

# Lightweight Technology Workforce

*Supply-Demand Quarterly 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.

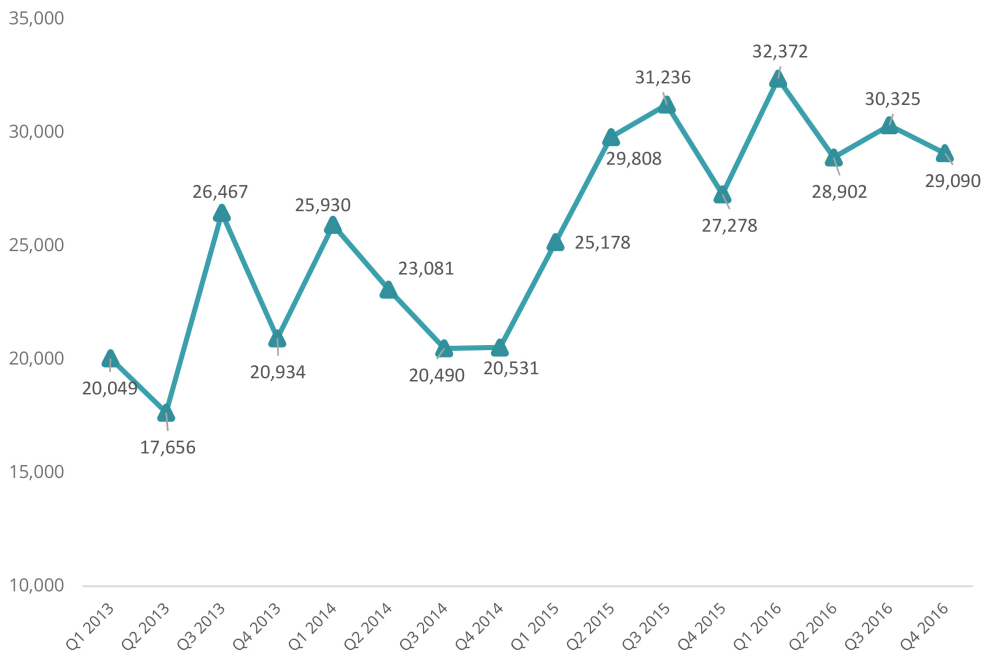
From welding to skilled metalwork, to logistics and mechanical and chemical engineering, to industrial design and manufacturing management, lightweighting-related jobs are found in nearly every manufacturing sector. This report provides an overview and examines the changing demand for workers in jobs 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.



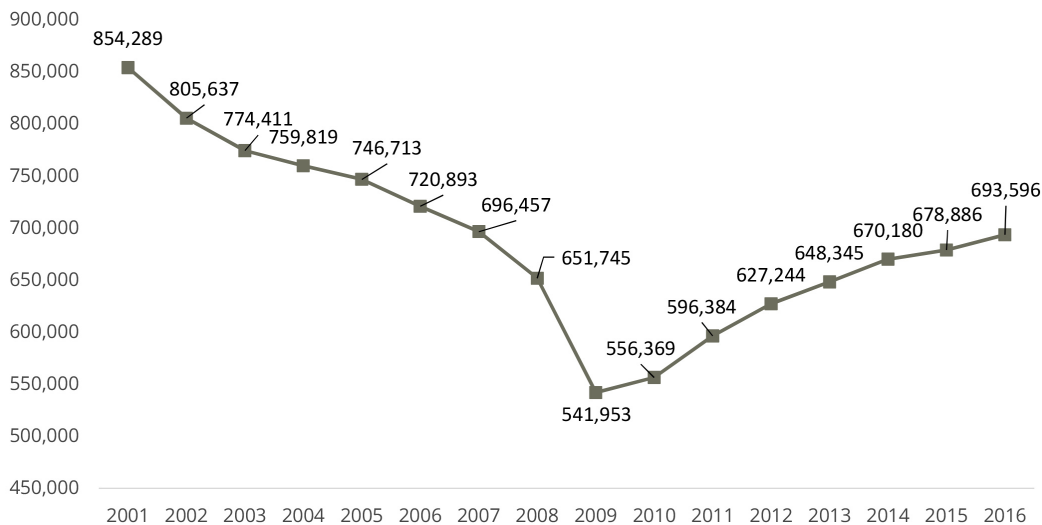
## EMPLOYER DEMAND AND EMPLOYMENT TRENDS

Online job ads for occupations related to lightweighting in Michigan fell 4 percent between Q3 and Q4 2016, from 30,325 to 29,090. Compared to Q4 2015, postings have increased by 6.6 percent from 27,278 postings. Posting levels have fluctuated over the past year but the general trend has been positive with increased demand from employers for workers in advanced manufacturing occupations. The increased demand for these workers has driven employment growth in Michigan - 2016 marked the seventh consecutive year of employment growth for lightweighting-related jobs in Michigan since the depths of the Great Recession in 2009. In 2009, only 540,500 Michigan workers were employed in lightweighting-related advanced manufacturing jobs, and in 2016, employment reached nearly 700,000.



