Labor Market Analysis for Program Review: 0957.00/Civil and Construction Management Technology (*Engineering Civil Technology AS Degree and Certificate*)
Orange County Center of Excellence, June 2024

Program reviews are conducted by individual colleges to periodically review curriculum of their existing programs, and in the case of career technical education programs, ensure continued alignment with regional labor market needs. Because a program review evaluates an existing program, rather than establishing a new program, additional supply will not be added; therefore, the endorsement criteria included in this report is determined slightly differently than it is for a new program that requires regional recommendation.

Summary

Program LMI Endorsement	Endorsed: All LMI Criteria Met	☒	Endorsed: Some LMI Criteria Met	☐	Not LMI Endorsed	☐

Program LMI Endorsement Criteria		
	Yes ☑	No ☐
Supply Gap:	*Comments:* There are projected to be **2,239 middle-skill annual job openings** throughout Los Angeles and Orange counties for these engineering occupations, which **is more than the 1,641 awards conferred by educational institutions.**	
	Yes ☑	No ☐
Living Wage: (Entry-Level, 25th)	*Comments:* **All annual job openings** for these engineering occupations **have entry-level hourly wages above the OC living wage of $20.63.**	
	Yes ☑	No ☐
Education:	*Comments:* The majority (92%) of annual openings for these engineering occupations typically require a high school diploma or equivalent; however, **between 31% and 51% of workers in the field have completed some college or an associate degree as their highest level of education.**	

Emerging Occupation(s)	
Yes ☐	No ☑
Comments: N/A	

The Orange County Center of Excellence for Labor Market Research (OC COE) prepared this report to determine whether there is a supply gap in the Los Angeles/Orange County regional labor market related to two middle-skill occupations:

- *Civil Engineering Technologists and Technicians (17-3022)*
- *First-Line Supervisors of Construction Trades and Extraction Workers (47-1011)*

Based on the available data, there appears to be a supply gap for these engineering occupations. In addition, typical education requirements for these occupations align with a community college education and typical entry-level wages are above the living wage. **Therefore, due to all regional labor market criteria being met, the COE endorses this proposed program.**

Exhibit 1 lists the occupational demand, supply, typical entry-level education, and educational attainment for the occupations included in this report.

<p align="center">Exhibit 1: Labor Market Endorsement Summary</p>

Occupation (SOC)	Demand (Annual Openings)	Supply (CC and Non-CC)	Entry-Level Hourly Earnings (25th Percentile)	Typical Entry-Level Education	Community College Educational Attainment
Civil Engineering Technologists and Technicians (17-3022)	LA: 115	LA: 474	OC: $29.44	Associate degree	51%
	OC: 62	OC: 92			
	TTL: 178	TTL: 566			
First-Line Supervisors of Construction Trades and Extraction Workers (47-1011)	LA: 1,345	LA: 623	OC: $32.54	High school diploma or equivalent	31%
	OC: 716	OC: 452			
	TTL:2,061	TTL: 1,075			
Total	2,239	1,641	N/A	N/A	N/A

Demand:

- The number of jobs related to these engineering occupations is projected to increase 3% through 2027, equating to 2,239 annual job openings.
- Hourly entry-level wages for these engineering occupations range from $29.44 to $32.54 in Orange County; all annual job openings have entry-level wages above the living wage.
- There were 1,387 online job postings for these engineering occupations over the past 12 months. The highest number of postings were for construction foremen, asbestos supervisors, and electrical foremen.
- The typical entry-level education for these engineering occupations ranges from a high school diploma or equivalent to an associate degree.
- Between 31% and 51% of workers in the field have completed some college or an associate degree as their highest level of educational attainment.

Supply:

- There was an average of 1,151 awards conferred by 22 community colleges in Los Angeles and Orange Counties from 2019 to 2022.
- Non-community college institutions conferred an average of 490 awards from 2019 to 2021.
- Orange County community college students that exited civil and construction management technology programs in the 2020-21 academic year had a median annual wage of $55,040 ($26.46 per hour) after exiting the program and 68% attained the regional living wage.
- Throughout Orange County, 100% of civil and construction management technology students that exited their program in 2019-20 reported that they are working in a job closely related to their field of study. However, this figure represents only 5 students.

Demand

Occupational Projections:

Exhibit 2 shows the annual percent change in jobs for these engineering occupations from 2017 through 2027. Employment in these engineering occupations decreased 8% from 2019 to 2020, which is nearly identical to the 7% decline across all occupations in Los Angeles and Orange counties due to the COVID-19 pandemic. However, employment for these engineering occupations experienced an increase through 2022.

In the years preceding the pandemic, employment for these occupations fluctuated, with notable increases in 2017 and 2018, followed by a sharp decline in 2019. However, employment for these engineering occupations is projected to increase, similarly to all occupations, through 2027 in Orange County.

Exhibit 2: Annual Percent Change in Jobs for Engineering Occupations, 2017-2027
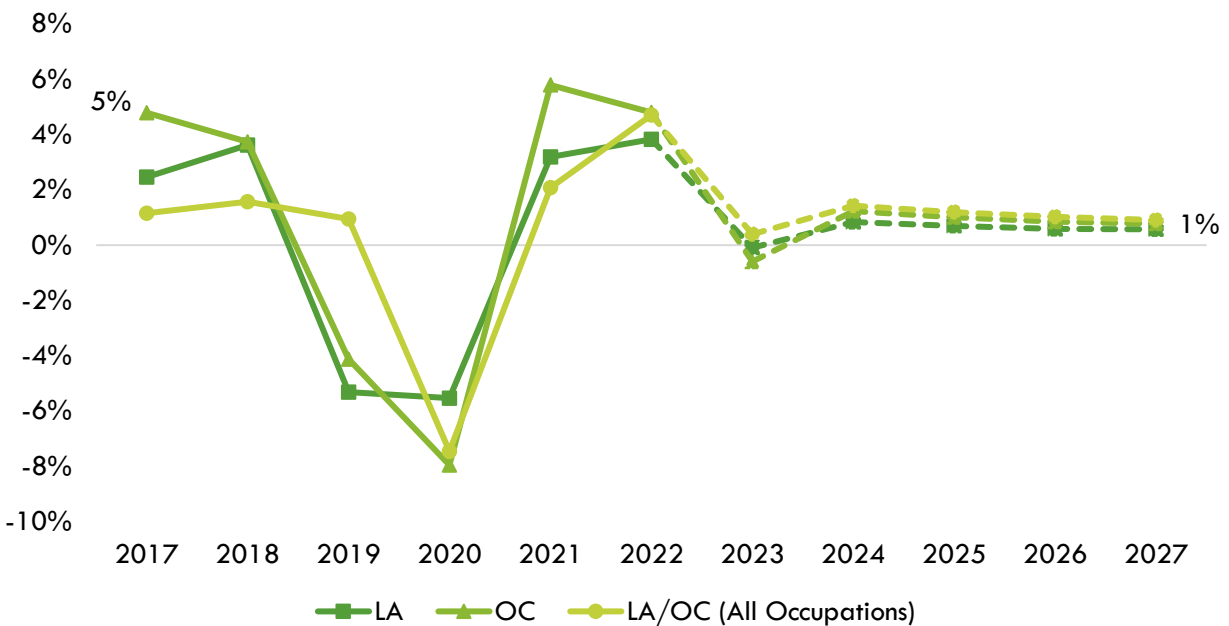

