

Advanced Manufacturing Industry and Occupations in the Inland Empire

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Manufacturing in California generates \$230 billion in gross state product and funds 60% of research and development activities in California.

— Source: California Manufacturers & Technology Association

Introduction

Manufacturing is an industry that is critical for the long-term health of California's regional and statewide economies. In particular, the industry is regionally important for the Inland Empire, an area encompassing San Bernardino and Riverside counties.

Industry insiders often refer to manufacturing as being an economic game changer and a critical foundational component for a strong and healthy economy. According to the California Manufacturers & Technology Association (CMTA), manufacturing in California generates \$230 billion in gross state product and funds 60% of research and development activities in California.

Similarly, manufacturing within the Inland Empire is an economic driver. According to the California Inland Empire District Export Council, the region's top five export sectors are all in manufacturing: computer and electronic product manufacturing (20% of all exports), miscellaneous manufacturing (20%), transportation equipment (13%), machinery manufacturing (8%), and chemical manufacturing (7%).¹

Across the state, manufacturing businesses employ 1.3 million workers.² This is approximately 8% of the workforce in California.³ And more than half of the 30,000 manufacturers in California are small businesses employing nine or fewer employees, according to CMTA.

Within the Inland Empire, the manufacturing industry is one of the regional economy's most important sectors, employing approximately 84,000 workers. However, the manufacturing industry appears to have been impacted by the economic downturn and since 2012 has shrunk by 3,700 jobs in the region.⁴ According to the Inland Empire Quarterly Economic Report, the decline in jobs in the region can be attributed to California's lack of competitiveness, even though the manufacturing sector is growing nationally.⁵

Despite the somewhat dour outlook, in recent months economic indicators that measure purchasing and production seem to indicate that manufacturing could be on an upswing in the region.⁶

Meanwhile, California's manufacturing industry is still recovering from the recession and is lagging behind national job growth.⁷ While jobs are available in California's manufacturing industry, skilled workers to fill those openings are difficult to find, even though manufacturing jobs often pay premium

¹ "The Inland Empire Region." The California Inland Empire District Export Council. <http://www.ciedec.org/inland-empire-region.html>

² "California's Labor Market at a Glance." State of California Economic Development Department. <http://www.labormarketinfo.edd.ca.gov/Content.asp?pageid=4>

³ "California Manufacturing Facts." National Association of Manufacturers.

<http://www.nam.org/~media/AB89C6F3E49E4682B007F9BA524CDBAB.ashx>

⁴ "Inland Empire Employment...Questionable Job Growth Figures." Inland Empire Quarterly Economic Report (October 2013). http://www.ieep.com/pdf/GER_Oct_2013_IEEP.pdf

⁵ Ibid.

⁶ Gruszecki, Debra. "Economy: A Good Month for Inland Factories." The Riverside Press-Enterprise. (2 December 2013.) <http://www.pe.com/business/business-headlines/20131202-economy-a-good-month-for-inland-factories.ece>

⁷ "Manufacturing Employment Data." California Manufacturers & Technology Association. <http://www.cmta.net/page/mnfg-trends.php>

wages and benefits, and higher paying jobs have increased as a percentage of total manufacturing employment.⁸

Employers in the Inland Empire also say they are encountering this difficulty. Experts attribute this worker shortage to a decline in career and technical education within public schools, which has curbed the pipeline of students leaving high school who are ready to learn more advanced skills through employment or community colleges.

Industry insiders also say that a workforce shortage has been exacerbated because the skillsets of workers have not kept pace with industry advances. To remain competitive, manufacturing has become more technologically sophisticated in recent decades. Manufacturing subsectors such as food processing, plastics manufacturing, and metal manufacturing have adopted new technologies to improve output and efficiency.

“At one time, California was a national leader in training and developing a skilled workforce,” said Nicole Rice, CMTA policy director, during a recent event hosted by Chaffey College. “Now, that is not the case. More students are graduating from high school and postsecondary school without the skills and technical knowhow to fill jobs in the most vital sectors.”

On November 14, 2013, Chaffey College on behalf of the Desert/Inland Empire Regional Consortium of Community Colleges convened a panel of stakeholders to weigh in on occupational skills that are in demand and those skills that are changing and evolving within the advanced manufacturing industry. The regional Center of Excellence for Labor Market Research compiled and presented labor market data on the advanced manufacturing industry and occupations in the region to help frame the discussion. Among those who provided comment were manufacturing company representatives, as well as the advanced manufacturing statewide sector navigator and deputy sector navigator with the California Community College Chancellor’s Office. Input from the participants on technological advancements, workforce needs, and how to inspire innovation has been included in this report.

Methodology

This study presents an analysis of labor market data and postsecondary student completion numbers for the field of advanced manufacturing. Both quantitative and qualitative primary and secondary data were collected from employers, proprietary schools, community colleges, and proprietary data sources.

The North American Industry Classification System (NAICS) was used to identify industries related to advanced manufacturing and the Standard Occupational Classification (SOC) system was used to identify specific occupations employed by advanced manufacturing. Occupation and industry data were obtained using the Economic Forecaster tool provided by Economic Modeling Specialists, Inc. (EMSI). Job posting data were collected using Labor Insight’s Burning Glass tool and examined to identify employer needs and trends in hiring.

Information on regional training programs was gathered from the California Community Colleges Chancellor’s Office Data Mart system and the Integrated Postsecondary Education Data System (IPEDS). College programs were identified using Taxonomy of Programs (TOP) codes and the Classification of Instructional Programs (CIP) system. For more information on the data sources utilized, please refer to Appendix A.

⁸ “Manufacturing: Still a Force in Southern California.” Los Angeles County Economic Development Corporation and Kyser Center for Economic Research. (2011.) http://laedc.org/reports/Manufacturing_2011.pdf

Industry Trends

Manufacturing drivers

Industry experts believe that a manufacturing resurgence is in its early stages in California and across the nation as industry opportunities and jobs return from overseas. Likewise, at the local level, increased port activities in Los Angeles and Long Beach in addition to growth in the Purchasing Managers Index indicate expansion.⁹ The Purchasing Managers Index (PMI) is derived using indicators related to production and new orders as well as inventories and employment levels. If a PMI is 50 or greater, then growth is expected. The PMI for the Inland Empire in September 2013 was 53.¹⁰

However, industry stakeholders caution that to ensure domestic manufacturing production continues to increase, a strong framework needs to be in place to support a skilled workforce pipeline.

Scarcity of skills

Manufacturers across the nation say they have job openings and are ready to hire, but lament that they can't find skilled individuals with the technical knowhow to fill these jobs. As a result, this worker shortage appears to not only be a state concern, but a national one. In 2010, there were approximately 227,000 unfilled manufacturing jobs nationwide.¹¹

There is apprehension within the advanced manufacturing industry that this shortage may impede the state's and the nation's ability to compete globally.¹² Within the Inland Empire, employers have expressed concerns that the shortage may hinder their ability to grow and expand. They cite a reliable supply of skilled workers as being necessary for increased productivity.

