

JANUARY 2019

# LABOR MARKET

# ANALYSIS

## Manufacturing



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# SUMMARY

This study conducted by the Central Valley/Mother Lode Center of Excellence examines labor market demand, wages, skills and postsecondary supply for occupations related to manufacturing for Modesto Junior College and Fresno City College. Nine occupations were identified for this study and analysis included 10-related Taxonomy of Programs codes. Four counties are the focus of this report: Fresno, Merced, Stanislaus and Madera.

## KEY FINDINGS:

- **Occupational demand** — In the four-county subregion, more than 22,500 workers were employed in jobs related to manufacturing in 2017. The largest occupation is laborers and freight, stock, and material movers (hand) with 12,068 workers, which has a growth rate of 6% over the next five years and 1,811 projected annual openings.
- **Wages** — The entry-level wages for all nine occupations exceed the average self-sufficiency wage for a single adult in the subregion, \$10.28/hour and the average living wage for a single adult in the subregion, \$11.16/hour. The occupation earning the highest median wages is engineering technicians (except drafters), \$35.32/hour in the region and \$31.45/hour in the four-county subregion.
- **Employers** — Top employers in the region include United Parcel Service Incorporated, FedEx and the Home Depot Incorporated.
- **Job titles** — The most common occupational title in job postings is laborers and freight, stock and material movers (hand). The most common job title is maintenance technician.
- **Skills and certifications** — The top baseline skill is physical abilities, the top specialized skill is repair, and the top software skill is Microsoft Office. The most in-demand certification is a driver's license.
- **Education** — All nine occupations are middle skill requiring either an associate degree, a postsecondary nondegree award or a high school diploma in conjunction with on-the-job training.
- **Supply** — Analysis of postsecondary completions in the region shows that on average 325 certificates, 71 degrees and 52 non-credit awards were conferred in the Central Valley/Mother Lode region each year.

Based on a comparison of occupational demand and supply, there is an undersupply of 2,613 trained workers in the four-county subregion. In the region, the shortage is 7,636. The Center of Excellence recommends that Modesto Junior College and Fresno City College work with the region's advanced manufacturing deputy sector navigator, the colleges' advisory board and local industry the creation or expansion of a program to meet the workforce demand for manufacturing workers.

# INTRODUCTION

The Central Valley/Mother Lode Center of Excellence was asked by Modesto Junior College and Fresno City College to provide labor market information for manufacturing. Review of the Taxonomy of Programs identified 12 appropriate programs for this analysis:

- Agricultural Power Equipment Technology-011600
- Computer Electronics-093410
- Diesel Technology-094700
- Electro-Mechanical Technology-093500
- Engineering Technology, General (requires Trigonometry)-092400
- Heavy Equipment Maintenance-094720
- Industrial Electronics-093420
- Industrial Systems Technology and Maintenance-094500
- Instrumentation Technology-094300
- Logistics and Materials Transportation-051000
- Manufacturing and Industrial Technology-095600
- Other Engineering and Related Industrial Technologies-099900

Analysis of the Chancellor's Office Data Mart and Launchboard revealed that only 10 of the 12 identified programs were conferring awards in the region and the metrics for two programs were masked. Therefore, the two programs with no awards and fully masked data are not included in the supply and metrics sections of this report.

The geographical focus for this report is four counties: Fresno, Merced, Stanislaus and Madera. Regional demand and supply data has been included for broader applicability and use.

Analysis of the program and occupational data related to manufacturing resulted in the identification of nine applicable occupations. The Standard Occupational Classification (SOC) System titles and codes are:

- Electro-Mechanical Technicians (SOC 17-3024)
- Industrial Engineering Technicians (SOC 17-3026)
- Mechanical Engineering Technicians (SOC 17-3027)
- Engineering Technicians, Except Drafters, All Other (SOC 17-3029)
- Electrical and Electronics Repairers, Commercial and Industrial Equipment (SOC 49-2094)
- Industrial Machinery Mechanics (SOC 49-9041)
- Maintenance Workers, Machinery (SOC 49-9043)
- Maintenance and Repair Workers, General (SOC 49-9071)
- Laborers and Freight, Stock, and Material Movers, Hand (SOC 53-7062)

The SOC codes, occupational titles, job descriptions, sample job titles, and knowledge and skills from the Bureau of Labor Statistics and O\*NET OnLine are shown in Exhibit 1. O\*NET data was not available for Engineering Technicians, Except Drafters, All Other (SOC 17-3029).