Exhibit 3 shows the five-year occupational demand projections for these engineering occupations. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 3% through 2027. There is projected to be 2,239 jobs available annually.

Exhibit 3: Occupational Demand in Los Angeles and Orange Counties[1]

| Geography	2022 Jobs	2027 Jobs	2022-2027 Change	2022-2027 % Change	Annual Openings
Los Angeles	16,454	15,637	410	3%	1,345
Orange	8,674	8,960	286	3%	778
Total	**25,128**	**25,845**	**717**	**3%**	**2,239**

[1] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

Wages:

The labor market endorsement in this report considers the entry-level hourly wages for these engineering occupations in Orange County as they relate to the county's living wage. Los Angeles County wages are included below to provide a complete analysis of the LA/OC region.

All annual openings for these engineering occupations have entry-level wages above the living wage for one adult ($20.63 in Orange County). Typical entry-level hourly wages range between $29.44 and $32.54. Orange County's average wages of $44.99 are above the average statewide wage of $43.13 for these occupations. Exhibit 4 shows the wage range for each of these engineering occupations in Orange County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 4: Wages by Occupation in Orange County
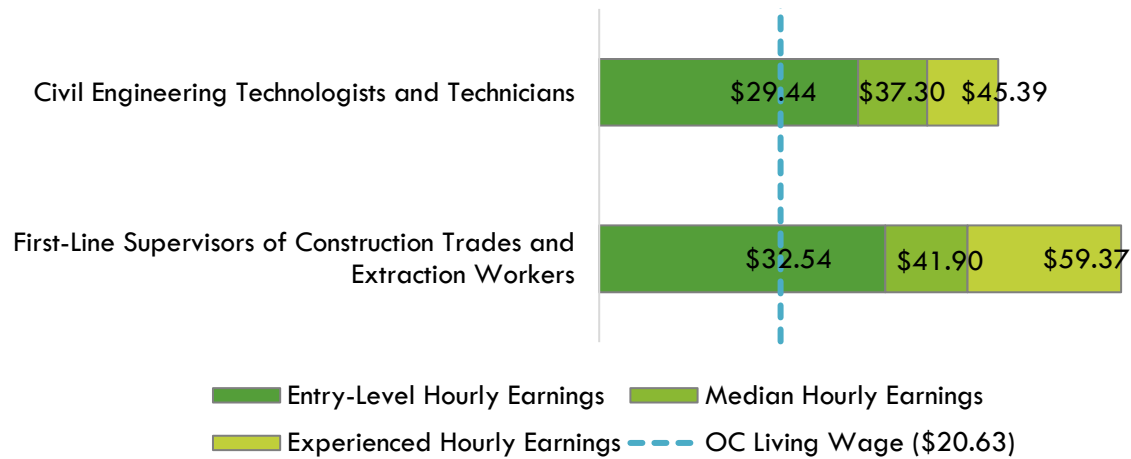
All annual openings for these engineering occupations have entry-level wages above the living wage for one adult ($18.10 in Los Angeles County). Typical entry-level hourly wages are in a range between $28.93 and $29.83. Los Angeles County's average wages of $41.14 are below the average statewide wage of $43.13 for these occupations. Exhibit 5 shows the wage range for each of these engineering occupations in Los Angeles County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 5: Wages by Occupation in Los Angeles County
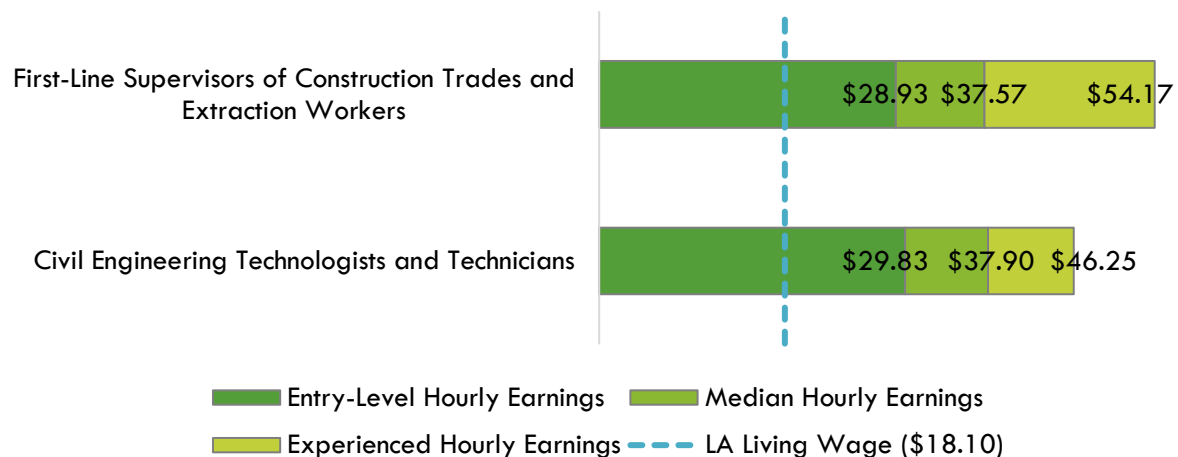
Job Postings:

Important Online Job Postings Data Note: *Online job postings data is sourced from Lightcast, a labor market analytics firm that scrapes, collects, and organizes data from online job boards such as LinkedIn, Indeed, Glassdoor, Monster, GovernmentJobs.com, and thousands more. Lightcast uses natural language processing (NLP) to determine the related company, industry, occupation, and other information for each job posting. However, NLP has limitations that include understanding contextual words of phrases; determining differences in words that can be used as nouns, verbs, and/or adjectives; and misspellings or grammatical errors.[2] For these reasons, job postings could be assigned to the wrong employer, industry, or occupation within Lightcast's database.*

Additionally, there are several limitations when analyzing job postings. A single job posting may not represent a single job opening, as employers may be creating a pool of candidates for future openings or hiring for multiple positions with a single posting. Additionally, not all jobs are posted online, and jobs may be filled through other methods such as internal promotion, word-of-mouth advertising, physical job boards, or a variety of other channels.

There were 1,387 online job postings related to these engineering occupations listed in the past 12 months. Exhibit 6 shows the number of job postings by occupation. Over 93% of job postings were for *first-line supervisors of construction trades and extraction workers* and nearly 7% were for *civil engineering technologists and technicians*.

Exhibit 6: Number of Job Postings by Occupation (n=1,387)

Occupation	Job Postings	Percentage of Job Postings
First-Line Supervisors of Construction Trades and Extraction Workers	1,293	93%
Civil Engineering Technologists and Technicians	94	7%
Total Postings	**1,387**	**100%**

The top employers in the region, by number of job postings, are shown in Exhibit 7.

Exhibit 7: Top Employers by Number of Job Postings (n=1,387)

Employer	Job Postings	Percentage of Job Postings
Aerotek	50	4%
Standardaero	26	2%
Alpha Structural	16	1%
Lighthouse Property Management	16	1%
American Multi Cinema	15	1%
Spectrum	14	1%
GPAC	13	1%
AMC Theatres	12	1%
Bf Construction	12	1%
E.Construct.USA	12	1%

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[2] K. R. Chowdhary, Fundamentals of Artificial Intelligence (Basingstoke: Springer Nature, 2020), https://link.springer.com/book/10.1007/978-81-322-3972-7.

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) are shown in Exhibit 8.

Exhibit 8: Top Skills by Number of Job Postings (n=1,387)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Construction (409)	Communication (511)	Microsoft Excel (72)
Project Management (264)	Management (310)	Microsoft Outlook (71)
Plumbing (182)	Leadership (304)	Microsoft Office (65)
Subcontracting (182)	Operations (269)	Microsoft Word (45)
Renovation (169)	Customer Service (220)	Operating Systems (31)
Carpentry (137)	Detail Oriented (193)	Autodesk Revit (26)
Drywall (Installation And Repair) (116)	Problem Solving (186)	AutoCAD (22)
Blueprinting (96)	Coordinating (154)	IBM Maximo (21)
Machinery (93)	Lifting Ability (152)	Spreadsheets (21)
Roofing (93)	Scheduling (150)	Microsoft PowerPoint (16)

Educational Attainment:

The Bureau of Labor Statistics (BLS) lists a high school diploma or equivalent as the typical entry-level education for *first-line supervisors of construction trades and extraction workers* and an associate degree for *civil engineering technologists and technicians*. However, the national-level educational attainment data indicates between 31% and 51% of workers in the field have completed some college or an associate degree as their highest level of education. Exhibit 9 shows the educational attainment for each occupation, sorted by highest community college educational attainment to lowest.

Exhibit 9: National-level Educational Attainment for Occupations
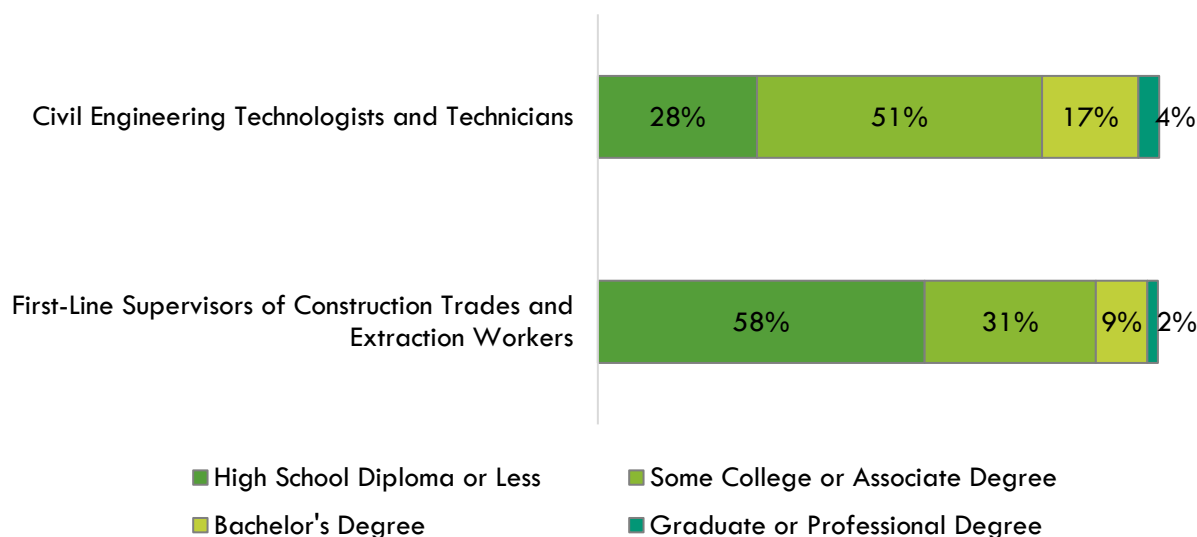
Of the 29% of the cumulative job postings for these engineering occupations that listed a minimum education requirement in Los Angeles/Orange County, 66% (267) requested a high school diploma or an associate degree and 34% (137) requested a bachelor's degree.