Meanwhile, the shortage is being exacerbated by an aging workforce. According to CMTA, the average worker in the California manufacturing industry is 55 years old. As a result, a large number of workers are expected to retire over the next decade. Skilled workers are needed to backfill those positions. Without them, experts say, the industry could face a crisis.

Transformative advances

In the next 20 years, emerging manufacturing technologies are expected to further change the industry and revolutionize the way products are made, with new techniques and systems incorporating rapid prototyping, such as 3-D printing.¹³ Manufacturing practices also are expected to adopt "cradle-to-cradle" design approaches, taking into account the full lifecycle of a product and the reuse of materials once that lifecycle reaches an end.¹⁴ In the future, the manufacturing industry will consist of companies that can quickly alter and adjust their processes and that rely on virtual large-scale collaboration of workers with high motivation and skill levels.

⁹ 2012 Riverside San Bernardino Economic Forecast. Beacon Economics, UCR School of Business Administration. (December 2012). https://beaconecon.com/Misc/2012_RSB_Book_Online.pdf

¹⁰ "Inland Empire Report on Business." The Institute for Applied Research, Cal State San Bernardino. (September 2013.) <http://mfgcouncilie.com/wp-content/uploads/2013/10/ROBSept2013Final.pdf>

¹¹ Bowers, Cynthia. "Skilled Labor Shortage Frustrates Employers." CBS News. (11 August 2010). <http://www.cbsnews.com/news/skilled-labor-shortage-frustrates-employers/>

¹² Whoriskey, Peter. "U.S. manufacturing sees shortage of skilled factory workers." The Washington Post. (19 February 2012.) http://articles.washingtonpost.com/2012-02-19/business/35444240_1_factory-workers-laid-off-workers-jobs

¹³ "Industries of the Future: Manufacturing." Centers of Excellence and the Institute for the Future. (2012.) http://www.coecc.net/documents/mfg_STEMin20_12.pdf

¹⁴ Ibid.

Industry Overview

Within the Inland Empire’s two-county region, there are 4,350 advanced manufacturing businesses, generating \$24 billion in revenue, and providing 96,519 jobs, according to 2012 data. The majority of these establishments are small businesses, employing between 1 and 4 employees. Data projections report a decline of 4% in manufacturing jobs within the region by 2015.

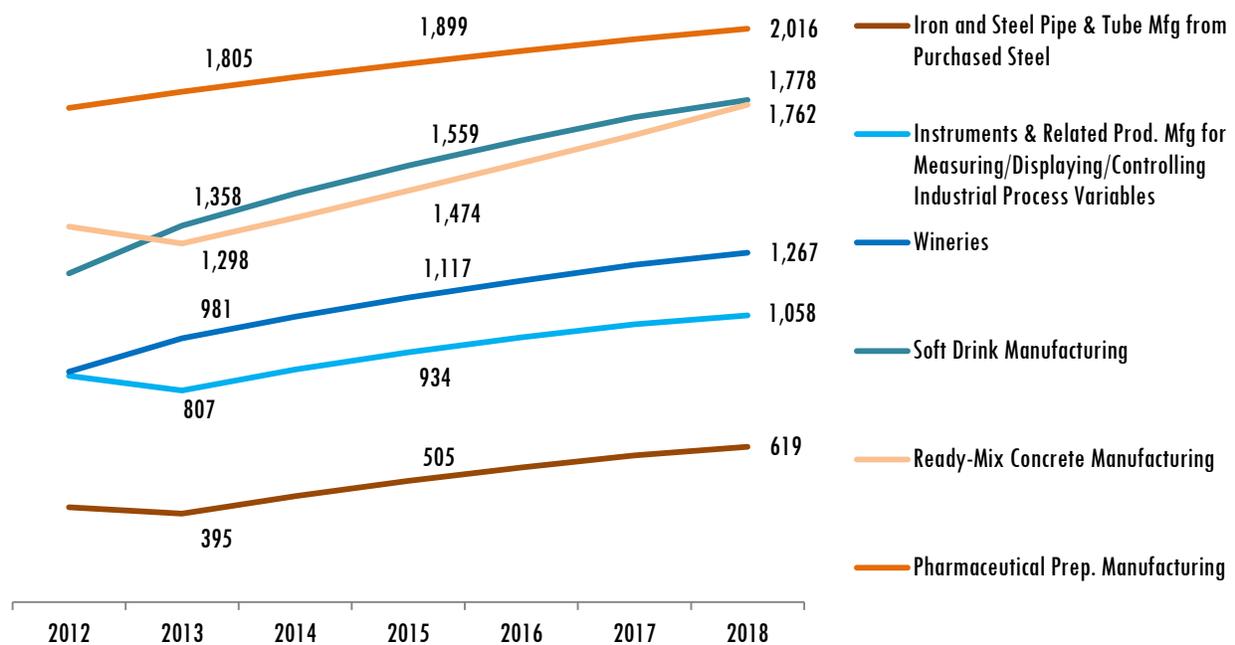
The top five most common manufacturing businesses in the Inland Empire are:

- 1) Other (jewelry, sports & athletic goods, and office supplies)
- 2) Printing
- 3) Machine shops
- 4) Bakeries and tortilla makers, and
- 5) Household, institutional furniture and kitchen cabinet producers.

Six subsectors within the advanced manufacturing sector are expected to expand between now and 2018. Those subsectors—which include iron and steel manufacturers, wineries and pharmaceuticals—are shown in Figure 1. Soft drink manufacturing is expected to be the largest growing industry, by absolute number of jobs (growth of 580 jobs), followed by Ready-Mix Concrete manufacturing (408 jobs), and Wineries (397 jobs).

An examination of staffing patterns reveals that local manufacturing industries mostly employ team assemblers, supervisors of production/operating workers, and laborers and freight stock and material movers. See Appendix B for a detailed list of occupations commonly employed by manufacturing industries.

Figure 1. Advanced manufacturing industries undergoing expansion (2012-2018)



Occupational Overview

The following section provides detailed labor market information on occupations specific to the advanced manufacturing industry in the Inland Empire. Using 2013 data, 45 manufacturing occupations were identified, comprising 76,280 jobs in the region. Among these occupations, 2,020 annual openings (new and replacement jobs) can be expected.

To more closely analyze the manufacturing occupations they were divided into three clusters:

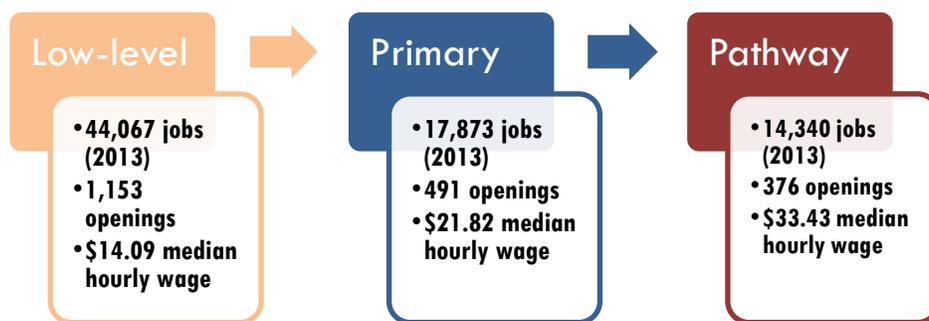
- **Low-level occupations** (occupations requiring on-the-job training and no postsecondary education);
- **Primary occupations** (occupations requiring some level of postsecondary education or training), and
- **Pathway occupations** (manager, supervisor, and engineering positions that usually require a bachelor's degree).

