

July 2021

# Skills Evaluation

## Transitional Occupations for Workers in Oil Field Services



Prepared by the Central Valley/Mother Lode Center of Excellence

# Table of Contents

- Introduction.....3
- Methodology .....4
- Job Postings Overview: In-demand Skills, Certifications & Educational Attainment .....7
- Transitional Occupations..... 10
- Demand ..... 13
- Wages ..... 15
- Education, Work Experience & Training ..... 16
- Shared Skills among Transitional Occupational Clusters ..... 17
- Conclusion..... 18
- Appendix A: Methodology & Data Sources ..... 20
- Appendix B: Matrix of Occupations related to Oil Field Services ..... 22
- Appendix C: Top Skills and Activities by Occupational Cluster ..... 23

**COVID-19 Statement:** This report includes employment projection data by EMSI. EMSI’s projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

*If for any reason this document is not accessible or if you have specific needs for readability, please contact us and we will do our utmost to accommodate you with a modified version. To make a request, contact Nora Seronello by phone at (209) 575-6894 or by email [seronellon@mjc.edu](mailto:seronellon@mjc.edu).*

**© 2021 California Community Colleges Chancellor’s Office,  
Centers of Excellence, Economic and Workforce Development Program**

# Introduction

Given mounting political pressure to end oil production in California and the potential impact to employment in the Kern River Oil Field,<sup>1</sup> the Central Valley/Mother Lode Center of Excellence was asked by the Energy, Construction and Utilities Regional Director for Employer Engagement to conduct a skills evaluation of occupations related to oil field technicians to gain insights into new job areas into which oil field workers could transition with minimal education and training.

The study set out to determine those skills that are directly transferable to other occupations or that require minimal upskilling or training that could be provided by a local community college. The geographic focus for this study is Kern County.

Using the Standard Occupational Classification (SOC) System, five primary occupations related to oil field technicians were provided as a starting point for the study (Exhibit 1).

## Exhibit 1. Occupations related to oil field technicians

SOC Code	SOC Title
47-5011	Derrick Operators, Oil and Gas
47-5012	Rotary Drill Operators, Oil and Gas
47-5013	Service Unit Operators, Oil and Gas
47-5071	Roustabouts, Oil and Gas
53-7072	Pump Operators, Except Wellhead Pumps

Based on Emsi data, of the five primary occupations, the roustabouts, oil, and gas occupation has a strong projected growth rate, more than 14%, in Kern County and the Central Valley/Mother Lode Region, and the occupational database O\*NET OnLine identifies this occupation as having a bright outlook. However, anticipated federal and state policy changes are expected to negatively impact demand for this occupation and the remaining four listed occupations.

Using the Central Valley/Mother Lode Region's Verify Viper tool, a skills comparison was conducted for the SOC codes and titles of the five primary occupations. This revealed that the five occupations share 10 skills (Exhibit 2). Four of the occupations have two skills in common—coordination and social perceptiveness. These 12 skills and their association with the five primary occupations were used to narrow down a list of 13 occupations that are suitable for oil field workers seeking to transition into new employment areas. The following report examines skills shared across related occupations and highlights 13 transitional occupations that are well suited for oil field workers planning to enter new areas of employment.

---

<sup>1</sup> "California regulators deny new fracking permits," AP News, July 9, 2021, accessed July 14, 2021, <https://apnews.com/article/business-environment-and-nature-california-climate-change-227a506338794c1afb8f68e3ba3e12dc>.

## Exhibit 2. Skills shared by the five oil field occupations

Skills	
Active Listening	Quality Control Analysis
Critical Thinking	Repairing
Judgment and Decision Making	Operation Monitoring
Monitoring	Speaking
Operation and Control	Troubleshooting

# Methodology

## Analysis of primary occupations to determine related occupations

Using the “Related Jobs” dashboard through the job postings aggregator Burning Glass, occupations related to each of the five primary oil field occupations were identified. Two primary occupations—derrick operators and service unit operators—had no directly related occupations, but the remaining three of the five primary occupations did have directly related occupations.<sup>2</sup>

Most of the occupations identified through Burning Glass that are directly related to each of the three primary occupations are also shared in common among these occupations. There are four related occupations that occur among the three primary occupations:

- Construction workers, all other
- Loading machine operators
- Underground mining
- Mining machine operators, all other

The primary occupation roustabouts, oil, and gas, has two unique transitional occupations in Kern County that are relevant to community college training and that Burning Glass categorizes as directly related:

- Robotics technicians
- Telecommunications equipment installers and repairs, except line installers

The primary occupation pump operators, except wellhead pumps, has one unique occupation related to it—crane and tower operators. Similarly, the primary occupation rotary drill operators has one unique occupation related to it—paving, surfacing, and tamping equipment operators. Appendix B contains a list of the occupations associated with each of these three primary occupations.

## Skills analysis informing selection of transitional occupations

The 10 top skills among the five primary oil field occupations informed the selection of transitional occupations well suited for former oil field workers. These transitional occupations were identified using the skills search function in Burning Glass. Job posting data from the last 12 months for Kern County was pulled utilizing the 10 skills shared among the primary five occupations.

---

<sup>2</sup> These three primary occupations are rotary drill operators; pump operators, except wellhead pumps; and roustabouts, oil and gas.

The first dataset contained 3,847 job postings distributed across 354 occupations. Analysis of this data revealed that ads for register nurses dominated the job postings and skewed the data set.<sup>3</sup> Because registered nursing programs are highly impacted, take two years to complete, and require state certification, this occupation was excluded from the dataset to get a clearer understanding of other jobs that require minimal education and training that are suitable for transitioning oil field workers.

With registered nurses excluded from the search, 3,527 job postings were identified, distributed across 347 occupations. Exhibit 3 shows the top 15 SOC codes and titles that are related to the top 10 skills shared by the primary five oil field occupations. The most in-demand occupation based on the targeted 10 skills is maintenance and repair workers (general) listed in 145 of the postings, followed by electricians, in 117 job postings. Computer user support specialists occurs in 107 job postings, and network and computer systems administrators appears in 93 job postings. This preliminary list informed the selection of the 13 transitional occupations which are discussed later in this report.