**Job postings over time**  
*Michigan*  
Q1 2013 - Q4 2016

Data: Burning Glass  
Technologies Analysis:  
Workforce Intelligence Network



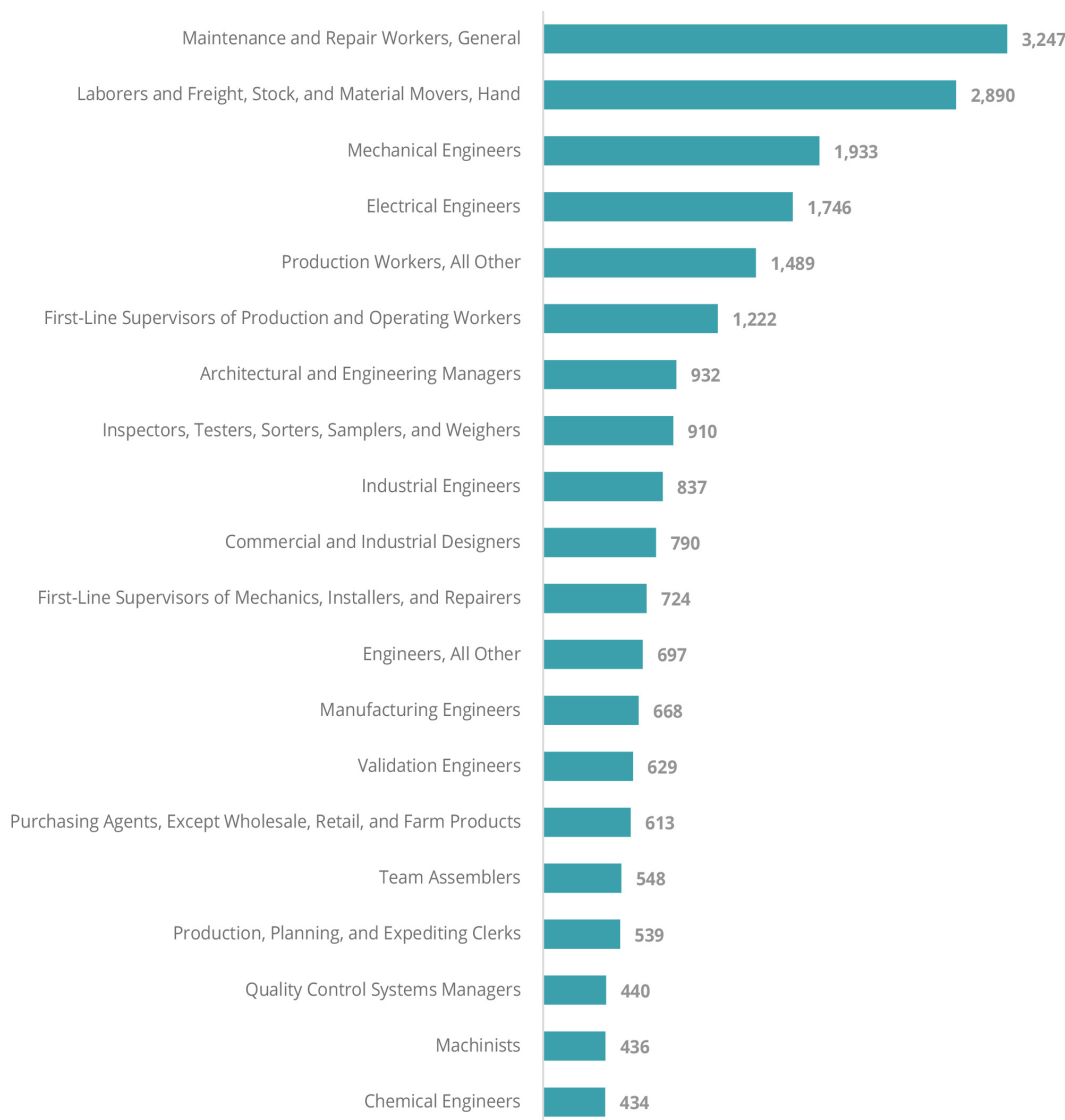
**Employment over time**  
*Michigan*  
2001 - 2016

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 during Q4 2016 with 3,247 job postings. Laborers and freight, stock, and material movers (2,890 postings) also held their second place spot. Mechanical engineers (1,933 postings) and electrical engineers (1,799 postings) are also in high demand across the state. Other engineering occupations like engineering managers and commercial and industrial designers populate the remainder of the top jobs list for Q4.



