



HIGH GROWTH MIDDLE-SKILL OCCUPATIONS

LOOKING OUTSIDE CCW
TARGET INDUSTRIES IN
THE LOS ANGELES BASIN

2019



CENTER FOR A COMPETITIVE WORKFORCE

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About CCW

Center for a Competitive Workforce

Center for a Competitive Workforce (CCW) is a Strong Workforce regional project of the 19 Los Angeles area community colleges in partnership with the Los Angeles County Economic Development Corporation (LAEDC). CCW facilitates the alignment of industry-driven career education, training, workforce development programs to prepare talent for high-growth sectors through strategic industry engagement; supports faculty and curriculum development; and increased completions, work-based learning and employment opportunities for students in in-demand occupations with career pathways.

The primary goals are: 1) build, sustain and leverage partnerships on shared regional labor intelligence, talent development and student/worker placement strategies, initiatives and projects; 2) increase L.A. region community college coordination and cross system engagement with industry and leading firms, especially those that are from industries that are competitive, growing and ripe with middle skill job opportunities over the next three to 10 years; and 3) produce sector labor market analyses to better achieve regional alignment of workforce development and education initiatives, programs and resources.

Learn more: www.CompetitiveWorkforce.LA



EXECUTIVE SUMMARY

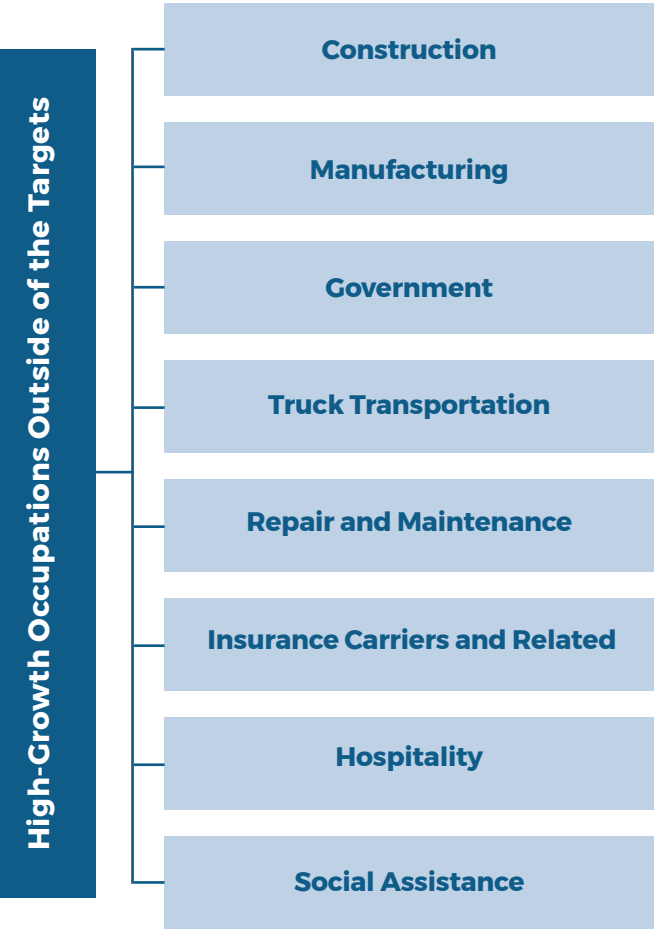
What we have covered thus far.

Center for a Competitive Workforce (CCW or the “Center”) is working on behalf of colleges, industry, government and students in the LA County region, by looking ahead at the future of work and providing data and analysis to help inform good decisions, whether you’re a job seeker studying possible career paths, or a faculty member planning next year’s coursework, or a government making public finance-oriented budgetary decisions related to education and workforce development funding based on labor market changes in our fast moving economy. CCW continues to evaluate the demand for hiring in middle-skill occupations and compare that to the related supply of talent from our region’s community colleges with the goal to offer decision-makers with actionable intelligence.

In CCW’s baseline report “L.A. & Orange County Community Colleges: Powering Economic Opportunity”, the Los Angeles County Economic Development Corporation’s (LAEDC) Institute for Applied Economics identified six target industries in the Los Angeles Basin (Los Angeles and Orange counties) expected to undergo significant middle-skill job growth between 2016 and 2021. From those six industries, three select target industries were chosen for a series of deep-dive industry reports: **1) entertainment and digital media; 2) health care services; and 3) professional services.** In each report, a set of 15 middle-skill occupations with the most job creation potential (highest net new and replacement openings), were selected as targets with the most potential for alignment with relevant post-secondary programs offered by community colleges.

EXHIBIT ES-1

Industries where other target occupations are found



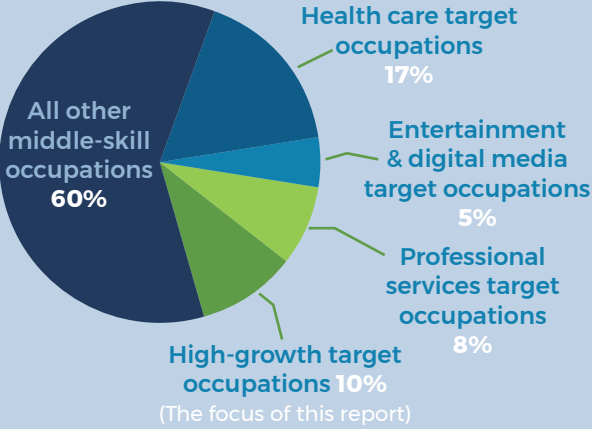
This report is the fifth in the series of reports by the Center and the LAEDC and focuses on high-growth, middle-skill occupations in the Los Angeles Basin that exist *outside* of the Center’s aforementioned deep-dive target industries¹. Target occupations identified in this report are related to a variety of different industries (ES-1), including construction trades, manufacturing and transportation industries, local government, repair industries and hospitality. The 15 middle-skill occupations in this report all have high-growth potential over the next five years, pay well above a living wage, and are accessible to job-seekers who have attained some post-secondary education but less than a bachelor’s degree. In essence, these chosen occupations all represent viable career paths for community college students in the region who are interested in these career fields.

As mentioned, this report is designed to be useful to deans and faculty who seek market data about demand for students both matriculating into and graduating from college programs, and that includes an assessment about the balance of supply and demand to identify opportunities for adjusting the scale of college programs. The report also presents a thorough description of the job responsibilities and work environment, identifies important skills requirements and core competencies, specific brands of software and technology that are widely used by employers, identifies top employers in the region, and related information that will help LA Basin community colleges and other allied talent development systems, e.g., workforce boards, align curricula and placement with the needs of employers, which in turn serves the overall labor market and economic development interests of the macro region.

Additionally, much of this same information can be used by job seekers, providing them with a good picture of what to expect in these occupational categories, what training will be needed, what competencies will be valued, and lists top employers to help identify specific job opportunities.

EXHIBIT ES-2

Total middle-skill openings in the region - 2016-2021



As is the general trend in our information age economy, most occupations in this report require greater use of technology than a few years ago, including varying levels of computer literacy and competency, from communicating via email to using industry-specific software applications to successfully perform the basic duties of the job. In addition, most of the occupations listed in this report require a high degree of personal interaction between the worker and his/her customer/client or the general public, which 1) requires as much “soft-skill” proficiency as technical know-how, and 2) implies that most of these occupations have only modest threat from automation, meaning that the jobs are less likely to disappear as more automation and other capital-labor substituting technologies, such as artificial intelligence, are adopted and accepted across the economy.²

This report is not structured to be read cover-to-cover. Rather, it is designed to help examine specific occupations profiled, and as such, readers are likely to focus on those occupations most relevant to their interest, decision-making or academic focus. The report’s primary goal is to provide enough detail on each occupation to significantly inform college program development.

¹ This will be the last report in this series using 2016 to 2021 data, future reports will include an updated industry forecast and updated occupational projections.

² The threat of disemployment (where the job goes away) posed by automation is ranked for each occupation to provide guidance to both colleges and job seekers.

Using on this and other CCW-sponsored reports, CCW and LAEDC are implementing work plans to connect industry with the colleges, to link other talent development systems, e.g., workforce boards, adult schools, four-year colleges/universities, with one another, and to develop internship, work-based learning and employment opportunities. We are facilitating tighter relationships between major employers and faculty, not only to help students get a “foot in the door,” but also to help edify faculty regarding the incredible rapidity and dynamism of the changing work environment and skills requirements. This work is also being publicized, shared and discussed with regional thought leaders and elected officials to create greater engagement and awareness of progress, all of which aligns with and advances Strong Workforce / Doing What Matters goals across the State of California. Learn more about the entirety of CCW programs at www.CompetitiveWorkforce.LA.

CCW, LAEDC and all the collaborators who contribute to this work thank you for your engagement, and we welcome your input and meaningful engagement as CCW’s work continues to intensify and scale. We extend special thanks the California Community College Chancellor’s office for its leadership, and the California legislature for prioritizing ongoing improvement of post-secondary education, which is becoming increasingly important to powering economic opportunity for California’s residents. Today, more than ever, post-secondary education is not only a prerequisite for a greater number of occupations, it is also the primary means through which to boost career prospects, lifetime earnings and standards of living. In addition, a high skilled talent base supports a more productive economy where firms flourish and per capita incomes rise. Through its work, CCW, along with all its partners and collaborators, is helping the LA Basin’s residents, colleges, industries and governments prepare for the future.

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Target Industries

What we have covered thus far.

Economic development efforts are organized around several priorities, including encouraging job growth in industries that are export-oriented, competitive, regionally concentrated, and that will generate high paying jobs that, through their spillover effects, will drive economic growth, further job creation, and increased wages for a greater number of residents.

To this end, CCW commissioned the LAEDC’s Institute for Applied Economics to do a baseline report: “L.A. & Orange County Community Colleges: Powering Economic Opportunity”, which identified six industries in the Los Angeles Basin that would be prime targets for new or continued investments made to programs specializing in the training and/or education for individuals to fill the projected demand for middle-skill jobs over the next five years. These training and education programs, to be provided by community colleges, include postsecondary nondegree awards, career education and associate degree programs.

Using the identified target industries, the LAEDC completed a series of deep-dive industry reports for three select target industries expected to have the strongest growth potential between 2016 and 2021 for middle-skill jobs, which are defined as requiring more than a high school diploma but less than a bachelor’s degree to gain employment. The three (3) deep-dive reports included:

1. “Entertainment and the Rise of Digital Media: An Industry Disrupted”
2. “Health Care Services in the L.A. Basin: A High-Growth Industry”
3. “Professional Services in the L.A. Basin: A Knowledge-Based Industry.”

These deep-dive industry reports are intended to establish a baseline from which the Center and the region’s community colleges can further build their knowledge and, working in partnership with industry, amplify their understanding about the region’s labor markets and the middle-skill workforce gaps, as gauged by the difference between industry needs and community college program completions over a given period. All reports are available online at www.CompetitiveWorkforce.LA

TARGET OCCUPATIONS FROM THE “DEEP-DIVES”

For each of the three target industries for which a deep-dive report was produced, a set of 15 middle-skill occupations with the most job creation (and thus demand) potential (highest net new and replacement openings), were selected as targets with the most potential to be active and successful post-secondary programs at LA Basin community colleges.

The occupations across these industry deep-dive reports included a selection of: high-tech occupations, from health information technicians, to network and computer systems administrators; occupations that provide healthcare support services, including registered nurses (RNs), lab tech and respiratory therapists; creative occupations across the digital media and entertainment industry such as graphic designers, multimedia artists and animators, photographers and makeup artists; and occupations that support businesses in the professional services industries, including environmental science and protection technicians, civil drafters, engineering technicians and veterinary technicians.

For each of the target occupations identified in the three completed industry deep-dives, an occupational profile was provided presenting wage and employment data, projected openings, and the demographic characteristics of workers. The middle-skill target occupations covered in the previous industry deep-dive reports are as follows:

Entertainment and the Rise of Digital Media: An Industry Disrupted

- Producers and Directors (SOC 27-2012)
- Audio and Video Techs (SOC 27-4011)
- Film and Video Editors (SOC 27-4032)
- Production, Planning and Expediting Clerks (SOC 43-5061)
- Fashion Designers (SOC 27-1022)
- Camera Operators, TV, Video and Motion Picture (SOC 27-4031)
- Advertising Sales Agents (SOC 41-3011)
- Makeup Artists, Theatrical and Performance (SOC 39-5091)
- Multimedia Artists and Animators (SOC 27-1014)
- Photographers (SOC 27-4021)
- Hairdressers, Hairstylists and Cosmetologists (SOC 39-5012)
- Sound Engineering Techs (SOC 27-4014)
- Public Address System and Other Announcers (SOC 27-3012)
- Radio and Television Announcers (SOC 27-3011)

Health Care Services in the L.A. Basin: A High-Growth Industry

- Registered Nurses (SOC 29-1141)
- Licensed Vocational Nurses (SOC 29-2061)
- Pharmacy Technicians (SOC 29-2052)
- Medical Records and Health Information Technicians (SOC 29-2071)
- Radiologic Technologists (SOC 29-2034)
- Medical and Clinical Laboratory Technicians (SOC 29-2012)
- Emergency Medical Technicians and Paramedics (SOC 29-2041)
- Dental Hygienists (SOC 29-2021)
- Respiratory Therapists (SOC 29-1126)
- Phlebotomists (SOC 31-9097)
- Magnetic Resonance Imaging Technologists (SOC 29-2035)

- Cardiovascular Technologists and Technicians (SOC 29-2031)
- Surgical Technologists (SOC29-2055)
- Medical and Clinical Laboratory Technologists (SOC29-2011)
- Physical Therapist Assistants (SOC31-2021)

Professional Services in the L.A. Basin: A Knowledge-Based Industry

- Graphic Designers (SOC 27-1024)
- Paralegals and Legal Assistants (SOC 23-2011)
- Secretaries and Administrative Assistants, Except Legal, Medical, and Executive (SOC 43-6014)
- Web Developers (SOC 15-1134)
- Network and Computer Systems Administrators (SOC 15-1142)
- Tax Preparers (SOC 13-2082)
- Bill and Account Collectors (SOC 43-3011)
- Veterinary Technologists and Technicians (SOC 29-2056)
- Computer User Support Specialists (SOC 15-1151)
- Architectural and Civil Drafters (SOC 17-3011)
- Interpreters and Translators (SOC 27-3091)
- Payroll and Timekeeping Clerks (SOC 43-3051)
- Construction and Building Inspectors (SOC 47-4011)
- Environmental Science and Protection Technicians, Including Health (SOC 19-4091)
- Civil Engineering Technicians (SOC 17-3022)

BEYOND THE TARGET INDUSTRIES

Demand for labor is generated by local and regional businesses and organizations across all industries. This is a function of the overall economic health of the regional economy and its expected growth, as well as locational and hiring decisions made by growing businesses.

Businesses in the Los Angeles Basin employ a wide range of workers by occupation, skill level, educational attainment and experience. Projected demand for labor (total openings, including net new jobs and replacement jobs) from 2016 to 2021 by industry sector is broken out according to the job’s entry-level education requirements (Exhibit 1).

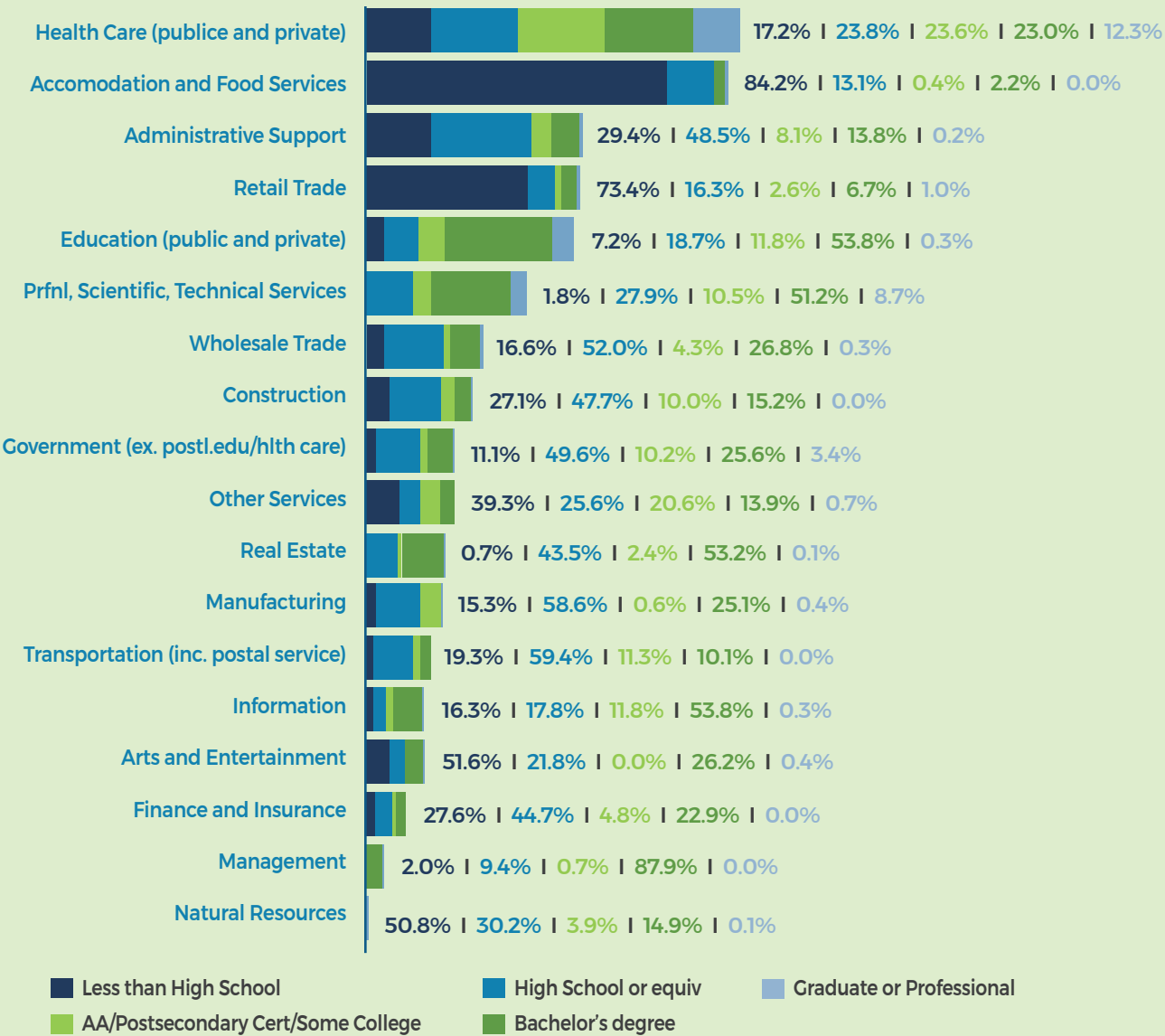
³ While the structure of this report differs, in that it is not specific to any one industry, the occupational profiles for each of the 15 identified middle-skill target occupations are included in the last section of this report in the same format for consistency.

Identifying Demand

Other industries with high-growth middle-skill occupations.

EXHIBIT 1

Projected Job Demand by Industry 2016 to 2021f
Distribution of total projected openings by entry-level education requirements



Occupations requiring an education of an Associate degree, postsecondary certification or nondegree award, or some college figure prominently in every industry and are growing at a faster rate compared to occupations requiring high school for entry-level.

EXHIBIT 3

Industries where other target occupations are found

This report is the latest in the series of reports by the Center and the LAEDC that focuses on high-growth middle-skill occupations in the Los Angeles Basin that exist outside of the Center's deep-dive target industries.

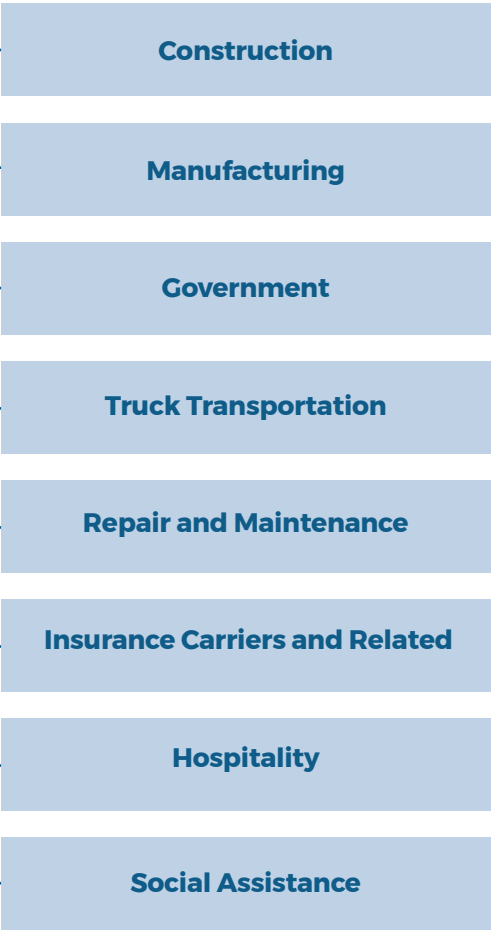
Industry Employment

The industries covered in our deep-dive reports: entertainment and digital media; health care services; and professional business services, account for just over 20 percent of total payroll employment across all skill levels in the Los Angeles Basin in 2016 (**Exhibit 2**). So, what about the other 80 percent of workers in non-target industries? What opportunities exist for those who have earned an Associate degree, certificate or nondegree award from a community college?

Target occupations identified in this report represent different industries (**Exhibit 3**), including occupations found in construction trades, manufacturing and transportation industries. In addition, local government, repair industries and hospitality are also identified as having middle-skill occupations with high-growth potential over the next five years. Taken together, the eight identified industries employ 1.9 million private payroll workers (2016) in the Los Angeles Basin (**Exhibit 4**), accounting for 32 regional employment of 5.9 million.

Although the size of each of these industries varies, as do their staffing patterns and growth projections, each has a significant share of its employment in

High-Growth Occupations Outside of the Targets



⁴ See supra note 1

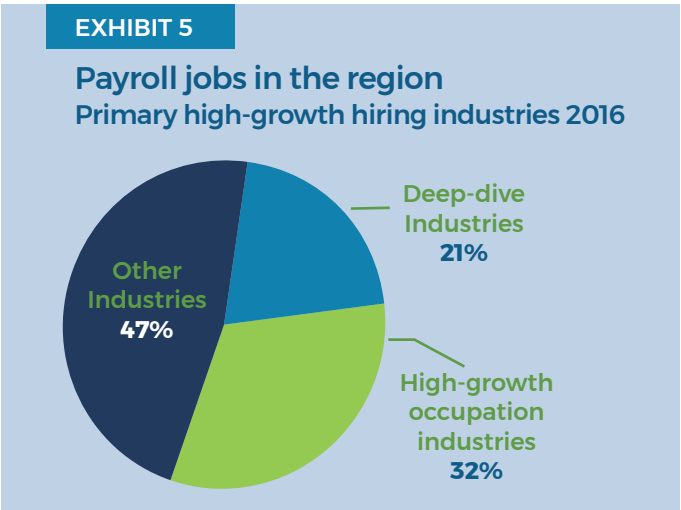
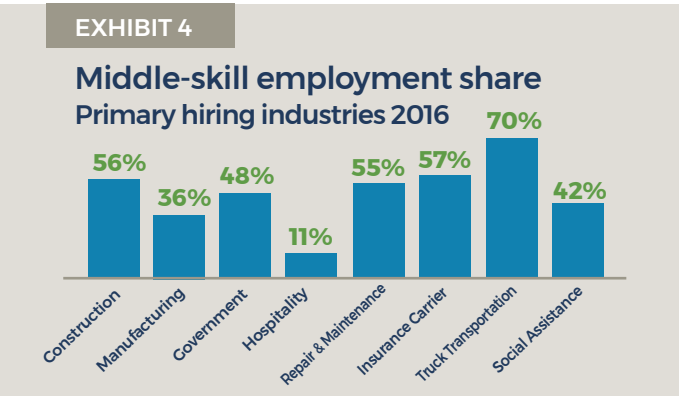
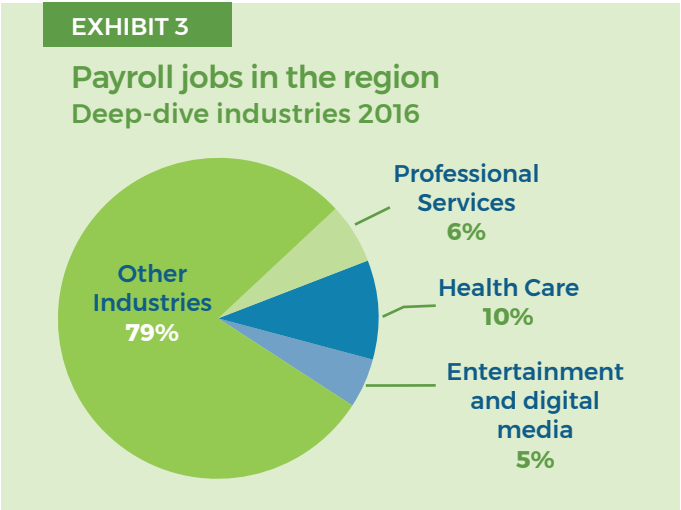
middle-skill occupations (Exhibit 5). An estimated 70 percent of workers in the truck transportation industry are middle-skill. More than half the jobs in the repair and maintenance, insurance carriers and construction industries are in middle-skill occupations. Government, manufacturing and social assistance have a middle-skill employment share of 48 percent, 42 percent and 36 percent, respectively. Approximately 11 percent of the jobs in the hospitality industry are middle-skill, with a more significant share of workers in the hotel and food services industry in below middle-skill occupations, which are defined as those requiring a high school diploma (or equivalent) or less.

TARGET OCCUPATIONS FROM THE “DEEP-DIVES”

The growth of industries in the region will correspondingly precipitate the growth of occupations. The overall net growth of an occupation is a consequence of its contribution to industries that are growing and to industries that are declining. Additionally, workers within industries leave current positions, either through retirement or through promotion, or for other reasons, leaving positions open and in need of replacement. When combined, net new jobs and replacement jobs constitute the total number of job openings.

Replacement rates depend on several factors. The age profile of the existing workforce can portend high replacement rates, such as occurs in many manufacturing industries as highly-skilled craftsmen reach retirement age and younger workers have not been trained and/or received apprenticeships

Middle-skill jobs are expected to account for close to 40 percent of projected job openings over the next five years.



to replace them. Occupations that enable current workers to gain valuable skills through on-the-job training will encourage them to move into higher-skilled occupations and consequently create jobs

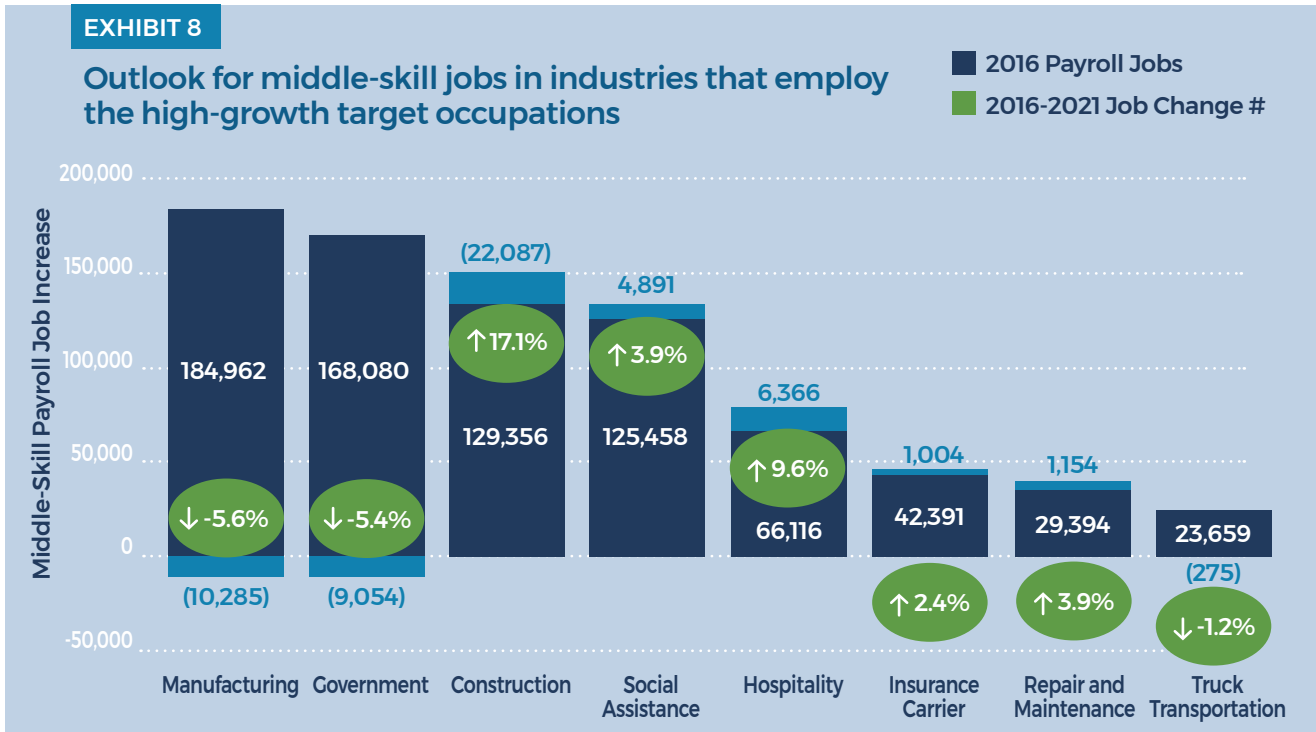
openings for those with less experience. Industries that are undergoing technological change may find that new processes require fewer workers, leaving fewer openings available as workers retire or leave for other positions. Estimated replacements are an important component of occupational job openings and workforce development needs, since the retirement and promotion of individuals create openings for newer entrants and those moving up the “career ladder” to assume.

Total employment in the LA Basin is forecast to grow by 4.2 percent between 2016 and 2021, adding 287,500 net new jobs with an additional 790,000 replacement job openings available due to employment churn. Together, total projected openings (net new and replacement) are expected to reach over one million in the LA Basin over the period, 37 percent of which are in middle-skill occupations (Exhibit 6). We used the occupational composition of the expected jobs across all industries to identify the most promising 15 detailed occupations, classified as middle-skill, not covered in our three previous target industry deep-dive reports. These occupations are expected to account for 10 percent of projected

total openings for middle-skill occupations in the LA Basin between 2016 and 2021f (Exhibit 7). By comparison, the previously identified target middle-skill occupations covered in our three industry deep-dive reports account for 31 percent of projected total openings for middle-skill jobs in the region. Combined, the 59 identified target middle-skill occupations highlighted thus far are forecast to account for approximately 40 percent of all projected openings for middle-skill jobs in the Los Angeles Basin between 2016 and 2021.

INDUSTRY FORECAST

Analysis of industry trends provides insights into the challenges and opportunities facing an industry’s workers and employers. Understanding where the jobs are now and in the future is critical to tailor training and career education programs, as well as regional public finance and other policies to prepare for these changes and fill the jobs of the future with a workforce that is competitive in a fast-changing global economy.

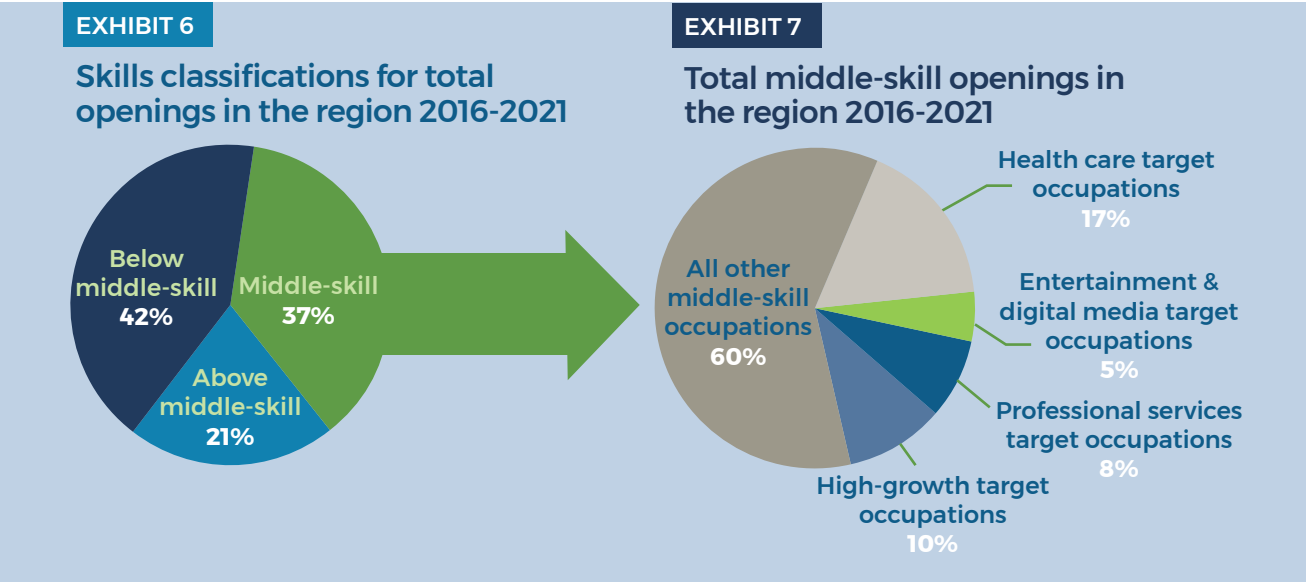


An industry’s current size, together with its projected growth rate, determines the cumulative potential for job creation in the industry. A small industry growing quickly will add jobs, but the absolute number of jobs added will be smaller than a large industry growing slowly. Exhibit 8 shows the current size and expected growth for the main industries that hire middle-skill workers in the target occupations identified in this report.

Between 2016 and 2021, most of the main industries that hire for the high-growth target occupations identified hereunder will experience positive net new job growth for middle-skill occupations in the LA Basin. Construction leads the way with over 22,000 middle-skill jobs forecast to be added over the five-year period. Hospitality, which includes accommodation and food services, and social assistance follow behind with expected job gains of just under 6,400 middle-skill jobs and 4,900 middle-skill jobs, respectively. Insurance carriers and related services and repair and maintenance services are anticipated to add approximately 1,000 middle-skill jobs each over the period. Manufacturing as whole is expected to continue its long-term decline, even though certain industries within the sector, such as biomedical manufacturing, which is quite

Construction is expected to add over 22,000 middle-skill jobs over the next five years.

small in terms of the current number of payroll jobs in the industry, are growing in the region. The expected retirement of aging skilled craftsman in some specialized manufacturing industries presents opportunities for apprenticeships, new entrants, and those moving up the “career ladder.” Middle-skill jobs in government will decline over the next five-years by just over 9,000 jobs and truck transportation is forecast to falter slightly in its middle-skill employment, shedding approximately 275 jobs between 2016 and 2021. Even though there may be negative net changes in the overall number of middle-skill jobs in these industries -- due to employment churn (changing jobs), retirements and other separations in the industry, there will be additional employment opportunities available to middle-skill job applicants in the form of replacement jobs.



High-Growth Middle-Skill Occupations

The best of the rest.

To better understand where the high-growth middle-skill occupations in this report are headed, employment and growth in each occupation is quantified and forecasted over the next five years and the top hiring industries are identified. This forecast is used to extrapolate future workforce needs; that is, the demand for workers.

The Standard Occupational Classification (SOC) system is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating,

or disseminating data. All workers are classified into one of 867 detailed occupations according to their occupational definition. Detailed occupations in the SOC with similar job duties, and in some cases skills, education, and/or training, are grouped together.

Data from 2016 is used to determine wages and worker characteristics for the charts included with the profiles. Data from this year maintains consistency with the data set created and used by the LAEDC to identify target industries in the baseline report and in the three industry deep-dive reports that followed.

EXHIBIT 9

Target middle-skill occupations by total openings, 2016-2021.

SOC	Detailed Occupation	New Jobs	Replacement Jobs	Total Job Openings	Median Hourly Wage
47-2031	Carpenters	3,430	1,450	4,880	\$ 50,200
47-2111	Electricians	2,300	1,380	3,690	58,900
33-3051	Police and Sheriff's Patrol Officers	(1,650)	5,240	3,590	100,390
47-2152	Plumbers, Pipefitters and Steamfitters	2,280	900	3,190	55,270
41-3021	Insurance Sales Agents	1,080	2,050	3,130	57,040
49-3023	Automotive Service Technicians and Mechanics	200	2,840	3,050	41,530
21-1093	Social and Human Service Assistants	(660)	3,070	2,400	40,150
51-4121	Welders, Cutters, Solderers and Brazers	850	1,410	2,250	36,020
31-9011	Massage Therapists	1,910	270	2,180	41,200
35-1011	Chefs and Head Cooks	1,560	540	2,100	45,570
49-9021	Heating, Air Conditioning and Refrigeration Mechanics and Installers	1,380	680	2,060	52,960
53-3032	Heavy Tractor-Trailer Truck Drivers	(1,312)	3,360	2,040	43,310
49-9041	Industrial Machinery Mechanics	550	1,040	1,590	54,750
51-4041	Machinists	(880)	2,420	1,540	38,730
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	480	1,020	1,500	34,050

Sources: Census Bureau, OES; Estimates by LAEDC

Social and Human Service Assistants (SOC 21-1093).

Social and human service assistants are considered a middle-skill occupation. Social and human service assistants assist in providing client services in a wide variety of fields, such as psychology, rehabilitation, or social work, including support for families. These workers may assist clients in identifying and obtaining available benefits and social and community services. Individuals employed in this occupation may also assist social workers with developing, organizing, and conducting programs to prevent and resolve problems relevant to substance abuse, human relationships, rehabilitation, or dependent care.

IN THE WORKPLACE

Many social and human service assistants work for nonprofit organizations, for-profit social service agencies, and state and local governments. They generally work full time, and some work nights and weekends. They are constantly in contact with others, whether it be face-to-face discussions, telephone conversations or email messages, and as such, soft-skills including interpersonal skills, effective communication skills and time management skills are highly valued.

Knowledge of psychology, therapy, counseling, sociology and anthropology are required for this occupation. Such knowledge provides individuals in this occupation with the requisite understanding of: human behavior and performance, individual differences, psychological research methods, and the assessment and treatment of behavioral and affective disorders. This occupation also requires knowledge of principles, methods, and procedures for diagnosis, treatment, and rehabilitation; and knowledge of group behavior and dynamics, societal trends and influences, human migrations, ethnicity, cultures and their history and origins. Combined together, this base of knowledge allows social and human service assistants to navigate their job duties successfully.

No previous work experience is necessary to obtain employment and workers only require short-term on-the-job training, of one month or less, to achieve basic competency in the occupation. Job responsibilities for social and human services assistants typically involve: interviewing clients to gather information about their background, needs or progress; writing reports or evaluations; maintaining social services program records; sharing information

Job Titles Found in this Occupation:

- Advocate,
- Caseworker,
- Community Coordinator,
- Family Support Worker,
- Home based Assistant,
- Human Services Program Specialist,
- Mental Health Technician,
- Outreach Specialist,
- Social Services Assistant,
- Social Work Associate

on social services programs with the public; providing referrals to clients to community or social service programs; teaching life skills and strategies to clients and/or their families; and collaborating with other professionals to assess client needs and create treatment plans. These work duties occur in a clinical environment or in the home of the individual or family, but can also include transportation of clients to appointments.

This occupation is considered slightly automated with an automation score of 31 out of 100. Currently automation in this occupation is considered complimentary versus a direct threat to employment. New technologies are augmenting the capabilities and increasing the capacity of social and human service assistants to perform their duties through the use of electronic medical records (EMR) and related software and voice capture software, among other technologies. The high degree of personal interaction with others required to successfully complete the job duties in this occupation, in addition to the job being performed in unpredictable environments,

largely shields this occupation from the threat of disemployment related to automation.

Nearly 29 percent of social and human service assistants in the Los Angeles Basin have a community college-level education, meaning that employment opportunities exist for workers with this level of educational attainment. Only 12 percent of workers in this occupation in the Basin are ages 55 years and over, meaning retirement of experienced workers is not as pressing of a threat as in other occupations.

OCCUPATIONAL DEMAND

Social and human service assistants number 31,320 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016 social and human service assistant jobs grew by 3,230 jobs (11.5 percent) (Exhibit 10)).

The employment outlook for this occupation is promising, as the demand for individuals in this role is expected to increase as the population ages and services are expanded for vulnerable populations such as the formerly incarcerated, homeless and those with mental health and substance abuse issues.

This occupation has a relatively high level of employment churn with an annual replacement rate of 9.8 percent. Employment of social and human service assistants is projected to number 30,600 jobs by 2021 with **2,400 total openings in the Los Angeles Basin between 2016 and 2021** due to replacement jobs (Exhibit 11).

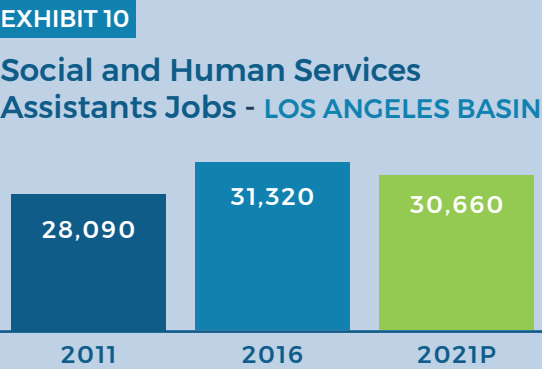
The top-five industries employing the largest number of social and human service assistants are listed in Exhibit 12. They include health care and social assistance, government and religious, grantmaking, civic, professional, and similar organizations (which includes nonprofits, charities and community organizations). Each industry is expected to add jobs between 2016 and 2021, except for local government which is anticipated to lose close to 5 percent of its payroll employment over the period. Social and human service assistants account for over 11 percent of the middle-skill jobs in social assistance (NAICS 624).

Technology Requirement Often Cited in Employer Job Postings:

- Microsoft Office
 - Access
 - Excel
 - Outlook
- Medical Software
 - MEDITECH software
 - EMR software
 - PointClickCare HER
- Nuance Dragon NaturallySpeaking

The median annual wage for social and human service assistants is \$40,150 in the Los Angeles Basin. Annual wages in this occupation increased in real terms by 7.8 percent between 2011 and 2016. On an hourly basis, wages range from \$11.94 per hour in the tenth percentile to \$33.38 per hour in the nintieith percentile, with a median hourly wage of \$19.30, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 13).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries with an LQ of 1.0 indicating the national average and an LQ of 2.0 meaning that occupation is twice as concentrated as in the rest of the nation. Social and human service assistants have an LQ of 1.1 in the Los Angeles Basin in 2016, meaning that while there are a large number of social and human service assistants in the Los Angeles Basin, the concentration is similar to that found nationally.



Los Angeles County ranks second in the nation for the largest number of social and human services assistants employed, behind the New York metropolitan area, and ranks third as the top paying metropolitan area behind Yuba and El Centro California with an hourly median wage of \$20.00, which is \$6.92 over the MIT living wage of \$13.08.

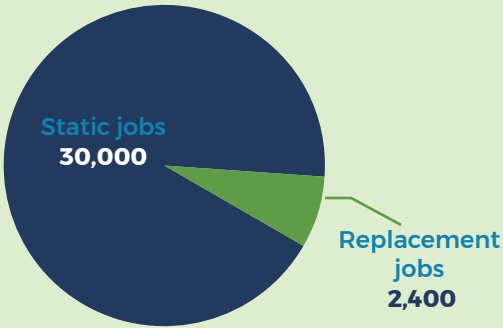
TALENT SUPPLY

Across the Los Angeles Basin, there are 18 college programs providing training for social and human services assistants, they include human services (TOP 210400) and alcohol and controlled substances (TOP 210440). These two programs are offered across 15 community college campuses in the Los Angeles Basin, and in the 2017-2018 academic year, there were 439 program completions. The supply of programs training for social and human service assistants appears to be meeting demand, with 481 annual openings projected for this occupation.

Other community college programs associated with the training of this occupation, but are not available at campuses located in the Los Angeles Basin, include Community Helath Care Worker (TOP 126100), Family and Consumer Sciences, General (TOP 130100) and Family Studies (TOP 130800); however, these programs are offered at colleges in the surrounding counties including Allan Hancock, Antelope Valley, Cuesta, San Diego City and Southwestern colleges.