**Exhibit 3. Top 15 occupations in job postings based on the 10 targeted skills**

SOC Code	Occupation	Job Postings
49-9071.00	Maintenance and Repair Workers, General	145
47-2111.00	Electricians	117
15-1151.00	Computer User Support Specialists	107
15-1142.00	Network and Computer Systems Administrators	93
41-1011.00	First-Line Supervisors of Retail Sales Workers	71
41-2031.00	Retail Salespersons	71
17-3023.01	Electronics Engineering Technicians	67
11-9199.00	Managers, All Other	67
53-7062.00	Laborers and Freight, Stock, and Material Movers, Hand	63
11-9111.00	Medical and Health Services Managers	62
49-3023.02	Automotive Specialty Technicians	61
41-4012.00	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	58
15-1132.00	Software Developers, Applications	54
49-3031.00	Bus and Truck Mechanics and Diesel Engine Specialists	52
17-3026.00	Industrial Engineering Technicians	52

---

<sup>3</sup> Registered nurses had the greatest number of job postings, but these programs are highly impacted and take more than a minimal amount of education and training to become successfully employed. A state certification requirement also must be met and maintained. However, this occupation is still a very good high-paying option for someone needing to transition out of oil field employment. Appendix B contains a list of skills frequently requested in job postings for registered nurses.

### Occupations in BLS job families

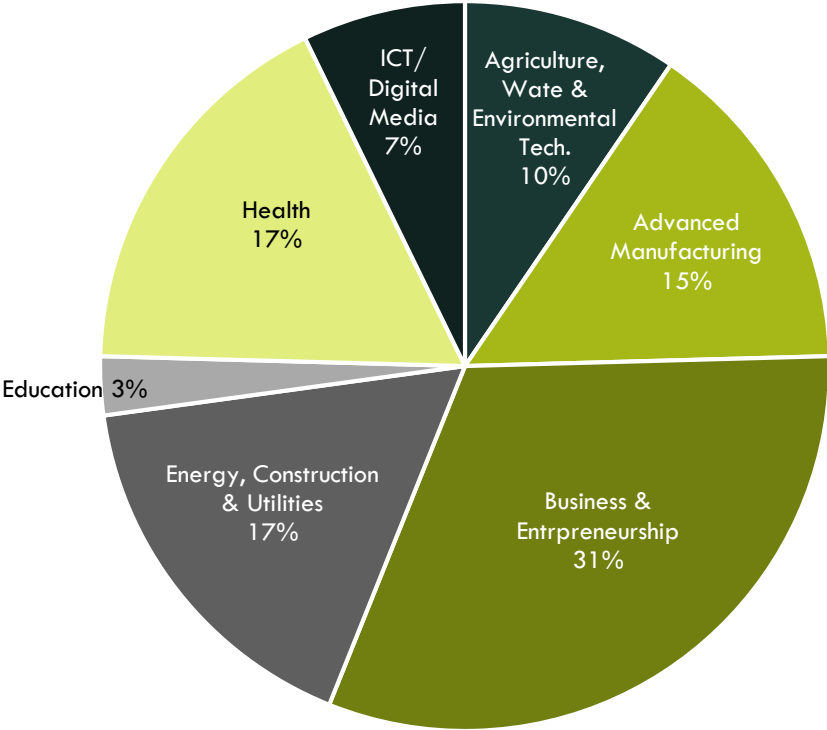
The 347 occupations were organized into their Bureau of Labor Statistics (BLS) job families at the two-digit SOC code level. There was one “military” occupation, which was removed from the dataset. The remaining 346 occupations were sorted into the sectors designated by the Chancellor’s Office (CCCCO) that best align with each occupation (Exhibit 4). Please note that logistics sector, global trade sector, and most of the retail, hospitality, and tourism sector are assigned business TOP codes in the system created for the CCCCCO sectors; therefore, they have all been captured under business (BUSI) in the table below.

**Exhibit 4. Matrix showing relationship between BLS job families and CCCCCO sectors**

BLS Job Family	CCCCO Sector	Number of Occupations	Percent of Total Occupations
Management	BUSI & ECU	33	9.5%
Business and Fiscal Services	BUSI	22	6.3%
Computer and Mathematics	ICT/DM	25	7.2%
Architecture and Engineering	ECU & AM	34	9.8%
Life, Physical and Social Sciences	Health & AG	22	6.3%
Community and Social Services	Health	5	1.4%
Legal	BUSI	1	0.3%
Education and Library	Education	9	2.6%
Arts, Design, Entertainment, Sports and Media	BUSI	7	2.0%
Healthcare Support	Health	28	8.1%
Healthcare	Health	9	2.6%
Protective Services	PS	3	0.9%
Food Preparation and Serving Related	BUSI	5	1.4%
Building and Grounds Cleaning and Maintenance	BUSI & AG	6	1.7%
Personal Care and Services	Health & RHTLE	6	1.7%
Sales and Related	BUSI & AG	13	3.7%
Office Administrative Support	BUSI	23	6.6%
Farming, Fishing and Forestry	AG	3	0.9%
Construction and Extraction	ECU	17	4.9%
Installation, Maintenance and Repair	ECU, AM, AG & BUSI	33	9.5%
Production	AM	27	7.8%
Transportation and Material Moving/Logistics	BUSI	15	4.3%
Military	Military	1	0.3%
<b>TOTAL</b>		<b>347</b>	<b>100.0%</b>

Of these 346 occupations, 32% are in the CCCC CO business and entrepreneurship sector; 17% are in the health sector; 17% are in the energy, construction, and utilities sector; and 15% are in the advanced manufacturing sector (Exhibit 5).