Educational Supply

Community College Supply:

Exhibit 10 shows the three-year average number of awards conferred by community colleges in the related TOP codes:

- Architecture and Architectural Technology (0201.00)
- Engineering Technology, General (requires Trigonometry) (0924.00)
- Construction Crafts Technology (0952.00)
- Carpentry (0952.10)
- Electrical (0952.20)
- Plumbing, Pipefitting and Steamfitting (0952.30)

- Masonry, Tile, Cement, Lath and Plaster (0952.60)
- Drywall and Insulation (0952.80)
- Civil and Construction Management Technology (0957.00)
- Construction Inspection (0957.20)
- Public Works (2102.10)

No awards were conferred under the following related TOP codes: Glazing (0952.40), Painting, Decorating, and Flooring (0952.70), and Roofing (0952.90).

The colleges with the most completions in the region are Pasadena, LA Trade, and LA Southwest. Over the past 12 months, there was one other related program recommendation requests from regional community colleges.

Exhibit 10: Regional Community College Awards (Certificates and Degrees), 2019-2022

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
0201.00	Architecture and Architectural Technology	Cerritos	44	28	15	29
		Citrus	6	6	7	6
		East LA	25	16	23	21
		El Camino	21	5	15	14
		Glendale	6	3	17	9
		LA Harbor	4	4	13	7
		LA Pierce	4	16	11	10
		LA Trade	8	7	13	9
		LA Valley	3	4	3	3
		Long Beach	13	11	9	11
		Mt San Antonio	51	61	95	69
		Pasadena	18	12	12	14
		Rio Hondo	3	3	8	5
		LA Subtotal	**206**	**176**	**241**	**208**
		Fullerton	12	4	0	5
		Orange Coast	59	38	75	57
		Saddleback	8	3	4	5

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		OC Subtotal	**79**	**45**	**79**	**68**
		Supply Subtotal/Average	**285**	**221**	**320**	**275**
0924.00	Engineering Technology, General (requires Trigonometry)	Cerritos	15	6	15	12
		East LA	1	1	0	1
		Glendale	7	14	3	8
		Mt San Antonio	2	0	6	3
		Pasadena	216	238	211	222
		LA Subtotal	**241**	**264**	**235**	**248**
		Santa Ana	3	5	0	3
		OC Subtotal	**3**	**5**	**0**	**3**
		Supply Subtotal/Average	**244**	**264**	**235**	**248**
0952.00	Construction Crafts Technology	El Camino	17	2	7	9
		LA Southwest	152	79	23	85
		Long Beach	60	39	40	46
		Pasadena	1	0	0	0
		LA Subtotal	**230**	**120**	**70**	**140**
		Fullerton	8	7	4	6
		Orange Coast	37	14	22	24
		Santa Ana	85	85	31	67
		OC Subtotal	**130**	**106**	**57**	**98**
		Supply Subtotal/Average	**360**	**226**	**127**	**238**
0952.10	Carpentry	LA Southwest	0	0	23	8
		LA Trade	27	38	42	36
		LA Subtotal	**27**	**38**	**65**	**43**
		Santiago Canyon	2	0	1	1
		OC Subtotal	**2**	**0**	**1**	**1**
		Supply Subtotal/Average	**29**	**38**	**66**	**44**
0952.20	Electrical	LA Trade	149	135	147	144
		LA Subtotal	**149**	**135**	**147**	**144**
		Coastline	0	0	1	0
		Irvine	8	21	12	14
		North Orange Adult	2	0	0	1
		Orange Coast	0	0	3	1
		Santiago Canyon	31	33	0	21
		OC Subtotal	**41**	**54**	**16**	**37**
		Supply Subtotal/Average	**190**	**189**	**163**	**181**

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
0952.30	Plumbing, Pipefitting and Steamfitting	LA Trade	31	21	33	28
		LA Subtotal	**31**	**21**	**33**	**28**
		Orange Coast	1	0	5	2
		OC Subtotal	**1**	**0**	**5**	**2**
	Supply Subtotal/Average		**32**	**21**	**38**	**30**
0952.60	Masonry, Tile, Cement, Lath and Plaster	-	-	-	-	-
		LA Subtotal	**-**	**-**	**-**	**-**
		Orange Coast	0	0	3	1
		OC Subtotal	**0**	**0**	**3**	**1**
	Supply Subtotal/Average		**0**	**0**	**3**	**1**
0952.80	Drywall and Insulation	-	-	-	-	-
		LA Subtotal	**-**	**-**	**-**	**-**
		Santiago Canyon	1	5	1	2
		OC Subtotal	**1**	**5**	**1**	**2**
	Supply Subtotal/Average		**1**	**5**	**1**	**2**
0957.00	Civil and Construction Management Technology	Citrus	0	6	5	4
		East LA	1	0	0	0
		LA Valley	13	5	5	8
		Mt San Antonio	11	13	10	11
		LA Subtotal	**25**	**24**	**20**	**23**
		Fullerton	11	7	14	11
		Santa Ana	0	0	2	1
		OC Subtotal	**11**	**7**	**16**	**11**
	Supply Subtotal/Average		**36**	**31**	**36**	**34**
0957.20	Construction Inspection	Pasadena	21	20	14	18
		LA Subtotal	**21**	**20**	**14**	**18**
		Coastline	11	12	14	12
		Fullerton	4	5	10	6
		Saddleback	15	8	1	8
		Santiago Canyon	15	17	11	14
		OC Subtotal	**45**	**42**	**36**	**41**
	Supply Subtotal/Average		**66**	**62**	**50**	**59**
2102.10	Public Works	Citrus	22	7	13	14
		LA Trade	0	2	6	3
		LA Subtotal	**22**	**9**	**19**	**17**
		Santiago Canyon	26	18	21	22
		OC Subtotal	**26**	**18**	**21**	**22**

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		Supply Subtotal/Average	48	27	40	38
		Supply Total/Average	1,291	1,084	1,079	1,151

Exhibit 11 shows the annual average community college awards by type from 2019-20 to 2021-22. The plurality of the awards are for associate degrees, followed by certificates between 30 and less than 60 semester units and certificates between 16 and less than 30 semester units.