EXHIBIT 11

Social and Human Services Assistants Jobs - LOS ANGELES BASIN 2021F



Large Employers in the LA Basin

- Integra Service Connect
- Atria Senior Living
- Buena Vida Learning Services, Inc.
- Citrus Valley Health Partners
- Los Angeles LGBT Center

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline

EXHIBIT 12

Top Five Industries Employing Social and Human Service Assistants in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Social Assistance	295,420	42.5%	14,090	11.2%	8.5%
Government	299,640	47.7%	1,150	0.8%	-4.9%
Nursing and Residential Care Facilities	106,690	59.9%	720	1.1%	9.4%
Ambulatory Health Care Services	292,260	59.1%	490	0.3%	13.3%
Religious, Grantmaking, Civic, Profl, Similar Orgs	56,040	39.3%	400	1.8%	3.2%

Source: QCEW, OES, forecast and analysis by LAEDC

EXHIBIT 13

Social and Human Services Assistants Wages - LOS ANGELES BASIN

10th percentile	\$11.94
25th percentile	\$15.02
Median wage (50th pct)	\$19.30
75th percentile	\$26.35
90th percentile	\$33.38
LAC Living Wage (1 adult)	\$13.08
OC Living Wage (1 adult)	\$14.48

metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, social and human service assistants number 28,160 payroll workers in 2016; 3,160 jobs were added since 2011 (12.6 percent). Employment in this occupation is projected to number 27,330 jobs by 2021 with 1,930 total openings between 2016 and 2021 (390 annually). Wages range from \$12.26 per hour in the tenth percentile to \$34.06 per hour in the nintieth percentile, with a median hourly wage of

LOS ANGELES COUNTY HIGHLIGHTS

2016 Employment:

28,160

Occupation LQ:

1.3

Total Openings 2016-2021:

1,930

College Completions (2016/2017):

292

Colleges:

10

Median Wage:

\$19.30

(52.9% above MIT Living Wage)

OCCUPATION HIGHLIGHTS

2016 Employment:

31,320 Jobs

2016-2021 Projected Openings:

2,400

College Completions (2016/2017):

439

College Programs:

18

2016 LQ:

1.1

Median Hourly Wage:

\$19.30

47.6% above MIT Living Wage

Current Degree of Automation:

31/100

Slightly Automated

On-the-Job Training:

Short-term (Less than 1 month)

Characteristics of Workers

29% with a community college level education

12% ages 55 years and over

EXHIBIT 14

Social and Human Service Assistant Programs 2017-18 Awards

Human Services	166
Alcohol and Controlled Substances	273
Total	439

Sources: COE

\$20.00, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 53 percent.

In Los Angeles County, there are college programs providing training across ten campuses. In the 2017-2018 year, there were 292 program completions.

In Orange County specifically, social and human service assistants number 3,170 payroll workers in 2016; 70 jobs were added since 2011 (2.3 percent). Employment in this occupation is projected to number 3,330 jobs by 2021 with 475 total openings between 2016 and 2021 (95 annually). Wages range from \$10.26 per hour in the tenth percentile to \$27.43 per hour in the nintieth percentile, with a median hourly wage of \$16.53, higher than the \$13.08 per hour MIT living wage in Orange County by 14 percent.

In Orange County, there are college programs providing training across five campuses. In the 2017-2018 year, there were 147 program completions.

ORANGE COUNTY HIGHLIGHTS

2016 Employment:

3,170

Occupation LQ:

0.5

Total Openings 2016-2021:

475

College Completions (2016/2017):

147

College Programs:

5

Median Wage:

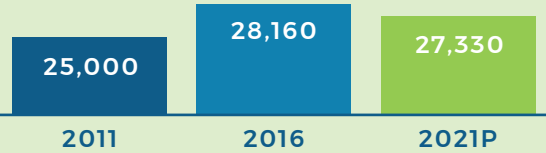
\$16.53

(14.2% above MIT Living Wage)

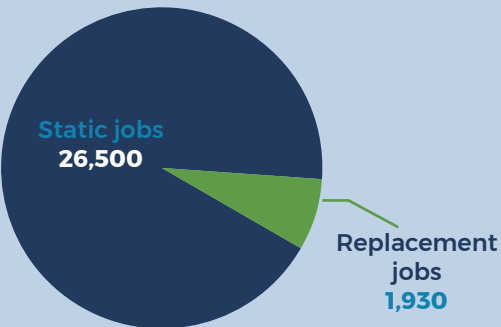
Colleges with Programs

- Cerritos
- Coastline
- Cypress
- East L.A.
- Glendale
- LA City
- LA Pierce
- LA Southwest
- Long Beach
- Mt San Antonio
- Orange Coast
- Rio Hondo
- Saddleback
- Santa Ana
- West LA

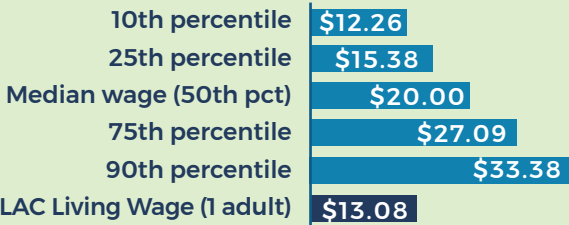
Social and Human Services Assistants Jobs - LOS ANGELES COUNTRY



Social and Human Services Assistants Jobs - LOS ANGELES COUNTY 2021F



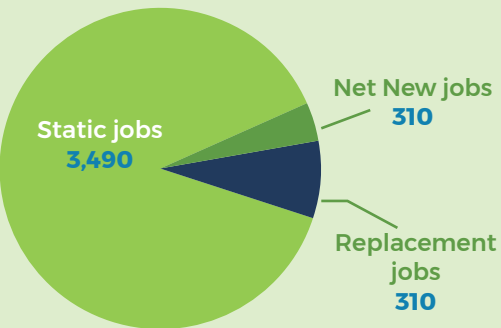
Social and Human Services Assistants Wages - LOS ANGELES COUNTY 2016



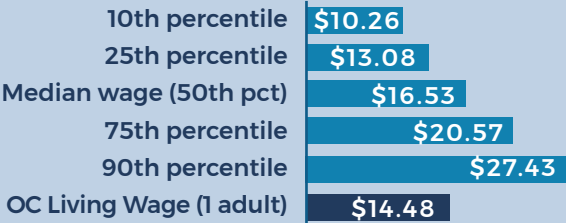
Social and Human Services Assistants Jobs - ORANGE COUNTY



Social and Human Services Assistants Jobs - ORANGE COUNTY 2021F



Social and Human Services Assistants Wages - ORANGE COUNTY 2016



Massage Therapists (SOC 31-9011)

Massage therapists are considered a middle-skill occupation. Massage therapists treat clients by using touch to manipulate the muscles and other soft tissues of the body. With their touch, therapists relieve pain, help heal injuries, improve circulation, relieve stress, increase relaxation, and aid in the general wellness of clients. They may assist in the assessment of range of motion and muscle strength, or propose client therapy plans.

Massage therapists often specialize in multiple types of massage or modalities, such as Swedish massage, deep-tissue massage, sports massage, and prenatal massage, which require different techniques. Education programs are typically found in private or public postsecondary institutions.

IN THE WORKPLACE

Many massage therapists work for spas, hotels, medical offices, fitness centers and franchised clinics. Some are mobile and travel to client's homes or offices to provide services. In 2016, an estimated 40 percent of massage therapists were self employed and about half worked part-time. Massage therapy can be physically demanding, making it difficult to work a traditional full-time 40-hour work week. Appointment-based work also leads to a large variance in the number of hours worked by individuals in this occupation.

Massage therapists work in very close proximity to others, using their hands and other tools to provide services to clients. They interact, face-to-face with others on a constant basis, making soft skills such as interpersonal skills and effective communication highly valuable.

Massage therapists often have a lot of freedom in their day-to-day activities, able to establish their own priorities and goals, determine their tasks, and make decisions without supervision.

Knowledge of customer and personal service, biology, sales and marketing, clerical procedures and systems and physiology are required for this occupation. **Within those broad categories, individuals in this occupation will benefit from a requisite understanding of: how to assess** customer needs, meeting quality standards for services, and evaluating customer satisfaction; human tissues, cells, functions, interdependencies, and interactions with each other and the environment; marketing strategies and tactics, product demonstration,

Job Titles Found in this Occupation:

- **Bodywork Therapist,**
- **Certified Massage Therapist (CMT),**
- **Clinical Massage Therapist,**
- **Integrated Deep Tissue Massage Therapist,**
- **Licensed Massage Practitioner (LMP),**
- **Licensed Massage Therapist,**
- **Massage Therapist,**
- **Medical Massage Therapist,**
- **Registered Massage Therapist,**
- **Therapeutic Massage Technician**

sales techniques, and sales control systems; word processing software, files and records management, stenography and transcription and designing forms; awareness of human behavior and performance; individual differences in ability, personality, and interests; learning and motivation; psychological research methods; and the assessment and treatment of behavioral and affective disorders. Together, this base of knowledge allows massage therapists to navigate their job duties successfully.

No previous work experience is necessary to obtain employment and no additional occupation specific training or preparation is required to achieve competency in the occupation. Job responsibilities for massage therapists typically involve: talking with clients about their symptoms, medical history, and desired results; evaluating clients to locate painful

Technology Requirement Often Cited in Employer Job Postings:

- **AppointmentQuest Online Appointment Manager**
- **Microsoft Office**
 - **Word**
 - **Excel**
- **Medical Software**
 - **ICS Software SammyUSA**
 - **Land Software Customer Pro-File**
 - **Massage Suite**
 - **WinCity Custom Software WinCity Massage SOAP Notes**

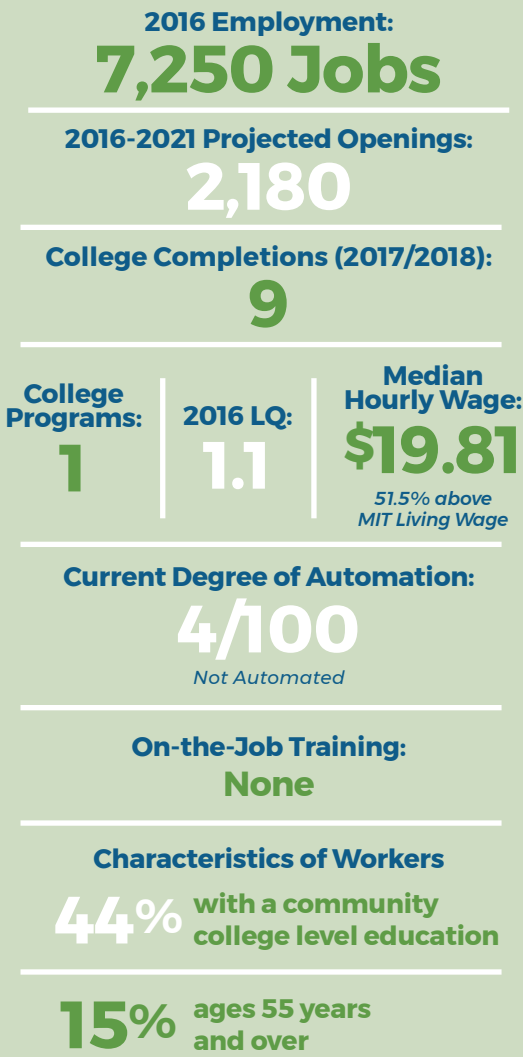
or tense areas of the body; manipulating muscles and other soft tissues of the body; providing clients with guidance on stretching, strengthening, overall relaxation, and how to improve their posture; and documenting clients' conditions and progress.

There is very little automation in this occupation, with an automation score of 4 out of 100. What little automation does currently exist is considered complimentary, because client bookings, reminders, cancellations and payments are done using booking software and apps. The high degree of personal hands-on interaction with others required to successfully complete the job duties in this occupation, in addition to the job being performed in unpredictable environments, shields this occupation from the threat of displacement related to automation.

The California Massage Therapy Council (CAMTC) provides the Certified Massage Therapist (CMT) certification for massage therapists in the state of California. A massage therapist must fulfill three criteria to obtain the CMT credential. They must complete 500 hours of education from approved providers, which includes community colleges, with at least 100 hours in the following areas: anatomy, physiology, health and hygiene, contraindications, and business and ethics. Additionally they are required to successfully pass an examination and pass a criminal background check. Certification is voluntary in California, and is not mandated.

Just over 44 percent of massage therapists in the Los Angeles Basin have a community college-level education, meaning that most employment opportunities exist for workers with this level of educational attainment. About 15 percent of workers in this occupation in the Basin are ages 55 years and over, most workers in this occupation in the Los Angeles Basin fall between the ages of 25 to 39 years and 40 to 54 years, with 36 percent and 39 percent of workers respectively, most likely due to the physicality of this occupation.

OCCUPATION HIGHLIGHTS



OCCUPATIONAL DEMAND

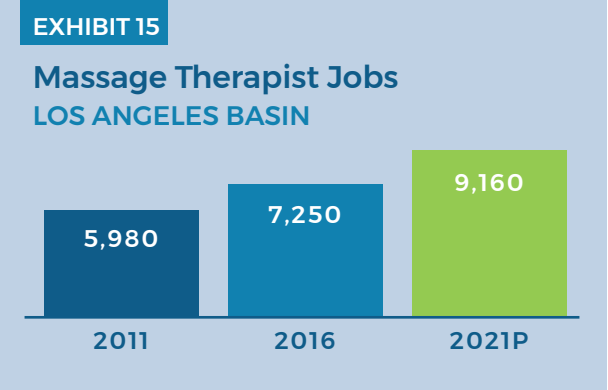
Massage therapists number 7,250 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016 massage therapist jobs grew by 1,270 jobs (21.2 percent) (Exhibit 15).

The employment outlook for this occupation is promising, and the demand for massage therapists is anticipated to increase for a number of reasons, such as the baby boomer generation aging and seeking more physical care. Healthcare providers are expected to increase the use of massage therapy in their treatment plans as it becomes more accepted as a way to treat pain. Limits on insurance coverage for services may temper this demand slightly. Other demand includes the use of massage therapists to help athletes rehabilitate from injuries, and individuals looking to improve their overall wellness in spa, hotel, or franchise clinic settings.

This occupation has a relatively low level of employment churn with an annual replacement rate of 3.7 percent. Employment of massage therapists is projected to number 9,160 jobs by 2021 with **2,180 total opennings in the Los Angeles Basin between 2016 and 2021** due to 1,910 net new jobs predicted to be added over the period (Exhibit 16).

The top-five industries employing the largest number of massage therapists are listed in Exhibit 17. They include personal and laundry services, ambulatory health care, accommodation, amusements, gambling and recreation (which includes country clubs and fitness centers) and local government. Each industry is expected to add jobs between 2016 and 2021, except for local government which is anticipated to lose close to 5 percent of its payroll employment over the period. Massage therapists account for over 10 percent of the middle-skill jobs in personal services (NAICS 624).

The median annual wage for massage therapists is \$41,200 in the Los Angeles Basin. Annual wages in this occupation increased in real terms by 17.0 percent between 2011 and 2016. On an hourly basis, wages range from \$10.01 per hour in the tenth percentile to \$30.70 per hour in the nintieth percentile, with



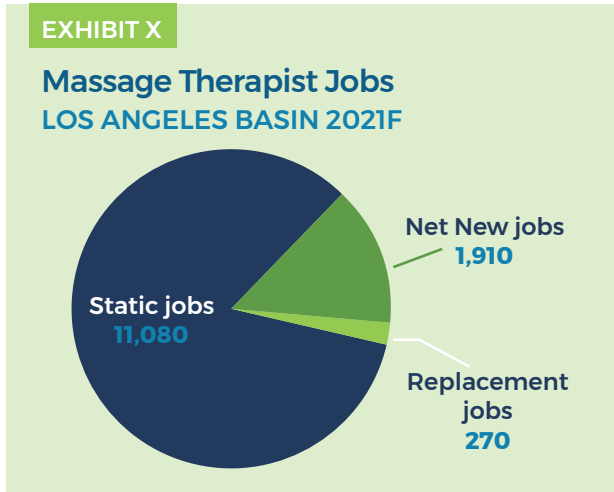
a median hourly wage of \$19.81, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 18).

Ocupations with LQs around 1.0, indicate similar proportions to national concentrations,. Massage therapists have an LQ of 1.1 in the Los Angeles Basin in 2016, the concentration is similar to that found nationally.

Los Angeles County, specificlly, ranks first in the nation for the largest number of massage therapists employed, and Orange County ranks fourth behind the Denver and New York Metropolitan areas.

TALENT SUPPLY

Across the Los Angeles Basin, there is only one college program providing training for massage therapists / massage therapy (TOP 1262.00). In the Los Angeles Basin, this program is only offered at Fullerton College, and in the 2017-18 academic year, there were



nine certificate completions. Workforce demand for massage therapists appears to far exceed supply. There are 437 projected annual openings for massage therapists in the Los Angeles Basin, compared to the nine program completions.

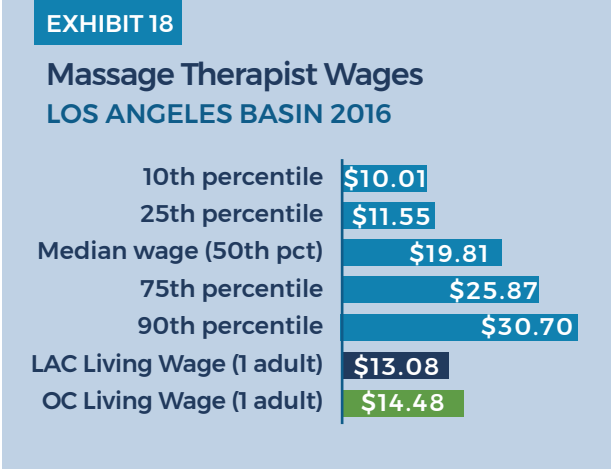
In the state, four additional community colleges have massage therapy programs: De Anza, Mira Costa, Monterey, and Skyline colleges. In the 2017-

EXHIBIT 17

Top Five Industries Employing Massage therapists in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Personal and laundry services	69,137	41.3%	2,914	10.2%	13.5%
Ambulatory health care services	292,257	59.1%	1,412	0.8%	13.3%
Accommodation	72,813	19.8%	606	4.2%	4.2%
Amusements, gambling, and recreation	81,889	25.7%	188	0.9%	4.0%
Local Government	299,641	47.7%	27	0.0%	-4.9%

Source: QCEW, OES, forecast and analysis by LAEDC



In Los Angeles County specifically, massage therapists number 5,240 payroll workers in 2016; 2,040 jobs were added since 2011 (63.7 percent). Employment in this occupation is projected to number 6,680 jobs by 2021 with **1,640 total opennings between 2016 and 2021** (330 annually). Wages range from \$10.01



per hour in the tenth percentile to \$31.53 per hour in the nintieth percentile, with a median hourly wage of \$20.69, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 58 percent.

In Los Angeles County, there are no community colleges providing training.

In Orange County specifically, massage therapists number 2,010 payroll workers in 2016; 70 jobs were added since 2011 (2.3 percent). Employment in this occupation is projected to number 3,330 jobs by 2021 with 550 total opennings between 2016 and 2021 (95 annually). Wages range from \$10.01 per hour in

LOS ANGELES COUNTY HIGHLIGHTS

2016 Employment:

5,240

Occupation LQ:

1.3

Total Openings 2016-2021:

1,640

College Completions (2016/2017):

0

Colleges:

0

Median Wage:

\$20.69

(58.2% above MIT Living Wage)

Massage Therapist Jobs
LOS ANGELES COUNTRY



ORANGE COUNTY HIGHLIGHTS

2016 Employment:

2,010

Occupation LQ:

not disclosed

Total Openings 2016-2021:

550

College Completions (2016/2017):

9

College Programs:

1

Median Wage:

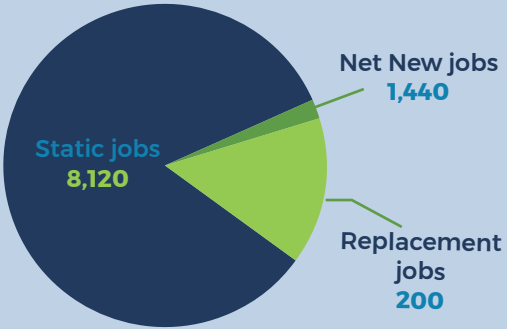
\$18.32

(26.5% above MIT Living Wage)

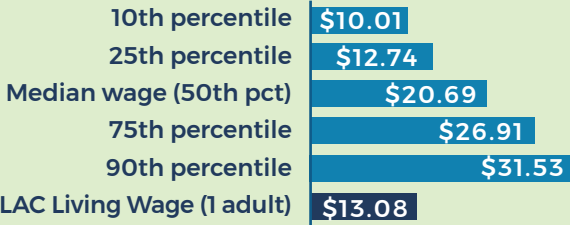
the tenth percentile to \$29.43 per hour in the nintieth percentile, with a median hourly wage of \$18.32, higher than the \$14.48 per hour MIT living wage in Orange County by nearly 27 percent.

In Orange County, there is one community college with the massage therapy program. In the 2017-2018 year, there were nine program completions.

Massage Therapist Jobs
LOS ANGELES COUNTY 2021F



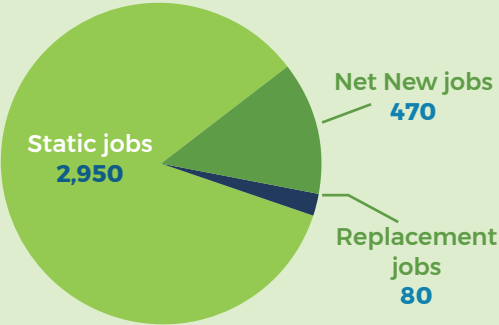
Massage Therapist Wages
LOS ANGELES COUNTY 2016



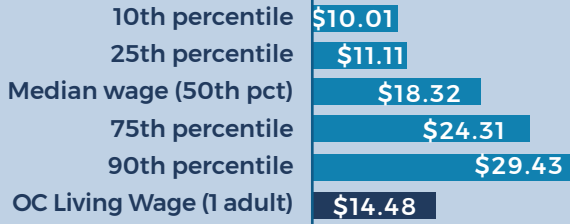
Massage Therapist Jobs
ORANGE COUNTY



Massage Therapist Jobs
ORANGE COUNTY 2021F



Massage Therapist Wages
ORANGE COUNTY 2016



Police and Sheriff’s Patrol Officers (SOC 33-3051)

Police and sheriff’s patrol officers are considered a middle-skill occupation. Police and sheriff’s patrol officers maintain order and protect life and property by enforcing local, tribal, state, or federal laws and ordinances. Individuals employed in this occupation perform a combination of the following duties: patrol a specific area; direct traffic; issue traffic summonses; investigate accidents; apprehend and arrest suspects, or serve legal processes of courts.

IN THE WORKPLACE

Many Police and sheriff’s patrol officers work for local, state and federal governments, and additional employers include transit agencies, schools and railroads. Police and sheriff’s patrol officers have the highest rate of injuries and illness of all occupations. They often work full-time in shifts around the clock with overtime and in high-stress and dangerous environments. However, many find the job rewarding, viewing it as a way to provide service to the community. Uniforms are worn so they are easily recognizable by the public as police officers. Most of their time is spent in a patrol car or other law enforcement vehicles, and police and sheriff’s patrol officers are in constant contact with the public. As such, soft-skills, including interpersonal skills, conflict negotiation and de-escalation, social perceptiveness, critical thinking, empathy and effective communication skills are highly valued.

Technology Requirement Often Cited in Employer Job Postings:

- **Integrated Automated Fingerprint Identification System IAFIS;**
- **Law enforcement information databases;**
- **National Crime Information Center NCIC database;**
- **National Integrated Ballistics Information Network NIBIN**
- **DesignWare 3D EyeWitness;**
- **Microsoft Visio Hot technology ;**
- **SmartDraw.com SmartDraw Legal;**
- **The CAD Zone The Crime Zone**
- **ESRI ArcView**

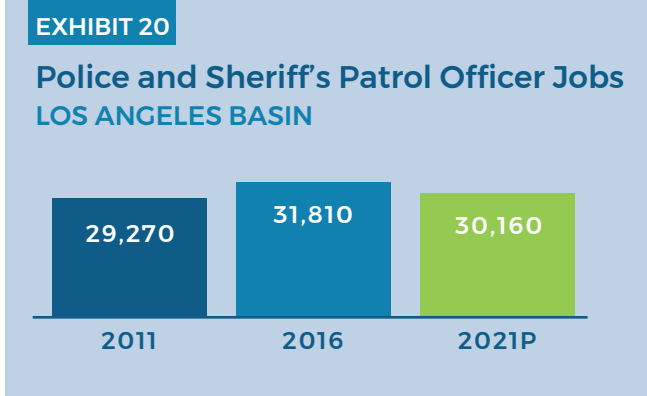
Job Titles Found in this Occupation:

- **Alcohol Law Enforcement Agent (ALE Agent)**
- **Law Enforcement/Patrol/Peace/ Police /Police Patrol Officer**
- **Public Safety Officer**
- **State Trooper**
- **K-9 Deputy**
- **Chief Deputy Sheriff**
- **Civil Division Deputy Sheriff**
- **Civil Process Server**
- **Corporal-Road Deputy with Sheriff Department**
- **Deputy (Patrol)**
- **Deputy Sheriff**
- **Bailiff**
- **Drug Abuse Resistance Education Officer (DARE Officer)**

Physical strength and stamina are also typically required to perform their job duties effectively.

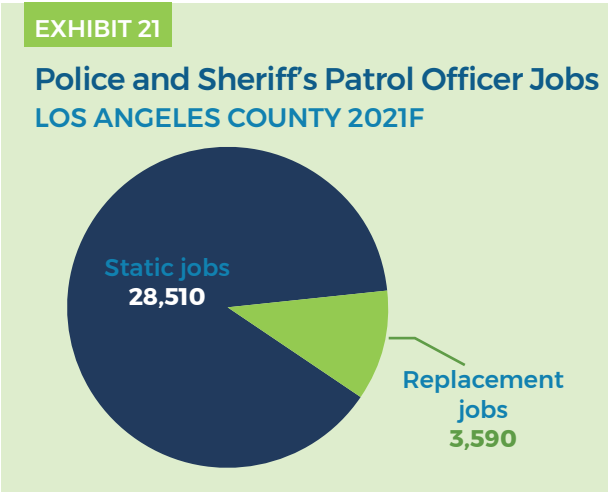
To be a candidate for a position, police and sheriff’s patrol officers must graduate from their agency’s training academy, be a U.S. citizen, be the age of 21 years or older and meet physical and personal qualifications. A felony conviction or drug use conviction may disqualify a candidate. Once hired by an agency, they will begin a period of moderate-term on-the-job training (between one month and a year) under the supervision of a field training officer to achieve competency in the occupation.

Job responsibilities for police and sheriff’s patrol officers typically involve: responding to emergency calls and



rendering first aid if needed; identifying, pursuing and arresting suspects and perpetrators of criminal activities; obtaining warrants; collecting and securing evidence from crime scenes; providing public safety through maintaining order, protecting people and property, conducting motor vehicle and traffic stops, enforcing criminal laws, and promoting good behavior; and reviewing and recording facts to document incidents and to identify if violations took place.

Knowledge of law and government, psychology and public safety and security are required for this occupation. Those general areas of study should include enough depth to provides individuals in this occupation with the requisite understanding of: laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process; knowledge of human behavior and performance; individual differences, personality, and interests; learning and motivation; and the assessment and treatment of behavioral and affective disorders; and familiarity with relevant equipment, policies, procedures, and strategies to promote effective local,



state, or national security operations for the protection of people, data, property, and institutions. This base of knowledge allows police and sheriff’s patrol officers to navigate their job duties successfully.

This occupation is considered slightly automated with an automation score of 21 out of 100. Currently automation in this occupation is considered complimentary versus a direct threat to employment. New technologies are increasing efficiency in report writing and record keeping, providing almost immediate access to law enforcement databases through apps and biometric identification tools such as instant fingerprint identification (Blue Check). Applications of technology that are increasing safety

Large Employers in the LA Basin

- **City of Glendale**
- **City of Monterey Park**
- **City of Santa Monica**
- **City of Tustin**
- **City of Whittier**

include the use of unmanned robots, four-wheeled drones used in bomb units and SWAT team activities, and the use of drones to follow and record suspects. Proactively, 3D architectural models are used in planning raids and other police actions including counterterrorism efforts. Finally, social media continues to be a useful tool in gathering information to solve crimes. The high degree of personal interaction with others required to successfully complete the job duties in this occupation, in addition to the job being performed in unpredictable environments, largely shields this occupation from the threat of disemployment related to automation.

Just over 48 percent of police and sheriff’s patrol officers in the Los Angeles Basin have a community college-level education, meaning that significant employment opportunities exist for workers with this level of educational attainment. About 15 percent of workers in this occupation in the Basin are ages 55 years and over, retirement benefits offered typically allow for retirement at relatively earlier than average age compared to other careers.

EXHIBIT 22

Top Five Industries Employing Police and Sheriff's Patrol Officers in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Local government	299,641	47.7%	30,340	21.2%	-4.9%
State government	18,953	38.2%	751	10.4%	-32.3%
Educational services	411,514	20.5%	441	0.5%	5.0%
Federal government	33,132	53.8%	249	1.4%	2.2%
Postal service	18,860	8.6%	25	1.5%	-3.3%

Source: QCEW, OES, forecast and analysis by LAEDC

OCCUPATIONAL DEMAND

Police and sheriff's patrol officers number 31,810 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016 police and sheriff's patrol officer jobs grew by 2,540 jobs (8.7 percent) (Exhibit 20)).

The demand for public safety is always strong, making the employment outlook for this occupation promising, and demand fluctuates across localities with varying socioeconomic conditions. Budget constraints faced by state and local governments also affect the demand for this occupation. Employment of police and sheriff's patrol officers is projected to number 30,160 jobs by 2021 with 3,590 total openings in the Los Angeles Basin between 2016 and 2021 due to replacement jobs (Exhibit 21).

The top-five industries employing the largest number of police and sheriff's patrol officers are listed in Exhibit 22. They include local, state and federal government, education and postal service. Educational services and federal government employment is expected to add jobs between 2016 and 2021. Local and state government are anticipated to lose close to 5 percent and 32 percent of payroll employment, respectively, over the period. Police and sheriff's patrol officers account for over 20 percent of the middle-skill jobs in local government.

The median annual wage for police and sheriff's patrol officers is \$100,390 in the Los Angeles Basin. Annual wages in this occupation increased in real

OCCUPATION HIGHLIGHTS

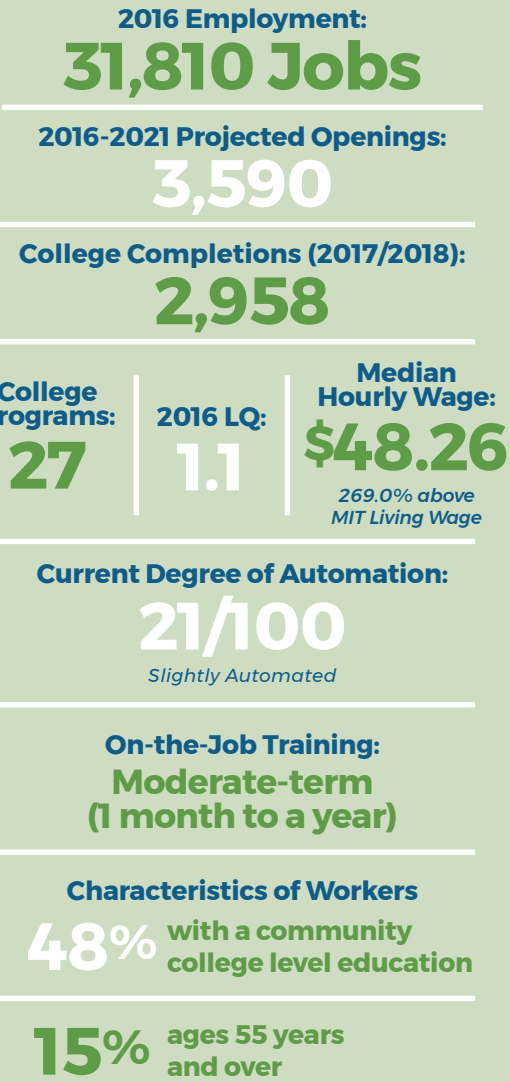
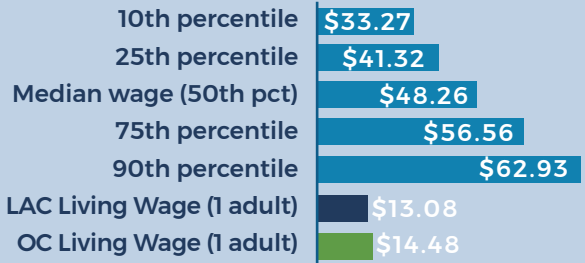


EXHIBIT 23

Police and Sheriff's Patrol Officer Wages - LOS ANGELES BASIN 2016



terms by 9.6 percent between 2011 and 2016. On an hourly basis, wages range from \$33.27 per hour in the tenth percentile to \$62.93 per hour in the nintieth percentile, with a median hourly wage of \$48.26, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 23).

In addition to strong wages, police and sheriff's patrol officers receive other benefits including a uniform allowance, and extensive benefits like good medical coverage and retirement options that allow an individual to retire earlier than typical with most other occupations.

EXHIBIT 24

Police and Sheriff's Patrol Officers Programs		2017-18 Awards
Administration of Justice		2,487
Police Academy		471
Total		2,958

Sources: COE

Occupations with LQs around 1.0, indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Police and sheriff's patrol officers have an LQ of 1.1 in the Los Angeles Basin in 2016. While there are a large number of police and sheriff's patrol officers in the Los Angeles Basin, and the concentration is similar to that found nationally.

Los Angeles County, specifically, ranks second in the nation for the largest number of police and sheriff's patrol officers employed, behind the New York metropolitan area. Orange County ranks eighth and

Colleges with Programs

- Cerritos
- Citrus
- Coastline
- Compton
- Cypress
- East LA
- El Camino
- Fullerton
- Glendale
- Golden West
- Irvine Valley
- LA City
- LA Harbor
- LA Mission
- LA Pierce
- LA Southwest
- LA Trade-Tech
- LA Valley
- Long Beach
- Mt San Antonio
- Pasadena
- Rio Hondo
- Santa Ana
- West LA

LOS ANGELES COUNTY HIGHLIGHTS



ORANGE COUNTY HIGHLIGHTS



Los Angeles County ranks tenth in the top paying metropolitan areas for this occupation with an hourly median wage of \$47.61 and \$48.39 respectively, well over 2 times the MIT living wage in both counties.

TALENT SUPPLY

Across the Los Angeles Basin, 24 community colleges have programs training for police and sheriff's patrol officers. Colleges offering administration of justice (TOP 210500) and police academy (TOP 2105.50) programs conferred 2,958 awards in the 2017-18 year. Nearly half of all completions were certificates (1,274 certificates; 1,684 associate degrees). It appears that there may be an oversupply of students, since there are 719 annual job openings projected in the Los Angeles Basin.

Police Academies (TOP 210550) exist at three campuses in the Los Angeles Basin, East Los Angeles, Golden West and West Los Angeles colleges, there were 471 completions in the 2017-18 year.

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, police and sheriff's patrol officers number 26,520 payroll workers in 2016; 3,180 jobs were added since 2011 (13.6 percent). Employment in this occupation is projected to number 25,260 jobs by 2021 with **3,100 total openings projected between 2016 and 2021** (620 annually). Wages range from \$33.18 per hour in the tenth percentile to \$63.01 per hour in the nintieth percentile, with a median hourly wage of \$48.39, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 270 percent.

In Los Angeles County, there are college programs providing training across 18 campuses. In the 2017-2018 year, there were 2,533 program completions.

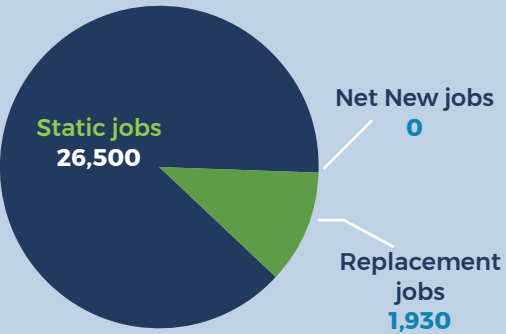
In Orange County specifically, police and sheriff's patrol officers number 5,280 payroll workers in 2016; 640 jobs were lost since 2011 (-10.8 percent). Employment in this occupation is projected to number 4,890 jobs by 2021 with **480 total projected openings between 2016 and 2021** (100 annually). Wages range from \$34.15 per hour in the tenth percentile to \$62.28 per hour in the nintieth percentile, with a median hourly wage of \$47.61, higher than the \$14.48 per hour MIT living wage in Orange County by 229 percent.

In Orange County, there are college programs providing training across six campuses. In the 2017-2018 year, there were 425 program completions.

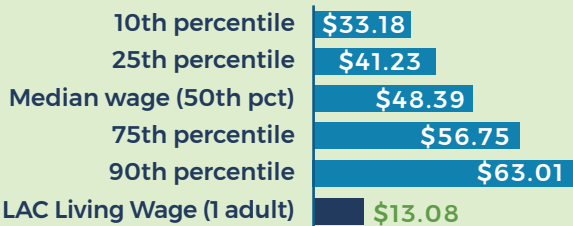
Social and Human Services Assistants Jobs - LOS ANGELES COUNTRY



Police and Sheriff's Patrol Officer Jobs - LOS ANGELES COUNTY 2021F



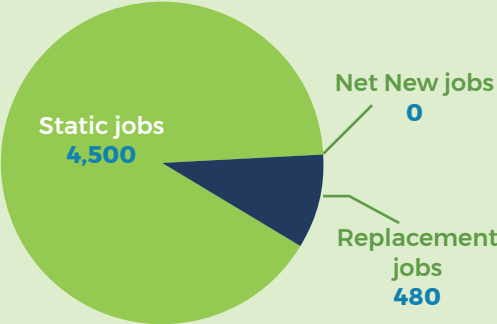
Police and Sheriff's Patrol Officer Wages - LOS ANGELES COUNTY 2016



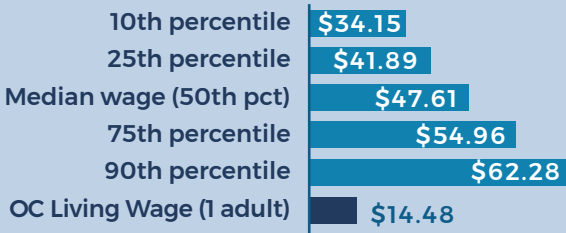
Police and Sheriff's Patrol Officer Jobs - ORANGE COUNTY



Police and Sheriff's Patrol Officer Jobs - ORANGE COUNTY 2021F



Police and Sheriff's Patrol Officer Wages - ORANGE COUNTY 2016



Chefs and Head Cooks (SOC 35-1011)

Chefs and head cooks are considered a middle-skill occupation. Individuals in this occupation oversee the daily food preparation at restaurants and other places where food is served. They direct kitchen staff and handle any food-related concerns. They may participate in the preparation, seasoning, and cooking of salads, soups, fish, meats, vegetables, desserts, or other foods, and may also plan and price menu items, order supplies, and keep records and accounts.

Most chefs and head cooks learn their skills through work experience. Others receive training at a community college, technical school, culinary arts school, or 4-year college. Some learn through apprenticeship programs. Students in culinary programs spend most of their time in kitchens, practicing their cooking skills. Programs cover all aspects of kitchen work, including menu planning, food sanitation procedures, and purchasing and inventory methods. Most training programs also require students to gain experience in a commercial kitchen through an internship or apprenticeship program. Executive chefs, head cooks, and sous chefs who work in upscale restaurants often have many years of training and experience.

The American Culinary Federation provides certifications for personal chefs, and for multiple levels of chefs including sous chefs or executive chefs. Certifications are not required, but can lead to advancement and higher pay. Certification standards are largely based on formal training and work-related experience, with minimum work experience ranging from about 6 months to 5 years, depending on the level of certification being sought.

IN THE WORKPLACE

Individuals employed in this occupation work in places where food is served, this includes restaurants, hotels and other food service establishments. Additional opportunities exist in healthcare (residential care facilities, hospitals, etc.), cruise ships, and even private households. They generally work full time, and many work in excess of 40 hours per week. Their work schedule includes early mornings, late evenings, weekends, and holidays. Chefs and head

Technology Requirement Often Cited in Employer Job Postings:

- Sage MAS 90 ERP
- Axxya Systems Nutritionist Pro
- GNOME Gnutrition
- IPro Restaurant Inventory
- Barrington Software CookenPro Commercial
- CostGuard
- Culinary Software Services ChefTec
- ReServe Interactive

Job Titles Found in this Occupation:

- Banquet Chef
- Certified Executive Chef (CEC)
- Chef
- Chef, Instructor
- Cook
- Corporate Executive Chef
- Executive Chef (Ex Chef)
- Executive Sous Chef
- Head Cook
- Line Cook

cooks usually stand for long periods and work in a fast-paced, high stress environment. A number of chefs are self-employed and run their own restaurant or catering business; in addition to their kitchen duties, these individuals are responsible for managing all aspects of the business including payment of bills and wages and profitability. Chefs and head cooks interact heavily with the public and other staff members, whether it be face-to-face discussions, telephone conversations or email messages. High stress

environments and situations that they encounter make soft-skills, including interpersonal skills, effective communication skills, social perceptiveness, integrity, dependability and stress tolerance highly valued.

Knowledge of food production, production and processing, customer and personal service, training and management are required for this occupation. This provides individuals in this occupation with the requisite understanding of: food storage and handling techniques; managing costs and quality control; assessing customer needs and satisfaction; and coordination of staff and resources. This base of knowledge allows chefs and head cooks to navigate their job duties successfully.

Job responsibilities for chefs and head cooks typically involve: checking the quality of foods or supplies; estimating supplies, ingredients, or staff requirements for food preparation activities; training food preparation or food service personnel; coordinating activities of food service staff; and inspecting facilities, equipment or supplies to ensure conformance to standards.

This occupation is not automated with an automation score of 19 out of 100. Currently automation with the potential for disemployment in this occupation is not as developed as in other foodservice occupations such as servers and cashiers who face the threat of being replaced by kiosks. The foodservice industry is looking for ways technology can reduce waste and streamline their operations and minimum wage increases have motivated the industry to look towards innovation as a way to address rising labor costs. However, due to the high cost of R&D, most investment into robotics (food assembly machinery, etcetera) are being undertaken by large scale businesses. Other more complimentary forms of automation, such as, bluetooth food temperatures sensors, digital inventory tracking, scheduling software and digital table reservation systems, are more common in operations of all sizes.

OCCUPATIONAL DEMAND

Chefs and head cooks number 7,210 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016 this occupation grew significantly adding 3,130

EXHIBIT 25

Chefs and Head Cooks Jobs LOS ANGELES BASIN

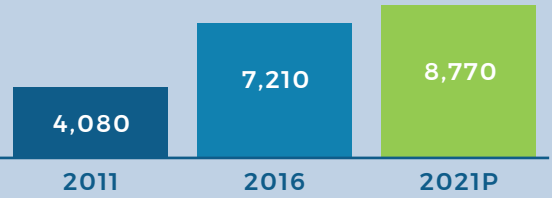
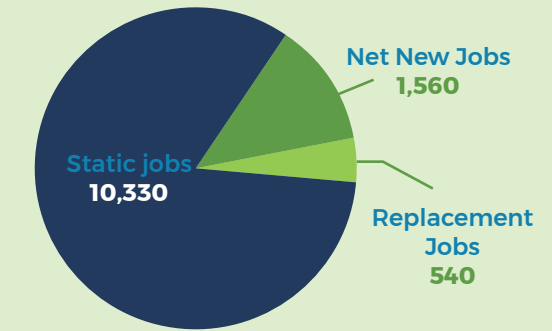


EXHIBIT 26

Chefs and Head Cooks Jobs LOS ANGELES COUNTY 2021F



jobs (76.8 percent). The employment outlook for this occupation is promising, as the demand for individuals in this role is expected to increase as personal income rises and more individuals frequent restaurants and demand healthy eating options. This occupation has an annual replacement rate of 7.5 percent. Employment of chefs and head cooks is projected to number 8,770 jobs by 2021 with **2,100 total openings in the Los Angeles Basin between 2016 and 2021** due mostly to net new jobs.

