

Manufacturing

Industry Summary

Industry Definition

The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Major sectors include the manufacture and processing of food, textiles, metals, chemicals and drugs, paper and printing, machinery, electrical, electronic, and transportation equipment, and medical devices.

Industry Profile

In all, the manufacturing industry category contains 21 separate sub-sectors engaged in the processing and manufacture of food, natural resources, and equipment. Nationwide, 16.6% of firms in the manufacturing category fall into the fabricated metal products sub-sector, followed by printing (10.3%), miscellaneous manufacturing (8.9%, which includes medical equipment, toys, and jewelry manufacturing), and machinery manufacturing (8.6%). In terms of employment, the transportation equipment sub-sector accounts for the largest percentage in the manufacturing category (12.5%), followed by fabricated metal products (10.7%), food manufacturing (10.4%), and computer and electronic products (9.2%).

Industry Trends

The manufacturing sector is one of the largest in the U.S. and contributes 14.2 million jobs to the economy. This ranks third behind the retail sector (15.3 million jobs) and health services (14.3 million jobs). Employment in manufacturing nationwide has decreased 13.4% between 2001 and 2005, due largely to a recessionary downturn and overseas competition. Greater Phoenix has weathered the manufacturing downturn better than the U.S. as a whole, with employment declining 11.7%. Several sectors, such as measuring and controlling devices, aircraft, and furniture manufacturing increased employment in the Greater Phoenix region between 2001 and 2005 while declining nationally. The U.S. Bureau of Labor Statistics (BLS) projects a 0.6% annual decline in manufacturing employment nationwide between 2004 and 2014. Indeed, all of BLS's most rapidly declining industry sectors for wage and salary employment between 2004 and 2014 are in manufacturing, although bright spots appear in sectors such as pharmaceutical and drug manufacturing (2.3% average annual increase between 2004 and 2014), aerospace product and part manufacturing (0.8% average annual increase), and machine shops (0.4% average annual increase).

Workforce Profile

The manufacturing sector accounted for 70% of production jobs nationwide in 2004. In the Greater Phoenix region, the majority of manufacturing firms are small to medium in size. Over 80% of firms employ fewer than 50 workers. Medium size firms with 20 to 499 workers account for nearly 60% of manufacturing employment, but a substantial portion (21.0%) is accounted for by the 0.4% of manufacturing firms in the region with 1,000 or more employees.

Workforce Trends

The American manufacturing sector is expected to lose more than half a million jobs between 2004 and 2014. In the BLS's latest occupational employment outlook report, a full third (ten of thirty) occupations BLS expects to experience the largest job declines nationally between 2004 and 2014 were production occupations.

Occupational Summary

Local Occupational Trends

Despite national trends that forecast a decline in employment, demand for manufacturing occupations in Greater Phoenix is expected to increase in the coming years. Between 2003 and 2013, employment in production occupations is forecasted to grow 14.7%. This is due in part to the region's favorable population trends as well as continued business attraction from higher cost states such as California.

Employment for electrical and electronic engineering technicians, for example, is expected to grow over 10% in the Greater Phoenix metropolitan area between 2003 and 2013, while the number of electricians is expected to grow nearly 40% during the same period. Annual turnover for electrical and electronic engineering technicians is only 6%, while turnover for electricians is 23%. Turnover rates are higher for less skilled occupations in the manufacturing sector, although many of these occupations are considered gateway jobs leading participants to higher-skilled positions once the appropriate education and training is obtained. Gateway occupations include packaging and filling machine operators and tenders (21% annual turnover), team assemblers (16%), shipping, receiving, and traffic clerks (10%), and stock clerks and order fillers (35%). High turnover is typical for these lower skilled occupations, resulting in a correspondingly high demand rate. This demand rate is expected to increase in the coming years and account for a significant portion of employment demand in the manufacturing sector as workers cycle through existing jobs and upgrade skills to higher paying positions.

