# CTE LABOR MARKET TOOL

This resource provides data snapshots and insights about the overall engineering and architecture labor market, and a closer focus on the Environmental Engineers, Mechanical Engineers, and Architectural and Civil Drafters occupations as those are popular areas for CTE engineering and architecture programs. It also includes some guiding questions to help apply the data to your school's CTE program.

Careers in engineering and architecture include many different kinds of jobs designing and planning built structures and ensuring the safety of their environments. People with these occupations primarily work in office settings, though some may have the option to work remotely. The three largest engineering and architecture occupations in New York City are Architects (Except Landscape and Naval), Civil Engineers, and Architectural and Civil Drafters. Chart 1 below shows the many different kinds of NYC organizations hiring professionals in engineering and architecture.

## Why use this resource?

- ➢ **Use as a critical tool with your school's self study group to guide program planning and improvement aligned to labor market data**

- ➢ **Use as a critical tool to prepare students for postsecondary planning towards high-demand careers**

- ➢ **Feel prepared and confident when responding to NYSED questions about incorporating labor market data into your work**





**Chart 1: Types of organizations doing the most entry-level hiring in engineering and architecture\*, NYC, number of online job ads\*\*, 10/1/2021 - 3/31/2022**

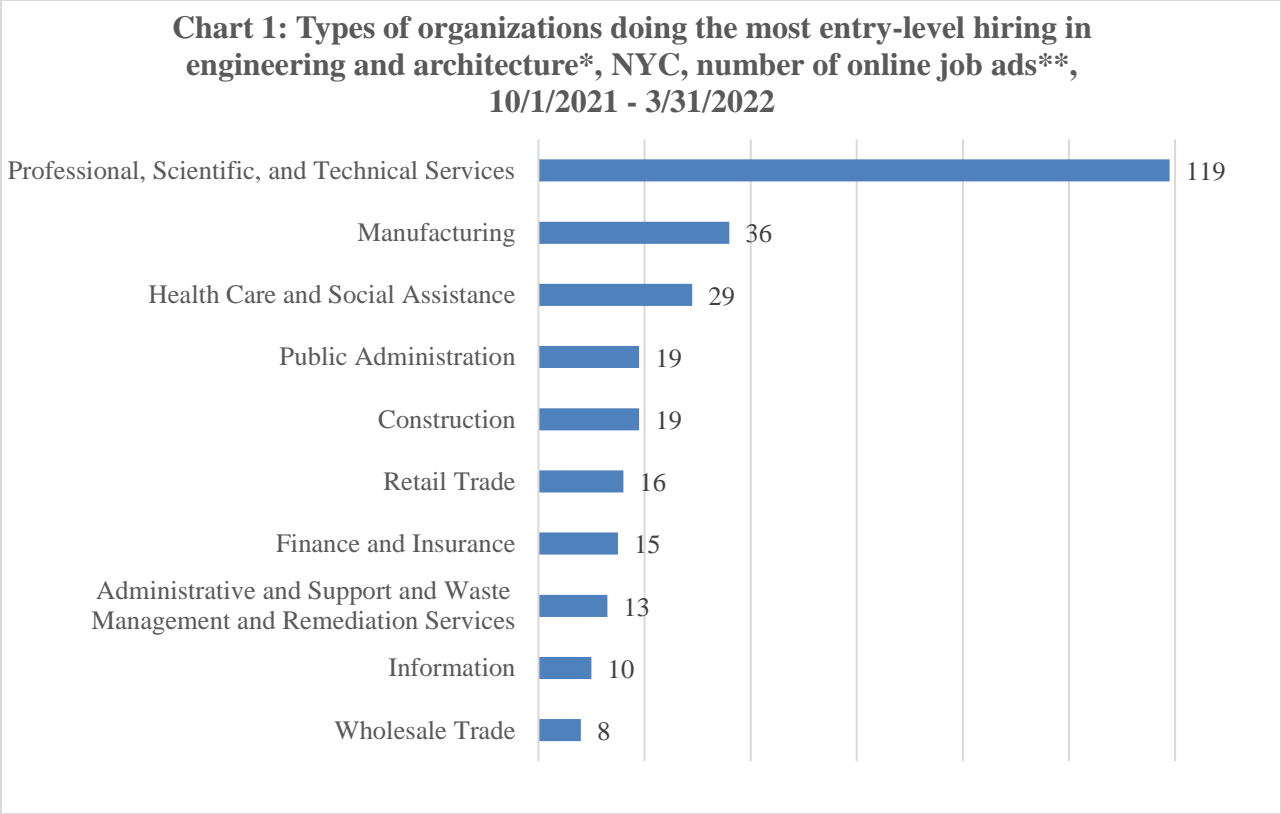| Organization type | Number |
|---|---|
| Professional, Scientific, and Technical Services | 119 |
| Manufacturing | 36 |
| Health Care and Social Assistance | 29 |
| Public Administration | 19 |
| Construction | 19 |
| Retail Trade | 16 |
| Finance and Insurance | 15 |
| Administrative and Support and Waste Management and Remediation Services | 13 |
| Information | 10 |
| Wholesale Trade | 8 |

