

# 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, have better performance and use less fuel.

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 that are related to lightweighting in Tennessee. 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 just 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.





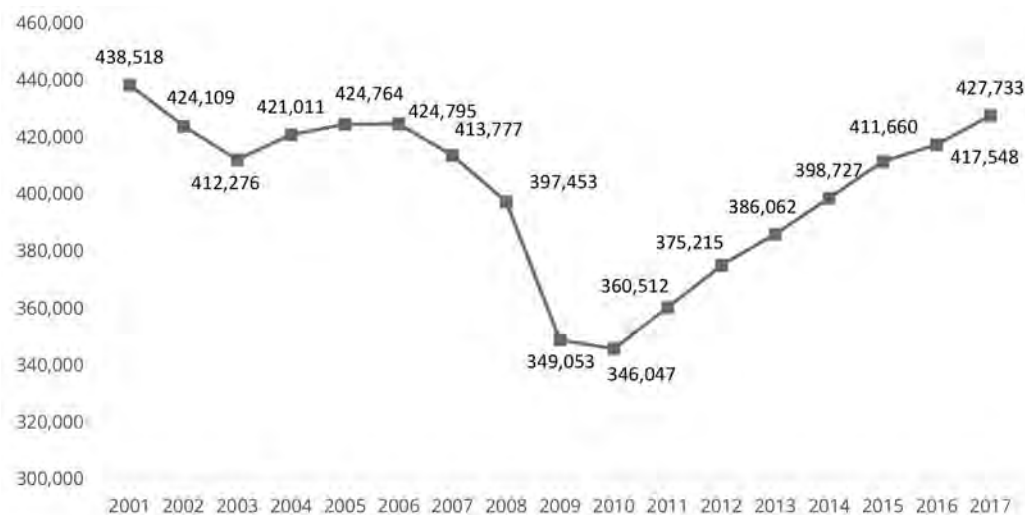
## EMPLOYER DEMAND AND EMPLOYMENT TRENDS

Online job ads for advanced manufacturing jobs related to lightweighting in Tennessee increased 11 percent from 9,237 in Q4 2016 to 10,261 in Q1 2017. Job postings for lightweighting-related occupations was volatile during 2016 – continued analysis will illustrate larger trends in employer demand. Meanwhile, 2017 marks the seventh consecutive year of employment growth for lightweighting-related jobs in Tennessee. In 2010, just 346,000 workers were employed in lightweighting-related advanced manufacturing jobs, and in 2017, employment reached over 427,000, a 23 percent increase.