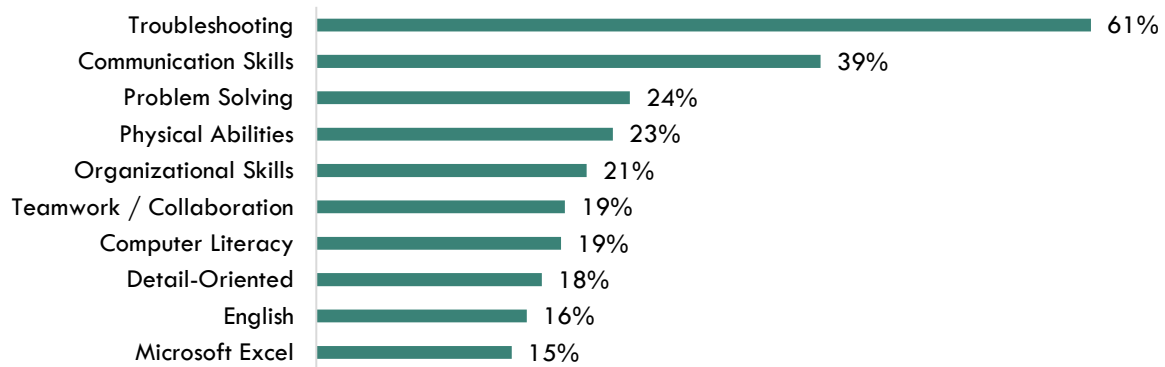
**Exhibit 5. Concentration of 346 occupations by CCCC CO sector**



# Job Postings Overview: In-demand Skills, Certifications & Educational Attainment

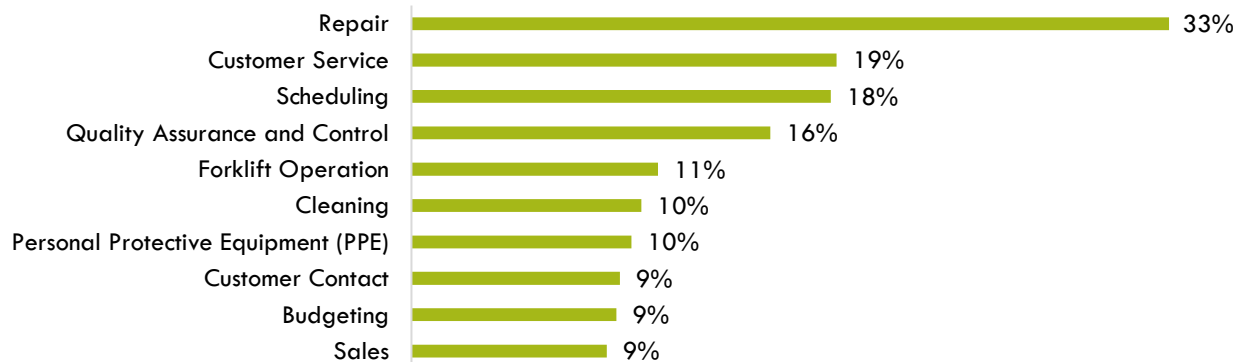
The 346 occupations were analyzed for in-demand skills, certifications, and educational attainment.<sup>4</sup> Exhibit 6 depicts the top baseline skills affiliated with the 346 occupations. The three most important baseline skills are troubleshooting, 61% of job postings, communication skills, 39%, and problem solving, 24%.

**Exhibit 6. Top baseline skills in job postings**



The top three specialized skills requested by employers are repair, 33% of job postings, customer service, 19%, and scheduling, 18%. (Exhibit 7).

**Exhibit 7. Top specialized skills in job postings**

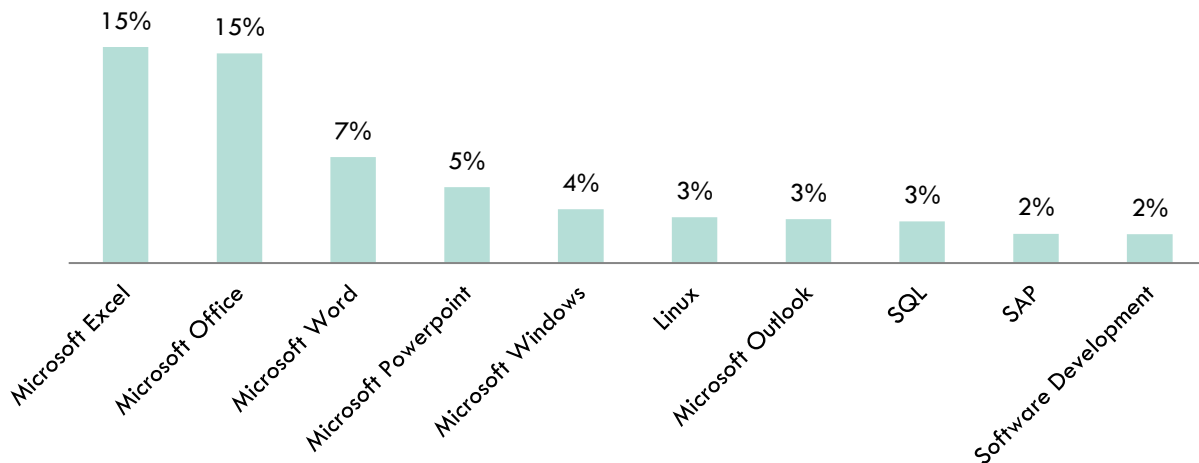


Analysis also included the software skills most in demand by employers. Microsoft Excel and Microsoft Office were the top two software skills identified in job postings (Exhibit 8).

<sup>4</sup> Other than occupation titles and job titles, the categories discussed in this section can be counted one or multiple times per job posting, and across several areas in a single posting. For example, a skill can be counted in two different skill types, and an employer can indicate more than one education level.



**Exhibit 8. Top software skills in job postings**



Of the 3,527 job postings, 1,776 requested certifications. The most in demand certification was a driver’s license, listed in 987 job postings, followed by a security clearance, 250 job postings, and OSHA Forklift Certification, 99 job postings (Exhibit 9).

