120th ASEE Annual Conference & Exposition
FRANKLY, WE DO GIVE A D*MN
June 23-26, 2013

Paper ID #6975

Opportunities for Civil Engineering Technologists within the Enterprise of Civil Engineering

Dr. Joe D Manous Jr P.E., Institute for Water Resources, USACE

Dr. Joe Manous serves as a group manager and the Future Directions team leader for the Institute for Water Resources, US Army Corps of Engineers and is on part-time detail to the Office of the Assistant Secretary of the Army for Civil Works. Dr. Manous is a civil engineer specializing in the areas of water resources and environmental security issues associated with water. He served as an academy professor at the United States Military Academy at West Point from 2000 through 2008, where he taught courses in environmental engineering, water resources, and environmental security. Dr. Manous has been actively involved with the ”professional” aspects of the engineering profession for over 20 years particularly through his involvement with the American Society of Civil Engineers where he chaired the ASCE Committee on Professional Practice, Post-Hurricane Katrina Critical Infrastructure Guidance Task Force, and Paraprofessional Task Committee. He is also chair of the Executive Board of the National Institute for Engineering Ethics (NIEE).

Mr. Jon D Nelson, Tetra Tech, Inc.

Jon D. Nelson, P.E. is a senior vice president in the central region of the Engineering and Consulting Services group of Tetra Tech, Inc. in Tulsa, Okla. He has 39 years of engineering experience with most of his career focusing on municipal water and waste water projects. He has been with Tetra Tech for 28 years. He holds a B.S. degree in Civil Engineering from Kansas State University and a M.S. degree in Environmental Engineering from Oklahoma State University. Nelson is licensed as a professional engineer in four states and holds Class A operator licenses in Oklahoma for water works and waste water works. Nelson served on the Oklahoma State Board of Licensure for Professional Engineers and Land Surveyors for twelve years and was board chair for two years. He served as president of the National Council of Examiners for Engineering and Surveying in 2004-2005. In 2008, he served as chair of the American Association of Engineering Societies. Mr. Nelson is an active member of the National Society of Professional Engineers and is currently the vice-chair of the Licensure and Qualifications for Practice Committee. He also serves on the board of directors of ABET, Inc. as NSPE’s representative. In 2009, he was inducted as a Distinguished Member of the American Society of Civil Engineers. He is currently a member of ASCE’s ’Raise the Bar’ Committee and chair of ASCE’s Technologist Credentialing Task Committee.

Opportunities for Civil Engineering Technologists within the Enterprise of Civil Engineering

Opportunities for Civil Engineering Technologists within the Enterprise of Civil Engineering

Introduction

The roles played by civil engineering technologists (CETs) are important to the civil engineering profession and should be properly recognized and understood by members and employers of the civil engineering workforce. Finding the best match between qualifications and work responsibilities of CETs will help maximize their effectiveness. The creation of a CET certification program is one means that could assist employers and CETs with finding the best match. Such a program could also provide a solid foundation for setting appropriate roles for CETs on project teams, and be useful in establishing worthy career paths. This paper will address the work of the American Society of Civil Engineers (ASCE) to embrace CETs. It will present information relative to the roles and responsibilities of individuals functioning as CETs and offer some possibilities for a CET certification program.

Background

ASCE has been considering the roles and needs of technologists for several years. The effort began with the commissioning of the Paraprofessional Exploratory Task Committee (PETC) in 2008, followed by the Paraprofessional Task Committee (PTC) in 2010, and the Technologists Credentialing Task Committee (TCTC) in 2011. The results of the first two committees were submitted to the ASCE Board of Direction as committee reports[11,12], while the TCTC is an on-going activity. The PETC and PTC[11,12] both found a general lack of recognition and regard for technologists within the civil engineering workforce. They noted that individuals working as technologists exist, but they are not well recognized. Also, there are a considerable number of individuals whose job titles may include "engineer," but their job descriptions actually meet ASCE's definition of a technologist.

To differentiate the roles and qualifications of the key players within the civil engineering workforce, definitions were developed by the PTC based on several sources of information including the competency guidelines of the International Engineering Alliance (IEA).[7,8,12] The IEA is made up of the signatories of the Washington Accord (addressing engineers), the Sydney Accord (addressing technologists) and the Dublin Accord (addressing technicians). The differences between the education, roles and competencies expressed by the IEA were in-depth and seem to be embraced by the engineering profession around the world. The definitions prepared by the PTC included the following.