**Job postings over time  
Tennessee**  
Q1 2013 - Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

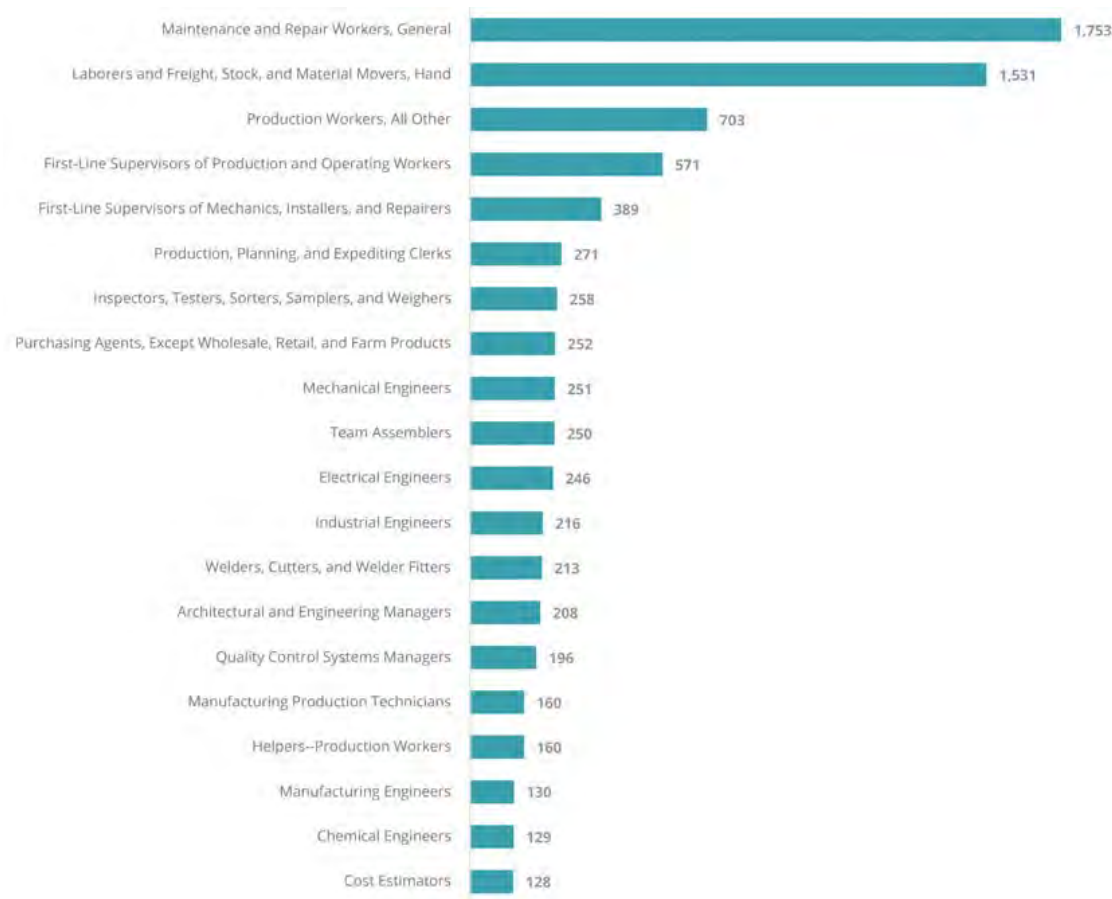


**Employment over time  
Tennessee**  
2001 - 2017

Data: EMSI, QWI  
Analysis: Workforce Intelligence Network

## TOP JOBS

The top in-demand occupation related to lightweight advanced manufacturing was general maintenance and repair workers with 1,753 online job postings in Tennessee during Q1 2017. Laborers and freight, stock, and material movers dropped to second place with 1,531 online job ads. These workers, along with production workers (703 postings), continually appear in Tennessee's top jobs list. Demand for another Skilled Trades job – inspectors, testers, sorters, samplers, and weighers – continues to drop, which may indicate that employers have been successful in hiring to fulfill demand.



