorotelomer alcohols (FTOHs)), etc.) that may have specific implications for contaminant transport, exposure, and transformations in the indoor environment.

What actions should ASHRAE consider?

- Follow the definition of PFAS adopted by the OECD to emphasize ASHRAE's interest in taking preventative action and acknowledging the current limitations in our understanding of the risk associated with many fluorinated chemicals.

- Seek to, when possible, harmonize its position on PFAS with international regulatory efforts.
- Consider taking positions on the use of “PFAS-free equivalent”, including promotion of research on safe alternatives to PFAS-containing HVACR equipment and refrigerants, aimed at avoiding “regrettable substitutions”.
- Advocate for technologies that use PFAS-free components and consumables.
- Emphasize the need for refrigerants that do not degrade to ultra-short chain PFAS like TFA.
- Further assist in the definition and identification of non-essential uses of PFAS and PFAS precursors for HVAC systems, including those in use in vehicles and commercial buildings.

References

(1) Fenton, Suzanne E., Alan Ducatman, Alan Boobis, Jamie C. DeWitt, Christopher Lau, Carla Ng, James S. Smith, and Stephen M. Roberts. "Per-and polyfluoroalkyl substance toxicity and human health review: Current state of knowledge and strategies for informing future research." *Environmental toxicology and chemistry* 40, no. 3 (2021): 606-630.

(2) Buck, Robert C., James Franklin, Urs Berger, Jason M. Conder, Ian T. Cousins, Pim De Voogt, Allan Astrup Jensen, Kurunthachalam Kannan, Scott A. Mabury, and Stefan Pj Van Leeuwen. "Perfluoroalkyl and polyfluoroalkyl substances in the environment: terminology, classification, and origins." *Integrated environmental assessment and management* 7, no. 4 (2011): 513-541.

(3) Sigmund, Gabriel, Marta Venier, Marlene Ågerstrand, Ian T. Cousins, Jamie DeWitt, Miriam L. Diamond, Jennifer Field et al. "Scientists' Statement on the Chemical Definition of PFASs." *Environmental Science & Technology Letters* (2025).

(4) Dewapriya, P.; Chadwick, L.; Gorji, S. G.; Schulze, B.; Valsecchi, S.; Samanipour, S.; Thomas, K. V.; Kaserzon, S. L. Per- and polyfluoroalkyl substances (PFAS) in consumer products: Current knowledge and research gaps. *Journal of Hazardous Materials Letters* **2023**, *4*, 100086. DOI: 10.1016/j.hazl.2023.100086.

Authors