- Civil Engineering Professional (CE Professional) – A person who holds a professional engineering license. A person initially obtains status as a CE Professional by professional engineering (PE) licensure obtained through the completion of requisite formal education, engineering experiences, examinations, and other requirements as specified by an appropriate Board of Licensure. A person working as a CE Professional

is qualified to be professionally responsible for engineering work through the exercise of direct control and personal supervision of engineering activities and can comprehend and apply an advanced knowledge of widely applied engineering principles in the solution of complex problems.

- Civil Engineering Technologist (CE Technologist) – A person who exerts a high level of judgment in the performance of engineering work, while working under the direct control and personal supervision of a CE Professional. A person initially obtains status as a CE Technologist through the completion of requisite formal education and engineering experiences and may include examination and other requirements as specified by a credentialing body. A person working as a CE Technologist can comprehend and apply knowledge of engineering principles in the solution of broadly defined problems.

- Civil Engineering Technician (CE Technician) – A person typically performing task-oriented scientific or engineering related activities and exercising technical judgments commensurate with those specific tasks. A person working as a CE Technician works under the direct control and personal supervision of a CE Professional or direction of a CE Technologist. A person initially obtains status as a CE Technician through the completion of requisite formal education, technical experiences, examination(s), and/or other requirements as specified by an appropriate credentialing body. A person working as a CE Technician is expected to comprehend and apply knowledge of engineering principles toward the solution of well-defined problems.

- Civil Engineering Intern (EI) – An individual who has met the "Civil Engineering Intern" or "Engineer-in-Training" requirements of a State Licensure Board, which normally includes passing the Fundamentals of Engineering Examination.

- Civil Graduate – A person holding a baccalaureate degree from a civil engineering or technology program.

- College Graduate – A person holding a baccalaureate or associate degree from a college or university.

ASCE is interested in CETs because they recognize their importance and realizes that CETs are not a well-defined group. Technologists perform important technical work, but do not perform it as a licensed engineer – they are not in responsible charge – and therefore lack recognition.

Through the creation of a certification program for CETs, the roles, responsibilities, salary scales, and career paths for individuals working as technologists may be better defined. Career opportunities available to CETs can be recognized and valued by employers, graduates of civil engineering technology programs (ABET-Engineering

Technology Accreditation Commission or ETAC accredited), graduates of engineering programs (ABET-Engineering Accreditation Commission or EAC accredited), and members of the general public. Further, the "value" of CETs is of such regard that it is commonly a "first choice" career for many who enter the civil engineering workforce.

Another attribute of a credentialing system would be the demonstration of a competency level and a range of capabilities exhibited by individuals functioning at a highly technical level, but who cannot or do not choose to be licensed. Improved recognition of these individuals may become increasingly important as ASCE's "Raise the Bar" initiative[4] increases the minimum requirements required for a PE license[10,15].

Fundamentally, CET certification is a means of recognizing the capabilities of a select group of individuals, well trained in specialized civil engineering knowledge, but not performing "responsible charge" duties. Currently, the common recognition for CETs is through Engineer-in-Training and PE status, but some individuals do not wish to seek licensure and some are denied licensure due to state laws. The CET credential would provide them appropriate recognition.

ASCE Committee Work To Date

To understand the needs, challenges, and opportunities for CETs in the workforce, two series of telephone interviews were conducted by PTC members of graduates from ETAC academic programs. ETAC program graduates were selected as being the most likely cohort of engineering program graduates, nationwide, to fill CET positions. The PTC acknowledged that graduates of EAC programs may also be employed as CETs; however, desiring a higher level of commonality for the survey, the PTC felt ETAC graduates provided a reasonable pool for assessing CETs in practice. The survey excluded those ETAC graduates who had earned a PE, a qualification that then classifies those individuals as CE Professionals.

The first set of interviews was with individuals with four-year civil engineering technology degrees and currently working as CETs. The second group consisted of employers of people working as CETs.

