

# 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 Kentucky. 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

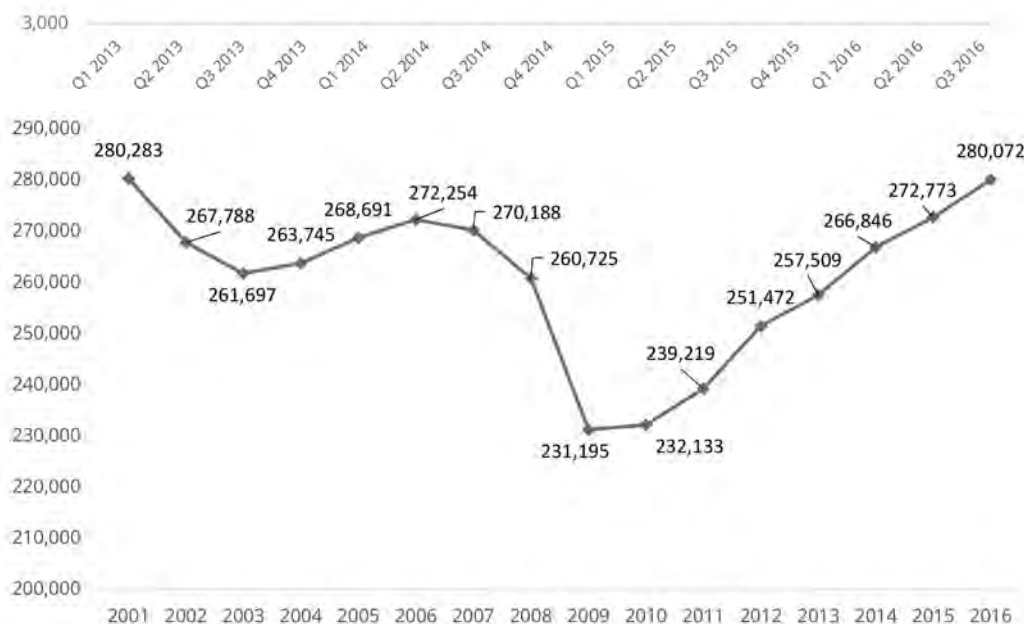
Online job postings for occupations related to lightweighting in Kentucky increased for a third consecutive quarter during Q3 2016. Kentucky advanced manufacturing employers posted 8,123 online job ads for lightweighting-related occupations between July and September 2016, up 2.9% from 7,892 postings in Q2. Compared to one year ago, Q3 2015, postings have not shifted in a meaningful way. Since Q2 of 2015 postings have remained at consistent high levels, above 7,000 postings each quarter indicating sustained demand for workers. Increased employer demand for these workers has also driven employment growth in these occupations. 2016 marks the seventh consecutive year of employment growth for lightweighting-related jobs in Kentucky since the depths of the Great Recession in 2009. In 2009, only 231,195 Kentucky workers were employed in lightweighting-related advanced manufacturing jobs, and in 2016, employment reached just over 280,000.



