APPENDIX B

Glossary and Definitions

Concepts and Principles

Advanced concepts and principles: Relationship and combination of ideas and theories with rules and methods that are ahead or further along in progress, complexity, knowledge, skill, and so forth, and related to specific situations or classes of problems taken as being at a higher level than standardized, established, or traditional (only used in the Depth in a Civil Engineering Area outcome).

Concepts and principles: Relationship and combination of general ideas and theories with rules and methods related to specific situations or classes of problems.

Design

Design alternative: One possible solution to an engineering design project.

Engineering design: The iterative, creative, decision-making process of devising a system, component, or process to meet desired needs and specifications within constraints, which involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs, for the purpose of obtaining a high-quality solution under the given circumstances (ABET 2018).

Engineering design process: See definition for "engineering design."

Problems and Projects

Civil engineering problems: Problems (not necessarily complex) related to or involving civil engineering.

Complex civil engineering problems: Complex problems (see definition of "complex problems") related to or involving civil engineering.

Complex civil engineering projects: Complex projects (see definition of "complex projects") related to or involving civil engineering.

Complex problems: Problems requiring in-depth engineering knowledge (IEA 2013) and having, for example, wide-ranging or conflicting technical issues, no obvious solution, diverse

groups of stakeholders, multiple disciplines, or significant consequences in a range of contexts (ABET 2018). Engineers solve complex problems, technologists solve broadly defined problems, and technicians solve well-defined problems (IEA 2013).

Complex projects: Projects having, for example, wide-ranging or conflicting technical issues, no obvious solution, diverse groups of stakeholders, multiple disciplines, or significant consequences in a range of contexts.

Problems: Lessons or inquiries starting from a set of given conditions or constraints to investigate or demonstrate a theory, application, or process.

Projects: In contrast to problems, projects are individual or collaborative efforts larger in scope, often involving research or design, to achieve specific objectives.

Sustainability

Sustainable performance: ASCE defines sustainability as a set of environmental, economic, and social conditions—the triple bottom line—in which all of society has the capacity and opportunity to maintain and improve its quality of life indefinitely, without degrading the quantity, quality, or the availability of natural, economic, and social resources (ASCE 2017). Sustainable performance of complex civil engineering projects would denote compliance with the triple bottom line.

Systems perspective: Consideration of a system as a whole in the context of its environment; a non-reductionist approach to describing the properties of a system itself.

Typical Pathway

Undergraduate education: Undergraduate education leading to a bachelor's degree in civil engineering or closely related engineering discipline, generally from a four-year program accredited by the Engineering Accreditation Commission of ABET.

Postgraduate education: Postgraduate education equivalent to or leading to a master's degree in civil engineering or a closely related engineering discipline, generally equivalent to one year of full-time study.

Mentored experience: Early-career experience under the mentorship of a civil engineer practicing at the professional level, which progresses in both complexity and level of responsibility.

Self-developed: Individual self-development through formal or informal activities and personal observation and reflection.

References

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IEA (International Engineering Alliance). 2013. "Graduate attributes and professional competencies." Accessed August 4, 2018. http://www.ieagreements.org/about-us/key-documents/.

APPENDIX C

Committee Charge, Process, and Membership

Charge

The charge to the *Civil Engineering Body of Knowledge* 3 Task Committee (CEBOK3TC) was to

- Critically review published literature regarding the future of engineering, other disciplines, and civil engineering practice;
- Proactively solicit constituent input;
- Evaluate the CEBOK2;
- Determine if a third edition of the *Civil Engineering Body of Knowledge* (CEBOK3) report was warranted; and
- If warranted, develop the CEBOK3 report.

Process

The CEBOK3TC was formed in the fall of 2016 from applicants to a broad call for members distributed to the ASCE membership during the summer of 2016. More than 62 applications were received, and the leadership of the committee selected 25 to invite to a workshop in August 2016 that explored the process behind developing the first and second editions of the *Civil Engineering Body of Knowledge*. Invitations for membership in the task committee were extended to 15 applicants in September 2016. The remaining applicants were invited to be corresponding members to the committee and the majority accepted that invitation.

The task committee met primarily by teleconference with weekly calls through most of 2017 and early 2018, with less frequent calls beginning in the summer of 2018. A total of 58 teleconferences were held beginning in September 2016 and concluding in October 2018. The CEBOK3TC also had four face-to-face meetings in October 2016, March 2017, November 2017, and May 2018.

A smaller editing task group also met three times in September 2017, January 2018, and August 2018, to edit the full group's work in preparation for key milestones.

