Updating the Civil Engineering Body of Knowledge: A Project for the Profession
Agenda

- What is the Civil Engineering (CE) Body of Knowledge (BOK)?
- How could the current version (CE BOK 2) be improved?
- How can you provide input?
- Where do we go from here?
The American Society of Civil Engineers (ASCE) supports the attainment of an engineering body of knowledge for entry into the practice of engineering at the professional level, i.e., practice as a licensed professional engineer, through appropriate engineering education and experience, and validation by passing the licensure examinations.
The purpose of the Civil Engineering Body of Knowledge (BOK) is to define

1. the knowledge, skills, and attitudes needed to enter into professional practice;

2. how the Body of Knowledge can be fulfilled by tomorrow’s aspiring engineers; and

3. who should guide the learning of the engineering student and engineer intern

Professional Practice = Licensed Professional Engineer
Guiding Principles for the CE BOK

- The CE BOK is a living document.
- It will continue to be updated and revised to coincide with ASCE’s stated eight year cycle of reviews and updates.
A Brief History of the CE BOK

■ 2004: *The Civil Engineering Body of Knowledge for the 21st Century* was published

■ 2008: Second edition of the *Civil Engineering Body of Knowledge* (BOK2) was published
A Brief History of the CE BOK (Part II)

- 2016: Body of Knowledge 3 Task Committee (BOK3TC) chartered to:
  - Determine whether a 3rd edition of the Civil Engineering Body of Knowledge report is warranted at this time
  - Evaluate ASCE BOK2
  - Critically review published literature regarding the future of engineering, other disciplines and civil engineering practice
  - Develop the BOK3 report
    - Critically review published literature regarding the future of engineering, other disciplines and civil engineering practice
  - Proactively solicit constituent input
A BOK is the complete set of concepts, terms and activities that make up a professional domain, as defined by the relevant learned society or professional association.
Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively, and ethically as master:

- planners, designers, constructors, and operators of the built environment
- stewards of the natural environment
- integrators of ideas and technology
- managers of risk and uncertainty
- leaders in shaping policy
Vision
(for civil engineering)

Knowledge, skills, & attitudes necessary to enter into the practice of civil engineering at the professional level.

BOK
(for the civil engineer)

Professional Practice = Licensed Professional Engineer
Outcomes Based on 3 Competency Areas

1. **FOUNDATIONAL**
   (math, science, humanities, and social science)

2. **TECHNICAL**
   (breadth and depth)

3. **PROFESSIONAL**
   (depth)
Civil Engineering BOK2

- Technical Depth
- Professional Practice Breadth
- Technical Breadth
- Natural Sciences
- Mathematics
- Humanities
- Social Sciences
CE BOK2
FOUNDATIONAL OUTCOMES

- Mathematics
- Natural Sciences
- Humanities
- Social Science
CE BOK2
TECHNICAL OUTCOMES

- Material Science
- Mechanics
- Experimentation
- Problem Recognition & Solving
- Breadth in Civil Engineering
- Design
- Sustainability
- Contemporary Issues
- Risk & Uncertainty
- Project Management
- Technical Specialization
CE BOK2

PROFESSIONAL OUTCOMES

- Communication
- Public Policy
- Business & Public Administration
- Globalization
- Leadership
- Teamwork
- Attitudes
- Life-long Learning
- Professional & Ethical Responsibility
Bloom’s Cognitive Domain Taxonomy

1. Knowledge
   - list, recite, define, ...

2. Comprehension
   - explain, describe, ...

3. Application
   - apply, solve, ...

4. Analysis
   - analyze, formulate, ...

5. Synthesis
   - design, create, ...

6. Evaluation
   - assess, evaluate, ...
BOK Educational Fulfillment Committee (and many others)

“BOK cannot fit into today’s BS.”