Figure 2 details the number of jobs, number of openings, and median wage for each cluster.

Low-level occupations, by far, had more positions than primary and pathway positions combined, totaling 44,067 jobs in 2013.

Correspondingly, low-level occupations also had more openings. However, the median wage for this subgroup is far lower. At \$14.63 per hour, it is less than half the \$33.43 median wage of pathway occupations. Primary occupations had slightly more positions than pathway occupations, and workers earn a slightly lower rate, nearly \$22 per hour.

Figure 2. Summary of low-level, primary and pathway occupational characteristics



Low-level Occupations

There were more than 44,000 positions within low-level occupations in the Inland Empire in 2013. That number is expected to remain about constant over the next three years. Job openings (including new and replacement jobs) are projected to hover around 1,153 per year. Examples of low-level occupations include assemblers, fabricators, metal workers and plastics workers.

Overall, the low-level cluster of occupations is expected to remain relatively stable over the next few years. Most categories of occupations within this group show a decline but only Cabinetmakers and bench carpenters demonstrate significant job loss (16%). The Maintenance and Repair Workers, General occupation is projected to have the greatest number of job openings over the next two years (368). Table 1 provides summary occupational jobs statistics for low-level occupations. (Detailed occupational jobs statistics for all low-level occupations is included in Appendix C).

Table 1 – Labor Market Data for Low-level Occupations and Occupational Groups

Description	2013 Jobs	2015 Jobs	Change	% Change	Annual Openings	Median Hourly Earnings
Maintenance and repair workers, general	11,429	11,736	307	3%	368	\$17.09
Other production occupations*	11,415	11,431	16	0%	348	\$13.74
Assemblers and fabricators*	11,996	11,762	(234)	(2%)	241	\$13.33
Metal workers and plastic workers*	6,945	6,736	(209)	(3%)	124	\$14.71
Printing press operators	1,187	1,168	(19)	(2%)	44	\$15.16
Cabinetmakers and bench carpenters	1,095	922	(173)	(16%)	28	\$13.72
Total/Average	44,067	43,755	(312)	(1%)	1,153	\$14.63

*General categories of occupations, not all inclusive.

Source: EMSI Employment Data – 2013.3

Inverse staffing patterns revealed that employment services and temporary employment agencies are, by and large, filling openings for low-level occupations. However, a significant amount of hiring is being conducted by plastics product manufacturers. Detailed inverse staffing patterns by occupational cluster are included in Appendix D.

Primary Occupations

Within the primary occupations subgroup, 17,873 jobs and 491 annual openings were identified. Unlike low-level positions, primary occupations typically require some postsecondary training, such as a certificate or an associate degree.

Only four occupations within the primary subgroup are expected to grow over the next two years: industrial machinery mechanics, electrical and electronics engineering technicians, maintenance workers, and electro-mechanical technicians (Table 2). Anecdotally, comments from those who participated in the Advanced Manufacturing Skills Panel mirrored these findings. Panelists expressed a need for electricians, machinists, and mechanics skilled in maintenance and repair.

Table 2 – Labor Market Data for Primary Occupations

Description	2013 Jobs	2015 Jobs	Change	% Change	Annual Openings	Median Hourly Earnings
Electricians	4,680	4,576	(104)	(2%)	150	\$23.56
Welders, Cutters, Solderers, and Brazers	3,163	3,048	(115)	(4%)	83	\$17.30
Machinists	2,776	2,755	(21)	(1%)	61	\$18.69
Industrial Machinery Mechanics	2,376	2,457	81	3%	88	\$23.52
Sheet Metal Workers	1,629	1,526	(103)	(6%)	27	\$22.91
Electrical and Electronics Engineering Technicians	1,064	1,085	21	2%	32	\$28.97
Maintenance Workers, Machinery	677	683	6	1%	14	\$21.02
Mechanical Drafters	378	367	(11)	(3%)	7	\$26.29
Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	304	292	(12)	(4%)	8	\$15.94
Industrial Engineering Technicians	219	219	0	0%	4	\$24.14
Chemical Plant and System Operators	218	197	(21)	(10%)	7	\$25.79
Mechanical Engineering Technicians	201	201	0	0%	4	\$23.82
Electro-Mechanical Technicians	188	193	5	3%	6	\$24.78
Total/Average	17,873	17,599	(274)	(2%)	491	\$21.82

Source: EMSI Employment Data – 2013.3

The occupation of industrial machinery mechanics is projected to have the greatest increase in positions over the next two years (3%), potentially indicating a trend in manufacturing whereby innovation and advances in machines and technology are becoming more prevalent. The annual openings for industrial machinery mechanics show that there will be a regional need for more machinery mechanics.

Overall, the primary occupations cluster is expected to contract by 2% over the next two years, shedding 274 jobs. Employment is projected to decline from 17,873 to 17,599. However, there are still expected to be 491 annual openings.

Analysis also revealed that building equipment operators, commercial and industrial machine suppliers, machine shops and metals manufacturers, and architectural and structural engineering firms are the main businesses that employ primary occupations (Appendix D).

Pathway Occupations

Pathway occupations often require a high level of educational attainment, such as a degree from a four-year educational institution and/or significant work experience. Examples of professions within this subgroup are engineers, supervisors, and managers. Overall, this occupational cluster is not expected to grow over the next two years.

According to 2013 data, there are more than 14,000 pathway occupation positions in the Inland Empire. Over the next two years, only 28 positions are expected to be added, a number which is not large enough to affect a percentage change in growth. Nearly 380 annual openings are projected.

The occupation of managers and supervisors of mechanics, installers, and repairers is expected to grow the most, adding 75 jobs over the next two years in the region. Openings for this occupation are expected to total 125 annually (Table 3).

Table 3 – Labor Market Data for Pathway Occupations

Description	2013 Jobs	2015 Jobs	Change	% Change	Annual Openings	Median Hourly Earnings
First-Line Supervisors of Production and Operating Workers	4,918	4,815	(103)	(2%)	68	\$22.02
First-Line Supervisors of Mechanics, Installers, and Repairers	3,604	3,679	75	2%	125	\$31.35
Industrial Production Managers	1,268	1,255	(13)	(1%)	31	\$40.29
Mechanical Engineers	1,205	1,196	(9)	(1%)	39	\$36.17
Architectural and Engineering Managers	1,157	1,164	7	1%	26	\$60.73
Electronics Engineers, Except Computer	826	877	51	6%	47	\$47.47
Industrial Engineers	783	789	6	1%	19	\$35.76
Electrical Engineers	579	593	14	2%	20	\$45.58
Total/Average	14,340	14,368	28	0%	376	\$33.43

Most occupations within the pathway subgroup will remain stable. However, the number of positions for first-line supervisors of production and operating workers is expected to decrease by 2%, from 4,918 positions to 4,815 positions. Annual openings for this occupation are projected to total 68.