Exhibit 11: Annual Average Community College Awards by Type, 2019-2022

Award Type	Value
Associate Degree	485
Certificate 30 < 60 semester units	233
Certificate 16 < 30 semester units	128
Certificate 8 < 16 semester units	17
Certificate 6 < 18 semester units	81
Credit Award < 6 semester units	7
Noncredit award 288 < 480 hours	67
Noncredit award 192 < 288 hours	88
Noncredit award 96 < 144 hours	20
Noncredit award 48 < 96 hours	8
Noncredit award < 48 hours	18
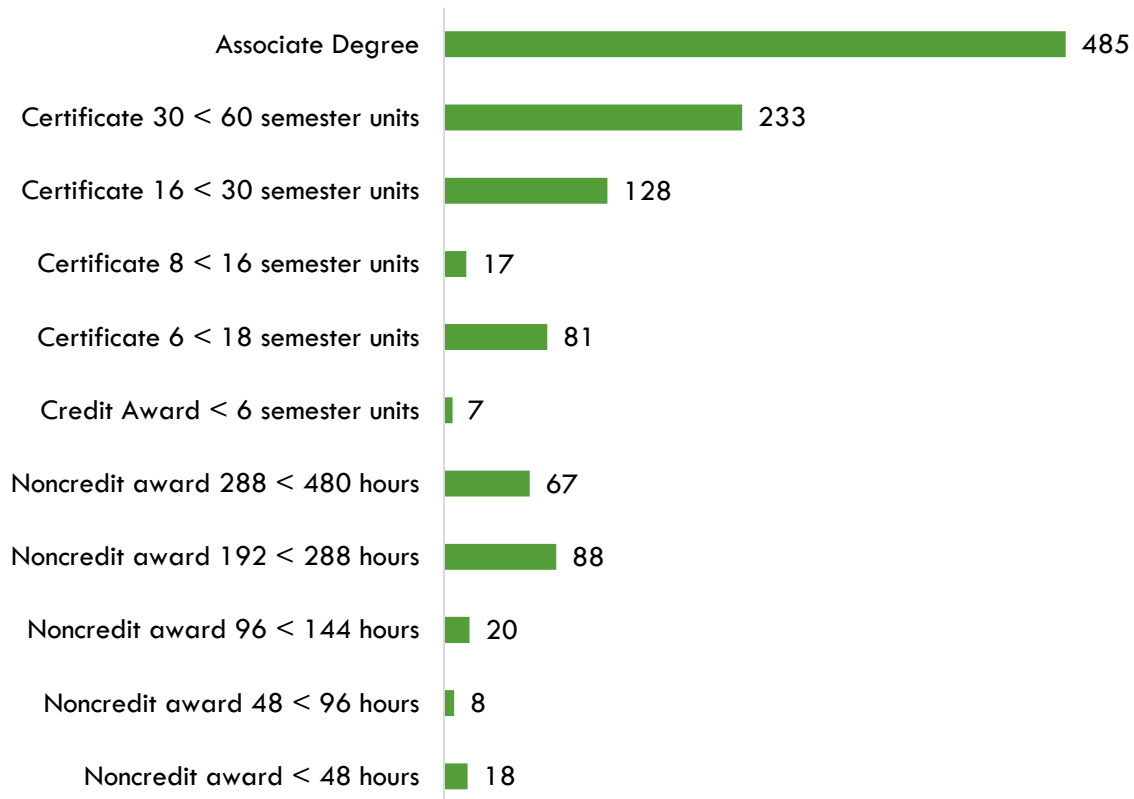
Community College Student Outcomes:

Exhibit 12 shows the Strong Workforce Program (SWP) metrics for civil and construction management technology programs in Rancho Santiago Community College District (RSCCD), the Orange County Region, and California. According to Chancellor's Office Curriculum Inventory (COCI) data, there are two active civil and construction management technology programs in RSCCD and four in Orange County. However, due to a low number of students, several outcomes are unavailable at the district and regional levels.

Of the 215 Orange County civil and construction management technology students in the 2020-21 academic year, 47% (100) attended an RSCCD college. Orange County students that exited civil and construction management technology programs in the 2020-21 academic year had significantly lower median annual earnings ($55,040 or $26.46 per hour) compared to all civil and construction management technology students statewide ($62,016 or $29.82 per hour). A lower percentage of Orange County civil

and construction management technology students attained the living wage (68%) when compared to all civil and construction management technology students in the state (72%).

Exhibit 12: Civil and Construction Management Technology (0957.00) Strong Workforce Program Metrics, 2020-21[3]

SWP Metric	RSCCD	OC Region	California
SWP Students	100	215	2,754
SWP Students Who Earned 9 or More Career Education Units in the District in a Single Year	16%	36%	37%
SWP Students Who Completed a Noncredit CTE or Workforce Preparation Course	Insufficient Data	Insufficient Data	83%
SWP Students Who Earned a Degree or Certificate or Attained Apprenticeship Journey Status	Insufficient Data	Insufficient Data	99
SWP Students Who Transferred to a Four-Year Postsecondary Institution (2019-20)	Insufficient Data	Insufficient Data	56
SWP Students with a Job Closely Related to Their Field of Study (2019-20)	Insufficient Data	100%	79%
Median Annual Earnings for SWP Exiting Students	Insufficient Data	$55,040 ($26.46)	$62,016 ($29.82)
Median Change in Earnings for SWP Exiting Students	Insufficient Data	18%	21%
SWP Exiting Students Who Attained the Living Wage	Insufficient Data	68%	72%

Non-Community College Supply:

To comprehensively analyze the regional supply, it is crucial to include data from other institutions offering engineering training programs. Exhibit 13 displays the annual and two-year average awards granted by these institutions under the related Classification of Instructional Programs (CIP) Codes:

- Engineering Technologies/Technicians, General (15.0000)
- Civil Engineering Technologies/Technicians (15.0201)
- Electrician (46.0302)

No awards were conferred under the following related CIP Codes:

- Applied Engineering Technologies/Technicians (15.0001)
- Mason/Masonry (46.0101)
- Carpentry/Carpenter (46.0201)
- Concrete Finishing/Concrete Finisher (46.0402)
- Building/Home/Construction Inspection/Inspector (46.0403)
- Drywall Installation/Drywaller (46.0404)
- Glazier (46.0406)
- Painting/Painter and Wall Coverer (46.0408)
- Roofer (46.0410)
- Building/Construction Site Management/Manager (46.0412)
- Building Construction Technology/Technician (46.0415)
- Pipefitting/Pipefitter and Sprinkler Fitter (46.0502)
- Plumbing Technology/Plumber (46.0503)

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[3] All SWP metrics are for 2020-21 unless otherwise noted.