The criteria for employee interview selection included individuals 1) approximately five to ten years beyond graduation, 2) employed by firms that engaged in engineering design or construction, 3) who had not earned a professional engineering license, and 4) currently working in a capacity as or similar to a CET. Twenty-eight interviews were conducted between November 2009 and February 2010 using a standard interview format (Tables 2 and 3) with each interview lasting approximately one hour. The majority of the interviewees met all of the selection criteria; however, there were several that met only three of the four qualifications. The most common deviation was the number of years beyond graduation, which varied from two-years to much greater than ten years. However, because the pool of suitable interviewees proved challenging to identify, these individuals were included in the analysis.

CET Observations

- CET Employees. As the number of interviews was small, the following observations resulting from interviews conducted by the PTC are not statistically based. These observations are, however, intended to provide a qualitative view of "typical" roles held by CETs. The trends from the interviews indicated CE Technologists were not titled technologists and their duties when serving in design roles were similar to those of an Engineering Intern though upward mobility was often limited. As the differentiating credential for individuals working as CE Professionals and CE Technologists is professional licensure, the limitations on upward mobility are a particular issue for individuals without EAC degrees in those states that require an EAC degree as an eligibility requirement for the Fundamentals of Engineering (FE) and/or PE examinations. State licensure requirements vary, but specific to ETAC graduates there are currently 12 states that require ETAC graduates to earn additional educational requirements and 4 additional states that only accept an EAC degree for licensure eligibility. Some ETAC graduates have circumvented this criterion through licensure in a state without additional prerequisites and then sought licensure in another state through comity. In summary, the lack of a recognized credential for CETs is a significant disincentive for pursuing a technologist career path or even being recognized as a technologist.

  There was a clear distinction noted between CETs involved with design work and those involved with construction. Individuals involved with construction stated their performance and upward mobility was based almost entirely on their performance associated with site or project supervision and less on previous educational background or obtaining a credential such as professional engineering licensure. Unfortunately, the PTC was unable to determine the percentage of ETAC graduates, or similarly EAC graduates, who followed a construction oriented career path. One consensus among the CE design and construction technologists interviewed was that a widely recognized credential of CET qualifications would be beneficial to both career paths.

  The PTC also identified individuals as technologists who worked in positions that did not involve engineering design, but whose work directly involves the business of civil engineering. Examples included contract administration, marketing, resources management, and computer aided design (CAD) based work.

  It is noteworthy that many interviewees had not been fully aware of the differences in content or opportunities between ETAC and EAC accredited programs when making decisions about colleges. The information is limited, but common reasons for selecting ETAC (technology) rather than EAC (engineering) programs often reflected personal situations (i.e., location, cost, grades, etc.) rather than an understanding of the job opportunities offered by these programs. In some states, a limitation by the university

system on the number of EAC programs within a state created ETAC programs whose explicit goal is to produce graduates seeking professional licensure, which was not an issue in states whose licensure boards permitted ETAC degrees as FE and/or PE exam prerequisites.

- CET Employers. In general, employers did not specifically seek CETs or individuals with ETAC degrees although such individuals were found in some firms and when identified were doing well. Employer interviews indicated the majority of ETAC graduates were pursuing and being successful as CE Professionals and not CE Technologists. None of the civil engineering managers interviewed expressed any prejudice for or against a graduate of a Civil Engineering Technology program. The key question was whether this person was willing or able to pursue their PE license and how they performed on the job. It was difficult to determine from the interview results whether attainment of a PE always, or usually, meant employees were destined for work of a "complex nature" or requiring exercise of "responsible charge" over a project. A plausible alternative is that regardless of an individual's work assignments, licensure is a standard and defensible measure of minimum competency. Again, there is no alternative credential from which to base a comparison and employers are rightfully hesitant to acknowledge generic limitations on employee advancement. However, several interviewees stated that their firms do employ career non-licensed engineering graduates.

There was a wide variation in the opportunities and duties of CETs as defined by the PTC. Some of the key types of variations are as follows.

- Size of firm – Large design offices found some economic advantage in employing lower salaried CETs if the firm could keep the CETs gainfully employed. This need varied by size of office with smaller firms and small offices of large firms finding they often do not have sufficient workload to justify fulltime CETs. Small to medium size design offices needed multi-skilled individuals, so had few if any had specialized CETs. Instead, those offices use CE Professionals or Engineering Interns to perform technology work. Several firms determined the "traditional" duties of CETs can be effectively and economically performed by CE Professionals through the advancing capability of Information Technology such as design software and computer aided design (CAD), while others indicated that some software can be used by technicians.