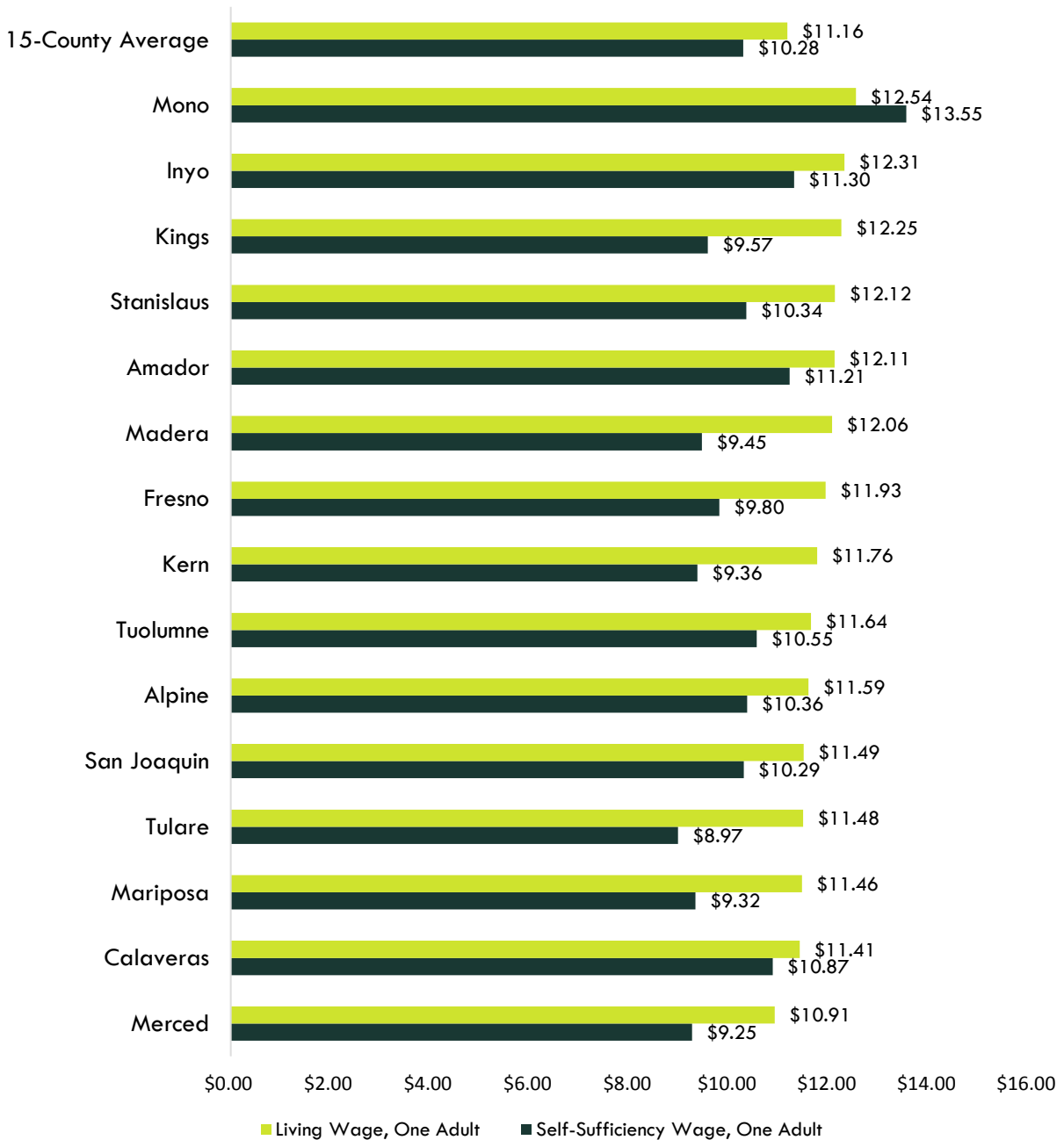
**EXHIBIT 1. Manufacturing SOC titles, job descriptions, sample job titles, and knowledge and skills**

<b>SOC TITLE &amp; CODE</b>	<b>DESCRIPTION</b>	<b>SAMPLE JOB TITLES</b>	<b>KNOWLEDGE &amp; SKILLS</b>
<b>Electro-Mechanical Technicians (SOC 17-3024)</b>	Operate, test, maintain, or calibrate unmanned, automated, servo-mechanical, or electromechanical equipment. May operate unmanned submarines, aircraft, or other equipment at worksites, such as oil rigs, deep ocean exploration, or hazardous waste removal. May assist engineers in testing and designing robotics equipment.	Electro-Mechanic, Electro-Mechanical Technician (E/M Technician), Electronic Technician, Engineering Technician, Laboratory Technician (Lab Technician), Maintenance Technician, Mechanical Technician, Product Test Specialist, Test Technician, Tester	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>Mechanical</li> <li>Computers and Electronics</li> <li>Engineering and Technology</li> <li>English Language</li> <li>Production and Processing</li> </ul> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>Operation Monitoring</li> <li>Monitoring</li> <li>Quality Control Analysis</li> <li>Troubleshooting</li> <li>Critical Thinking</li> </ul>
<b>Industrial Engineering Technicians (SOC 17-3026)</b>	Apply engineering theory and principles to problems of industrial layout or manufacturing production, usually under the direction of engineering staff. May perform time and motion studies on worker operations in a variety of industries for purposes such as establishing standard production rates or improving efficiency.	Engineering Technician, Industrial Engineering Analyst, Industrial Engineering Technician, Manufacturing Technician, Methods Engineer, Process Documentation and Methods Analyst, Process Engineer, Process Technician, Production Staff Worker, Quality Control Engineering Technician (QC Engineering Technician)	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>Mechanical</li> <li>Engineering and Technology</li> <li>Production and Processing</li> <li>Mathematics</li> <li>Design</li> </ul> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>Reading Comprehension</li> <li>Active Listening</li> <li>Critical Thinking</li> <li>Complex Problem Solving</li> <li>Monitoring</li> </ul>
<b>Mechanical Engineering Technicians (SOC 17-3027)</b>	Apply theory and principles of mechanical engineering to modify, develop, test, or calibrate machinery and equipment under direction of engineering staff or physical scientists.	Designer, Engineering Lab Technician, Engineering Technical Analyst, Laboratory Technician, Maintenance Technician, Mechanical Designer, Mechanical Technician, Process Engineering Technician, Process Technician, Research and Development Technician	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>Engineering and Technology</li> <li>Design</li> <li>Mechanical</li> <li>Mathematics</li> <li>Computers and Electronics</li> </ul> <p><b>Skills</b></p> <ul style="list-style-type: none"> <li>Reading Comprehension</li> <li>Active Listening</li> <li>Critical Thinking</li> <li>Operation Monitoring</li> <li>Complex Problem Solving</li> </ul>
<b>Electrical and Electronics Repairers, Commercial and Industrial</b>	Repair, test, adjust, or install electronic equipment, such as	Control Technician, Electrical and Instrument Mechanic, Electrical and Instrument Technician (E&I)	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>Computers and Electronics</li> <li>Engineering and Technology</li> </ul>