### Top posting jobs Michigan Q4 2016

Data: Burning Glass  
Technologies  
Analysis: Workforce  
Intelligence Network

**4%**  
**decrease in demand  
for advanced  
manufacturing  
workers**

**29,090**  
**Total online job  
ads in Q4 2016**

**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

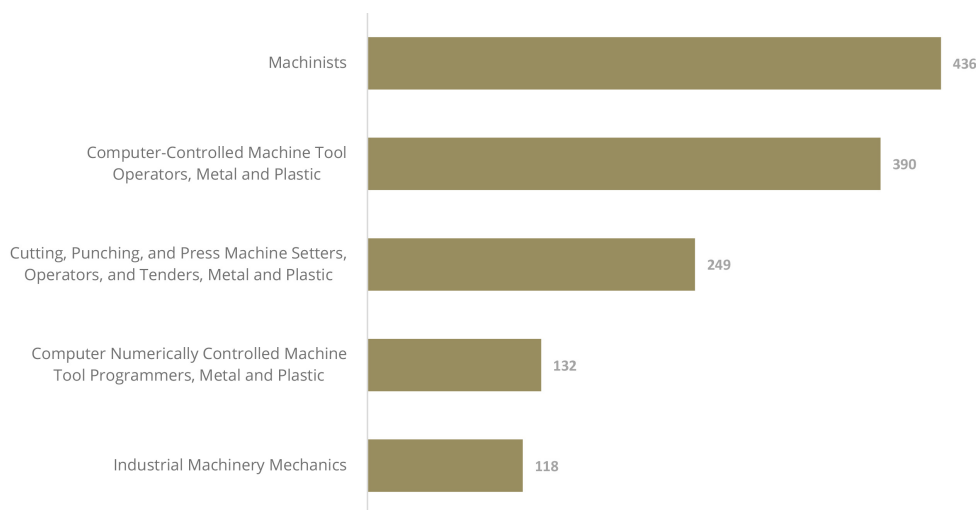
*Machinists set up and operate a variety of machine tools to produce parts and instruments. Some work on traditional industrial machinery while others operate or develop programs for computer-controlled machinery.*

### 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

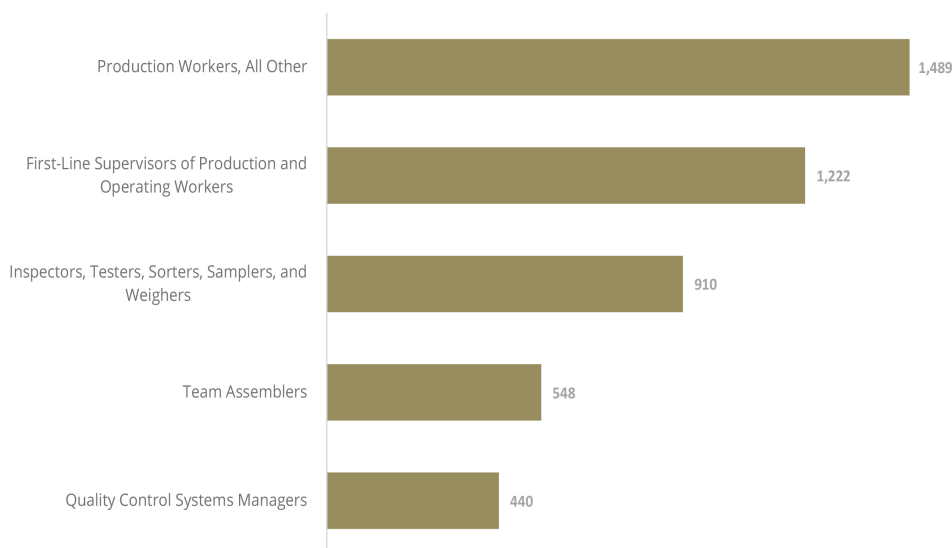
#### Machinists

Q4 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

General machinists were the most in-demand occupation in the Machinists sub-group in Q4 2016. Michigan employers posted 436 online job ads for these workers between October and December, 2016. The next most in-demand occupations were computer-controlled machine tool operators (390 postings) and cutting, punching, and press machine operators (249 postings).