- Type of education degree – Many firms made little or no differentiation between civil engineering technology degrees versus civil engineering degrees. Assignment of duties and advancement were based on an individual's job performance and achievement of professional licensure.

- Type of work – Structural design firms historically employed staffs of drafts people and individuals to conduct routine calculations, but this has become less necessary and less

cost effective due to the increased capability of desktop computers and design software. Some firms retain individuals who once performed these duties, but they have migrated to niche areas within the firms. These niches can include operators of specialized software or a business area. Of note, firms are not routinely hiring replacements for specialized individuals, but rather pass the duties to new hires, to include EIs.

- Field work – Field inspection or field observation has not yet been significantly replaced by computer technology. Because of the type of work and time involved, firms recognize the economic advantage of using CE Technicians or CETs instead of EIs or CE Professionals for routine observational work. The prerequisites for field positions vary, but can include a high school diploma, two-year college degree, or a four-year college degree. Though not necessarily in civil engineering or civil engineering technology, four-year college degrees appear to be a common educational background.

- Public versus private firms – As stated previously, private engineering design firms are generally moving toward project delivery that employs almost exclusively CE Professionals and individuals on the path to becoming CE Professionals. However, in the public sector there continues to be significant work involving field oversight, compliance, and regulatory activities, which continue to be areas of employment for CETs. While government employment can provide job stability and opportunities to gain work experience, there are also significant challenges including limited advancement opportunities and lower compensation than commensurate work in the private sector.

Path Forward

The creation of a CET body of knowledge (Technologist BoK or TBoK) and credentialing process can develop career paths, while supporting the advancement of the both CETs and CE Professionals (CEPs) and possibly influence salary scales. A TBoK will also distinguish CETs from technicians working in the civil engineering field. Table 1[12] includes grade descriptions for CEPs, CETs, and civil engineering technicians based on existing descriptions published by ASCE and the National Institute for Certification Engineering Technologies (NICET)[14]. By distinguishing CETs, a cohort of similarly-minded career professionals can be identified, which could lead to the development of professional associations, common business practices, salary scales, training of technical skills, and similar group dynamics that are characteristic of a group of people working in the same career field. The accreditation of a CET certification by the American National Standards Institute (ANSI) should be a long-term goal.

The components of CET credentialing could parallel CEP standards and consist of three areas; formal education, work experience, and standardized examination. A variety of combinations in these components is appropriate considering the variety of alternatives for an individual's formal education. For CETs, the types of formal education would be approximately equivalent to the

CEP levels of education. This is a situation not dissimilar to the EAC and ETAC accreditation processes currently applied by ABET[1].

The TCTC is considering 2-year Technology Accreditation Commission (TAC) Associates degrees, the 4-year ETAC Technology degrees, and the 4-year Engineering Accreditation Commission (EAC) Engineering degrees for the CET formal education prerequisite. The amount and type of work experience would then vary with the type of earned degree, but balanced with the minimum requirements of a TBoK. Such a combination can be represented by the following expression.

(Formal Education) + (Work Experience) = Minimum TBoK

Another group of individuals that may be included are those without degrees. One proposal would require the individual to submit a portfolio with documentation of projects they have worked for review by the credentialing body. An exam would be administered based on the discipline described by the portfolio. This type of credentialing would have a discipline specific focus.

The attainment of a minimum level of TBoK knowledge could be evaluated through a standardized examination, such as a "Fundamentals of Engineering Technology" (FET) examination with education and work experience mirroring the Professional Engineering model such that the FET is administered at the end of formal education. However for technologists, the examination prerequisite might also require work experience if the education is of insufficient depth (e.g., 2-year program) or not appropriately accredited, such as through ABET. Finally, equivalency for the FET, by passing an alternative standardized examination, is a possibility. Such an alternative examination could be the Fundamentals of Engineering Examination (FEE).