In January of 2006, the Battelle Memorial Institute's Technology Partnership Practice released a report on the future of the high-technology manufacturing industry in the Greater Phoenix region. Funded by the Maricopa Community Colleges and its partners, the report analyzes the Maricopa System's activities in addressing current high-technology manufacturing workforce needs and future requirements. The report surveyed local firms and found that the need for technician-level occupations (which the Maricopa System is well-suited to train) is expected to increase 24% in the next two years. A third of firms expect their need to continue for three to five years. Leading this demand are technician occupations in areas such as science (a 64% increase), manufacturing software/applications (44%), drafting, design, and product development (34%), and mechanical engineering (31%). Many of these occupations require extensive training. At least 74% mandate some post-high school training or an associates degree, and 21% require a bachelor's degree or higher.

Occupation Forecasts

The consolidation of wage data, occupational forecast data, and other data elements from the U.S. Department of Labor permits the further detailed analysis of manufacturing occupations based on user defined thresholds. An initial set of 188 occupations were found to be employed by organizations in the manufacturing industry segment. Of these 188 occupations, 116 were determined to be not unique, in terms of their jobs functions, to the manufacturing industry. These occupations, which are generally considered to be cross industry, included functions in the areas of management, research, professional services, art, sales, construction, repair, transportation. The remaining 72 occupations were determined to be largely associated with manufacturing and were further filtered into the following three occupational tiers.

Tier I. Tier 1 occupations are those which have been determined to meet three critical criteria as follows.

- **High Wage:** Offer an hourly wage in excess of \$17.00 per hour. This \$17.00 per hour threshold is presently being used by the Arizona Department of Commerce and the Greater Phoenix Economic Council in determining the low end of their "high wage" business attraction initiatives.

- High Demand: Project an annual demand (growth plus separations replacements) of over 100 positions **valley wide** between now and 2013, the most recent forecast period by the Dept of Labor.
- High Skill: Generally required a two-year college degree or equivalent.

Tier II. Tier II criteria are as follows.

- Low Wage: Offer an hourly wage less than \$17.00 per hour.
- High Demand: Project an annual demand (growth plus separations replacements) of over 100 positions **valley wide** between now and 2013, the most recent forecast period by the Dept of Labor.
- High Skill: Generally are required by employers to have a BS Diploma or more.

Tier III. Tier III criteria are applied as follows.

- Low Wage: Offer an hourly wage less than \$17.00 per hour.
- High Demand: Project an annual demand (growth plus separations replacements) of over 100 positions **valley wide** between now and 2013, the most recent forecast period by the Dept of Labor.
- Low Skill: Generally are required by employers to have a HS Diploma or less.

Occupations by Tier Level

The following three charts reflect the filtered occupations according to the wage and skill criteria. For reference purposes, all the relevant occupations were placed in the applicable tier based on wage and skill level. Only those occupations which met an annual demand threshold level of 100 are candidates for a detailed occupational analysis, those selected occupations are shown in the shaded areas on the following charts for each tier.

Tier I Shaded Occupations = High Wage, High Demand, High Skill Occupations Selected For Individual Profiling							
SOC Code	Occupational Title	Percent of Employers Requiring HS Diploma or Less	Work Zone	Mean Wage	Annual Growth	Annual Separations	Total
51-4012	Numerical Tool and Process Control Programmers		3	\$22.25		2	3
17-3024	Electro-Mechanical Technicians		4	\$23.02	2	4	6
17-2041	Chemical Engineers		4	\$34.02	2.8	4	7
17-2131	Materials Engineers		5	\$31.87	1.9	6	8
51-4111	Tool and Die Makers	14.4%	3	\$21.89	1.2	10	11
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic		3	\$17.49		12	12
17-3021	Aerospace Engineering and Operations Technicians		4	\$20.91	3	9	12
51-2041	Structural Metal Fabricators and Fitters		4	\$13.20	1.4	11	12
19-2031	Chemists		4	\$24.27	11.1	12	23
27-3042	Technical Writers		4	\$23.91	9.1	19	28
17-3013	Mechanical Drafters	0%	3	\$19.67	5.9	25	31
49-9041	Industrial Machinery Mechanics		3	\$19.02	15.3	18	33
17-3026	Industrial Engineering Technicians	19.57%	3	\$23.72	11.2	23	34
17-3027	Mechanical Engineering Technicians	16.99%	3	\$20.56	18.7	21	40
49-9043	Maintenance Workers, Machinery		1	\$17.74	16.7	29	46
49-9043	Maintenance Workers, Machinery		1	\$17.74	16.7	29	46
17-3012	Electrical and Electronics Drafters	8.38%	3	\$23.54	4.5	44	49
41-9031	Sales Engineers		5	\$32.41	19.3	30	49
11-3051	Industrial Production Managers		4	\$37.92	22.4	34	56
17-2112	Industrial Engineers		4	\$27.81	24.4	45	69
17-2011	Aerospace Engineers		5	\$39.61	16.3	57	73
17-2071	Electrical Engineers		4	\$32.20	18.6	73	92
17-2141	Mechanical Engineers		4	\$30.31	16	92	108
51-4041	Machinists	70.43%	3	\$17.09	38.4	74	112
11-9041	Engineering Managers		5	\$44.43	54.5	73	128
17-2072	Electronics Engineers, Except Computer		4	\$37.11	51.3	90	141
43-5061	Production, Planning, and Expediting Clerks		2	\$18.27	70.9	81	152
17-3023	Electrical and Electronic Engineering Technicians	4.62%	3	\$19.94	70.6	144	215
47-2111	Electricians	54.13%	3	\$17.90	297.3	150	447
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products		3	\$24.19	286.1	330	616