SOC TITLE & CODE	DESCRIPTION	SAMPLE JOB TITLES	KNOWLEDGE & SKILLS
<b>Equipment (SOC 49-2094)</b>	industrial controls, transmitters, and antennas.	Tech), Electrical Maintenance Technician, Electrical Technician, I&C Tech (Instrument and Control Technician), Instrument and Electrical Technician (I&E Tech), Repair Technician, Service Technician, Technical Support Specialist	Mechanical English Language Mathematics <b>Skills</b> Operation Monitoring Quality Control Analysis Repairing Troubleshooting Critical Thinking
<b>Industrial Machinery Mechanics (SOC 49-9041)</b>	Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems.	Fixer, Industrial Machinery Mechanic, Industrial Mechanic, Loom Fixer, Machine Adjuster, Maintenance Mechanic, Maintenance Technician, Master Mechanic, Mechanic, Overhauler	<b>Knowledge</b> Mechanical Engineering and Technology Production and Processing English Language Mathematics <b>Skills</b> Equipment Maintenance Repairing Operation Monitoring Troubleshooting Operation and Control
<b>Maintenance Workers, Machinery (SOC 49-9043)</b>	Lubricate machinery, change parts, or perform other routine machinery maintenance.	Lubricator, Machine Repairer, Maintainer, Maintenance Electrician, Maintenance Man, Maintenance Mechanic, Maintenance Technician, Maintenance Worker, Oiler, Overhauler	<b>Knowledge</b> Mechanical English Language Mathematics Design Engineering and Technology <b>Skills</b> Equipment Maintenance Operation Monitoring Repairing Troubleshooting Operation and Control
<b>Laborers and Freight, Stock, and Material Movers, Hand (SOC 53-7062)</b>	Manually move freight, stock, or other materials or perform other general labor. Includes all manual laborers not elsewhere classified.	Dock Worker, Laborer, Line Tender, Loader, Material Handler, Merchandise Pickup/Receiving Associate, Receiver, Receiving Associate, Shipping and Receiving Materials Handler, Warehouse Worker	<b>Knowledge</b> No knowledge met the minimum score. <b>Skills</b> No knowledge met the minimum score.

The 2014 average self-sufficiency wage for a single adult in the Central Valley/Mother Lode region is \$10.28/hour, and the current average living wage for a single adult is \$11.16/hour. Self-sufficiency and living wage data by county (in descending order) and the overall 15-county average are shown in Exhibit 2. In the wages sections of this report, Pct. 25 hourly denotes entry-level wages, and median represents experienced wages.

**EXHIBIT 2. Self-sufficiency and living wages in the Central Valley/Mother Lode region**



# OCCUPATIONAL DEMAND

The subregion employed more than 22,500 workers in manufacturing occupations in 2017 in the four-county subregion (Exhibit 3). The largest occupation is laborers and freight, stock, and material movers (hand) with 12,068 workers in 2017. This occupation is projected to grow by 6% over the next five years and has the greatest number of projected annual openings, 1,811. The next largest occupation is maintenance and repair workers (general) with 6,320 jobs in 2017. This occupation is projected to undergo moderate growth, 7% over the next five years, and will have 715 annual openings.

