

Lightweight Technology Workforce

Supply-Demand Annual Update



ABOUT THIS REPORT

Lightweight Innovations for Tomorrow (LIFT) is a public-private partnership that develops and deploys advanced lightweight materials manufacturing technologies and implements education and training programs to prepare the workforce. An educated and skilled workforce is critical to the future of manufacturing. Under the direction of Emily Stover DeRocco, LIFT's Education & Workforce Director, LIFT's State Teams, engaging manufacturers, educators, workforce and economic developers, and state and local officials, are designing and implementing a cohesive strategy to deliver the talent necessary to the long-term health of the U.S. defense and commercial industrial bases.

Lightweight materials are increasingly important to the competitiveness of transportation manufacturing sectors, including suppliers in the automotive, aircraft, heavy truck, ship, rail, and defense manufacturing industries. Lighter vehicles for the military, industry, and consumer alike, are more fuel-efficient and demonstrate better performance.

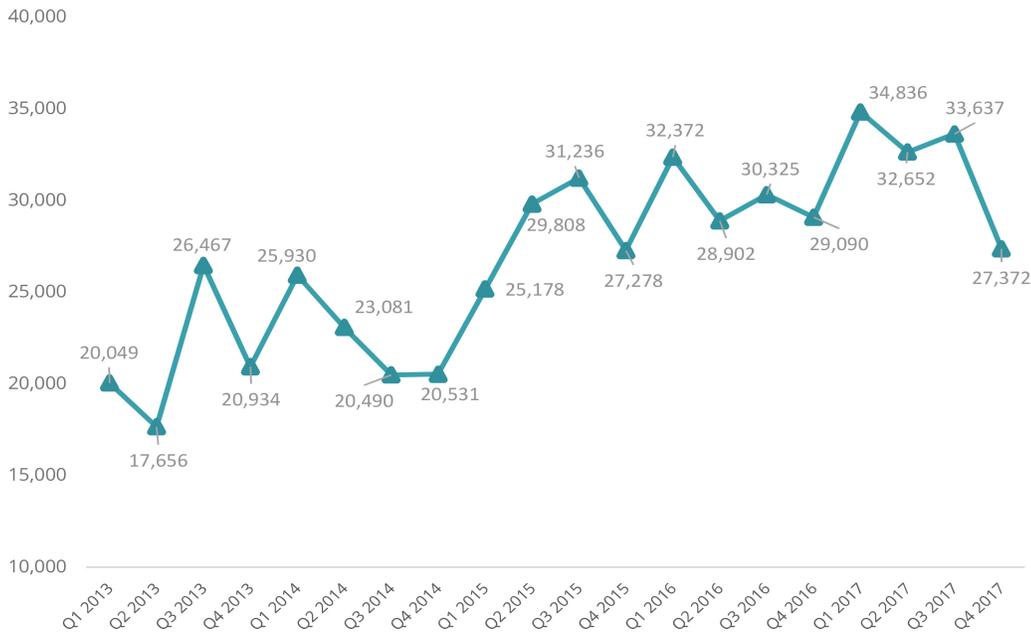
From welding to skilled metalwork, to logistics and mechanical and chemical engineering, to industrial design and manufacturing management, lightweighting-related jobs are found in nearly every manufacturing sector. This report provides an overview and examines the changing demand for workers in jobs related to lightweighting in Michigan. This analysis is meant to further enhance the future development of lightweighting workforce education and training in the region.

Of particular note, throughout this analysis and report, we rely not only on national databases related to traditional occupations and job families. The pace of change in the manufacturing industry, largely resulting from technology infusion and forces of globalization, is reflected in rapid-fire change in the knowledge, skills and abilities the manufacturing workforce requires. To provide the best available analyses, this report integrates intelligence gathered from the real time, transactional labor market reflecting the realities of demand and supply, the changing nature of manufacturing employment, and the competencies that are needed in the 21st century manufacturing workforce.