### Top posting jobs Tennessee Q1 2017

Data: Burning Glass  
Technologies  
Analysis: Workforce Intelligence  
Network

**7**  
**consecutive years**  
**of lightweighting-**  
**related**  
**employment**  
**growth**

**10,261**  
**Total online job**  
**ads in Q1 2017**  
**related to**  
**lightweighting**  
**occupations**

**427,733**  
**Tennessee**  
**workers in**  
**advanced**  
**manufacturing**



## 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 the 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.*

### Skilled Materials

*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.*

### 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.*

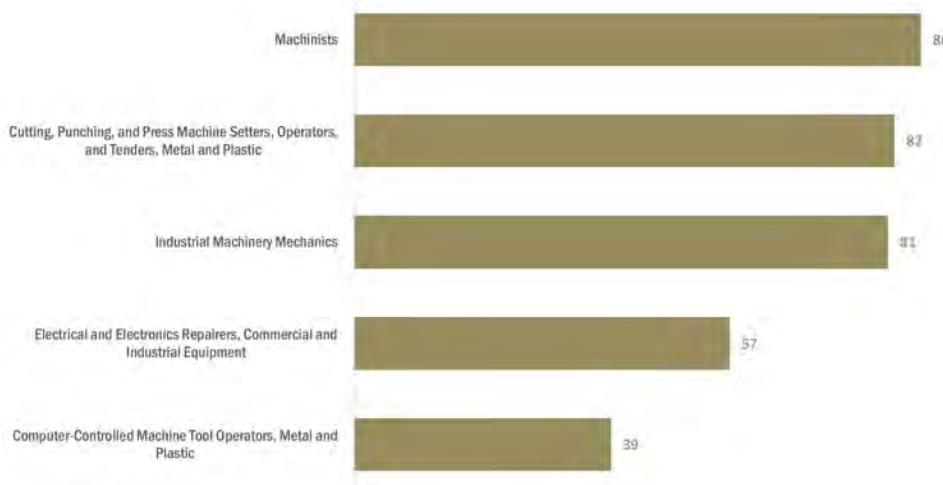
### Top posting jobs

#### Machinists

Q1 2017

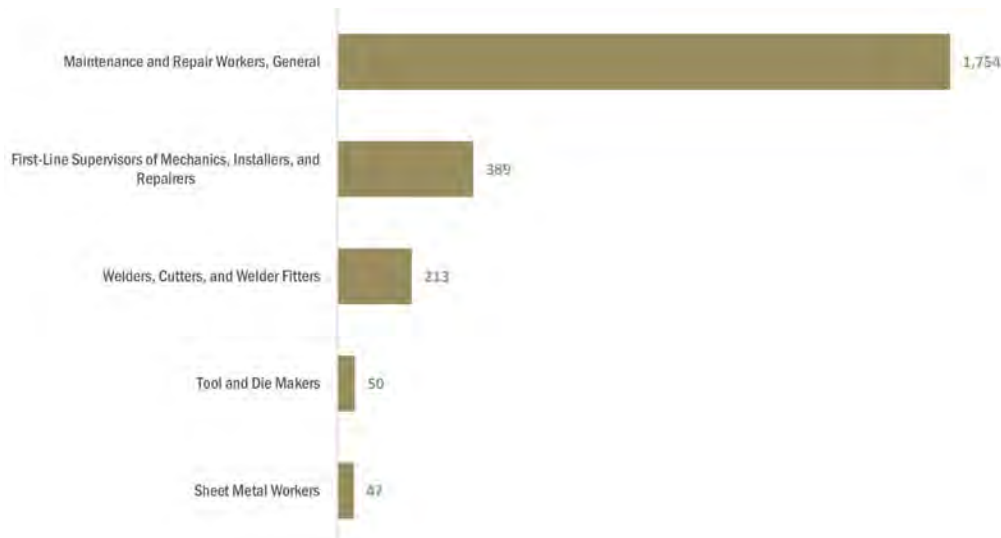
Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



Machinists were the most in-demand occupation in the Machinists sub-group during Q1 2017, keeping their top spot from Q4 2016. Tennessee employers posted 86 online job ads for these workers between January and March 2017. The next most in-demand occupations included cutting, punching and press machine setters, operators, and tenders (82 postings) and industrial machinery mechanics (81 postings).

# SKILLED TRADES



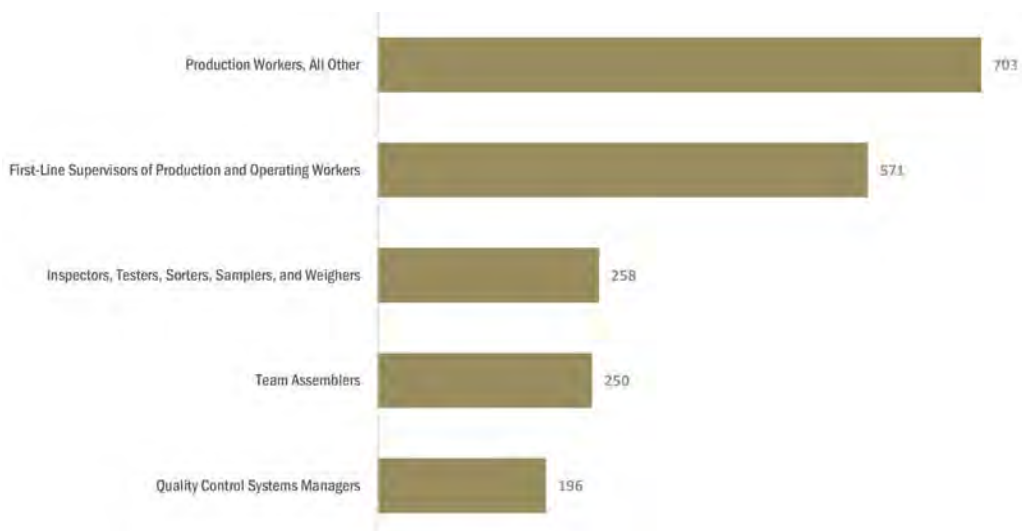
## Top posting jobs

### Skilled Materials Workers

Q1 2017

Data: Burning Glass Technologies Analysis:  
Workforce Intelligence Network

Maintenance and repair workers were the most in-demand occupation in the Skilled Materials sub-group. The 1,754 online job ads for this occupation were more than four times the demand for the next most in-demand job in the sub-group, first-line supervisors of mechanics, installers, and repairers (389 postings). Welders, cutters, and welder fitters, with 213 postings, were also in high-demand.



## Top posting jobs

### Assembly & Operations

Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Production workers led the Assembly and Operations sub-group with 703 postings while first line supervisors of production and operation workers had 571 postings during Q1 2017. The high demand for both occupations as well as continued growth between quarters indicates strong employment potential in Assembly and Operations.

# SKILLED TRADES

## IN-DEMAND TECHNICAL SKILLS

The Skilled Trades group requires a wide array of high-level technical skills. While more traditional skills remain necessary, such as repair, inspection and the ability to weld and use hand tools, more skills requiring post-secondary education and training have become prevalent in Skilled Trades job postings. Supervisory skills and project management are in high-demand.