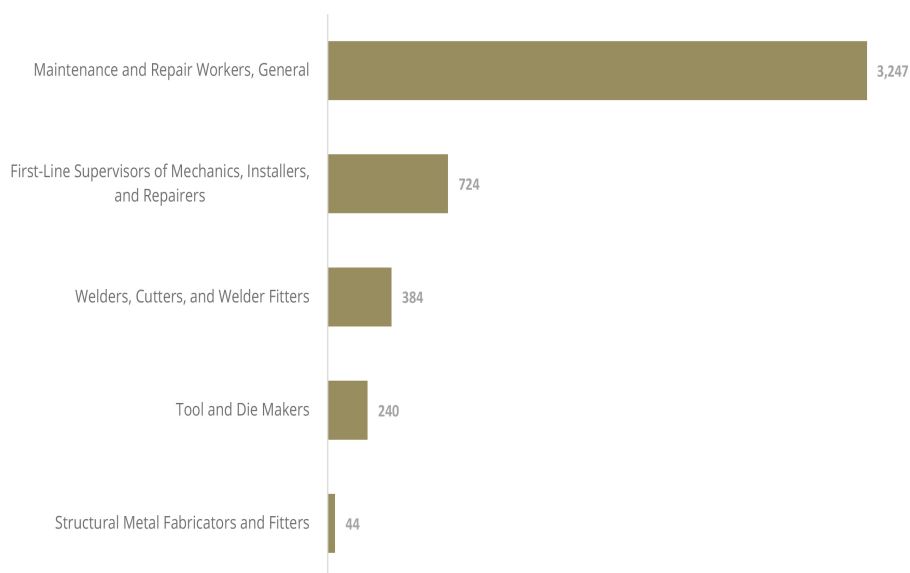
# SKILLED TRADES



## Top posting jobs Assembly & Operations Q4 2016

Data: Burning Glass Technologies Analysis:  
Workforce Intelligence Network

Production workers were in high demand in Q4 2016. Michigan advanced manufacturing employers posted almost 1,500 online job ads for these workers. The next most in-demand workers in the Assembly & Operations sub-group were first-line supervisors of production and operating workers with over 1,000 online job ads. Inspectors, testers, sorters, samplers, and weighers (910 postings) and team assemblers (548 postings) also appeared in the top jobs list for this sub-group.



## Top posting jobs Skilled Materials Workers Q4 2016

Data: Burning Glass Technologies Analysis:  
Workforce Intelligence Network

The most in-demand lightweighting-related occupation in Michigan in Q4 2016 was general maintenance and repair workers. The 3,247 online job ads for this occupation was more than four times the demand for the next most in-demand Skilled Materials sub-group occupation, first-line supervisors of mechanics, installers, and repairers (724 postings). Welders (384 postings) and tool and die makers (240 postings) are also high-demand Skilled Materials workers.

# 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. The increased demand for managers in Skilled Trades occupations in Michigan is demonstrated in the posting for skillsets like supervisory skills and scheduling. As employers seek more managers, the job postings have reflected the need in an evolving list of skills. Advanced technical skills like computer skills also appear on Q4 2016's skills list, further illustrating a shift in Skilled Trades employment to more advanced education and technology requirements.

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Repair</li><li>• Inspection</li><li>• Machinery</li><li>• Supervisory Skills</li><li>• Scheduling</li><li>• Welding</li><li>• Computer Numerical Control (CNC)</li></ul> | <ul style="list-style-type: none"><li>• Machining</li><li>• Microsoft Office</li><li>• Hand Tools</li><li>• Plumbing</li><li>• Cleaning</li><li>• Customer Service</li><li>• Machine Operation</li></ul> |
|--|--|

## IN-DEMAND EMPLOYABILITY SKILLS

While Skilled Trades workers need advanced technical skills, they also need to maintain more traditional employability skills critical to succeeding in a workplace. 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.

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Communication Skills, Teamwork, Collaboration</li><li>• Troubleshooting</li><li>• Ability to perform physical labor</li><li>• Problem Solving</li><li>• Preventive Maintenance</li><li>• Detail-Oriented, Organizational Skills</li></ul> | <ul style="list-style-type: none"><li>• Writing</li><li>• Computer Skills</li><li>• Mathematics</li><li>• Quality Assurance and Control</li><li>• Planning</li><li>• Work Area Maintenance</li></ul> |
|---|--|

## IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

Of the 5,364 Skilled Trades group job postings that specified a desired experience level in Q4 2016, 88 percent were available to workers with less than five years of experience. Entry-level Skilled Trades positions were available to Michigan workers with willingness to undertake some post-secondary training in applicable skills, like mathematics, welding, or programming, qualifying them for one of the 6,160 jobs requiring a high school diploma or some vocational training. Job postings that required more than five years of experience (689 in Q4 2016) were most likely for supervisor or management roles in the Skilled Trades and will require advanced educational attainment, possibly a bachelor's degree, as specified in 946 Q4 job postings.