The available data covers 2019 to 2021. During this period, non-community college institutions in the region conferred an average of 490 awards annually in related programs.

<div align="center">Exhibit 13: Regional Non-Community College Awards, 2019-2021</div>

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
15.0000	Engineering Technologies / Technicians, General	California State Polytechnic University-Pomona	1	3	2
		California State University-Long Beach	0	0	0
		Supply Subtotal/Average	**1**	**3**	**2**
15.0201	Civil Engineering Technologies / Technicians	University of Southern California	0	5	3
		Supply Subtotal/Average	**0**	**5**	**3**
46.0302	Electrician	Baldwin Park Adult & Community Education	61	74	68
		Capstone College	4	23	14
		InterCoast Colleges-Santa Ana	35	12	24
		InterCoast Colleges-West Covina	86	54	70
		Southern California Institute of Technology	190	281	236
		United Education Institute-Huntington Park Campus	0	0	0
		United Education Institute-West Covina	6	144	75
		Supply Subtotal/Average	**382**	**588**	**485**
		Supply Total/Average	**383**	**596**	**490**

Regional Demographics

This section examines demographic data for Orange County community college students in civil and construction management technology programs compared to the OC population, along with occupational data, to identify potential diversity and equity issues addressable by community college programs.
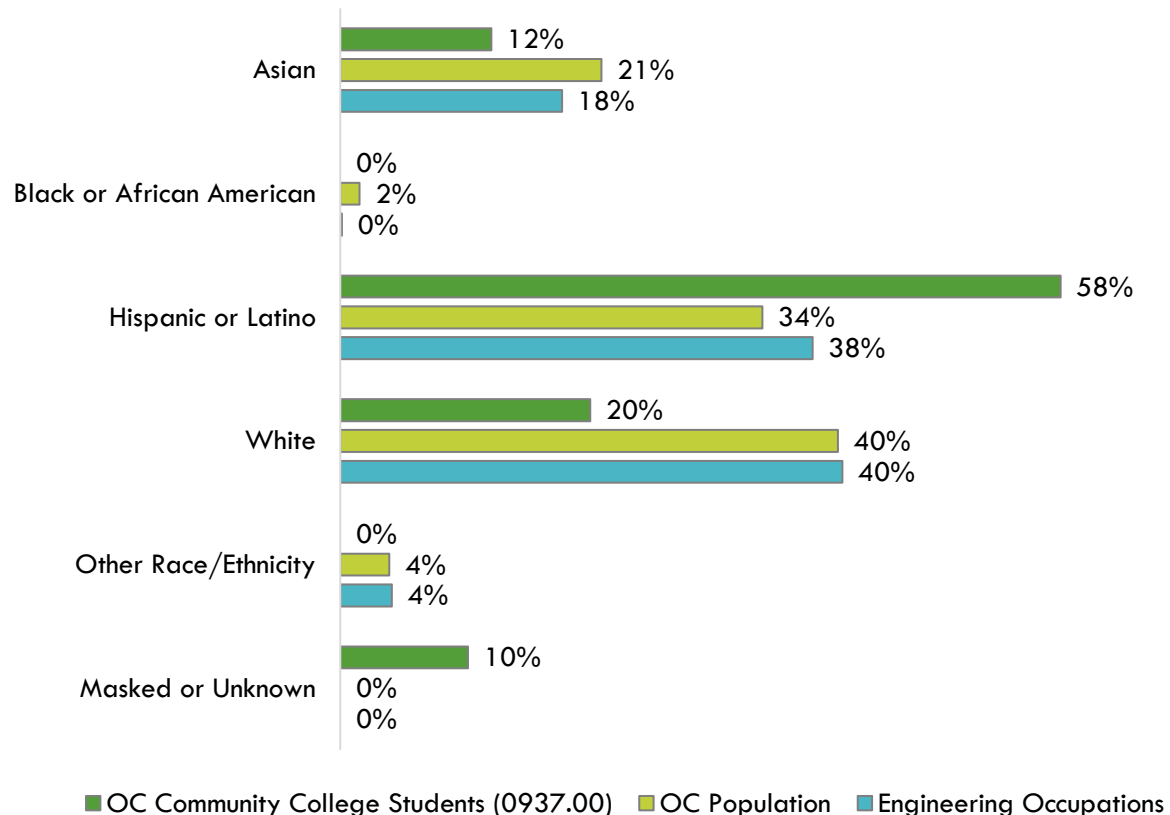
Ethnicity:

Exhibit 14 compares the ethnicity of Orange County community college students enrolled in civil and construction management technology programs, the overall Orange County population, and occupation-specific data for the two engineering occupations included in this report.

The plurality of workers (40%) in these engineering occupations are white, which aligns their share in the county population (40%) but is double the percentage of community college civil and construction management technology students (20%). Conversely, most community college civil and construction management technology students are Hispanic or Latino (58%), accounting for a higher percentage relative to their shares in the county population (34%) and of workers in the field (38%). In addition, though Asian individuals account for 21% of the county population, only 18% of workers and 12% of community college civil and construction management technology students are Asian.

Examining disaggregated data for each occupation (not shown), Asian individuals (36%) account for the plurality of *civil engineering technologists and technicians*, followed closely by Hispanic or Latino workers (33%). This occupation has the lowest entry-level wage ($29.44) but highest educational requirement (associate degree) of the two occupations. Furthermore, a majority (52%) of *first-line supervisors of construction trades and extraction workers* are white, followed by Hispanic or Latino workers (41%). This occupation has the highest entry-level wage ($32.54) but lowest educational requirement (high school diploma or equivalent) of the two occupations.

