



Shaping Tomorrow's  
Built Environment Today

## STEM EDUCATION AND HVAC&R WORKFORCE

### THE ISSUE

Commitment to a solid education in science, technology, engineering, and mathematics (STEM) to develop the future supply of technicians, engineers and scientists is critical to our future well-being and standard of living. Even students pursuing non-STEM specialties need basic knowledge of scientific and technological applications for effective participation in the workforce, success in their personal lives and responsible citizenship.

Moreover, there has been increased growth in jobs related to STEM that need to be filled. The U.S. Bureau of Labor Statistics projects that employment in architecture and engineering occupations is expected to grow faster than the average, and salaries are nearly double, with a 2023 median annual wage of \$91,420 compared to \$48,060, the median wage across all occupations.<sup>1</sup> Additionally, over 150,000 openings in the U.S. for construction employment are projected each year on average over the next decade.<sup>2</sup>

The HVAC&R workforce in North America remains a male-dominated employment sector; the share of female workers in engineering and architecture is 19.3 percent<sup>3</sup> and 5.9 percent of HVAC&R Technicians.<sup>4</sup> Additionally, underrepresented minority students receive only 24 percent of the degrees within the engineering of buildings and HVAC&R sectors.<sup>5</sup>

### ASHRAE's ROLE

As professionals focused on the design, construction, operation, and maintenance of buildings and infrastructure, and as educators of future generations of engineers and the HVAC&R workforce, our members also recognize the importance of mentoring and helping students learn about STEM careers, which is why our members are active in their local communities and in national programs, bringing exciting science and engineering programs to students. ASHRAE is actively engaged in the Solar Decathlon, the Design Competition, National Engineers Week, Lucy's Engineering Adventure events, and other STEM education efforts worldwide, including through its more than 500 student branches.

ASHRAE is also a member of the National STEM Education Coalition, which supports new and innovative initiatives that help improve the content, knowledge, skills, and professional development of the K-12 STEM teacher workforce, and informal educators. ASHRAE is dedicated to ensuring quality STEM programs for teachers and students all around the world by encouraging its members to get involved with their local school systems.<sup>6</sup>

<sup>1</sup> U.S. Bureau of Labor Statistics. 2023. Occupational Outlook Handbook: Architecture and Engineering Occupations.

<sup>2</sup> U.S. Bureau of Labor Statistics. 2023. Occupational Outlook Handbook: Construction Laborers and Helpers.

<sup>3</sup> Zippia, 2024. Architectural Engineer Demographics and Statistics in the US. <https://www.zippia.com/architectural-engineer-jobs/demographics/>.

<sup>4</sup> Zippia, 2024. Heating and Cooling Technician Demographics and Statistics in the US. <https://www.zippia.com/heating-and-cooling-technician-jobs/demographics/>.

<sup>5</sup> US National Science Foundation, 2024. Women, Minorities, and Persons with Disabilities in Science and Engineering. <https://nces.nsf.gov/pubs/nsf21321/report/field-of-degree-minorities>.

<sup>6</sup> For more information, see <https://www.ashrae.org/communities/student-zone/k-12-activities>.

ASHRAE's Board of Directors has committed to promoting diversity and inclusion at all levels of the Society. This includes efforts to promote STEM education and training to children, schools, and educators, in a way that will attract, train, and retain more women, disabled, LGBTQ, and people of all socioeconomic and ethnic backgrounds to engineering education and employment.

ASHRAE also supports strengthening the broader HVAC&R workforce, including technicians who install and maintain HVAC&R equipment as well as distributors, contractors, and facility operators and managers. The HVAC&R and buildings industry has been facing a serious shortage of skilled trade employees for several years. Unfortunately, there is a broadening skills gap as well due to several factors, including the retirement of the baby boomers, advancements in technology that require new skills, increased job competition in the global marketplace, failure to cultivate and retain skilled talent, a societal focus only on four-year degree programs to the exclusion of technical and technological education, and a lack of emphasis on the necessary skill sets for advanced manufacturing. Of these, the last two are most critical to ensuring innovative, high-efficiency products are able to be manufactured and installed properly. Community colleges, training programs, internships, apprenticeships, and certification programs can strengthen the pipeline for the HVAC&R workforce.

### **ASHRAE'S VIEW**

Future generations need to possess the skills and critical competencies necessary to be successful in a highly competitive, global, and technologically sophisticated economy. We must work cooperatively to ensure that students receive the STEM training essential for future success.

ASHRAE encourages policymakers to implement the following recommendations:

- Increase government-funded research to improve teaching and learning of STEM concepts and critical thinking skills.
- Recruit, train, and retain qualified STEM teachers through the development of programs recognizing educators who excel in STEM education and incentives, that encourage the best and brightest scientists, engineers, technologists, and technicians to act as role models and teachers, to pave the way for future generations.
- Foster partnerships among educational institutions, industry and non-profit organizations, and their members to introduce students of all backgrounds to STEM career opportunities, including those careers that do not necessarily require a four-year university degree.
- Support and encourage students who choose to enroll in community college, or other career and technical education programs, that prepare and qualify individuals for careers as HVAC&R technologists, technicians, facility operators, and building managers by providing these students with affordable tuition options.
- Create opportunities and incentives for women and those of diverse backgrounds to pursue STEM coursework and careers.
- Encourage diversity in STEM education and the HVAC&R workforce.