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Repair, inspection</li><li>• Scheduling</li><li>• Welding</li><li>• Packaging</li><li>• Supervisory skills, budgeting, project management</li></ul> | <ul style="list-style-type: none"><li>• Machinery</li><li>• Plumbing, HVAC</li><li>• Hand tools</li><li>• Forklift operation</li><li>• Microsoft Office</li></ul> |
|---|---|

## IN-DEMAND EMPLOYABILITY SKILLS

While Skilled Trades workers need advanced technical skills, they also need to maintain traditional employability skills critical to succeeding in the workplace. Employers hiring Skilled Trades workers often desire employability skills like communication, the ability to perform physical labor, problem solving, and basic computer knowledge. These types of skills are crucial for Skilled Trades workers so that they can collaborate effectively. Employability skills are especially needed in high-demand supervisor roles.

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|--|--|
| <ul style="list-style-type: none"><li>• Communication skills</li><li>• Ability to perform physical labor</li><li>• Troubleshooting, problem solving</li><li>• Preventative maintenance/quality assurance and control</li></ul> | <ul style="list-style-type: none"><li>• Computer Skills</li><li>• Writing</li><li>• Organizational Skills</li><li>• Research</li><li>• Detail Oriented</li></ul> |
|--|--|

# SKILLED TRADES

## IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

Advertised experience in online job postings for Skilled Trades workers in Tennessee reveals that an overwhelming majority of openings require less than five years of experience. The nearly 1,500 job postings stating a requirement of under two years of experience indicate that entry-level jobs are available for qualified workers. Furthermore, many employers expect candidates to have a high school diploma or some vocational training, as evidenced by the 78 percent of postings in Q1 2017 advertising a desire for this level of educational attainment. If potential candidates can learn in-demand technical skills like welding, programming, or mathematics, they can begin to fill the low experience openings that have high demand among employers in Tennessee. Job postings requiring five or more years of experience most likely represent supervisor or management positions.

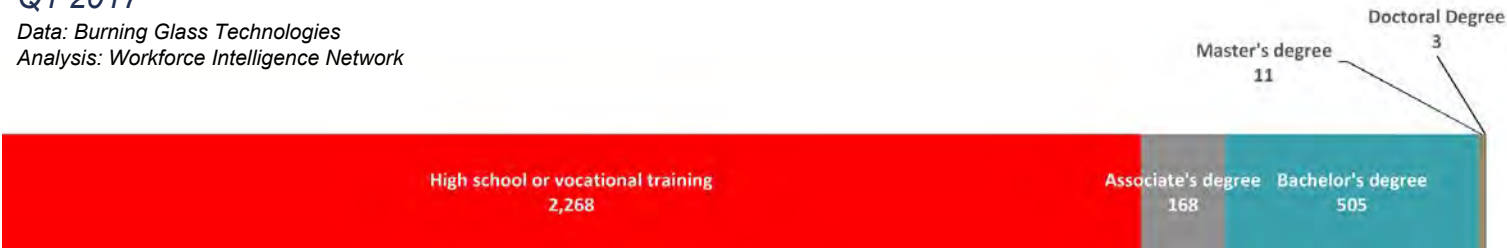
### Experience in-demand Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



### Education & training in-demand Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



## WAGES

### Advertised wages Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

The average advertised annual salary in online job postings during Q1 2017 for Skilled Trades workers in Tennessee was \$40,410. This presented a four percent increase from their average advertised online salary in Q4 2016. Nearly 60 percent of postings advertising salary offered less than \$35,000, but increased demand for these workers is beginning to drive wages up. Furthermore, the ability to gain training and education in less than two years paired with the higher wage opportunities make Skilled Trades occupations an exciting option for Tennessee workers.



**0-2 years**  
Experience most  
in-demand by  
Tennessee  
employers

**\$40,410**  
average  
advertised salary

**Associate's  
degree or less  
is required**





## 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

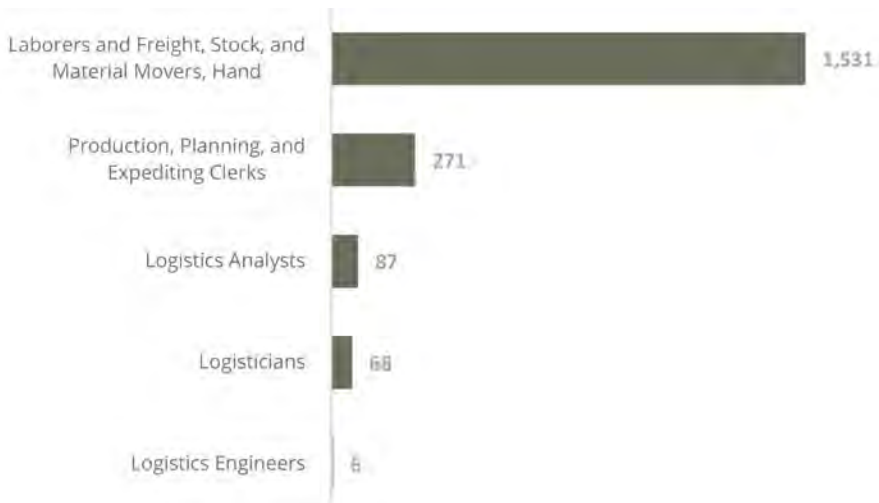
*Logistics workers ensure transportation optimization of materials within organizations, from designing efficient supply chain processes to engaging in the actual transport of material and freight.*