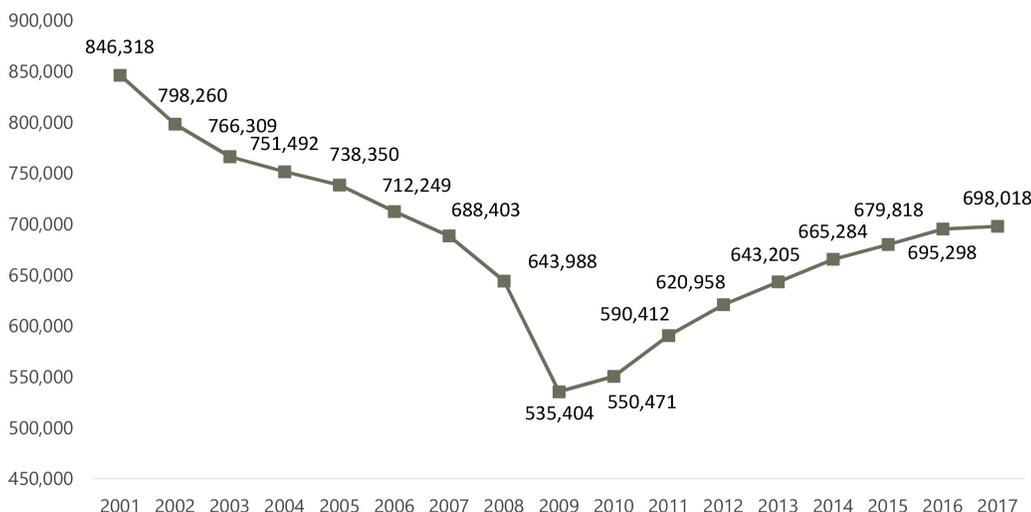
EMPLOYER DEMAND AND EMPLOYMENT TRENDS

Online job ads for occupations related to lightweighting in Michigan declined by about 19 percent between Q3 2017 and Q4 2017, from 33,637 postings to 27,372. Compared to Q4 2016, postings have fallen by about 6 percent from 29,090 postings. Posting levels tend to fluctuate over the course of a year, with a spike in postings during Q1. Overall, employer demand for workers with lightweighting-related skills seems to be slowing in Michigan, but this is not reflected in the steady growth in employment. 2017 marked the eighth consecutive year of employment growth for lightweighting-related jobs in Michigan, since the Great Recession in 2009. In 2009, only 535,000 Michigan workers were employed in lightweighting-related advanced manufacturing jobs, and in 2017, employment reached nearly 700,000.



Job postings over time
Michigan
Q1 2013 - Q4 2017

Data: Burning Glass
Technologies Analysis:
Workforce Intelligence Network

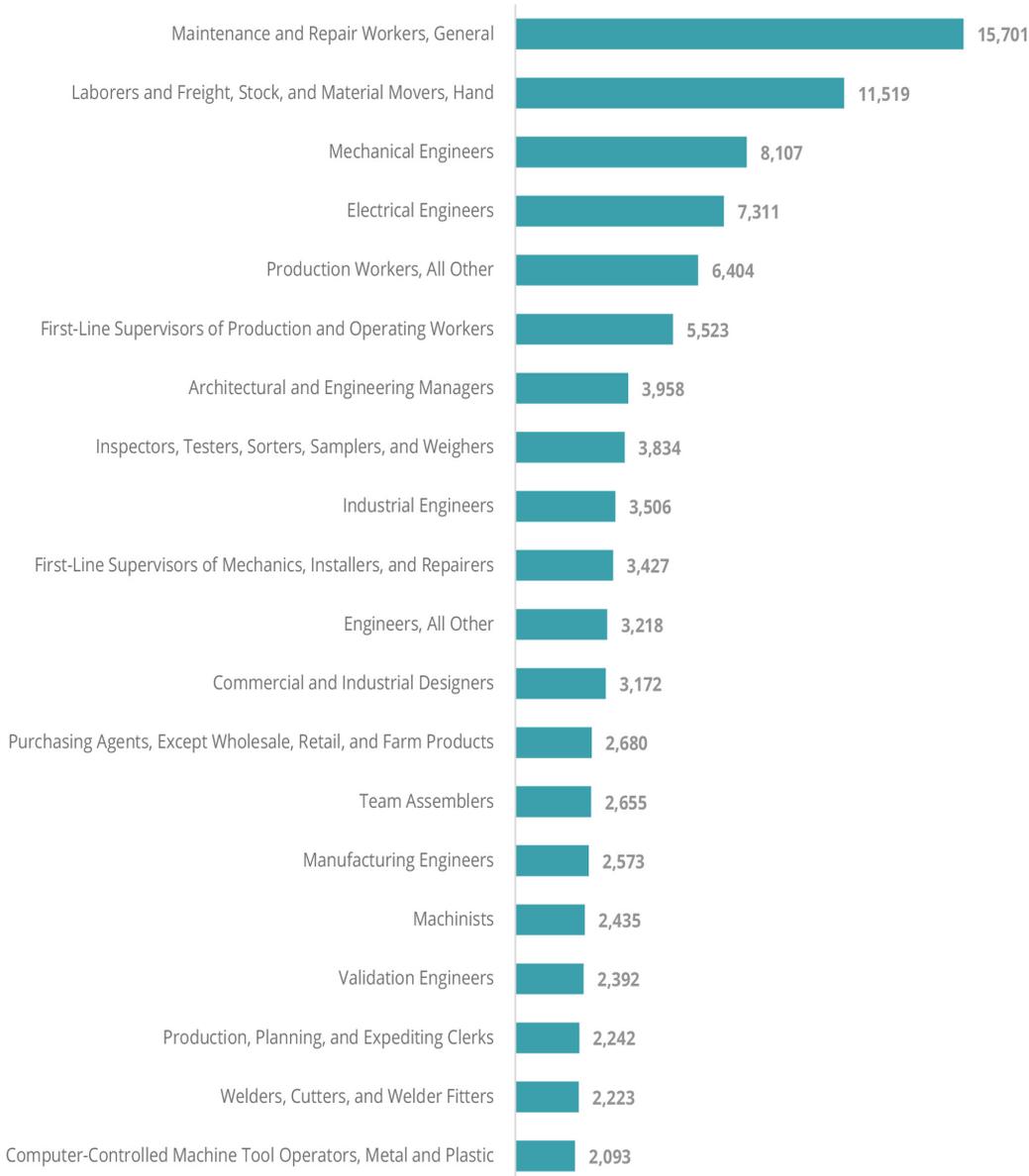


Employment over time
Michigan
2001 - 2017

Data: EMSI, QWI
Analysis: Workforce Intelligence Network

TOP JOBS

Maintenance and Repair Workers remained the top in-demand job related to lightweight advanced manufacturing in Michigan throughout 2017, with 15,701 job postings. Laborers and Freight, Stock, and Material Movers (11,519 postings) also held their second position. Mechanical Engineers (8,107 postings) and Electrical Engineers (7,311 postings) rounded out the top spots. Other high-demand positions include both Production Workers, All Other and First-Line Supervisors of Production Workers.