**EXHIBIT 3. Manufacturing employment and occupational projections in the four-county subregion**

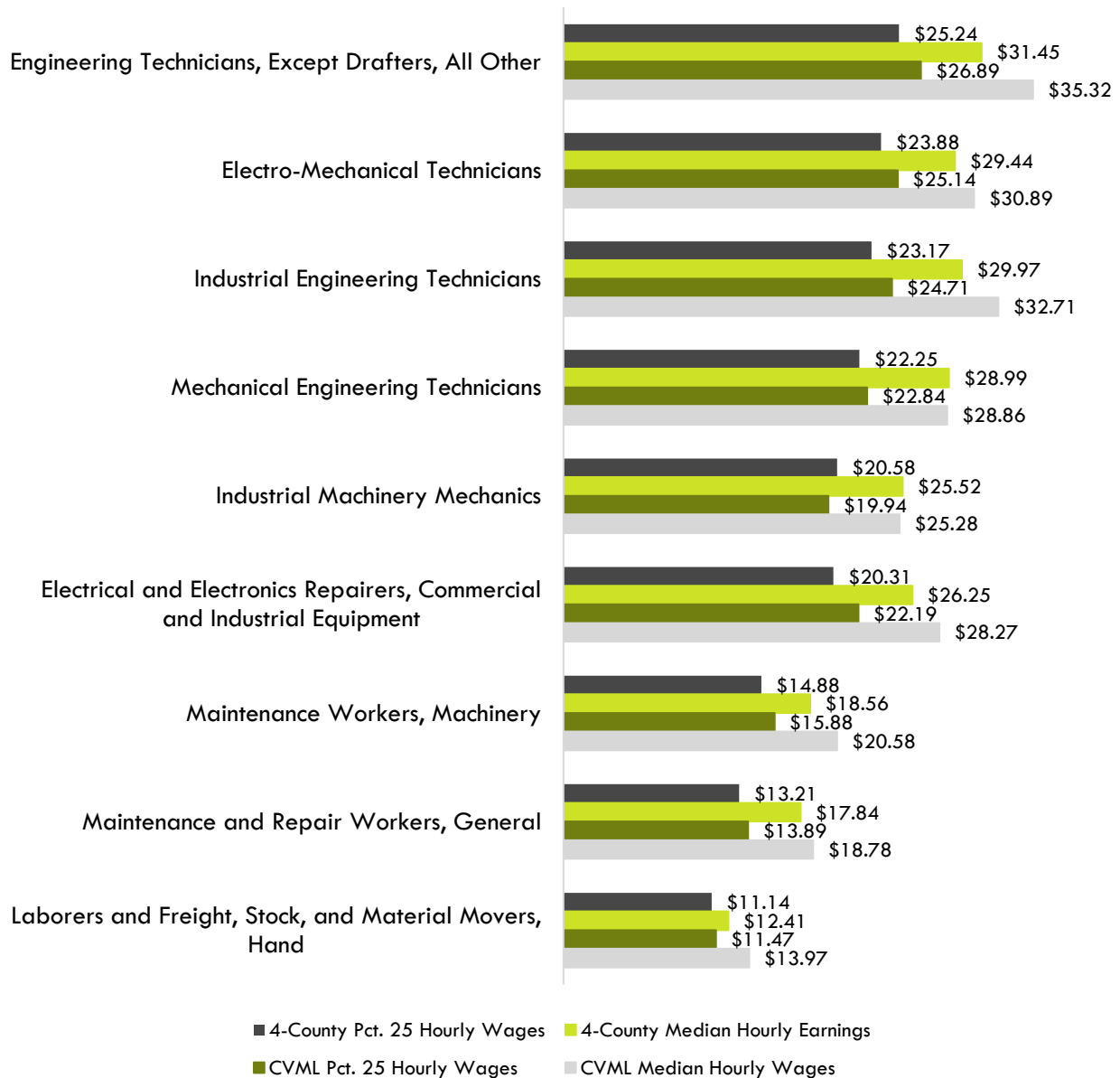
OCCUPATION	2017 JOBS	2022 JOBS	5-YEAR CHANGE	5-YEAR % CHANGE	ANNUAL OPENINGS
Laborers and Freight, Stock, and Material Movers, Hand	12,068	12,758	690	6%	1,811
Maintenance and Repair Workers, General	6,320	6,771	451	7%	715
Industrial Machinery Mechanics	2,708	2,863	155	6%	267
Maintenance Workers, Machinery	599	627	28	5%	67
Electrical and Electronics Repairers, Commercial and Industrial Equipment	244	254	10	4%	23
Engineering Technicians, Except Drafters, All Other	181	192	11	6%	18
Industrial Engineering Technicians	54	64	10	19%	7
Mechanical Engineering Technicians	63	70	7	11%	7
Electro-Mechanical Technicians	22	23	1	5%	2
<b>TOTAL</b>	<b>22,259</b>	<b>23,622</b>	<b>1,363</b>	<b>6%</b>	<b>2,918</b>



# WAGES

Exhibit 4 compares the entry-level and experienced wages of the nine manufacturing occupations. The entry-level wages for all nine occupations exceed the average self-sufficiency wage for a single adult in the subregion, \$10.28/hour, and the average living wage for a single adult in the subregion, \$11.16/hour. The occupation earning the highest median wages is engineering technicians (except drafters), \$35.32/hour in the region and \$31.45/hour in the four-county subregion.

**EXHIBIT 4. Manufacturing entry-level and experienced wage comparison in the subregion and region**



# JOB POSTINGS

There were 8,931 job postings for the nine occupations in the Central Valley/ Mother Lode region from January 2018 through December 2018. The top employers advertising these job postings are listed in Exhibit 5.

**EXHIBIT 5. Top employers of manufacturing occupations by number of job postings**

EMPLOYER	JOB POSTINGS
United Parcel Service Incorporated	188
FedEx	111
The Home Depot Incorporated	92
Foster Farms	68
Lowe's Companies, Inc	60
Saalex Solutions Incorporated	59
US Air Force	55
Winncompanies	55
McDonald's	47
Shipt	42

Exhibit 6 shows how job postings for the nine targeted manufacturing occupations in the region are distributed across several O\*NET OnLine occupations. The majority of job postings, 3,860 in total, use the occupational title laborers and freight, stock and material movers (hand), followed by maintenance and repair workers (general), 2,970 job postings.

