

Profile of the 2025 Civil Engineer

The Vision for Civil Engineering (ASCE)

What could civil engineers be doing in 2025? In addressing this question Summit participants created a profile of the civil engineer in 2025, that is, the attributes possessed by the individual consistent with the profession's aspirational vision.

Attributes may be defined as desirable knowledge, skills, and attitudes. As used here, knowledge is largely cognitive and consists of theories, principles, and fundamentals. Examples are geometry, calculus, vectors, momentum, friction, stress and strain, fluid mechanics, energy, continuity, and variability.

In contrast, skill refers to the ability to do tasks. Examples are using a spreadsheet; continuous learning; problem solving; critical, global, integrative/system, and creative thinking; teamwork; communication; and self-assessment. Formal education is the primary source of knowledge, whereas skills are developed via formal education, focused training, and on-the-job experience.

Attitudes reflect an individual's values and determine how he or she perceives, interprets, and approaches the world. Attitudes conducive to effective professional practice include commitment, curiosity, honesty, integrity, objectivity, optimism, sensitivity, thoroughness, and tolerance.

Summit participants identified many, varied attributes, organized into the categories of knowledge, skills, and attitudes. The results are presented here.

The civil engineer is **knowledgeable**. He or she understands the theories, principles, and/or fundamentals of:

- Mathematics, physics, chemistry, biology, mechanics, and materials, which are the foundation of engineering.
- Design of structures, facilities, and systems.
- Risk/uncertainty, such as risk identification, data-based and knowledge-based types, and probability and statistics.
- Sustainability, including social, economic, and physical dimensions
- Public policy and administration, including elements such as the political process, laws and regulations, and funding mechanisms.
- Business basics, such as legal forms of ownership, profit, income statements and balance sheets, decision or engineering economics, and marketing

- Social sciences, including economics, history, and sociology.
- Ethical behavior, including client confidentiality, codes of ethics within and outside of engineering societies, anticorruption and the differences between legal requirements.
- and ethical expectations, and the profession's responsibility to hold paramount public health, safety, and welfare.

The civil engineer is **skillful**. He or she knows how to:

- Apply basic engineering tools, such as statistical analysis, computer models, design codes and standards, and project monitoring methods.
- Learn about, assess, and master new technology to enhance individual and organizational effectiveness and efficiency.
- Communicate with technical and non-technical audiences, convincingly and with passion, through listening, speaking, writing, mathematics, and visuals.
- Collaborate on intra-disciplinary, cross-disciplinary, and multi-disciplinary traditional and virtual teams.
- Manage tasks, projects, and programs to provide expected deliverables while satisfying budget, schedule, and other constraints.
- Lead by formulating and articulating environmental, infrastructure, and other improvements and build consensus by practicing inclusiveness, empathy, compassion, persuasiveness, patience, and critical thinking.

The civil engineer embraces **attitudes** conducive to effective professional practice. He or she exhibits:

- Creativity and entrepreneurship that leads to proactive identification of possibilities and opportunities and taking action to develop them.
- Commitment to ethics, personal and organizational goals, and worthy teams and organizations.
- Curiosity, which is a basis for continued learning, fresh approaches, development of new technology or innovative applications of existing technology, and new endeavors
- Honesty and integrity—telling the truth and keeping one's word.
- Optimism in the face of challenges and setbacks, recognizing the power inherent in vision, commitment, planning, persistence, flexibility, and teamwork.
- Respect for and tolerance of the rights, values, views, property, possessions, and sensitivities of others.
- Thoroughness and self-discipline in keeping with the public health, safety, and welfare implications for most engineering projects and the high-degree of interdependence within project teams and between teams and their stakeholders.