### 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 workplace environment.*



### Top posting jobs

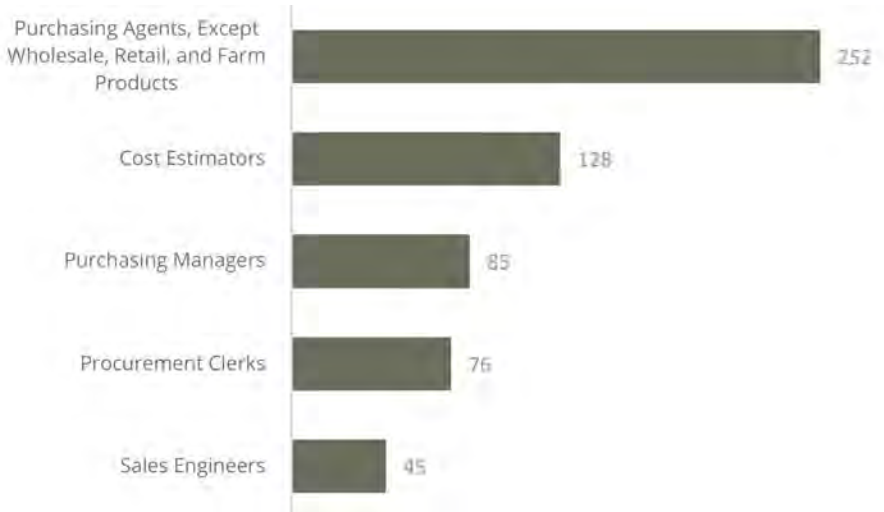
#### Logistics

Q1 2017

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

The Logistics occupation in Tennessee in Q1 2017 with the most online job postings was laborers and freight, stock, and material movers with 1,531 ads. Other top Logistics jobs included production, planning, and expediting clerks (271 postings), and logistics analysts (87 postings).

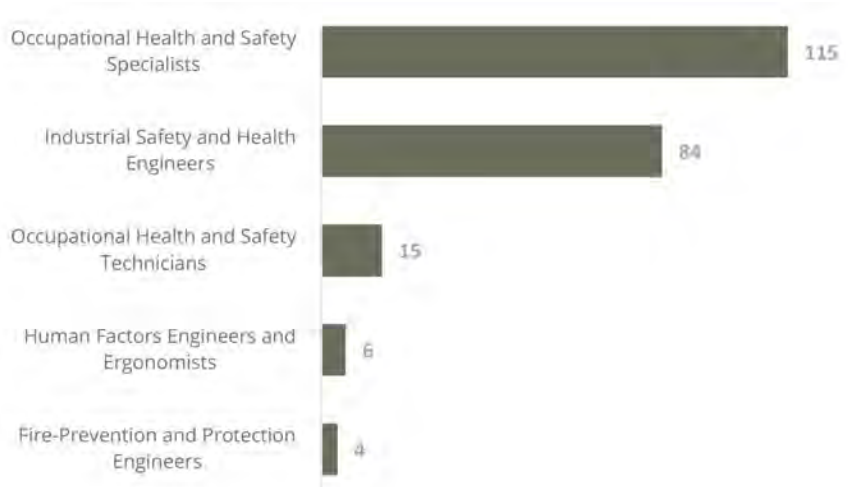
# ADMINISTRATION



## Top posting jobs *Procurement & Purchasing* Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Purchasing agents led the sub-group with 252 online postings during Q1 2017. Cost estimators, procurement clerks, and purchasing managers also continued to be highly sought-after occupations in this group.



## Top posting jobs *Human Safety* Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Occupational health and safety specialists and industrial safety and health engineers dominated postings for this sub-group with 115 and 84 postings respectively during Q1 2017.

# ADMINISTRATION

## IN-DEMAND TECHNICAL SKILLS

Occupations within the Administration group require a unique combination of hands-on technical skills, like those needed in the Skilled Trades, and business and management prowess. For example, online job postings in Tennessee showed that Administration workers need to understand manufacturing-related subjects such as machinery and inspection while also having customer service and procurement skills. Common skill listings like scheduling and contract management communicate employer demand for Administration workers in high-wage management occupations.