Occupations related to engineering are expected to sustain the most growth within the pathways occupational cluster over the next two years and offer relatively high paying hourly wages.

The analysis of hiring trends revealed that firms specializing in “architectural, engineering and related services” are primarily hiring for pathways occupations. Other top employers include local government

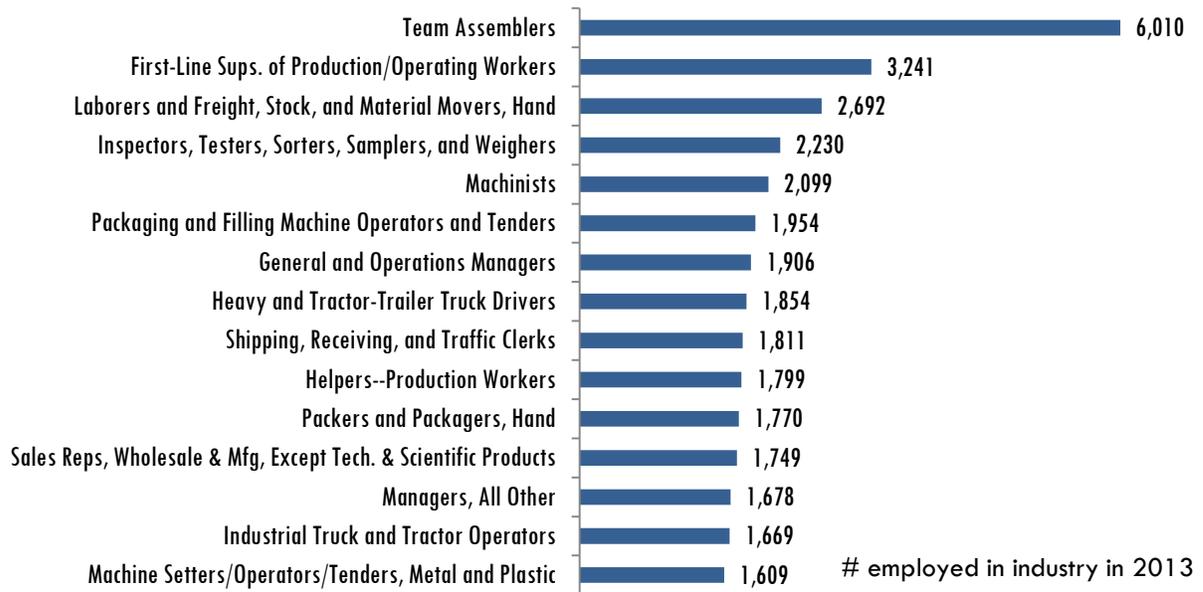
agencies, excluding educational institutions and hospitals, as well as businesses that specialize in plastics product manufacturing or automotive repair and maintenance.

Occupational Hiring Trends

In addition to traditional labor market data, job postings data were examined to understand what area employers are looking for in qualified candidates for manufacturing occupations.

The analysis of job postings revealed that the most in demand workers in the Inland Empire are team assemblers (Figure 3). First-line supervisors of production/operating workers are also high on the list, as are laborers and freight, stock and material movers and inspectors, testers, sorters, samplers, and weighers.

Figure 3. Advanced Manufacturing Occupations in highest demand – Job postings (Jan-Dec, 2012)



By examining employer job postings for primary occupations for all 12 months of 2012, we were able to determine the employers with the most online job postings in the region:

- Desert Sands Unified School District (30 job ads);
- CIRCOR Aerospace (24);
- Freeport-McMoRan Copper & Gold Inc. (21);
- Goodrich Corporation (14); and
- Leslie Controls, Inc., a subsidiary of CIRCOR (14).

Within the employer job postings for primary occupations, the most common job titles were welder (115 ads), electrician (96), machinist (67), electronics technician (40), and maintenance electrician (33). Overall, electricians, mechanics, and technicians dominated the top 10 most common job titles.

Some of the most in demand skills, as contained in job advertisements, are soft skills, such as communication and problem solving. Electrical and programming abilities were specialized skill sets that also frequently appeared. The high demand for software and programming skills may reflect a general trend in advanced manufacturing as the industry becomes more technologically sophisticated.

The following is a summary of top skill clusters for primary occupations, as identified in job postings:

- Repair: General (240 ads)
- Common skills: Problem solving (234)
- Common skills: Communication & coordination (173)
- Construction: General (169)
- Construction: Electrical (157)
- Common skills: Business environment skills (152)
- Software and programming skills (137)

Skills that appear in job advertisements for manufacturing occupations substantiate the comments made by employers at the Inland Empire Manufacturing Skills Panel Event. Panelists mentioned the need not only for technical skills, but also for non-technical, soft skills—such as communication, initiative, persistence, independence, punctuality, and dependability.

There was overall agreement from panel participants that when they are screening applicants, they are looking most for soft skills, with the idea that if an employee has critical thinking skills and determination, he or she can learn whatever else is needed through on-the-job training. As one participant said, employers hire attitude and train for skills.

A more detailed summary of top job titles, employers, and skills clusters is included in Appendix E.

Education Requirements

As identified through data from the Bureau of Labor Statistics, education requirements for low-level, primary, and pathway occupations are presented in this section. Among this group, eight occupations necessitate certificates or degrees from community colleges (Table 4). Six require bachelor’s degrees for employment.

Rather than requiring a specific degree, two pathway occupations mandate having work experience in a related occupation. Those occupations are first-line supervisors of mechanics, installers and repairers, and first-line supervisors of production and operating workers.

A panel of industry experts in attendance at the Inland Empire Manufacturing Skills Panel Event in November noted that postsecondary certificates can be a preliminary indicator of skill level and job preparedness. However, panelists also said it is most important that workers have soft skills and critical thinking skills since technical skills specific to particular occupations can be taught on the job.

Table 4 - Education requirements by occupational cluster

Education Requirement	Occupational Cluster	Occupations
On-the-job training	▪ Low-level	<ul style="list-style-type: none"> ▪ Maintenance and repair workers ▪ Assemblers and fabricators ▪ Metal workers and plastic workers
	▪ Primary	<ul style="list-style-type: none"> ▪ Sheet metal workers ▪ Maintenance workers ▪ Industrial machinery mechanics
		<ul style="list-style-type: none"> ▪ Printing press operators ▪ Cabinet makers and bench carpenters ▪ Electricians ▪ Machinists ▪ Chemical plant and system operators

Postsecondary Certificate/ Associate Degree	<ul style="list-style-type: none"> ▪ Primary 	<ul style="list-style-type: none"> ▪ Welding, soldering, and brazing machine setters, operators and tenders ▪ Drafters, engineering technicians, and mapping technicians ▪ Electrical & electronics engineering technicians 	<ul style="list-style-type: none"> ▪ Welders, cutters, solderers and brazers ▪ Mechanical drafters ▪ Electro-mechanical technicians ▪ Industrial engineering technicians ▪ Mechanical engineering technicians
Bachelor's degree	<ul style="list-style-type: none"> ▪ Pathway 	<ul style="list-style-type: none"> ▪ Industrial production managers ▪ Architectural and engineering managers ▪ Electrical engineers 	<ul style="list-style-type: none"> ▪ Electronics engineers, except computer ▪ Industrial engineers ▪ Mechanical engineers

Education and Training

One of the study's objectives was to catalog available regional education and training programs that prepare students to enter the advanced manufacturing workforce. This information can provide a picture of how postsecondary institutions are meeting employer demand for qualified employees. The analysis of this data also can be of use to community colleges that are developing new programs or seeking to tailor existing programs to specifically target employer needs.