Continuing to mirror the professional engineering licensure model, a second examination preceded by substantial, supervised work experience is appropriate. Again, the length and type of work experience will depend on the TBoK. The second examination might also include discipline specific (e.g., geotechnical, hydrology, transportation, etc) material. Given the differences in work responsibilities between the CET and CEP career paths and the expected differences between the Civil Engineering (CE) BoK[4] and TBoK, it does not seem appropriate to substitute the Professional Engineering (PE) examination for an "Applications in Engineering Technology" (AET) examination. Figure 1 compares possible advancement pathways for technologists with those for professional engineering.

Successfully passing an AET, would be the final step in certification. A credential, Certified Civil Engineering Technologist (CCET), could then be awarded indicating a minimum competency level. While credentialing by a state licensure board is a possibility, the TCTC is considering certification by an independent body such as the American Society of Certified Engineering Technicians (ASCET)[3], National Institute for Certification Engineering Technologies (NICET)[14], Civil Engineering Certification (CEC)[5], or similar organization. As

with the PE, the certificate would be issued with an expiration within 2-4 years. Recertification could require submitting an update of personal contact information and completion of continuing education credits.

Individuals with 4-year Technology degrees are currently allowed to sit for the PE exam in several states following their successful completion of the FEE and required experience. However, some of these individuals may choose to follow the CE Technologist Certification route, if such a pathway were to exist. As states implement higher standards for the PE, as required by "Raise the Bar", additional EAC graduates may choose to follow a CE Technologist credentialing path.

Conclusion

In summary, the work by the PETC and PTC indicated a lack of recognition by the civil engineering workforce for contributions by technologists. However, success of the "Raise the Bar" initiative will increase the need for a new type of recognition for technical people in specialized areas and not performing "responsible charge" engineering work. Currently there is no option to the FEE and PE pathway for individuals working in the civil engineering workforce who want to demonstrate professional accomplishments through credentialing. The development of a technologist credential, such as Civil Engineering Technologist or CET, seems an appropriate and necessary step to recognize an essential and growing segment of the civil engineering workforce. The success of such an effort also appears necessary for success of the "Raise the Bar" effort for professional engineers.

Bibliography

1. "ABET Accreditation Criteria and Supporting Documents" ABET. Available from http://www.abet.org/accreditation-criteria-policies-documents/. Last Accessed on 4 Jan 13.

2. Achieving the Vision for Civil Engineering in 2025: A Roadmap for the Profession (2009) American Society of Civil Engineers, Reston, VA.

3. "American Society of Certified Engineering Technicians (ASCET)" Available from http://www.ascet.org/. Last Accessed on 4 Jan 13.

4. Civil Engineering Body of Knowledge for the 21st Century, 2ed (2008) American Society of Civil Engineers, Reston, VA.

5. "Civil Engineering Certification" American Society of Civil Engineers. Available from http://www.asce.org/PPLContent.aspx?id=2147485045. Last Accessed on 4 Jan 13.

6. Galloway, Patricia D. (2008) The 21st-Century Engineer: A Proposal for Engineering Education Reform. American Society of Civil Engineers, Reston, VA.

7. International Engineering Alliance (2009) “Graduate Attributes and Professional Competencies”, White Paper.

8. International Engineering Meetings (2005) *IEM Graduate Attributes and Professional Competency Profiles*, International Engineering Meetings of the Washington Accord, Sydney Accord and Dublin Accord.

9. Lambrechts, James (2008) “When Civil Engineering Technology is Elevated to Civil Engineering, What Can Fill the Void”, ASEE Annual Conference

10. National Academy of Engineering (2004) The Engineer of 2020, Visions of Engineering in the New Century. National Academy Press. Washington, DC.

11. *Paraprofessional Exploratory Task Committee Final Report* (2008) American Society of Civil Engineers, Reston, VA.

12. *Paraprofessional Task Committee Final Report* (2010) American Society of Civil Engineers, Reston, VA.

13. Prados, John W., Editor (2007) A Proud Legacy of Quality Assurance in the Preparation of Technical Professionals, ABET 75th Anniversary Retrospective. Accreditation Board for Engineering and Technology

14. “Technologist Certification Programs” National Institute for Certification Engineering Technologies (NICET). Available from http://www.nicet.org/certificants/information.cfm. Last accessed 4 Jan 13.