### Job postings over time Kentucky

Q1 2013 - Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



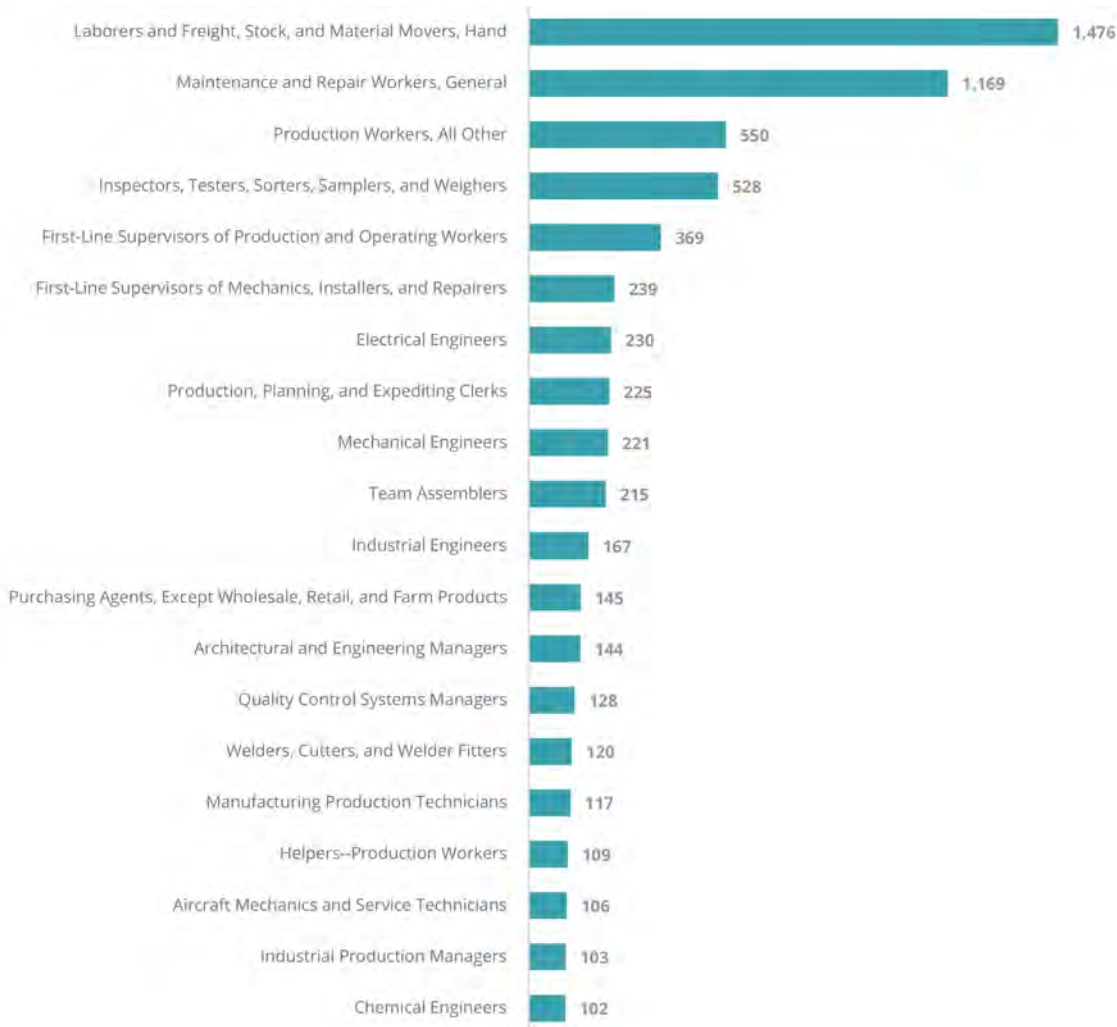
### Employment over time Kentucky

2001 - 2016

Data: EMSI, QWI  
Analysis: Workforce Intelligence Network

## TOP JOBS

The top in-demand occupation in Q3 2016 related to lightweight advanced manufacturing was laborers and freight, stock, and materials movers (1,476 postings). This moves maintenance and repair workers, with 1,169 online job postings in Kentucky out of the top spot. These two occupations routinely are in top in-demand positions due to employer need and turnover. Strong demand continues for workers in the Skilled Trades and industrial technology maintenance. Supervisors and managers are also in consistent demand in Kentucky along with electrical and mechanical engineers.



### Top posting jobs Kentucky Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence  
Network

**>7,000**

**consistent strong  
demand for  
workers for 6  
consecutive  
quarters**

**8,123**

**total online  
job ads in Q3  
2016**

**Skilled  
Trades: top  
in-demand  
occupation  
group**



## 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

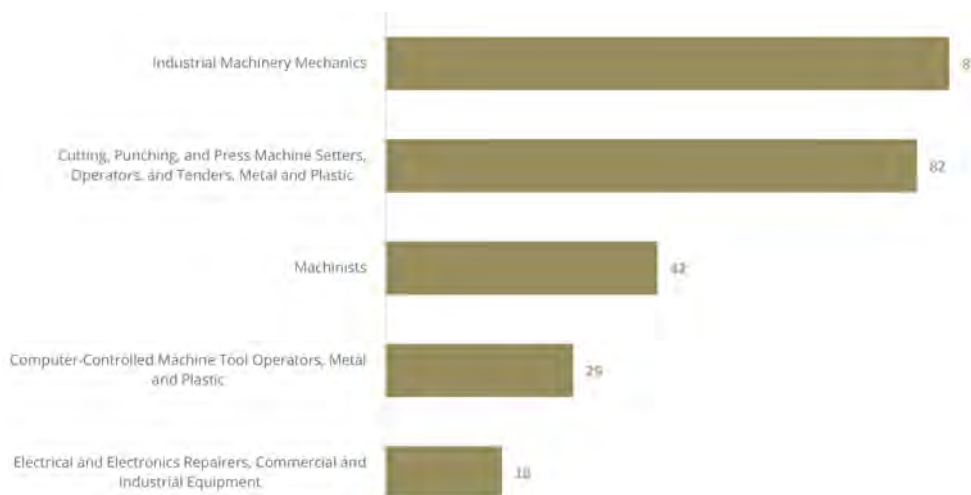
*Machinists set up and operate a variety of machine tools to produce parts and instruments. Some work on traditional industrial machinery while others operate or develop programs for computer-controlled machinery.*

