EDITORIAL

Revisiting the Future of Engineering

By Bruce Burt, P. E., P. Eng.

CASE, NCSEA and SEI have embarked on an update to their jointly prepared Vision of the Future of Structural Engineering. Having just re-read the previous statement released in May of 2019, I am struck by the number of developments that just four years later are reshaping the engineering profession. Many of these issues have been trending for a decade or more, but have gained an increased sense of urgency over the past four years. If you've been reading STRUCTURE Magazine, the topics will be familiar: climate change; diversity, equity, inclusion (DEI); an inadequate talent pipeline, changes in structural engineering licensure; artificial intelligence; the evolving built environment; resiliency and sustainability. A comprehensive vision of the future of structural engineering must consider all these challenges.

To create an aspirational vision of the future, it is helpful to consider current efforts to address these issues. The engineering community, with contributions from NCSEA, SEI and CASE, are confronting these challenges.

Climate Change. There may be no more controversial or discussed topic than climate change. Climate targets are in jeopardy; the effects of climate change, though potentially devastating, are not precisely known. Engineers designing structures with 50-year or greater lifespans need guidance in addressing the current and future needs of their clients and to meet their standard of care. Is a design based on current codes sufficient if sea levels rise as predicted, or if extreme weather events occur with greater frequency than those on which existing codes are predicated?

ASCE 7-22, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, has been updated to protect against 500-year floods, rather than the 100-year flood hazard referenced in the 2016 edition.

CASE is in the process of updating its suite of contracts for structural engineers, and is incorporating language that will clarify the responsibilities of the engineer for designing beyond current minimum code requirements.

The Structural Engineers 2050 Commitment Program, SE2050 for short, is an SEI-led initiative to reduce embodied carbon emissions through the use of more efficient materials. The aims of the program are to educate the structural engineering profession on best practices for design and construction, engage in a carbon tracking program, report on impacts and trends of various structural systems, and advocate on behalf of clients, the design community, and the public, all with the goal of achieving net zero embodied carbon emissions by 2050.

Diversity, Equity & Inclusion. NCSEA's Structural Engineering Engagement & Equity (SE3) Committee has developed a series of webinars that discuss ways to develop "multicultural organizations via inclusive policies, programs and practices." Webinars are available on NCSEA's website that deal with bias awareness, improving STEM programs and improving the structural engineering talent pipeline.

Fostering an inclusive environment within engineering firms is a critical step in providing wider opportunities. However, more opportunity will not in itself address DEI challenges, nor the talent shortage facing the engineering profession. Addressing the diversity issue requires further investment in STEM education and building greater awareness of engineering as a career path at the earliest stages of children's development. One goal of NCSEA's WeSEE promotional campaign is to raise awareness of structural engineering as an attainable, rewarding career path.

Structural Licensure. Changes are taking place in structural engineering licensure. The format of the PE Structural Engineer Exam has changed. The SE exam is the last of the engineering exams to be converted to a computer-based test. As of April 2024, the exam will have four sections with a total exam time of 21 hours, in contrast to the previous two-part, 16-hour paper exam.

The Structural Engineering Licensure Coalition (SELC) is a partnership of SEI, NCSEA and CASE established to promote a common position on structural licensure and to work towards SE licensing in all U.S. jurisdictions (there are currently sixteen states with some form of SE license requirement). The SELC has taken the lead in educating SE-aspiring engineers on these changes. The SELC is also in the process of updating its Significant Structure Model Recommendations, first adopted in 2019. The intent of this document is to identify the types of structures that should be designed under the responsible charge of a Licensed Structural Engineer.

Artificial Intelligence. Rapid advances in artificial intelligence will soon cause fundamental changes in the way the typical design firm conducts business. Among its many potential benefits, AI promises to improve design optimization through generative design and more efficient methods of structural analysis. Proposals, specifications, and reports can be developed more quickly and efficiently with the aid of AI. Increased productivity resulting from the appropriate use of AI could help resolve the talent shortage. However, for the foreseeable future the liability for the accuracy of AI-generated material will remain in human hands. Other risks, such as infringements in confidentiality and intellectual property, must be considered.

Evolving Built Environment. The global pandemic greatly accelerated societal change. Remote work became commonplace, reshaped the workplace, and disrupted office building markets across the U.S. As leases expire and tenants downsize, it very likely will require repurposing many of the buildings comprising our urban and suburban communities. Other factors will also help transform the built environment. ASCE's Future World identifies six trends: autonomous vehicles, climate change, smart cities, advanced materials, and policy and funding. Mega City 2070 is ASCE's second iteration of an envisioned future city.

Resiliency and Sustainability. In 2023 ASCE, in partnership with ACEC and APWA (American Public Works Association), released ASCE/COS 73-23: Standard Practice for Sustainable Infrastructure. This non-mandatory, performance-based consensus standard targets civil infrastructure and "provides guidance for infrastructure owners to develop and implement sustainable solutions through a project's entire life cycle." The standard also focuses on reducing embodied carbon.

A new generation of structural engineers, using new methods, new technologies and new materials will play a crucial role in reshaping our built environment. Updating the **Vision of the Future of Structural Engineering** offers an opportunity to provide insight and guidance in this time of change and challenge. Then sometime in the near future our rapidly changing world will necessitate another reappraisal.▪

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