15. The Vision for Civil Engineering in 2025 (2007) American Society of Civil Engineers, Reston, VA.

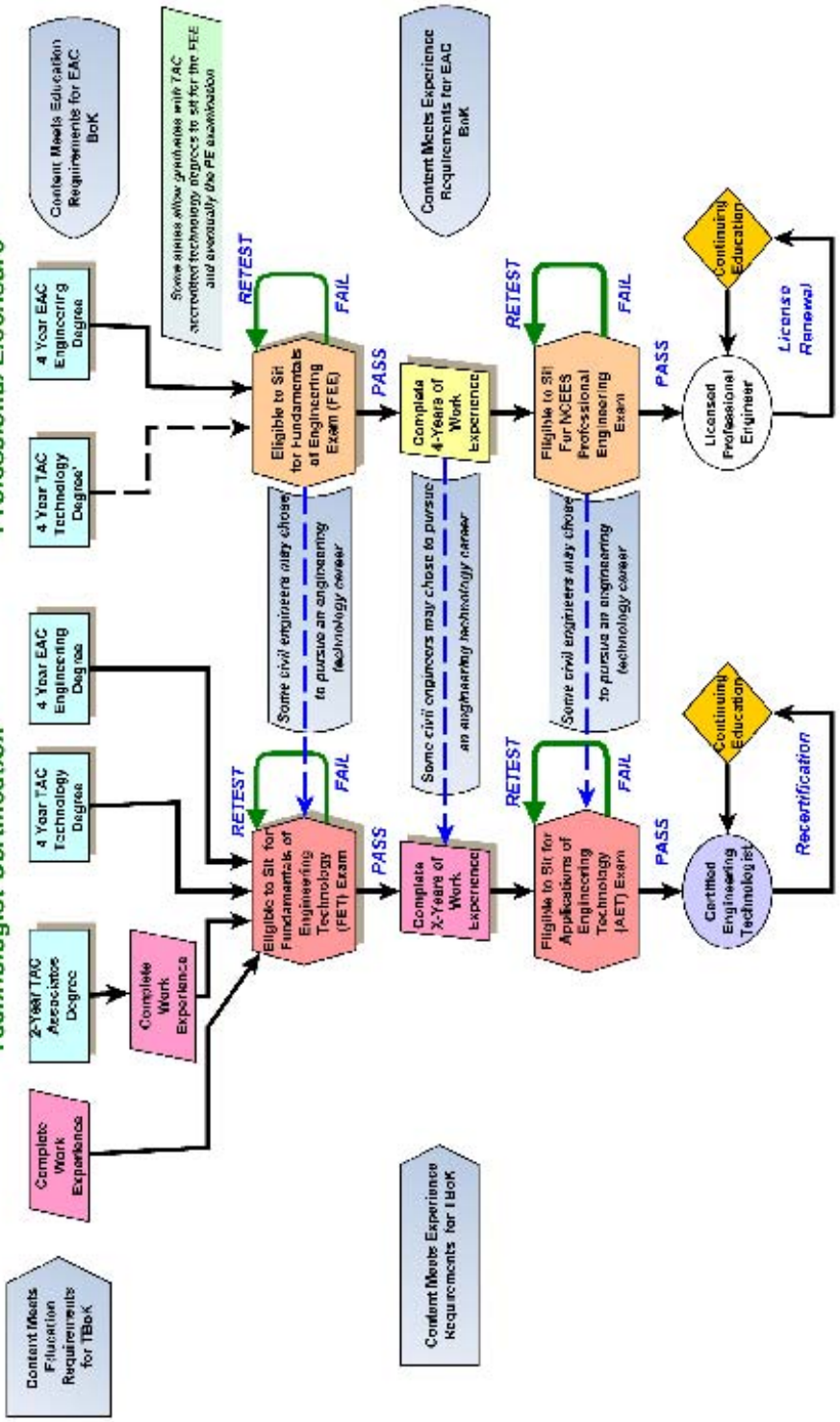

Figure 1 – Possible pathways for Professional Engineering licensure and Civil Engineering Technologist Credentialing.