**EXHIBIT 6. Manufacturing occupational titles in job postings**

OCCUPATIONAL TITLE & CODE	JOB POSTINGS
Laborers and Freight, Stock, and Material Movers, Hand (53-7062)	3,860
Maintenance and Repair Workers, General (49-9071)	2,970
Industrial Engineering Technicians (17-3026)	807
Industrial Machinery Mechanics (49-9041)	568
Engineering Technicians, Except Drafters, All Other (17-3029)	497
Electro-Mechanical Technicians (17-3024)	138
Mechanical Engineering Technicians (17-3027)	63
Maintenance Workers, Machinery (49-9043)	27
Electrical and Electronics Repairers, Commercial and Industrial Equipment (49-2094)	1

## JOB TITLES

Analysis of the 8,931 advertised job titles for the targeted occupations reveals the top title is maintenance technician, occurring in 981 job postings, followed by material handler, 505 job postings (Exhibit 7).

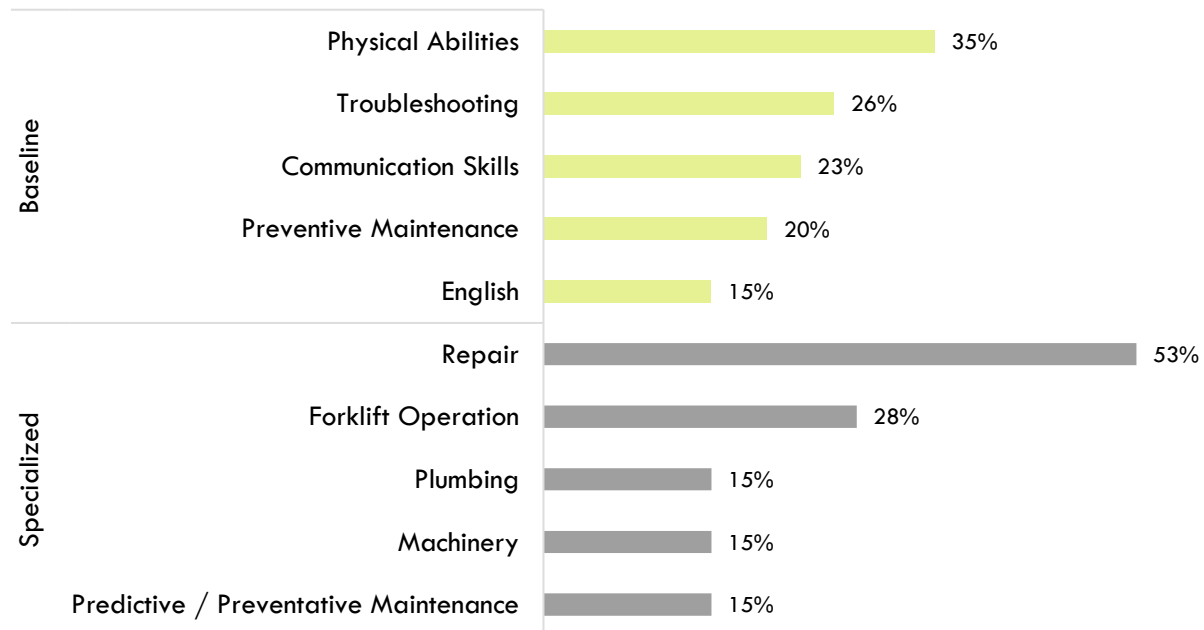
**EXHIBIT 7. Top manufacturing job titles by number of job postings**

JOB TITLE	JOB POSTINGS
Maintenance Technician	981
Material Handler	505
Warehouse Associate	499
Maintenance Mechanic	449
Service Technician	403
Warehouse Worker	376
Field Service Technician	262
Maintenance Worker	260
Mechanic	229
General Labor	223

## SKILLS

Exhibit 8 depicts the top baseline and specialized skills for the nine targeted occupations. Approximately 6,700 job postings contained skills data. Of these job postings, the three most important baseline skills are physical abilities, 35% of job postings, troubleshooting, 26%, and communication skills, 23%. The top three specialized skills are repair, 53% of job postings, forklift operation, 28%, and plumbing, 15%.

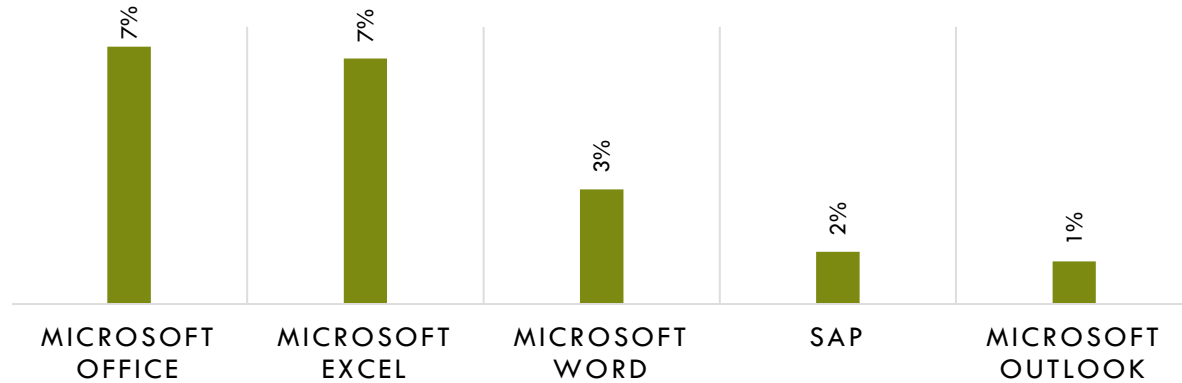
**EXHIBIT 8. Manufacturing in-demand baseline and specialized skills**



## SOFTWARE SKILLS

Analysis also included the software skills most in demand by employers. Microsoft Office and Microsoft Excel rank first and second (Exhibit 9).