Educational program identification

To quantify the available education and training for advanced manufacturing occupations in the region, an inventory of relevant programs from two- and four-year institutions was conducted. Relevant programs were identified using Taxonomy of Programs (TOP) codes and Classification of Instructional Programs (CIP) codes.

Programs included in this inventory are:

TOP Code	Program Name
092400	Engineering Technology, General
093400	Electronics and Electric Technology
093500	Electro-Mechanical Technology
095300	Drafting Technology
095310	Architectural Drafting
095340	Mechanical Drafting
095600	Manufacturing and Industrial Technology
095630	Machining and Machine Tools
095650	Welding Technology

Two-year education programs

Certificates or degrees earned through a community college show that a student has acquired a sufficient foundation in industry-recognized skills and abilities. Ten community colleges and two proprietary technical schools offer relevant advanced manufacturing training programs in the Inland Empire (Table 5).

There are nine types of programs related to advanced manufacturing offered by community colleges in the region. Welding and drafting technology are the most commonly offered programs in the Inland Empire.

Six colleges and one proprietary school offer welding while five colleges offer drafting. Electronics and electric technology programs are offered by four colleges.

Interestingly, while panelists at the advanced manufacturing skills panel event expressed a need for skilled machinists and machinery maintenance technicians, a machining and machine tools program is only offered by one community college, San Bernardino Valley College, and one proprietary school, the Center for Employment Training, San Bernardino.

Table 5 - Manufacturing-related programs offered by community colleges and proprietary schools

Program/College	Barstow	Cerro Coso	Chaffey	Desert	Mt San Jacinto	Norco	Palo Verde	Riverside	San Bernardino	Victor Valley	NTMA Training	CET San Bdo
Engineering Technology, General												
Electronics and Electric Technology												
Electro-Mechanical Technology												
Drafting Technology												
Architectural Drafting												
Mechanical Drafting												
Manufacturing and Industrial Technology												
Machining and Machine Tools												
Welding Technology*												

*Regional ROPs offer welding courses

Community college program completions

In order to quantify the potential workforce gap for the advanced manufacturing sector, this study looks at student completion numbers from community college programs relevant to advanced manufacturing. The findings indicate that proprietary schools in the Inland Empire award far more certificates than community colleges (Table 6).

Table 6 - Community college certificates and degrees awarded in academic year 2011-2012

Program	Certificates	Associate degrees	Total program awards
Architectural drafting		1	1
Drafting technology	65	18	83
Electro-mechanical technology		2	2
Electronics and electric technology	20	8	28
Engineering technology, general	9	12	21
Machine and machine tools	9		9
Manufacturing and industrial technology	9	1	10
Welding technology	50	9	59
Total	162	51	183

Community colleges awarded the most certificates to students in the fields of drafting technology and welding technology, 65 and 50 students, respectively. Additionally, 20 students received certificates in the area of electronics and electronic technology.

Marshall Gartenlaub, managing director at QIEDU Associates, recommended that community colleges consider the importance of national certification standards when developing programs and remarked that national associations and councils can be helpful in developing standards for certification. Panelists agreed that certification can be a good indicator of someone's ability to do a job. Some employers said they specifically look for certified welders and maintenance mechanics.

In the 2011-2012 academic year, community colleges issued 51 associate degrees to students in programs related to advanced manufacturing. The most student completions were for drafting technology (18) and engineering technology, general (12). Welding technology programs conferred 9 associate degrees.

Proprietary education institutions

Student completions for related programs at proprietary schools (defined as for-profit businesses providing training and vocational instruction) were also collected. The findings indicate that proprietary schools in the Inland Empire award far more certificates than community colleges but offer only two programs. In total, there were 531 proprietary certificates earned by students; 458 for machine tools from NTMA Center and 76 in welding technology from CET San Bernardino.

Four-year institutions

To further develop an understanding of postsecondary education in the Inland Empire, student completions related to advanced manufacturing at four-year institutions were analyzed. In 2012, 237 bachelor's degrees were issued in related fields.

The Inland Empire has three four-year institutions of higher education that offer relevant training programs: California Baptist University, California State University-San Bernardino, and the University of California, Riverside. One private educational institution, The University of America, also offers relevant programs.

Workforce gap

The study compared student completions with annual job openings. The findings indicate that student completions exceeded annual job openings. Occupations that require a postsecondary certificate or associate degree estimate 491 annual job openings; there were 747 student completions for certificates and awards in the 2011-2012 academic year, with 531 of these awards granted by proprietary technical schools. This produces a potential oversupply to the labor market for occupations related to advanced manufacturing in the amount of 256 workers.

However, even though the results of this analysis show that the number of student completions is much higher than job openings, there does not seem to be an oversupply of graduating students. There are several factors that are likely skewing the data.

For example, many manufacturing jobs are union jobs. As a result, these jobs are typically not posted because workers are recruited through unions.

In addition, proprietary school data may be skewing the numbers, because those numbers include incumbent workers who are seeking retraining or new training for career advancement purposes. Due to the recession, workers have been seeking additional skills through quick training courses to make them more attractive to employers.

Conclusions & Recommendations

Manufacturing is an important sector that contributes to the economic health of not only the country's economy but also to that of California and increasingly to the Inland Empire region. Although factors in recent years have resulted in some job contraction, forecasts show a return of jobs and industry growth for manufacturing in the coming years. There are indications that manufacturing is rebounding, but equally as important is the shift occurring within the industry. Manufacturing technology has been rapidly evolving and, as a result, the practice of producing goods has become more technologically advanced.

Expected growth in manufacturing is important for the Inland Empire, a region that relies on manufacturing for the health of the local economy. Currently, there are 4,350 advanced manufacturing businesses in the two-county region, generating \$24 billion in revenue and providing 96,519 jobs. The majority of these firms are very small businesses that employ between one and four employees. Manufacturing occupations included in this study account for over 76,000 jobs in the region. Among the three occupational clusters (low-level, primary, and pathways), the most annual job openings are for low-level occupations requiring little training. However, the primary occupations that require community college level training or education and pay good wages are expected to grow at the fastest rate in the region.

While the manufacturing industry shows great promise for employment in the coming years, industry experts note a shortage of technically trained workers who possess skills such as communication and self-motivation. Additionally, the technological advancements taking place in the manufacturing process is requiring a workforce that is sufficiently prepared with technology skills in addition to traditional skills. Employer job advertisements validate this need for not only soft skills but also technical proficiencies. One of the emerging areas of great need among the regional employers is maintenance and repair workers, especially those with electrical background.

The workforce and skills void presents an opportunity for regional education institutions to address the new demands on the labor market for the manufacturing workforce. Regional community colleges mostly offer programs in welding and drafting technology. Proprietary schools are responsible for a large number of student completions in machine tools and welding technology programs.

