

Discussions for the Technical Papers from the 2022 ASHRAE Annual Conference in Toronto, Ontario, Canada

This is a compilation of the written questions and comments submitted to authors by attendees at the 2022 ASHRAE Annual Conference in Toronto, Ontario, Canada. All authors were given the opportunity to respond.

The questions/comments and authors' responses are published with the papers in the hardbound volume of *ASHRAE Transactions*, Vol. 128, Part 2.

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Impact and Value of ASHRAE's Standards and Technology

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Larry Spielvogel, PE, FASHRAE, FCIBSE: The ASHRAE RFP for Research Project (RP) 1848 requires this project:

To calculate the *quantitative metrics* and document the milestones/accomplishments of ASHRAE Standards and Technology (emphasis added).

These comments primarily address the section titled, "ASHRAE's Impact on Building Energy Efficiency." It is simply not possible to show that *quantitative* reductions in Energy Use Index (EUI) are due solely to ASHRAE standards and technology. The paper does not mention the basis for the EUI reductions shown in Figure 1 or, importantly, whether the reductions include all existing buildings or just those new buildings subject to codes and/or ASHRAE standards. Figure 1 shows reductions in EUIs for commercial and residential buildings; however, there are no ASHRAE energy codes or standards for residential buildings adopted anywhere, so it is not possible to determine whether any claimed energy savings or reductions are ASHRAE related. When error bars (from the Commercial Buildings Energy Consumption Survey Relative Standard Error [CBECS RSE]) are added to the commercial curve, there is no upward or downward trend in EUI since 1985 except for the first two data points.

The paper does not mention the very substantial impacts that building owners and operators have made on EUI reductions that are unrelated to ASHRAE standards and technology and are instead due to (1) the price or availability of energy and (2) paying attention to better operation of buildings. There are no examples or references relating the specific content of any ASHRAE standards to *quantifiable* reductions in energy use or performance improvements in any of the buildings cited, much less across the board. Dozens of other organizations worked on reducing building energy use, so the savings could have just as well been the result of their work.

It is important to understand that individual practitioners take personal responsibility, both professionally and financially, for compliance with energy codes and applicable standards, which makes it essential for them to know exactly what energy codes and standards are required for any specific project. Just because an energy code or ASHRAE standard exists does not mean that it will be needed, applied, required, or used for any or every building.

Contrary to the assertion in the text of the paper that ASHRAE 90.1 applies everywhere, ASHRAE 90.1 (often with local amendments) is the mandatory energy code in only a handful of states at best. Figure 3 does not correctly show the adoption status of Standard 90.1. Thirty-eight states have NOT directly adopted it. Most U.S. states adopt and enforce the International Code Council (ICC) International Energy Conservation Code (IECC) that only in recent years has allowed the use of ASHRAE 90.1 as an *option*. The only case in which the use of ASHRAE 90.1 is *mandatory* is with LEED® Certification. Peer-reviewed publications show that ASHRAE 90.1-compliant LEED Certified buildings use no less energy than uncertified buildings.

There are means readily available to *quantitatively* and qualitatively compare the EUI of buildings required to comply with ASHRAE 90.1 and others built at the same time. This information was given to the PI during multiple ASHRAE meetings but was ignored. Most large cities have mandatory energy benchmarking programs that require annual EUI publication. The U. S. Green Building Council (USGBC) LEED project database shows LEED buildings in each of those cities, and the benchmark data allows comparisons with all other buildings of the same type and age. Some of that data has already been published, and the search by the authors failed to find and cite any of those.

The authors completely neglected to cite any of the contrary peer-reviewed references that said:

The results show that, collectively, the LEED® buildings use the same amount of source energy and emit the same amount of GHG (Green House Gas) as do other NYC office buildings.¹

For all three space-types (Offices, K-12 Schools, and Multifamily Housing) we found that LEED®-certified buildings demonstrated no significant source energy savings or reduction in greenhouse gas emission relative to comparable, conventional buildings.²

First, our estimates show no effect of LEED® certification on average energy consumption measured in kBtus/ft².³

Therefore, any claim that ASHRAE 90.1 has resulted or helped in lowering the energy use of new commercial buildings compared with existing buildings has not been *quantitatively* verified by the authors.

