

Civil Engineering Body of Knowledge, 4th Edition: An Update

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In October 2024, the American Society of Civil Engineers (ASCE) embarked on a revision of the Civil Engineering Body of Knowledge (CEBOK), the landmark publication of the knowledge, skills, and attitudes necessary for the practice of responsible charge in civil engineering and continued growth in the profession.[1] This comprehensive resource has informed many efforts in ASCE, including development of the civil engineering program criteria in ABET as well as leadership and mentoring resources. Numerous civil engineering baccalaureate programs have also used the CEBOK to develop and refine their curriculum to be in line with the needs of industry and the needs of 21st century infrastructure.

This paper provides an update on the activities of the Task Committee of volunteers working on the 4th edition of the CEBOK, including:

- In-depth reviews of the outcomes of the 3rd edition.
- Discussion of the importance of mathematics fundamentals to civil engineering preparation and practice.
- Development of potential new outcomes.
- Launch of a broad constituent survey to gather feedback from the civil engineering community on the draft of the 4th edition.
- Efforts to develop a new presentation of the CEBOK that is easier for non-academic audiences to apply to their work and careers.

Background: Phases I & II

The ASCE Civil Engineering Body of Knowledge Task Committee was formed in October 2024 consisting of 12 voting members and 31 corresponding members. The Task Committee has been meeting about every two weeks, with exceptions around holidays and in February 2025 when an in-person meeting was held at the ASCE Headquarters in Reston, VA. Task Committee members represent a broad cross-section of the civil engineering profession, both in terms of experience (i.e. academic, consulting practice, and government practice) and also sub-discipline specialties. Members have engaged in a variety of roles within ASCE, and since October 2024 have also participated in conferences and events with related themes, including the ASCE 2025 Civil Engineering Education Summit, the American Society for Engineering Education (ASEE) Annual Conference, and meetings of ASCE entities focused on workforce and education topics.

Work in 2024 and early 2025 focused on reviewing the third edition of the CEBOK, examining literature published since its release, and identifying issues and outcomes in civil engineering that have evolved since the third edition was produced. In addition, the group discussed what a final version of the fourth edition might look like, including alternative publications to a bound

book that was the final product of the first three editions. As part of this phase, the task committee conducted an extensive stakeholder analysis to identify all relevant entities and groups with an interest in, or influence on, the revised CEBOK. A more detailed discussion of these early activities is provided in Barry et al. [2]

Current work: Phase III

The Task Committee began drafting the possible outcomes for a fourth edition in Summer 2025 and continued with this effort through Winter 2025. This work consisted of each member researching an outcome and relevant literature, reviewing previous discussions, and proposing a draft to the full Task Committee for consideration. This includes an updated rubric using Bloom's Taxonomy as well as a draft narrative description of the outcome to explain how it should be interpreted and used. While the final publication may not include the Bloom's Taxonomy rubric as that format is often unfamiliar and not always readily grasped (especially outside of academia), it was felt this was an important step to quantify and organize the group's ideas for each outcome and would also be a helpful resource for some audiences of the CEBOK.

Reflecting the fundamental nature of most of the CEBOK, the consensus of the Task Committee is that not many changes to the outcomes will be needed in the fourth edition. Two notable exceptions are the incorporation of outcomes focused on resilience and artificial intelligence/emerging technologies. In previous editions, resilience was addressed with the sustainability outcome. However, many members felt that it should be a separate outcome to recognize the distinct issues of resilience that don't necessarily relate to sustainability. Resilience prioritizes redundancy, adaptability and recovery, and given the importance of ensuring reliable performance in civil engineering planning and design, merited separate emphasis in the next edition of the CEBOK. A subgroup of Task Committee members surveyed specific groups in the civil engineering community with interest and expertise in resilience, including civil engineering department heads and ASCE's Center for Technical Advancement (CTA). The results of this study are being prepared for dissemination in a separate paper [2].

Similarly, a subgroup of Task Committee members worked to research and draft an outcome that would address what aspects of artificial intelligence and other emerging technologies should be incorporated into the CEBOK. While artificial intelligence is top of mind right now for virtually every profession and industry, the Task Committee anticipates other technologies will emerge over the coming 8 years before the next CEBOK revision is planned. It will be important to provide guidance on how these can be included in the CEBOK as they are developed rather than ignoring the changes until ASCE's cycles catch up. This guidance could include specific questions or issues for civil engineering professionals to look for when determining their courses of study in preparation for responsible charge.