Tier II Shaded Occupations = Low Wage, High Demand, High Skill Occupations Selected For Individual Profiling								
SOC Code	Occupational Title	Percent of Employers Requiring HS Diploma or Less		Job Zone	Mean Wage	Annual Growth or Decline	Annual Separations	Total
51-9195	Molders, Shapers, and Casters, Except Metal and Plastic			3	\$7.16	2.1	7	9
51-2023	Electromechanical Equipment Assemblers			3	\$11.19	-2.1	11	9
51-2041	Structural Metal Fabricators and Fitters	79.42%		4	\$13.20	1.4	11	12
51-2022	Electrical and Electronic Equipment Assemblers	65.36%		3	\$13.79	-26.3	51	25
51-9071	Jewelers and Precious Stone and Metal Workers			3	\$14.06	1.3	2	3
51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic			3	\$14.13	7.6	7	15
51-4192	Lay-Out Workers, Metal and Plastic	83.86%		3	\$15.43	#	1	1
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	36.4%		3	\$16.48	30.3	41	71
51-4194	Tool Grinders, Filers, and Sharpeners	76.07%		3	\$16.50	-2	15	13
19-4031	Chemical Technicians	22.75%		3	\$16.57	3.9	6	10

Tier III Shaded Occupations = Low Wage, High Demand, Low Skill Occupations Selected For Individual Profiling								
SOC Code	Occupational Title	Percent of Employers Requiring HS Diploma or Less		Job Zone	Mean Wage	Annual Growth or Decline	Annual Separations	Total
51-4052	Pourers and Casters, Metal			1	\$13.09		1	1
51-4051	Metal-Refining Furnace Operators and Tenders	82.33%		2	\$15.21		1	1
51-9191	Cementing and Gluing Machine Operators and Tenders			1	\$10.19		3	3
51-4071	Foundry Mold and Coremakers			2	\$14.28	-0.1	4	4
51-2021	Coil Winders, Tapers, and Finishers			2	\$9.29	-1.7	7	5
51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic	98.36%		2	\$12.29	1.6	5	7
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	65.68%		2	\$12.48		7	7
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	90.18%		2	\$14.54	1.4	7	8
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing			2	\$10.40	-1.9	12	10
51-3093	Food Cooking Machine Operators and Tenders	93.39%		2	\$12.43	3.5	7	11
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders			2	\$13.34	5.7	8	14
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders			2	\$12.28		14	14
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic			2	\$13.92	-0.4	15	15
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic			2	\$16.09	4.9	10	15
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood			2	\$9.37	1.3	14	15
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders			1	\$13.39	1.4	18	19
51-9196	Paper Goods Machine Setters, Operators, and Tenders			2	\$13.80	7.7	14	22
53-7063	Machine Feeders and Offbearers			1	\$9.41	1.8	24	26
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	85.59%		2	\$13.61	2.2	24	26
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	72.66%		2	\$13.75	1.6	29	31
43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping			1	\$16.69	17.7	20	38
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders			2	\$12.99	12	26	38
51-9022	Grinding and Polishing Workers, Hand			1	\$10.81	21	30	51
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	97.66%		2	\$12.76	18.9	33	52
47-2211	Sheet Metal Workers	62.24%		2	\$14.94	68.1	48	116
51-4121	Welders, Cutters, Solderers, and Brazers	65.33%		2	\$13.58	73	96	169
53-7051	Industrial Truck and Tractor Operators	70.13%		2	\$12.35	87.4	96	183
51-9111	Packaging and Filling Machine Operators and Tenders	85.26%		2	\$12.48	239.2	72	311
51-2092	Team Assemblers	86.2%		2	\$11.08	81.3	352	433
43-5071	Shipping, Receiving, and Traffic Clerks	55.65%		2	\$13.00	315.5	237	553
53-7064	Packers and Packagers, Hand	99.2%		1	\$9.12	438.8	218	657
43-5081	Stock Clerks and Order Fillers	87.175%		1	\$12.42	110.4	650	760
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	89.78%		1	\$10.84	523.4	915	1438