Top posting jobs Michigan

Annual 2017

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

37%
increase in demand
for advanced
manufacturing
workers since 2013

27,372
Total online job
ads in Q4 2017

**Maintenance and
repair workers:
top in-demand job**



INTRODUCTION TO SKILLED TRADES

Skilled Trades workers are the builders and makers of America. They work directly with advanced materials, assemble complicated products, and are experts in welding and machinery. They ensure that designs and plans are carried out to every detail and specification. These workers do everything from welding, to setting and managing computer-numerically-controlled machines, to overseeing manufacturing floors. These skilled workers are essential to manufacturing of lightweight materials.

The 71 individual occupations within this cluster can be split into three distinct occupation sub-groups; Machinists, Assembly & Operations workers, and Skilled Materials Workers.

Machinists

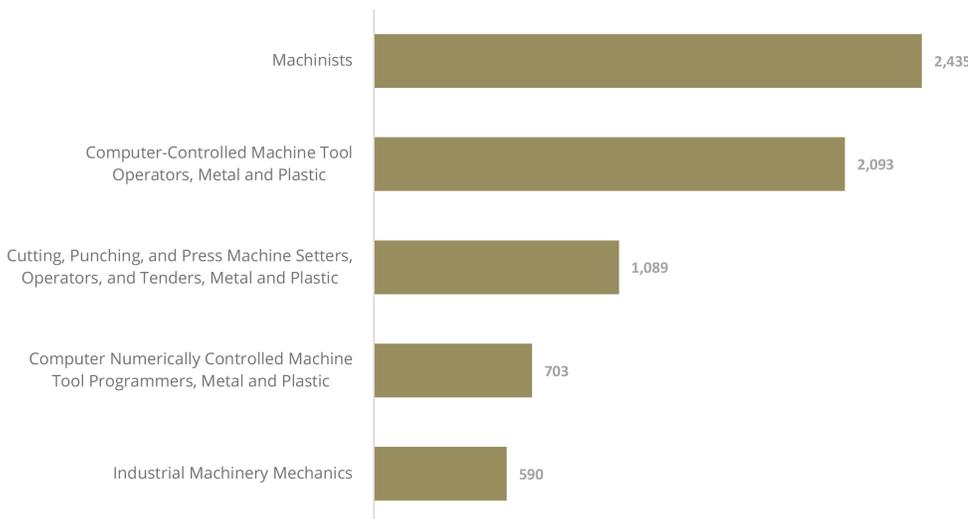
Machinists set up and operate a variety of machine tools to produce parts and instruments. Some work on traditional industrial machinery while others operate or develop programs for computer-controlled machinery.

Assembly & Operations

Assembly & Operations workers assist other Skilled Trades workers during production. Some perform quality assurance inspections, assist with assembly, or perform supervisory duties on the factory floor.

Skilled Materials Workers

Skilled Materials workers perform numerous roles from general maintenance to welding. All Skilled Materials workers must have intimate knowledge of lightweight metals and techniques in order to conduct proper repairs and/or assembly.



Top posting jobs

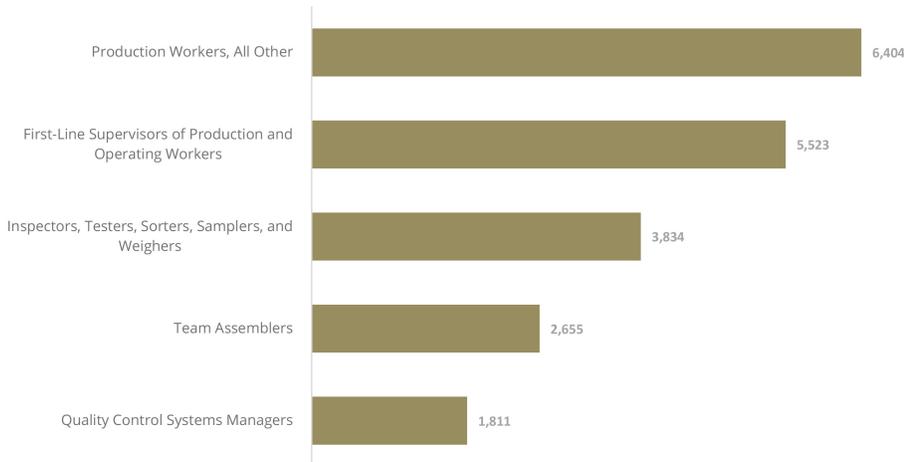
Machinists

2017

*Data: Burning Glass Technologies
Analysis: Workforce Intelligence Network*

General Machinists were the most in-demand occupation in the Machinists sub-group during 2017. Michigan employers posted 2,435 online job ads for these workers between January and December 2017. The next most in-demand occupations were Computer-Controlled Machine Tool Operators (2,093 postings) and Cutting, Punching, and Press Machine Operators (1,089 postings).

