Civil Engineering Technicians

An analysis of the current and future civil engineering technician workforce in the Delmarva Region

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Vision: The Center for Industry Research & Workforce Alignment strives to be Delaware’s key source of labor-market insight to enable educational institutions to better align their program and training resources to meet the skill demands of business and industry.

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Introduction
This occupational brief seeks to provide Delaware Tech faculty and administrators with data outcomes and recommendations specific to Civil Engineering Technology that will aid in course development, curriculum delivery and non-credit training and certifications that will give students an advantage in the job market upon graduation.

This survey data contained within this occupational brief was taken from a larger study that examines several disciplines of engineering technology within a 13-county mid-Atlantic region that includes the three counties in the State of Delaware and ten bordering counties where graduates of Delaware Tech are likely to find employment. The purpose of that labor market study was to examine current and projected employment levels, how these jobs are changing due to a variety of market drivers, and what Delaware Tech and other community colleges can do to ensure that associate degree programs accurately reflect the skill needs of employers in the near future.

This brief primarily highlights data and information specific to civil engineering technicians gleaned from an extensive workforce survey conducted in July of 2014 from a sample of over 7,400 companies in the region. Survey interviewers fully screened 400 firms for qualifying criteria. Surveying efforts resulted in 252 occupational-level completions from 153 firms. Several firms responded for more than a single occupation. Extrapolations of employment data were conducted to provide readers with a more comprehensive picture of current and projected workforce demographics and to perform a supply/demand gap analysis for the region. In addition, executive interviews were held with 17 individuals from 15 public and private sector firms and existing sources were researched for secondary supporting data.

A total of 49 employers responded to the regional survey for civil engineering technicians. The proceeding sections of this brief provide an overview of data outcomes and executive interviews held with employers of this occupation. Aggregate data for all occupations such as market drivers, soft skill needs, and can be found in the full labor market study available on the CIRWA web page at www.dtcc.edu/cirwa.

Civil Engineering Technicians - SOC 17-3022

Occupational Definition
Applies theory and principles of civil engineering in planning, designing, and overseeing construction and maintenance of structures and facilities under the direction of engineering staff or physical scientists.¹

Figure 1 - Hiring Difficulty
Fifty-one percent of the 49 firms that responded for civil engineering technicians find it difficult or very difficult to find a quality candidate to fill their position vacancies. Seventy-four percent find it at least somewhat difficult to find the right candidate.

¹ O*Net Online, Summary Report for Civil Engineering Technicians, Accessed September 11, 2014
Table 1 - Current and Projected Employment – SURVEY DATA (n=49)
The data in the table below reflects data from survey responses only. Projected job change, retirements and turnover were combined to determine total 3YR and annual openings.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>440</td>
<td>476</td>
<td>+36 (8%)</td>
<td>48 (11%)</td>
<td>41 (9%)</td>
</tr>
</tbody>
</table>

Table 2 - Universe of Firms and Employment – EXTRAPOLATED REGIONAL ESTIMATES
From the survey’s qualifying incidence rate (percentage of firms screened that hire the occupation), CIRWA was able to determine the estimated total number of firms in the region that employ civil engineering technicians. After eliminating outliers out 2 standard deviations, CIRWA utilized adjusted employment means to extrapolate regional estimates for current and projected employment. Projected job change, retirements and turnover were combined to determine total 3YR and annual openings.

<table>
<thead>
<tr>
<th>Total Firms that Employ Civil Eng. Technicians</th>
<th>Current Employment</th>
<th>Projected Employment in 3 years</th>
<th>3YR Projected Openings</th>
<th>Total 3YR Openings incl. Growth</th>
<th>Annual Openings over next 3 yrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>247</td>
<td>944</td>
<td>1091</td>
<td>+147 (16%)</td>
<td>112 (12%)</td>
<td>119 (13%)</td>
</tr>
</tbody>
</table>