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Forklift operation</li><li>• Microsoft Office</li><li>• Scheduling, project management, contract management</li><li>• Purchasing/procurement</li><li>• Labeling/packaging</li></ul> | <ul style="list-style-type: none"><li>• Customer service/customer contact</li><li>• Supply chain knowledge/logistics/inventory management</li><li>• Repair/inspection</li><li>• Occupational health and safety</li><li>• Retail experience</li></ul> |
|---|--|

## IN-DEMAND EMPLOYABILITY SKILLS

As in many similar groups, Tennessee employers seek administration workers with traditional employability skills such as the ability to communicate, perform physical labor, organize, and solve problems. The inclusion of mathematics as a common baseline skill in postings reflects the technical nature of Administration occupations and the higher levels of education required for most openings. Due to the numerous business-oriented duties of Administration workers, computer and writing skills are necessary for success.

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Communication Skills, Teamwork/ Collaboration</li><li>• Ability to Perform Physical Labor</li><li>• Organizational Skills, Detail-Oriented</li><li>• Computer Skills</li><li>• Writing, English</li></ul> | <ul style="list-style-type: none"><li>• Planning, Project Management</li><li>• Problem Solving, Troubleshooting</li><li>• Mathematics</li><li>• Research</li><li>• Work Area Maintenance</li></ul> |
|---|--|

# ADMINISTRATION

## IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

Of the online postings that advertised required experience, about 59 percent sought Administration workers with little to no experience. Another substantial proportion of postings (30 percent) required three to five years, possibly indicating that employers would like sales analysts with previous experience or enough experience for management positions. Of the online postings that advertised minimum education requirements, over 56 percent required a high school diploma or some vocational training. Another substantial share of ads required a bachelor's degree, most likely for high-wage sales, logistics, and management positions.

### Experience in-demand Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



### Education & training in-demand Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



## WAGES

### Advertised wages Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

A substantial majority of postings advertising wages for Administration occupations offer less than \$35,000 per year (69 percent). The average advertised salary in online job postings during Q1 2017 for Administration workers in Tennessee was \$38,327, a four percent increase from the average advertised salary in Q4 2016. The overwhelming majority of advertised salaries being less than \$35,000 could indicate that employers' greatest needs are at the entry-level.



**0-2 years**  
Experience most  
in-demand by  
Tennessee  
employers

**\$38,327**  
average  
advertised salary

**High school  
diploma or  
vocational training  
are required**





## 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 group which can be split into four distinct occupation sub-groups; Electrical & Mechanical Engineering, Chemical Engineering & Metallurgy, Industrial Designers & Drafters, and Process Engineering & Testing.

### Process & Testing

*Process & 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.*

### Electrical & Mechanical

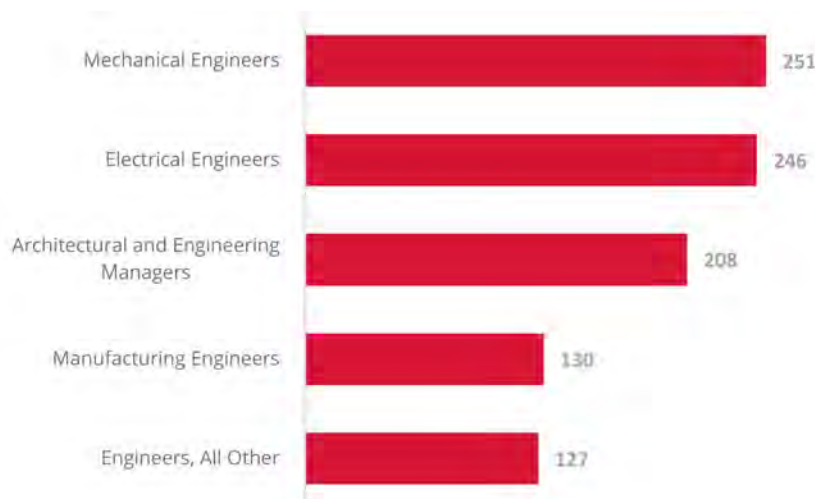
*Electrical & Mechanical Engineers perform duties related to the research, design, development, and testing of mechanical functioning, electrical, and manufacturing equipment, components, or systems for commercial, industrial, military, or scientific use.*