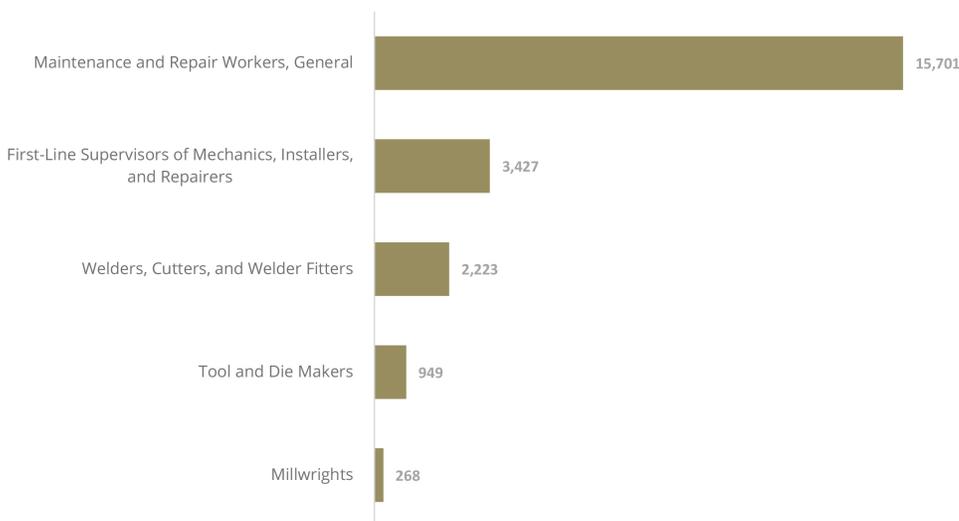
SKILLED TRADES



Top posting jobs Assembly & Operations 2017

Data: Burning Glass Technologies Analysis: Workforce Intelligence Network

Production Workers were in high demand in 2017. Michigan advanced manufacturing employers posted over 6,400 online job ads for these workers. The next most in-demand workers in the Assembly and Operations sub-group were First-Line Supervisors of Production and Operating Workers with over 5,500 online job ads. Inspectors, Testers, Sorters, Samplers, and Weighers (3,834 postings), Team Assemblers (2,655 postings), and Quality Control Systems Managers (1,811 postings) also appeared in the top jobs list for this sub-group.



Top posting jobs Skilled Materials Workers 2017

Data: Burning Glass Technologies Analysis: Workforce Intelligence Network

With 15,701 online job ads in 2017, General Maintenance and Repair Workers were by far the most advertised in the Skilled Materials sub-group, with over four times as many postings as the next most demanded occupation, First-Line Supervisors of Mechanics, Installers, and Repairers (3,427 postings). In fact, General Maintenance and Repair Workers was the most in-demand lightweighting-related occupation in Michigan in 2017.

SKILLED TRADES

IN-DEMAND TECHNICAL SKILLS

The occupations in the Skilled Trades group require a wide array of high-level technical skills. Traditional skills like repair, inspection, machine operation, and welding are still present in Skilled Trades job postings. Yet, as employers seek more managers in Michigan Skilled Trades occupations, the job postings are starting to reflect an evolving list of skills. Indeed, the increased demand for managers is demonstrated in postings requesting skillsets like supervisory skills and scheduling. Advanced technical skills like Computer Numerical Control (CNC) and other programming abilities are also prominent on 2017's skills list, further illustrating a shift in Skilled Trades employment to more advanced education and technology requirements.

- Repair
 - Inspection
 - Familiarity with machines
 - Computer Numerical Control (CNC)
 - Scheduling
 - Welding
 - Supervisory skills
- Machining
 - Microsoft Office
 - Hand Tools
 - Plumbing
 - Microsoft Excel
 - Cleaning
 - Calipers
 - Customer service

IN-DEMAND EMPLOYABILITY SKILLS

To succeed in the workplace, Skilled Trades workers need to maintain traditional employability skills to augment their increasingly advanced technical skills. Employers hiring Skilled Trades workers often indicate a desire for employability skills like communication, problem solving, and the ability to perform physical labor in job advertisements. These types of skills are crucial for Skilled Trades so that workers can collaborate effectively, especially in high-demand supervisor roles.

- Communication Skills, Teamwork, Collaboration
 - Troubleshooting
 - Ability to perform physical labor
 - Problem Solving
 - Preventive Maintenance
 - Detail-Oriented, Organizational Skills
- Writing
 - Computer Skills
 - Mathematics
 - Quality Assurance and Control
 - Planning
 - Work Area Maintenance

IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

About half of 2017 Michigan Skilled Trades job postings specified a desired experience level, and among them, 87 percent were available to workers with less than five years of experience. Entry-level Skilled Trades positions were available to Michigan workers who showed willingness to undertake some post-secondary training in applicable skills like mathematics, welding, or programming. This qualified them for one of the 80 percent of advertised jobs requiring a high school diploma or some vocational training. Job postings that required more than five years of experience or advanced educational attainment such as a bachelor's degree were likely for supervisor or management roles within the Skilled Trades. In 2017, about 13 percent of job postings advertised each of these high skill requirements.