Recommendations

- 1) Since employers expressed a specific need for qualified workers to fill the jobs of maintenance mechanic, machinist, and electrical and electronics repairers of industrial equipment, local community colleges are advised to respond to this need by creating more program offerings in these areas. They should develop program content in cooperation with manufacturing employers.
- 2) The manufacturing industry may be characterized by an outdated stigma that the work is not glamorous. Education institutions and employers can work together to shed light on the "new" manufacturing industry and encourage students to consider jobs in manufacturing. Some specific suggestions from the panelists included holding an "awareness" event to introduce students to careers in manufacturing, utilize and create digital and social media content to educate students about the "new" manufacturing in the classroom, and foster more frequent communication between educators and employers for career awareness.
- 3) To address manufacturing employers' concern with the lack of soft skills among their new hires, such as communication, punctuality, conflict resolution, and interview skills, high school and community college programs should embed soft and employability skills training into existing curriculum related to manufacturing.

References

Beacon Economics, UCR School of Business Administration. 2012 Riverside San Bernardino Economic Forecast. (December 2012). https://beaconecon.com/Misc/2012_RSB_Book_Online.pdf

Bowers, Cynthia. "Skilled Labor Shortage Frustrates Employers." CBS News. (11 August 2010.) <http://www.cbsnews.com/news/skilled-labor-shortage-frustrates-employers/>

"Cabinetmakers and Bench Carpenters in California." State of California Economic Development Department. <http://www.labormarketinfo.edd.ca.gov/OccGuides/Detail.aspx?Soccode=517011&Geography=0601000000>

"California's Labor Market at a Glance." State of California Economic Development Department. <http://www.labormarketinfo.edd.ca.gov/Content.asp?pageid=4>

"California Manufacturing Facts." National Association of Manufacturers. <http://www.nam.org/~media/AB89C6F3E49E4682B007F9BA524CDBAB.ashx>

"Can California Compete: Reducing the Skills Gap and Creating a Skilled Workforce through Linked Learning?" America's Edge. (June 2012.) <http://edsources.org/today/wp-content/uploads/CA-AE-Skills-Report-2012-update.pdf>

DeVol, Ross C., Perry Wong, Armen Bedroussian, Candice Flor Hynek and David Rice. "Manufacturing 2.0: A More Prosperous California." The Milken Institute. (June 2009.) http://www.cmta.net/pdfs/manufacturing_still_matters.pdf

Gruszecki, Debra. "Economy: A Good Month for Inland Factories." The Riverside Press-Enterprise. (2 December 2013.) <http://www.pe.com/business/business-headlines/20131202-economy-a-good-month-for-inland-factories.ece>

Hoover, Eric. "Where Life Earns Credit: 'Prior Learning' Gets a Fresh Assessment" The Chronicle of Higher Education. (14 March 2010) <http://chronicle.com/article/Where-Life-Earns-Credit-/64618/>

"Industries of the Future: Manufacturing." Centers of Excellence and the Institute for the Future. (2012.) http://www.coecc.net/documents/mfg_STEMin20_12.pdf

"Inland Empire Employment...Questionable Job Growth Figures." Inland Empire Quarterly Economic Report (October 2013.) http://www.ieep.com/pdf/QUER_Oct_2013_IEEP.pdf

"The Inland Empire Region." The California Inland Empire District Export Council. <http://www.ciedec.org/inland-empire-region.html>

"Inland Empire Report on Business." The Institute for Applied Research, Cal State San Bernardino. (September 2013.) <http://mfgcouncilie.com/wp-content/uploads/2013/10/ROBSept2013Final.pdf>

"Manufacturing Employment Data." California Manufacturers & Technology Association. <http://www.cmta.net/page/mnfg-trends.php>

Rich, Motoko. "Factory Jobs Return, but Employers Find Skills Shortage." The New York Times. (1 July 2010.)

<http://www.nytimes.com/2010/07/02/business/economy/02manufacturing.html?pagewanted=all&r=0>

"Manufacturing: Still a Force in Southern California." Los Angeles County Economic Development Corporation and Kyser Center for Economic Research. (2011.)

http://laedc.org/reports/Manufacturing_2011.pdf

Self, Brooke. "Precision Machining Academy debuts at AVHS." Victorville Daily Press. (21 November 2013.)

<http://www.vvdailypress.com/articles/machining-43785-precision-academy.html>

Whoriskey, Peter. "U.S. manufacturing sees shortage of skilled factory workers." The Washington Post. (19 February 2012.)

http://articles.washingtonpost.com/2012-02-19/business/35444240_1_factory-workers-laid-off-workers-jobs

Appendix A: How to use this report

This report is designed to provide current labor market information to:

- Understand the factors impacting advanced manufacturing occupations and their effect on the workforce in the Inland Empire, and;
- Provide information on advanced manufacturing-related education and training programs in the region

The information in this report has been validated by industry professionals and community colleges and includes a listing of programs being offered by colleges to address workforce needs. In some instances, the labor market information and industry validation will suggest that colleges might not want to begin or add programs, thereby avoiding needless replication and low enrollments.

The Centers of Excellence (COE), in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development. This information has proven valuable to colleges in beginning, revising, or updating economic development and Career Technical Education (CTE) programs, strengthening grant applications, assisting in the accreditation process, and in supporting strategic planning efforts.

More information about the Centers of Excellence is available at www.coeccc.net.

Important Disclaimer

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

Explanation of Data Sources

Industry Data

In order to capture a complete picture of industry employment, EMSI basically combines covered employment data from Quarterly Census of Employment and Wages (QCEW) produced by the Department of Labor with total employment data in Regional Economic Information System (REIS) published by the Bureau of Economic Analysis (BEA), augmented with County Business Patterns (CBP) and Nonemployer Statistics (NES) published by the U.S. Census Bureau. Projections are based on the latest available EMSI industry data, 15-year past local trends in each industry, growth rates in statewide and (where available) sub-state area industry projections published by individual state agencies, and (in part) growth rates in national projections from the Bureau of Labor Statistics.

Occupation Data

Organizing regional employment information by occupation provides a workforce-oriented view of the regional economy. EMSI's occupation data are based on EMSI's industry data and regional staffing patterns taken from the Occupational Employment Statistics program (U.S. Bureau of Labor Statistics). Wage information is partially derived from the American Community Survey.

Real Time Labor Market Data

Burning Glass Labor Insight data services provides data collected from numerous online job posting websites, job boards, and employer boards to present real-time information on job postings by region. Data collected and presented here may not be free of duplicate job postings and is not a proven source for estimating total employment, projecting demand, or education and training preferences.

Education Program Data

Community college education programs were extracted from the California Community Colleges Chancellor's Office Inventory of Approved Programs. This inventory lists credit degrees and certificates offered by California community colleges which are approved by the Chancellors office. California Community Colleges approved programs are identified by the Taxonomy of Programs (TOP), a system of nomenclature for designating programs in the California Community Colleges system. The complete TOP manual can be viewed on the Chancellor's office website at http://www.cccco.edu/Portals/4/TopTax6_rev0909.pdf

Program and completion data for four-year education institutions and technical/proprietary institutions was compiled using the Integrated Postsecondary Education Data System (IPEDS). IPEDS gathers information from every college, university, and technical and vocational institution that participates in the federal student financial aid programs. The Higher Education Act of 1965, as amended, requires that institutions that participate in federal student aid programs report data on enrollments, program completions, graduation rates, faculty and staff, finances, institutional prices, and student financial aid.