Large Employers in the LA Basin

- Marriott International
- Sodexo
- Benihana
- Cozymeal
- Gelson's Markets
- Compass Group

EXHIBIT 27

Top Five Industries Employing Chefs and Head Cooks in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Food services and drinking places	512,136	10.1%	5,322	10.3%	6.1%
Accommodation	72,813	19.8%	654	4.5%	4.2%
Amusements, gambling, and recreation	81,889	25.7%	358	1.7%	4.0%
Food and beverage stores	124,152	11.6%	134	0.9%	-5.0%
Nursing and residential care facilities	106,694	59.9%	126	0.2%	9.4%

Source: QCEW, OES, forecast and analysis by LAEDC

EXHIBIT 28

Chefs and Head Cooks Wages
LOS ANGELES BASIN

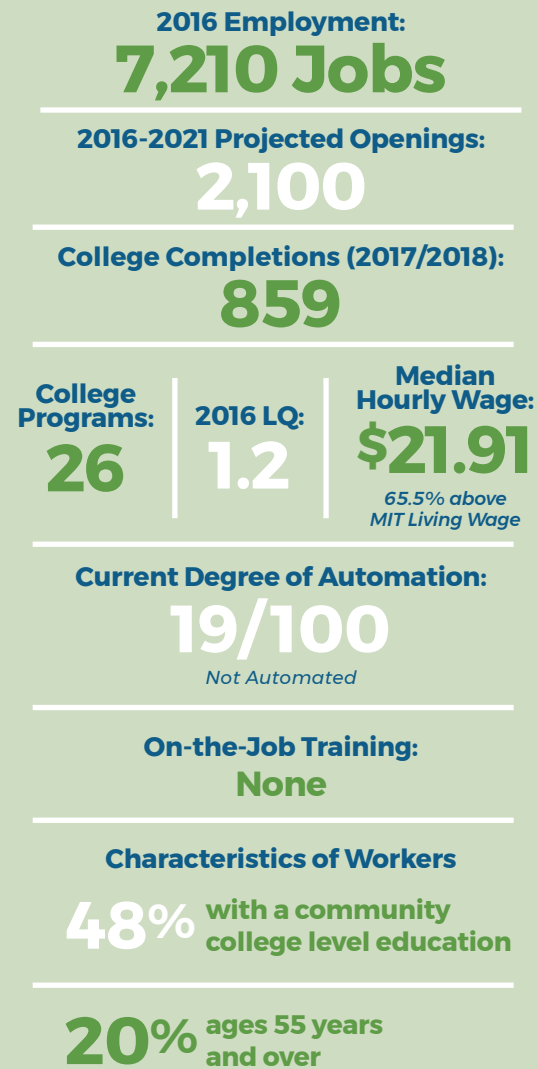
10th percentile	\$11.30
25th percentile	\$15.25
Median wage (50th pct)	\$21.91
75th percentile	\$29.27
90th percentile	\$35.85
LAC Living Wage (1 adult)	\$13.08
OC Living Wage (1 adult)	\$14.48

The top-five industries employing the largest number of chefs and head cooks are listed in Exhibit 27. They include restaurants and bars, hotels and casinos, food and beverage stores and nursing and residential care facilities. All top-five industries are expected to add jobs between 2016 and 2021, with the exception of food and beverage stores which is anticipated to lose 5 percent of its payroll employment between 2016 and 2021.

The median annual wage for chefs and head cooks is \$45,570 in the Los Angeles Basin. On an hourly basis, wages range from \$11.30 per hour in the tenth percentile to \$35.85 per hour in the nintieth percentile and a median hourly wage of \$21.91, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 28).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries.Ocupations with LQs around 1.0, indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of

OCCUPATION HIGHLIGHTS



the nation. Chefs and head cooks have an LQ of 1.2 in the Los Angeles Basin in 2016. While there are a large number of chefs and head cooks in the Los Angeles Bain, the concentration is only slightly stronger to that found nationally.

The Los Angeles Basin ranks second in the nation for the largest number of chefs and head cooks employed, behind the New York metropolitan area.

TALENT SUPPLY

Currently, 15 community colleges in the region provide training for chefs and head cooks. Colleges offering nutrition, foods, and culinary arts (TOP 1306.00), culinary arts (TOP 1306.30), and restaurant and food services and management (TOP 1307.10) programs conferred 859 awards in the 2017-18 academic year. Approximately 75 percent of all awards conferred were certificates (650 certificates; 209 associate degrees). There appears to be an oversupply of local community college completers, since there are only 420 openings projected for chefs and head cooks annually.

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, chefs and head cooks number 5,520 payroll workers in 2016; 2,310 jobs were added since 2011 (72 percent). Employment in this occupation is projected to number 6,680 jobs by 2021 with 1,570 total openings between 2016 and 2021 (315 annually). Wages range from \$11.08 per hour in the tenth percentile to \$35.62 per hour in the nintieth percentile, with a median hourly wage of \$20.33, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 55 percent.

In Los Angeles County, there are college programs providing training across ten campuses. In the 2017-2018 year, there were 527 program completions.

EXHIBIT 29

Chefs and Head Cooks Programs	2017-18 Awards
Nutrition, Foods, and Culinary Arts	76
Culinary Arts	
Restaurant and Food Services and Management	652
	131
Total	859

Sources: COE

Colleges with Programs

- Cerritos
- Cypress
- East LA
- Fullerton
- Glendale
- LA Harbor
- LA Mission
- LA Trade-Tech
- Long Beach
- Mt San Antonio
- Orange Coast
- Saddleback
- Santa Ana
- Santa Monica
- West LA

LOS ANGELES COUNTY HIGHLIGHTS



ORANGE COUNTY HIGHLIGHTS

2016 Employment:
1,690

Occupation LQ:
1.1

Total Openings 2016-2021:
530

College Completions (2016/2017):
332

College Programs:
5

Median Wage: **\$16.53** Real Wage Growth 2011-16
(14.2% above MIT Living Wage) **-1.0%**

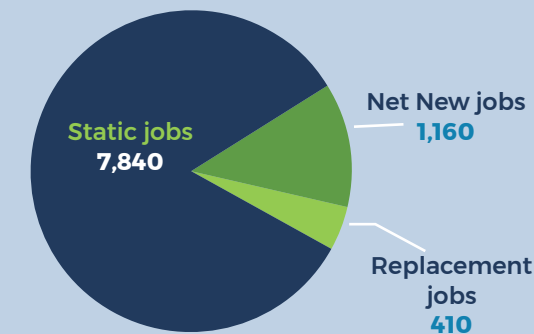
In Orange County specifically, chefs and head cooks number 1,690 payroll workers in 2016; 820 jobs were added since 2011 (94.3 percent). Employment in this occupation is projected to number 2,090 jobs by 2021 with **530 total openings between 2016 and 2021** (105 annually). Wages range from \$13.24 per hour in the tenth percentile to \$36.48 per hour in the nintieth percentile, with a median hourly wage of \$25.06, higher than the \$14.48 per hour MIT living wage in Orange County by 73 percent.

In Orange County, there are college programs providing training across five campuses. In the 2017-2018 year, there were 332 program completions.

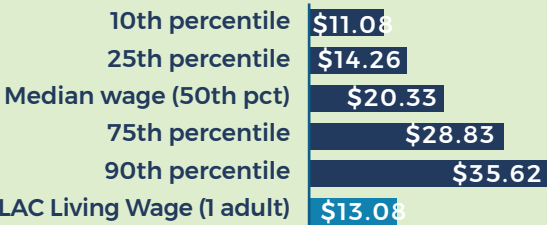
Chefs and Head Cooks Jobs
LOS ANGELES COUNTRY



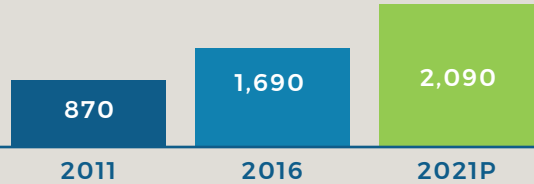
Chefs and Head Cooks Jobs
LOS ANGELES COUNTY 2021F



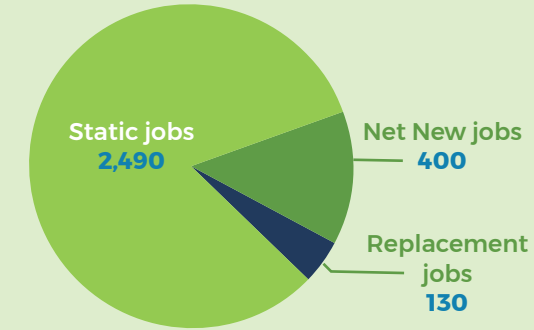
Chefs and Head Cooks Wages
LOS ANGELES COUNTY 2016



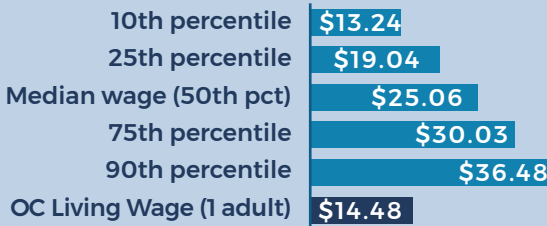
Chefs and Head Cooks Jobs
ORANGE COUNTRY



Police and Sheriff's Patrol Officer
ORANGE COUNTY 2021F



Chefs and Head Cooks Wages
ORANGE COUNTY 2016



Insurance Sales Agents (SOC 41-3021)

Chefs and head cooks are considered a middle-skill occupation. Individuals in this occupation oversee the daily food preparation at restaurants and other places where food is served. They direct kitchen staff and handle any food-related concerns. They may participate in the preparation, seasoning, and cooking of salads, soups, fish, meats, vegetables, desserts, or other foods, and may also plan and price menu items, order supplies, and keep records and accounts.

Most chefs and head cooks learn their skills through work experience. Others receive training at a community college, technical school, culinary arts school, or 4-year college. Some learn through apprenticeship programs. Students in culinary programs spend most of their time in kitchens, practicing their cooking skills. Programs cover all aspects of kitchen work, including menu planning, food sanitation procedures, and purchasing and inventory methods. Most training programs also require students to gain experience in a commercial kitchen through an internship or apprenticeship program. Executive chefs, head cooks, and sous chefs who work in upscale restaurants often have many years of training and experience.

IN THE WORKPLACE

Most insurance sales agents work for insurance carriers or in the financial services industry. Often they work full-time in an office environment, but some agents may travel to meet with clients. If the position requires travel, preparation of presentations and paperwork may take place outside of business hours. The bulk of their work includes marketing their services to others through a combination of networking, referrals and cold calls to build their own base of customers. They are constantly in contact with others, whether it be face-to-face discussions, telephone conversations or email messages, and as such, soft-skills, including interpersonal skills, effective communication skills and time management skills, are highly valued.

The California Department of Insurance (CDI) licenses agents in the state. A certified pre-licensing insurance course and an exam must be passed to obtain a license for each specialty, such as accident and health, automobile, life and disability, cargo shipper's and property and casualty. Due to the changing nature of insurance laws, consumer protections and the technical details of insurance policies, continuing education courses are required for renewal.

Insurance sales agents often diversify, offering their clients financial planning services as well, such as retirement and estate planning. In this instance,

Job Titles Found in this Occupation:

- Account Executive
- Account Manager
- Accounts Executive
- Insurance Agent
- Insurance Broker
- Insurance Sales Agent
- Sales Agent
- Sales Associate
- Sales Representative
- Underwriting Sales Representative

agents may pursue getting licensed to sell financial products including annuities, mutual funds and securities. The licensing exams, administered by the Financial Industry Regulatory Authority (FINRA), include the Series 6 exam for agents intending to sell only mutual funds and variable annuities and the Series 7 exam which qualifies agents as general securities sales representatives. Both exams require considerable preparation.

The fastest growing segment of insurance sales is in health and long-term care. These agents sell policies that cover the costs of medical and dental care, care related to a short-term or long-term disability and assisted-living services for senior citizens. As the

Technology Requirement Often Cited in Employer Job Postings:

- AMS Services AMS Sagitta;
- Microsoft Dynamics;
- United Systems and Software Individual Life and Health Administration System;
- Vulcan Solutions Vulcan Insurance
- Healthcare common procedure coding system HCPCS;
- Medical procedure coding software
- Allied Financial Software Act4Advisors;
- Applied Systems Vision; Insurance Technologies ForeSight Enterprise;
- Tangle S Creations Your Insurance Office
- Video creation and editing
 - Adobe Systems Adobe AfterEffects;
 - Apple Final Cut Pro;
 - YouTube

population continues to age, more opportunities for insurance agents will be available.

Knowledge of customer service, sales and marketing, law and government and math are required for this occupation. This provides individuals in this occupation with the requisite understanding of: providing customer and personal services, performing customer needs assessment, meeting quality standards for services and evaluating satisfaction; principles and methods for showing, promoting, and selling products or services, including marketing strategy and tactics, product demonstration, sales techniques, and sales control systems; knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process; and the understanding of arithmetic, algebra, geometry, calculus, statistics, and their applications. This base of knowledge allows social and insurance sales agents to navigate their job duties successfully.

This occupation is considered moderately automated with an automation score of 44 out of 100. Automation and big data are changing the industry. Artificial intelligence and Robotic Process Automation (RPA)

EXHIBIT 30

Insurance Sales Agents Jobs
LOS ANGELES BASIN

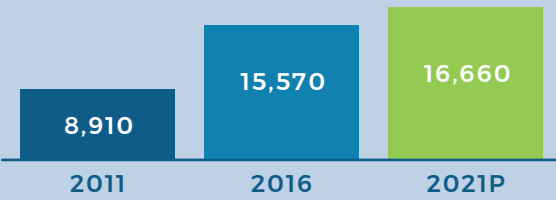
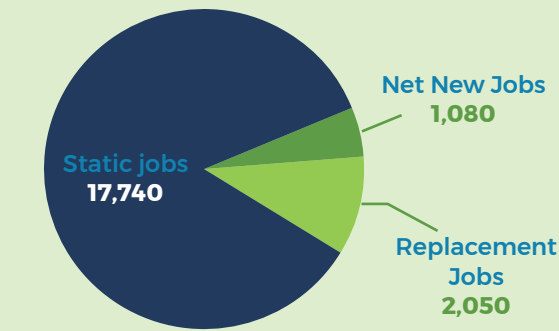


EXHIBIT 31

Insurance Sales Agents Jobs
LOS ANGELES COUNTY 2021F



are being used to increase efficiencies and control operational costs. An example includes the use of software that automates marketing. Future disemployment related to automation for insurance sales agents will depend upon several factors: companies with a large amount of personal data, e.g. Amazon and Google, are positioned to use this information to provide specialized products and policies online which could be disruptive; and while older generations may prefer to interact with agents, as younger technology-savvy generations grow older, the preference for human agent interaction

Large Employers in the LA Basin

- State Farm
- AAA
- Allstate
- Aflac
- Bankers Life

EXHIBIT 32

Top Five Industries Employing Insurance Sales Agents in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Insurance carriers and related activities	74,990	56.5%	15,100	35.6%	2.9%
Securities, commodity contracts, investments	36,650	28.8%	170	1.6%	-3.0%
Credit intermediation and related activities	103,740	59.7%	110	0.2%	0.4%
Management of companies and enterprises	88,130	42.3%	110	0.3%	0.7%
State Government	18,950	38.2%	50	0.7%	-32.3%

Source: QCEW, OES, forecast and analysis by LAEDC

EXHIBIT 33

Insurance Sales Agents Wages
LOS ANGELES BASIN

10th percentile	\$13.20
25th percentile	\$17.38
Median wage (50th pct)	\$27.42
75th percentile	\$40.41
90th percentile	\$70.57
LAC Living Wage (1 adult)	\$13.08
OC Living Wage (1 adult)	\$14.48

may decline. As it stands now, the industry already has a significant online presence with many potential clients obtaining detailed information and comparing different policies and provider companies via the internet. Still, the convenience of interacting with a knowledgeable agent and the growth in the industry related to increased sales of health insurance translate into employment growth for insurance sales agents in the near future.

OCCUPATIONAL DEMAND

Insurance sales agents number 15,570 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016 this occupation jobs grew by 6,660 jobs (74.7 percent). The employment outlook for this occupation is promising, as the demand for individuals in this role is expected to increase mainly due to growth in the health insurance industry. This occupation has a relatively high level of employment

OCCUPATION HIGHLIGHTS

2016 Employment:

15,570 Jobs

2016-2021 Projected Openings:

3,130

College Completions (2017/2018):

28

College Programs: **3**

2016 LQ: **1.0**

Median Hourly Wage: **\$27.42**
109.6% above MIT Living Wage

Current Degree of Automation:

44/100
Moderately Automated

On-the-Job Training:

Moderate-term (1 month to a year)

Characteristics of Workers

48% with a community college level education

29% ages 55 years and over

churn with an annual replacement rate of 13.2 percent; workers often move into other positions and other industries if they struggle with the commission-based nature of this position. Employment of insurance sales agents is projected to number 16,660 jobs by 2021 with **3,130 total openings in the Los Angeles Basin between 2016 and 2021** due to both new and replacement jobs, with nearly two replacement openings for every new job added.

The top-five industries employing the largest number of insurance sales agents are listed in Exhibit 32. In addition to insurance carriers, financial services, management of companies and the state government are industries that employ the most insurance sales agents. Employment in insurance carriers, credit intermediation and management of companies is expected to grow, albeit modestly, between 2016 and 2021. Local government is anticipated to lose close to 38 percent of payroll employment over the period. Insurance sales agents account for just under 36 percent of the middle-skill jobs in the insurance industry.

The top-five industries employing the largest number of insurance sales agents are listed in Exhibit 32. In addition to insurance carriers, financial services, management of companies and the state government are industries that employ the most insurance sales agents. Employment in insurance carriers, credit intermediation and management of companies is expected to grow, albeit modestly, between 2016 and 2021. Local government is anticipated to lose close to 38 percent of payroll employment over the period. Insurance sales agents account for just under 36 percent of the middle-skill jobs in the insurance industry.

The median annual wage for insurance sales agents is \$57,040 in the Los Angeles Basin. On an hourly basis, wages range from \$13.20 per hour in the tenth percentile to \$70.57 per hour in the nintieth percentile and a median hourly wage of \$27.42, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 33).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries., Occupations with LQs around 1.0 indicate similar proportions to

EXHIBIT 34	
Insurance Sales Agent Programs	2017-18 Awards
Sales and Salesmanship	28
Total	28

Sources: COE

Colleges with Programs

- Orange Coast
- Santa Ana
- Santa Monica

national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Insurance sales agents have an LQ of 1.0 in the Los Angeles Basin in 2016. The Los Angeles Basin ranks second in the nation for the largest number of insurance sales agents employed, behind the New York metropolitan area; while there are a large number of insurance sales agents in the region, the concentration is equal to that found nationally.

TALENT SUPPLY

Currently in the Los Angeles Basin, the sales and salesmanship (TOP 0509.40) program is offered at three community college campuses in the region. In the 2017-18 year, there were 28 program completions (24 certificates and 4 associate degrees).

Demand for insurance sales agents far exceeds the current supply of community college completers in the Los Angeles Basin. There are 626 projected annual openings for sales agents over the next five years, compared to 28 regional program completions.

Another community college program associated with the training of insurance sales agents, but is not available at campuses located in the Los Angeles Basin, is Insurance (TOP 0512.00). In 2016-17, five awards were conferred across three colleges in the state. Data for 2017-18 was not available.

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

LOS ANGELES COUNTY HIGHLIGHTS



In Los Angeles County specifically, insurance sales agents number 10,440 payroll workers in 2016; 4,280 jobs were added since 2011 (69.5 percent). Employment in this occupation is projected to number 11,110 jobs by 2021 with **2,040 total openings between 2016 and 2021** (408 annually). Wages range from \$12.85 per hour in the tenth percentile to \$59.83 per hour in the nintieth percentile, with a median hourly wage of \$25.91, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 98 percent.

In Los Angeles County, there is one community college providing training. In the 2017-2018 year, there were 16 program completions.

In Orange County specifically, insurance sales agents number 5,130 payroll workers in 2016; 2,380 jobs were added since 2011 (86.5 percent). Employment in this occupation is projected to number 5,550 jobs by 2021 with **1,090 total openings between 2016 and 2021** (218 annually). Wages range from \$14.23 per hour in the tenth percentile to \$79.67 per hour in the nintieth percentile, with a median hourly wage of \$31.71, higher than the \$14.48 per hour MIT living wage in Orange County by 119 percent.

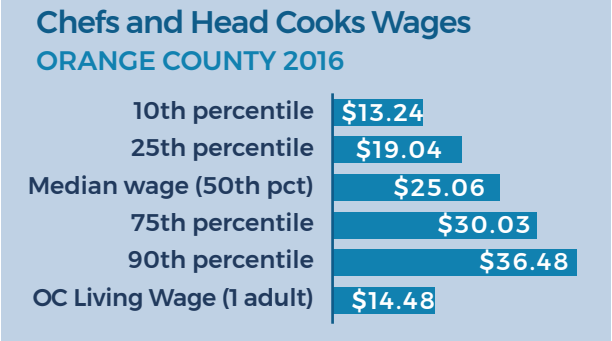
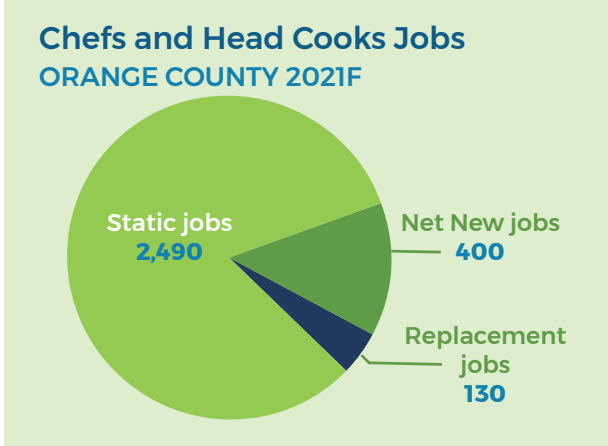
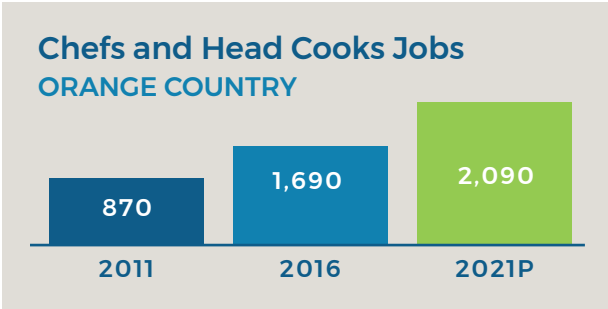
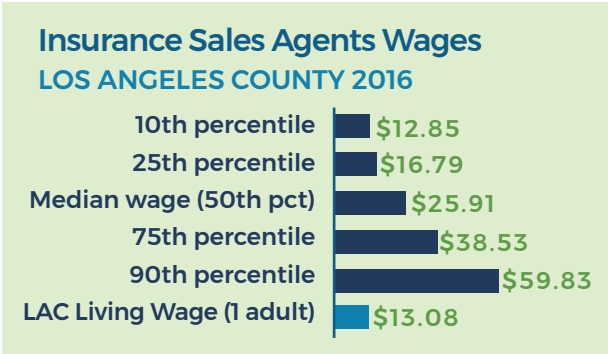
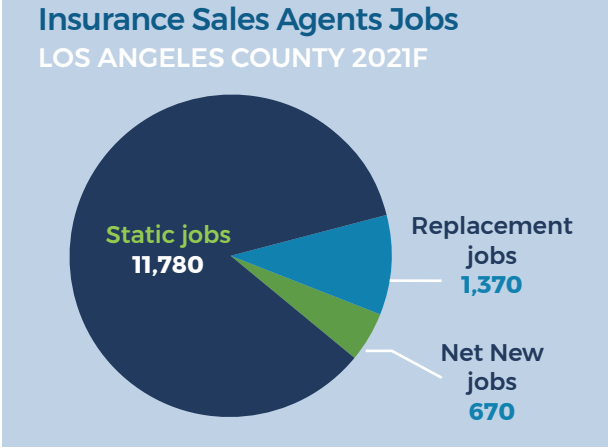
In Orange County, there are two community colleges providing training. In the 2017-2018 year, there were 12 program completions.

ORANGE COUNTY HIGHLIGHTS



Insurance Sales Agents Jobs LOS ANGELES COUNTRY





Carpenters (SOC 47-2031)

Chefs and head cooks are considered a middle-skill occupation. Individuals in this occupation oversee the daily food preparation at restaurants and other places where food is served. They direct kitchen staff and handle any food-related concerns. They may participate in the preparation, seasoning, and cooking of salads, soups, fish, meats, vegetables, desserts, or other foods, and may also plan and price menu items, order supplies, and keep records and accounts.

Most chefs and head cooks learn their skills through work experience. Others receive training at a community college, technical school, culinary arts school, or 4-year college. Some learn through apprenticeship programs. Students in culinary programs spend most of their time in kitchens, practicing their cooking skills. Programs cover all aspects of kitchen work, including menu planning, food sanitation procedures, and purchasing and inventory methods. Most training programs also require students to gain experience in a commercial kitchen through an internship or apprenticeship program. Executive chefs, head cooks, and sous chefs who work in upscale restaurants often have many years of training and experience.

IN THE WORKPLACE

Many carpenters work directly in the construction industry, but additional opportunities exist building sets in the LA Basin's large entertainment industry, providing facility maintenance, or working in manufacturing building cabinets and furniture. A significant number of carpenters are self-employed. Most carpenters work full-time, but their environments vary wildly with their specialty. Those who work outside can be exposed to the elements and extreme temperatures, and inclement weather can temporarily shutdown the job sites, impacting the worker's earnings. Carpenters have a greater risk of personal injury, in the form of strains, falls or cuts, due to the physicality of the job and the tools used. Some projects require work to be completed after traditional business hours or on weekends. Physical strength and manual dexterity are very important for this occupation, and climbing, lifting, balancing, walking, stooping, and handling of materials are required. Additional desired traits are the abilities to visualize before doing, to arrange and order processes (organize, prioritize, and plan) and to identify potential problems both before and while they are happening.

Sponsored apprenticeship programs exist, through unions and contractor associations, that teach carpentry basics, blueprint reading, mathematics, building code requirements, and safety and first aid practices. Specialized training is also available for

Job Titles Found in this Occupation:

- Assembler
- Cabinet Maker
- Carpenter Foreman
- Carpentry Foreman
- Concrete Carpenter
- Construction Superintendent
- Construction Worker
- Foreman
- Framer
- Production Worker

creating and setting concrete forms, rigging, welding, building scaffolding, and working within confined workspaces. Apprenticeship programs typically require the completion of 144 hours of technical training and 2,000 hours of paid on-the-job training per year. All carpenters must pass the Occupational Safety and Health Administration (OSHA) 10- and 30-hour safety courses.

The requisite knowledge for this occupation includes: building and construction materials, methods and tools; mathematics; mechanical knowledge of machines and tools, including their designs, uses, repair, and maintenance; and of design techniques, tools, and principles involved in production of

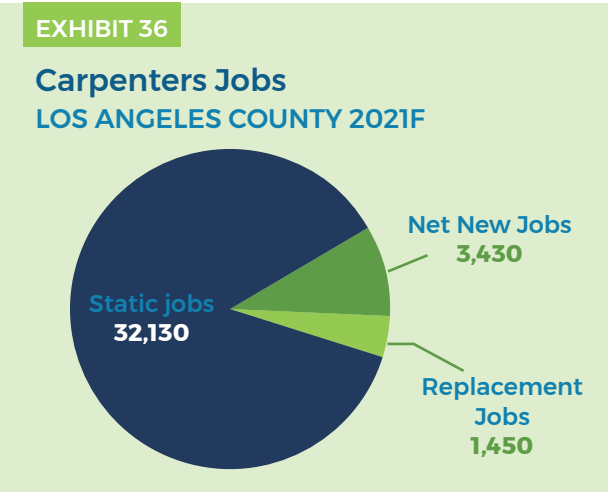
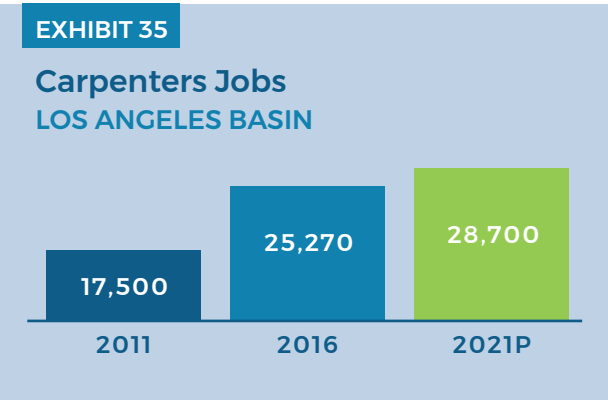
precision technical plans, blueprints, drawings, and models; and safety. This base of knowledge allows carpenters to navigate their job duties successfully.

Job responsibilities for carpenters typically involve: studying and following blueprints, sketches and plans for project layout, determining materials required and costing out a job; adherence to all safety rules and regulations; directing laborers and construction helpers; measuring and marking cutting lines on materials to specification; the construction, leveling, and installation of building frameworks, including walls, floors, and doorframes, with or without the aid of rigging hardware and cranes; inspect equipment, structures, or materials to identify problems or defects; and replace damaged framework or other structures and fixtures. Carpenters use hand tools, machines, or power tools to shape or cut materials, build frameworks and install structures or fixtures including windows, frames, floorings, molding, trim, or hardware. They are expected to maintain a safe and clean environment throughout the duration of the job and upon its completion.

Technology Requirement Often Cited in Employer Job Postings:

- Intuit QuickBooks & Quicken;
- Job costing software
- Project Management Software
 - Bosch Punch List;
 - Craftsman CD Estimator;
 - Turtle Creek Software Goldenseal;
 - VirtualBoss
- Microsoft Office
 - Excel
 - Word

This occupation is not at all automated with an automation score of 15 out of 100, which is no surprise as construction is often cited as one of the least automated and digitized industries. New technologies that hold the most promise for automation in the construction industry include: the use of virtual reality in project planning; the increased use of prefabricated and modular components to increase productivity, address worker shortages



and decrease waste; 3D printing of concrete buildings, bridges and other concrete structures; autonomous material movers; the use of drones for site inspections, inventory management and worker safety and supervision; and control systems and robotics used in concrete, masonry, excavation and demolition. While these advancements will make significant contributions to productivity in the industry, the occupation of carpenter will still be shielded from the threat of disemployment related to automation due to several factors: larger jobs and larger companies will be most likely to

Large Employers in the LA Basin

- Michaels Arts and Crafts
- California State University
- University California
- Amerit Fleet Solutions
- KDC Construction

use newer technologies, the cost of purchasing these technologies may be prohibitive for small jobs, the large market share of self employed and smaller-sized companies; jobs sites are unpredictable environments, no two are alike and things can and will go wrong at times; finally, the most opportunity for use of these new technologies exists for large-scale new construction, with the exception of prefabricated and modular components, their use in jobs in small and/or unconventional spaces, residential jobs and repairs and maintenance may be unfeasible or viewed as overkill.

construction, specialty trade contractors, the motion picture industry, administrative and support services (which includes facilities support and services to buildings) and furniture manufacturing. Employment in these top-five industries are expected to add jobs between 2016 and 2021, with the exception of furniture manufacturing which is anticipated to lose close to 3 percent of payroll employment over the period. Carpenters account for just under 16 percent of the middle-skill jobs in establishments engaged in the construction of buildings.

EXHIBIT 37

Top Five Industries Employing Carpenters in the LA Basin

Industry Description	TTL Jobs	M-Skill Share	2016		2016-21f
			Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Construction of buildings	53,560	56.9%	10,388	32.4%	9.5%
Specialty trade contractors	153,405	56.4%	9,753	11.3%	15.6%
Motion picture and sound recording industries	153,525	59.6%	1,102	1.2%	3.3%
Administrative and support services	387,999	26.5%	946	0.9%	8.5%
Furniture and related product mfg	18,668	26.2%	769	15.7%	-2.6%

Source: QCEW, OES, forecast and analysis by LAEDC

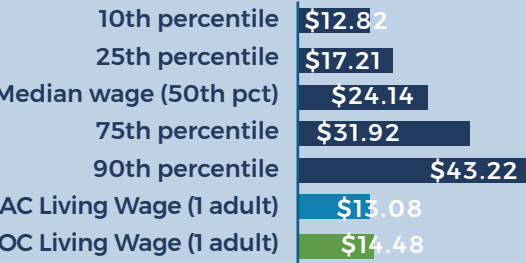
OCCUPATIONAL DEMAND

Carpenters number 25,270 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016 this occupation jobs grew by 7,770 jobs (44.4 percent). The employment outlook for this occupation is promising, as population growth will lead to increased demand for housing and supporting infrastructure such as schools, roads, power plants and commercial developments. This occupation has a relatively low level of employment churn with an annual replacement rate of 5.7 percent. Employment of carpenters is projected to number 28,700 jobs by 2021 with **4,880 total openings in the Los Angeles Basin between 2016 and 2021** due mostly to new jobs, which are projected to be double that of replacement openings.

The top-five industries employing the largest number of carpenters are listed in Exhibit 37. They include building

EXHIBIT 38

Carpenters Wages
LOS ANGELES BASIN



The median annual wage for carpenters is \$50,200 in the Los Angeles Basin. On an hourly basis, wages range from \$12.82 per hour in the tenth percentile to \$43.22 per hour in the nintieth percentile and a median hourly wage of \$24.14, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 38).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Carpenters have an LQ of 0.9 in the Los Angeles Basin in 2016. Los Angeles County, specifically, ranks second in the nation for the largest number of carpenters employed, behind the New York-Jersey City-White Plains Metropolitan Division. While there are a large number of carpenters in the Los Angeles Basin, the concentration is slightly less to that found nationally.

OCCUPATION HIGHLIGHTS

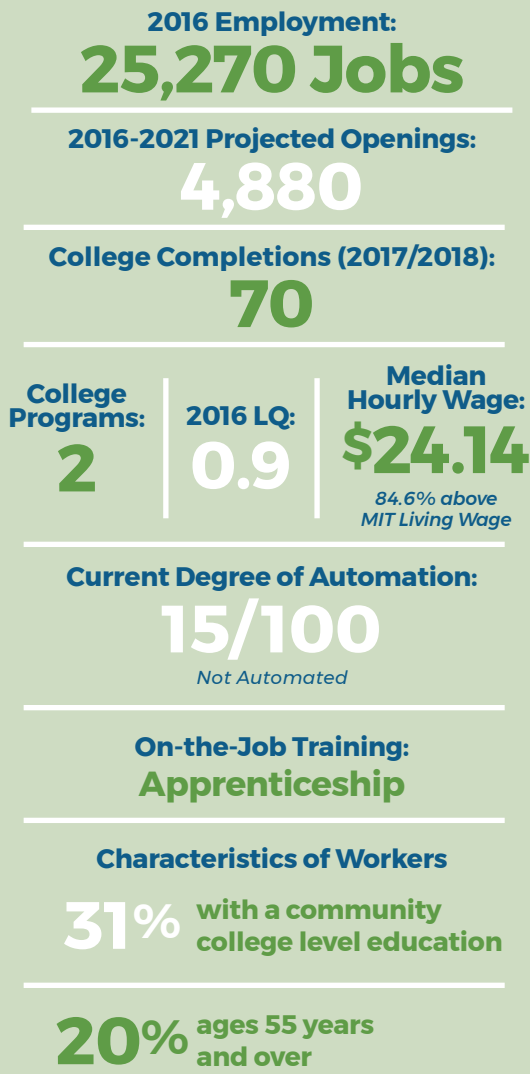


EXHIBIT 39

Carpentry Programs		2017-18 Awards
Carpentry		38
Mill and Cabinet Work		32
Total		70

Sources: COE

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

Colleges with Programs

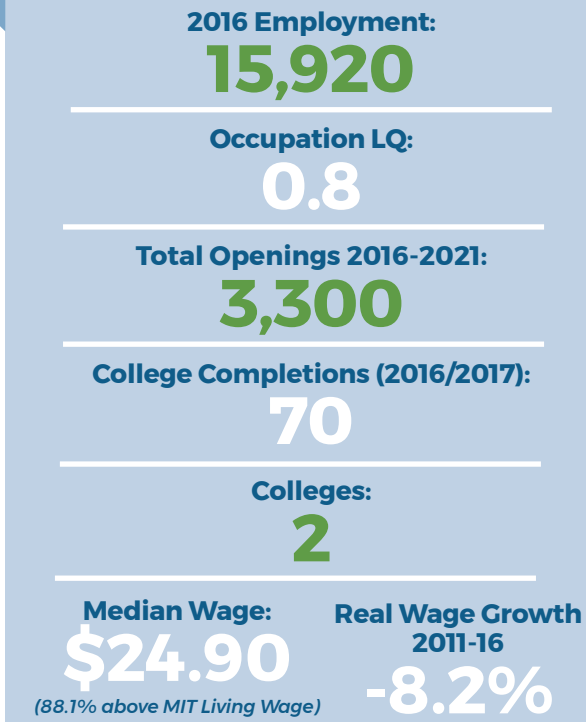
- Cerritos
- LA Trade-Tech

In Los Angeles County specifically, carpenters number 15,920 payroll workers in 2016; 5,990 jobs were added since 2011 (60.3 percent). Employment in this occupation is projected to number 18,300 jobs by 2021 with **3,300 total openings between 2016 and 2021** (659 annually). Wages range from \$11.98 per hour in the tenth percentile to \$44.44 per hour in the nintieth percentile, with a median hourly wage of \$24.60, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 88 percent.

In Los Angeles County, there are college programs providing training across two campuses. In the 2017-2018 year, there were 70 program completions.

In Orange County specifically, carpenters number 9,360 payroll workers in 2016; 1,780 jobs were added since 2011 (23.5 percent). Employment in this occupation is projected to number 10,400 jobs by

LOS ANGELES COUNTY HIGHLIGHTS



ORANGE COUNTY HIGHLIGHTS



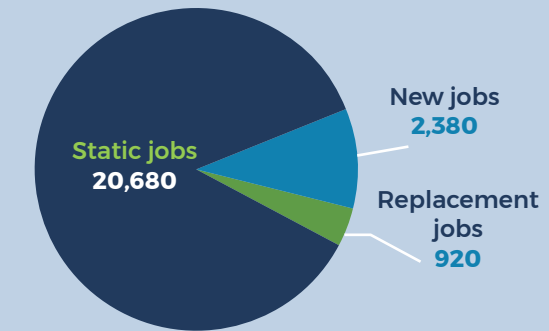
2021 with 1,590 total openings between 2016 and 2021 (317 annually). Wages range from \$15.26 per hour in the tenth percentile to \$41.06 per hour in the nintieth percentile, with a median hourly wage of \$23.52, higher than the \$14.48 per hour MIT living wage in Orange County by 62 percent.

In Orange County, there are no community college programs providing training for carpenters.

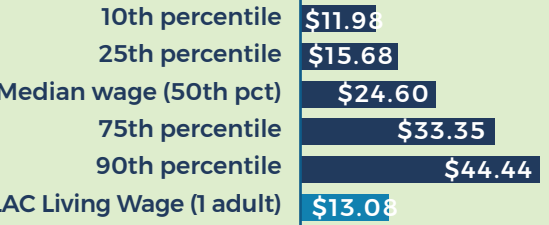
Carpenters Jobs LOS ANGELES COUNTY



Carpenters Jobs LOS ANGELES COUNTY 2021F



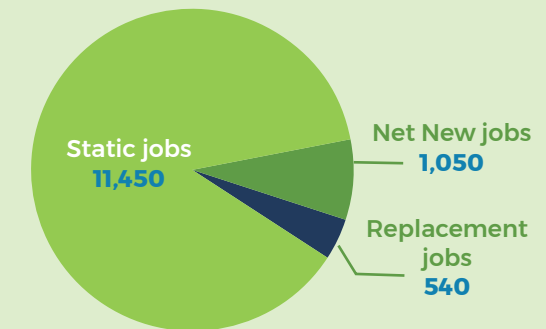
Carpenters Wages LOS ANGELES COUNTY 2016



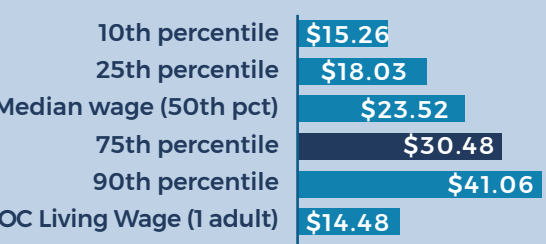
Carpenters Jobs
LOS ANGELES COUNTY



Carpenters Jobs
ORANGE COUNTY 2021F



Carpenters Wages
ORANGE COUNTY 2016



Electricians (SOC 47-2111)

Electricians are considered a middle-skill occupation. They install, maintain, and repair electrical wiring, equipment, and fixtures and ensure that all work done is in compliance with relevant codes. Electricians may also install or service street lights, intercom systems, or electrical control systems.

Electricians have jobs that range from electrical contracting to photovoltaic solarpanel installation, to electric vehicle charging station installation. They work in both residential and commercial environments, with some specializing specifically in new construction and others providing repair and services in existing buildings.

IN THE WORKPLACE

Many electricians work in the construction industry, in the LA Basin’s large entertainment industry, local government (utilities and electric power generation) or in building services and facilities support. They install, maintain, and repair electrical electrical power, communications, lighting, and control systems in homes, businesses, and factories.

Most electricians work full time with some nights and weekends, and it is not uncommon for them to work overtime as needed for scheduled maintenance or on construction sites. Safety is a key concern for individuals in this occupation as injuries related to the

Job Titles Found in this Occupation:

- Chief Electrician
- Control Electrician
- Electrician
- Industrial Electrician
- Inside Wireman
- Journeyman Electrician
- Journeyman Wireman
- Maintenance Electrician
- Mechanical Trades Specialist, Electrician
- Qualified Craft Worker, Electrician (QCW, Electrician)

Technology Requirement Often Cited in Employer Job Postings:

- Autodesk AutoCAD
- One Mile Up Panel Planner; SmartDraw
- Supervisory control and data acquisition SCADA software
- Construction Master Pro
- Electrosoft FlashWorks
- Elite Software Inpoin;
- SoftEmpire Electrical Calculations
- Wonderware InTouch
- Insight Direct ServiceCEO
- Resolve Systems Service Management
- Sage 300 Construction and Real Estate
- Shafer Service Systems
- Microsoft Word
- Socrates Contractor’s Library

job can be potentially fatal, including electrical shocks and falls, in addition to more minor injuries including burns and hearing loss.

Electricians regularly work alone, but in larger companies often work as a part of a team where they direct helpers and apprentices to assist them in finishing jobs. There are a significant number of electricians who are self-employed, and these individuals often work in residential construction.

Most electricians learn their trade in a 4- or 5-year apprenticeship program. For each year of the program, apprentices typically receive 2,000 hours of paid on-the-job training as well as some classroom instruction. In the classroom, apprentices learn electrical theory, blueprint reading, mathematics, electrical code requirements, and safety and first-aid practices. They may also receive specialized training related to soldering, communications, fire alarm systems, and elevators. Electricians in California are required to

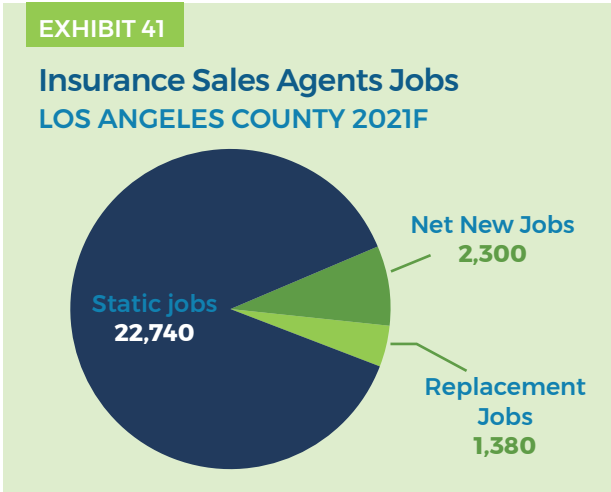
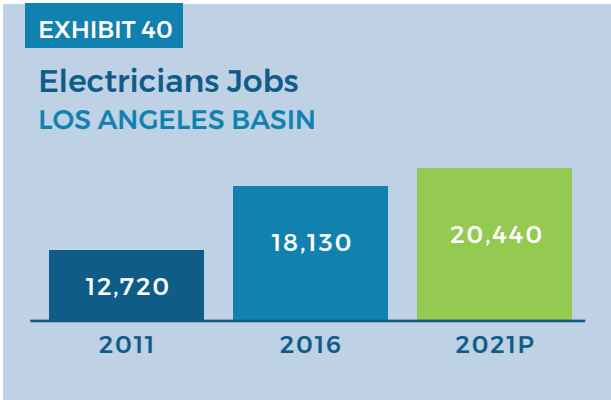
obtain a license by successfully passing the electrician certification exam.