Chart 2 provides an overview of New York City employment in each of the three focus occupations. As you can see, the number of jobs in each of the occupations is expected to grow by 2028, with the *percentage increase* the largest for the mechanical engineers occupation (10.2%), and the predicted *size* of the occupation the largest for architectural and civil drafters (3,080 jobs). It's important to keep in mind that even though these predictions help us understand the labor market's trajectory, things like new technologies or innovations, shifts in the economy, or major unexpected shocks like the COVID-19 pandemic can impact their accuracy.

| Chart 2: Current & projected employment for 3 focus occupations, NYC, 2018 - 2028 | # Employed in NYC\*\*\*\* | Projected NYC Employment\*\*\* | | Change Over Time (2018-2028) | |
|---|---|---|---|---|---|
| | 2020 | 2018 | 2028 | Net | Percent |
| Environmental Engineers | 1,050 | 920 | 1,010 | 90 | 9.8% |
| Mechanical Engineers | 2,100 | 2,660 | 2,930 | 270 | 10.2% |
| Architectural and Civil Drafters | 4,410 | 2,860 | 3,080 | 220 | 7.7% |

## IN THIS RESOURCE…

## *Looking Deeper: Who's Being Hired in This Field?*

➤ A significant number of job ads for each of the three focus occupations did not specify years of experience, and approximately one-third did not specify level of education sought. For those that did, a mid-range of experience – between 2-6 years – and a bachelor's degree was most common for all three occupations.

➤ There is some overlap in the employability skills that organizations look for in job candidates, with communication skills in-demand for all three focus occupations, and management and planning in-demand for two of the three occupations.

➤ Entry-level wages for all three focus occupations exceed the living wage for a single adult in NYC ($48,320*******).

**Chart 3: Percentage distribution of years of experience sought for job candidates in the 3 focus occupations in NYC, based on online job ads**, 10/1/2021 - 3/31/2022**