Table 1 – Consolidated list of engineer, technologist and technician grades

Source	Grade	General Characteristics	Typical Titles	CE Professional	CE Technologist	CE Technician
Engineer Grades (ASCE)	Engineer Grade VIII	Makes decisions with broad influence on the activities of his or her organization. Makes authoritative decisions and recommendations that are conclusive and have a far-reaching impact on the organization. Demonstrates a high degree of creativity, foresight, and mature judgment in planning organizing, and guiding extensive programs and activities of major consequences	Bureau Engineer Director of Public Works Dean President Senior Executive Service GS-15 (20+ years)			
	Engineer Grade VII	Uses creativity, foresight, and mature judgment in anticipating and solving unprecedented problems. Makes decisions and recommendations that are authoritative and have an important impact on extensive organizational activities. Set priorities and reconciles directions for competing interests. Works on programs with complex features.	Director Program Manager City Engineer County Engineer Division Engineer Department Head Vice President GS-14 (15+years)			
	Engineer Grade VI	Applies a thorough knowledge of current principles and practices of engineering as related to the variety of aspects affecting his or her organization. Applies knowledge and expertise acquired through progressive experience to resolve crucial issues and/or unique conditions. Keeps informed of new methods and developments affecting his or her organization, and recommends new practices or changes in emphasis of programs. Works on programs of limited complexity and scope.	Principal Engineer District Engineer Engineering Manager Professor GS-13 (10+years)			
	Engineer Grade V	Independently applies extensive and diversified knowledge of principles and practices in broad areas of assignments and related fields. Uses advanced techniques in the modification or extension of theories and practices of sciences and disciplines or complete assignments. Works on a major project or several projects of moderate scope with complex features.	Senior Engineer Project Manage Associate Professor GS-12 (8+years)			

Source	Grade	General Characteristics	Typical Titles	CE Professional	CE Technologist	CE Technician
	Engineer Grade IV	Applies broad knowledge of principles and practices in a specific practice area. Independently evaluates, selects, and adapts standard techniques, procedures and criteria. Acquires general knowledge of principles and practices of related fields, and ability to function on multidisciplinary teams. Works on multiple projects of moderate size or portions of major projects.	Civil Engineer Associate Engineer Project Engineer Resident Engineer Assistant Professor GS-10-11 (4+years)			
	Engineer Grade III	Develops broad knowledge and skills in specific area. Evaluates, selects, and applies standard techniques, procedures, and criteria to perform a task or sequence of tasks for conventional projects with few complex features. Collaboratively uses judgment to determine adaptations in methods for non-routine aspects of assignments. Works on small projects or portions of larger projects.	Engineer in Training Engineer Intern Assistant Engineer Junior Engineer Staff Engineer Engineering Instructor GS-9 (3+years)			
	Engineer Grade II	Acquires basic knowledge and develops skills in a specific practice area. Applies standard techniques, procedures, and criteria to perform assigned tasks as part of a broader assignment. Exercises limited judgment on details of work and in application of standard methods for conventional work.	Engineer in Training Engineer Intern Assistant Engineer Junior Engineer Staff Engineer Engineering Instructor GS-7 (1+years)	Engineering Intern		
	Engineer Grade I	Acquires limited knowledge and develops basic skills. Applies prescribed techniques and procedures in accordance with established criteria to perform assigned tasks. Performs routine work which does not require previous experience. Acquires and understanding of professional and ethical responsibilities.	Engineer in Training Engineer Intern Assistant Engineer Junior Engineer Staff Engineer Engineering Instructor GS-5; (0+years)			
NICET	Certified Engineering Technologist (CT)	The Institute defines engineering technologists as members of the engineering team who work closely with engineers, scientists, and technicians. Technologists have a thorough knowledge of the equipment, applications, and established state-of-the-art design and implementation methods in a particular engineering area.	Senior Engineering Technologist Level VI or VII Technician			