Exhibit 14: Program and County Demographics by Ethnicity

Legend: ■ OC Community College Students (0937.00) ■ OC Population ■ Engineering Occupations

Asian — 12% / 21% / 18%
Black or African American — 0% / 2% / 0%
Hispanic or Latino — 58% / 34% / 38%
White — 20% / 40% / 40%
Other Race/Ethnicity — 0% / 4% / 4%
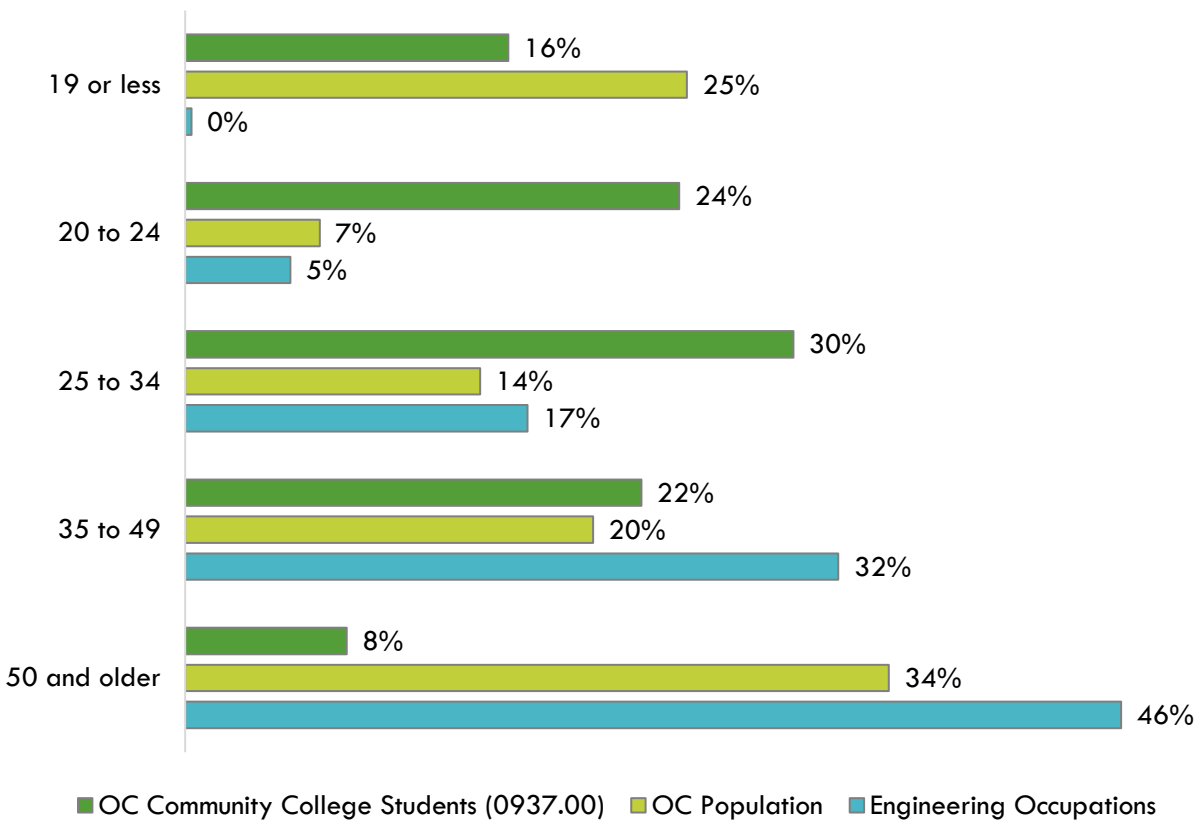Masked or Unknown — 10% / 0% / 0%

Age:

Exhibit 15 compares the age of Orange County community college students enrolled in civil and construction management technology programs, the overall Orange County population, and occupation-specific data for the two engineering occupations included in this report.

A large majority of workers in these engineering occupations are age 35 and older (78%), which is higher than the population (54%) and more than double community college civil and construction management technology students (30%). Most community college civil and construction management technology students are 20 to 34 (54%), which is significantly higher than the 22% of workers in the field and 21% of the county population.

Examining disaggregated data for each occupation (not shown), individuals 35 and older account for the majority of workers across both occupations respectively: *civil engineering technologists and technicians* (74%) and *first-line supervisors of construction trades and extraction workers* (80%).

Exhibit 15: Program and County Demographics by Age

19 or less
- OC Community College Students (0937.00): 16%
- OC Population: 25%
- Engineering Occupations: 0%

20 to 24
- OC Community College Students (0937.00): 24%
- OC Population: 7%
- Engineering Occupations: 5%

25 to 34
- OC Community College Students (0937.00): 30%
- OC Population: 14%
- Engineering Occupations: 17%

35 to 49
- OC Community College Students (0937.00): 22%
- OC Population: 20%
- Engineering Occupations: 32%

50 and older
- OC Community College Students (0937.00): 8%
- OC Population: 34%
- Engineering Occupations: 46%

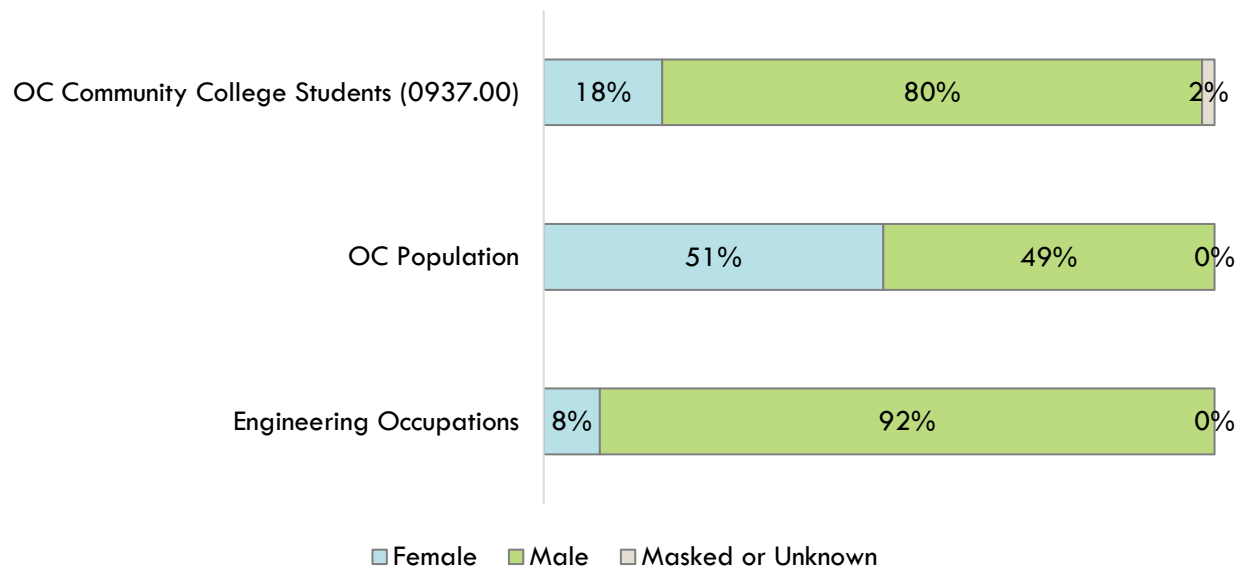■ OC Community College Students (0937.00)   ■ OC Population   ■ Engineering Occupations