Appendix B: Staffing Patterns of Manufacturing Industries

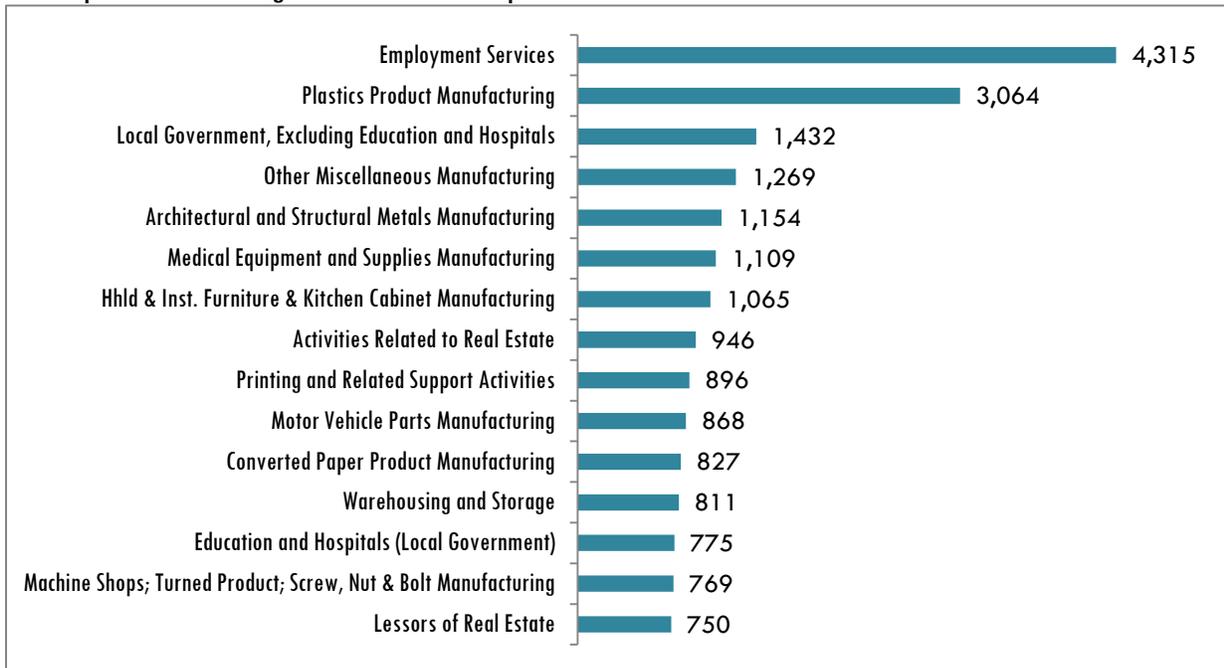
Appendix C: Employment Statistics for Low-Level Manufacturing Occupations

Description	2013 Jobs	2015 Jobs	Change	% Change	Annual Openings	Median Hourly Earnings
Maintenance and Repair Workers, General	11,429	11,736	307	3%	368	\$17.09
Team Assemblers	8,941	8,761	(180)	(2%)	175	\$11.31
Inspectors, Testers, Sorters, Samplers, and Weighers	4,017	4,090	73	2%	124	\$16.50
Packaging and Filling Machine Operators and Tenders	3,360	3,459	99	3%	106	\$10.72
Assemblers and Fabricators, All Other	2,368	2,361	(7)	0%	53	\$12.39
Molding, Coremaking, and Casting Machine Setters, Operators & Tenders, Metal and Plastic	1,668	1,563	(105)	(6%)	27	\$10.64
Cutting, Punching & Press Machine Setters, Operators & Tenders, Metal and Plastic	1,621	1,566	(55)	(3%)	12	\$13.52
Printing Press Operators	1,187	1,168	(19)	(2%)	44	\$15.16
Cabinetmakers and Bench Carpenters	1,095	922	(173)	(16%)	28	\$13.72
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	1,092	1,016	(76)	(7%)	23	\$16.30
Mixing and Blending Machine Setters, Operators, and Tenders	970	967	(3)	0%	31	\$14.37
Computer-Controlled Machine Tool Operators, Metal and Plastic	833	851	18	2%	24	\$16.30
Paper Goods Machine Setters, Operators, and Tenders	733	711	(22)	(3%)	11	\$11.01
Extruding & Drawing Machine Setters, Operators & Tenders, Metal and Plastic	692	671	(21)	(3%)	13	\$12.48
Structural Metal Fabricators and Fitters	687	640	(47)	(7%)	13	\$17.33
Molders, Shapers, and Casters	647	632	(15)	(2%)	33	\$11.75
Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	551	536	(15)	(3%)	9	\$13.73
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	455	442	(13)	(3%)	9	\$12.77
Forging Machine Setters, Operators, and Tenders, Metal and Plastic	420	413	(7)	(2%)	8	\$15.42
Adhesive Bonding Machine Operators and Tenders	393	330	(63)	(16%)	5	\$11.00
Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	346	336	(10)	(3%)	12	\$19.50
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	203	226	23	11%	15	\$16.06
Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	191	183	(8)	(4%)	4	\$15.56
Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	168	175	7	4%	6	\$18.30
Total	44,067	43,755	(312)	(1%)	1,153	\$14.09