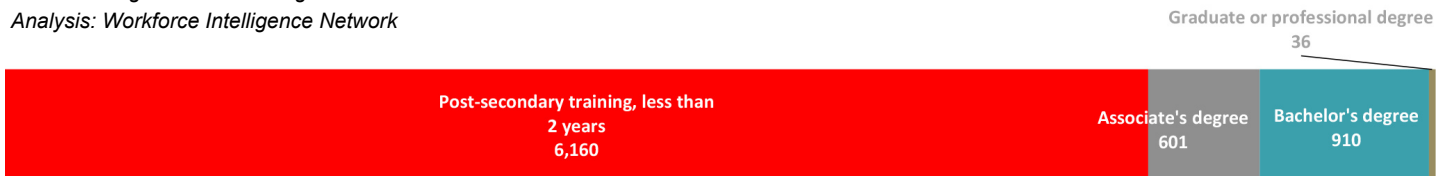
### Experience in-demand Q4 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



### Education & training in-demand Q4 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



Though a majority of advertised salaries in the Skilled Trades group in Q4 2016 were below \$35,000 per year, the average advertised salary for Michigan workers in this group was \$39,538. This salary was 16 percent higher than the Michigan's median annual earnings for all workers in 2014, \$34,000, and just slightly higher than the state's median earnings for all workers in the Skilled Trades group in 2014, \$38,522. 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 Q4 2016

Data: Burning Glass Technologies Analysis:  
Workforce Intelligence Network



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

**\$39,538**  
average advertised salary

**910**  
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

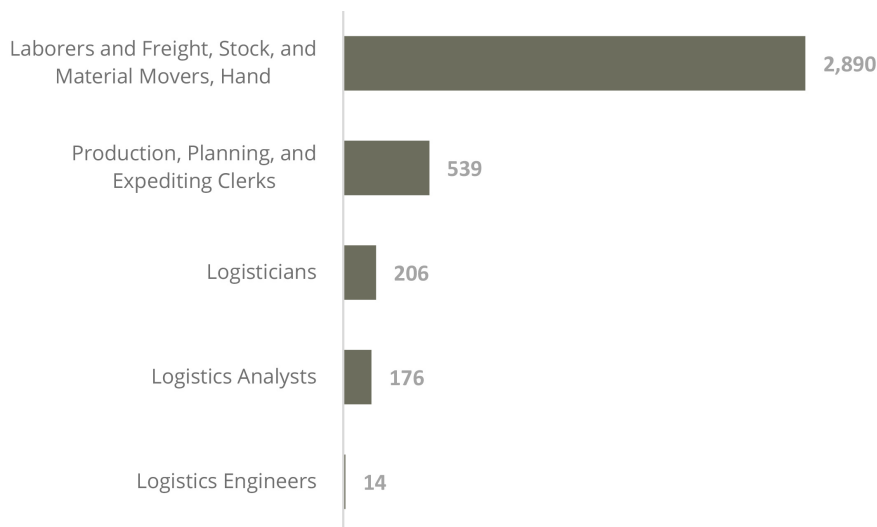
*Logistics workers ensure transportation optimization of materials within organizations, from designing efficient supply chain processes to engaging in the actual transport of material and freight.*

### 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.*



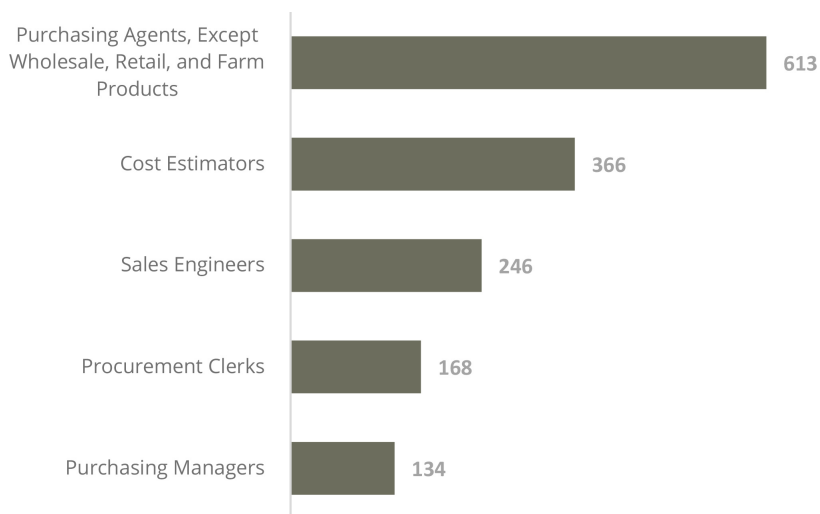
### Top posting jobs

#### Logistics Q4 2016

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

The most in-demand Logistics occupation in Michigan in Q4 2016 was laborers and freight, stock, and material movers. With 2,890 online job postings between October and December, this occupation was the second most in-demand lightweighting-related occupation overall. Other top Logistics jobs included production, planning, and expediting clerks (539 postings), and logisticians (206 postings).