There is a high degree of interaction with others, predominantly in face-to-face discussions with clients and coworkers, and as such, soft-skills, including interpersonal skills, effective communication skills, reliability and time management skills are highly valued.

The requisite knowledge for this occupation includes: building and construction materials, methods and tools used in the construction or repair of houses, buildings, or other structures such as highways and roads; mathematics; mechanical knowledge of machines and tools, including their designs, uses, repair, and maintenance; knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models; and safety. This base of knowledge allows electricians to navigate their job duties successfully.

Job responsibilities for electricians typically involve: the planning, layout and installation of electrical wiring, equipment, or fixtures, based on job specifications and local codes; connecting wires to circuit breakers, transformers, or other electrical components; testing electrical systems or continuity of circuits in electrical wiring, equipment, or fixtures to ensure compatibility and safety of system; and inspecting electrical systems, equipment, or components to identify hazards, defects, or the need for adjustment or repair, and to ensure compliance with codes. A variety of tools and equipment are used on the job including: power construction equipment; measuring devices; power tools; and testing devices, such as ohmmeters, voltmeters, oscilloscopes, ammeters, or test lamps. Because their work is required to be performed on the job site, commuting is often involved. It is becoming increasingly more important for electricians to gain the required licenses/degrees/certificates to be eligible to work on commercial low-voltage building automation systems.

This occupation is considered slightly automated with an automation score of 21 out of 100. Currently automation in this occupation varies according to the industry in which an electrician works. Those in construction industries face the least threat of automation as their duties are unpredictable, in terms of both location and tasks. Those working in power distribution face some threat of disemployment as



the automation of power distribution systems and substations and the use of smart-grid technologies continue to grow. Industrial automation is presenting employment opportunities for electricians; smart building technologies are automating the centralized control of a building's heating, ventilation and air conditioning, lighting, and other systems. These building automation systems (BAS) are requiring new skills for electricians who install and work on them, including tools, like an oscilloscope to look at line interference, system integration, data installing,

Large Employers in the LA Basin

- **Outsource**
- **Edison**
- **Disney**
- **City of Los Angeles**
- **Rogers Electric**

Internet-of-Things (IoT) and installation techniques, and understanding network data in order to install firewalls and other security measures to prevent hacking into the BAS.

OCCUPATIONAL DEMAND

Electricians number 18,140 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, jobs in this occupation grew by 5,410 jobs (42.5 percent).

lose close to 5 percent of payroll employment, over the period. Electricians account for close to 15 percent of the middle-skill jobs in specialty trade contractors.

The median annual wage for electricians is \$58,900 in the Los Angeles Basin. On an hourly basis, wages range from \$15.10 per hour in the tenth percentile to \$46.00 per hour in the nintieth percentile and a median hourly wage of \$28.32, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 43).

EXHIBIT 42

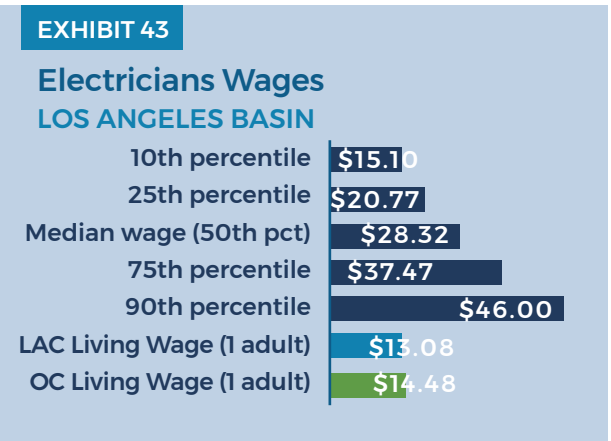
Top Five Industries Employing Electricians in the LA Basin

Industry Description	2016				2016-21f TTL Job Growth (%)
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	
Specialty trade contractors	153,405	56.4%	12,526	14.5%	15.6%
Local Government	299,641	47.7%	1,305	0.9%	-4.9%
Motion picture and sound recording industries	153,525	59.6%	1,064	1.2%	3.3%
Construction of buildings	53,560	59.9%	664	2.1%	9.5%
Administrative and support services	387,999	26.5%	475	0.5%	8.5%

Source: QCEW, OES, forecast and analysis by LAEDC

The employment outlook for this occupation is promising, as construction activity in the Basin remains robust and the demand for and investment in renewable and alternative energy sources increases. This occupation has a relatively high level of employment churn with an annual replacement rate of 7.6 percent. Employment of electricians is projected to number 20,440 jobs by 2021 with 3,690 total openings in the Los Angeles Basin between 2016 and 2021 due to both new and replacement jobs; the number of new jobs added are anticipated to be twice that of the replacement jobs over the period.

The top-five industries employing the largest number of electricians are listed in Exhibit 42. They include specialty trade contractors, local government, the motion picture and sound recording industry, construction of buildings and administrative and support services (includes security systems services, services to buildings and dwellings and facilities support services). Employment in these five industries is expected to grow between 2016 and 2021, with the exception of local government which is anticipated to



The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Electricians have an LQ of 0.8 in the Los Angeles Basin in 2016. Los Angeles County and Orange county ranks fifth and tenth in the nation, respectively,

for the largest number of electricians employed. While there are a large number of electricians in the Los Angeles Basin, the concentration is 20 percent less than is found nationally.

TALENT SUPPLY

Students interested in pursuing a career as an electrician may attend any of the four community colleges that offer the electrical (TOP 0952.20) program. In the 2017-18 academic year, these colleges conferred 177 awards (138 certificates and 39 associate degrees), with LA Trade-Tech conferring the majority (163 out

EXHIBIT 44	
Electrician Programs	
Electrical	2017-18 Awards 177
Total	177

Sources: COE

of 177). **The workforce demand for electricians far exceeds the supply**, as there are 737 projected job openings in the Los Angeles Basin annually.

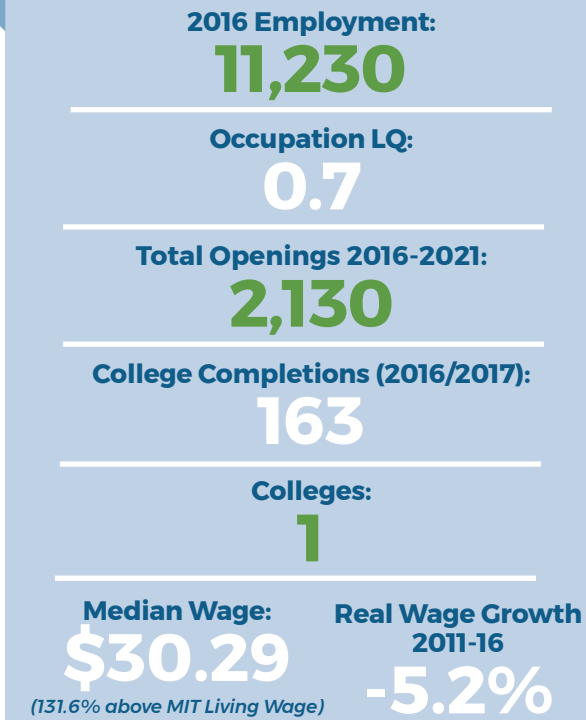
COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography. In Los Angeles County specifically, electricians number 11,230 payroll workers in 2016; 2,770 jobs were added since 2011 (32.7 percent). Employment in this occupation is projected to number 12,510 jobs by 2021 with **2,130 total openings between 2016 and 2021** (426 annually). Wages range from \$16.44 per hour in the tenth percentile to \$47.25 per hour in the nintieth percentile, with a median hourly wage of \$30.29, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 132 percent.

In Los Angeles County, there is one community college providing training. In the 2017-2018 year, there were 163 program completions.

In Orange County specifically, electricians number 6,900 payroll workers in 2016; 2,640 jobs were added since 2011 (62 percent). Employment in this occupation is projected to number 7,930 jobs by 2021 with **1,550 total openings between 2016 and 2021** (311 annually). Wages range from \$14.13 per hour in the tenth percentile to \$41.40 per hour in the nintieth percentile, with a median hourly wage of \$25.54, higher than the \$14.48 per hour MIT living wage in Orange County by 76 percent.

LOS ANGELES COUNTY HIGHLIGHTS



ORANGE COUNTY HIGHLIGHTS

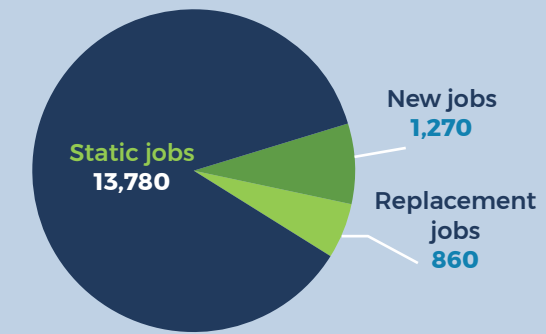


In Orange County, there are college programs providing training across three campuses. In the 2017-2018 year, there were 163 program completions.

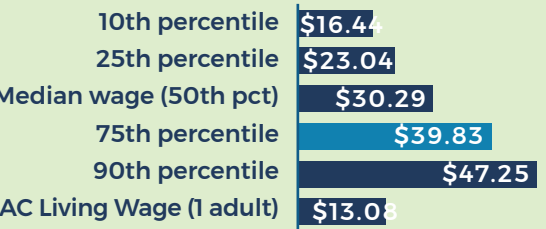
Electricians Jobs
LOS ANGELES COUNTRY

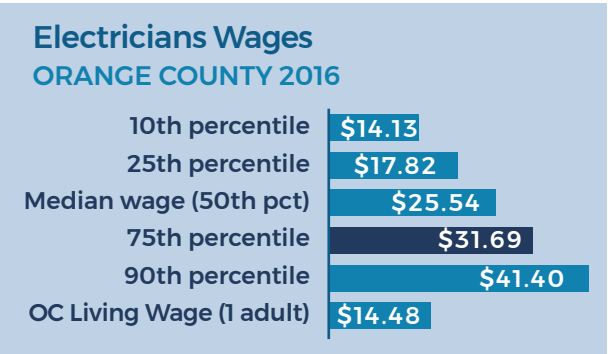
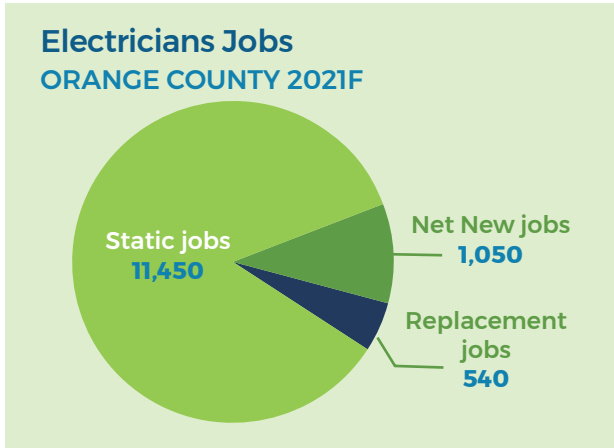
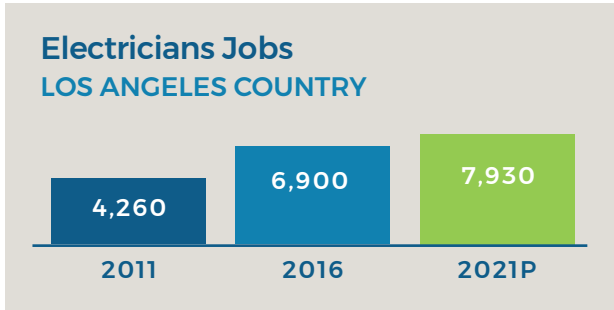


Electricians Jobs
LOS ANGELES COUNTY 2021F



Electricians Wages
LOS ANGELES COUNTY 2016





Job Titles Found in this Occupation:

- **Commercial Plumber**
- **Drain Cleaner**
- **Plumber**
- **Drain Technician**
- **Journeyman Plumber**
- **Master Plumber**
- **Plumber**
- **Plumber Gasfitter**
- **Plumbing and Heating Mechanic**
- **Residential Plumber**
- **Service Plumber**
- **Equipment Service Associate (ESA)**
- **Fire Sprinkler Service Technician**
- **Journeyman Pipefitter**
- **Machine Repairman**
- **Pipe Welder**
- **Pipefitter**
- **Sprinkler Fitter**
- **Steamfitter**

soldering, or threading joints; and inspecting, examining or testing installed systems or pipe lines, using pressure gauge, hydrostatic testing, observation, or other methods. A variety of tools and equipment are used on the job including: saws, cutting torches, pipe threaders, or pipe benders.

This occupation is considered not automated with an automation score of 17 out of 100. The majority of plumbers, pipefitters and steamfitters work in the construction sector, which is often cited as one of the least automated and digitized industries. The occupation of plumbers, pipefitters and steamfitters will largely be shielded from the threat of disemployment related to automation due to several factors: the number of self employed and smaller-sized companies operating in the repair side of the industry; jobs sites are unpredictable environments, and no two are alike; and things can and will go wrong at times.

OCCUPATIONAL DEMAND

Plumbers, pipefitters and steamfitters number 13,710 payroll workers in the Los Angeles Basin in our

Plumbers, Pipefitters and Steamfitters (SOC 47-2152)

Plumbers, pipefitters and steamfitters are considered a middle-skill occupation. Plumbers assemble, install, or repair pipes, fittings, or fixtures of heating, water, or drainage systems, according to specifications or plumbing codes. Pipefitters and steamfitters lay out, assemble, install, or maintain pipe systems, pipe supports, or related hydraulic or pneumatic equipment for steam, hot water, heating, cooling, lubricating, sprinkling, or industrial production or processing systems.

IN THE WORKPLACE

Many plumbers, pipefitters and steamfitters work for construction companies, in heavy and civil engineering construction, utilities, manufacturing industries and for local government; any industry that requires the assembly, installation, alteration, and repair of pipelines or pipe systems that carry water, steam, air, or other liquids or gases. A significant number of plumbers, pipefitters and steamfitters are self-employed. Their job sites are varied, including manufacturing facilities, homes, businesses, and other

places where there are pipes or septic systems; travel to various worksites on a daily basis is often required.

Individuals in this occupation generally work full time, including nights and weekends, and are often on-call to handle emergencies. There is a high degree of physicality in their job duties, and they spend most of their time on their feet, lift heavy materials, climb ladders, and often work in tight spaces, which also leads to a higher risk of personal injuries related to these job activities. They often interact with others, including clients and coworkers, and as such, soft-skills,

including interpersonal skills, effective communication skills, a cooperative attitude, reliability and time management skills are highly valued.

The requisite knowledge for this occupation includes: building and construction materials, methods and tools used in the construction or repair of houses, buildings, or other structures.; mathematics; mechanical knowledge of machines and tools, including their designs, uses, repair, and maintenance; knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models; and safety. This base of knowledge allows plumbers, pipefitters and steamfitters to navigate their job duties successfully.

Job responsibilities for plumbers, pipefitters and steamfitters typically involve: lay out of full scale drawings of pipe systems, supports or related equipment according to blueprints; measuring and marking pipes and cutting, threading or hammering pipes to specifications; assembling or securing pipes, tubes, fittings, or related equipment according to specifications, by welding, brazing, cementing,

Technology Requirement Often Cited in Employer Job Postings:

- **Autodesk Building Systems**
- **Elite Software Plumbing CAD and Sprinkler CAD**
- **Horizon Engineering Sigma Plumbing Calculator**
- **AEC Design Group CADPIPE**
- **ViziFlow**
- **Elite Software DPIPE**
- **Elite Software FIRE**
- **Klear Estimator**
- **Quote Software QuoteExpress**
- **Bentley Systems AutoPIPE**
- **COADE CAESAR II**
- **Pipepro Pipefitting**
- **Watter Hammer Software Hytran Office**
- **Intuit QuickBooks and Quicken**
- **Job costing software**
- **KRS Enterprises Service First!**

initial analysis of the regional economy for the CCW. Between 2011 and 2016 jobs in this occupation grew by 2,900 jobs (26.8 percent). The employment outlook for this occupation is promising, as the demand for individuals in this role is expected to increase related to growth in new construction and as current workers retire; in the LA Basin, 22 percent of workers in this occupation are ages 55 and older. This occupation has a relatively low level of employment churn with an annual replacement rate of 6.6 percent. Employment of plumbers, pipefitters and steamfitters is projected to number 16,000 jobs by 2021 with **3,190 total openings in the Los Angeles Basin between 2016 and 2021** mostly due to new jobs added.

The top-five industries employing the largest number of plumbers, pipefitters and steamfitters are listed in Exhibit 47. Besides the construction industries (specialty trade, buildings and heavy and civil engineering), they include local government and utilities. Specialty trade contractors, construction of buildings and heavy and civil engineering construction employment is anticipated to add jobs between 2016 and 2021. Local government and utilities are each expected to lose close to 5 percent of payroll employment over the period. Plumbers, pipefitters and steamfitters account for just over 12 percent of the middle-skill jobs in specialty trade contractors.

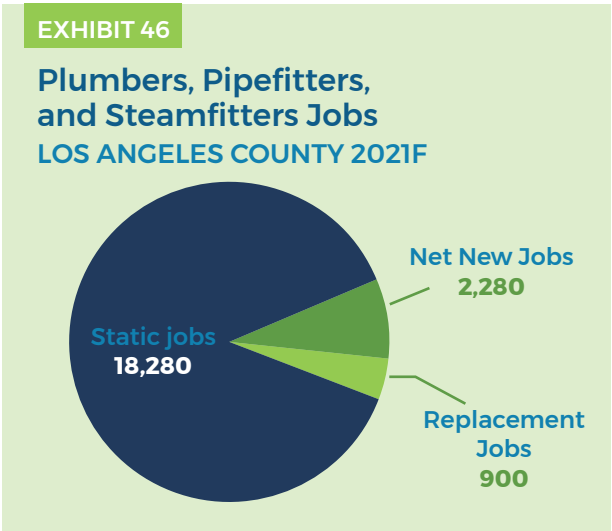
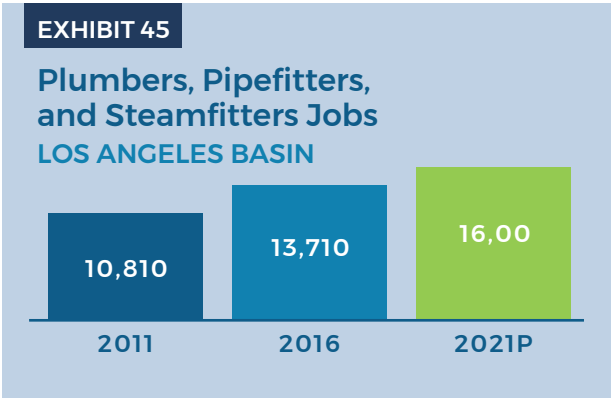


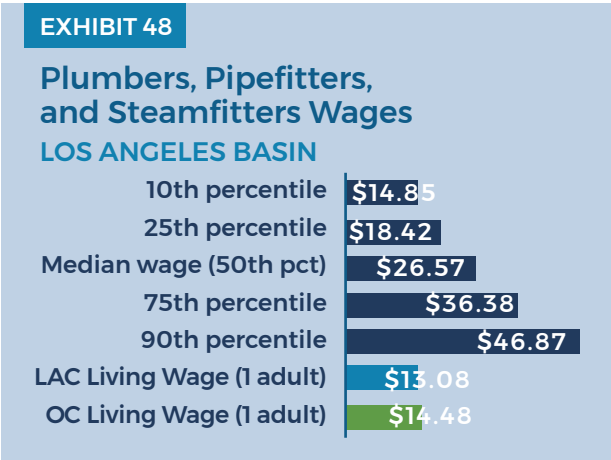
EXHIBIT 47

Top Five Industries Employing Plumbers, Pipefitters and Steamfitters in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Specialty trade contractors	153,405	56.4%	10,661	12.3%	15.6%
Local Government	299,641	47.7%	802	0.6%	-4.9%
Construction of buildings	53,560	59.9%	586	1.8%	9.5%
Heavy and civil engineering construction	22,030	48.7%	335	3.1%	22.6%
Utilities	14,935	60.6%	290	3.2%	-5.3%

The median annual wage for plumbers, pipefitters and steamfitters is \$55,270 in the Los Angeles Basin. On an hourly basis, wages range from \$14.85 per hour in the tenth percentile to \$46.87 per hour in the nintieith percentile and a median hourly wage of \$26.57, above the MIT living wage of \$13.08 and \$14.48 per hour in Los

Source: QCEW, OES, forecast and analysis by LAEDC Angeles and Orange counties respectively (Exhibit 48). The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest



Colleges with Programs

- LA Trade-Tech

of the nation. Plumbers, pipefitters and steamfitters have an LQ of 0.8 in the Los Angeles Basin in 2016. Los Angeles County, specifically, ranks fourth in the nation for the largest number of plumbers, pipefitters and steamfitters employed, behind the New York, Houston and Chicago metropolitan areas, While there are a large number of plumbers, pipefitters and steamfitters in the Los Angeles Basin, the concentration is 20 percent less to that found nationally.

TALENT SUPPLY

LA Trade-Tech is the only college in the Los Angeles Basin that offers the plumbing, pipefitting and steamfitting (TOP 0952.30) program. In the 2017-18 year, LA Trade-Tech conferred 35 awards (31 certificates and 4 associate degrees).

In the Los Angeles Basin, the demand for plumbers, pipefitters and steamfitters exceeds the current community college supply. There are 637 job openings projected within the region annually compared to 35 program completions.

In the state, four additional community colleges have plumbing, pipefitting, and steamfitting program: Bakersfield, Diablo Valley, Foothill, and San Francisco colleges. In the 2017-18 academic year, these four colleges conferred 121 certificates (no associate degrees).

OCCUPATION HIGHLIGHTS

2016 Employment:
13,710 Jobs

2016-2021 Projected Openings:
3,190

College Completions (2017/2018):
35

College Programs: **1** | **2016 LQ:** **0.8** | **Median Hourly Wage:** **\$26.57**
103.1% above MIT Living Wage

Current Degree of Automation:
17/100
Not Automated

On-the-Job Training:
Apprenticeship

Characteristics of Workers

35% with a community college level education

22% ages 55 years and over

Large Employers in the LA Basin

- American Residential Services
- Beutler Air Conditioning and Plumbing
- Roto-Rooter Plumbing
- Los Angeles County
- Suburban Plumbing

EXHIBIT 49

Plumbers, Pipefitters, and Steamfitters Programs

Plumbing, Pipefitting and Steamfitting	35
Total	35

2017-18 Awards

Sources: COE

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county’s economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

LOS ANGELES COUNTY HIGHLIGHTS



In Los Angeles County specifically, plumbers, pipefitters, and steamfitters number 8,680 payroll workers in 2016; 1,780 jobs were added since 2011 (25.8 percent). Employment in this occupation is projected to number 10,030 jobs by 2021 with **1,920 total openings between 2016 and 2021** (385 annually). Wages range from \$15.15 per hour in the tenth percentile to \$45.76 per hour in the nintieth percentile, with a median hourly wage of \$26.39, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 102 percent.

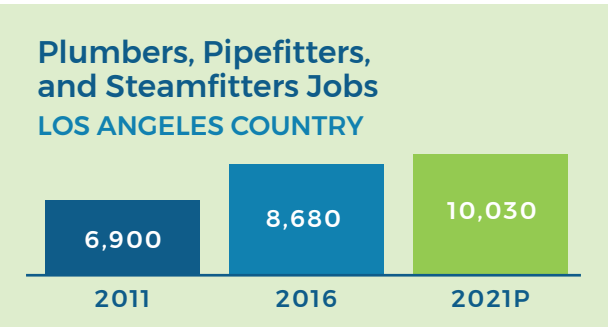
In Los Angeles County, there is one community college providing training. In the 2017-2018 year, there were 35 program completions.

ORANGE COUNTY HIGHLIGHTS

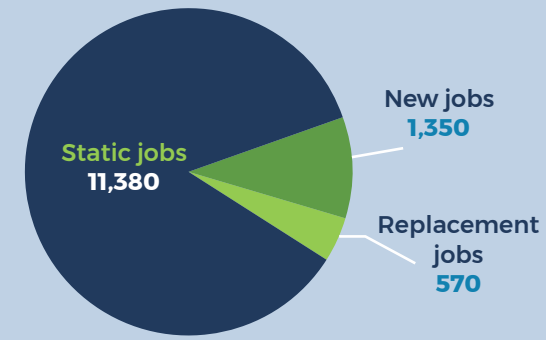


In Orange County specifically, plumbers, pipefitters, and steamfitters number 5,040 payroll workers in 2016; 1,120 jobs were added since 2011 (28.6 percent). Employment in this occupation is projected to number 5,970 jobs by 2021 with **1,260 total openings between 2016 and 2021** (252 annually). Wages range from \$14.38 per hour in the tenth percentile to \$48.96 per hour in the nintieth percentile, with a median hourly wage of \$27.10, higher than the \$14.48 per hour MIT living wage in Orange County by 87 percent.

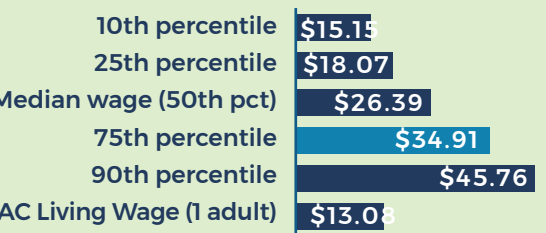
In Orange County, there are no community colleges with the plumbing, pipefitting and steamfitting program.



Plumbers, Pipefitters, and Steamfitters
LOS ANGELES COUNTY 2021F



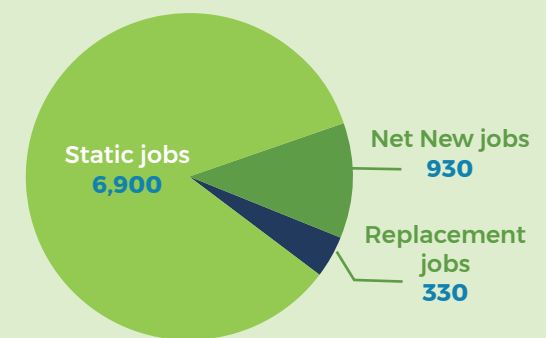
Plumbers, Pipefitters, and Steamfitters Wages
LOS ANGELES COUNTY 2016



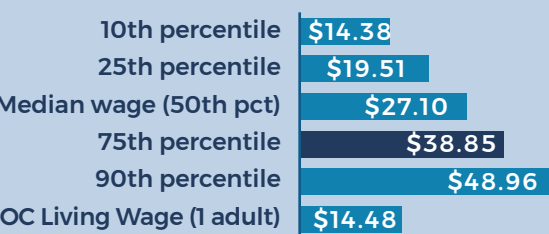
Plumbers, Pipefitters, and Steamfitters Jobs
ORANGE COUNTRY



Plumbers, Pipefitters, and Steamfitters Jobs
ORANGE COUNTY 2021F



Plumbers, Pipefitters, and Steamfitters
ORANGE COUNTY 2016



Automotive Service Technicians and Mechanics (SOC 49-3023)

Automotive service technicians and mechanics are considered a middle-skill occupation. They diagnose, adjust, repair, or overhaul automotive vehicles and light trucks. This occupation includes technicians and mechanics who specialize in electric and other alternative fuel vehicles. Excluded from this occupation are individuals who specialize in autobody repair, large engine and diesel engines or installers of electronic equipment into motor vehicles.

IN THE WORKPLACE

Many automotive service technicians and mechanics work for repair shops, in the service departments of car dealerships, or provide maintenance and service to operations with fleet vehicles, such as in local government, transit agencies, law enforcement agencies, companies who provide security and patrol services, and taxis and limousine services. Some individuals in this occupation are self-employed.

Automotive service technicians and mechanics generally work full time, many work nights and weekends and overtime is very common. Individuals working in this occupation are on their feet most of the time and often have to get into uncomfortable positions to complete their tasks. Computers are used to diagnose automotive problems, and automotive repair and maintenance requires the use of tools and

Technology Requirement Often Cited in Employer Job Postings:

- Data entry software
- Work order management software
- Hunter WinAlign
- Nexiq Tech HDS Suite for Palm
- Alliance Automotive Shop Controller
- Mitchell OnDemand5 Manager
- Scott Systems MaxxTraxx Pro
- Snap-On ShopKey
- Online service/technical manual database software
- IBM Note
- Microsoft Outlook

Job Titles Found in this Occupation:

- A/C Technician
- Automobile/ Automotive Mechanic
- Automobile/ Automotive Technician
- Drivability Technician
- Heavy Line Technician
- Lube Technician
- Oil Bay Technician
- Quick Service Technician
- Service Technician ASE (Automotive Service Excellence)
- Master Mechanic
- Automotive Drivability Technician
- Automotive Service Technician
- Certified ASE Master Automotive Technician
- Master Automotive Technician
- Master Technician
- Mechanic, Transmission Rebuilder

handling of parts that are often heavy, greasy and dirty. Service technicians and mechanics wear protective and safety equipment to protect them from exposure to contaminants, loud noises and other potential hazards they are exposed to on the job. They have a high degree of interaction with others, having face-to-face discussions with customers and coworkers on a dialy basis. As such, soft-skills, including interpersonal skills and effective communication skills, attention to detail, dependability, integrity, and time management skills, are highly valued. This occupation can be high stress, with pressure to complete tasks within a certain allotted time being very common.

Mechanical knowledge, customer service practices, and knowledge of computers and electronics and administrative and management functions are required for this occupation. More specifically, individuals in this occupation require an understanding of: machines and tools, including their designs, uses, repair, and maintenance; principles and processes for providing customer and personal services, including customer needs assessments, meeting quality standards for services, and evaluating customer satisfaction; circuit boards, and processors, chips, electronic equipment, and computer hardware and software, including applications and programming. This base of knowledge allows automotive service technicians and mechanics to navigate their job duties sucessfully.

Job responsibilities for automotive service technicians and mechanics typically involve: inspecting vehicles for damage and necessary repairs; identifying problems and troubleshooting automotive systems using computerized diagnostic and other electronic testing equipment; planning work procedures using charts, reading technical manuals; performing basic care and maintenance and repairing or replacing worn parts; providing cost estimates; performing repairs to manufacturer and customer specifications; and explaining problems and repairs to customers. A growing number of technicians are required to work on vehicles that use electricity (EVs) or run on alternative fuels.

This occupation is considered not at all automated with an automation score of 16 out of 100. Currently automation in this occupation is considered complimentary versus a direct threat to employment. New technologies are being used in the diagnoses of mechanical issues while the repair and maintenance part of the job is still mostly hands on. As cars are equiped with increasingly detailed computerized components, automotive service technicians and mechanics must be trained in electronic and computer-based skills and specific computer diagnostic hardware and software to work on these new complex systems. Their duties now include programming computer systems in vehicles and using tablet computers as a diagnostic tool. Vehicle maintenance records are electronic, increasing efficiency in operations and allowing a vehicle's maintenance and repair history to be immediately accessible. Future technologies may include the

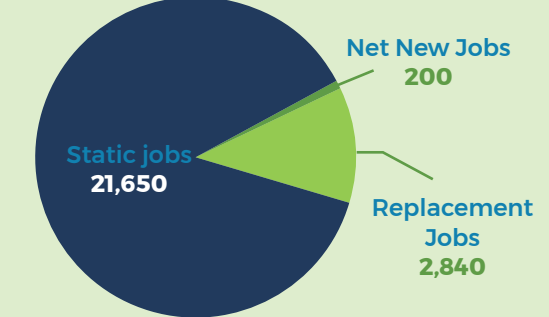
EXHIBIT 50

Automotive Service Technicians and Mechanics Jobs LOS ANGELES BASIN



EXHIBIT 51

Automotive Service Technicians and Mechanics Jobs LOS ANGELES COUNTY 2021F



incorporation of augmented reality apps for diagnosis and 3D printing of hard-to-find or customized parts.

OCCUPATIONAL DEMAND

Automotive service technicians and mechanics number 21,240 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, the number of people employed in this occupation grew by 1,680 jobs (8.6 percent). The employment outlook for this occupation

Large Employers in the LA Basin

- Chrysler
- AutoNation
- Pep Boys
- Honda
- Toyota

EXHIBIT 52

Top Five Industries Employing Automotive Service Technicians and Mechanics in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Motor vehicle and parts dealers	65,403	43.5%	10,271	36.1%	1.2%
Repair and maintenance	53,929	54.5%	8,400	28.6%	2.1%
Local Government	299,641	47.7%	642	0.4%	-4.9%
Administrative and support services	387,999	26.5%	348	0.3%	8.5%
Support activities for transportation	55,160	55.5%	217	0.7%	-0.4%

Source: QCEW, OES, forecast and analysis by LAEDC

is promising, as the demand for individuals in this role is expected to increase as the the number of vehicles on the road rises and individuals with training in new automotive technologies are required. This occupation has a relatively high level of employment churn with an annual replacement rate of 13.4 percent. Employment of automotive service technicians and mechanics is projected to number 21,450 jobs by 2021 with 3,050 total openings in the Los Angeles Basin between 2016 and 2021 mostly due to replacement jobs.

EXHIBIT 53

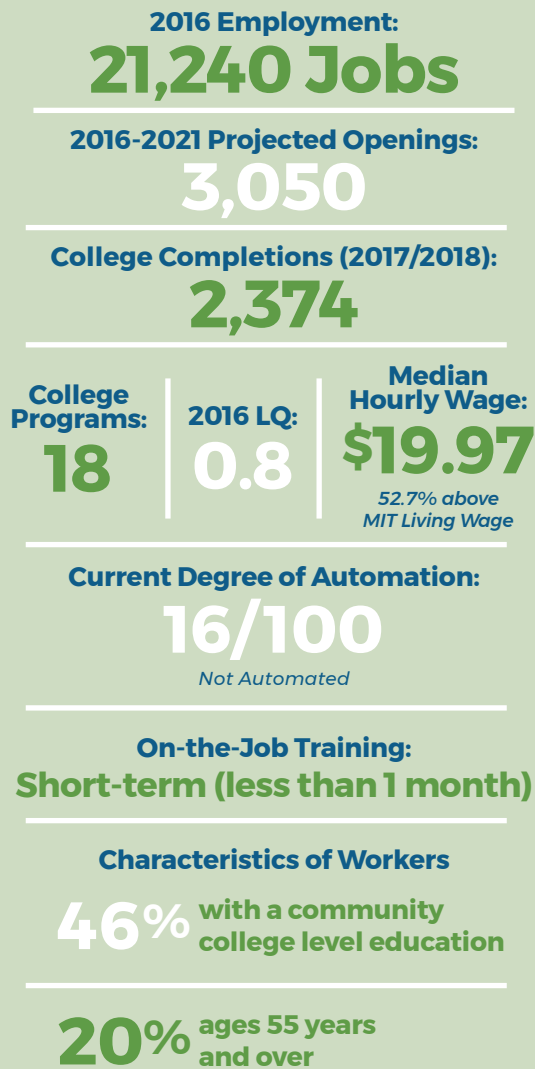
Automotive Service Technicians and Mechanics Wages

LOS ANGELES BASIN

10th percentile	\$11.48
25th percentile	\$15.28
Median wage (50th pct)	\$19.97
75th percentile	\$28.07
90th percentile	\$35.84
LAC Living Wage (1 adult)	\$13.08
OC Living Wage (1 adult)	\$14.48

The top-five industries employing the largest number of automotive service technicians and mechanics are listed in Exhibit 52. They include a variety of industries such as motor vehicle and parts dealers, repair and maintenance, local government, administrative and support services (includes tour operators and security services) and support activities for transportation (includes towing services).These industries are expected to add jobs between 2016 and 2021, with the exception of local government and support activities for transportation which are anticipated to decrease

OCCUPATION HIGHLIGHTS



payroll employment by 5 percent and less than 1 percent, respectively, over the period. Automotive service technicians and mechanics account for 36 percent and close to 29 percent of the middle-skill jobs in motor vehicle and parts dealers, and the repair and maintenance industry respectively.

The median annual wage for automotive service technicians and mechanics is \$41,530 in the Los Angeles Basin. On an hourly basis, wages range from \$11.48 per hour in the tenth percentile to \$35.84 per hour in the nintietth percentile and a median hourly wage of \$19.97, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 53).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Automotive service technicians and mechanics have an LQ of 0.8 in the Los Angeles Basin in 2016. Los Angeles County, specifically, ranks second in the nation for the largest number of automotive service technicians and mechanics employed, behind the New York metropolitan area. While there are a large number of automotive service technicians and mechanics in the Los Angeles Basin, the concentration is 20 percent less than that found nationally.

TALENT SUPPLY

Across the Los Angeles Basin, there are 15 community colleges providing training for automotive service technicians and mechanics. In the 2017-18 year, colleges with automotive technology (TOP 0948.00), and alternative fuels and advanced transportation technology (TOP 0948.40) programs conferred 2,374 awards (2,229 certificates; 145 associate degrees). As a result of these completions, **there appears to be an oversupply of trained students**. There are expected to be 609 job openings annually for automotive service technicians and mechanics, which is far below the number of regional community college program completions.

Colleges with Programs

- Cerritos
- Citrus
- Compton
- Cypress
- East LA
- El Camino
- Fullerton
- Golden West
- LA Pierce
- LA Trade-Tech
- Long Beach
- Pasadena
- Rio Hondo
- Saddleback
- Santa Ana

EXHIBIT 54

Auto Service Techs and Mechanics Programs	2017-18 Awards
Automotive Technology	2,326
Alternative Fuels and Advanced Transportation Technology	48
Total	2,374

Sources: COE

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, automotive service technicians and mechanics number 16,080 payroll workers in 2016; 1,770 jobs were added since 2011 (12.4 percent). Employment in this occupation is projected to number 16,090 jobs by 2021 with **2,160 total openings between 2016 and 2021** (433 annually). Wages range from \$11.42 per hour in the tenth percentile to \$31.80 per hour in the nintietth percentile, with a median hourly wage of \$18.99, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 45 percent.

In Los Angeles County, there are college programs providing training across ten campuses. In the 2017-2018 year, there were 793 program completions.

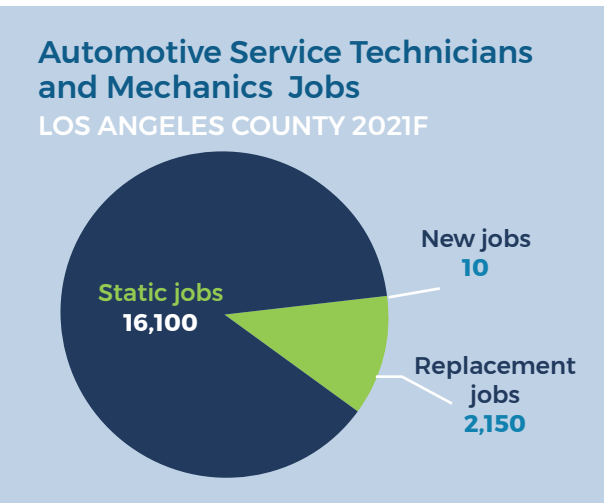
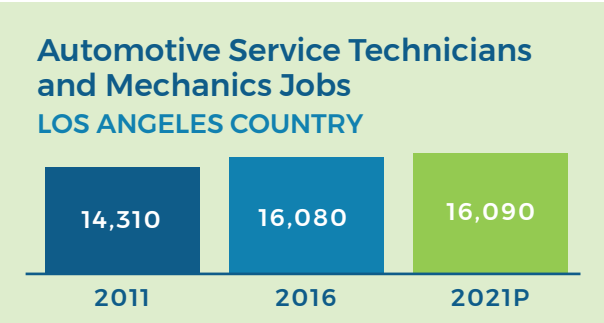
LOS ANGELES COUNTY HIGHLIGHTS



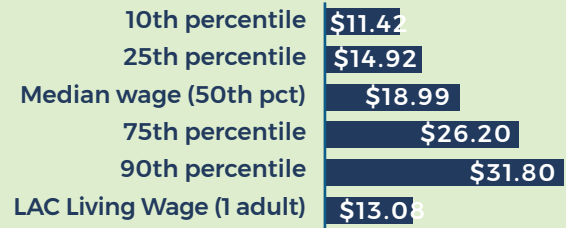
In Orange County specifically, automotive service technicians and mechanics number 5,170 payroll workers in 2016; 90 jobs were lost since 2011 (-1.7 percent). Employment in this occupation is projected to number 5,360 jobs by 2021 with **880 total openings between 2016 and 2021** (176 annually). Wages range from \$11.66 per hour in the tenth percentile to \$43.82 per hour in the nintieth percentile, with a median hourly wage of \$25.40, higher than the \$14.48 per hour MIT living wage in Orange County by 75 percent.

In Orange County, there are college programs providing training across five campuses. In the 2017-2018 year, there were 1,581 program completions.

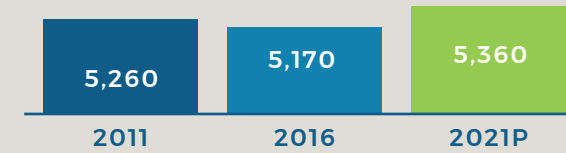
ORANGE COUNTY HIGHLIGHTS



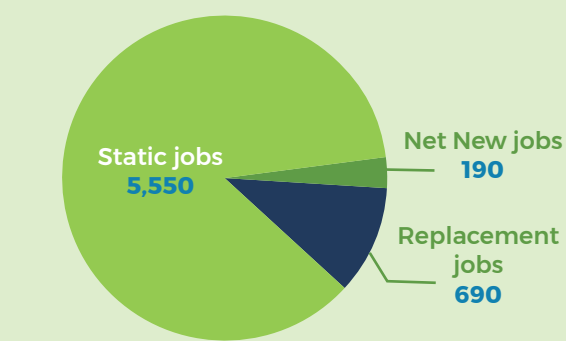
Automotive Service Technicians and Mechanics Wages
LOS ANGELES COUNTY 2016



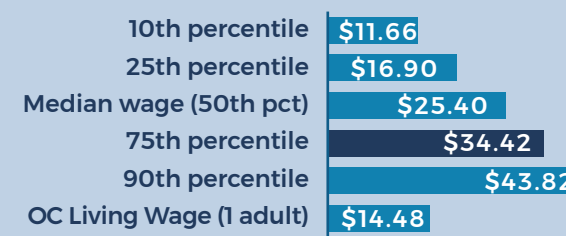
Automotive Service Technicians and Mechanics Jobs
LOS ANGELES COUNTRY



Automotive Service Technicians and Mechanics Jobs
ORANGE COUNTY 2021F



Automotive Service Technicians and Mechanics Wages
ORANGE COUNTY 2016



Heating, Air Conditioning and Refrigeration Mechanics and Installers (SOC 49-9021)

Heating, air conditioning and refrigeration (HVAC or HVACR) mechanics and installers are considered a middle-skill occupation. They install or repair heating, central air conditioning or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves. Through their services, they provide climate-controlled environments where the temperature, humidity, and overall air quality in homes, businesses, and other buildings are regulated. Refrigeration systems installed by HVACR technicians make it possible to store and transport food, medicine, and other perishable items.

IN THE WORKPLACE

Many heating, air conditioning and refrigeration mechanics and installers work in the construction industry, for repair and maintenance companies, in wholesale operations and for local governments. Individuals in this occupation typically work full-time, withovertime or irregular hours common, especially during peak heating and cooling seasons and some may have to work night and/or weekend shifts. They are constantly interacting with others, both clients and coworkers, making soft-skills (including interpersonal skills, effective communication skills and time management skills) highly valued.