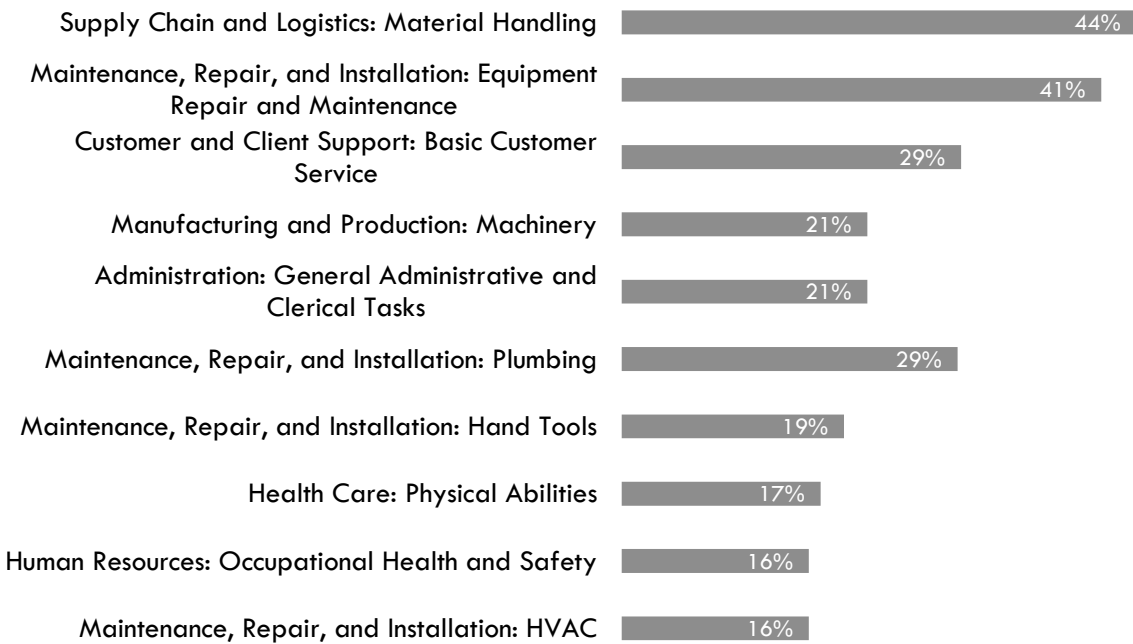
**EXHIBIT 9. Manufacturing in-demand software skills**



## SKILL CLUSTER PROJECTIONS

About 67% of the 8,931 job postings, a total of 5,098 job postings, contain skill projections. An evaluation of the skill clusters that will have the greatest gains in level of importance shows that the top areas are supply chain and logistics: material handling (44%); maintenance, repair, and installation: equipment repair and maintenance (41%); and customer and client support: basic customer service (29%) (Exhibit 10). (Note: 43% of records have been excluded because they do not include a skill cluster. As a result, the chart below may not be representative of the full sample.)

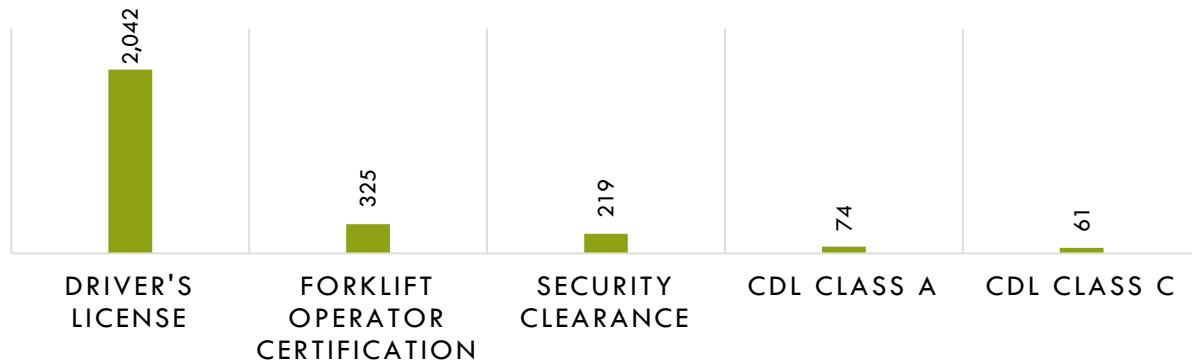
**EXHIBIT 10. Skill cluster projections for manufacturing occupations**



## CERTIFICATIONS

Of the postings with certification data, of which there were 2,790 total, a large share, 2,042 indicated a need for a driver's license. The next two top certifications are forklift operator and security clearance (Exhibit 11). (Note: 69% of records have been excluded because they do not include a certification. As a result, the chart below may not be representative of the full sample.)

**EXHIBIT 11. Manufacturing certifications requested in job postings**



## EDUCATION, WORK EXPERIENCE AND TRAINING

All nine occupations are relevant to community college education based on the typical education required for entry-level positions. Four occupations require an associate degree, one occupation (electrical and electronics repairers, commercial and industrial equipment) requires a postsecondary nondegree award, and the remaining four occupations require a high school diploma with on-the job training (Exhibit 12).