### Chemical & Metallurgy

*Chemical & 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.*



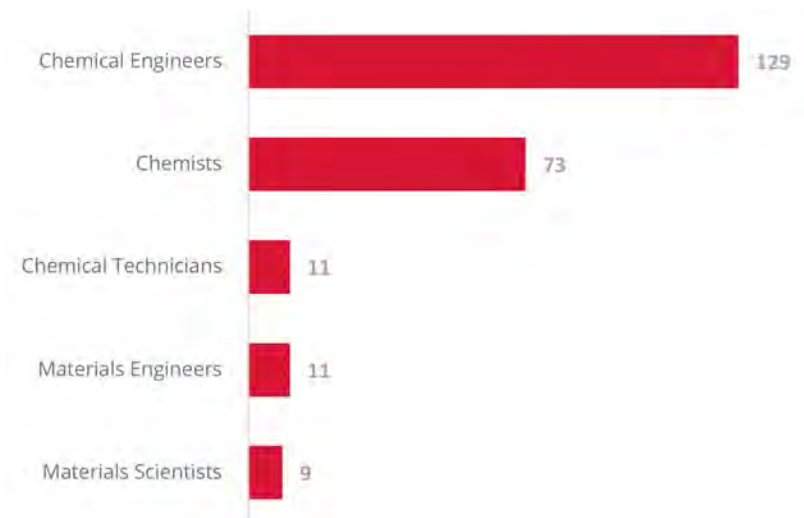
### Top posting jobs

#### Electrical & Mechanical Q1 2017

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

This sub-group represents the largest in the Engineering and Design group in terms of employer demand. Mechanical engineers reclaimed their top spot in Q1 2017 with 251 postings, with electrical engineers (246 postings) and architectural and engineering managers (208 postings) still in high demand.

## ENGINEERING & DESIGN

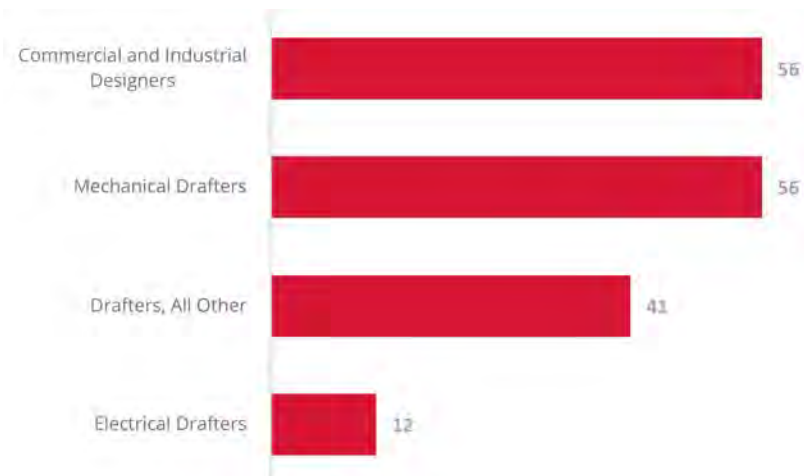


### Top posting jobs

#### *Chemical & Metallurgy* Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Chemical engineers dominated this sub-group with 129 online ads during Q1 2017 (55 percent of all postings in this sub-group). Chemists were also in demand with 73 postings, followed by chemical technicians and materials engineers with 11 postings each during this quarter.

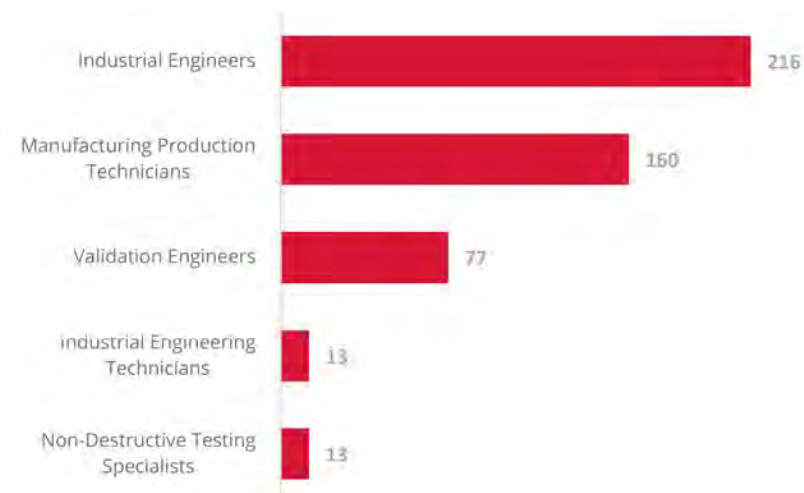


### Top posting jobs

#### *Designers & Drafters* Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Mechanical drafters and commercial and industrial designers were tied for lead in the Designers and Drafters sub-group with 56 online postings each during Q1 2017. Drafters (41 postings) also had relatively high demand.