Individuals in this occupation must be aware of, and adhere to, government regulations that exist for the use, recovery, disposal and recycling of refrigerants and disposal of fluids and pressurized gases. HVACR workers wear protective clothing and use other safety equipment to minimize the risk associated with handling chemicals and other hazardous materials, including refrigerants which can be highly flammable

Technology Requirement Often Cited in Employer Job Postings:

- Enterprise resource planning ERP software
- SAP
- Facility energy management software;
- Johnson Controls Metasys
- Building automation software
- Microsoft Office/Outlook

Job Titles Found in this Occupation:

- A/C (Air Conditioning) Tech/ Technician
- HVAC (Heating, Ventilation, Air Conditioning) Installer/ Mechanic/ Service Tech/ Technician/ Specialist
- Service Technician
- Systems Mechanic
- Ammonia Refrigeration Technician
- HVAC / R (Heating, Ventilation, Air Conditioning / Refrigeration) Technician/ Service Technician/
- HVAC Service Technician
- Refrigeration Mechanic/ Operator/ Technician
- Transportation Refrigeration Technician

and can result in skin damage, frostbite or blindness if not properly handled. When working in small spaces, inhalation of refrigerants is also a concern. The U.S. Environmental Protection Agency (EPA) requires those who buy, handle, or work with refrigerants to be certified in proper refrigerant handling, and certification is obtained by successfully passing an exam.

Some HVACR technicians specialize in one or more specific aspects of HVACR, such as radiant heating systems, solar panels, testing and balancing, or commercial refrigeration. Candidates familiar with tablet computers and electronics, as well as those who have developed troubleshooting skills will have the best job prospects.

Mechanical knowledge, customer service practices, and knowledge of building and construction, design, physics and mathematics are required for this occupation. More specifically, individuals in this occupation require an understanding of: machines and tools, including their designs, uses, repair, and maintenance; principles and processes for providing customer service including needs assessments, meeting quality standards for services, and evaluating satisfaction; materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures; design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models; physical principles, laws, their interrelationships and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes; circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming; and mathematics. This base of knowledge allows HVACR mechanics and installers to navigate their job duties sucessfully.

Job responsibilities for heating, air conditioning and refrigeration typically involve: installing, cleaning and maintaining HVACR systems and their electrical components and wiring; inspecting and testing HVACR systems and components; discussing malfunctions with customers and recommending maintenance to improve system performance; repairing and/or replacing worn or defective parts; and maintaining records of work performed.

This occupation is considered slightly automated with an automation score of 24 out of 100. HVACR mechanics and installers can can repair heating and air conditioning issues in homes and businesses, install heating and air conditioning systems in new construction, and install and provide service for refrigerated warehouses and install smart building technologies. Currently automation in this occupation varies according to the industry in which an electrician works. Those in construction industries face the least threat of automation as their duties are unpredictable, in terms of both location and tasks. Sales and services are being automated, and new technologies include the use of online tools and software by HVACR contractors in their design, smart phone apps used to control systems, and the use of HVAC zoning, which

EXHIBIT 55

Heating, Air Conditioning, and Refrigeration Mechanics and Installers Jobs LOS ANGELES BASIN

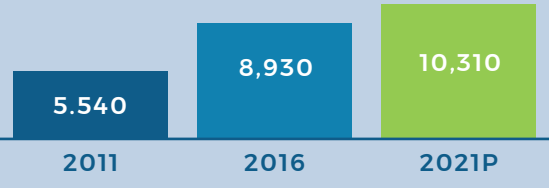
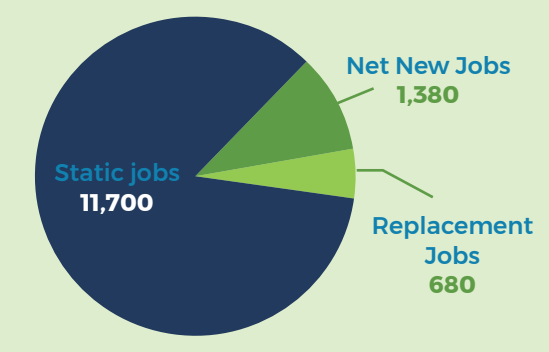


EXHIBIT 56

Heating, Air Conditioning, and Refrigeration Mechanics and Installers Jobs LOS ANGELES COUNTY 2021F



controls different parts of the home seperately for increased energy efficiency. The use of smart building technologies are automating the centralized control of a building's heating, ventilation and air conditioning, lighting, and other systems. These building automation systems (BAS) are requiring new and more technical skills for HVACR mechanics and installers.For this reason, understanding and experience with advanced automation and controls is highly valued.

Large Employers in the LA Basin

- Sears
- Gulfstream Strategic Placements
- Alliance Residential Company
- Control Air Conditioning Corporation
- Legacy Air

EXHIBIT 52

Top Five Industries Employing Heating, Air Conditioning and Refrigeration Mechanics and Installers in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Specialty trade contractors	153,405	56.4%	6,473	7.5%	15.6%
Repair and maintenance	53,929	54.5%	625	2.1%	2.1%
Merchant wholesalers, durable goods	146,962	46.4%	403	0.6%	2.3%
Local Government	288,641	47.7%	378	0.3%	-4.9%
Educational services	411,514	20.5%	235	0.3%	5.0%

Source: QCEW, OES, forecast and analysis by LAEDC

OCCUPATIONAL DEMAND

Heating, air conditioning and refrigeration mechanics and installers number 8,930 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, people employed in this occupation increased by 3,390 jobs (61.2 percent). The employment outlook for this occupation is promising, and the demand for individuals in this role is expected to increase as construction of commercial and residential buildings grow, the push for energy efficiency continues and climate control systems become more advanced. The annual replacement rate, stemming mostly from employment churn in this occupation, is 7.6 percent. Employment of heating, air conditioning and refrigeration mechanics and installers is projected to number 10,310 jobs by 2021 with **2,060 total opennings in the Los Angeles Basin between 2016 and 2021** due mostly to new jobs that will be added.

EXHIBIT 58

Heating, Air Conditioning, and Refrigeration Mechanics and Installers Jobs

LOS ANGELES BASIN

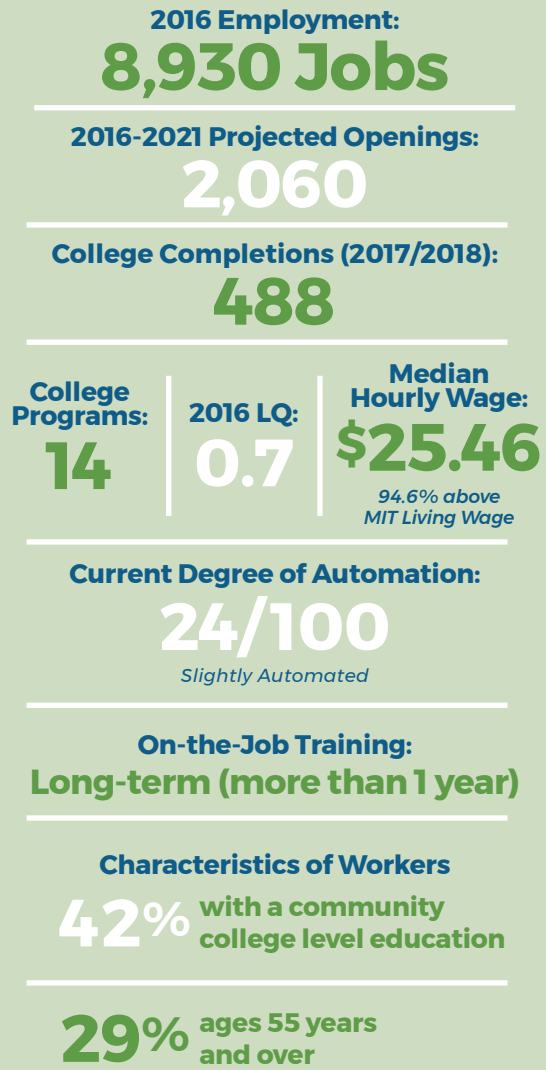
10th percentile	\$13.90
25th percentile	\$18.90
Median wage (50th pct)	\$25.46
75th percentile	\$34.62
90th percentile	\$42.64
LAC Living Wage (1 adult)	\$13.08
OC Living Wage (1 adult)	\$14.48

The top-five industries employing the largest number of heating, air conditioning, and refrigeration mechanics and installers are listed in Exhibit 57. They include specialty trade contractors, repair and maintenance, durable goods wholesalers, local government and education and postal service. Four of the top-five are anticipated to add jobs between 2016 and 2021, with local government expected to lose close to 5 percent of payroll employment over the period. Heating, air conditioning, and refrigeration mechanics and installers account for close to 8 percent of the middle-skill jobs in specialty trade contractors.

The median annual wage for heating, air conditioning, and refrigeration mechanics and installers is \$52,960 in the Los Angeles Basin. On an hourly basis, wages range from \$13.90 per hour in the tenth percentile to \$42.64 per hour in the nintieth percentile and a median hourly wage of \$25.46, which is above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 58).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Heating, air conditioning, and refrigeration mechanics and installers have an LQ of 0.7 in the Los Angeles Basin in 2016. Los Angeles County, specifically, ranks fifth in the nation for the largest number of heating, air conditioning and refrigeration mechanics and installers employed.

OCCUPATION HIGHLIGHTS



While there are a large number of heating, air conditioning and refrigeration mechanics and installers in the Los Angeles Basin, the concentration is 30 percent less to that found nationally.

OCCUPATIONAL DEMAND

Currently, 12 community colleges in the region provide training for heating, air conditioning, and refrigeration mechanics and installers. In the 2017-18 academic year, colleges offering environmental control technology (TOP 0946.00) and energy systems technology (TOP 0946.10) conferred 488 awards (421 certificates and 67 associate degrees). **There may be a slight oversupply of**

Colleges with Programs

- Compton
- Cypress
- El Camino
- Golden West
- LA Trade-Tech
- LA Valley
- Long Beach
- Mt San Antonio
- Orange Coast
- Pasadena
- Rio Hondo
- Santa Monica

community college HVACR completers, since there are 413 projected annual openings in the Los Angeles Basin.

EXHIBIT 59

HVACR Programs	2017-18 Awards
Environmental Control Technology	429
Energy Systems Technology	59
Total	488

Sources: COE

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, heating, air conditioning, and refrigeration mechanics and installers number 6,500 payroll workers in 2016; 3,010 jobs were added since 2011 (86.2 percent). Employment in this occupation is projected to number 7,430 jobs by 2021 with **1,430 total opennings between 2016 and 2021** (286 annually). Wages range from \$12.14 per hour in the tenth percentile to \$43.70 per hour in the nintieth percentile, with a median hourly wage of \$26.40, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 102 percent.

In Los Angeles County, there are college programs providing training across nine campuses. In the 2017-2018 year, there were 320 program completions.

LOS ANGELES COUNTY HIGHLIGHTS



In Los Angeles County specifically, heating, air conditioning, and refrigeration mechanics and installers number 6,500 payroll workers in 2016; 3,010 jobs were added since 2011 (86.2 percent). Employment in this occupation is projected to number 7,430 jobs by 2021 with **1,430 total openings between 2016 and 2021** (286 annually). Wages range from \$12.14 per hour in the tenth percentile to \$43.70 per hour in the nintieth percentile, with a median hourly wage of \$26.40, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 102 percent.

In Los Angeles County, there are college programs providing training across nine campuses. In the 2017-2018 year, there were 320 program completions.

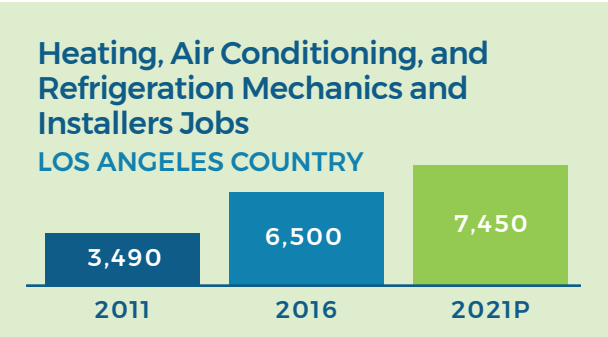
In Orange County specifically, heating, air conditioning, and refrigeration mechanics and installers number 2,430 payroll workers in 2016; 380 jobs were added since 2011 (18.5 percent). Employment in this occupation is projected to number 2,880 jobs by 2021

ORANGE COUNTY HIGHLIGHTS



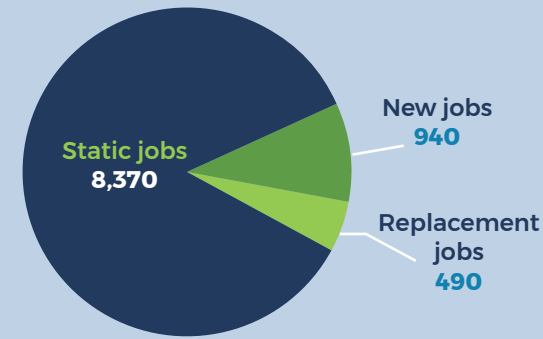
with **640 total openings between 2016 and 2021** (127 annually). Wages range from \$16.20 per hour in the tenth percentile to \$38.22 per hour in the nintieth percentile, with a median hourly wage of \$23.79, higher than the \$14.48 per hour MIT living wage in Orange County by 64 percent.

In Orange County, there are college programs providing training across three campuses. In the 2017-2018 year, there were 168 program completions.



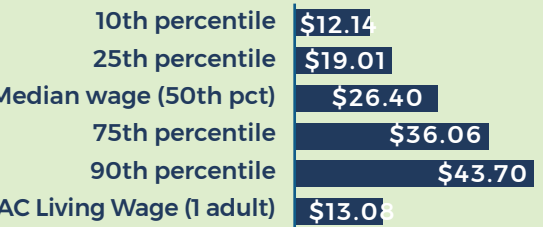
Heating, Air Conditioning, and Refrigeration Mechanics and Installers Jobs

LOS ANGELES COUNTY 2021F



Heating, Air Conditioning, and Refrigeration Mechanics and Installers Wages

LOS ANGELES COUNTY 2016



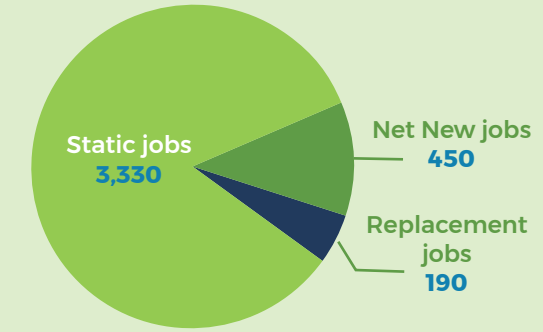
Heating, Air Conditioning, and Refrigeration Mechanics and Installers Jobs

ORANGE COUNTRY



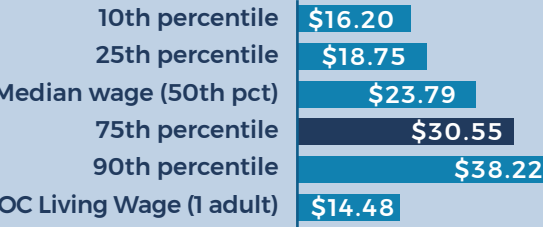
Heating, Air Conditioning, and Refrigeration Mechanics and Installers Jobs

ORANGE COUNTY 2021F



Heating, Air Conditioning, and Refrigeration Mechanics and Installers Wages

ORANGE COUNTY 2016



Industrial Machinery Mechanics (SOC 49-9041)

Industrial machinery mechanics are considered a middle-skill occupation. They repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems. This occupation does not include millwrights, mechanics specializing in mobile heavy equipment and machinery maintenance workers.

Industrial machinery mechanics are also sometimes referred to as maintenance machinists. Individuals in this occupation maintain industrial machinery, keeping it in working order through the detection and correction of errors in a timely manner to protect the machinery or what is being produced from incurring damage. Many of the machines they maintain are run by computers; for example, robotic welding arms, automobile assembly line conveyor belts and hydraulic lifts. They use a combination of technical manuals, their understanding of industrial equipment and observation to troubleshoot problems. Computerized diagnostic systems and vibration analysis techniques may be used to determine the source of problems.

IN THE WORKPLACE

Many industrial machinery mechanics work in manufacturing industries, at wholesale operations and for businesses that provide repair and maintenance services. Most work full-time, with some working night and weekend shifts. Workers may be on call or be required to work overtime. Tools used in this occupation include hand tools, lathes, grinders and drill presses and many industrial machinery mechanics are also required to know how to weld. Individuals in this occupation interact regularly with others, making soft-skills, including interpersonal skills, effective communication skills, a cooperative

Technology Requirement Often Cited in Employer Job Postings:

- Microsoft Office
- BIT Corp ProMACS PLC
- KEYENCE PLC Ladder Logic
- Supervisory control and data acquisition SCADA software
- Data entry software
- Maintenance planning and control software
- Enterprise resource planning ERP software
- SAP
- Microsoft Outlook/Excel

Job Titles Found in this Occupation:

- Fixer
- Industrial Machinery Mechanic
- Industrial Mechanic
- Loom Fixer
- Machine Adjuster
- Maintenance Mechanic
- Maintenance Technician
- Master Mechanic
- Mechanic, Overhauler

attitude and time management skills, highly valued. Other valuable attributes desired in workers include dependability, attention to detail, initiative, analytical thinking and problem solving skills.

Knowledge of machines and tools, production and processing, and mathematics are required for this occupation. More specifically, individuals in this occupation require an understanding of: the designs, uses, repair, maintenance, engineering and technology of machines and tools; practical applications of engineering science and technology, including applying principles, techniques, procedures, and equipment to the design and production of various goods and services; raw materials, and production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods. This base of knowledge allows industrial machinery mechanics to navigate their job duties successfully.

Job responsibilities for industrial machinery mechanics typically involve: maintaining the operating condition of industrial production or processing machinery or equipment; repairing or maintaining broken or malfunctioning components; disassembling machinery or equipment to remove parts and make repairs; observing and testing the operation of machinery or equipment to diagnose malfunctions, using testing devices such as voltmeters; and reassembling equipment after inspections, testing, or repairs are completed.

This occupation is considered moderately automated with an automation score of 43 out of 100. An industrial machinery mechanic is responsible for the maintenance and repair of stationary industrial machinery, mechanical equipment, and automated and robotic systems in industrial plants and manufacturing facilities, they also maintain facilities equipped with automated systems. Their service role is vital to the automation process, keeping labor substituting machinery, such as conveying systems, CNC machines, production machinery and packaging equipment, in good working condition. They use computerized diagnostic systems and vibration analysis techniques along with their training and experience to help identify problems. Increasingly, industrial machinery mechanics are required to have electrical, electronic, and computer programming skills in order to repair sophisticated industrial equipment.

OCCUPATIONAL DEMAND

Industrial machinery mechanics number 8,090 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, people employed in this occupation increased by 1,040 jobs (14.8 percent). The employment outlook for this occupation is promising, as the demand for individuals in this role is expected to increase as the sophisticated nature of machinery and use of automation across trade and logistics and manufacturing industries increase. Individuals will be needed to install, maintain and repair these systems. This occupation has a relatively high level of employment churn with an annual replacement rate of 12.9 percent. Employment of industrial machinery mechanics is projected to number 8,630 jobs by

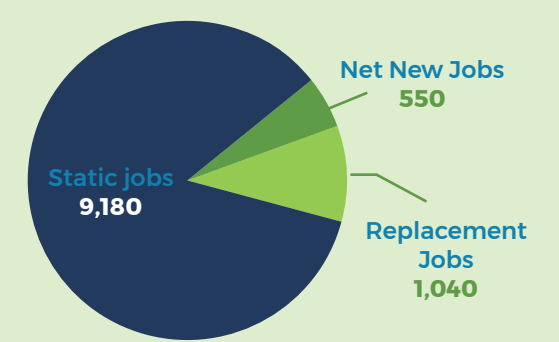
EXHIBIT 60

Industrial Machinery Mechanics Jobs LOS ANGELES BASIN



EXHIBIT 61

Industrial Machinery Mechanics Jobs LOS ANGELES COUNTY 2021F



2021 with 1,590 total openings in the Los Angeles Basin between 2016 and 2021 due to new jobs and replacement jobs.

The top-five industries employing the largest number of industrial machinery mechanics are listed in Exhibit 62. They include wholesale of durable goods, manufacturing industries (food, transportation equipment and chemical) and the repair and maintenance industry. Durable goods wholesale and the repair and maintenance industry are expected to add jobs between 2016 and 2021, while the manufacturing industries are anticipated

Large Employers in the LA Basin

- Aerojet
- Kroger Company
- Sunstate Equipment Company
- Precision Castparts Corp.
- Atwork

EXHIBIT 62

Top Five Industries Employing Industrial Machinery Mechanics in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Merchant wholesalers, durable goods	146,962	46.4%	1,320	1.9%	2.3%
Repair and maintenance	53,929	54.5%	1,282	4.4%	2.1%
Food manufacturing	47,180	19.8%	1,077	11.6%	-4.7%
Transportation equipment mfg	60,022	41.3%	516	2.1%	-0.9%
Chemical manufacturing	28,617	33.0%	416	4.4%	-2.3%

Source: QCEW, OES, forecast and analysis by LAEDC

to lose payroll employment, over the period. Industrial Machinery Mechanics account for close to 12 percent of the middle-skill jobs in food manufacturing.

The median annual wage for industrial machinery mechanics is \$54,750 in the Los Angeles Basin. On an hourly basis, wages range from \$15.11 per hour in the tenth percentile to \$39.80 per hour in the nintieth percentile and a median hourly wage of \$26.32, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 63).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Industrial machinery mechanics have an LQ of 0.6 in the Los Angeles Basin in 2016. The LA Basin ranks

fifth in the nation for the largest number of industrial machinery mechanics employed. While there are a large number of social and human service assistants in the Los Angeles Basin, the concentration is just over half of that found nationally.

TALENT SUPPLY

Students interested in becoming industrial machinery mechanics typically enroll in industrial systems technology and maintenance (TOP 0945.00). In the Los Angeles Basin, this program is offered at five community college campuses, and in the 2017-18 year, there were 104 program completions (97 certificates and 7 associate degrees). There are projected to be 318 job openings annually for industrial machinery mechanics, which may signal an **undersupply of community college program completers**.

EXHIBIT 64

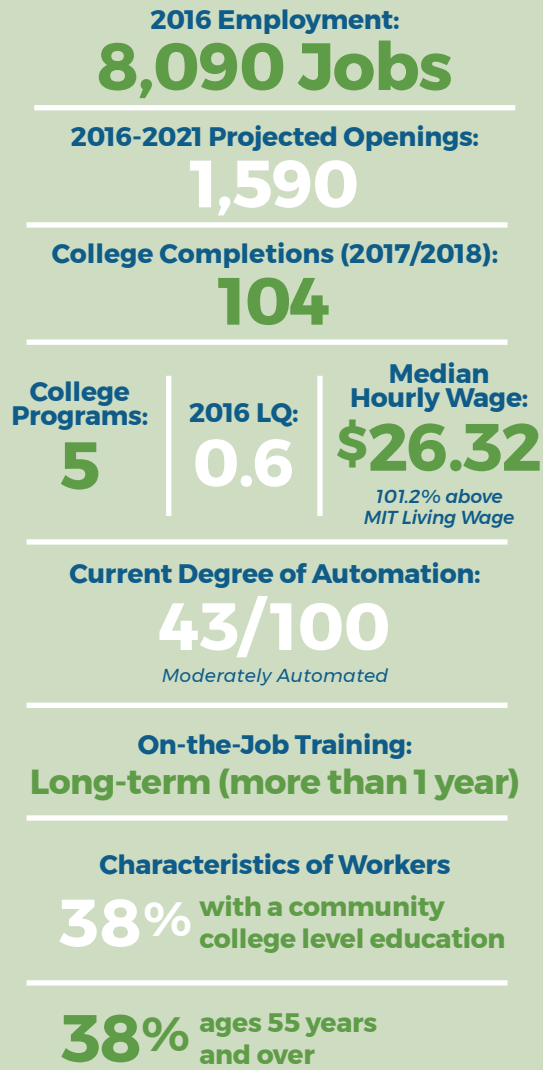
Industrial Machinery Mechanics Programs	2017-18 Awards
Industrial Systems Technology and Maintenance	104
Total	104

Sources: COE

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs

OCCUPATION HIGHLIGHTS



as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, industrial machinery mechanics number 5,960 payroll workers in 2016; 550 jobs were added since 2011 (10.2 percent). Employment in this occupation is projected to number 6,360 jobs by 2021 with 1,160 total openings between 2016 and 2021 (233 annually). Wages range from \$14.49 per hour in the tenth percentile to \$40.54 per hour in the nintieth percentile, with a median hourly wage of \$26.61, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 103 percent.

Colleges with Programs

- Fullerton
- LA Harbor
- LA Trade-Tech
- Long Beach
- Santiago Canyon

LOS ANGELES COUNTY HIGHLIGHTS



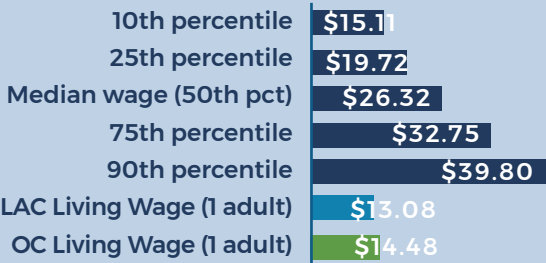
In Los Angeles County, there are college programs providing training across three campuses. In the 2017-2018 year, there were 96 program completions.

In Orange County specifically, industrial machinery mechanics number 2,120 payroll workers in 2016; 490 jobs were added since 2011 (30.1 percent). Employment in this occupation is projected to number 2,280 jobs by 2021 with 420 total openings between 2016 and 2021 (85 annually). Wages range from \$15.74 per hour in the tenth percentile to \$38.18 per hour in the nintieth percentile, with a median hourly wage of \$25.48, higher than the \$14.48 per hour MIT living wage in Orange County by 76 percent.

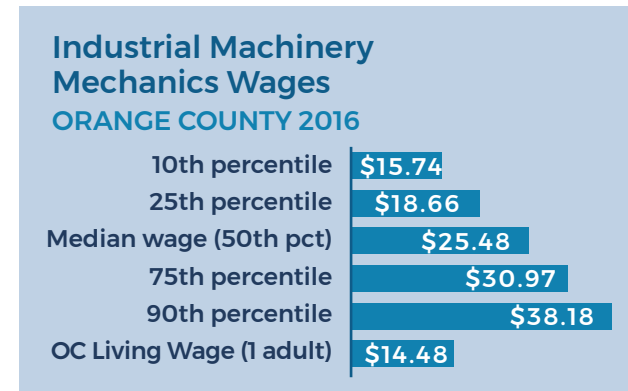
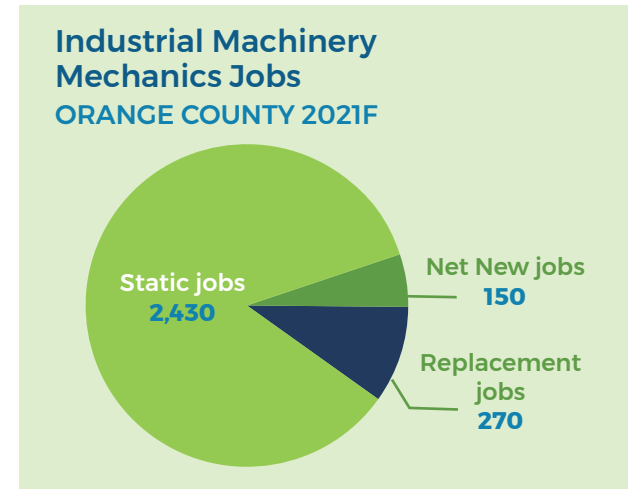
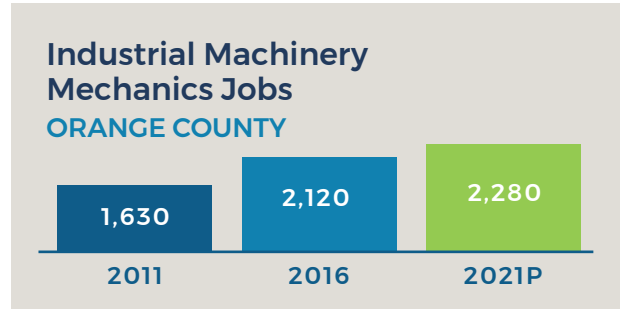
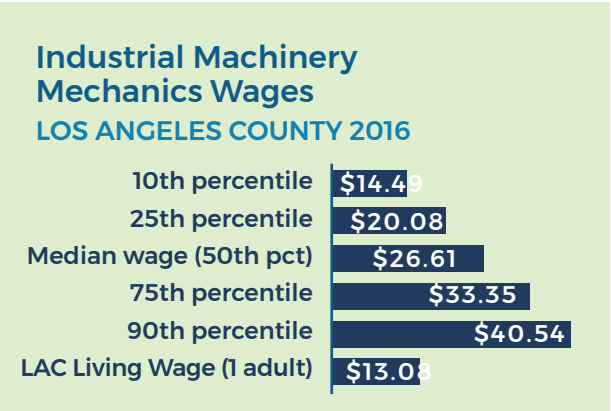
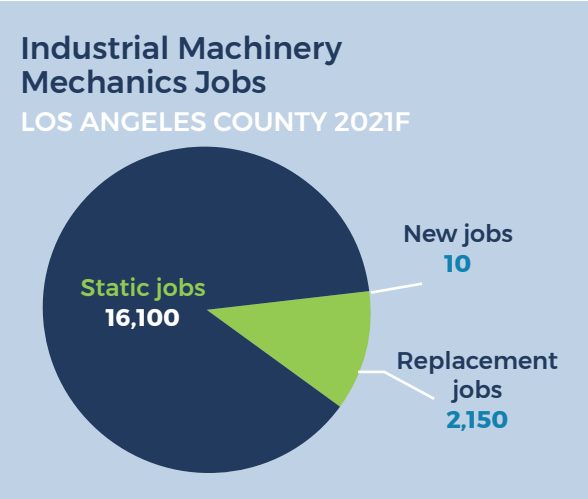
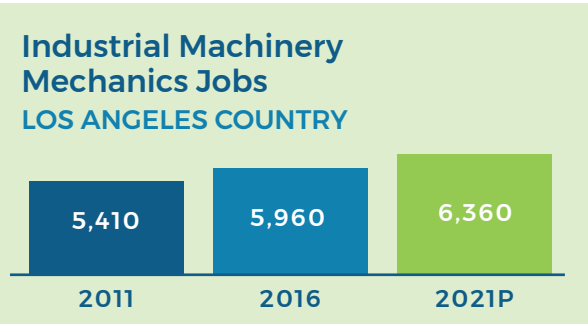
In Orange County, there are college programs providing training across two campuses. In the 2017-2018 year, there were eight program completions.

EXHIBIT 63

Industrial Machinery Mechanics Wages



ORANGE COUNTY HIGHLIGHTS



Computer-Controlled Machine Tool Operators, Metal and Plastic (SOC 51-4011)

Computer-controlled machine tool operators are considered a middle-skill occupation. They operate computer-controlled machines or robots to perform one or more machine functions on metal or plastic work pieces. Such tools are often referred to as CNC machines (Computer Numerical Control).

IN THE WORKPLACE

Many computer-controlled machine tool operators work mainly in manufacturing industries, including fabricated metal products, transportation equipment, plastics and rubber products, machinery and primary metals. They generally work full time, and overtime is common. Factories with extended production schedules mean that some workers are required to work night and weekend shifts. Operators usually wear protective clothing and safety equipment, to protect them from flying particles of metal or plastic, machine noise and heavy objects.

Employers are looking for individuals who pay attention to detail, actively listen, and who possess problem solving and critical thinking skills. Operators interact with others regularly, and as such, soft-skills, including interpersonal skills, effective communication skills, a cooperative attitude and time management skills, are also highly valued. Workers trained to operate CNC machines and who

Technology Requirement Often Cited in Employer Job Postings:

- CNC Consulting Machinists' Calculator
- Kentech Kipware Trig Calculator
- Autodesk AutoCAD
- Dassault Systemes SOLIDWORKS
- KCD
- Kentech Kipware Studio
- 1CadCam Unigraphics
- CNC Mastercam
- SigmaTEK SigmaNEST
- Vero International VISI-Series
- Microsoft Project
- Microsoft Excel

Job Titles Found in this Occupation:

- Brake Press Operator
- CNC(Computer Numerical Control) Lathe Operator
- CNC Machine Operator
- CNC Machinist
- CNC Mill Operator
- CNC Operator
- CNC Set-Up and Operator
- Machine Operator
- Machine Set-Up Operator
- Machinist

possess industry certifications will have an advantage in obtaining employment.

Knowledge of machines and tools, design, computers and electronics, engineering and technology and mathematics are required for this occupation. More specifically, individuals in this occupation require an understanding of: the designs, uses, repair, and maintenance of machines and tools; design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models; circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming; and the practical application of engineering science and technology, including applying principles, techniques, procedures, and equipment to the design and production of various goods and services. This base of knowledge allows computer-controlled machine tool operators to navigate their job duties successfully.

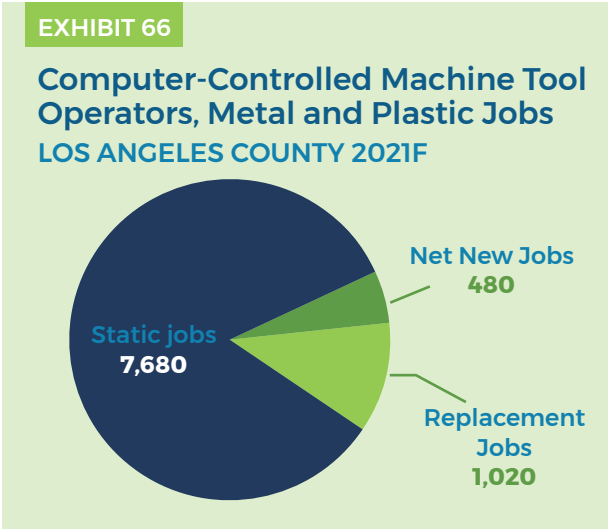
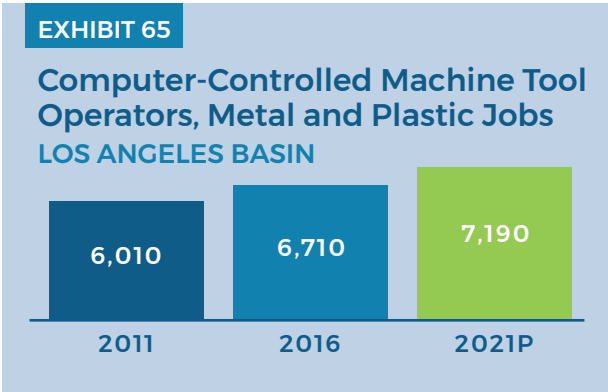
Job responsibilities for computer-controlled machine tool operators typically involve: using precision measuring instruments, templates, and fixtures to measure dimensions of finished workpieces ensuring

conformance to desired specifications; using hand tools and precision measuring instruments; mounting, installing, aligning and securing tools, attachments, fixtures and workpieces on machines; transferring commands from servers to computer numerical control (CNC) modules, using computer network links; stopping machines to remove finished workpieces and change tooling, setup, or workpiece placement, according to required machining sequences; and checking that workpieces are properly lubricated and cooled during machine operation.

This occupation is considered moderately automated with an automation score of 58 out of 100; just two score points away from being considered highly automated. Computer-controlled machine tool operators can use CNC machines to form and shape anything from plastic packaging to solar mirror or panel components. As artificial intelligence and machine learning become more advanced, operators may not be needed for programming and, therefore, may be displaced. In the near-term, the LA Basin's large manufacturing industry will still provide opportunities for trained operators, especially those with certifications.

OCCUPATIONAL DEMAND

Computer-controlled machine tool operators number 6,710 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, people employed in this occupation increased by 700 jobs (11.6 percent). The employment outlook for this occupation is positive, modest growth is expected for this occupation in the Basin, and the high level of employment churn with an annual replacement rate of 14.4 percent translates into a large number of openings expected over the five-year period. Future factors that will influence employment in this occupation include advancement of technologies (which will require increased training) and foreign competition for what is



being produced. This occupation has a high level of employment churn with an annual replacement rate of 15.2 percent. Employment of computer-controlled machine tool operators is projected to number 7,190 jobs by 2021 with **1,500 total openings in the Los Angeles Basin between 2016 and 2021** mostly due to replacement jobs.

The top-five industries employing the largest number of computer-controlled machine tool operators are all manufacturing industries, they are listed in Exhibit 67. These industries include fabricated metal products, transportation equipment, computer and electronic products, machinery and miscellaneous manufacturing. As the employment in the manufacturing sector has been on a long-term decline as a whole, it is not surprising these industries are anticipated to decline between 2016 to 2021. Computer-controlled machine tool operators account for just over 9 percent of the middle-skill jobs in fabricated metal products manufacturing and just under 7 percent in transportation equipment manufacturing.

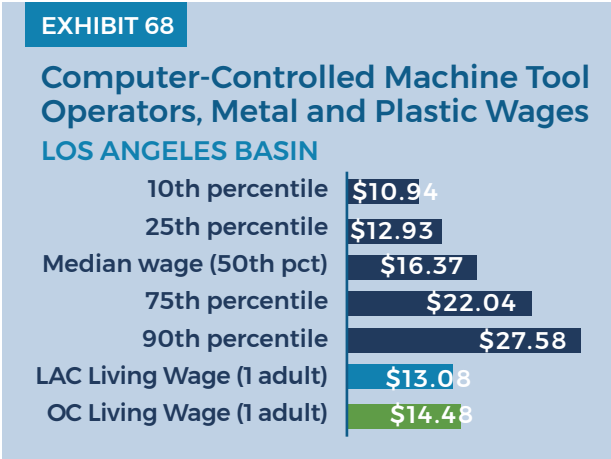
EXHIBIT 67

Top Five Industries Employing Computer-Controlled Machine Tool Operators in the LA Basin

Industry Description	TTL Jobs	M-Skill Share	2016		2016-21f
			Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Fabricated metal product mfg	65,707	44.7%	2,709	9.2%	-9.5%
Transportation equipment mfg	60,022	41.3%	1,718	6.9%	-0.9%
Computer and electronic product mfg	70,753	40.4%	922	3.2%	-2.3%
Machinery manufacturing	23,719	44.9%	537	5.0%	-7.7%
Miscellaneous manufacturing	40,732	41.7%	420	2.5%	-7.1%

Source: QCEW, OES, forecast and analysis by LAEDC

The median annual wage for computer-controlled machine tool operators is \$34,050 in the Los Angeles Basin. On an hourly basis, wages range from just over minimum wage in the tenth percentile to \$27.58 per hour in the ninetieth percentile and a median hourly wage of \$16.37, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 68).



The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Computer-controlled machine tool operators have an

EXHIBIT 69

Computer-Controlled Machine Tool Operators Programs
2017-18 Awards

Manufacturing and Industrial Technology	44
Machining and Machine Tools	280
Total	324

Sources: COE

OCCUPATION HIGHLIGHTS

2016 Employment:
6,710 Jobs

2016-2021 Projected Openings:
1,500

College Completions (2017/2018):
324

College Programs: **18** | 2016 LQ: **1.0** | Median Hourly Wage: **\$16.37**
25.2% above MIT Living Wage

Current Degree of Automation:
58/100
Moderately Automated

On-the-Job Training:
Moderate-term (1 month to a year)

Characteristics of Workers
55% with a community college level education

15% ages 55 years and over

Large Employers in the LA Basin

- Arconic
- Alcoa
- Precision Castparts Corp.

LQ of 1.0 in the Los Angeles Basin in 2016. Los Angeles County, specifically, ranks fourth in the nation for the largest number of computer-controlled machine tool operators employed, behind the metropolitan areas of Milwaukee, Houston and Cleveland. While there are a large number of computer-controlled machine tool operators in the Los Angeles Basin, the concentration of 1.0 is equal to that found nationally.

Colleges with Programs

- Cerritos
 - Compton
 - El Camino
 - Fullerton
 - Irvine Valley
 - LA Pierce
- LA Trade-Tech
 - LA Valley
 - Mt San Antonio
 - Orange Coast
 - Saddleback
 - Santa Ana

TALENT SUPPLY

Across the Los Angeles Basin, there are two community college programs that train students to become computer-controlled machine tool operators, metal and plastic: Manufacturing and industrial technology (0956.00) and machining and machine tools (TOP 0956.30). These programs are offered at 12 community college campuses in the Los Angeles Basin, and in the 2017-18 year there were 324 program completions (244 certificates and 80 associate degrees). There are projected to be 300 annual openings for computer-controlled machine tool operators, metal and plastic in the Los Angeles Basin, signaling a **slight oversupply of community college completers** in the local workforce.

COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, computer-controlled

LOS ANGELES COUNTY HIGHLIGHTS



ORANGE COUNTY HIGHLIGHTS



machine tool operators, metal and plastic, number 4,600 payroll workers in 2016; 770 jobs were added since 2011 (20.1 percent). Employment in this occupation is projected to number 4,930 jobs by 2021 with **1,040 total openings between 2016 and 2021** (207 annually). Wages range from \$10.97 per hour in the tenth percentile to \$28.11 per hour in the nintieth percentile, with a median hourly wage of \$16.11, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 23 percent.

In Los Angeles County, there are college programs providing training across seven campuses. In the 2017-2018 year, there were 123 program completions.

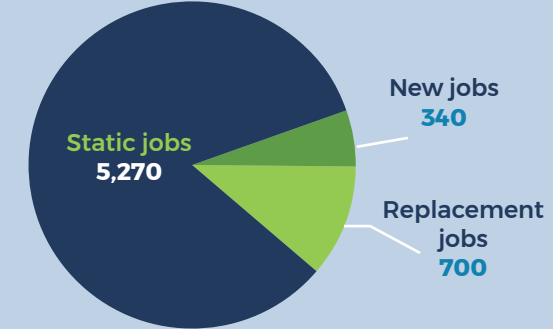
In Orange County specifically, computer-controlled machine tool operators, metal and plastic, number 2,110 payroll workers in 2016; 70 jobs were lost since 2011 (-3.2 percent). Employment in this occupation is projected to number 2,260 jobs by 2021 with **470 total openings between 2016 and 2021** (93 annually). Wages range from \$10.88 per hour in the tenth percentile to \$26.24 per hour in the nintieth percentile, with a median hourly wage of \$16.66, higher than the \$14.48 per hour MIT living wage in Orange County by 15 percent.

In Orange County, there are college programs providing training across five campuses. In the 2017-2018 year, there were 201 program completions.

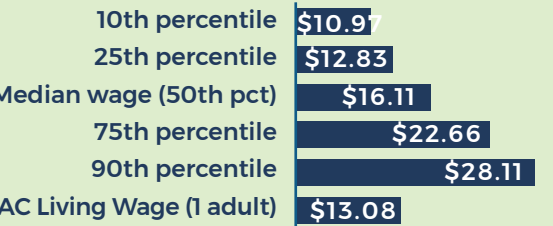
Computer-Controlled Machine Tool Operators, Metal and Plastic Jobs LOS ANGELES COUNTY



Computer-Controlled Machine Tool Operators, Metal and Plastic Jobs LOS ANGELES COUNTY 2021F



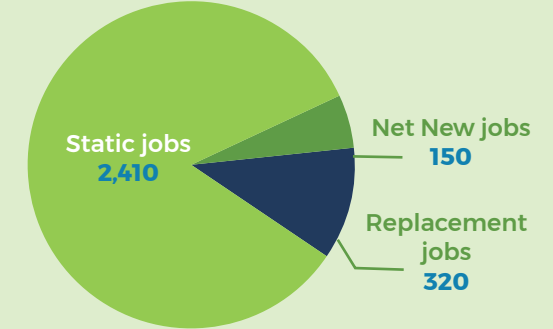
Computer-Controlled Machine Tool Operators, Metal and Plastic Wages LOS ANGELES COUNTY 2016



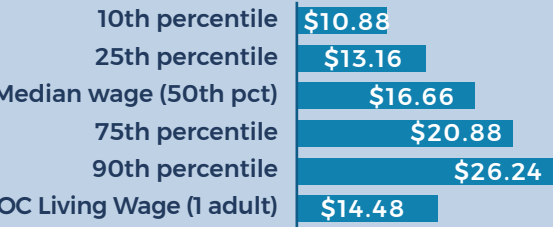
Computer-Controlled Machine Tool Operators, Metal and Plastic Jobs ORANGE COUNTY



Computer-Controlled Machine Tool Operators, Metal and Plastic Jobs ORANGE COUNTY 2021F



Computer-Controlled Machine Tool Operators, Metal and Plastic Wages ORANGE COUNTY 2016



Machinists (SOC 51-4041)

Machinists are considered a middle-skill occupation. They set up and operate a variety of machine tools to produce precision parts and instruments. This occupation includes precision instrument makers who fabricate, modify, or repair mechanical instruments. Machinists also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.