**EXHIBIT 12. Education, work experience, training and Current Population Survey results for manufacturing occupations<sup>1</sup>**

OCCUPATION	TYPICAL ENTRY-LEVEL EDUCATION	WORK EXPERIENCE REQUIRED	TYPICAL ON-THE-JOB TRAINING	CPS
Electro-Mechanical Technicians	Associate degree	None	None	53.6%
Industrial Engineering Technicians	Associate degree	None	None	53.6%
Mechanical Engineering Technicians	Associate degree	None	None	53.6%
Engineering Technicians, Except Drafters, All Other	Associate degree	None	None	53.6%

<sup>1</sup> "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, <https://www.bls.gov/cps/>.

OCCUPATION	TYPICAL ENTRY-LEVEL EDUCATION	WORK EXPERIENCE REQUIRED	TYPICAL ON-THE-JOB TRAINING	CPS
Electrical and Electronics Repairers, Commercial and Industrial Equipment	Postsecondary nondegree award	None	Long-term	51.8%
Industrial Machinery Mechanics	High school diploma or equivalent	None	Long-term	41.4%
Maintenance Workers, Machinery	High school diploma or equivalent	None	Long-term	38.6%
Maintenance and Repair Workers, General	High school diploma or equivalent	None	Moderate-term	37.9%
Laborers and Freight, Stock, and Material Movers, Hand	No formal educational credential	None	Short-term	27.6%

## SUPPLY

Analysis of California Community Colleges Chancellor's Office Curriculum Inventory (COCI) program data shows there are 10 community colleges in the region offering programs contributing to workforce supply for the identified occupations in the 10 TOP codes identified for this study. Analysis of the last three years of TOP code data, from 2014 through 2017, shows that, on average, 325 certificates, 71 degrees and 52 non-credit awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 13).

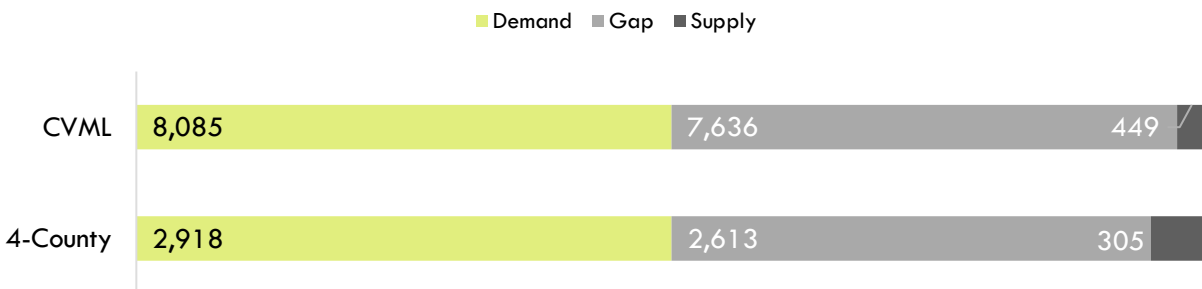
**EXHIBIT 13. Postsecondary supply for manufacturing occupations in the region**

TOP TITLE-CODE	COLLEGE	CERTIFICATE	DEGREE	NON-CREDIT	SUBTOTAL
<b>Agricultural Power Equipment Technology-011600</b>	Merced	42	4		46
	Modesto Junior	18	4		23
	Reedley	117	3		120
	San Joaquin Delta	4			4
	Sequoias	1	1		2
<b>Computer Electronics-093410</b>	Merced	11	7		18
	Modesto Junior	0	1		1
<b>Diesel Technology-094700</b>	San Joaquin Delta	9	1		10
<b>Electro-Mechanical Technology-093500</b>	San Joaquin Delta	1	0		1
<b>Engineering Technology, General (requires Trigonometry)-092400</b>	Bakersfield		0		0
	Merced		1		1
	San Joaquin Delta		1		1

TOP TITLE-CODE	COLLEGE	CERTIFICATE	DEGREE	NON-CREDIT	SUBTOTAL
<b>Heavy Equipment Maintenance-094720</b>	San Joaquin Delta	7	23		30
	Fresno City	18			18
<b>Industrial Electronics-093420</b>	Merced	0	1		1
	Modesto Junior	2	9		12
	Fresno City			9	9
<b>Industrial Systems Technology and Maintenance-094500</b>	Merced	1	1		2
	Modesto Junior		0		0
	San Joaquin Delta	3	0		3
	Sequoias	33	2		35
	Merced	1	1		3
<b>Instrumentation Technology-094300</b>	Fresno City			20	20
	Modesto Junior	0			0
	San Joaquin Delta	2	0		2
	Bakersfield	1	2		2
	Fresno City	3	2	23	28
<b>Manufacturing and Industrial Technology-095600</b>	Modesto Junior	3			3
	Porterville	24			24
	Reedley	0			0
	San Joaquin Delta		1		1
<b>Other Engineering and Related Industrial Technologies-099900</b>	Taft	23	6		29
	<b>TOTAL</b>	<b>325</b>	<b>71</b>	<b>52</b>	<b>449</b>

A substantial undersupply of manufacturing workers appears to exist in the region and the four-county subregion. In the four-county subregion, there is a shortage of 2,613 trained workers. In the region, the shortage is 7,636 trained workers (Exhibit 14).