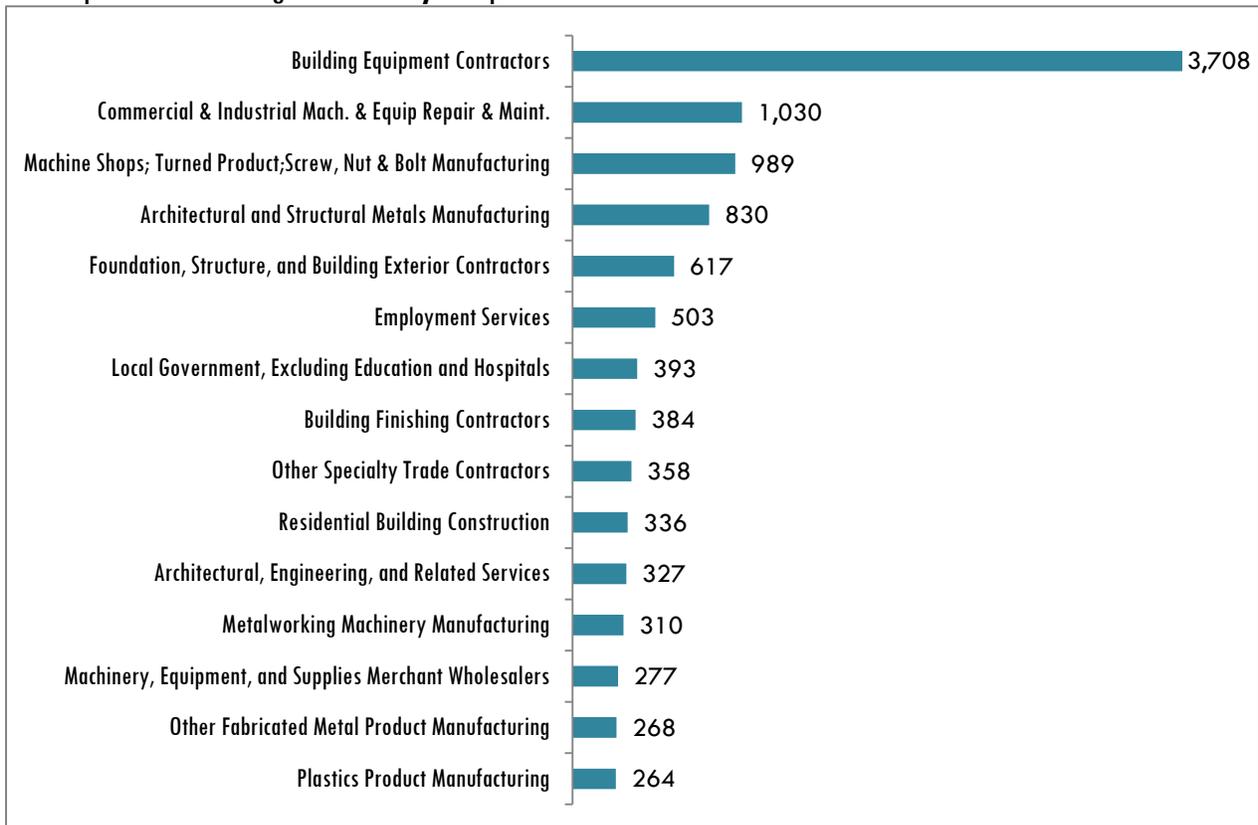
Source: EMSI Inc., 2013.

Appendix D: Type of manufacturing industries hiring, by occupational cluster

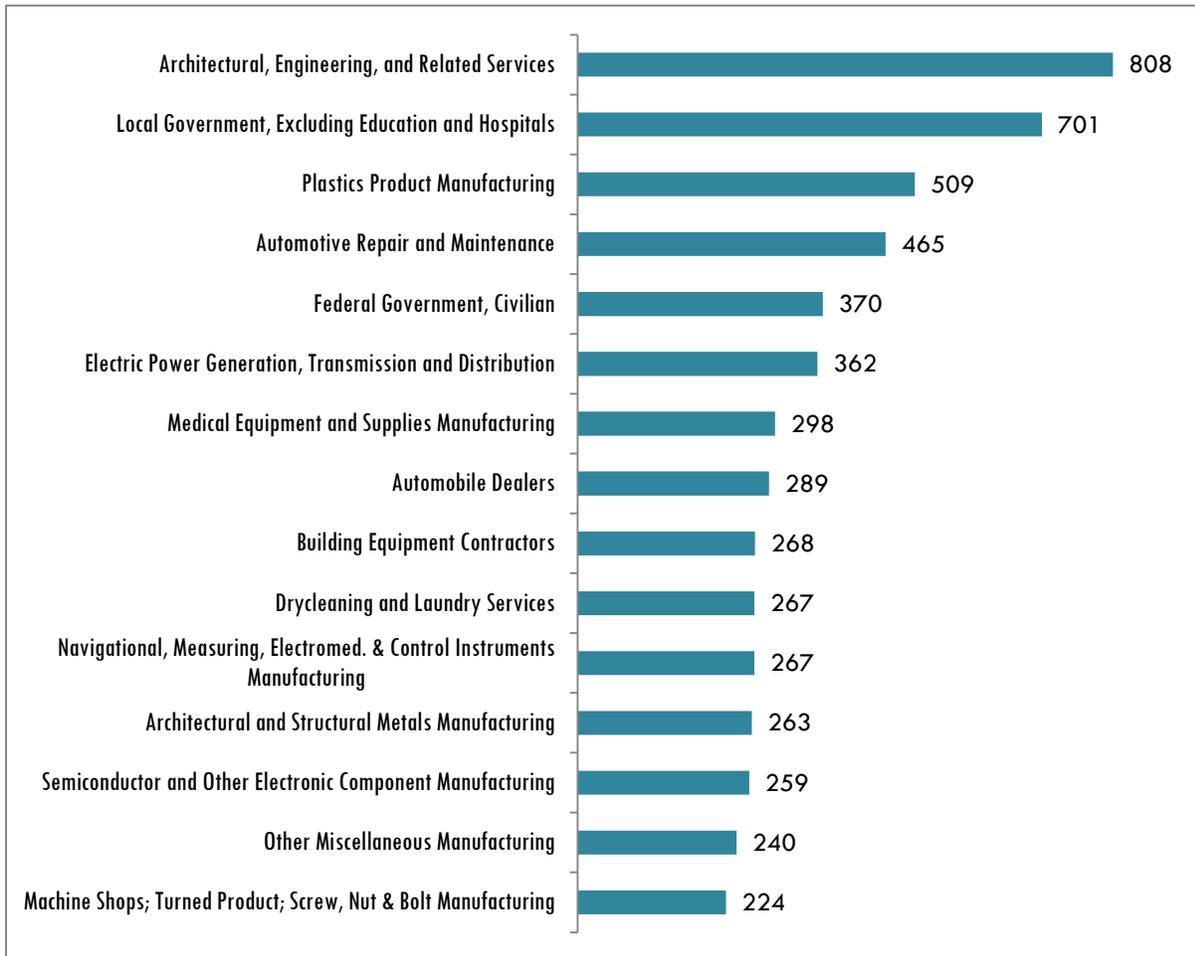
D-1. Top industries hiring for **Low-level** occupations



D-2. Top industries hiring for **Primary** occupations



D-3. Top industries hiring for **Pathway** occupations



Appendix E: Top Job Titles, Employers and Skills Identified through Job Posting Data

Employer Job Advertisements, Jan – Dec 2012

Top 10 Job Titles

- Welder (115 ads)
- Electrician (96)
- Machinist (67)
- Electronics Technician (40)
- Maintenance Electrician (33)
- Instrument Technician (15)
- Journeyman Electrician (13)
- Industrial Mechanic (13)
- Test Technician (12)
- Sheet Metal Mechanic (11)

Top 10 Employers

- Desert Sands USD (30 ads)
- Circor (24)
- Freeport-McMoRan Copper & Gold (21)
- Goodrich Corp. (14)
- Leslie Controls Inc (14)
- Dept of Veterans Affairs (11)
- ITT Educational Svcs (9)
- Mag Instrument Inc. (9)
- Halliburton (7)
- US Marine Corps (7)

Top 10 Skill Clusters

- Repair: General (240 ads)
- Commons Skills: Problem Solving (234)
- Common Skills: Communication and Coordination (173)
- Construction: General (169)
- Construction: Electrical (157)
- Common Skills: Business Environment Skills (152)
- Software and Programming Skills (137)
- Engineering: Electrical and Electronic (129)
- Production: General (129)
- Engineering: Mechanical (129)

Source: Burning Glass Labor Market Insight, Nov 2013