IN THE WORKPLACE

The majority of machinists work in manufacturing industries, including machine shops, fabricated metal products, transportation equipment, machinery and computer and electronic products. Additional opportunities exist in administrative and support services, which includes packaging and labeling services. They generally work full time, with opportunities for overtime. Many manufacturing facilities have production schedules that run all 24 hours, machinists who work in these facilities may be required to work night and weekend shifts.

Machinists make precision parts that range from basic steel bolts to complex items like titanium bone screws for orthopedic implants, often in small batches or even as a one-off. Other common parts made include: hydraulic parts, antilock brakes, and automobile

Technology Requirement Often Cited in Employer Job Postings:

- Autodesk AutoCAD
- Dassault Systemes CATIA
- PTC Creo Parametric
- SolidCAM
- ERP software
- JobBOSS
- SAP
- Armchair Machinist software
- CNC Consulting Machinists' Calculator
- Kentech Kipware Trig Calculator
- Autodesk Fusion 360
- CNC Mastercam
- GRZ Software MeshCAM
- OneCNC CAD/CAM
- EditCNC; Mazak Mazatrol SMART CNC

Job Titles Found in this Occupation:

- Gear Machinist
- Journeyman Machinist
- Machine Operator
- Machine Repair Person
- Machinist
- Maintenance Machinist
- Maintenance Specialist
- Production Machinist
- Set-Up Machinist
- Tool Room Machinist

pistons. Tools used on the job include: lathes, milling machines and grinders; measuring devices like micrometers or vernier calipers; and lasers, water jets, and electrified wires to cut workpieces. Machinists may be expected to know how to operate both manual and CNC machinery. Machinists using CNC machines program the instructions which sets the path, speed and feed rate to perform all the cuts necessary to create a part. It is very important that workers in this occupation keep up with new machining properties and techniques.

Employers are seeking out candidates who possess the following attributes: attention to detail, dependability, initiative to take on responsibility, the ability to maintain composure in difficult situations; and the ability to get things done with minimal supervision. Soft-skills, including interpersonal skills, effective communication skills and time management skills, are also highly valued.

Knowledge of machines and tools, production and processing, mathematics and design are required for this occupation. More specifically, individuals in this occupation require an understanding of: the

designs, uses, repair and maintenance of machines and tools; raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods; and design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models. This base of knowledge allows machinists to navigate their job duties successfully.

Job responsibilities for machinists typically involve: reading blueprints, sketches, or computer-aided design (CAD) and computer-aided manufacturing (CAM) files; calculating dimensions or tolerances; machining parts to specification; setting up, adjusting and operating and disassembling manual, automatic, and computer numerically controlled (CNC) machine tools used to perform precision machining operations; aligning and securing holding fixtures, cutting tools, attachments, accessories, or materials onto machines; monitoring the feed and speed of machines; measuring, examining or testing completed units to check for defects and ensure conformance to specifications; and presenting finished workpieces to customers, making modifications upon request.

This occupation is considered slightly automated with an automation score of 31 out of 100. Machinists program, maintain and troubleshoot machines including cutting tool strategies, cooling systems, CAM software and machine tools. New technologies are augmenting the capabilities and increasing the capacity of machinists to perform their duties through the use of machine automation, 3D printing systems, tooling, and machine-based metrology and analytics. Technology is constantly evolving and modern machinists must keep up on the latest advancements in order to remain relevant. Machine programming is required, individuals should be familiar with the different canned cycles and quick codes and how to design automated toolpaths.

OCCUPATIONAL DEMAND

Machinists number 16,750 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, people employed in this occupation increased by 2,230 jobs (15.4 percent). While new job growth is not expected to be robust, this occupation has a

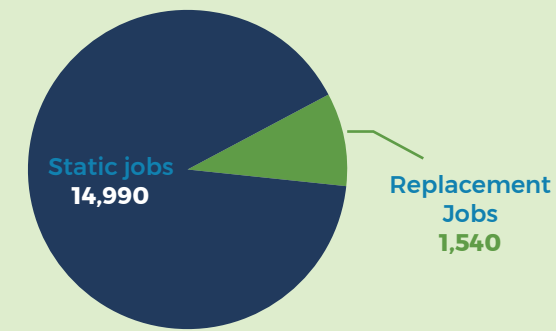
EXHIBIT 70

Machinists Jobs LOS ANGELES BASIN



EXHIBIT 71

Machinists Jobs LOS ANGELES COUNTY 2021F



high level of employment churn with an annual replacement rate of 14.4 percent; this translates into a large number of openings expected over the five-year period. Looking beyond, machinists will be vital in automating processes in numerous industries and maintaining those systems, which will present consistent employment opportunities. Employment of machinists is projected to number 15,870 jobs by 2021 with **1,540 total openings in the Los Angeles Basin between 2016 and 2021** due to replacement jobs.

The top-five industries employing the largest number of machinists are listed in Exhibit 72. They include

Large Employers in the LA Basin

- Arconic
- Aerojet
- Parker Hannifin
- Precision Castparts Corp.
- Alcoa

EXHIBIT 72

Top Five Industries Employing Machinists in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Fabricated metal product mfg	65,707	44.7%	8,128	27.7%	-9.5%
Transportation equipment mfg	60,022	41.3%	2,543	10.3%	-0.9%
Machinery manufacturing	23,719	44.9%	1,624	15.2%	-7.7%
Administrative and support services	387,999	26.5%	1,084	1.1%	8.5%
Computer and electronic product mfg	70,753	40.4%	893	3.1%	-2.3%

Source: QCEW, OES, forecast and analysis by LAEDC

manufacturing industries (fabricated metal product, transportation equipment, machinery and computer and electronic product) and administrative and support services (packaging and labelling services, services to buildings and dwellings, security systems and facilities support services). Administrative and support services employment is expected to add jobs between 2016 and 2021, while the four manufacturing industries that made the top five are anticipated to decline over the period. Machinists account for close to 28 percent of the middle-skill jobs in fabricated metal product manufacturing.

The median annual wage for machinists is \$38,730 in the Los Angeles Basin. On an hourly basis, wages range from \$11.21 per hour in the tenth percentile to \$30.41 per hour in the nintieth percentile and a median hourly wage of \$18.62, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 73).

The location quotients (LQs) of occupations can reveal employment concentrations associated with

a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Machinists have an LQ of 1.0 in the Los Angeles Basin in 2016. Los Angeles County, specifically, ranks second in the nation for the largest number of machinists employed, behind the Chicago metropolitan area. While there are a large number of machinists in the Los Angeles Basin, the concentration is equal to that found nationally.

TALENT SUPPLY

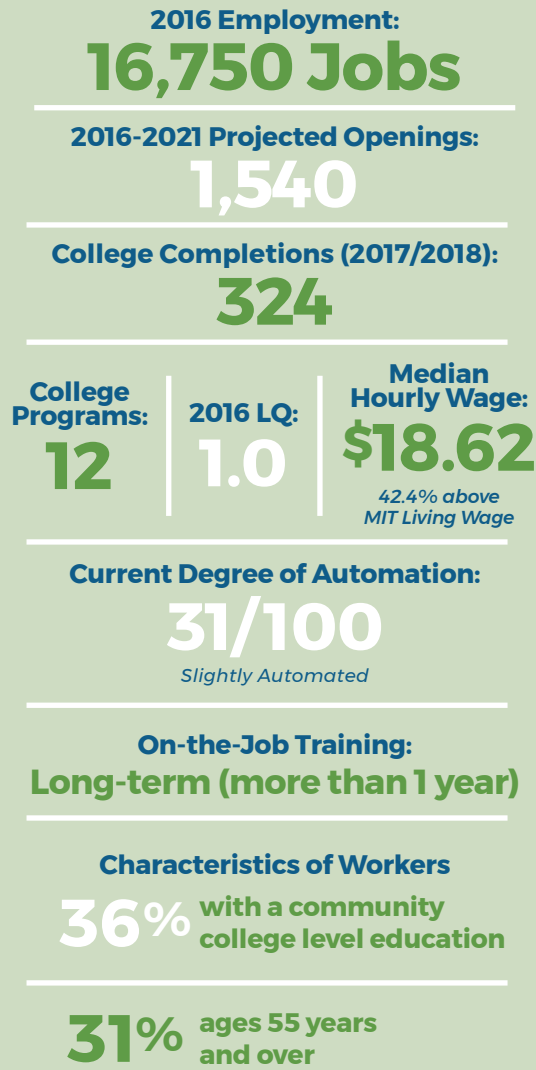
Across the Los Angeles Basin, two community college programs train students to become machinists: Manufacturing and industrial technology (0956.00) and machining and machine tools (TOP 0956.30). These programs are offered at 12 community college campuses in the Los Angeles Basin, and in the 2017-18 academic year there were 324 program completions (244 certificates and 80 associate degrees). The number of program completions signals a **fairly good balance between demand and supply** in the local workforce, since there are 308 projected annual job openings for machinists in the Los Angeles Basin.

EXHIBIT 74

Machinists Programs	2017-18 Awards
Manufacturing and Industrial Technology	44
Machining and Machine Tools	280
Total	104

Sources: COE

OCCUPATION HIGHLIGHTS



COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, machinists number 10,880 payroll workers in 2016; 2,180 jobs were added since 2011 (25.1 percent). Employment in this occupation is projected to number 10,180 jobs by 2021 with **870 total**

Colleges with Programs

- Cerritos
- Compton
- El Camino
- Fullerton
- Irvine Valley
- LA Pierce
- LA Trade-Tech
- LA Valley
- Mt San Antonio
- Orange Coast
- Saddleback
- Santa Ana

LOS ANGELES COUNTY HIGHLIGHTS



openings between 2016 and 2021 (173 annually). Wages range from just above minimum wage (\$10.76 per hour) in the tenth percentile to \$29.33 per hour in the nintieth percentile, with a median hourly wage of \$17.96, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 37 percent.

In Los Angeles County, there are college programs providing training across seven campuses. In the 2017-2018 year, there were 123 program completions.

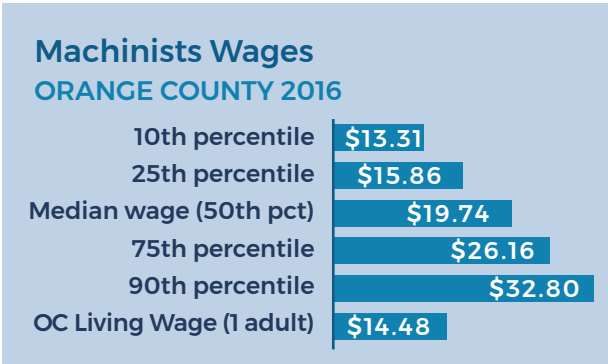
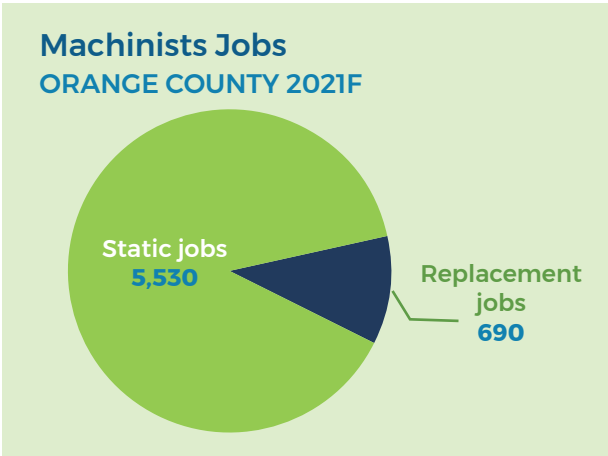
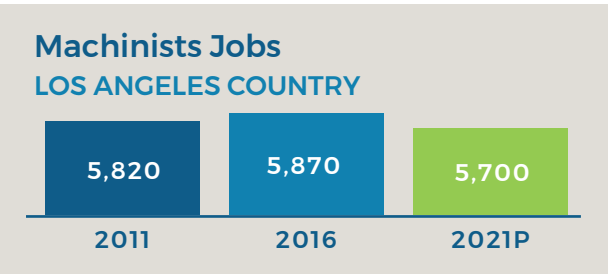
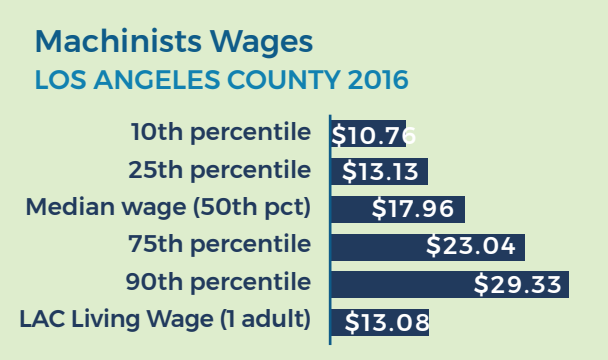
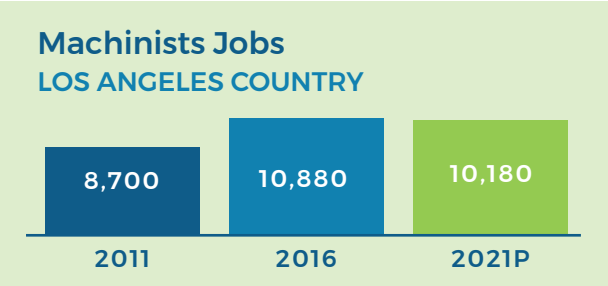
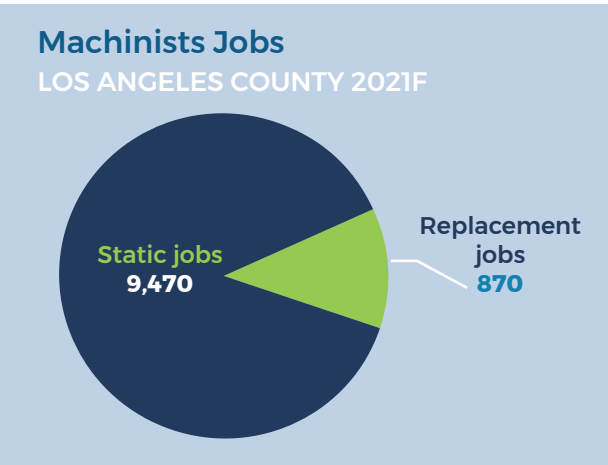
In Orange County specifically, machinists number 5,870 payroll workers in 2016; 50 jobs were added since 2011 (0.85 percent). Employment in this occupation is

ORANGE COUNTY HIGHLIGHTS



projected to number 5,700 jobs by 2021 with **670 total openings between 2016 and 2021** (93 annually). Wages range from \$13.31 per hour in the tenth percentile to \$32.80 per hour in the nintieith percentile, with a median hourly wage of \$19.74, higher than the \$14.48 per hour MIT living wage in Orange County by 36 percent.

In Orange County, there are college programs providing training across five campuses. In the 2017-2018 year, there were 201 program completions.



Welders, Cutters, Solderers and Brazers (SOC 51-4121)

Welders, cutters, solderers and brazers are considered a middle-skill occupation. They use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.

Welders use heat to bond metals together, the type of welding undertaken is determined by the type of metal and conditions of where the work is to take place. Cutters use heat to cut and trim metal objects, the dismantling of large objects such as automobiles, buildings and railroad cars are examples of jobs that require cutters. Soldering, the use of molten metal, with a lower melting point, to join pieces of metal, is a process often found in the manufacture of electrical and electronic circuit boards. Brazing can be used to apply coatings to parts in order to reduce wear and protect against corrosion.

IN THE WORKPLACE

Many computer-controlled machine tool operators work mainly in manufacturing industries, including fabricated metal products, transportation equipment, plastics and rubber products, machinery and primary metals. They generally work full time, and overtime is common. Factories with extended production schedules mean that some workers are required to work night and weekend shifts. Operators usually wear protective clothing and safety equipment, to protect them from flying particles of metal or plastic, machine noise and heavy objects.

Employers are looking for individuals who pay attention to detail, actively listen, and who possess problem solving and critical thinking skills. Operators interact with others regularly, and as such, soft-skills,

Technology Requirement Often Cited in Employer Job Postings:

- EZ Pipe
- Scientific Software Group Filter Drain FD
- OmniFleet Equipment Maintenance Management
- Fred's Tip Cartridge Picker
- Value Analysis
- Microsoft Office
 - Outlook
 - Windows
 - Excel

Job Titles Found in this Occupation:

- Aluminum Welder
- Fabrication Welder
- Fabricator
- Fitter/Welder
- Maintenance Welder
- MIG (Metal Inert Gas) Welder
- Sub Arc Operator
- Welder
- Welder-Fitter
- Welder/Fabricator
- Assembly Line Brazer
- Brazer
- Connector
- Electronic Technician
- Production Technician
- Refrigeration Brazer/Solderer
- Solderer
- Wirer

including interpersonal skills, effective communication skills, a cooperative attitude and time management skills, are also highly valued. Workers trained to operate CNC machines and who possess industry certifications will have an advantage in obtaining employment.

Knowledge of machines and tools, design, computers and electronics, engineering and technology and mathematics are required for this occupation. More specifically, individuals in this occupation require an understanding of: the designs, uses, repair, and maintenance of machines and tools; design techniques,

tools, and principles involved in production of precision technical plans, blueprints, drawings, and models; circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming; and the practical application of engineering science and technology, including applying principles, techniques, procedures, and equipment to the design and production of various goods and services. This base of knowledge allows computer-controlled machine tool operators to navigate their job duties successfully.

Job responsibilities for welders, cutters, solderers and brazers typically involve: studying blueprints, sketches, or specifications; calculating the dimensions of parts to be welded; the lay out, positioning, aligning and securing of parts and assemblies; welding components; monitoring the welding process to avoid overheating; the set up and operation of hand and power tools common to the welding trade; examining workpieces and seams for defects and conformance with specifications; melting and applying solder; preparing and cleaning workpieces; and maintaining equipment and machinery.

This occupation is considered slightly automated with an automation score of 25 out of 100. Jobs that require welding, cutting, soldering and brazing are varied, they need to be performed on a variety of different materials and in different environments. While these processes can be automated in factory settings, many repair or small-scale jobs take place in unpredictable environments where automation and robotics aren't an option. In between automated welding and an actual welder is mechanized welding, where a worker observes the machine that holds a torch, gun or electrode and manually adjusts the equipment controls based upon their observations, but this process is also more suited to fixed industrial facilities.

Large Employers in the LA Basin

- SpaceX
- Athens Services
- Waste Management
- Aerojet Rocketdyne
- Conveyor Manufacturing Company

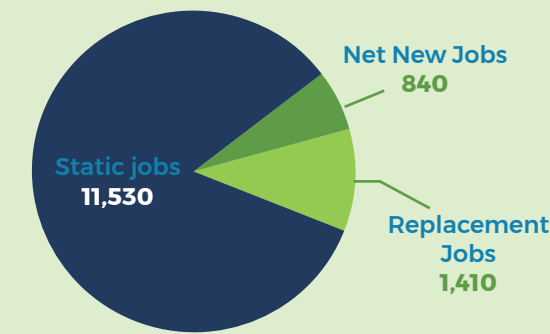
EXHIBIT 75

Welders, Cutters, Solderers, and Brazers Jobs
LOS ANGELES BASIN



EXHIBIT 76

Welders, Cutters, Solderers, and Brazers Jobs
LOS ANGELES COUNTY 2021F



OCCUPATIONAL DEMAND

Welders, cutters, solderers and brazers number 9,840 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, people employed in this occupation increased by 2,430 jobs (32.8 percent). The employment outlook for this occupation is promising, as the demand for individuals in this role is expected to increase as investments into infrastructure, such as roads and bridges, natural gas pipelines and power generation plants, rise. This occupation has a relatively high level of employment churn with an annual replacement rate of 14.3 percent, partly because individuals are able to work across multiple industries allowing them to move across industries and positions as opportunities become available. Employment of welders, cutters, solderers and brazers is projected to number 10,690 jobs by 2021 with **2,250 total openings in the Los Angeles Basin between 2016 and 2021** due to a combination of new jobs and replacement jobs.

EXHIBIT 77

Top Five Industries Employing Computer-Controlled Machine Tool Operators in the LA Basin

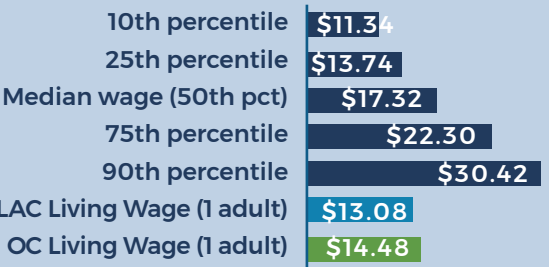
Industry Description	TTL Jobs	M-Skill Share	2016		2016-21f
			Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Fabricated metal product mfg	65,707	44.7%	2,348	8.0%	-9.5%
Transportation equipment mfg	60,022	41.3%	1,215	4.9%	-0.9%
Specialty trade contractors	153,405	56.4%	1,039	1.2%	15.6%
Machinery manufacturing	23,719	44.9%	952	8.9%	-7.7%
Computer and electronic product mfg	70,753	40.4%	563	2.0%	-2.3%

Source: QCEW, OES, forecast and analysis by LAEDC

The top-five industries employing the largest number of welders, cutters, solderers and brazers are listed in Exhibit 77. Four of the top-five industries are in the manufacturing sector: fabricated metal products; transportation equipment; machinery; and computer and electronic products. Specialty trade contractors ranks third in employing the largest number of welders, cutters, solderers and brazers and, out of the

EXHIBIT 78

Welders, Cutters, Solderers, and Brazers Wages
LOS ANGELES BASIN



top-five, is the industry predicted to have the highest job growth between 2016 and 2021 with close to 16 percent. The manufacturing industries are anticipated to lose payroll employment over the period. Welders, cutters, solderers and brazers account for about 8 percent of the middle-skill jobs in the fabricated metal product manufacturing and machinery manufacturing industries.

EXHIBIT 79

Welders, Cutters, Solderers and Brazers Programs		2017-18 Awards
Welding Technology		218
Total		218

Sources: COE

OCCUPATION HIGHLIGHTS

2016 Employment:

9,840 Jobs

2016-2021 Projected Openings:

2,250

College Completions (2017/2018):

218

College Programs: 11

2016 LQ: 0.6

Median Hourly Wage: \$17.32
25.2% above MIT Living Wage

Current Degree of Automation:

25/100
Slightly Automated

On-the-Job Training:

Moderate-term
(1 month to a year)

Characteristics of Workers

27% with a community college level education

17% ages 55 years and over

The median annual wage for welders, cutters, solderers and brazers is \$36,020 in the Los Angeles Basin. On an hourly basis, wages range from \$11.34 per hour in the tenth percentile to \$30.42 per hour in the nintieth percentile and a median hourly wage of \$17.32, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 78).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Welders, cutters, solderers and brazers have an LQ of 0.6 in the Los Angeles Basin in 2016. Los Angeles County, specifilly, ranks third in the nation for the largest number of welders, cutters, solderers and brazers employed, behind the Houston and Dallas metropolitan areas. While there are a large number of welders, cutters, solderers and brazers in the Los Angeles Basin, the concentration is just over half of that found nationally.

TALENT SUPPLY

Currently, ten community colleges in the region provide training for welders, cutters, solderers, and brazers. In the 2017-18 academic year, colleges offering welding technology (TOP 0956.50) conferred 218 awards (163 certificates and 55 associate degrees). It should be noted that between the 2016-17 academic year and 2017-18, completions dipped by 5 percent. Since there are 450 annual openings projected for welders, cutters, solderers, and brazers in the Los Angeles Basin, it appears there is an **undersupply of program completers**.

Colleges with Programs

- Cerritos
- Compton
- El Camino
- Fullerton
- Irvine Valley
- LA Pierce
- LA Trade-Tech
- LA Valley
- Mt San Antonio
- Orange Coast
- Saddleback
- Santa Ana

LOS ANGELES COUNTY HIGHLIGHTS



ORANGE COUNTY HIGHLIGHTS



COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county's economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

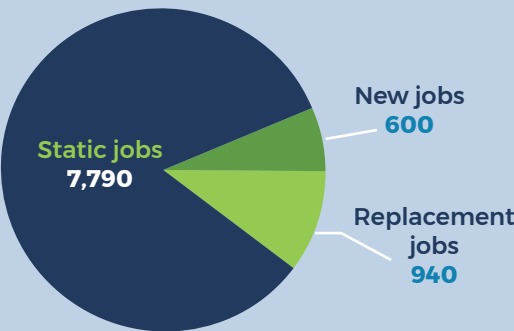
In Los Angeles County specifically, welders, cutters, solderers, and brazers number 6,590 payroll workers in 2016; 1,280 jobs were added since 2011 (24.1 percent). Employment in this occupation is projected to number 7,190 jobs by 2021 with 1,540 total openings between 2016 and 2021 (308 annually). Wages range from \$11.16 per hour in the tenth percentile to \$30.67 per hour in the nintieth percentile, with a median hourly wage of \$17.80, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 36 percent.

In Los Angeles County, there are college programs providing training across seven campuses. In the 2017-2018 year, there were 177 program completions.

In Orange County specifically, welders, cutters, solderers, and brazers number 3,250 payroll workers in 2016; 1,150 jobs were added since 2011 (54.8 percent). Employment in this occupation is projected to number 3,500 jobs by 2021 with **710 total openings between 2016 and 2021** (142 annually). Wages range from \$11.86 per hour in the tenth percentile to \$29.65 per hour in the nintieth percentile, with a median hourly wage of \$16.16, higher than the \$14.48 per hour MIT living wage in Orange County by 12 percent.

In Orange County, there are college programs providing training across three campuses. In the 2017-2018 year, there were 41 program completions.

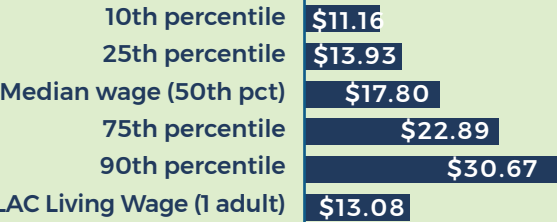
Welders, Cutters, Solderers, and Brazers Jobs LOS ANGELES COUNTY 2021F



Welders, Cutters, Solderers, and Brazers Jobs LOS ANGELES COUNTRY



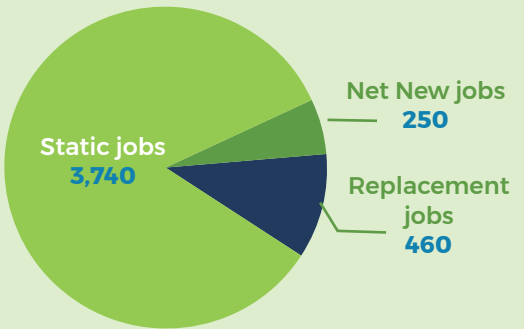
Welders, Cutters, Solderers, and Brazers Jobs LOS ANGELES COUNTY 2016



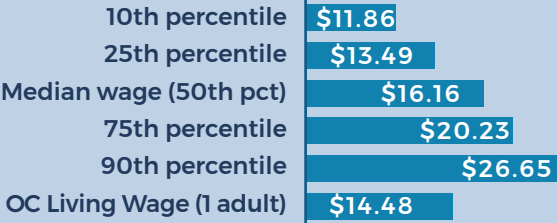
Welders, Cutters, Solderers, and Brazers Jobs ORANGE COUNTY



Welders, Cutters, Solderers, and Brazers Jobs ORANGE COUNTY 2021F



Welders, Cutters, Solderers, and Brazers Wages ORANGE COUNTY 2016



Heavy and Tractor-Trailer Truck Drivers (SOC 53-3032)

Heavy and tractor-trailer truck drivers are considered a middle-skill occupation. They drive a tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW) transporting goods from one location to another. Trucking routes are classified as either short-haul or long-haul; most tractor-trailer drivers are long-haul drivers with routes that cross state lines. Workers in this occupation require a commercial drivers' license (CDL) and they may be required to unload trucks.

Truck driving is highly regulated. Federal regulations require CDL drivers to maintain a clean driving record and pass a physical exam every two years. They are also subject to random testing for drugs and/or alcohol. Drivers' schedules and work hours must be planned to include legally required rest periods and recorded into logbooks.

IN THE WORKPLACE

Many heavy and tractor-trailer trucks work for trucking companies, but wholesalers, shipping and logistics operations and courier services are other industries that hire this occupation. There are a number of self-employed drivers (owner-operators) who own/ lease and drive their own truck, these individuals may either lease on to a carrier or operate under their own authority. Most heavy and tractor-trailer truck drivers' routes are assigned by a dispatcher. Depending upon the route, drivers can be away from home for days or weeks at a time. Most drivers travel alone, but some companies use teams (two drivers) on long runs to minimize required downtime.

Heavy and tractor-trailer truck drivers are required to have a commercial drivers' license (CDL) and they can obtain endorsements to drive specialized types of vehicles. Trucking endorsements include: Hazardous

Technology Requirement Often Cited in Employer Job Postings:

- [ddlsoftware.com drivers daily log program DDL](#)
- [Fog Line Software Truckn Pro](#)
- [TruckersHelper](#)
- [SAP](#)
- [ALK Technologies PC*Miler](#)
- [MarcoSoft Quo Vadis](#)
- [Microsoft Outlook/ Excel](#)

Job Titles Found in this Occupation:

- **Delivery Driver**
- **Driver**
- **Line Haul Driver**
- **Log Truck Driver**
- **Over the Road Driver (OTR Driver)**
- **Production Truck Driver**
- **Road Driver**
- **Semi-Truck Driver**
- **Tractor Trailer Operator**
- **Truck Driver**

Materials; DoubleTrailer; Triple Trailer; Tank Vehicle; and Passenger Transportation. Certain cargo, such as hazardous material and chemical waste, are subject to additional safety regulations and require specialized safety equipment and other special precautions. Drivers carrying liquids, oversize loads or cars also have specific rules that apply.

Heavy and tractor-trailer truck drivers generally work full time, and often work nights, weekends and holidays. The hours they work are highly regulated by the Federal Motor Carrier Safety Administration, drivers are required to log their hours to ensure compliance. Drivers may not work more than 14 straight hours (11 hours driving and 3 hours other work), they must have at least 10 hours off duty between shifts, and are limited to driving no more than 60 hours within 7 days or 70 hours within 8 days, after which drivers are required to take 34 hours off before starting another 7- or 8-day run.

Employers are seeking candidates who are dependable, those who can deal with high stress situations and maintain composure in difficult situations, integrity and attention to detail. Other soft-skills, including effective communication skills and time management skills, are highly valued.

Knowledge of transportation, public safety and security, customer service and machines and tools are required for this occupation. More specifically, individuals in this occupation require an understanding of: principles and methods for moving people or goods by air, rail, sea, or road, including the relative costs and benefits; equipment, policies, procedures, and strategies to promote effective local, state, or national security for the protection of people, data, property, and institutions; principles and processes for providing customer and personal services, including customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction; and designs, uses, repair, and maintenance of machines and tools. This base of knowledge allows heavy and tractor-trailer truck drivers to navigate their job duties successfully.

Job responsibilities for heavy and tractor-trailer truck drivers typically involve: inspecting trailers before and after the trip and recording any defects; driving long distances, following all applicable traffic laws and safety protocols; securing the cargo and inspecting the load to ensure it is secure; maintaining logs of working hours, vehicle service or repair status to ensure compliance with state and federal regulations; reporting mechanical problems and incidents on the road; checking that mechanical, safety, and emergency equipment is operational; and keeping their trucks and associated equipment clean and in good condition.

This occupation is considered slightly automated with an automation score of 22 out of 100. Currently automation in this occupation is considered complimentary versus a direct threat to employment. New technologies are augmenting the capabilities and increasing the capacity of heavy and tractor-trailer truck drivers to perform their duties through the use of integrated technology including networks of sensors mounted throughout the truck which can monitor everything from tire pressure to load stability, cloud-based platforms with real-time information about the location and condition of freight in transit,

EXHIBIT 80

Heavy and Tractor-Trailer Truck Drivers Jobs LOS ANGELES BASIN

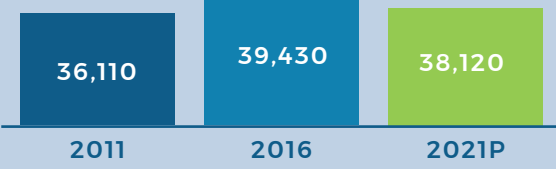
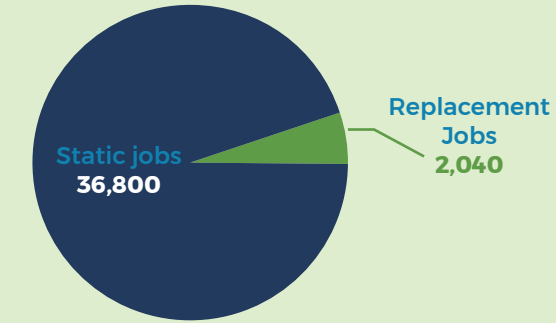


EXHIBIT 81

Heavy and Tractor-Trailer Truck Drivers Jobs LOS ANGELES BASIN 2021F



and big data paired with AI algorithms which make forecasting of shipping volumes possible so that companies may optimize freight delivery. While the subject of fully automated, or self-driving trucks is increasingly discussed relative to the future of the trucking industry, the rollout of self-driving trucks on the road is not yet realized, and their adoption will most likely occur slowly and include limited routes or require human drivers to drive the last mile of routes, for at least the next several years. In fact, it is expected that the demand for drivers will persist for quite some time until regulations and policies catch up to current technology.

Large Employers in the LA Basin

- **Hub Group Trucking**
- **May Trucking Company**
- **C.R. England Inc.**
- **Sysco Corp.**
- **Heartland Express**

EXHIBIT 82

Top Five Industries Employing Heavy and Tractor-Trailer Truck Drivers in the LA Basin

Industry Description	2016				2016-21f
	TTL Jobs	M-Skill Share	Target Occ	Target Share of M-Skill	TTL Job Growth (%)
Truck transportation	33,731	70.1%	17,637	74.5%	-2.8%
Merchant wholesalers, nondurable goods	128,529	39.9%	4,875	9.5%	-0.4%
Support activities for transportation	55,160	55.5%	4,405	14.4%	-0.4%
Couriers and messengers	28,910	24.1%	1,875	26.9%	6.7%
Merchant wholesalers, durable goods	146,962	46.4%	1,860	2.7%	2.3%

Source: QCEW, OES, forecast and analysis by LAEDC

OCCUPATIONAL DEMAND

Heavy and tractor-trailer truck drivers number 39,430 payroll workers in the Los Angeles Basin in our initial analysis of the regional economy for the CCW. Between 2011 and 2016, people employed in this occupation increased by 3,320 jobs (9.2 percent). The employment outlook for individuals in this occupation is promising. As demand for goods rises, as a result of increased consumer spending, these goods must be shipped to the businesses and consumers who purchase them. This occupation’s annual replacement rate of 8.5 is associated with the challenging lifestyle of many truck drivers, especially individuals with long-distance routes who spend long hours on the road and away from home. Additionally, a significant share (22 percent) of the existing workforce is ages 55 years and over, these positions will also need to be filled as individuals retire and separate from the industry. Employment of heavy and tractor-trailer truck drivers is projected to number 38,120 jobs by 2021 with **2,040 total openings in the**

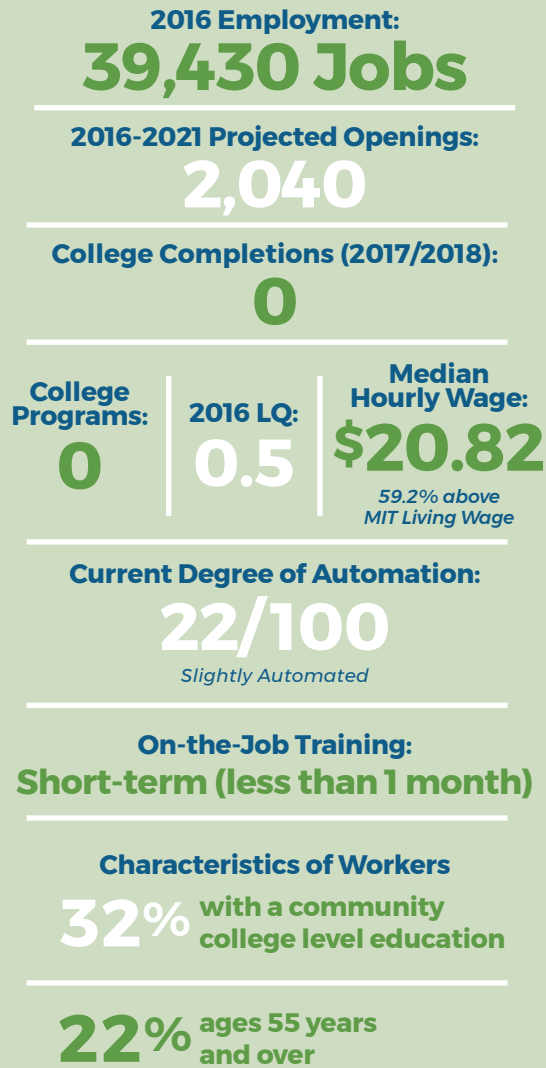
Los Angeles Basin between 2016 and 2021 due to replacement jobs.

The top-five industries employing the largest number of heavy and tractor-trailer truck drivers are listed in Exhibit 82. In addition to the trucking industry, they include wholesale operations, the logistics industry and couriers and messengers. Couriers and messengers and durable goods wholesalers employment is expected to add jobs between 2016 and 2021. Heavy and tractor-trailer truck drivers account for about three quarters of the middle-skill jobs in the truck transportation industry and over a quarter of the middle skill jobs in the couriers and messengers industry.

The median annual wage for heavy and tractor-trailer truck drivers is \$20.82 in the Los Angeles Basin. On an hourly basis, wages range from \$12.55 per hour in the tenth percentile to \$30.54 per hour in the nintieth percentile and a median hourly wage of \$20.82, above the MIT living wage of \$13.08 and \$14.48 per hour in Los Angeles and Orange counties respectively (Exhibit 83).

The location quotients (LQs) of occupations can reveal employment concentrations associated with a geographic clustering of industries. Occupations with LQs around 1.0 indicate similar proportions to national concentrations, and an LQ of 2.0 means that occupation is twice as concentrated as in the rest of the nation. Heavy and tractor-trailer truck drivers have an LQ of 0.5 in the Los Angeles Basin in 2016. Los Angeles County, specifically, ranks fifth in the nation for the largest number of heavy and tractor-trailer truck drivers employed. While there are a large number of heavy and tractor-trailer truck drivers in the Los Angeles Basin, the concentration is only half of that found nationally.

OCCUPATION HIGHLIGHTS



TALENT SUPPLY

Although truck and bus driving (TOP 0947.50) provides the training necessary for heavy and tractor-trailer truck drivers, no community college in the state conferred any awards in the 2017-18 academic year. However, Allan Hancock (Santa Barbara County) has a commercial truck driving program and Mission College (Santa Clara County) has a coach operator program listed under the TOP code of interest. It should be noted that Allan Hancock’s program is listed as a non-credit program. While **there are no community college completers** for truck and bus driving, there are projected to be 409 job openings annually for heavy and tractor-trailer truck drivers.

Colleges with Programs

- none

LOS ANGELES COUNTY HIGHLIGHTS



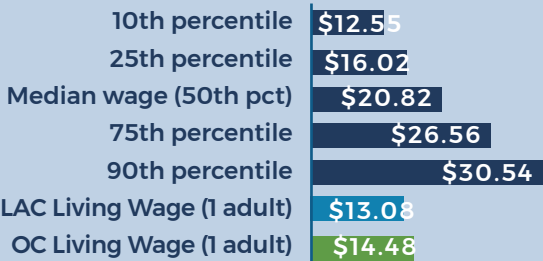
COUNTY SPECIFIC TALENT SUPPLY AND INDUSTRY DEMAND

The Los Angeles Basin includes Los Angeles and Orange counties. The size of each county’s economy differs as does its industry and occupational composition. To provide better information for partners in each geography, we cover key topline metrics for this detailed middle-skill occupation specific to each geography.

In Los Angeles County specifically, heavy and tractor-trailer truck drivers number 32,600 payroll workers in 2016; 3,040 jobs were added since 2011 (10.3 percent). Employment in this occupation is projected to number 31,360 jobs by 2021 with **1,530 total openings between 2016 and 2021** (306 annually). Wages range from \$12.41 per hour in the tenth percentile to \$30.77 per hour in the nintieth percentile, with a median

EXHIBIT 83

Heavy and Tractor-Trailer Truck Drivers Wages
LOS ANGELES BASIN



ORANGE COUNTY HIGHLIGHTS



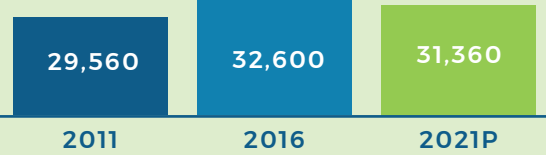
hourly wage of \$21.07, higher than the \$13.08 per hour MIT living wage in Los Angeles County by 61 percent.

In Los Angeles County, there are no community colleges that offer truck and bus driving programs.

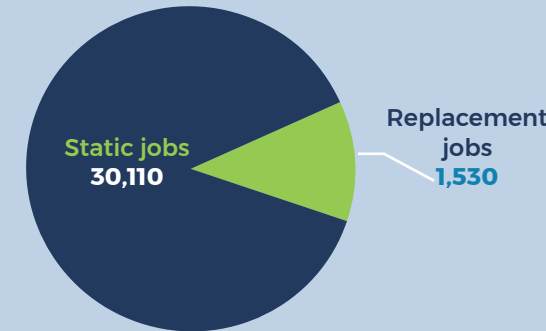
In Orange County specifically, heavy and tractor-trailer truck drivers number 6,820 payroll workers in 2016; 280 jobs were added since 2011 (4.3 percent). Employment in this occupation is projected to number 6,760 jobs by 2021 with 510 total openings between 2016 and 2021 (103 annually). Wages range from \$13.39 per hour in the tenth percentile to \$29.72 per hour in the nintieth percentile, with a median hourly wage of \$19.69, higher than the \$14.48 per hour MIT living wage in Orange County by 36 percent.

In Orange County, there are no community colleges that offer truck and bus driving programs.

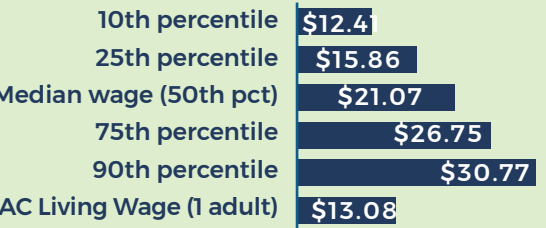
Heavy and Tractor-Trailer
Truck Drivers Jobs
LOS ANGELES COUNTY



Heavy and Tractor-Trailer
Truck Drivers Jobs
LOS ANGELES COUNTY 2021F



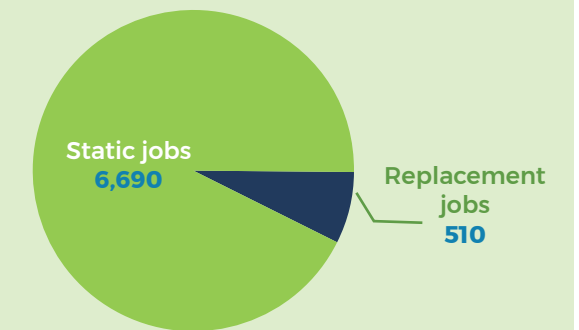
Heavy and Tractor-Trailer
Truck Drivers Wages
LOS ANGELES COUNTY 2016



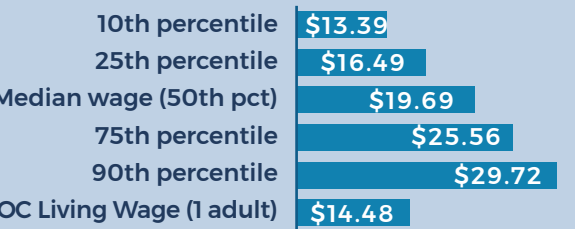
Heavy and Tractor-Trailer
Truck Drivers Jobs
ORANGE COUNTY



Heavy and Tractor-Trailer
Truck Drivers Jobs
ORANGE COUNTY 2021F



Heavy and Tractor-Trailer
Truck Drivers Wages
ORANGE COUNTY 2016



Conclusion

Tying it all together.