**EXHIBIT 14. Manufacturing workforce annual demand and supply in the subregion and region**



# STUDENT OUTCOMES

Exhibit 15 summarizes employment and wage outcomes from the California Community College Chancellor's Cal-PASS Plus LaunchBoard for the 10 manufacturing-related TOP codes. Across the region, completions were highest in agriculture power equipment and industrial systems technology. Transfers were highest in engineering technology, general. Diesel technology shows the highest percentage of students employed after exit and the highest median change in earnings.

**Exhibit 15: Regional metrics for the TOP codes related to manufacturing**

METRIC	AGRICULTURAL POWER EQUIPMENT TECHNOLOGY- TECHNOLOGY- 011600	DIESEL TECHNOLOGY- 094700	HEAVY EQUIPMENT MAINTENANCE- 094720	LOGISTICS AND MATERIALS TECHNOLOGY, TRANSPORTATION- 051000	ENGINEERING TECHNOLOGY, GENERAL- 092400
Students Who Got a Degree or Certificate	99	24	20	28	*
Number of Students Who Transferred	51	*	*	0	86
Employed in the Second Fiscal Quarter after Exit	78% (n=196)	89% (n=44)	89% (n=56)	*	*
Attained a Living Wage	73% (n=134)	95% (n=38)	93% (n=41)	*	*
Median Change in Earnings	59% (n=99)	271% (n=24)	254% (n=29)	*	*
Job Closely Related to Field of Study	*	*	*	*	*

\* denotes data not available.

METRIC	COMPUTER ELECTRONICS- 093410	INDUSTRIAL ELECTRONICS- 093420	INDUSTRIAL SYSTEMS TECHNOLOGY- 094500	MANUFACTURING TECHNOLOGY- 095600	OTHER ENGINEERING TECHNOLOGY- 099900
Students Who Got a Degree or Certificate	20	25	67	26	14
Number of Students Who Transferred	*	16	0	*	*
Employed in the Second Fiscal Quarter after Exit	58% (n=36)	80% (n=100)	72% (n=110)	79% (n=200)	*
Attained a Living Wage	*	61% (n=61)	60% (n=67)	68% (n=128)	*
Median Change in Earnings	*	59% (n=60)	85% (n=53)	64% (n=106)	*
Job Closely Related to Field of Study	*	*	*	*	*

\* denotes data not available.

# CONCLUSION

The entry-level wages for all nine occupations exceed the average self-sufficiency wage for a single adult in the subregion, \$10.28/hour, and the average living wage for a single adult in the subregion, \$11.16/hour. There were 8,931 job postings in the past 12 months for occupations related to manufacturing in the Central Valley/Mother Lode subregion. Analysis of skills and certificate requirements in job postings indicates:

- The top baseline skill is physical abilities, and the top specialized skill is repair.
- The top software skill is Microsoft Office.
- The top certification is a driver's license.

There are 10 community colleges in the region offering programs contributing to workforce supply for occupations related to manufacturing. However, there is an undersupply of trained workers, a shortage of 2,613 in the four-county subregion and 7,636 in the region.

# RECOMMENDATION

Based on these findings, it is recommended that Modesto Junior College and Fresno City College work with the region's advanced manufacturing deputy sector navigator, the colleges' advisory boards and local industry the creation or expansion of a program to meet the workforce demand for manufacturing workers.



# APPENDIX A: METHODOLOGY & DATA SOURCES

## DATA SOURCES

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor's Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

DATA TYPE	SOURCE
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (EMSI). EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry: <a href="http://economicmodeling.com">economicmodeling.com</a> .
Living Wage	A living wage calculator that estimates the cost of living in a specific community or region: <a href="http://livingwage.mit.edu">livingwage.mit.edu</a> .
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: <a href="http://www.bls.gov/emp/ep_education_tech.htm">www.bls.gov/emp/ep_education_tech.htm</a> .
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division, <a href="http://labormarketinfo.edd.ca.gov">labormarketinfo.edd.ca.gov</a>
Job Posting and Skills Data	Burning Glass, <a href="http://www.burning-glass.com/">http://www.burning-glass.com/</a>
Additional Education Requirements/ Employer Preferences	The O*NET Job Zone database includes over 900 occupations as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: <a href="http://www.onetonline.org">www.onetonline.org</a>

## Key Terms and Concepts

**Annual Job Openings:** Annual openings are calculated by dividing the number of years in the projection period by total job openings.

**Education Attainment Level:** The highest education attainment level of workers age 25 years or older.

**Employment Estimate:** The total number of workers currently employed.

**Employment Projections:** Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (EMSI) formula that includes historical employment and economic indicators along with national, state and local trends.

**Living Wage:** The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

**Occupation:** An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

**Percent Change:** Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

**Replacements:** Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

**Total Job Openings (New + Replacements):** Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

**Typical Education Requirement:** represents the typical education level most workers need to enter an occupation.

**Typical On-The-Job Training:** indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.

**Wages Family Compositions:** The living wage calculator estimates the living wage needed to support families. For single adult families, the adult is assumed to be employed full time. For two adult families where both adults are in the labor force, both adults are assumed to be employed full time. For two adult families where one adult is not in the labor force, one of the adults is assumed to be employed full time while the other non-wage-earning adult provides full-time child care for the family's children. Full-time work is assumed to be year-round, 40 hours per week for 52 weeks, per adult. Families with one child are assumed to have a 'young child' (4 years old). Families with two children are assumed to have a 'young child' and a 'child' (9 years old). Families with three children are assumed to have a 'young child,' a 'child,' and a 'teenager' (15 years old).