**Exhibit 9. Top 10 certifications in job postings**

Certification	Job Postings
Driver's License	987
Security Clearance	250
OSHA Forklift Certification	99
CompTIA Security+	76
Certified Public Accountant (CPA)	64
Basic Life Saving (BLS)	58
Cisco Certified Network Associate (CCNA)	55
First Aid/CPR/AED	52
American Board for Engineering and Technology (ABET) Accredited	48
Electrician Certification	47

Of the 3,527 job postings, 2,348 indicated a preferred education level for the positions being filled. Among those, 56% requested high school or vocational training, 43% requested a bachelor’s degree, and 14% requested an associate degree (Exhibit 10). A job posting can indicate more than one education level. Hence, the percentages shown in the chart below total more than 100%.

**Exhibit 10. Educational attainment requested in job postings**

Education Level	# Job Postings	% of Job Postings
High school or vocational training	1,316	56%
Bachelor's degree	1,018	43%
Associate degree	336	14%
Master's degree	221	9%
Doctoral degree	82	3%

# Transitional Occupations

The Center of Excellence examined the 346 occupations and identified 13 occupations that are most closely related to the primary five occupations and that would require minimal additional education or training for oil field workers to transition into these jobs. These 13 occupations have been organized into four distinct groups or occupational clusters (Exhibit 11).<sup>5</sup> The majority of the occupations, a total of 11, are middle skill, requiring more education than a high school diploma, but less than a bachelor’s degree, making these occupations suitable for community college training.

**Exhibit 11. The 13 transitional occupations grouped by occupational cluster**

Occupational Cluster	SOC Code and Title
<b>Business</b>	<ul style="list-style-type: none"> <li>• 41-1011, First-Line Supervisors of Retail Sales Workers</li> <li>• 41-4012, Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products</li> <li>• 11-9198, Personal Service Managers, All Other; Entertainment and Recreation Managers, Except Gambling</li> </ul>
<b>Electrical</b>	<ul style="list-style-type: none"> <li>• 47-2111, Electricians</li> <li>• 49-2022, Telecommunications Equipment Installers and Repairers, Except Line Installers</li> <li>• 17-3023, Electrical and Electronic Engineering Technologists and Technicians</li> </ul>
<b>Information &amp; Communication Technology (ICT)</b>	<ul style="list-style-type: none"> <li>• 15-1232, Computer User Support Specialists</li> <li>• 15-1244, Network and Computer Systems Administrators</li> </ul>
<b>Mechanics and Technicians</b>	<ul style="list-style-type: none"> <li>• 49-9071, Maintenance and Repair Workers, General</li> <li>• 49-3023, Automotive Service Technicians and Mechanics</li> <li>• 49-3031, Bus and Truck Mechanics and Diesel Engine Specialists</li> <li>• 17-2199, Engineers, All Other</li> <li>• 17-3026, Industrial Engineering Technologists and Technicians</li> </ul>

The analysis also looked at how job postings for these three occupational clusters have fluctuated over time. Please note that online job postings can provide insights into employer demand for specific jobs and skill sets; however, while job postings can offer a broader understanding of employer demand, they should

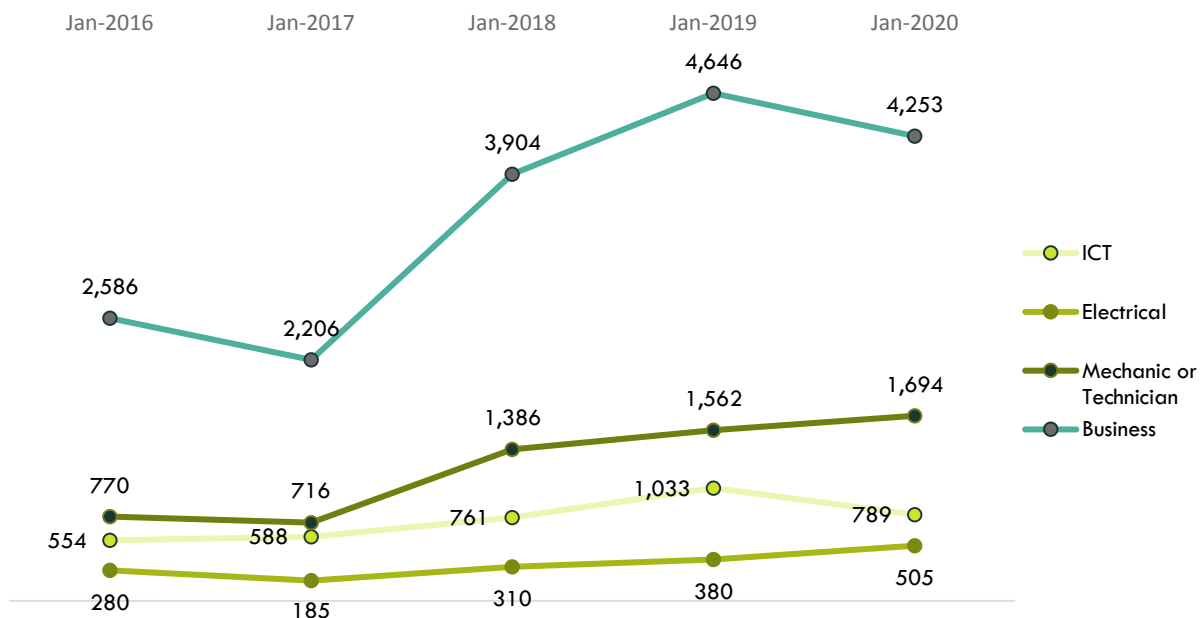
---

<sup>5</sup> The SOC code and title 17-2199, engineers, all other has been substituted for the emerging occupation robotic technician which is an emerging occupation and was identified as being directly related to the five primary occupations; as a result, employment numbers and projected occupational demand may be overstated as engineers, all other is a broader occupation than that of robotic technician. In addition, Emsi data was not available for managers, all other; as a result, 11-9198, personal service managers, all other; entertainment and recreation managers, except gambling was substituted for this occupation.

not be used as a direct measure of demand for specific occupations in the economy since an employer can post more than one job ad for the same position or may post job ads to test out a potential labor market without actually filling any positions.