Sex:

Exhibit 16 compares the sex of Orange County community college students enrolled in civil and construction management technology programs, the overall Orange County population, and occupation-specific data for these engineering occupations.

Though the population is split nearly evenly between women and men, only 18% of community college civil and construction management technology students and 8% of workers in the field are women.

Examining disaggregated data for each occupation (not shown), there are significantly larger percentages of men than women across both occupations. Notably, 98% of *first-line supervisors of construction trades and extraction workers* are men. The occupation with the largest percentage of women is *civil engineering technologists and technicians* (18%). This occupation has the lowest entry level wage ($29.44) but highest educational requirement (associate degree) of the two occupations.

Exhibit 16: Program and County Demographics by Sex

	Female	Male	Masked or Unknown
OC Community College Students (0937.00)	18%	80%	2%
OC Population	51%	49%	0%
Engineering Occupations	8%	92%	0%

Legend: ☐ Female ☐ Male ☐ Masked or Unknown

Appendix A: Methodology

The OC COE prepared this report by analyzing data from occupations and education programs. Occupational data is derived from Lightcast, a labor market analytics firm that consolidates data from the California Employment Development Department (EDD), U.S. Bureau of Labor Statistics (BLS) and other government agencies. Program supply data is drawn from two systems: Taxonomy of Programs (TOP) and Classification of Instructional Programs (CIP).

Using a TOP-SOC crosswalk, the OC COE identified middle-skill jobs for which programs within these TOP codes train. Middle-skill jobs include:

- All occupations that require an educational requirement of some college, associate degree or apprenticeship;
- All occupations that require a bachelor's degree, but also have more than one-third of their existing labor force with an educational attainment of some college or associate degree; or
- All occupations that require a high school diploma or equivalent or no formal education, but also require short- to long-term on-the-job training where multiple community colleges have existing programs.

The OC COE determined labor market supply for an occupation or SOC code by analyzing the number of program completers or awards in a related TOP or CIP code. The COE developed a "supply table" with this information, which is the source of the program supply data for this report. TOP code data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP code data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data), also known as IPEDS. TOP is a system of numerical codes used at the state level to collect and report information on California community college programs and courses throughout the state that have similar outcomes. CIP codes are a taxonomy of academic disciplines at institutions of higher education in the United States and Canada. Institutions outside of the California Community College system do not use TOP codes in their reporting systems.

Data included in this analysis represent the labor market demand for relevant positions most closely related to the proposed program as expressed by the requesting college in consultation with the OC COE. Traditional labor market information was used to show current and projected employment based on data trends, as well as annual average awards granted by regional community colleges. Real-time labor market information captures job post advertisements for occupations relevant to the field of study which can signal demand and show what employers are looking for in potential employees, but is not a perfect measure of the quantity of open positions.

All representations have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. The most recent data available at the time of the analysis was examined; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.

Appendix B: Data Sources

Data Type	Source
Occupational Projections, Wages, and Job Postings	Traditional labor market information data is sourced from Lightcast, a labor market analytics firm. Lightcast occupational employment data are based on final Lightcast industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics and the American Community Survey. For more information, see https://lightcast.io/
Living Wage	The living wage is derived from the Insight Center's California Family Needs Calculator, which measures the income necessary for an individual of family to afford basic expenses. The data assesses the cost of housing, food, child care, health care, transportation, and taxes. For more information, see: https://insightcced.org/family-needs-calculator/ The living wage for one adult in Orange County is $20.63 per hour ($42,910.40 annually). This figure is used by the CCCCO to calculate the percentage of students that attained the regional living wage.
Typical Education and Training Requirements, and Educational Attainment	The Bureau of Labor Statistics (BLS) provides information about education and training requirements for hundreds of occupations. BLS uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which BLS publishes projections data. For more information, see https://www.bls.gov/emp/documentation/education/tech.htm
Emerging Occupation Descriptions, Additional Education Requirements, and Employer Preferences	The O*NET database includes information on skills, abilities, knowledges, work activities, and interests associated with occupations. For more information, see https://www.onetonline.org/help/online/
Educational Supply	The CCCCO Data Mart provides information about students, courses, student services, outcomes and faculty and staff. For more information, see: https://datamart.cccco.edu The National Center for Education Statistics (NCES) Integrated Postsecondary Integrated Data System (IPEDS) collects data on the number of postsecondary awards earned (completions). For more information, see https://nces.ed.gov/ipeds/use-the-data/survey-components/7/completions
Student Metrics and Demographics	LaunchBoard, a statewide data system supported by the California Community Colleges Chancellor's Office and hosted by Cal-PASS Plus, provides data on progress, success, employment, and earnings outcomes for California community college students. For more information, see: https://www.calpassplus.org/LaunchBoard/Home.aspx

Data Type	Source
Population and Occupation Demographics	The Census Bureau's American Community Survey (ACS) is the premier source for detailed population and housing information. For more information, see: https://www.census.gov/programs-surveys/acs Data is sourced from IPUMS USA, a database providing access to ACS and other Census Bureau data products. For more information, see: https://usa.ipums.org/usa/about.shtml

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