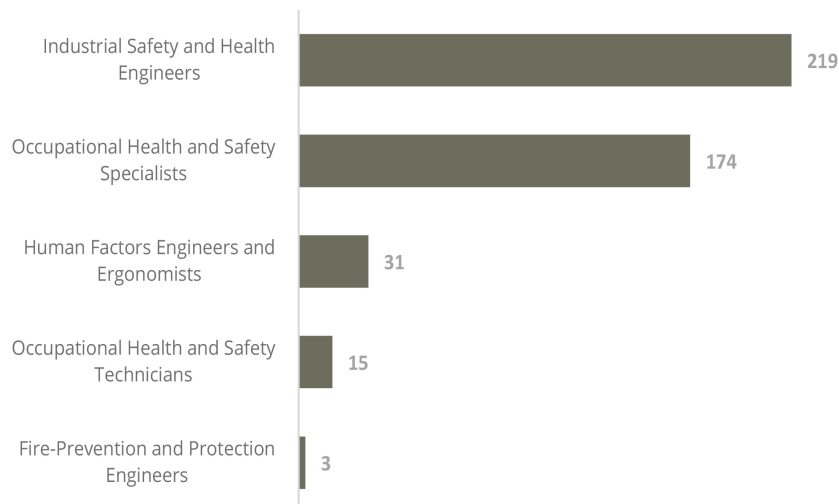
# ADMINISTRATION



## Top posting jobs *Procurement & Purchasing* Q4 2016

Data: Burning Glass Technologies Analysis:  
Workforce Intelligence  
Network

Purchasing agents was the top in-demand Procurement & Purchasing occupation in Michigan in Q4 2016. Michigan employers posted 613 online job ads for purchasing agents, 366 for cost estimators, and 246 for purchasing managers, all occupations with skills important to the manufacture of lightweight products.



## Top posting jobs *Human Safety* Q4 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence  
Network

Employer demand in the Human Safety occupation sub-group was largely split between industrial safety and health engineers (219 postings) and occupational health and safety specialists (174 postings) in Q4 2016. Other in-demand Human Safety workers were human factors engineers and ergonomists, occupational health and safety technicians, 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
- Scheduling
- Customer service
- Logistics
- Project management
- Supply chain management, supply chain knowledge

- Forklift operation
- Inspection, repair
- SAP
- Cost control, budgeting
- Packaging
- Sales Engineering

## IN-DEMAND EMPLOYABILITY SKILLS

Basic skills desired by Michigan employers hiring Administration workers are focused on communication, organizational, and computer skills. Q4 2016 job postings in the Administration group also indicate that these workers should have strong writing skills, be creative, and be able 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, 1,738 required an associate's degree or less and 1,592 required bachelor's degree.

## Experience in-demand

Q4 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

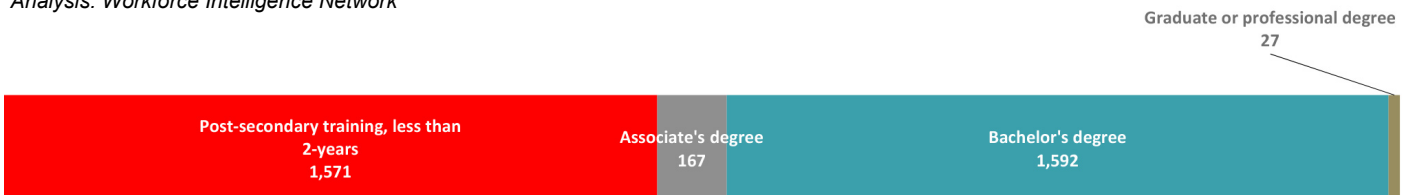


## Education & training in-demand

Q4 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



Just 1,311 Administration sub-group job postings during Q4 2016 advertised an annual salary. Of those, a majority of postings advertised a salary less than \$35,000 a year but the mean advertised salary for this occupation group was \$41,842 indicating that some jobs offered higher wages pulling the average up. This average salary was 23 percent higher than Michigan's median annual earnings for all workers in 2014, but 11 percent lower than the state's median salary for Administration occupations in 2014, \$46,883.