### Top posting jobs

#### *Process & Testing* Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Industrial engineers led this sub-group with 216 online job postings during Q1 2017. Manufacturing production technicians (160 postings) and validation engineers (77 postings) were also in high demand.

# ENGINEERING & DESIGN

## IN-DEMAND TECHNICAL SKILLS

STEM-related skills dominate the technical proficiency list for the Engineering & Design group such as PLC programming, CAD, and knowledge of mechanical and electrical engineering. Business and management-related skills such as budgeting and industry experience were also prevalent in postings, reflecting the demand for experienced workers for supervisory roles in Tennessee.

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Project Management, Budgeting, Scheduling</li><li>• Microsoft Office</li><li>• Repair, Inspection</li><li>• AutoCAD/Computer Aided Drafting/Design (CAD), Six Sigma</li><li>• Mechanical Engineering, Electrical Engineering</li></ul> | <ul style="list-style-type: none"><li>• TechnicalSupport</li><li>• Programmable Logic Controller (PLC) Programming</li><li>• Manufacturing Process, Lean Manufacturing, Manufacturing Engineer</li><li>• Industrial Engineering Industry Expertise</li><li>• Process Engineering and Improvement</li></ul> |
|--|--|

## IN-DEMAND EMPLOYABILITY SKILLS

While Engineers and Designers require critical technical skills learned through rigorous, advanced education, employers also require these workers to have foundational skills necessary to function efficiently on a team such as communication, teamwork, and planning. They must also have important project-oriented skills like planning, attention to detail, and problem solving. Overall, the top employability and technical skills reflect that Tennessee employers seek well-rounded candidates for Engineering & Design openings.

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Communication Skills, Teamwork/ Collaboration</li><li>• Problem Solving, Troubleshooting</li><li>• Writing</li><li>• Planning, Organizational Skills, Detail-Oriented</li><li>• Quality Assurance and Control, Preventative Maintenance</li></ul> | <ul style="list-style-type: none"><li>• Ability to Perform Physical Labor</li><li>• Research</li><li>• Leadership</li><li>• Multi-tasking</li><li>• Creativity</li></ul> |
|---|--|

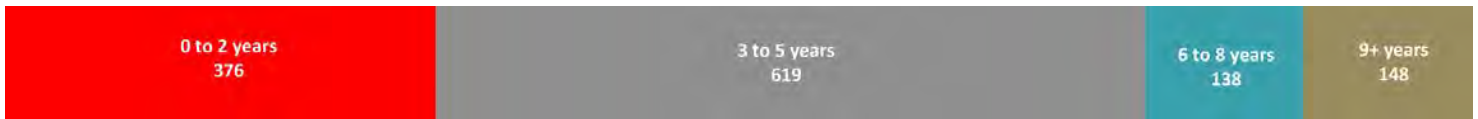
# ENGINEERING & DESIGN

## IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

The most advertised experience range for Engineers and Designers in Tennessee during Q1 2017 was three to five years with over 619 online ads, representing almost half of available experience data. The entry-level experience range, zero to two years, captured the next highest proportion with 371 postings, nearly a third. This indicates that employers prefer Engineering and Design workers with previous experience but opportunities do exist at the entry-level. Employers seeking to hire workers in this group overwhelmingly want candidates with a bachelor's degree: it was specified by 82 percent of the 1,425 postings for Engineers and Designers that advertised an education requirement.

### Experience in-demand Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



### Education & training in-demand Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

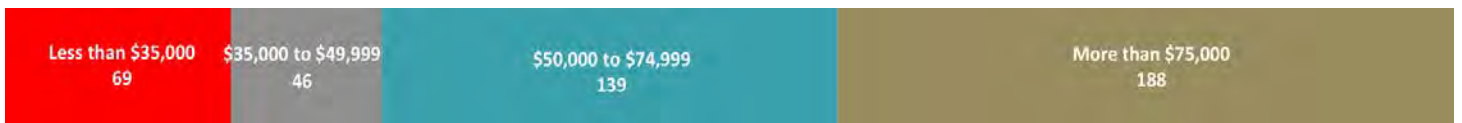


## WAGES

### Advertised wages Q1 2017

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

The higher levels of experience and education requirement in online job postings for Engineers and Designers has translated into higher, more competitive wage advertisements by employers in Tennessee. Nearly 31 percent of Q1 postings that included wage information advertised annual salaries above \$50,000 and 43 percent of Q4 postings that included wage information advertised annual salaries above \$75,000. The average advertised annual salary in Q1 2017 postings was \$69,774.



**3-5 years**  
Experience most  
in-demand by  
Tennessee  
employers

**\$69,774**  
average  
advertised salary

**Bachelor's  
Degree most  
often required**





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