No states have adopted or required ASHRAE Standard 90.2 for residential energy codes and/or ASHRAE Standard 100 for all existing buildings. Claims that ASHRAE Standard 100 has had any *quantitative* impact on energy efficiency in existing buildings also cannot be supported, because it has not been adopted or required by any state in the U.S. ANSI/ASHRAE/IES Standard 100 was also first approved in 1995, not 2006 as claimed. The hundreds of thousands of ASHRAE, AIA, IES, USGBC, and DOE Advanced Energy Design Guidelines downloads shown in Figures 4, 5, and 6 is irrelevant, because there are no resulting, *quantifiable* energy use reductions.

Few, if any, of the references in this paper are authoritative, peer-reviewed, reliable publications nor are they always tied to the text in the paper so readers can independently confirm the basis for the analyses and conclusions. Too many of the references upon which the research relies are self-serving or biased papers by private, government, or government contractors whose paid goal is to advocate for energy efficiency. It is obvious the authors made no attempt to independently confirm the information in any of the more than 100 references that serve as the basis for this “research.” Some of those references support or advocate the biased technology or concepts of their authors or their employers or sponsors. Just because a reference came up on a Google search does not mean it is (1) correct, (2) unbiased, or (3) relevant to this subject, nor does it appear the authors made any attempts at independent verification.

This is an ASHRAE “feel good” biased paper about ASHRAE standards and technology influences on building

energy efficiency. Despite approval of the final research report over two years ago, there is no evidence that the work of this “research” has ever been used or even referenced for its intended purpose, even by ASHRAE. There are no *quantitative* metrics associated with ASHRAE standards and technology as required by the RFP. I do not recall seeing any other mention or application of this work inside or outside of ASHRAE. ASHRAE should know better than to accept and approve these conclusions when they often contradict the first-hand experience of some ASHRAE members.

There is no doubt that some ASHRAE standards and technology have contributed to the products and systems used by engineers designing and operating buildings and the resulting energy efficiency. By the same token, the increased complexity and adoption of ASHRAE standards and technology has resulted in cases where compliant buildings waste energy efficiently, because that technology may not be completely understood or dependable.

Nothing in the paper supports the research conclusion that “ASHRAE has contributed to significant energy-efficiency improvements of conditioning the built environment,” and those improvements are not *quantified* as explicitly required by the scope of work in the RFP. There is not a single negative comment or reference about ASHRAE standards or technology. A balanced and complete presentation would have both positive and negative comments. Even ASHRAE advocates understand that it is not always all good news.

Liping Liu, Brent Bartone, Zahra Habib, Kinshuk Makhija Kashif Nawaz: We shared these comments with Dan Pettway, the chair of MTG.IAST and the RP-1848 Project Monitoring Subcommittee, and we would like to provide comments from him here:

This project, **RP-1848 Assessing the Impacts and Value of ASHRAE’s Standards and Technology**, was initiated by the previous ASHRAE 2014 strategic plan to **connect** to its membership by actions to develop, implement, and assess methods to strengthen the member value proposition and to **extend** ASHRAE’s reach by augmenting ASHRAE’s marketing and promotional capabilities to drive higher levels of awareness and uptake of offerings. As the project progressed, it was discovered by the MTG.IAST, the project’s guiding committee, that the importance of ASHRAE’s standards and technology reached far beyond the definitive work itself. As the research clearly shows, ASHRAE’s work has been incorporated far beyond ASHRAE products themselves. It was quickly decided that quantifying ASHRAE’s contributions (e.g., ‘ASHRAE reduced U.S. commercial building EUI by x%’) was neither feasible nor useful. The approach adopted by the MTG and directed to the author was to highlight areas where ASHRAE has materially had an impact and to support that thesis with facts of specific instances of technical and performance advancements from the adoption of ASHRAE research, standards, and guidelines. The resultant paper shows the many areas and contributions ASHRAE has made. The results are intended to provide an informative body of work that ASHRAE can use in places to show the value of ASHRAE encouraging membership, volunteerism, and industry support. The paper excellently provides this.

1. Scofield, J.H. 2013. Efficacy of LEED-certification in reducing energy consumption and greenhouse gas emission for large New York City office buildings. *Energy Build* 67:517–24.
2. Scofield, J.H., and J. Doane. 2018. Energy performance of LEED-certified buildings from 2015 Chicago benchmarking data. *Energy and Buildings* 174:402–13.
3. Clay, K., E. Severini, and X. Sun. 2021. Does LEED certification save energy? Evidence from federal buildings. IZA DP No. 14211. Bonn, Germany: Institute of Labor Economics.