## WAGES

### Advertised wages

Q4 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



**350**  
job postings  
advertising salaries  
over \$50,000

**\$41,842**  
average  
advertised salary

**1,592**  
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

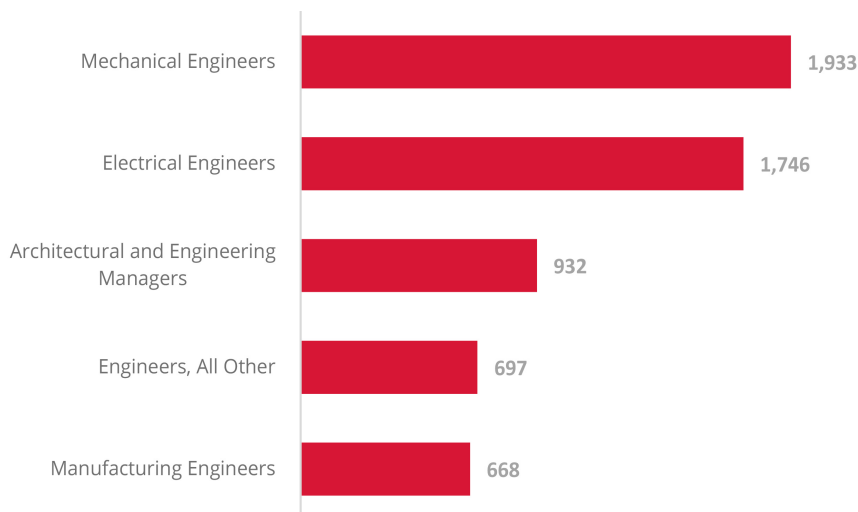
*Chemical Engineers & Metallurgy workers perform duties related to the research, design, development, and testing of chemicals and metal materials. These workers often lead the charge in finding cutting-edge uses of lightweight metal materials.*

### 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 Q4 2016

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 Q4 2016. Michigan employers posted 1,933 online job ads for mechanical engineers and 1,746 ads for electrical engineers between October and December 2016. Other in-demand occupations in the Electrical & Mechanical Engineering sub-group included architectural and engineering managers (932 postings) and manufacturing engineers (697 postings).



# ENGINEERING & DESIGN

## Top posting jobs

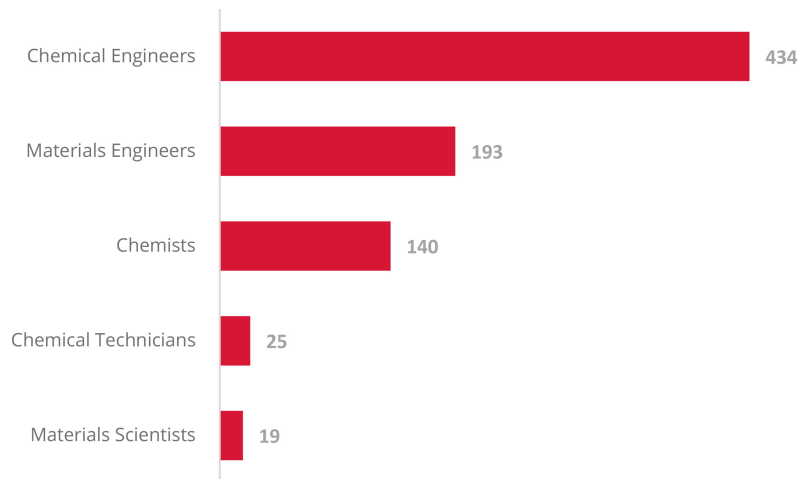
### Chemical & Metallurgy

Q4 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

The most in-demand Chemical Engineering & Metallurgy occupation in Michigan in Q4 2016 was chemical engineers. Michigan employers posted 434 online job ads for chemical engineers and 140 for chemists. Materials engineers (193 postings) were also in high-demand.



## Top posting jobs

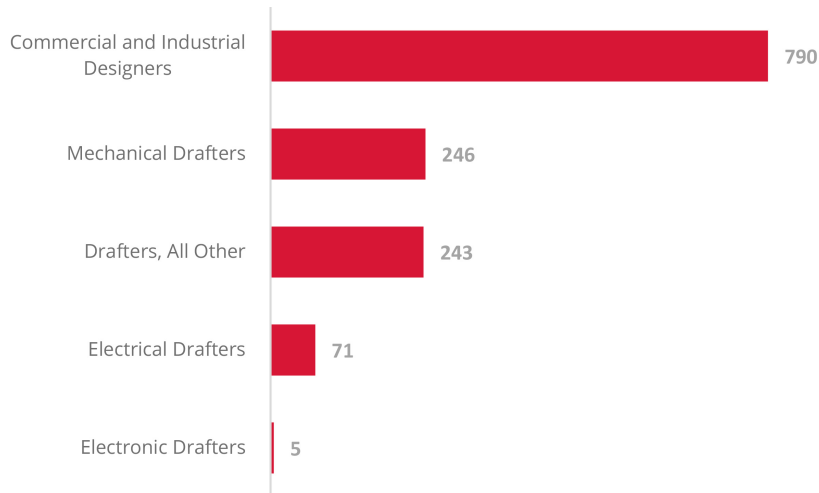
### Designers & Drafters

Q4 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

Michigan employers were seeking commercial designers and drafters that have skills transferrable to lightweight, advanced manufacturing in Q4 2016. Commercial and industrial designers garnered 790 online job postings, more than three times the demand for the next top job, mechanical drafters, which pulled in 246 postings.