Membership

The foundation of the CEBOK3TC work rests on efforts of its members and many others. The task committee is extremely grateful and appreciative of the efforts of the individuals, committees, and other entities, within and outside ASCE, including the CEBOK2 and CEBOK1 committees, all of whom contributed to this work in some way. The chair of the CEBOK3TC and editor of the CEBOK3 report extend a truly special thank you to all the members, corresponding members, and other contributors, including those who provided input through the three constituent surveys, all of whom were an integral part of the overall effort. Table C-1 lists the full members of the CEBOK3TC and Table C-2 lists the corresponding members. Affiliations are provided wherever possible.

Table C-1. CEBOK3TC Full Members.

Name	Affiliation	Location
Kenneth J. Fridley, Ph.D., F.ASCE (Chair)	University of Alabama	Tuscaloosa, AL
Decker B. Hains, Ph.D., P.E., M.ASCE (Editor)	Western Michigan University	Kalamazoo, MI
Brock E. Barry, Ph.D., P.E., F.ASCE	United States Military Academy	West Point, NY
Angela R. Bielefeldt, Ph.D., P.E., M.ASCE	University of Colorado	Boulder, CO
Horst G. Brandes, Ph.D., P.E., F.ASCE	University of Hawaii	Honolulu, HI
Norbert J. Delatte, Jr., Ph.D., P.E., F.ASCE	Oklahoma State University	Stillwater, OK
Norman D. Dennis, Jr., Ph.D., P.E., D.GE, F.ASCE	University of Arkansas	Fayetteville, AR
Ryan K. Giles, Ph.D., A.M.ASCE	Stony Brook University	Stony Brook, NY
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Muthusamy Krishnamurthy, Ph.D., P.E., F.ASCE	Hydro Modeling, Inc.	Orlando, FL
Audra N. Morse, Ph.D., P.E., F.ASCE	Michigan Technological University	Houghton, MI
David A. Pezza, Dr.Eng., P.E., D.GE, F.ASCE	US Army Corps of Engineers (Retired)	Norfolk, VA
Monte L. Phillips, Ph.D., P.E., Dist.M.ASCE	University of North Dakota (Retired)	Park Rapids, MN
Matthew W. Roberts, Ph.D., P.E., M.ASCE	Southern Utah University	Cedar City, UT
Kristen L. Sanford Bernhardt, Ph.D., P.E., M.ASCE	Lafayette College	Easton, PA
Camilo Torres, EIT, C.Eng, M.ASCE	Pontificia Universidad Javeriana	Bogota, Colombia
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James J. O'Brien, Jr., P.E., M.ASCE	ASCE	Reston, VA

Table C-2. CEBOK3TC Corresponding Members.

Name	Affiliation	Location
Caesar Abi Shdid, P.E., M.ASCE	Lebanese American University	New York, NY
Arzhang Alimoradi, Ph.D., P.E., M.ASCE	____	Las Vegas, NV
Daryl R. Armentrout, Ph.D., P.E., F.ASCE	____	Knoxville, TN
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M Asghar Bhatti, Ph.D., P.E., F.ASCE	University of Iowa	Iowa City, IA
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Ching Chiaw Choo, P.E., M.ASCE	California State University, Fresno	Fresno, CA
Marvin E. Criswell, Ph.D., P.E., F.ASCE	Colorado State University (Retired)	Estes Park, CO
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Sara E. Guntrum, A.M.ASCE	____	Windermere, FL
Charles N. Haas, Ph.D., F.ASCE	Drexel University	Philadelphia, PA
Jerome F. Hajjar, Ph.D., P.E., F.SEI, F.ASCE	Northeastern University	Boston, MA
Kevin D. Hall, Ph.D., P.E., M.ASCE	University of Arkansas	Fayetteville, AR
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(continued)

Table C-2. CEBOK3TC Corresponding Members. (Continued)

Name	Affiliation	Location
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George F. List, P.E., F.ASCE	North Carolina State University	Garner, NC
Kamyar C. Mahboub, Ph.D., P.E., F.ASCE	University of Kentucky	Lexington, KY
John M. Mason, Ph.D., P.E., M.ASCE	Penn State Harrisburg	University Park, PA
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Note: Not all credentials or affiliations are listed by request of the individual listed.

APPENDIX D

Constituent Engagement Through Surveys

The CEBOK3TC engaged constituents through a series of three separate structured surveys, which are described including summary results in this appendix.

CEBOK2 Survey, Winter 2017

A survey was developed to solicit input from constituents on the existing CEBOK2 and potential additions and changes to the CEBOK2. The first part of the survey asked respondents to consider each of the 24 outcomes in the CEBOK2. They were provided with a link to the rubric and the full CEBOK2 in the survey. Survey takers then rated the following:

1. Importance of each outcome using a 5-point scale:
   1 = not important
   2 = minor importance
   3 = neutral
   4 = moderately important
   5 = very important.
2. Description of each using a 5-point scale:
   1 = poorly described
   2 = not well described
   3 = neutral
   4 = well described
   5 = very well described.

Any ratings of 2 or below resulted in the survey participant being prompted to provide an explanation in an open text format.