In this report we focused on middle-skill opportunities that exist in the Los Angeles Basin outside of the target industries identified in the Center for a Competitive Workforce’s baseline report “L.A. & Orange County Community Colleges: Powering Economic Opportunity.”

Currently, about 10 percent of all jobs in the Los Angeles Basin are considered middle-skill jobs, which provide identifiable opportunities for workers to earn a living wage and well-defined “career ladders” to move up the economic opportunity chain. However, this percentage is almost certain to increase markedly over the next half decade, with over one million total job openings forecast to be created in the Los Angeles Basin over the next five years and with employers seeking to fill many of those openings with middle-skill workers.

For this report, we used the occupational composition of the expected jobs across all industries to identify the 15 most promising detailed occupations, classified as middle-skill occupations not covered in our three previous target industry deep-dive reports (entertainment and digital media, health care and professional business services). The occupations detailed in this report are expected to account for 10 percent of projected total openings for middle-skill occupations in the Los Angeles Basin between 2016 and 2021 (forecast), which when combined with the target middle-skill occupations covered in our three deep-dive industry reports (representing an additional 31 percent of projected total openings for middle-skill jobs in the region) are projected to account for 40 percent of all forecast middle-skill occupations in the LA Basin between 2016 and 2021.

Compared to those occupations found in our deep-dive reports, the target occupations identified in

Combined, the target middle-skill occupations highlighted in CCW reports thus far are forecast to account for 40 percent of all projected openings for middle-skill jobs in the Los Angeles Basin between 2016 and 2021.

this report are employed across various industries, including the construction trades, manufacturing and transportation industries. Local government, repair industries and hospitality are also identified as having middle-skill occupations with high-growth potential over the next five years.

Between 2016 and 2021, most of the main industries that hire the target occupations detailed in this report will experience positive net new job growth for middle-skill occupations in the Los Angeles Basin, except for manufacturing, government and truck transportation. Even though there may be negative net changes in the overall number of middle-skill jobs in these industries, there will be additional employment opportunities available to middle-skill job applicants in the form of replacement jobs due to employment churn (changing jobs), retirements and other separations in the industry.

SUPPLY VS. DEMAND

Community colleges are an essential talent pipeline for middle-skill jobs in the Los Angeles Basin. Students who successfully complete programs relevant to high-tech, health care, sales, production and repair, and construction occupations will likely find employment.

However, when considering only community college completions, an analysis of community college supply reveals certain programs may need to be calibrated to meet forecasted demand for occupations. In some cases, such as machinists and automotive service technicians and mechanics, regional programs appear to be graduating more students than there are job openings across all industries. In other cases, such as plumbers,

Key Findings

- **Virtually all occupations require some degree of computer competency**
- **Soft skills are increasingly valued by employers across all industries and occupations**
- **Most high-growth occupations require a high degree of personal interaction**
- **High-growth target occupations will account for 10 percent of total openings over the next five years**
- **Deep-dive target occupations account for an additional 31 percent of total openings**
- **Middle-skill workers can minimize the risk of becoming obsolete by keeping up with the latest skills and technologies**
- **Middle-skill occupations account for 37 percent of projected total openings in the region**

pipefitters and steamfitters, and welders, cutters and brazers, there are not enough students to fill projected job openings. The Center recommends the community colleges take a closer look at these programs to determine whether program capacity is sufficient to meet demand. Additional areas of concern, where there may be an undersupply of students, include massage therapists, carpenters and electricians.

THE FUTURE WORKFORCE

Technology used across all industries is fast-changing, requiring community colleges to be constantly engaged with industry in order to stay on top of the skills required for ever evolving occupations. Virtually all occupations in this report require some degree of computer competency, from communicating via email (Microsoft Outlook), to using industry specific software to meet unique needs such as medical procedure coding software, project management software, enterprise resource planning (ERP) software, AutoCAD or ESRI ArcView. In addition to computer competency and software, other types of applications and technology are used to complete their job duties successfully.

In addition, most of the occupations covered in this report require a high degree of personal interaction between the worker and their customer/client or

AT RISK FOR DISRUPTION due to automation

- **Computer-controlled machine tool operators**
- **Insurance sales agents**
- **Industrial machinery mechanics**

SHIELDED FROM DISRUPTION due to automation

- **Massage therapists**
- **Carpenters**
- **Automotive service technicians and mechanics**
- **Plumbers, pipefitters and steamfitters**
- **Chefs and head cooks**

the general public. For this reason, many of these occupations have a low-risk of being fully automated. In particular, massage therapists have the least chance of being automated out of all the high-growth occupations identified, while computer-controlled machine tool operators and industrial machinery mechanics are considered to be at moderate risk of being automated. It’s important to

note that machine learning and artificial intelligence, along with yet-to-be-identified technologies, will have the potential to further automate occupations or certain job activities within occupations, thereby reducing the overall number of workers required in the long-term. It is vital that current and potential future workers keep up with the latest skills and technologies to reduce the risk of becoming obsolete.

RECOMMENDATIONS AND NEXT STEPS

Looking at middle-skill occupations outside of the CCW target industries, there are several industries in which the LAEDC recommends deeper research and analysis, as they are forecast to experience middle-skill job growth, such as in the manufacturing, energy and construction sectors.⁵ The hospitality industry and social assistance are other possible alternatives.⁶

The Center for a Competitive Workforce will regularly promulgate its findings and report on its work, primarily through its website: www.competitiveworkforce.la.

⁵ For example, manufacturing employs 185,000 workers in the Los Angeles Basin, 36 percent of which are in middle-skill occupations, and the construction industry is expected to add over 22,000 middle-skill jobs between 2016 and 2021.
⁶ Hospitality and social assistance are projected to have middle-skill job growth of 6,370 jobs and 4,890 jobs, respectively, over the period

Occupational Profiles

Employment numbers and worker characteristics.

Detailed information has been compiled for the top 15 middle-skill occupations in the L.A. Basin, not covered in the previous deep-dive industry reports. To maintain consistency and comparability with existing CCW reports, data from 2016 is used to determine wages and worker characteristics for the charts included with the profiles.

The information on top industries employing these occupations, current and projected employment, wages and demographics can be used by community colleges to tailor existing programs and guide outreach to potential students. The occupational analyses that follow may even inspire new program development or new approaches in attracting students to promising career paths.

EACH OCCUPATIONAL PROFILE SHEET CONTAINS:

- Hourly wages paid in 2016 for workers in Los Angeles and Orange counties compared to the living wage;
- The distribution of workers across industry sectors in the Los Angeles Basin;
- Metrics for the occupation including the number of current jobs and projected openings; and
- Worker characteristics, such as educational attainment, age distribution, race and ethnicity, and gender.

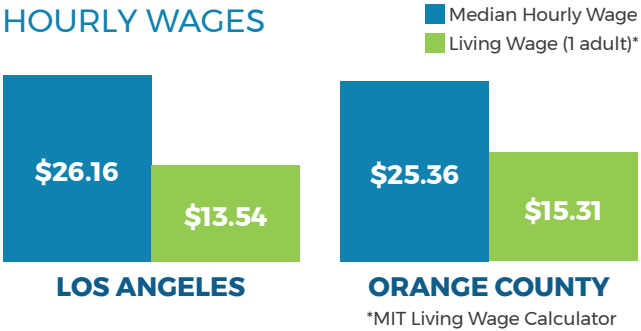
Top 15 Occupations

- Carpenters (SOC 47-2031)
- Electricians (SOC 47-2111)
- Police and Sheriff’s Patrol Officers (SOC 33-3051)
- Plumbers, Pipefitters and Steamfitters (SOC47-2152)
- Insurance Sales Agents (SOC 41-3021)
- Automotive Service Technicians and Mechanics (SOC 49-3023)
- Social and Human Service Assistants (SOC 21-1093)
- Welders, Cutters, Solderers and Brazers (SOC 51-4121)
- Massage Therapists (31-9011)
- Chefs and Head Cooks (SOC 35-1011)
- Heating, Air Conditioning and Refrigeration Mechanics and Installers (SOC 49-9021)
- Heavy and Tractor-Trailer Truck Drivers (SOC 53-3032)
- Industrial Machinery Mechanics (SOC 49-9041)
- Machinists (SOC 51-4041)
- Computer-Controlled Machine Tool Operators, metal and plastic (SOC 51-4011)

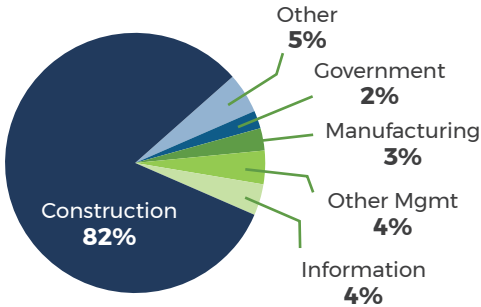
Carpenters (SOC 47-2031)

Construct, erect, install, or repair structures and fixtures made of wood, such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; and wood stairways, window and door frames, and hardwood floors. May also install cabinets, siding, drywall and batt or roll insulation. Includes brattice builders who build doors or brattices (ventilation walls or partitions) in underground passageways

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 47-2031 IN LA/OC



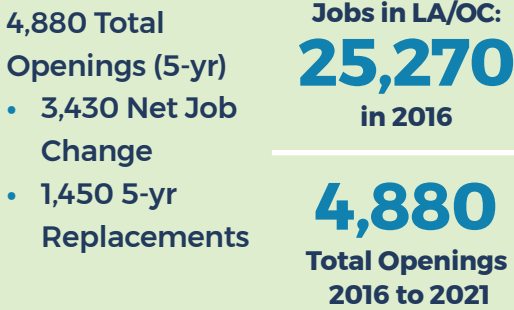
INDUSTRY DISTRIBUTION

Most carpenters are employed in construction; **20,600 carpenters** were employed in the construction industry in the region in 2016. They accounted for **82 percent** of employment in this occupation across all industries.

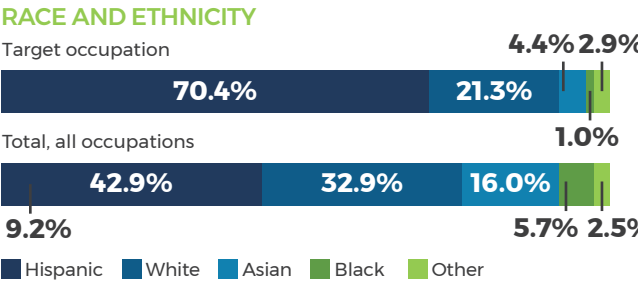
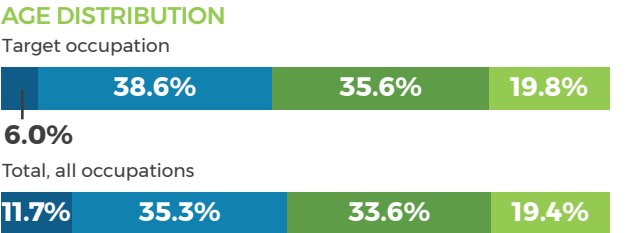
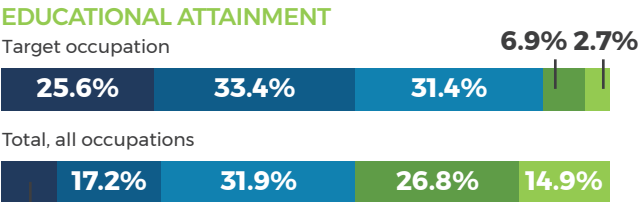
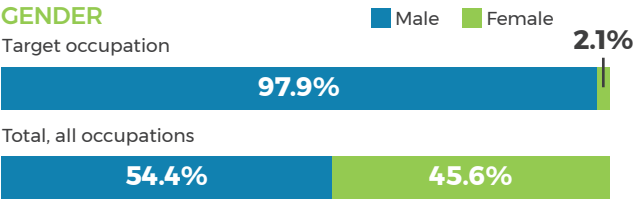
Top three industry subsectors employing this occupation:

- » Construction of Buildings (NAICS 236)
- » Specialty Trade Contractors (NAICS 238)
- » Motion Picture and Sound Recording (NAICS 512)

Total Projected Openings 2021



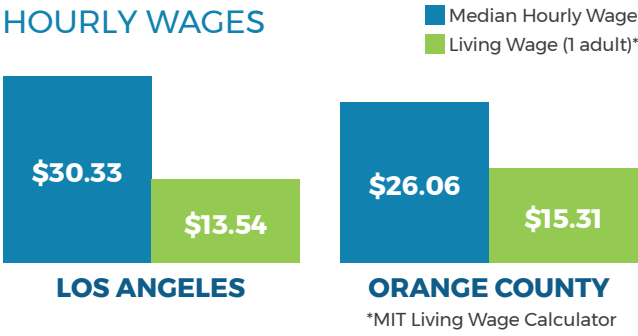
REGIONAL WORKER CHARACTERISTICS



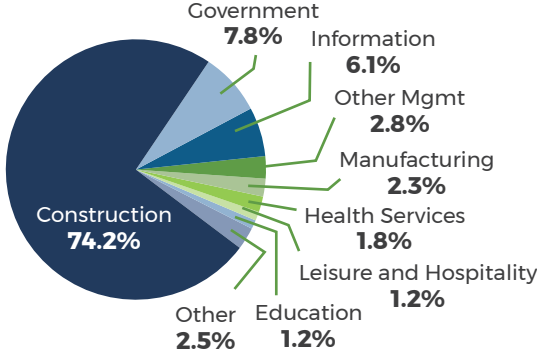
Electricians (SOC 47-2111)

Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems. Excludes "Security and Fire Alarm Systems Installers"

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 47-2111 IN LA/OC



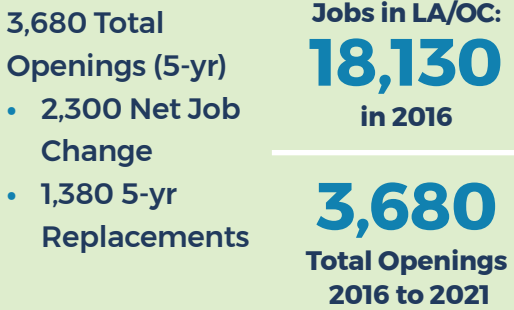
INDUSTRY DISTRIBUTION

Electricians are primarily employed in construction; indeed, **12,500 carpenters** were employed in the construction industry in the region in 2016. They accounted for **74 percent** of employment in this occupation across all industries. Other major industries employing electricians are government and information.

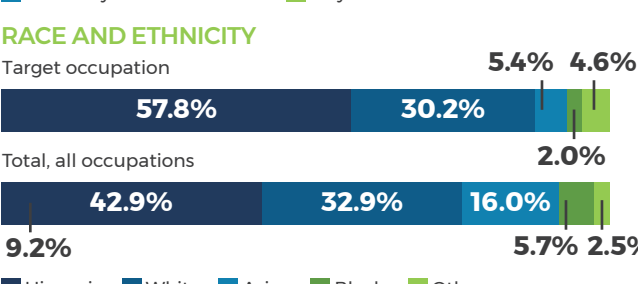
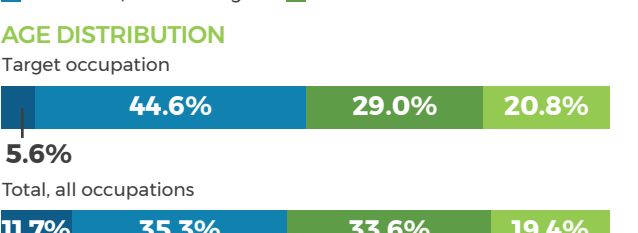
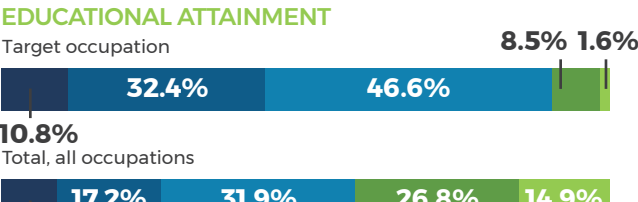
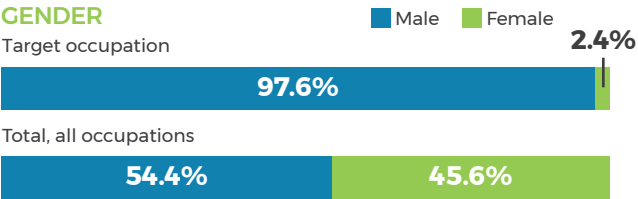
Top three industry subsectors employing this occupation:

- » Specialty Trade Contractors (NAICS 238)
- » Local Government (NAICS 993)
- » Motion Picture and Sound Recording (NAICS 512)

Total Projected Openings 2021



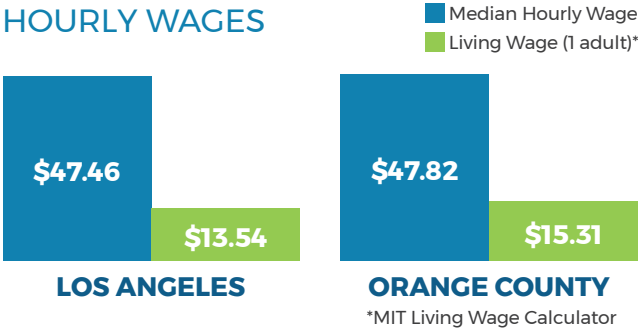
REGIONAL WORKER CHARACTERISTICS



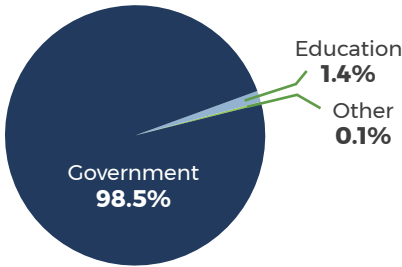
Police and Sheriff's Patrol Officers (SOC 33-3051)

Maintain order and protect life and property by enforcing local, tribal, State, or Federal laws and ordinances. Perform a combination of the following duties: patrol a specific area; direct traffic; issue traffic summonses; investigate accidents; apprehend and arrest suspects, or serve legal processes of courts.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 33-3051 IN LA/OC



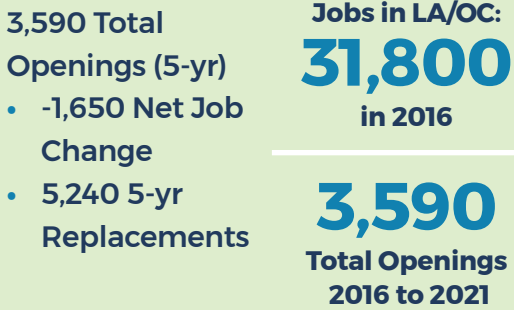
INDUSTRY DISTRIBUTION

Police and sheriff's patrol officers are almost entirely employed by local government; indeed, **31,800 policy and sheriff's patrol officers** were employed by local government in the region in the region in 2016. They accounted for over **98 percent** of employment in this occupation across all industries.

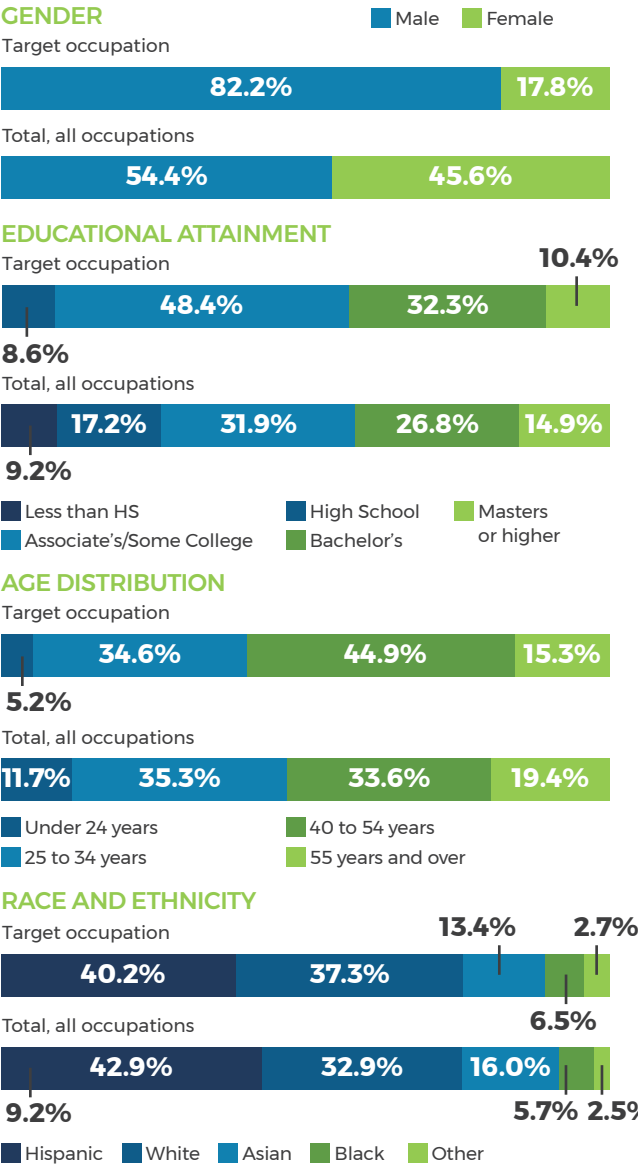
Top three industry subsectors employing this occupation:

- » Local Government (NAICS 993)
- » Federal Government (NAICS 991)
- » Educational Services (NAICS 611)

Total Projected Openings 2021



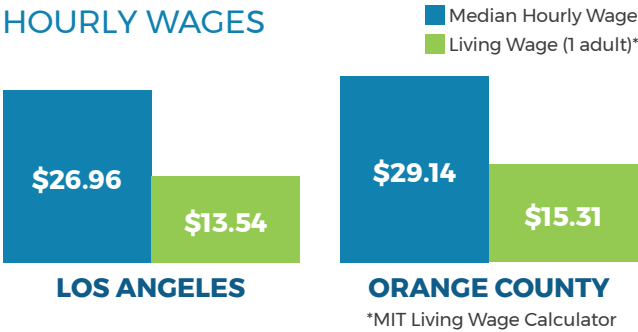
REGIONAL WORKER CHARACTERISTICS



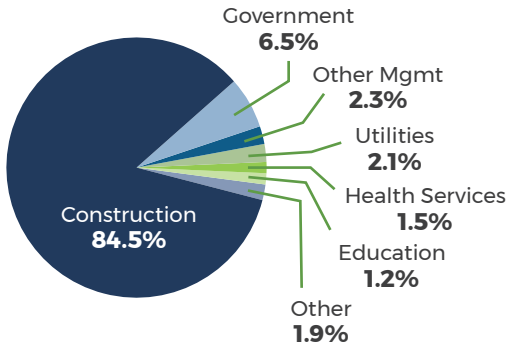
Plumbers, Pipefitters, and Steamfitters (SOC 47-2152)

Assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases. May install heating and cooling equipment and mechanical control systems. Includes sprinkler fitters.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 47-2152 IN LA/OC



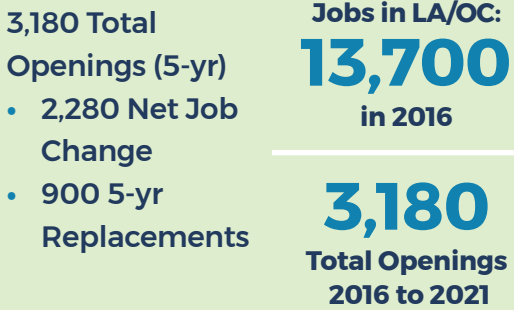
INDUSTRY DISTRIBUTION

Most plumbers, pipefitters and steamfitters are employed in the construction industry; **13,700 plumbers, pipefitters and steamfitters** were employed in the construction industry in the region in 2016. They accounted for over **84 percent** of employment in this occupation across all industries.

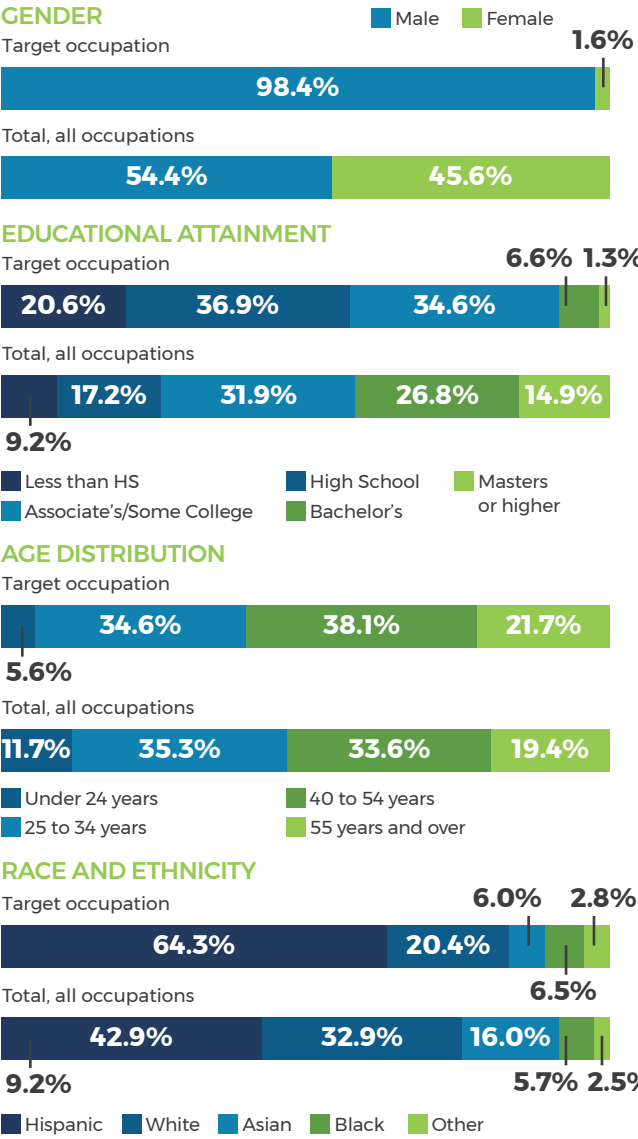
Top three industry subsectors employing this occupation:

- » Specialty Trade Contractors (NAICS 238)
- » Local Government (NAICS 993)
- » Construction of Buildings (NAICS 236)

Total Projected Openings 2021



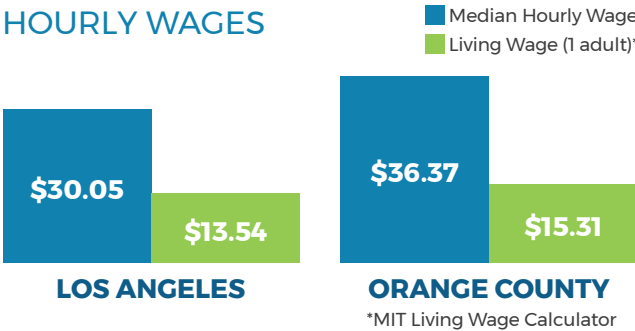
REGIONAL WORKER CHARACTERISTICS



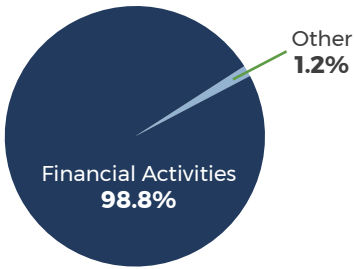
Insurance Sales Agents (SOC 41-3021)

Sell life, property, casualty, health, automotive, or other types of insurance. May refer clients to independent brokers, work as an independent broker, or be employed by an insurance company.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 41-3021 IN LA/OC



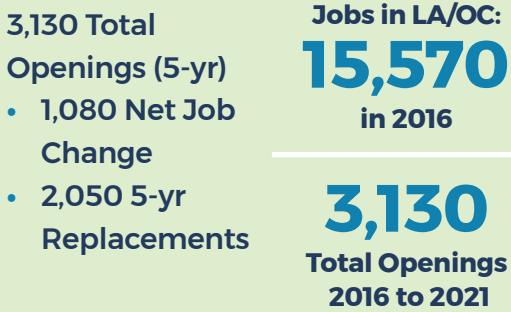
INDUSTRY DISTRIBUTION

Insurance sales agents are almost exclusively employed in the financial activities; **15,570 insurance sales agents** were employed in the financial services industry in the region in 2016. They accounted for almost **99 percent** of employment in this occupation across all industries.

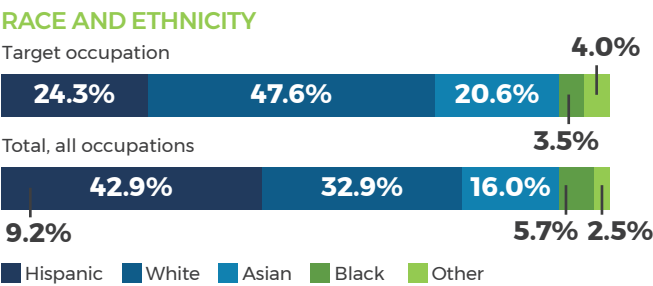
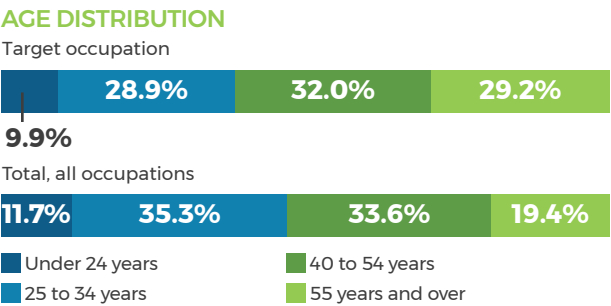
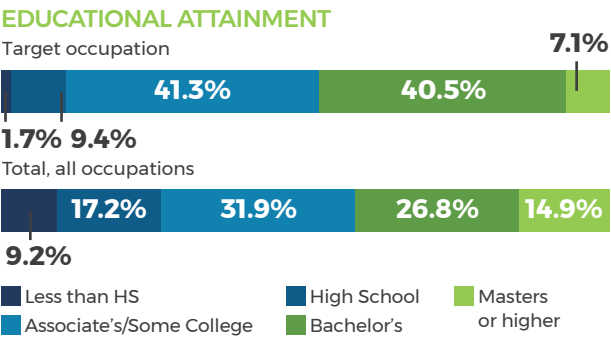
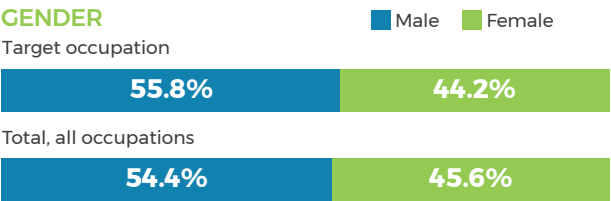
Top three industry subsectors employing this occupation:

- » Insurance Carriers and Related Activities (NAICS 524)
- » Securities, Commodity Contracts, Investments (NAICS 523)
- » Credit Intermediation and Related Activities (NAICS 522)

Total Projected Openings 2021



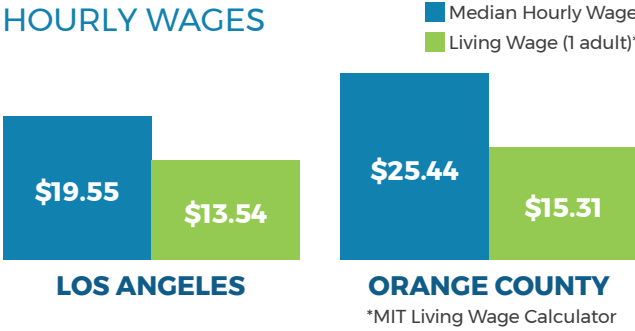
REGIONAL WORKER CHARACTERISTICS



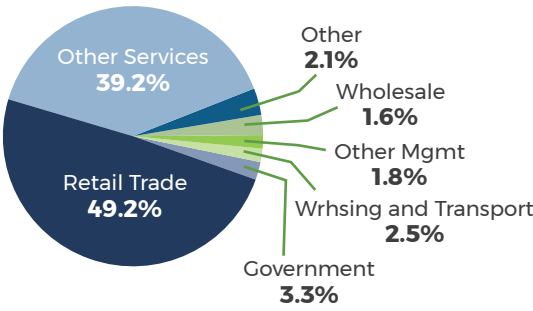
Automotive Service Technicians and Mechanics (SOC 49-3023)

Diagnose, adjust, repair, or overhaul automotive vehicles.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 49-3023 IN LA/OC



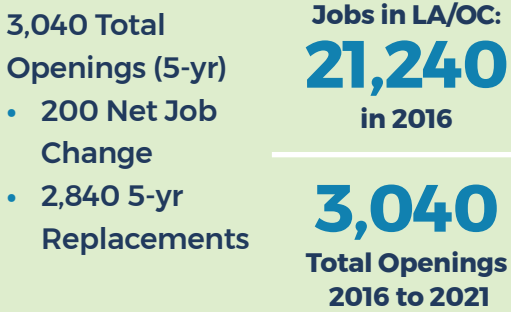
INDUSTRY DISTRIBUTION

Automotive service technicians are employed primarily in retail trade and personal services; **18,860 automotive service technicians and mechanics** were employed in the retail trade and personal services industries in the region in 2016. They accounted for **88.7 percent** of employment in this occupation across all industries.

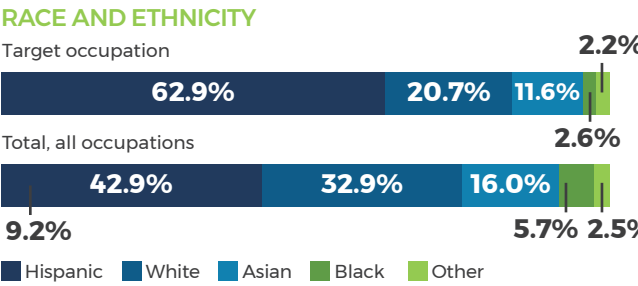
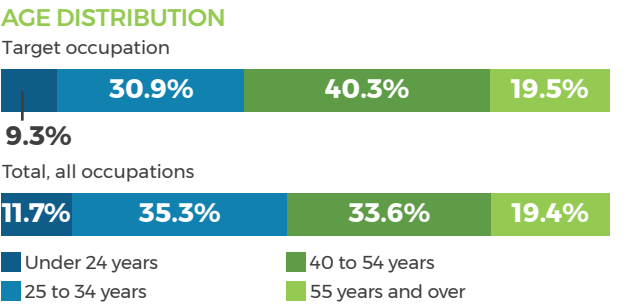
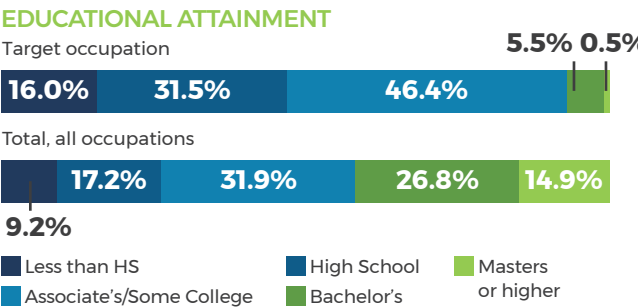
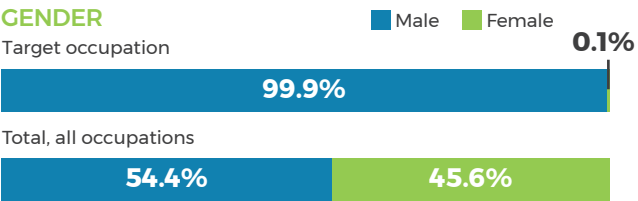
Top three industry subsectors employing this occupation:

- » Motor Vehicle and Parts Dealers (NAICS 441)
- » Repair and Maintenance (NAICS 811)
- » Local Government (NAICS 993)

Total Projected Openings 2021



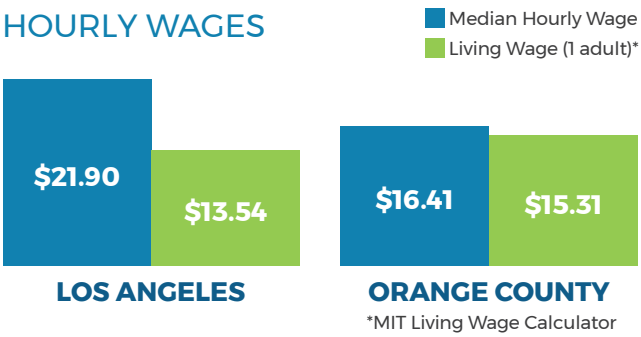
REGIONAL WORKER CHARACTERISTICS



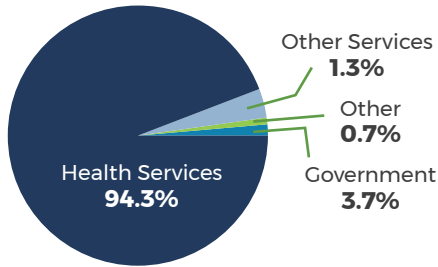
Social and Human Service Assistants (SOC 21-1093)

Assist in providing client services in a wide variety of fields, such as psychology, rehabilitation, or social work, including support for families. May assist clients in identifying and obtaining available benefits and social and community services. May assist social workers with developing, organizing, and conducting programs to prevent and resolve problems relevant to substance abuse, human relationships, rehabilitation, or dependent care.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 21-1093 IN LA/OC



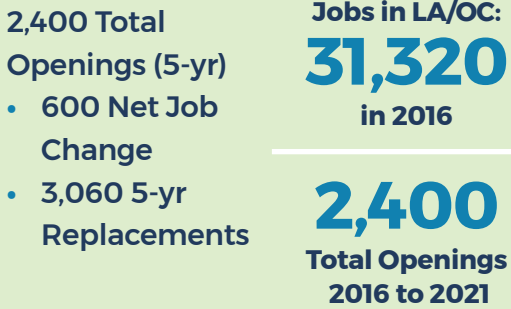
INDUSTRY DISTRIBUTION

Social and human service assistants are almost entirely employed in the health care industry; **29,520 social and human services assistants** were employed in the health care industry in the region in 2016. They accounted for over **94 percent** of employment in this occupation across all industries.

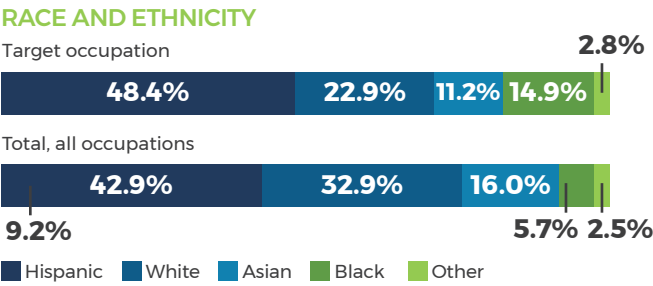
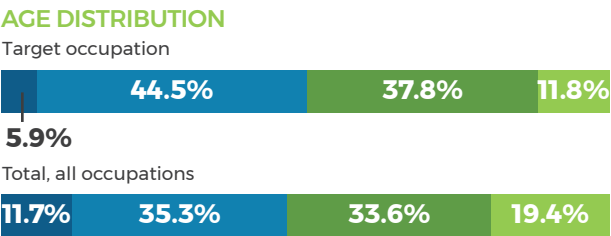
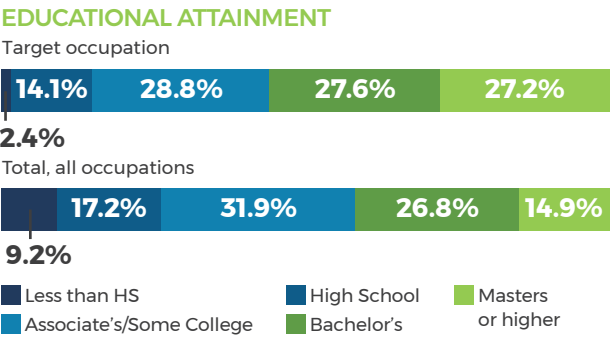
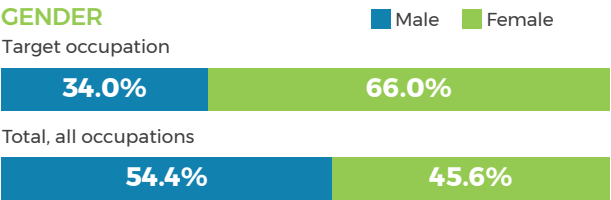
Top three industry subsectors employing this occupation:

- » Social Assistance (NAICS 624)
- » Local Government (NAICS 993)
- » Nursing and Residential Care Facilities (NAICS 623)

Total Projected Openings 2021



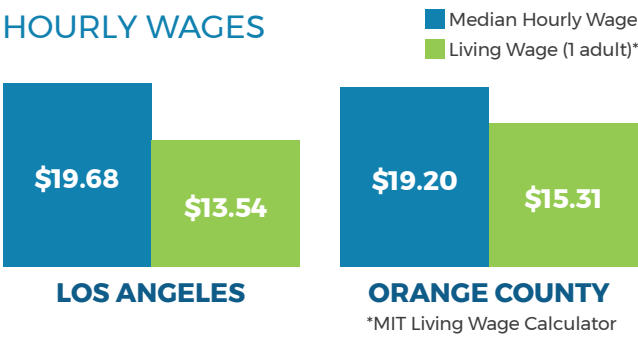
REGIONAL WORKER CHARACTERISTICS



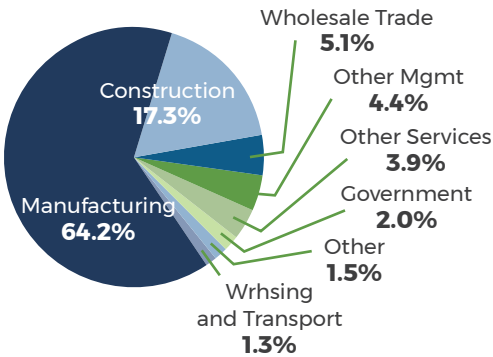
Welders, Cutters, Solderers, and Brazers (SOC 51-4121)

Use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 51-4121 IN LA/OC



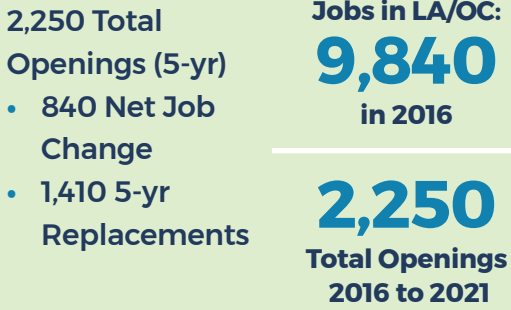
INDUSTRY DISTRIBUTION

Automotive service technicians are employed primarily in retail trade and personal services; **18,860 automotive service technicians and mechanics** were employed in the retail trade and personal services industries in the region in 2016. They accounted for **88.7 percent** of employment in this occupation across all industries.