## Top posting jobs

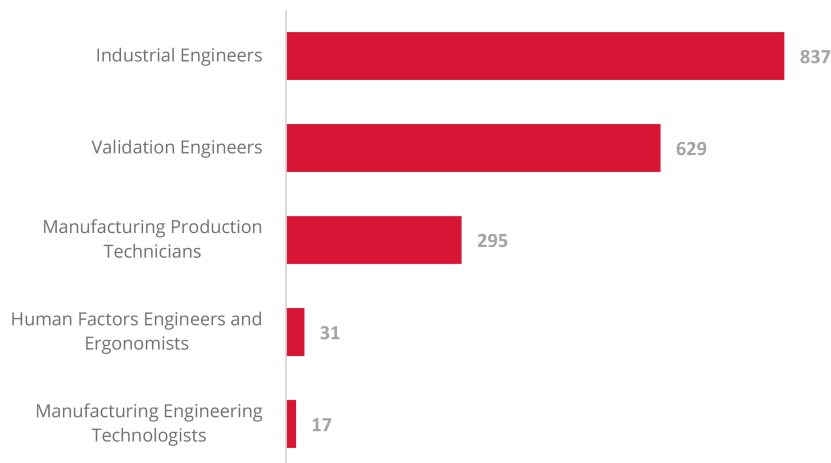
### Process & Testing

Q4 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

The most in-demand Process Engineering & Testing occupation in Q4 2016 in Michigan was industrial engineers (837 postings). Michigan employers were also seeking validation engineers (629 postings) and manufacturing production technicians (295 postings) that could 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 softwares. Knowledge in mechanical and electrical engineering is valued and applied to those specific engineering roles. Q4 2016 job postings illustrate that managerial engineering roles require strong project management and budgeting skills, along with industry experience.

- Mechanical engineering
- Project management
- Electrical engineering
- Validation
- Product development, product design
- Manufacturing processes

- Industrial engineering industry experience
- Budgeting
- AutoCAD
- Scheduling
- Purchasing
- Inspection and Repair

## IN-DEMAND EMPLOYABILITY SKILLS

Aside from the advanced technical skills sought after in lightweighting-related engineering employment, engineers are expected to have basic, foundational skills, too. Michigan employers seeking to hire engineers value candidates with strong communication and team work 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

According to Q4 2016 job postings in the Engineering & Design occupation group, many engineering jobs in Michigan were available to workers with fewer than five years of experience. Yet, engineers were often required to have at least a bachelor's degree: 8,037 Engineering & Design job postings in Q4 specified that candidates should have a bachelor's degree. Engineering jobs like technician positions were available to candidates with associate's degrees or other short-term training certificates.

## Experience in-demand

Q4 2016

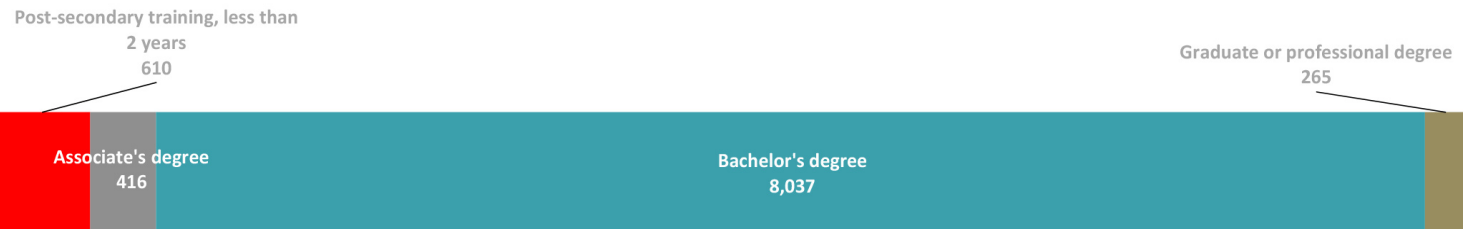
Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



## Education & training in-demand

Q4 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



The 1,458 Engineering & Design job postings that advertised a salary during Q4 2016 illustrated that these occupations are the highest paid of the lightweighting-related occupations in Michigan. The high educational attainment required to secure most engineering positions translates into high potential earnings. Most of the advertised salaries (55 percent) in Q4 postings were over \$75,000 per year with a mean advertised salary of \$74,211. This salary was over twice as much as the Michigan's median annual earnings for all workers in Engineering & Design in 2014, \$34,000, but 8 percent lower than the state's median 2014 salary for Engineering and Design occupations in 2014, \$80,891.

## WAGES

### Advertised wages

Q4 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



**8,037**  
job postings  
requiring a  
bachelor's degree

**\$74,211**  
average  
advertised salary

**1,170**  
job postings with  
salaries greater than  
\$50,000



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For more information about LIFT and additional workforce data visit [www.lift.technology](http://www.lift.technology)