Figure 2 - Educational Attainment of the Current Workforce – Survey Data (n=49)
CIRWA was unable to obtain current education level data for approximately 52% of the civil engineering technician workforce. Several firms responded “unknown” when asked what percentage of their workers have obtained each level of education. The remaining 48% of the workforce is fairly evenly distributed between those that have less than an associate degree, those with an associate degree and those with a bachelor’s degree.
Figure 3 - Educational Hiring Requirements and Preferences – Survey Data (n=49)
The figures below demonstrate survey respondents’ required versus preferred educational attainment for a civil engineering technician position in their firm. The data shows that while only 16% of firms require a bachelor’s degree for employment, 41% would prefer job candidates have one for employment. The percentage of firms that require an associate degree is in alignment with the number of firms that prefer an associate degree (39% and 41% respectively). Important to note is that 37 of 49 respondents (76%) indicated that they would prefer to hire at least one education level above what they currently require.

Figure 4 - Entry-Level Wages – Survey Data (n=49)
Twenty of 49 (41%) civil engineering technician employers offer an entry-level salary between $30,000 and $39,000. Seven firms offer a starting salary between $50,000 and $59,000 a year.

Figure 5 – Barriers to Hiring Qualified Civil Engineering Technicians – Survey Data (n=49)
Fifty-one percent (51%) of firms that employ civil engineering technicians find it either difficult or very difficult to find a highly-qualified worker for these positions. Survey completers were asked to indicate all of the challenges they encounter during the resume review and interview processes. Responses are summarized below:
Figure 6 – Top Technical Skill Needs based on Survey Data (n=49)
The figure to the right illustrates the technical skills and knowledge respondents selected as either “Extremely” or “Very Important” on a 5-point scale with an option for “Not Applicable”. Larger circles reflect higher response counts. Of the 49 companies that responded to this question for civil engineering technicians, 42 participants chose Hand/CAD Drafting as an “Extremely” or “Very Important” skill for their employees to have. Other frequently chosen skills include Stormwater Management, Inspections, Utility Systems, GIS Data Collection and GIS Data Analysis.

Figure 7 - Preferred and Required Industry Certifications – Survey Data (n=49)
Survey completers were provided with a list of industry recognized certifications for civil engineering technicians and asked to indicate which certifications they require for employment and which they prefer. Employers were also provided a “neutral” option if they had no preference. A summary of responses is provided below:

In general, most employers in the region do not require industry certifications for employment as a civil engineering technician. The most preferred certifications include NICET (various specialty areas), The NSPS Certified Survey Technician (CST) Level 1, the DNREC Certified Construction Reviewer (CCR) certification and OSHA safety certifications.
In an effort to determine what software programs students should be exposed to, employers of civil engineering technicians were given a list of software commonly used in the industry. They were asked to select all of the programs that their technicians use on a day-to-day basis. The chart below provides a summary count of the selected software:

Employer Insight Based on Executive Interviews
Knowledge of stormwater management design and infrastructure was mentioned by 5 out of 6 interviewees that specialize in civil engineering. This is a growing need among the workforce as regulations regarding the management of stormwater runoff become increasingly stringent throughout the region. In addition, experience with civil drafting software such as AutoCAD, Revit, Microstation, and Building Information Modeling (BIM) was identified as “high-need” by 5 out of 6 interviewees. Knowledge of geographic information systems (GIS) was cited as a need by 50% of all civil employers interviewed. However, it was noted that the need for this skill may be greater in the public sector than in private firms, as private firms tend to contract out their GIS work.

Firms in the region vary when it comes to the degree of surveying expertise a civil engineering technician should have. While two firms mentioned that a great deal of what their civil engineering technicians do on a day-to-day basis is surveying, 3 other firms indicated that their civil technicians are not actively involved in surveying activities. Interviews indicate that firm size may play a role in the degree to which civil technicians are expected to perform surveying duties with smaller firms seeking these skills in their civil technicians and larger firms not as concerned with this skill set when looking to hire. All firms interviewed stressed the need for experience on a job site prior to graduation and entry into the job market.

Supply and Demand Gap Analysis
Table 3, on the next page, provides data on regional program completions for civil engineering technicians. An annual average was calculated by pulling program (CIP code) completion data from the IPEDS database for a 3-year period (2011, 2012, and 2013) for all schools within the region that offer this program and report completions to IPEDS. These average annual completions were added together to produce a total annual completion number for
the region. The region is producing approximately 31 technicians annually for a 3YR supply of 93 graduates. Program completions were then weighed against the projected openings taken from extrapolated employment data.