Source	Grade	General Characteristics	Typical Titles	CE Professional	CE Technologist	CE Technician
	Associate Engineering Technologist (AT)		Engineering Technologist| Project Manager Level V Technician			
Technicians (NICET)	Technician Level IV	Applies a thorough knowledge of current principles and practices of technology as related to the variety of aspects affecting his or her organization. Applies knowledge and expertise acquired through progressive experience to resolve crucial issues and/or unique conditions. Keeps informed of new methods and developments affecting his or her organization, and recommends new practices or changes in emphasis of programs. Works on programs of limited complexity and scope.	Senior Level Technician| SET (Senior Engineering Technician)			
Technicians (NICET)	Technician Level III	Develops broad knowledge and skills in specific area. Evaluates, selects, and applies standard techniques, procedures, and criteria to perform a task or sequence of tasks for conventional projects with few complex features. Collaboratively uses judgment to determine adaptations in methods for non-routine aspects of assignments. Works on small projects or portions of larger projects.	Intermediate Level Technician, ET (Engineering Technician)			
	Technician Level II	Acquires basic knowledge and develops skills in a specific practice area. Applies standard techniques, procedures, and criteria to perform assigned tasks as part of a broader assignment. Exercises limited judgment on details of work and in application of standard methods for conventional work.	Technician, AET (Associate Engineering Technician)			
	Technician Level I	Acquires limited knowledge and develops basic skills. Applies prescribed techniques and procedures in accordance with established criteria to perform assigned tasks. Performs routine work which does not require previous experience. Acquires an understanding of professional and ethical responsibilities.	Trainee, Entry Level Technician, TT (Technician Trainee)			

Table 2 – CE Technologist Telephone Interview Questions

A. Opening Question:

1. What led you to get a civil engineering technology degree instead of a traditional civil engineering degree?

B. Subject's Practice:

2. What kind of civil engineering work does your company do in general?
3. What kind of work does your department do in particular?
4. How long have you been in your current position?
5. Are you licensed as a PE or do you plan to seek licensure as an engineer?
6. How many individuals with 2-year AS degrees in civil engineering technology work at your firm in your location?
7. What job titles does your firm typically use for these associate degree graduates?
8. How many individuals with 4-year BS degrees in civil engineering technology work at your firm in your location?
9. What job titles does your firm typically use for these bachelors degree graduates?
10. How many licensed civil engineers work at your firm in your location?
11. How many technicians without degrees in civil engineering technology work at your firm in your location?

C. Role of Technologist:

12. Does the definition we provided for a civil engineering technologist seem accurate? How would you change it?
13. Does the breakdown of typical tasks and responsibilities (examples) between the licensed engineers, engineering technologists, and technicians as shown on the tables for your sub-discipline look reasonable based on your experience? Comments? Could you provide any additions?
14. Are the tasks you perform as a technologist different from those performed by the licensed engineers? If so, provide an example.
15. Are the tasks you perform as a technologist different from those performed by the technicians? If so, provide an example.
16. Have your work tasks changed from those you performed right after college to today?
17. If so how have they changed generally speaking? Examples?
18. What are the career paths available to you with your company as a technologist?

D. General Questions:

19. Do you think a professional credential (such as formal certification) as a civil engineering technologist is needed for your practice? Would it be a benefit to you?
20. Do you know of other graduates with 4-year BS degrees in civil engineering technology that we might interview?

Table 3 – CE Technologist Supervisor Telephone Interview Questions

A. Opening Question:

1. What kind of civil engineering work does your company do in general?
2. What kind of work does your department do in particular?
3. How long have you been in your current position?
4. Are you licensed as a PE ?

B. Your Firm

5. How many individuals with 2-year AS degrees in civil engineering technology work at your location?
6. What job titles does your firm typically use for these associate degree graduates?
7. How many individuals with 4-year BS degrees in civil engineering work at your location?
8. What job titles does your firm typically use for these bachelors degree graduates?
9. For your firm is there any distinction between individuals with Civil Engineering Technology or Civil Engineering degrees?
10. Do you have individuals from 4-year CET programs working at your firm?
11. How many licensed civil engineers work at your location?
12. How many technicians (using the PTC definition) work at your location?
13. Does your firm have career paths for engineers? Please describe.
14. Does your firm have career paths for technologists? Please describe.
15. Does your firm have career paths for technicians? Please describe.

C. Role of Technologist

16. Does your firm employ technologists?
17. What are typical job titles for technologists and what are typical duties?
18. What is the future role of technologists within your firm?
19. What is the future role of technicians within your firm?

D. General Questions

20. Do you think a professional credential (such as formal certification) as a civil engineering technologist is needed for your practice?
21. If there were a credential, what purpose should it serve?