Experience in-demand 2017

Data: Burning Glass Technologies
Analysis: Workforce Intelligence Network



Education & training in-demand 2017

Data: Burning Glass Technologies
Analysis: Workforce Intelligence Network



Nearly 60 percent of advertised salaries in the Skilled Trades group in 2017 were below \$35,000 per year, with a median advertised salary for these workers of \$31,000. This salary was somewhat lower than Michigan's median annual earnings for all workers in 2016, \$36,200. However, the advertised mean salary of \$39,000, as well as this disproportionate representation of entry-level positions, suggest many growth opportunities. Higher wages in the Skilled Trades group would be available with some post-secondary training, as well as advancement to managerial and supervisory roles.

WAGES

Advertised wages Annual 2017

Data: Burning Glass Technologies Analysis:
Workforce Intelligence Network



0-5 years
Experience most in-demand by Michigan employers

\$39,000
average advertised salary

5,459
postings requiring a bachelor's degree



INTRODUCTION TO ADMINISTRATION

Purchasing materials, ensuring worker safety around machines and with materials, and coordinating and analyzing material and goods movement are essential administration jobs related to lightweighting. Without workers focused on worker safety, production would slow down, and more workers would be injured. Procurement professionals require an extensive understanding of the materials that they purchase. Logistics workers range from materials movers to logistics analysts. While these jobs are focused on administration, all of the workers in this occupation category must have detailed knowledge of materials, goods movement, and worker safety to help ensure smooth and seamless production.

There are 17 individual occupations within this cluster, which can be split into three distinct occupation sub-groups: Procurement & Purchasing, Human Safety, and Logistics Workers.

Logistics

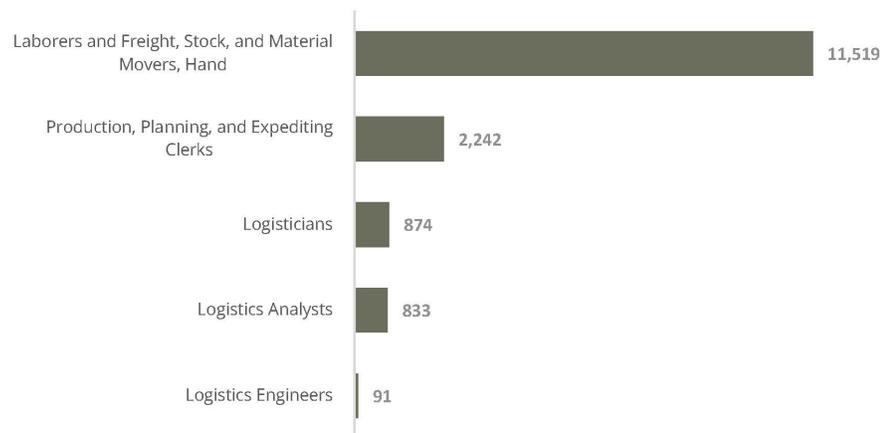
Logistics workers ensure transportation optimization of materials within organizations, from designing efficient supply chain processes to engaging in the actual transport of material and freight.

Procurement & Purchasing

Procurement & Purchasing workers ensure that all of the machinery, equipment, tools, and supplies necessary for metal manufacturers are ready and available for production.

Human Safety

Human Safety workers plan, implement, coordinate, review, and inspect safety programs and protocols to ensure a safe workforce environment.



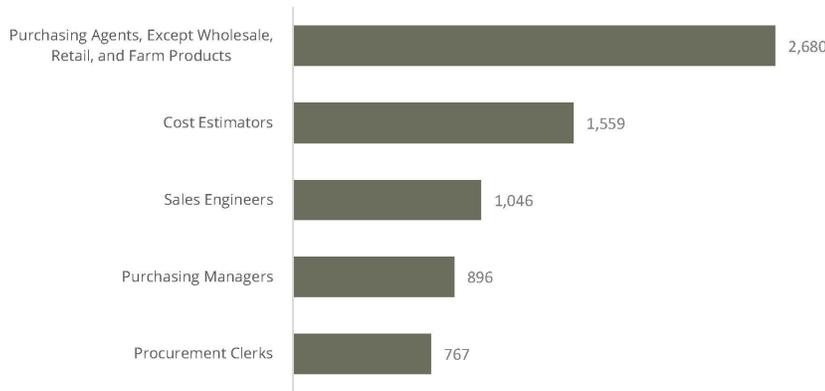
Top posting jobs

Logistics 2017

Data: Burning Glass Technologies Analysis: Workforce Intelligence Network

The most in-demand Logistics occupation in Michigan in 2017, as well as the second overall most in-demand lightweighting occupation in the state, was Laborers and Freight, Stock, and Material Movers. These positions had 11,519 online job postings between January and December. Other top Logistics jobs included Production, Planning, and Expediting Clerks (2,242 postings), Logisticians (874 postings), and Logistics Analysts (833 postings).