Another subgroup has been focusing specifically on the mathematics outcome. Mathematics requirements and expectations for the profession have long been, and continue to be, a topic that engenders strong views. The recent final report of the ASCE Task Committee on Transforming Our Workforce (TCTOW) explicitly called for a review of mathematics requirements, with particular emphasis on entry into the profession.[3] Part of this motivation stems from concerns that the profession may be requiring a higher level of mathematics knowledge than is actually necessary, thereby creating an unintended barrier to entry.[4]

Although the BOK task committee had already planned to review mathematics requirements, ASCE Board of Direction's acceptance of the TCTOW report further underscored the importance of this outcome.[5] In response, the CEBOK Task Committee formed a subgroup composed of both academic and practitioner members to conduct an in-depth review of mathematics requirements, which are largely fulfilled through undergraduate (bachelor's-level) degree programs. In addition, a second subgroup was established to examine current mathematics requirements across ABET-accredited civil engineering programs in the United States and to compare these requirements with ABET general criteria and civil engineering program criteria. They specifically examined and characterized mathematics requirements specified in the Task Committee on Transforming Our Workforce report, ABET criteria, and the CEBOK3. They then conducted a study to quantify mathematics requirements in ABET-accredited civil engineering programs and other engineering discipline BOKs and programs. This review of curriculum, and with input from practitioners is generally reaffirming CEBOK3's statement that "basic and broad knowledge, comprehension, and application of mathematics, including differential equations and numerical methods, [is] required for civil engineering practice." [1] However, to make civil engineering pathways more accessible, an applied mathematics approach is recommended, with potentially specialized engineering mathematics courses and also engineering courses that emphasize applied mathematics. Transitional math curriculum for those entering the profession from non-traditional backgrounds should be provided to assist in achieving the correct level of mathematical aptitude required to practice civil engineering.

Crosscutting Concepts

One idea currently under development is the explicit articulation of relationships among outcomes through the use of crosscutting concepts. Crosscutting concepts include knowledge, skills, and attitudes (KSAs) that underpin multiple outcomes. These concepts strengthen engineering intuitions and enhance civil engineers' ability to effectively apply a broad range of KSAs in professional practice.

The inclusion of crosscutting concepts in this edition of the CEBOK is intended to help engineers recognize connections among outcomes and to mitigate the perception of isolated or fragmented KSAs across the four outcome categories. Several crosscutting concepts have

appeared in previous editions of the CEBOK (e.g., leadership and sustainability), while others will be new to this edition (e.g., systems thinking). Collectively, these concepts are intended to deepen civil engineers' understanding of the relationships among concepts and outcomes within the CEBOK framework.

Presentation of a New CEBOK

Early in its work, the CEBOK Task Committee recognized that one of its most significant contributions would be to ensure that the final product is relevant, practical, useful, and widely known throughout the civil engineering community. Accordingly, the committee has focused not only on defining outcomes, but also on presenting them in ways that are engaging and easily accessible. Particular attention has been given to increasing awareness of the CEBOK among practitioners, who comprise the largest segment of ASCE membership and the civil engineering profession.

In collaboration with ASCE's publications professionals, early discussions suggest that this edition of the CEBOK will likely not be published in a traditional bound-book format. Instead, the committee is envisioning an online publication that incorporates extensive cross-linking, vignettes, and narrative examples to illustrate outcomes and possible pathways for achieving them. The committee also intends to take full advantage of advances in multimedia presentation and to provide links to related ASCE entities and their complementary work. The overarching goal is to create a CEBOK resource that serves as a primary reference for civil engineers at all career stages, supporting professional development across the profession and in all stages of a career.

Next Steps

In the spring of 2026, the Task Committee plans a comprehensive survey to be distributed broadly to the civil engineering profession. The survey will provide the first public draft of the fourth edition of the CEBOK for all members of the profession to review and provide feedback to the Task Committee before it is finalized. The draft and survey will focus on changes made since the third edition as well as how the CEBOK can best be communicated to various audiences within the civil engineering profession. The Task Committee will use work done in Phase II that identified constituents of the CEBOK to create and distribute the survey.

References

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