Occupational, Experience, Education, and Training Summary

Occupational Code	Occupational Title	Job Zone	Mean Wage	Annual Project Openings	Preparation Programs Offered At		
					WestMec	Maricopa Community Colleges	Some state and private universities
51-4041	Machinists	3	\$17.09	112	See Note	Yes	
43-5061	Production, Planning, and Expediting Clerks	2	\$18.27	152	See Note		Yes
17-3023	Electrical and Electronic Engineering Technicians	3	\$19.94	215	See Note	Yes	Yes
47-2111	Electricians	3	\$17.90	447	Yes	Yes	
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	3	\$16.48	71	Yes	Yes	
47-2211	Sheet Metal Workers	2	\$14.94	116		Yes	
51-4121	Welders, Cutters, Solderers, and Brazers	2	\$13.58	169	Yes	Yes	
51-9111	Packaging and Filling Machine Operators and Tenders	2	\$12.48	311			
51-2092	Team Assemblers	2	\$11.08	433	Yes		
43-5071	Shipping, Receiving, and Traffic Clerks	2	\$13.00	553	Yes		
43-5081	Stock Clerks and Order Fillers	1	\$12.42	760	Yes		

Note Pre-preparation courses may be available through WestMec. Students are advised to consult with counselors regarding WestMec

Job Zone Key

Job Zone

Job Zone One: Little or No Preparation Needed

Overall Experience

No previous work-related skill, knowledge, or experience is needed for these occupations. For example, a person can become a cashier even if he/she has never worked before.

Education

These occupations may require a high school diploma or GED certificate. Some may require a formal training course to obtain a license.

Job Training

Employees in these occupations need anywhere from a few days to a few months of training. Usually, an experienced worker could show you how to do the job.

Job Zone Two: Some Preparation Needed

Some previous work-related skill, knowledge, or experience may be helpful in these occupations, but usually is not needed. For example, a teller might benefit from experience working directly with the public, but an inexperienced person could still learn

These occupations usually require a high school diploma and may require some vocational training or job-related course work. In some cases, an associate's or bachelor's degree could be needed.

Employees in these occupations need anywhere from a few months to one year of working with experienced employees.

Job Zone Three: Medium Preparation Needed

Previous work-related skill, knowledge, or experience is required for these occupations. For example, an electrician must have completed three or four years of apprenticeship or several years of vocational training, and often must have passed a licensing

Most occupations in this zone require training in vocational schools, related on-the-job experience, or an associate's degree. Some may require a bachelor's degree.

Employees in these occupations usually need one or two years of training involving both on-the-job experience and informal training with experienced workers.

Job Zone Four: Considerable Preparation Needed

A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.

Most of these occupations require a four - year bachelor's degree, but some do not.

Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.

Job Zone Five: Extensive Preparation Needed

Extensive skill, knowledge, and experience are needed for these occupations. Many require more than five years of experience. For example, surgeons must complete four years of college and an additional five to seven years of specialized medical training t

A bachelor's degree is the minimum formal education required for these occupations. However, many also require graduate school. For example, they may require a master's degree, and some require a Ph.D., M.D., or J.D. (law degree).

Employees may need some on-the-job training, but most of these occupations assume that the person will already have the required skills, knowledge, work-related experience, and/or training.