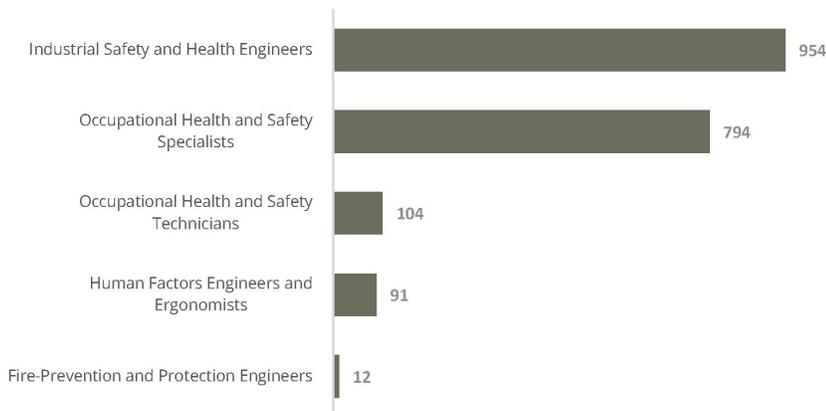
ADMINISTRATION



Top posting jobs Procurement & Purchasing 2017

Data: Burning Glass Technologies Analysis: Workforce Intelligence Network

Purchasing Agents were the top in-demand Procurement and Purchasing occupation in Michigan in 2017. Michigan employers posted 2,680 online job ads for this top job, along with 1,559 for Cost Estimators, and 1,046 for Sales Engineers. These occupations and many more are critical to administrative operations in the manufacture of lightweight products.



Top posting jobs Human Safety 2017

Data: Burning Glass Technologies Analysis: Workforce Intelligence Network

The top two drivers of employer demand in the Human Safety occupation sub-group were Industrial Safety and Health Engineers (954 postings) and Occupational Health and Safety Specialists (794 postings) during 2017. Other in-demand Human Safety workers were Occupational Health and Safety Technicians, Human Factors Engineers and Ergonomists, and Fire-Prevention and Protection Engineers.

ADMINISTRATION

IN-DEMAND TECHNICAL SKILLS

Job postings in the Administration occupation group seek skills and experience in purchasing, procurement, budgeting, customer service, scheduling, and project management. Other technical skills that Michigan employers may seek in Administration workers include forklift operation, logistics, SAP, inspection, repair, and sales engineering.

- Purchasing, procurement
 - Customer service
 - Scheduling
 - Forklift operation
 - Inspection, repair
 - Project management
- Supply chain management, supply chain knowledge
 - SAP
 - Logistics
 - Cost control, budgeting
 - Labeling
 - Sales engineering

IN-DEMAND EMPLOYABILITY SKILLS

Basic skills desired by Michigan employers hiring Administration workers are focused on communication, organizational, and computer skills. Q1 2017 job postings in the Administration group also indicate that these workers should have strong writing skills, creativity, and the ability to multi-task in their roles as Purchasing Agents, Occupational Health and Safety Specialists, and Logisticians.

- Communication skills, teamwork, collaboration, building effective relationships
 - Ability to perform physical labor
 - Writing, research
 - Planning
 - Organizational skills, detail-oriented, multi-tasking
 - Problem solving
- Computer skills/ Microsoft Office
 - Mathematics
 - Time management
 - Creativity
 - Analytical skills
 - Presentation skills

IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

The desired experience and education levels for Michigan Administration jobs were split between entry-level work that would be attainable with a high school diploma and some post-secondary training and other positions that would require three to five years of experience with, possibly a bachelor's degree. Of the job postings that specified a desired educational attainment, 49 percent required only a diploma or vocational training, and 45 percent required a bachelor's degree.

Experience in-demand

2017

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

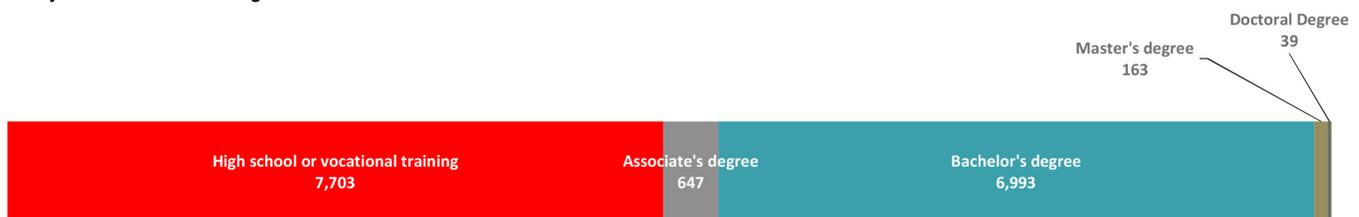


Education & training in-demand

2017

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



Just 21 percent of Administration sub-group job postings during 2017 advertised an annual salary. Many postings advertised a salary under \$35,000 per year, and the median advertised salary for this occupation group was \$27,000. However, 22 percent of postings offered over \$50,000 annually; these higher paying positions likely represent Logisticians and other occupations with higher education and skill criteria.

WAGES

Advertised wages

2017

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



1,151
job postings
advertising salaries
over \$50,000

\$39,000
average
advertised salary

6,993
job postings requiring
a bachelor's degree



INTRODUCTION TO ENGINEERING & DESIGN

Engineers and industrial designers create the blueprints for all things manufacturing. These workers not only envision the products of the future but they also ensure that the products are functional, safe, reliable, and durable.