Table 3 - Regional Annual Program Completions

<table>
<thead>
<tr>
<th>CIP Codes &amp; Descriptions</th>
<th>Delaware Technical Community College</th>
<th>Delaware County Community College</th>
<th>Penn Institute of Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.0000 - Engineering Technology, General</td>
<td>-</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>15.0201 - Civil Engineering Technology/Technician</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15.1301 - Drafting and Design Technology/Technician, General</td>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15.1302 - CAD/CADD Drafting and/or Design Technology/Technician</td>
<td>3</td>
<td>11</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4, below, reflects a 3-year supply gap of 285 technicians or about 95 technicians annually. However, it is important to remember that, currently, about 18% of this workforce does not hold an associate degree and another 52% of employers were unsure as to the education preparation of their workers. Therefore, this supply gap does not specifically represent a shortage of associate degree-prepared workers, but rather people to fill these positions in general. This possible shortage could force employers to continue to hire workers without a formal degree for the foreseeable future despite 94% of employers preferring to hire an associate degree or higher. In addition, growth projections may be slightly inflated due to inherent bias of self-reported data.

Table 4 - Extrapolated Employment Demand versus Supply

<table>
<thead>
<tr>
<th>Current Employment</th>
<th>Employment in 3 Years</th>
<th>3YR Growth</th>
<th>3YR Retirements</th>
<th>3YR Turnover</th>
<th>Total 3YR Openings</th>
<th>3YR Completions</th>
<th>3YR Shortage</th>
<th>Annual Shortage</th>
</tr>
</thead>
<tbody>
<tr>
<td>944</td>
<td>1,091</td>
<td>+147 (15.6%)</td>
<td>112 (12%)</td>
<td>119 (13%)</td>
<td>378</td>
<td>93</td>
<td>(285)</td>
<td>(95)</td>
</tr>
</tbody>
</table>

Conclusions and Recommendations

Overall, the employment outlook for civil engineering technicians in the region appears positive. Survey completers are generally optimistic about their ability to add jobs to the workforce over the next three years. Of the 247 firms screened that do not currently employ any of the engineering technicians examined in the survey, nine firms indicated that they plan to hire for 12 new civil engineering technician positions over the next 3 years. The conclusions on the next page were taken from the full study and have been adapted to reflect findings specific to civil engineering technology.
Conclusions

1. The region is not producing enough of these types of technicians to fill the replacement or growth need projected through 2018. Table 1 shows that survey takers are predicting approximately 89 position openings over the next 3 years due solely to replacements needed within their firms. Without extrapolating the data and without factoring in any growth, the region is still not producing enough graduates to fill the predicted number of replacement openings identified by survey completers. Until the region is able to increase the supply of associate degree-prepared workers to enter these jobs, employers will be forced to continue hiring individuals that may not have the level of educational preparation and experience they desire for employment at their firms.

2. Computer technology and software applications are changing the “must-have” skills needed for these jobs. Forty-nine percent (49%) of survey respondents feel that advancements in technology, particularly software packages, is a key factor that will impact technical skill need over the next few years. The integration of hand-held technology into everyday work responsibilities and the continued advancement of 3D drafting, GPS/GIS applicability and project management software are changing the way these firms do business and remain competitive in the marketplace. As a result, knowledge of these programs is in high-demand and, over the next few years, could become “must-have” for employment. In addition, federal, state and local codes, regulations and mandates such as Delaware’s new stormwater management regulations are constantly changing and technicians must put in the necessary time and effort to remain knowledgeable on all of these requirements to avoid heavy fines and penalties for their employer or clients.

3. On-site work experience (preferably on a construction site) gives new program graduates a significant advantage over job applicants lacking this experience. Eleven out of 15 firms (more than 70%) noted that they prefer to see some sort of construction experience on a job applicant’s resume. While several of these jobs focus on design or activities specific to one particular element of a construction project, familiarity with scheduling, budgeting, safety protocol and the sequence of activities that occur on a job site gives workers the perspective needed to plan, anticipate and predict in their specialty areas. It also exposes the student to several of the local, state, and federal codes, standards and regulations that govern these industries.