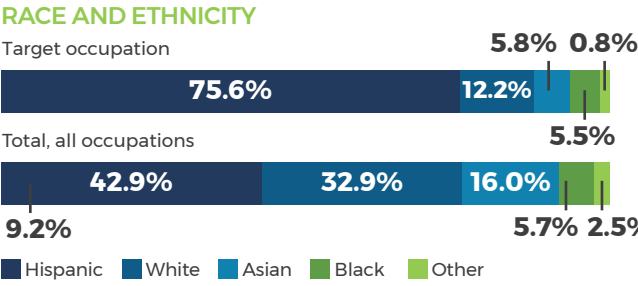
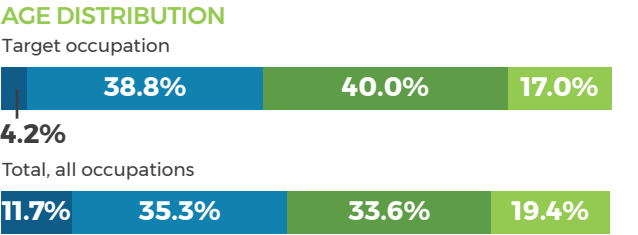
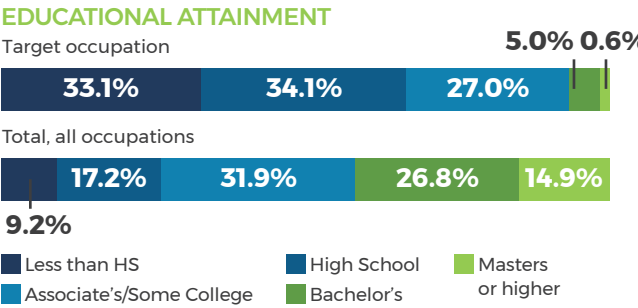
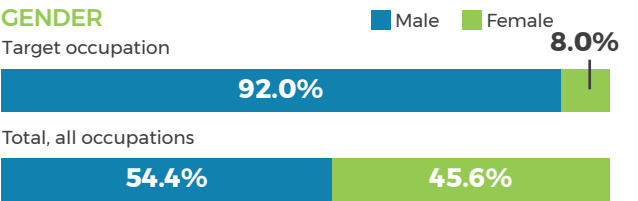
Top three industry subsectors employing this occupation:

- » Motor Vehicle and Parts Dealers (NAICS 441)
- » Repair and Maintenance (NAICS 811)
- » Local Government (NAICS 993)

Total Projected Openings 2021



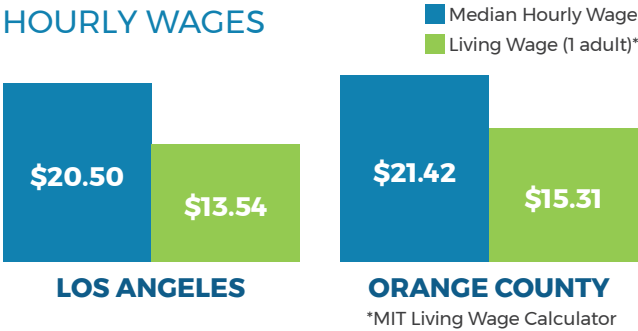
REGIONAL WORKER CHARACTERISTICS



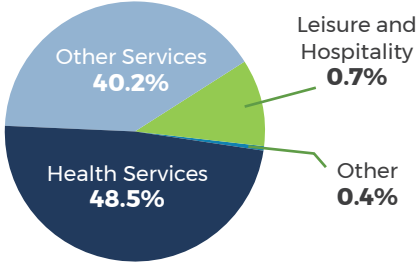
Massage Therapists (SOC 31-9011)

Perform therapeutic massages of soft tissues and joints. May assist in the assessment of range of motion and muscle strength or propose client therapy plans.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 31-9011 IN LA/OC

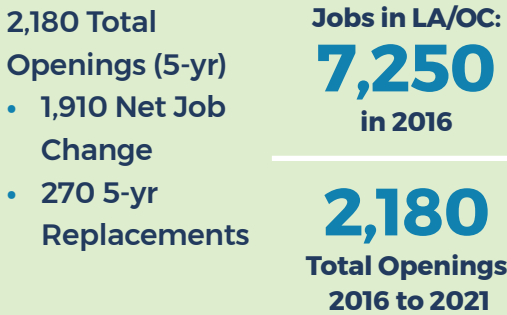


INDUSTRY DISTRIBUTION

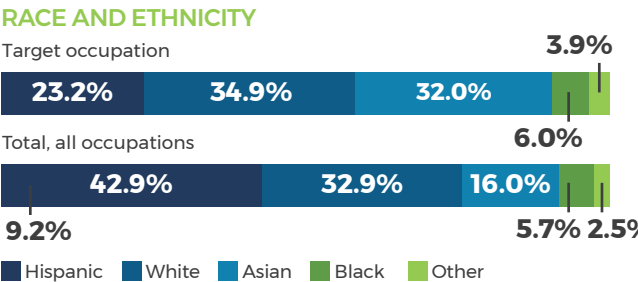
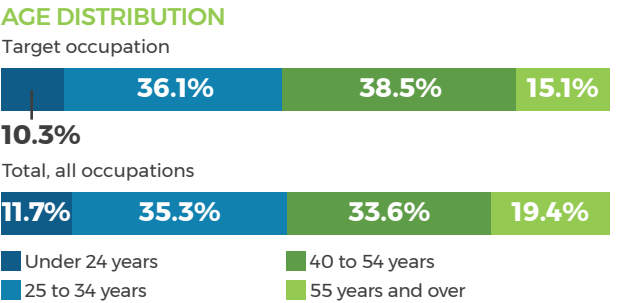
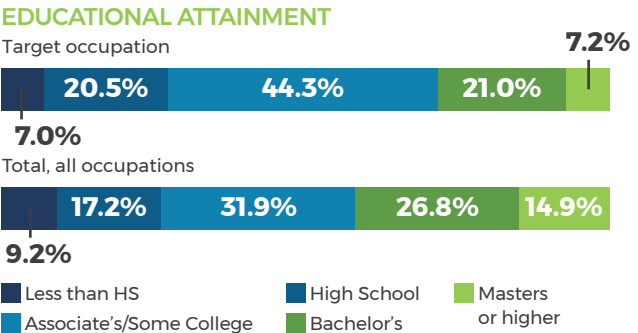
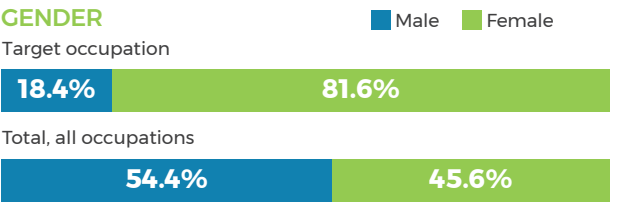
Message therapists are primarily employed in the health care or personal services industries; **6,430 message therapists** were employed in the health care and personal services industries in the region in 2016. They accounted for **88.7 percent** of employment in this occupation across all industries.

- Top three industry subsectors employing this occupation:
- » Ambulatory Health Care Services (NAICS 621)
 - » Personal and Laundry Services (NAICS 812)
 - » Accommodation (NAICS 721)

Total Projected Openings 2021



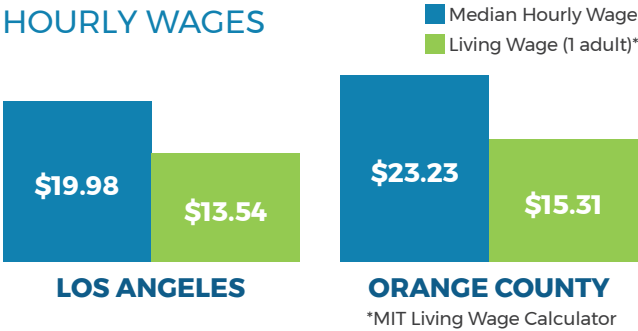
REGIONAL WORKER CHARACTERISTICS



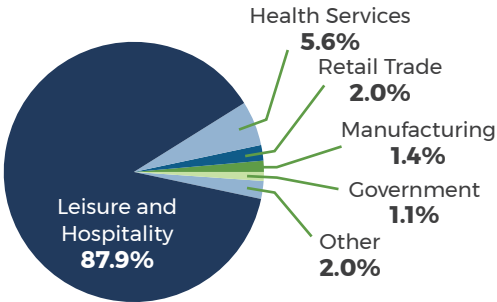
Chefs and Head Cooks (SOC 35-1011)

Direct and may participate in the preparation, seasoning, and cooking of salads, soups, fish, meats, vegetables, desserts, or other foods. May plan and price menu items, order supplies, and keep records and accounts.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 35-1011 IN LA/OC

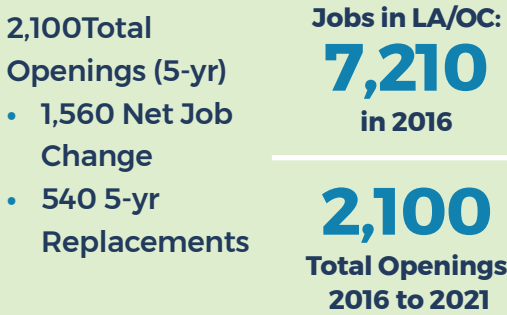


INDUSTRY DISTRIBUTION

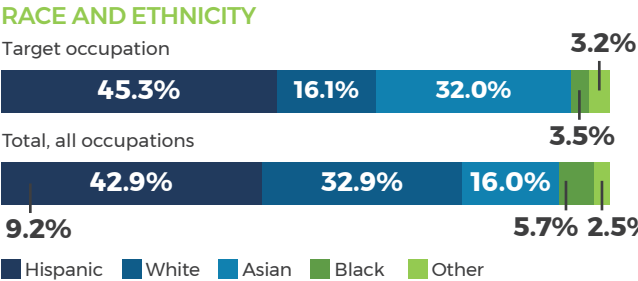
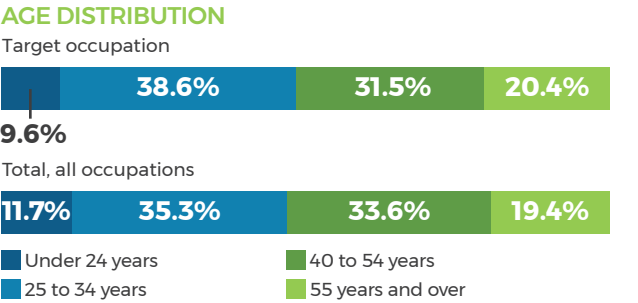
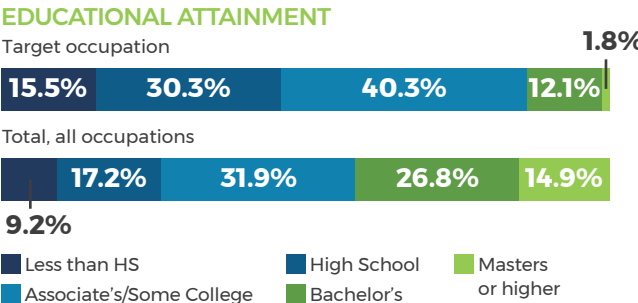
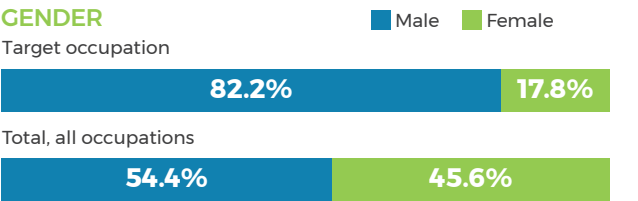
Chefs and head cooks are almost entirely employed in the leisure and hospitality industry; **6,340 chefs and head cooks** were employed in the leisure and hospitality industry in the region in 2016. They accounted for almost **88 percent** of employment in this occupation across all industries.

- Top three industry subsectors employing this occupation:
- » Food Services and Drinking Places (NAICS 722)
 - » Accommodation (NAICS 721)
 - » Amusements, Gambling and Recreation (NAICS 713)

Total Projected Openings 2021



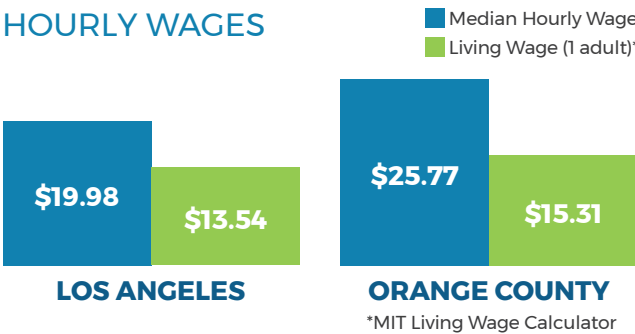
REGIONAL WORKER CHARACTERISTICS



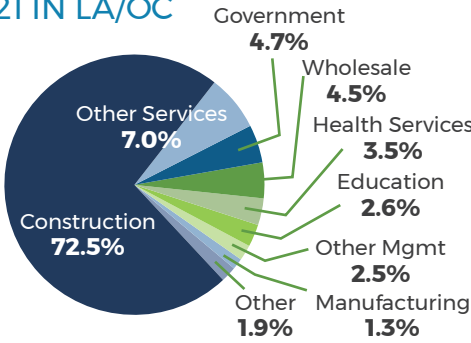
Heating, Air Conditioning, and Refrigeration Mechanics and Installers (SOC 49-9021)

Direct and may participate in the preparation, seasoning, and cooking of salads, soups, fish, meats, vegetables, desserts, or other foods. May plan and price menu items, order supplies, and keep records and accounts.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 49-9021 IN LA/OC



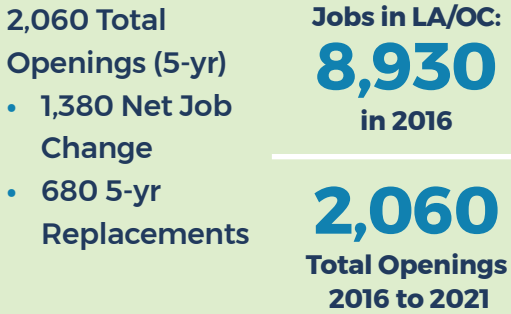
INDUSTRY DISTRIBUTION

Heating, air conditioning, and refrigeration mechanics and installers are primarily employed in the construction industry; **6,470 heating, air conditioning, and refrigeration mechanics and installers** were employed in the construction industry in the region in 2016. They accounted for **72.5 percent** of employment in this occupation across all industries.

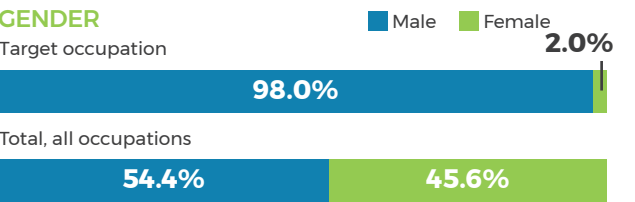
Top three industry subsectors employing this occupation:

- » Specialty Trade Contractors (NAICS 238)
- » Repair and Maintenance (NAICS 811)
- » Merchant Wholesalers, Durable Goods (NAICS 423)

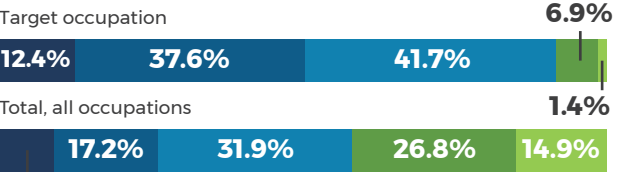
Total Projected Openings 2021



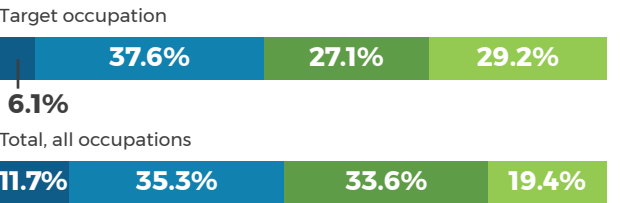
REGIONAL WORKER CHARACTERISTICS



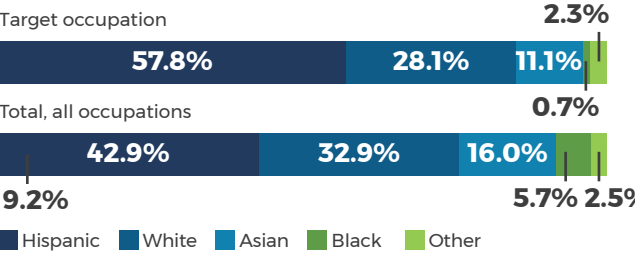
EDUCATIONAL ATTAINMENT



AGE DISTRIBUTION



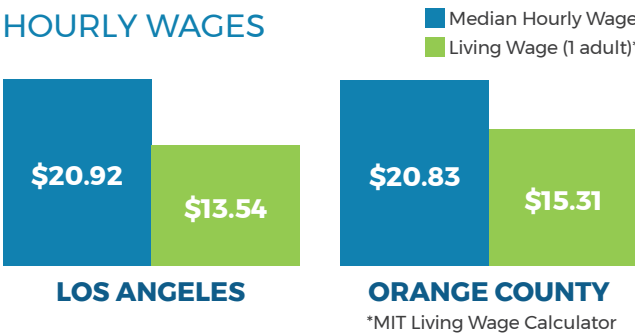
RACE AND ETHNICITY



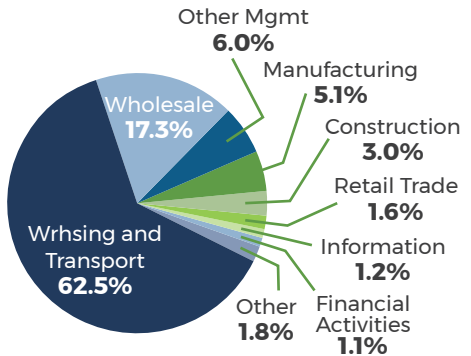
Heavy and Tractor-Trailer Truck Drivers (SOC 53-3032)

Drive a tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW). May be required to unload truck. Requires commercial drivers' license.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 53-3032 IN LA/OC



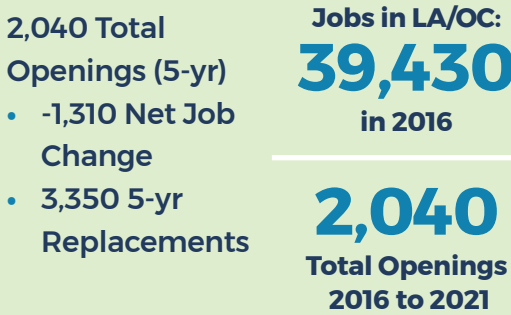
INDUSTRY DISTRIBUTION

Heavy and tractor-trailer truck drivers are primarily employed in the wholesale trade and transportation and wholesale trade industries; **31,430 heavy and tractor-trailer truck drivers** were employed in these industries in the region in 2016. They accounted for **79.8 percent** of employment in this occupation across all industries.

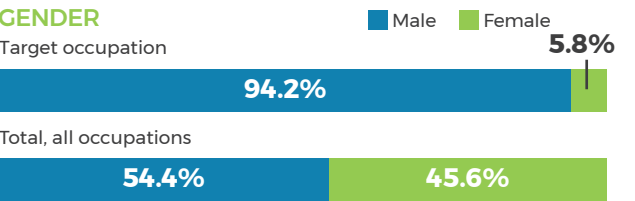
Top three industry subsectors employing this occupation:

- » Truck Transportation (NAICS 484)
- » Merchant Wholesalers, Nondurable Goods (NAICS 424)
- » Support Activities for Transportation (NAICS 488)

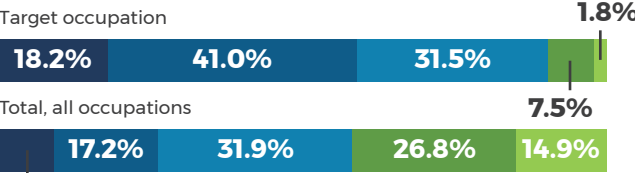
Total Projected Openings 2021



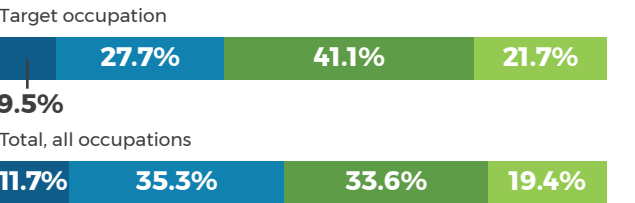
REGIONAL WORKER CHARACTERISTICS



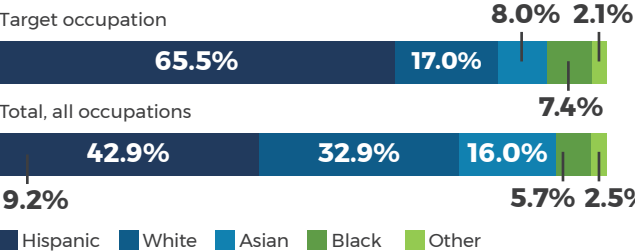
EDUCATIONAL ATTAINMENT



AGE DISTRIBUTION



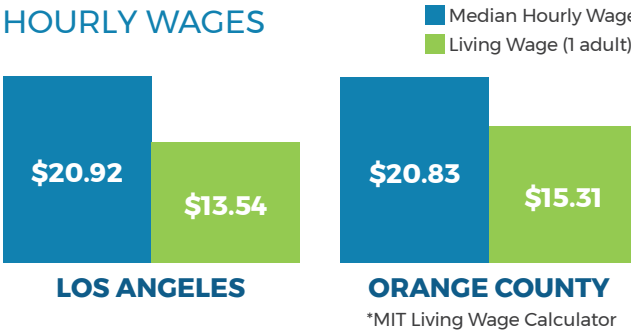
RACE AND ETHNICITY



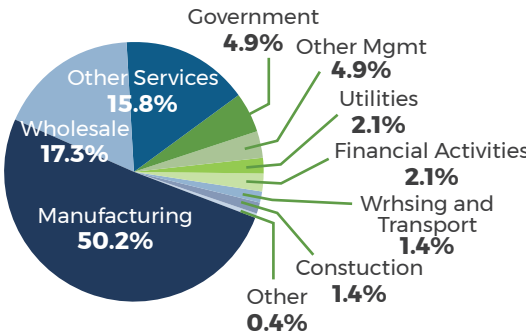
Industrial Machinery Mechanics (SOC 49-9041)

Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 49-9041 IN LA/OC



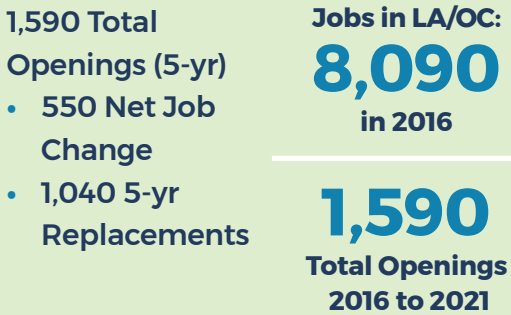
INDUSTRY DISTRIBUTION

Industrial machinery mechanics are primarily employed in the manufacturing, wholesale trade and personal services industries; **6,740 industrial machinery mechanics** were employed in these industries in the region in 2016. They accounted for **83.3 percent** of employment in this occupation across all industries.

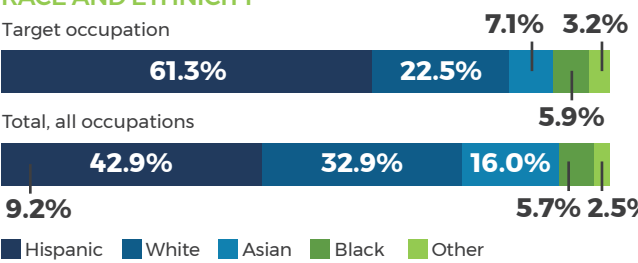
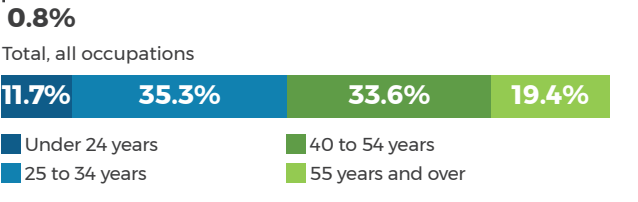
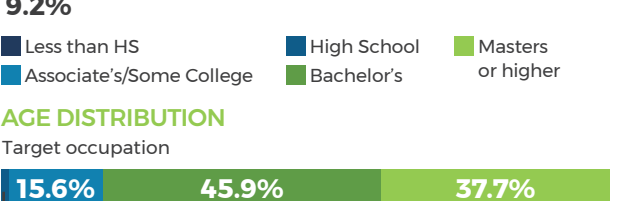
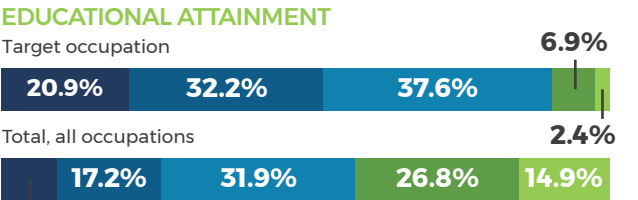
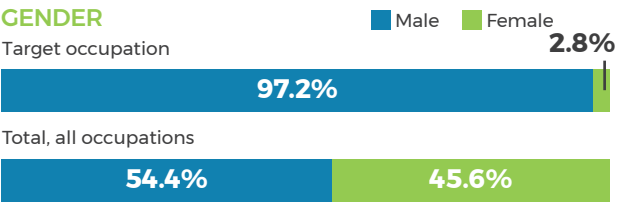
Top three industry subsectors employing this occupation:

- » Merchant Wholesaler, Durable Goods (NAICS 423)
- » Repair and Maintenance (NAICS 811)
- » Food Manufacturing (NAICS 311)

Total Projected Openings 2021



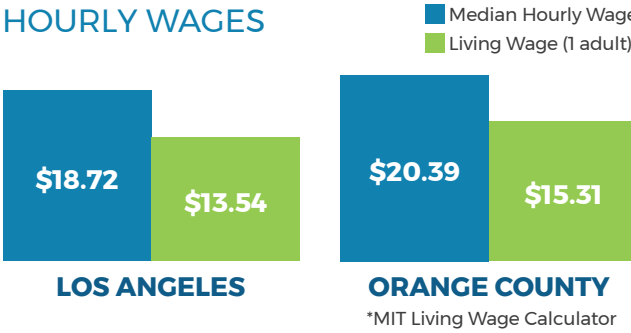
REGIONAL WORKER CHARACTERISTICS



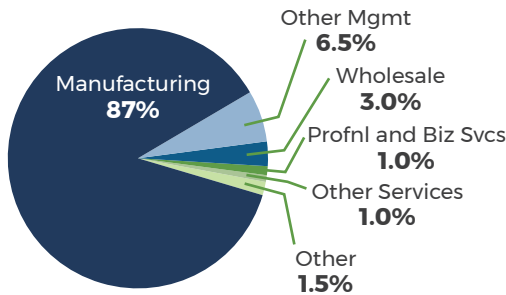
Machinists (SOC 51-4041)

Set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 51-4041 IN LA/OC



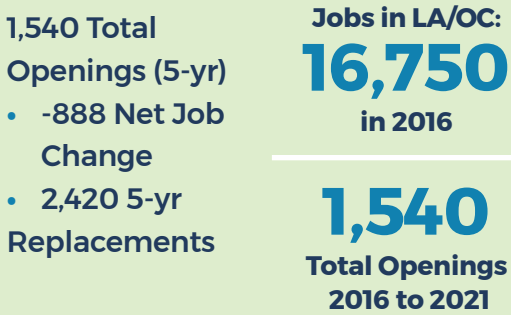
INDUSTRY DISTRIBUTION

Most machinists are employed in the manufacturing industry; indeed, **14,120 machinists** were employed in the manufacturing industry in the region in 2016. They accounted for **87 percent** of employment in this occupation across all industries.

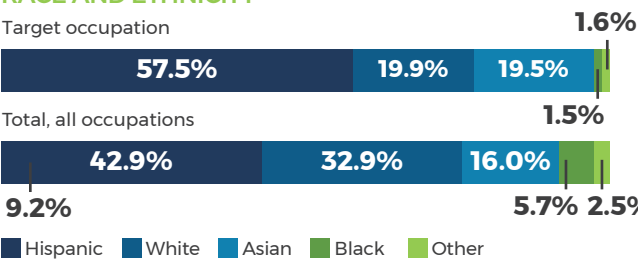
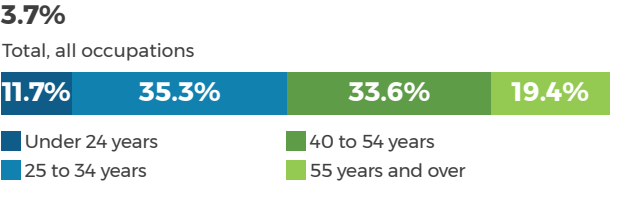
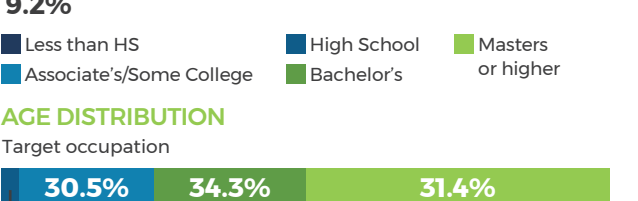
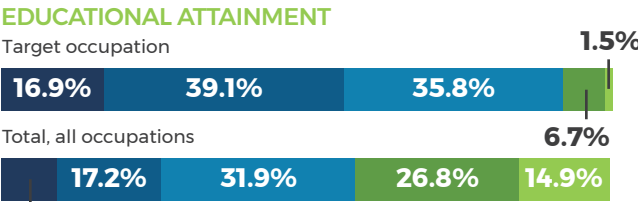
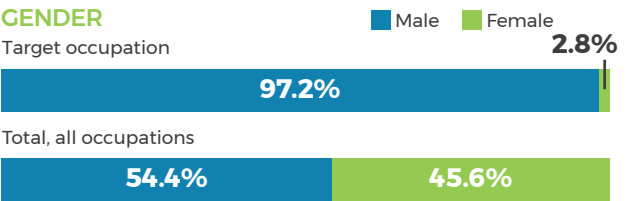
Top three industry subsectors employing this occupation:

- » Fabricated Metal Product Manufacturing (NAICS 332)
- » Transportation Equipment Manufacturing (NAICS 336)
- » Machinery Manufacturing (NAICS 333)

Total Projected Openings 2021



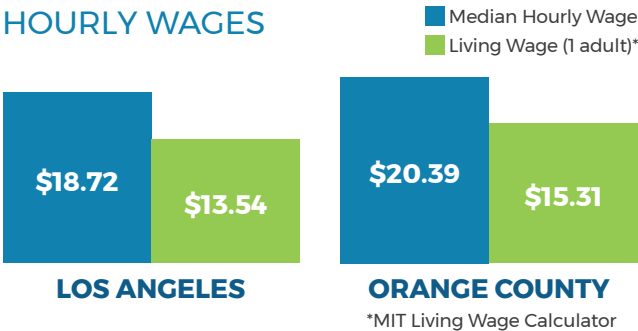
REGIONAL WORKER CHARACTERISTICS



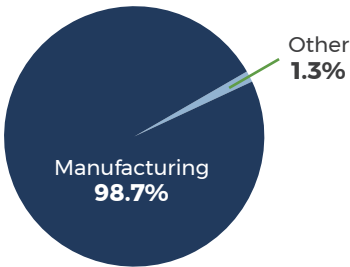
Computer-Controlled Machine Tool Operators, Metal and Plastic (SOC 51-4011)

Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems.

HOURLY WAGES



INDUSTRY DISTRIBUTION OF 51-4011 IN LA/OC

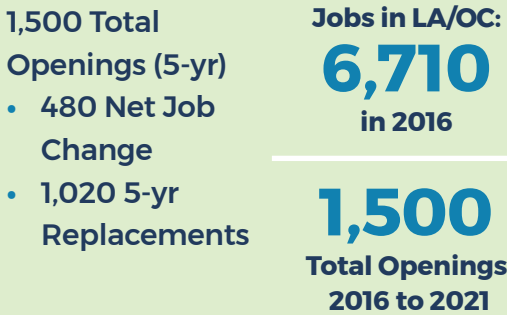


INDUSTRY DISTRIBUTION

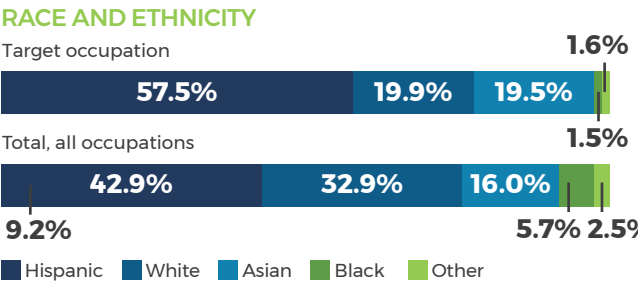
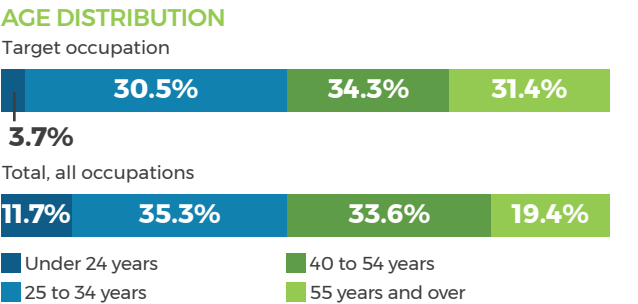
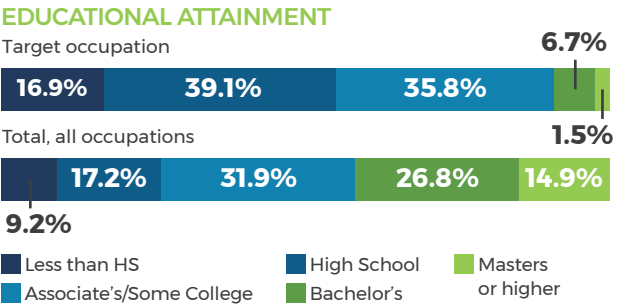
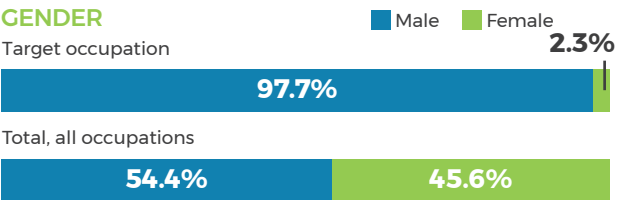
Computer-controlled machine tool operators, metal and plastic, are almost entirely employed in the manufacturing industry; **6,620 computer-controlled machine tool operators** were employed in the health care industry in the region in 2016. They accounted for almost **99 percent** of employment in this occupation across all industries.

- Top three industry subsectors employing this occupation:
- » Fabricated Metal Product Manufacturing (NAICS 332)
 - » Transportation Equipment Manufacturing (NAICS 336)
 - » Computer and Electronic Product Manufacturing (NAICS 334)

Total Projected Openings 2021



REGIONAL WORKER CHARACTERISTICS



Appendix

Community College Programs

Sales and Salesmanship (0509.40)

College	# of Certificates	# of Associate Degrees	Total Awards
Orange Coast	11	-	11
Santa Ana	1	-	1
Santa Monica	12	4	16
Total	24	4	28

Industrial Systems Technology and Maintenance (0945.00)

College	# of Certificates	# of Associate Degrees	Total Awards
Fullerton	-	2	2
LA Harbor	-	1	1
LA Trade	91	3	94
Long Beach	-	1	1
Santiago Canyon	6	-	6
Total	97	7	104

Environmental Control Technology (0946.00)

College	# of Certificates	# of Associate Degrees	Total Awards
Compton	31	1	32
Cypress	130	4	134
El Camino	92	12	104
LA Trade	69	23	92
Long Beach	-	1	1
Mt San Antonio	30	8	38
Orange Coast	24	4	28
Total	376	53	429

Energy Systems Technology (0946.10)

College	# of Certificates	# of Associate Degrees	Total Awards
Golden West	3	3	6
LA Trade	26	4	30
LA Valley	1	-	1
Mt San Antonio	5	2	7
Pasadena	4	-	4
Rio Hondo	5	2	7
Santa Monica	1	3	4
Total	45	14	59

Automotive Technology (0948.00)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	34	23	57
Citrus	80	5	85
Compton	18	3	21
Cypress	165	8	173
East LA	73	11	84
El Camino	89	8	97
Fullerton	43	6	49
Golden West	24	13	37
LA Pierce	119	18	137
LA Trade	133	14	147
Pasadena	34	6	40
Rio Hondo	78	7	85
Saddleback	16	7	23
Santa Ana	1,282	9	1,291
Total	2,188	138	2,326

Alternative Fuels and Advanced Transportation Technology (0948.40)

College	# of Certificates	# of Associate Degrees	Total Awards
LA Trade	18	-	18
Long Beach	3	-	3
Rio Hondo	14	5	19
Saddleback	6	2	8
Total	41	7	48

Carpentry (0952.10)

College	# of Certificates	# of Associate Degrees	Total Awards
LA Trade	33	5	38
Total	33	5	38

Electrical (0952.20)

College	# of Certificates	# of Associate Degrees	Total Awards
Irvine	7	-	7
LA Trade	124	39	163
Orange Coast	6	-	6
Santiago Canyon	1	-	1
Total	138	39	177

Plumbing, Pipefitting and Steamfitting (0952.30)

College	# of Certificates	# of Associate Degrees	Total Awards
LA Trade	31	4	32
Total	31	4	32

Mill and Cabinet Work (0952.50)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	28	4	32
Total	28	4	32

Manufacturing and Industrial Technology (0956.00)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	5	1	6
Compton	1	1	2
El Camino	1	2	3
Fullerton	-	11	11
Irvine	1	-	1
LA Valley	2	-	2
Mt San Antonio	4	5	9
Saddleback	6	3	9
Santa Ana	-	1	1
Total	20	24	44

Machining and Machine Tools (0956.30)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	31	7	38
Compton	-	1	1
El Camino	18	14	32
Fullerton	9	-	9
LA Pierce	3	7	10
LA Trade	11	6	17
LA Valley	3	-	3
Orange Coast	82	10	92
Santa Ana	67	11	78
Total	224	56	280

Welding Technology (0956.50)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	69	16	85
Compton	3	2	5
El Camino	15	10	25
Fullerton	10	-	10
LA Trade	18	9	27
Long Beach	-	-	-
Mt San Antonio	10	5	15
Orange Coast	3	4	7
Pasadena	1	1	2
Rio Hondo	18	-	18
Santa Ana	16	8	24
Total	163	55	218

Massage Therapy (1262.00)

College	# of Certificates	# of Associate Degrees	Total Awards
Fullerton	9	-	9
Total	9	-	9

Nutrition, Foods, and Culinary Arts (1306.00)

College	# of Certificates	# of Associate Degrees	Total Awards
East LA	-	7	7
Fullerton	-	9	9
Glendale	4	-	4
LA Mission	1	2	3
Long Beach	-	2	2
Mt San Antonio	8	2	10
Orange Coast	3	6	9
Saddleback	14	9	23
Santa Ana	-	3	3
Santa Monica	-	5	5
West LA	-	1	1
Total	30	46	76

Culinary Arts (1306.30)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	59	18	77
Cypress	78	19	97
LA Harbor	7	3	10
LA Mission	147	11	158
LA Trade	102	37	139
Long Beach	16	19	35
Mt San Antonio	13	-	13
Orange Coast	73	24	97
Saddleback	24	2	26
Total	519	133	652

Restaurant and Food Services and Management (1307.10)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	-	2	2
Cypress	55	8	63
LA Mission	24	10	34
LA Trade	-	8	8
Mt San Antonio	19	-	19
Orange Coast	3	2	5
Total	101	30	131

Human Services (2104.00)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	8	7	15
Coastline	9	9	18
Cypress	11	13	24
LA City	3	4	7
Long Beach	10	19	29
Orange Coast	3	-	3
Saddleback	13	2	15
Santa Ana	-	55	55
Total	57	109	166

Alcohol and Controlled Substances (2104.40)

College	# of Certificates	# of Associate Degrees	Total Awards
Cypress	2	-	2
East LA	37	-	37
Glendale	10	1	11
LA City	9	6	15
LA Pierce	24	10	34
LA Swest	34	-	34
Long Beach	43	15	58
Mt San Antonio	16	14	30
Rio Hondo	11	5	16
Saddleback	24	6	30
West LA	4	2	6
Total	214	59	273

Alcohol and Controlled Substances (2104.40)

College	# of Certificates	# of Associate Degrees	Total Awards
Cerritos	-	103	103
Citrus	44	132	176
Coastline	-	30	30
Compton	2	35	37
Cypress	1	-	1
East LA	623	246	869
El Camino	12	108	120
Fullerton	-	95	95
Glendale	4	39	43
Golden West	80	78	158
Irvine	1	27	28
LA City	5	33	38
LA Harbor	-	37	37
LA Mission	1	48	49
LA Pierce	-	63	63
LA Swest	11	28	39
LA Trade	-	17	17
LA Valley	5	35	40
Long Beach	13	104	117
Mt San Antonio	1	71	72
Pasadena	3	90	93
Rio Hondo	1	99	100
Santa Ana	-	109	109
West LA	-	53	53
Total	807	1,680	2,487

Police Academy (2105.50)

College	# of Certificates	# of Associate Degrees	Total Awards
East LA	466	-	466
Golden West	-	4	4
West LA	1	-	1
Total	467	4	471

How (and why) we did what we did.

Numerous data sources and methodologies were used to identify and provide metrics for the high-growth occupations identified in this report..

INDUSTRY FORECAST

An economic forecast is created to project employment by industry over the next five years using statistical analysis of historical data paired with the most recent qualitative information impacting a set of 151 industries in the Los Angeles Basin. The industries configured for this forecast are defined through the North American Industry Classification System (NAICS) and comprise industries denoted with 2-digit, 3-digit and 4-digit codes through the NAICS hierarchical classification system. A key input for the regional forecast is projected population growth in Los Angeles and Orange counties, provided by the California Department of Finance. State and national trends concerning production methods, consumer behavior, construction and property values that correspond to each industry are a few of the inputs used for the economic forecast model.

OCCUPATIONS AND PROJECTIONS

Occupations are commonly classified using the Standard Occupational Classification (SOC) system, developed by the Bureau of Labor Statistics. This system classifies workers into 867 detailed occupations that share similar job duties, skills, education and training. These occupations are not industry-specific, but are common to many industries. For example, retail salespersons are employed in a full spectrum of industries, from department and discount stores to computer systems design.

The economic forecast for employment by industry is used to guide a projection of net new jobs for each occupation, calculated by applying the industry occupational composition to the detailed industry employment forecast; occupational forecasts are aggregated across industries.

The United States Census Bureau estimates replacement needs by industry and occupation through detailed surveys of employers and households. These take into account industry changes, the age of the current workforce within each industry and occupation, and the nature of the career path. These estimates are an important component of occupational job openings and workforce development needs, since the retirement and promotion of individuals leave openings for new entrants and those moving up the career ladder.

Total openings are the sum of projected five-year replacement needs and positive net new jobs forecast over the period.

TARGET INDUSTRIES AND OCCUPATIONS

Target industries are selected using a variety of metrics: middle-skill job share; the projected change in middle-skill jobs from 2016 to 2021 (number and rate); the five-year job replacement rate; the 2016 location quotient; the change in location quotient from 2006 to 2016; the 2016 annual average wage relative to all industries; and value added per worker. (Middle-skill jobs require education and training

beyond a high school diploma but less than a bachelor’s degree.)

Target occupations are selected in a two-step process. First, all occupations identified as middle-skill are isolated from each target industry. Then, a variety of metrics are used to select target occupations: 2016 employment; projected net job change; replacement rate; number of projected replacement jobs from 2016 to 2021; number of projected total job openings from 2016 to 2021; and annual median wages.

SUPPLY

Community colleges and other two-year educational institutions provide education and training relevant to middle-skill occupations. Comparing occupations with related training programs provides information for supply-and-demand analysis. The number of awards conferred by community colleges reflects the most recent data available from the 2015-16 academic year. Award data for other two-year education institutions is from the 2014-2015 academic year. Due to data and timing limitations, training gap forecasts are an approximation of unmet labor demand do not represent an absolute oversupply or undersupply of available talent. In addition, a one-to-one relationship between program completions and occupational demand does not exist because some programs train for multiple occupations. Consequently, awards for some education and training programs overall with multiple occupations.

DATA SOURCES

All data was obtained from the Bureau of Labor Statistics and the Census Bureau. Annual employment and payroll data are from the Quarterly Census of Employment and Wages series. Estimates for non-disclosed employment and payroll data were produced using proportional shares of the prior year’s data or using midpoint estimates from the Census Bureau’s County Business Patterns dataset. Occupational data are from the Occupational Employment Statistics program. Unless noted otherwise, all data is for the 2016 calendar year.