There are 52 individual occupations within this groups which can be split into four distinct occupation sub-groups; Electrical & Mechanical Engineering, Chemical Engineering & Metallurgy, Industrial Designers & Drafters, and Process Engineering & Testing.

Electrical & Mechanical Engineers

Electrical & Mechanical Engineers perform duties related to the research, design, development, and testing of mechanical functioning, electrical, and manufacturing equipment, components, or systems for commercial, industrial, military, or scientific use.

Chemical Engineers & Metallurgy

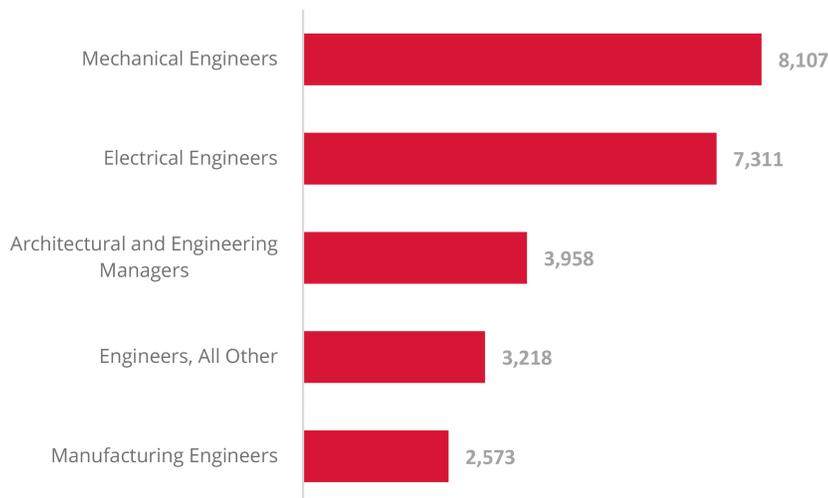
Chemical Engineers & Metallurgy workers perform duties related to the research, design, development, and testing of chemicals and metal materials. These workers often lead the charge in finding cutting-edge uses of lightweight metal materials.

Designers & Drafters

Designers & Drafters collaborate with other workers within the Engineer group to prepare detailed diagrams and designs of machinery, devices, and manufactured products. They combine their artistic talents and knowledge of lightweight metal capabilities to create both functional and appealing product designs.

Process Engineers & Testing

Process Engineering & Testing workers design processes and test manufacturing machinery to ensure that production of lightweight metal materials meet both internal and external safety and quality requirements.



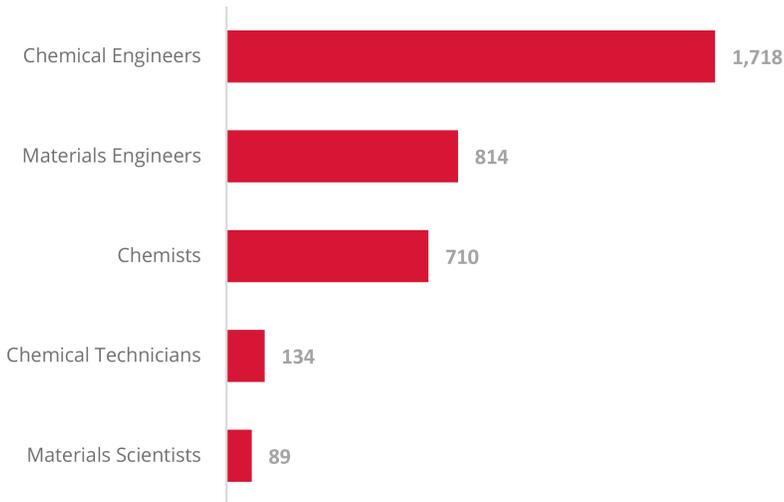
Top posting jobs

Electrical & Mechanical 2017

*Data: Burning Glass Technologies
Analysis: Workforce Intelligence Network*

Electrical and mechanical engineers with skillsets applicable to lightweight advanced manufacturing were in high demand in Michigan in 2017. Michigan employers posted 8,107 online job ads for Mechanical Engineers and 7,311 ads for Electrical Engineers between January and December 2017. Other in-demand occupations in the Electrical and Mechanical Engineering sub-group included Architectural and Engineering Managers (3,958 postings) and Engineers, All Other (3,218 postings).