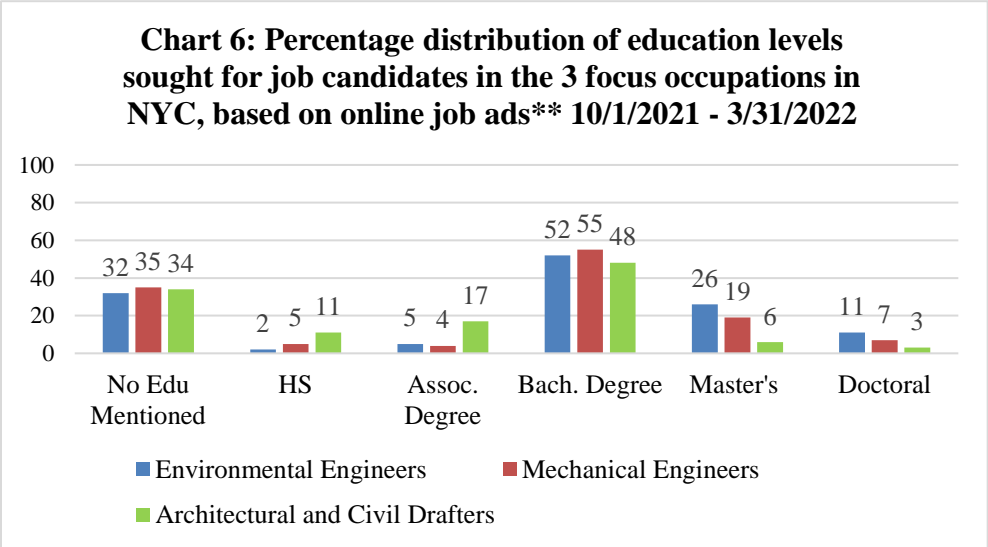| Experience | Environmental Engineers | Mechanical Engineers | Architectural and Civil Drafters |
|---|---|---|---|
| No Exp Mentioned | 41 | 37 | 55 |
| 0 - 1 Years | 9 | 6 | 11 |
| 2 - 3 Years | 21 | 20 | 20 |
| 4 - 6 Years | 18 | 21 | 11 |
| 7 - 9 Years | 5 | 9 | — |
| 10+ Years | 5 | 7 | 3 |
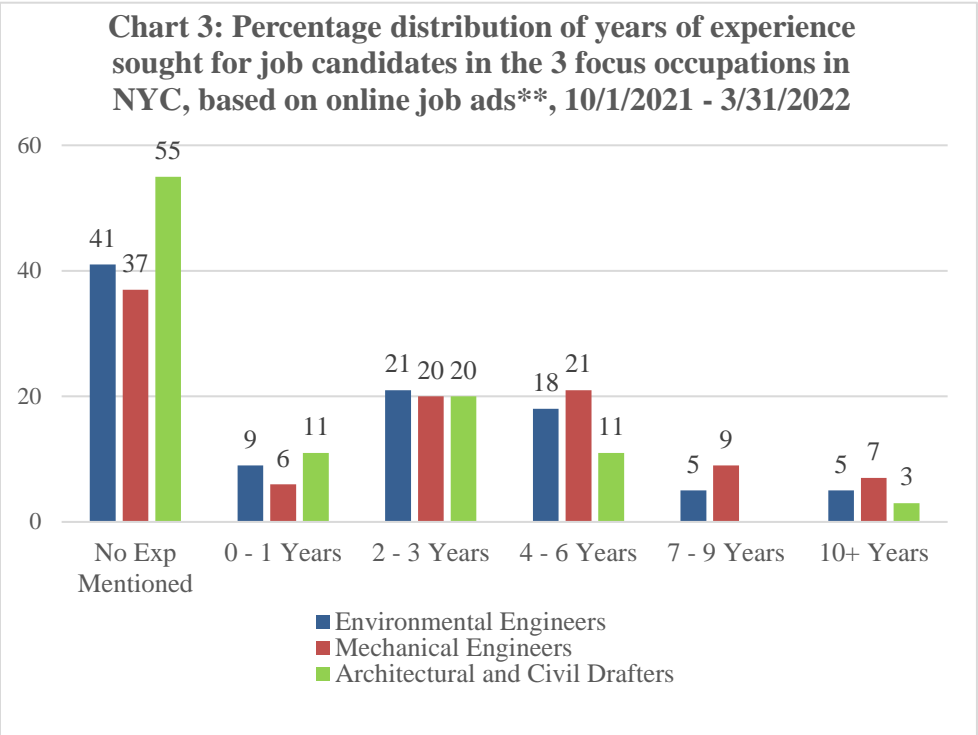
The chart below reflects entry-level wages****, as well as the most in-demand (i.e., among the five most frequently requested and in at least 10% of online job ads********) employability skills, technical skills, and certifications** for the three focus occupations from 10/1/2021 – 3/31/2022. Values in parentheses reflect the percentage of online job ads in which each skill is mentioned.