“Redesign today’s BS”

“Specialization after BS”
## Outcome title

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### Foundational

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<td>4. Social sciences</td>
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### Technical

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<td>7. Experiments</td>
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<td>8. Problem recognition &amp; solving</td>
<td>B</td>
<td>B</td>
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<td>10. Sustainability</td>
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<td>12. Risk &amp; uncertainty</td>
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## CE BOK2

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<th>Outcome title</th>
<th>Knowledge</th>
<th>Comprehension</th>
<th>Application</th>
<th>Analysis</th>
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<td>15. Technical specialization</td>
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<td>16. Communication</td>
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<td>17. Public policy</td>
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<td>19. Globalization</td>
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<td>20. Leadership</td>
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<td>21. Teamwork</td>
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<td>22. Attitudes</td>
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<td>23. Lifelong learning</td>
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<td>24. Professional &amp; ethical responsibility</td>
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Engineering is a Profession of Practice

- The BOK is not only about education.
- The BOK is about preparation.
- Preparation includes both education and mentored experience.
The requirement for licensure would comprise a combination of:

1. a baccalaureate degree in engineering

2. a master’s degree in engineering, or no less than 30 graduate or upper level technical and/or professional practice credits. . .

3. and appropriate experience . . .
How could the CE BOK2 be improved?
Updates to BOK2?

- Are all of the outcomes currently in the BOK2 needed?
- Are the levels of achievement established for each outcome in the BOK2 appropriate?
  - Higher?
  - Lower?
- Are any outcomes needed for entry into professional practice of civil engineering missing from the current BOK2?
  - International engineering groups have additional ideas
  - BOKs from other engineering disciplines provide ideas
### Top 10 Skills

World Economic Forum, 2016

<table>
<thead>
<tr>
<th>In 2015</th>
<th>In 2020</th>
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<tbody>
<tr>
<td>1. Complex Problem Solving</td>
<td>1. Complex Problem Solving</td>
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<tr>
<td>2. Coordinating with Others</td>
<td>2. Critical Thinking</td>
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<tr>
<td>3. People Management</td>
<td>3. Creativity</td>
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<tr>
<td>5. Negotiation</td>
<td>5. Coordinating with Others</td>
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<td>6. Quality Control</td>
<td>6. Emotional Intelligence</td>
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<td>7. Service Orientation</td>
<td>7. Judgement &amp; Decision Making</td>
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How can you provide input?
Opportunities for Input to CE BOK3

- **Take the online survey**
  - [https://www.surveymonkey.com/r/PPQF883](https://www.surveymonkey.com/r/PPQF883)

- **Become a Corresponding Member of BOK3TC**
  - Weekly conference calls, review documents
  - Volunteer at end of survey or email lnolen@asce.org

- **Focus Groups**

- **Email comments to lnolen@asce.org**
  - Subject line: BOK3 comments
Part A: Questions 1 – 24 relate to BOK2 outcomes, which define the knowledge, skills, and attitudes necessary for individuals to enter into the practice of civil engineering at the professional level (i.e., licensed as a PE).

Consider each BOK2 outcome = XX (e.g. math, mechanics, sustainability, etc.)

- How important is XX to the professional practice of a civil engineer? [rate from 1 low to 5 high]
- How well does the outcome statement accurately characterize the knowledge, skills, attitudes related to XX necessary for successful entry into the practice of civil engineering at the professional level? [rate from 1 not at all to 5 very well]
- Explain / comments- open response
Part B: Questions 25 – 35 relate to items not currently in the BOK2 on which your opinion is sought (e.g. creativity and innovation, critical and analytical thinking, etc.).

- How important is XX to the professional practice of a civil engineer? [rate from 1 low to 5 high]
- Any other outcomes? Why?

Demographic Information

- Including option to provide email address to receive more information, volunteer as corresponding member of BOK3TC
### Future Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>2016</td>
<td>BOK3TC organized</td>
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<tr>
<td>Now</td>
<td>Scholarly review, CE community input</td>
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<td></td>
<td>BOK3 draft</td>
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<td>Public comment</td>
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<td>2018-2019</td>
<td>BOK3 Finalized/Published</td>
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<td>2020</td>
<td>ABET accreditation committee</td>
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<td>Draft ABET CE Program Criteria</td>
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<tr>
<td>2024</td>
<td>First ABET reviews under new criteria</td>
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Questions?