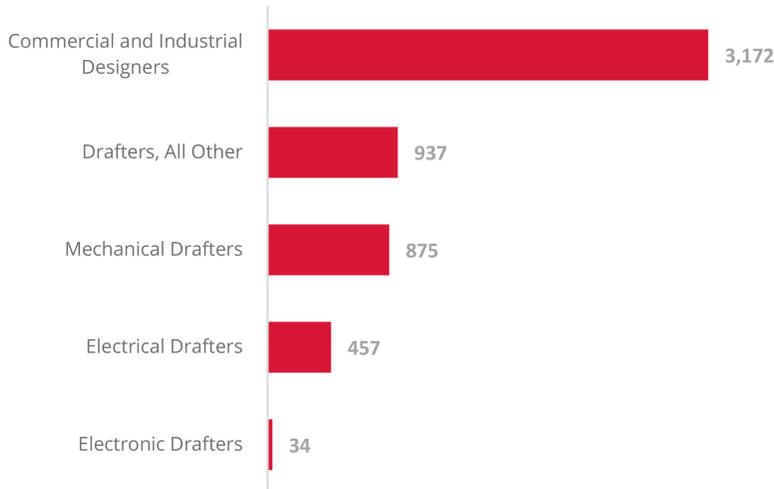
ENGINEERING & DESIGN



Top posting jobs Chemical & Metallurgy 2017

Data: Burning Glass Technologies
Analysis: Workforce Intelligence Network

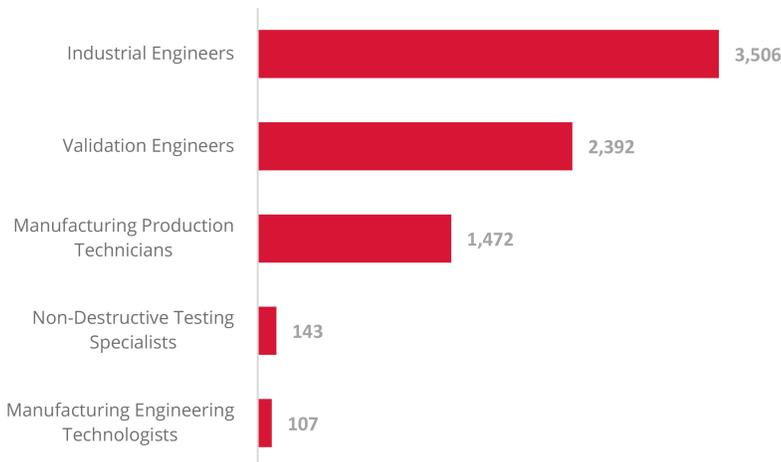
Chemical Engineers were by far the most in-demand occupation in the Chemical Engineering and Metallurgy sub-group in Michigan in 2017. Michigan employers posted 1,718 online job ads for Chemical Engineers, more than double the 814 postings for Materials Engineers. Chemists (710 postings) were also in high demand.



Top posting jobs Designers & Drafters 2017

Data: Burning Glass Technologies
Analysis: Workforce Intelligence Network

Michigan advanced manufacturing employers sought workers in the Designers and Drafters sub-group with the transferrable skills to improve their processes in 2017. Commercial and Industrial Designers, the top occupation, garnered 3,172 online job postings during the year. Drafters, all Other, and Mechanical Drafters were also in high demand with about 900 postings each.



Top posting jobs Process & Testing 2017

Data: Burning Glass Technologies
Analysis: Workforce Intelligence Network

The most in-demand Process Engineering and Testing occupation in 2017 in Michigan was Industrial Engineers (3,506 postings). Michigan employers were also seeking Validation Engineers (2,392 postings) and Manufacturing Production Technicians (1,472 postings) to work in advanced manufacturing settings.

ENGINEERING & DESIGN

IN-DEMAND TECHNICAL SKILLS

Engineering occupations demand a broad range of technical skills. Many engineers are expected to know AutoCAD, programming, and other software skills. Employers value knowledge in mechanical, electrical, and industrial engineering, and expect workers to apply that to these specific engineering roles. Q1 2017 job postings illustrate that managerial engineering roles require strong project management and budgeting skills, along with industry expertise.

- Mechanical engineering
- Validation
- Project management
- Electrical engineering
- Product development, product design
- Manufacturing processes
- Industrial engineering industry experience
- Budgeting
- AutoCAD
- Scheduling
- Purchasing
- Inspection and Repair

IN-DEMAND EMPLOYABILITY SKILLS

In addition to the advanced technical skills sought after in lightweighting-related engineering employment, engineers are expected to have basic, foundational skills. Michigan employers seeking to hire engineers value candidates with strong communication and teamwork skills, research skills, and demonstrated problem solving experience.

- Communication skills, teamwork, collaboration
- Problem solving, troubleshooting
- Mathematics
- Writing
- Planning
- Organizational skills, detail-oriented
- Research
- Computer skills/ Microsoft Office
- Quality assurance and control
- Creativity
- Ability to perform physical labor
- Multitasking

IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

As shown by 2017 job postings in the Engineering and Design occupation group, many engineering jobs in Michigan were available to workers with fewer than five years of experience. Among these, the majority prefer three to five years of experience. However, education was a less flexible requirement: engineers were often required to have at least a bachelor's degree. Engineering and Design job postings overwhelmingly specified that candidates should have a bachelor's degree, with about 85 percent of 2017 postings requiring a college degree. Another 12 percent of advertised engineering jobs such as technician positions were available to candidates with associate's degrees or other short-term training certificates.

Experience in-demand

2017

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



Education & training in-demand

2017

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



The 12 percent of Engineering and Design job postings that advertised a salary during 2017 illustrated that these positions are the highest paid among lightweighting-related occupations in Michigan. The high educational attainment required to secure most engineering positions translates into high potential earnings. About half of the advertised salaries (53 percent) were over \$75,000 per year, with a median advertised salary of \$75,000. This salary was more than double Michigan's median annual earnings for all workers in 2016, \$36,200.

WAGES

Advertised wages

2017

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



31,163
job postings
requiring a
bachelor's degree

\$75,000
average
advertised salary

4,328
job postings with
salaries greater than
\$50,000



For more information about LIFT and additional workforce data visit www.lift.technology