**Chart 4: Entry-level wages & in-demand skills for 3 focus occupations**

| Occupation | Entry-level Wage | In-demand Employability Skills | In-demand Technical Skills | In-demand Certifications |
|---|---|---|---|---|
| Environmental Engineers | $73,820 | Communications (50%), Management (35%), Planning (22%), Leadership (21%), and Verbal Communication Skills (21%) | Environmental Engineering (38%), Environmental Science (25%), Geology (16%), Environmental Laws (15%), and Biology (14%) | Driver's License (25%), Occupational Safety and Health Administration (OSHA) (15%) |
| Mechanical Engineers | $65,610 | Communications (43%), Management (23%), Research (20%), Operations (20%), and Problem Solving (19%) | Mechanical Engineering (54%), HVAC (25%), Construction (22%), AutoCAD (22%), and Mechanical Design (19%) | Licensed Professional Engineer (14%) |
| Architectural and Civil Drafters | $53,500 | Communications (29%), Planning (18%), Microsoft Office (15%), Coordinating (15%), and Detail Oriented (15%) | AutoCAD (82%), Computer-Aided Design (43%), Autodesk Revit (35%), Construction (26%), and Shop Drawing (20%) | N/A |

Chart 5 shows the ethnicity and sex of people who work in the three focus occupations in NYC*****. As you can see, more males than females are employed in all three focus occupations. The most common ethnicity for workers in all three occupations is White, with white workers making up approximately half of the workforce for each occupation.

**Chart 5: Sex and ethnicity distributions for 3 focus occupations**

| Occupation | Ethnicity % | | | | | | Sex % | |
|---|---|---|---|---|---|---|---|---|
| | American Indian/ Alaska Native | Asian/Pacific Islander | Black | Hispanic | White | Multi-ethnic/ Other | Female | Male |
| Environmental Engineers | 0.00 | 16.63 | 8.70 | 19.92 | 54.74 | 0.00 | 37.91 | 62.09 |
| Mechanical Engineers | 1.36 | 15.48 | 7.31 | 22.36 | 51.74 | 1.74 | 8.59 | 91.41 |
| Architectural and Civil Drafters | 0.00 | 7.90 | 9.06 | 27.06 | 49.94 | 6.04 | 33.57 | 66.43 |

**Chart 6: Percentage distribution of education levels sought for job candidates in the 3 focus occupations in NYC, based on online job ads** 10/1/2021 - 3/31/2022**

| Education | Environmental Engineers | Mechanical Engineers | Architectural and Civil Drafters |
|---|---|---|---|
| No Edu Mentioned | 32 | 35 | 34 |
| HS | 2 | 5 | 11 |
| Assoc. Degree | 5 | 4 | 17 |
| Bach. Degree | 52 | 55 | 48 |
| Master's | 26 | 19 | 6 |
| Doctoral | 11 | 7 | 3 |

## *Post-secondary Planning*

**CTE students are encouraged to pursue education and training after graduation from high school in order to enter into an in-demand career with family-sustaining wages in NYC. The following is a list of CUNY degree programs aligned with the engineering and architecture industry as well as non-degree programs that result in an industry-endorsed certification and/or college credits. Some CTE programs have robust partnerships with CUNY programs that are codified by an articulation agreement. These agreements provide a range of student benefits such as advanced standing, early college credit, and preferential placement. CTE school leaders, teachers, and work-based learning coordinators are encouraged to connect with the school counseling teams at their school to determine strong postsecondary options for their students. Please reach out to your Industry Engagement Manager for more information about the articulation agreements.**

➤ Chart 7 is a sample of the over 30 CUNY programs focused on engineering and architecture spread across the five boroughs, ranging from certificate programs up through Master's and PhD degree opportunities. It is helpful to keep in mind the data from Chart 6, above, which suggests that having a post-secondary educational credential is valuable for job candidates in this field.

➤ Chart 8, on the following page, provides a list of non-degree engineering and architecture occupation-focused training opportunities available through a variety of different NYC-based organizations.