The business cluster has the highest number of job postings from 2016 to 2020, although the number of job postings slightly declined between 2019 and 2020 (Exhibit 12). The electrical cluster had the second highest number of job postings during the same timeframe, and job postings have more than doubled since 2016. The electrical cluster has the lowest number of job postings, only 505 in 2020.

**Exhibit 12. Occupational clusters by number of job postings, 2016 to 2020**



Because this skills evaluation was conducted to identify potential occupations that oil field workers can transition into when the demand for their existing jobs dissipates, the study also examined the automation risk of the 13 transitional occupations to ensure that these jobs are not likely to be eliminated in the near future. The 13 occupations have a low to medium risk of automation (Exhibit 13).<sup>6</sup>

Of the 13 occupations, four are at low risk of automation:

- First-line supervisors of retail sales workers
- Electricians
- Network and computer systems administrators
- Industrial engineering technicians

<sup>6</sup> Due to the way that Burning Glass categorizes occupations that its algorithm considers directly related to the five primary oil field occupations, automation risk was not available for telecommunications equipment installers and repairers, or the occupation engineers (all other), which was substituted for robotic technicians, an emerging occupation without a SOC code. In addition, data for managers, all other, at the 6-digit SOC code level, was not available; as a result, automation risk could not be obtained for the sub-occupation 11-9198, personal service managers, all other; entertainment and recreation managers, except gambling.

**Exhibit 13. Automation risk of the 13 transitional occupations by cluster**

<b>Business Cluster</b>		
SOC Code	Occupation	Risk of Automation
41-1011	First-Line Supervisors of Retail Sales Workers	Low Risk
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Medium Risk
<b>Electrical Cluster</b>		
SOC Code	Occupation	Risk of Automation
47-2111	Electricians	Low Risk
17-3023	Electrical and Electronics Engineering Technicians	Medium Risk
<b>ICT Cluster</b>		
SOC Code	Occupation	Risk of Automation
15-1151	Computer User Support Specialists*	Medium Risk
15-1142	Network and Computer Systems Administrators*	Low Risk
<b>Mechanics and Technicians Cluster</b>		
SOC Code	Occupation	Risk of Automation
49-9071	Maintenance and Repair Workers, General	Medium Risk
49-3023	Automotive Service Technicians and Mechanics	Medium Risk
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	Medium Risk
17-3026	Industrial Engineering Technicians	Low Risk

# Occupational Demand

Future employment demand was also analyzed using labor market data from Emsi. Of the above 13 occupations, maintenance and repair workers, general has the greatest projected employment demand with 270 annual openings (Exhibit 14).<sup>7</sup> First-line supervisors of retail sales workers follows closely behind with 267 projected annual openings.

Occupations with projected declines in job growth include:

- Industrial engineering technologists and technicians (mechanics and technicians cluster)
- Sales representatives, wholesale and manufacturing, except technical and scientific products (business cluster)
- All occupations in the electrical cluster

However, all these occupations anticipate a need to replace workers and will still offer annual openings, with some annual openings as low as four but up to 144 depending on the occupation in question.

## **Business cluster**

Of the four clusters, the business cluster is projected to have the greatest number of annual openings, a combined total of 554 across three occupations. Within this cluster, the two occupations with the most annual openings are:

- First-line supervisors of retail sales workers, 267 projected annual openings
- Sales representatives, wholesale and manufacturing, except technical and scientific products, 150 annual openings

## **Electrical cluster**

The electrical cluster presents the most concerning workforce projections. All occupations within this cluster are expected to contract. Although new jobs in this cluster may be limited, there will still be demand resulting from replacement jobs, those jobs vacated through retirements or workers permanently leaving positions; as a result, these occupations still have a fair number of annual job openings. The occupation projected to have the most annual job openings in this cluster is electricians, a total of 144, followed by telecommunications equipment installers and repairers, a total of 118.

## **ICT cluster**

Compared to the occupations in other clusters, the occupations within the ICT cluster are projected to offer a fairly limited number of annual openings. A total of 60 annual openings are projected for computer user support specialists, and 25 annual openings are projected for network and computer systems administrators.

## **Mechanics and technicians cluster**

This cluster has the second highest number of annual openings, a total of 519, after the business cluster. Of all 13 occupations, maintenance and repair workers, general, has the greatest number of annual openings, 270, followed by automotive service technicians and mechanics, 137 annual openings. Only four annual openings are projected for industrial engineering technologists and technicians.

---

<sup>7</sup> Note: Emsi has excluded managers, other as an occupation; 11-9198 has been substituted and has the assigned title Personal Service Managers, All Other; Entertainment and Recreation Managers, Except Gambling. Burning Glass uses the SOC title managers, all other, but in the Verified Viper Tool (11-9199.01), all what was contained in ONET is the brownfield site managers, 11-9199.11, which is the best fit for the analysis, an emerging occupation of 11-9199. ONET lists six emerging occupations, related to this SOC code. The brownfield occupation is critical in the region but is omitted from Emsi.