4. Employers in the region are cautiously optimistic about the growth and resurgence of civil engineering technology jobs. Survey data clearly shows that firms in the region are predicting growth of their workforce over the coming 3 years. Raw survey data shows an overall 3-year growth rate of roughly 8% for these jobs. Much of this growth they attribute to the slow, but steady, recovery of the economy and stricter regulatory requirements. This is good news for educational institutions that are faced with the opportunity to provide employers throughout the region with highly-skilled, experienced workers that not only meet their hiring requirements, but also their preferences for hire.

Recommendations

The recommendations below are listed so as to correspond to the conclusions listed above and can be generalized into two broad objectives:

- Closing the Gap in Projected Demand; and
- Improving Educational Programs to Better Meet Employer Needs.

1. Promote involvement and partnerships with K-12 and other related organizations in an effort to increase teachers’, counselors’, parents’, and middle and high school students’ awareness of engineering technology options available to them. Addressing a shortage of workers to meet demand begins with targeted efforts to
boost awareness, interest, and enrollment in these programs. These efforts can be bolstered by developing statewide and regional strategies that engage not only K-12 education, but also organizations such as the Delaware STEM Council, trade associations, and other business and economic development agencies. Several survey respondents indicated that one of the drivers for increased technician employment will be greater recognition of the affordability and return on investment of 2-year degrees. The College would be well-served to emphasize these aspects to individuals looking to enter into a STEM occupation or who are currently in the process of choosing a career path.

2. **Continue working toward developing a 4-year engineering technology degree within the State of Delaware to stimulate more connected degree opportunities for Delaware Tech graduates in these fields.** Employers that were interviewed for this scan all felt that creating more opportunity for students to continue their education seamlessly into a bachelor’s degree program may help draw more students into these programs, thus alleviating the projected supply gap. Currently, several of these programs offer a transfer opportunity to either a business management or an organizational management bachelor’s degree, but none transfer to a bachelor’s degree such as Civil Engineering/Engineering Technology.

3. **Consider adopting a cooperative workplace education experience or internship as a requirement for graduation.** Similar to the last CIRWA study focused on Mechanical and Electrical-related engineering technologies, interviewees were surprised to find that this is not already a requirement for Delaware Tech graduates given that many employers are moving away from hiring graduates without relevant experience. This requirement would help Delaware Tech accomplish the following:

   a. Expand the College’s network of companies that hire program graduates;
   b. Expose a greater number of companies to the variety of programs offered at the college;
   c. Demonstrate the skills and abilities of Delaware Tech program graduates over other hiring options available to companies;
   d. Provide students with relevant, real-life workplace experiences and situations that will enable them to be more competitive and attractive to local employers upon graduation; and
   e. Open students up to the possibility of securing employment prior to graduation which may, in effect, provide increased incentive to complete the program and improve graduation and placements rates for the College.

2. **Consider curriculum updates or changes that would place increased emphasis on exposing students to software applications, state codes and regulations and the importance of developing interpersonal and networking skills.** Programs may be well-served to integrate more exercises that utilize the software programs and applications identified by employers in this scan. In addition, emphasizing the importance and implications of federal, state, and local mandates and codes will help students recognize that continually staying updated and knowledgeable about regulatory changes is a requirement of these jobs. Finally, exercises or group projects that focus on developing a student’s professionalism and confidence as well as business and marketing skills will help enable graduates to facilitate relationships and catalyze business opportunities for their employer.

The full labor market scan available at [www.dtcc.edu/cirwa](http://www.dtcc.edu/cirwa) contains more generalized data for civil engineering technology and other related occupations. Supplemental employment data for civil engineering technicians is provided in Appendix B of the full study. For further detail on the methodology of extrapolating employment estimates, please see the Methodology section in Appendix C of the full study.
Delaware Technical Community College established the Center for Industry Research & Workforce Alignment (CIRWA) in October 2011 as part of a U.S. Department of Labor Trade Adjustment Assistance Community College Career Training Grant.

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