| Chart 7: CUNY post-secondary programs related to engineering and architecture | | | | |
|---|---|---|---|---|
| **Borough** | **School** | **Academic program** | **Credential*****\***** | **DOE/CUNY articulation agreement benefits** |
| Bronx | Bronx CC | Electronic Engineering Technology and Environmental Technology | AAS | |
| Bronx | Bronx CC | Engineering Science | AS | |
| Bronx | Hostos CC | Chemical Engineering Science, Civil Engineering Science, Electrical Engineering Science, and Mechanical Engineering Science | AS | |
| Brooklyn | Kingsborough CC | Electrical Engineering | AS | |
| Brooklyn | NYC College of Tech | Architectural Technology | AAS and BTECH | Advanced Standing |
| Brooklyn | NYC College of Tech | Civil Engineering Technology, Electrical Engineering Technology, Electromechanical Engineering Technology, Environmental Control Technology, and Mechanical Engineering Technology | AAS | |
| Brooklyn | NYC College of Tech | Architecture | BArch | |
| Brooklyn | NYC College of Tech | Computer Engineering Technology, Construction Engineering Technology, Electrical Engineering Technology, and Mechanical Engineering Technology | BTECH | |
| Manhattan | Borough of Manhattan CC | Engineering Science and Geographic Information Science | AS | |
| Manhattan | City College of New York | Architecture | BArch and BS | |
| Manhattan | City College of New York | Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Earth Systems Science and Environmental Engineering, and Mechanical Engineering | BE | |
| Manhattan | City College of New York | Architecture | MArch and MS | |
| Manhattan | City College of New York | Chemical Engineering, Civil Engineering (Environmental, Structure, Transportation), Electrical Engineering, and Mechanical Engineering | ME | |
| Manhattan | City College of New York | Biomedical Engineering, Computer Engineering, Data Science and Engineering, Earth Systems & Environmental Engineering, and Sustainability in the Urban Environment | MS | |
| Manhattan | City College of New York | Landscape Architecture | MLA | |
| Manhattan | City College of New York | Urban Design | MUP | |
| Manhattan | City College of New York | Biomedical Engineering, Chemical Engineering, Civil Engineering (Environmental, Structure, Transportation), Electrical Engineering, and Mechanical Engineering | PhD | |
| Manhattan | Graduate Center | Nanoscience | MS | |
| Manhattan | Hunter College | Geographic Information Science | Advanced Certificate | |
| Manhattan | Hunter College | Geoinformatics | MS | |
| Manhattan | Hunter College | Urban Planning | MUP | |
| Queens | LaGuardia CC | Electrical Engineering, Engineering Science: Civil Engineering, and Mechanical Engineering | AS | |

| | | | | |
|---|---|---|---|---|
| Queens | Queensborough CC | Architectural Technology, Computer Engineering Technology, Electronic Engineering Technology, and Mechanical Engineering Technology | AAS | |
| Queens | Queensborough CC | Electrical Engineering | AS | |
| Queens | York College | Survey Research | Certificate | |
| Staten Island | College of Staten Island | Engineering Science | AS | |
| Staten Island | College of Staten Island | Engineering Science and Electrical Engineering | BS | |
| Staten Island | College of Staten Island | Electrical Engineering | ME | |

| Chart 8: Non-degree engineering and architecture training opportunities |
|---|
| ApprenticeNYC |
| CUNY's Continuing and Professional Education |
| San Institute of Design and Technology |

## *What Next? Guiding Questions & Web Resources*

**"Describe how current labor market data has informed program design and choice of technical assessment."**

The prompts below are designed to promote discussion and ideas for program planning, and to help you answer the question above from the CTS self study tab and the NYSED CTE application (Part 2, Section C).

| How can we incorporate this report's data insights into our… | Data points to consider: |
|---|---|
| …program focus? | Introductory paragraph overviews on page 1 and charts 1, 2, 3, 4 |
| …technical and employability skills? | Chart 4 |
| …articulation agreement? | Charts 6, 7 |
| …technical assessments? | Chart 4 |
| …career pathway options? | Charts 1, 27, 8 |

**Consider the questions below keeping in mind the labor market data points you've explored in this report and the questions that you've answered above.**

Select three ways that you might adjust your program in response to labor market data:

☐ Program focus      ☐ Articulation agreement      ☐ Technical assessments      ☐ Career pathway options
☐ Technical and employability skills      ☐ Other:

**Which one of these three adjustments could most easily be implemented this school year?**

**Which one of the three would make the biggest difference for the quality of your program? Why?**

> ### *Curious to explore more? Check out these web resources:*
> ➤ CTE NYC website: www.cte.nyc
> ➤ CTE Industry Commission resources: bitly.com/CTEIndustryEngagement
> ➤ CTE College and Career Planning Team's postsecondary milestones toolkit: https://bit.ly/35uglcc
> ➤ CareerOneStop labor market data explorer: www.careeronestop.org

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## *Technical Notes & Data Sources:*

\* "Engineering and architecture" occupations have been operationalized as occupations with a 2010 Standard Occupation Classification (SOC) code starting with the two-digit "17" ("Architecture and Engineering Occupations"): 17-1XXX for Architects, Surveyors, and Cartographers; 17-2XXX for Engineers; and 17-3XXX for Drafters, Engineering Technicians, and Mapping Technicians.

\*\* These analyses were conducted using the EMSI Burning Glass Analyst proprietary web-based research platform. Please note that some intra-occupation percentage totals may equal >100% if the employer indicated a range of minimum/preferred years of experience or education-attainment level. "Entry-level" jobs are considered to be those with job advertisements that specified 0-1 year of experience.

\*\*\* New York City 2018-2028 long-term employment projections are determined by New York State Department of Labor (NYSDOL). Please note that these estimates include self-employed workers, which is not always true of other estimates such as the OEWS estimates.

\*\*\*\* NYSDOL, Occupational Employment and Wage Statistics (OEWS) estimates for New York City (July 2021 release). NYSDOL adjusted wages to reflect levels in the first quarter of 2021. NYSDOL operationalizes "Entry Wage" as the average of the bottom third of wages.

\*\*\*\*\* Demographics based on U.S. Census, American Community Survey (ACS) estimates, NYC 2015-2019 5-year sample, IPUMS release February 2021. Please note that the ACS does not ask for respondents' gender, only biological sex. As a result, there are only results available for male and female categories. To learn more about this, please see here: https://www.census.gov/acs/www/about/why-we-ask-each-question/sex/

\*\*\*\*\*\* AAS denotes Associate in Applied Science; AS denotes Associate in Science; BArch denotes Bachelor of Architecture; BE denotes Bachelor of Engineering; BS denotes Bachelor of Science; BTECH denotes Bachelor of Technology; MArch denotes Master of Architecture; ME denotes Master of Engineering; MLA denotes Master of Landscape Architecture; MS denotes Master of Science; MUP denotes Master of Urban Planning; PhD denotes Doctor of Philosophy.

\*\*\*\*\*\*\* Massachusetts Institute of Technology's (MIT) Living Wage calculator, 2020 estimate for the five counties of New York City, NY (https://livingwage.mit.edu/metros/35620; data accessed April 2022), adjusted to the first quarter of 2021 using the U.S. Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (New York-Newark-Jersey City metropolitan area, not seasonally adjusted).

\*\*\*\*\*\*\*\* Additional skills that are in-demand as measured by being mentioned in at least 10% of online job ads for workers, but not among the top 5 most frequently requested are:

Environmental Engineers: Additional in-demand employability skills include detail oriented, Microsoft Excel, research, operations, investigation, written communication, interpersonal communications, report writing, organizational skills, problem solving, Microsoft Office, self-motivation, Microsoft PowerPoint, presentations, Microsoft Word, innovation, and teamwork. Additional in-demand technical skills include wastewater, soil science, stormwater management, data analysis, construction, field research, project management, sampling (statistics), and subcontracting.

Mechanical Engineers: Additional in-demand employability skills include leadership, Microsoft Excel, interpersonal communications, planning, presentations, troubleshooting (problem solving), coordinating, detail oriented, innovation, Microsoft Office, Microsoft PowerPoint, written communication, investigation, quality control, and decision making. Additional in-demand technical skills include mechanical systems, plumbing, Autodesk Revit, engineering design process, computer-aided design, and automation.

Architectural and Civil Drafters: Additional in-demand employability skills include self-motivation, verbal communication skills, and presentations. Additional in-demand technical skills include structural engineering, architectural drawing, building codes, schematic diagrams, SketchUp (3D modeling software), AutoCAD Civil 3D, civil engineering, engineering design process, building information modeling, surveying, and grading (landscape).