**Exhibit 14. Current employment and projected occupational demand for the 13 transitional occupations**

Business Cluster					
SOC	Occupation	2020 Jobs	5-Year Change	5-Year % Change	Annual Openings
41-1011	First-Line Supervisors of Retail Sales Workers	2,572	32	1%	267
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1,674	(17)	(1%)	150
11-9198	Personal Service Managers, All Other; Entertainment and Recreation Managers, Except Gambling; and Managers, All Other	1,754	98	6%	137
<b>TOTAL</b>		<b>6,001</b>	<b>113</b>	<b>2%</b>	<b>554</b>
Electrical Cluster					
SOC	Occupation	2020 Jobs	5-Year Change	5-Year % Change	Annual Openings
47-2111	Electricians	1,456	(40)	(3%)	144
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	1,214	(89)	(7%)	118
17-3023	Electrical and Electronic Engineering Technologists and Technicians	751	(21)	(3%)	61
<b>TOTAL</b>		<b>3,421</b>	<b>(150)</b>	<b>(4%)</b>	<b>323</b>
ICT Cluster					
SOC	Occupation	2020 Jobs	5-Year Change	5-Year % Change	Annual Openings
15-1232	Computer User Support Specialists	723	50	7%	60
15-1244	Network and Computer Systems Administrators	367	15	4%	25
<b>TOTAL</b>		<b>1,090</b>	<b>65</b>	<b>6%</b>	<b>85</b>
Mechanics and Technicians Cluster					
SOC	Occupation	2020 Jobs	5-Year Change	5-Year % Change	Annual Openings
49-9071	Maintenance and Repair Workers, General	2,756	138	5%	270
49-3023	Automotive Service Technicians and Mechanics	1,515	17	1%	137
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	646	52	8%	66
17-2199	Engineers, All Other	692	5	1%	42
17-3026	Industrial Engineering Technologists and Technicians	45	(0)	(1%)	4
<b>TOTAL</b>		<b>5,653</b>	<b>212</b>	<b>4%</b>	<b>519</b>

# Wages

Wages for each of the 13 occupations were identified (Exhibit 15). Please note that entry-level hourly earnings are derived from the 25<sup>th</sup> percentile and median hourly earnings are derived from the 50<sup>th</sup> percentile. Of all occupations, the highest median hour earnings are earned by engineers, all other, more than \$123,000, followed by network and computer systems administrators, nearly \$94,500.

**Exhibit 15. Wages for each of the 13 transitional occupations by cluster**

<b>Business Cluster</b>				
<b>SOC</b>	<b>Occupation</b>	<b>Entry-Level Hourly Earnings</b>	<b>Median Hourly Earnings</b>	<b>Median Annual Earnings</b>
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	\$20.18	\$31.78	\$66,093
11-9198	Personal Service Managers, All Other; Entertainment and Recreation Managers, Except Gambling; and Managers, All Other	\$19.47	\$33.69	\$70,074
41-1011	First-Line Supervisors of Retail Sales Workers	\$14.89	\$18.33	\$38,132
<b>Electrical Cluster</b>				
<b>SOC</b>	<b>Occupation</b>	<b>Entry-Level Hourly Earnings</b>	<b>Median Hourly Earnings</b>	<b>Median Annual Earnings</b>
17-3023	Electrical and Electronic Engineering Technologists and Technicians	\$36.08	\$43.11	\$89,665
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	\$28.47	\$32.20	\$66,972
47-2111	Electricians	\$23.51	\$32.01	\$66,590
<b>ICT Cluster</b>				
<b>SOC</b>	<b>Occupation</b>	<b>Entry-Level Hourly Earnings</b>	<b>Median Hourly Earnings</b>	<b>Median Annual Earnings</b>
15-1244	Network and Computer Systems Administrators	\$37.91	\$45.43	\$94,485
15-1232	Computer User Support Specialists	\$17.70	\$22.99	\$47,815
<b>Mechanics and Technicians Cluster</b>				
<b>SOC</b>	<b>Occupation</b>	<b>Entry-Level Hourly Earnings</b>	<b>Median Hourly Earnings</b>	<b>Median Annual Earnings</b>
17-2199	Engineers, All Other	\$40.89	\$59.14	\$123,007
17-3026	Industrial Engineering Technologists and Technicians	\$22.06	\$27.56	\$57,318
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	\$17.75	\$23.41	\$48,689
49-9071	Maintenance and Repair Workers, General	\$16.09	\$21.21	\$44,126
49-3023	Automotive Service Technicians and Mechanics	\$14.79	\$21.22	\$44,142

# Education, Work Experience & Training

**Exhibit 16. Education, work experience, training, and Current Population Survey results for the 13 transitional occupations**

Business Cluster					
SOC Code	Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
41-1011	First-Line Supervisors of Retail Sales Workers	High school diploma or equivalent	Less than 5 years	None	38.8%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	High school diploma or equivalent	None	Moderate-term	32.1%
11-9198	Personal Service Managers, All Other; Entertainment and Recreation Managers, Except Gambling; and Managers, All Other	Bachelor's degree	Less than 5 years	None	24.8%
Electrical Cluster					
SOC Code	Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
17-3023	Electrical and Electronic Engineering Technologists and Technicians	Associate degree	None	None	64.2%
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	Postsecondary nondegree award	None	Moderate-term	53.0%
47-2111	Electricians	High school diploma or equivalent	None	Apprenticeship	45.8%
ICT Cluster					
SOC Code	Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
15-1232	Computer User Support Specialists	Some college, no degree	None	None	39.2%
15-1244	Network and Computer Systems Administrators	Bachelor's degree	None	None	37.4%
Mechanics and Technicians Cluster					
SOC Code	Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
17-3026	Industrial Engineering Technologists and Technicians	Associate degree	None	None	50.7%
49-9071	Maintenance and Repair Workers, General	High school diploma or equivalent	None	Moderate-term	37.6%
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	High school diploma or equivalent	None	Long-term	36.4%
49-3023	Automotive Service Technicians and Mechanics	Postsecondary nondegree award	None	Short-term	35.7%
17-2199	Engineers, All Other	Bachelor's degree	None	None	14.0%



# Shared Skills among Transitional Occupational Clusters

The analysis conducted by the COE looked at skills and activities shared by the 13 transitional occupations. A breakdown of top skills and activities for each transitional occupational cluster is provided in Appendix C. Exhibit 17 shows the top shared skills. Troubleshooting, critical thinking, and repairing are the top three occurring skills.

**Exhibit 17. Top 15 skills among the 13 transitional occupations**

Skill	Count
Troubleshooting	8
Critical Thinking	7
Repairing	6
Active Listening	5
Reading Comprehension	5
Operation Monitoring	4
Speaking	4
Judgment and Decision Making	3
Monitoring	3
Operation and Control	3
Equipment Maintenance	2
Quality Control Analysis	2
Social Perceptiveness	2
Negotiation	1
Persuasion	1

Activities provide insight into jobs in which a worker can be more resilient when faced with automation because a worker who is trained in multiple activities can more easily transition into another occupation that has similar activities to the occupation that is being phased out. The top 15 activities performed by the 13 transitional occupations were also pulled using the Verify Viper tool (Exhibit 18).<sup>8</sup> Activities commonly shared among the 13 occupations include communicating with supervisors, peers, or subordinates; getting information; and identifying objects, actions, and events.

---

<sup>8</sup> Verify Viper, accessed January 13, 2021, <https://verifyviper.com>.

**Exhibit 18. Top 15 activities among the 13 transitional occupations**

Activities	Count
Communicating with Supervisors, Peers, or Subordinates	13
Getting Information	13
Identifying Objects, Actions, and Events	13
Organizing, Planning, and Prioritizing Work	13
Monitor Processes, Materials, or Surroundings	12
Updating and Using Relevant Knowledge	11
Interacting With Computers	10
Establishing and Maintaining Interpersonal Relationships	8
Inspecting Equipment, Structures, or Material	8
Repairing and Maintaining Electronic Equipment	8
Documenting/Recording Information	7
Processing Information	7
Analyzing Data or Information	6
Evaluating Information to Determine Compliance with Standards	6
Handling and Moving Objects	6

## Conclusion

This study examined 346 occupations that share skills associated with the five primary oil field occupations. Of that initial group of occupations, 13 occupations were selected that require minimal education and training for oil field workers seeking to transition into new areas of employment. Eleven of these occupations are middle skill.

A detailed skills analysis was conducted to identify common skills areas that are shared between the primary oil field occupations that are being phased out and promising occupations into which workers could choose to transition.

Top in-demand skills that should be considered as oil field workers retrain are troubleshooting, critical thinking, and repairing. These are top skills among the primary five oil field occupations and among the 13 transitional occupations identified by this study.

Of the 13 transitional occupations, four are at low risk of automation:

- First-line supervisors of retail sales workers
- Electricians
- Network and computer systems administrators
- Industrial engineering technicians

All 13 transitional occupations are well paid, offering annual median earnings ranging from \$38,132 to \$123,007. The highest paid occupations in terms of annual median earnings are:

- Engineers, all other, \$123,007 (mechanics and technicians cluster)
- Network and computer systems administrators, \$94,485 (ICT cluster)
- Electrical and electronic engineering technologists and technicians, \$89,665 (electrical cluster)

Educational attainment data shows almost all of the occupations are complemented by community college education. Two occupations typically require a four-year postsecondary degree and fewer than a third of workers in these occupations nationally have less than a bachelor's degree:

- Engineers, all other, and personal service managers, all other
- Entertainment and recreation managers, except gambling; and managers, all other

However, the jobs and sub-occupations housed under "All Other" generally have education levels that are not fully defined and may eventually roll out to be middle-skill.

Of the four occupational clusters, the business cluster had the greatest number of jobs in 2020 as well as the greatest projected demand in terms of annual openings. Two of the three occupations with the most annual openings fall within this cluster.

The three transitional occupations out of the group of 13 with the greatest projected demand are:

- Maintenance and repair workers, general, 270 annual openings
- First-line supervisors of retail sales workers, 267 projected annual openings
- Sales representatives, wholesale and manufacturing, except technical and scientific products, 150 annual openings

# 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> .
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="https://www.bls.gov/emp/tables/educational-attainment.htm">https://www.bls.gov/emp/tables/educational-attainment.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://burning-glass.com/">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://onetonline.org">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.

# Appendix B: Matrix of Occupations related to Oil Field Services

**Exhibit B1. Occupations related to the three primary oil field occupations, identified through Burning Glass**

Rotary Drill Operators, Oil and Gas	Roustabouts, Oil and Gas	Pump Operators, Except Wellhead Pumps
1. Construction and Related Workers, All Other	1. Construction and Related Workers, All Other	1. Construction and Related Workers, All Other
2. Earth Drillers, Except Oil and Gas	2. Loading Machine Operators, Underground Mining	2. Crane and Tower Operators
3. Loading Machine Operators, Underground Mining	3. Mining Machine Operators, All Other	3. Earth Drillers, Except Oil and Gas
4. Mining Machine Operators, All Other	4. Power Plant Operators	4. Loading Machine Operators, Underground Mining
5. Paving, Surfacing, and Tamping Equipment Operators	5. Pump Operators, Except Wellhead Pumps	5. Mining Machine Operators, All Other
6. Petroleum Engineers	6. Robotics Technicians	6. Rotary Drill Operators, Oil and Gas
7. Pump Operators, Except Wellhead Pumps	7. Rotary Drill Operators, Oil and Gas	7. Roustabouts, Oil and Gas
8. Sailors and Marine Oilers	8. Telecommunications Equipment Installers and Repairers, Except Line Installers	

The following skills are those most frequently requested in the 260 job postings for registered nurses. Patient care is noted 181 times in the job postings followed by cardiopulmonary resuscitation (CPR) noted 160 times and life support noted 146 times in the job postings.

**Exhibit B2. Top 10 skills frequently requested in job postings for registered nurses**

Skill	Job Postings
Patient Care	181
Cardiopulmonary Resuscitation (CPR)	160
Life Support	146
Acute Care	139
Discharge Planning	126
Assessment Data	115
Health Information Management (HIM)	115
Health Promotion Programs	115
Scheduling	33

# Appendix C: Top Skills and Activities by Occupational Cluster

**Exhibit C1. Top five skills and activities for the business occupational cluster**

	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Brownfield Redevelopment Specialists and Site Managers	First-Line Supervisors of Retail Sales Workers
	41-4012	11-9199.01	41-1011
Skills	Speaking: 4.00 Active Listening: 4.00 Persuasion: 3.88 Social Perceptiveness: 3.75 Negotiation: 3.62	Written Expression: 3.88 Written Comprehension: 3.88 Speech Clarity: 3.88 Speech Recognition: 3.75 Visualization: 2.75	Active Listening: 3.88 Speaking: 3.75 Service Orientation: 3.75 Social Perceptiveness: 3.50 Monitoring: 3.50
Activities	Selling or Influencing Others: 4.49 Communicating with Persons Outside Organization: 4.33 Getting Information: 4.13 Establishing and Maintaining Interpersonal Relationships: 4.13 Communicating with Supervisors, Peers, or Subordinates: 4.05	Getting Information: 4.56 Communicating with Persons Outside Organization: 4.48 Organizing, Planning, and Prioritizing Work: 4.28 Interacting With Computers: 4.28 Evaluating Information to Determine Compliance with Standards: 4.24	Training and Teaching Others: 4.09 Performing for or Working Directly with the Public: 4.08 Resolving Conflicts and Negotiating with Others: 3.89 Coaching and Developing Others: 3.89 Communicating with Supervisors, Peers, or Subordinates: 3.82

**Exhibit C2. Top five skills and activities for the electrical occupational cluster**

	Electricians	Telecommunications Equipment Installers and Repairers, Except Line Installers	Electronic Engineering Technicians
	47-2111	49-2022	17-3023.01
Skills	Troubleshooting: 3.62 Repairing: 3.50 Judgment and Decision Making: 3.38 Critical Thinking: 3.38 Active Listening: 3.38	Troubleshooting: 3.88 Repairing: 3.88 Quality Control Analysis: 3.62 Operation Monitoring: 3.62 Critical Thinking: 3.62	Reading Comprehension: 3.75 Critical Thinking: 3.38 Troubleshooting: 3.25 Speaking: 3.25 Monitoring: 3.25
Activities	Identifying Objects, Actions, and Events: 4.12 Getting Information: 4.10 Inspecting Equipment, Structures, or Material: 3.97 Handling and Moving Objects: 3.94 Monitor Processes, Materials, or Surroundings: 3.91	Interacting With Computers: 4.44 Getting Information: 4.41 Operating Vehicles, Mechanized Devices, or Equipment: 4.13 Communicating with Supervisors, Peers, or Subordinates: 4.07 Updating and Using Relevant Knowledge: 4.01	Repairing and Maintaining Electronic Equipment: 4.24 Inspecting Equipment, Structures, or Material: 4.06 Interacting With Computers: 3.92 Getting Information: 3.91 Identifying Objects, Actions, and Events: 3.88

**Exhibit C3. Top five skills and activities for the transition into ICT occupational cluster**

	<b>Network and Computer Systems Administrators</b>	<b>Computer User Support Specialists</b>
	<b>15-1244</b>	<b>15-1232</b>
<b>Skills</b>	Systems Analysis: 3.88 Reading Comprehension: 3.88 Judgment and Decision Making: 3.88 Critical Thinking: 3.88 Troubleshooting: 3.75	Speaking: 4.00 Reading Comprehension: 4.00 Active Listening: 4.00 Critical Thinking: 3.75 Writing: 3.62
<b>Activities</b>	Interacting With Computers: 4.86 Updating and Using Relevant Knowledge: 4.24 Getting Information: 4.17 Organizing, Planning, and Prioritizing Work: 4.08 Identifying Objects, Actions, and Events: 4.02	Interacting With Computers: 4.88 Getting Information: 4.22 Communicating with Supervisors, Peers, or Subordinates: 4.20 Updating and Using Relevant Knowledge: 4.08 Organizing, Planning, and Prioritizing Work: 3.75 Repairing and Maintaining Electronic Equipment: 3.69



**Exhibit C4. Top five skills and activities for the mechanics and technicians occupational cluster**

	<b>Maintenance and Repair Workers, General</b>	<b>Automotive Specialty Technicians</b>	<b>Bus and Truck Mechanics and Diesel Engine Specialists</b>	<b>Robotics Technicians</b>	<b>Industrial Engineering Technicians</b>
	<b>49-9071</b>	<b>49-3023.02</b>	<b>49-3031</b>	<b>17-3024.01</b>	<b>17-3026</b>
<b>Skills</b>	Repairing: 4.00 Equipment Maintenance: 4.00 Troubleshooting: 3.62 Operation and Control: 3.12 Operation Monitoring: 3.12	Repairing: 3.88 Troubleshooting: 3.75 Operation and Control: 3.50 Operation Monitoring: 3.38 Judgment and Decision Making: 3.38	Troubleshooting: 3.62 Repairing: 3.62 Operation and Control: 3.38 Operation Monitoring: 3.38 Quality Control Analysis: 3.25	Troubleshooting: 4.00 Repairing: 4.00 Reading Comprehension: 3.88 Equipment Maintenance: 3.88 Critical Thinking: 3.88	Reading Comprehension: 4.00 Critical Thinking: 3.88 Active Listening: 3.88 Monitoring: 3.38 Time Management: 3.25
<b>Activities</b>	Inspecting Equipment, Structures, or Material: 4.06 Handling and Moving Objects: 3.98 Performing General Physical Activities: 3.95 Repairing and Maintaining Mechanical Equipment: 3.80 Getting Information: 3.80	Identifying Objects, Actions, and Events: 4.04 Getting Information: 4.01 Operating Vehicles, Mechanized Devices, or Equipment: 3.99 Updating and Using Relevant Knowledge: 3.84 Handling and Moving Objects: 3.70	Repairing and Maintaining Mechanical Equipment: 4.16 Getting Information: 3.98 Operating Vehicles, Mechanized Devices, or Equipment: 3.82 Inspecting Equipment, Structures, or Material: 3.78 Evaluating Information to Determine Compliance with Standards: 3.73	Interacting With Computers: 4.59 Repairing and Maintaining Electronic Equipment: 4.36 Identifying Objects, Actions, and Events: 4.18 Monitor Processes, Materials, or Surroundings: 4.14 Getting Information: 4.14	Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment: 4.05 Thinking Creatively: 4.01 Communicating with Supervisors, Peers, or Subordinates: 3.93 Updating and Using Relevant Knowledge: 3.89 Getting Information: 3.86