### 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 & Operation

*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

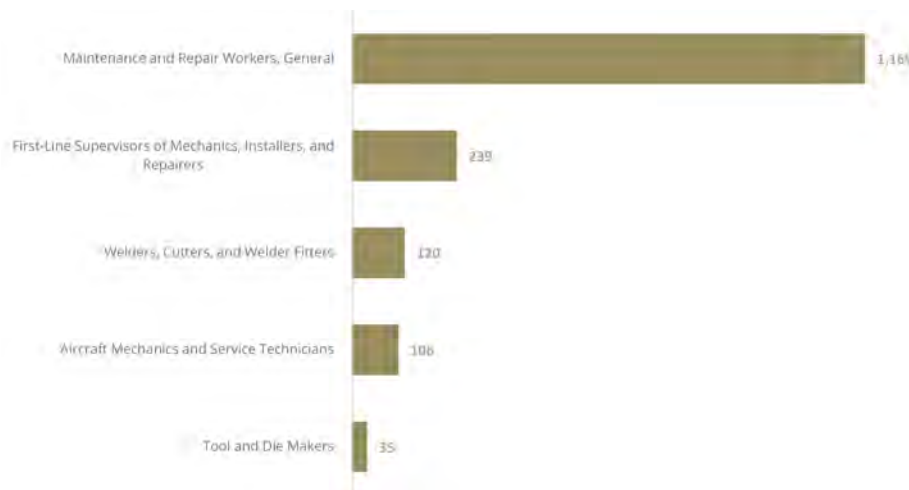
Q3 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

Industrial machinery mechanics were once again the most in-demand occupation in the Machinists sub-group during Q3 2016 with 87 online job postings up from 82 in Q2 2016. Cutting, punching, and press machine setters, operators, and tenders also remain in high demand with 82 postings.

# SKILLED TRADES

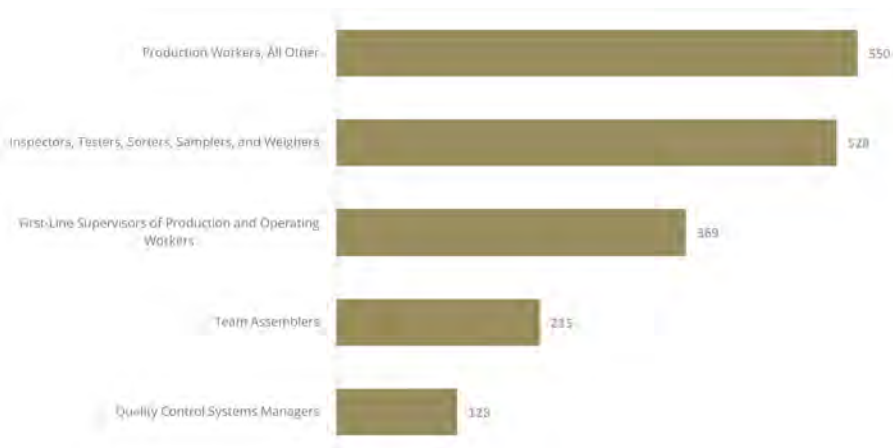


## Top posting jobs Skilled Materials Workers Q3 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

Maintenance and repair workers continue to dominate employer demand in the Skilled Materials sub-group with 1,169 postings between July and September 2016. Other in-demand jobs in this area include supervisors, welders, aircraft technicians, and tool and die makers.



## Top posting jobs Assembly & Operations Q3 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

Production workers were in high demand in Q3 2016. Kentucky advanced manufacturing employers posted 550 online job ads for these workers in Q3. Inspectors, testers, sorters, samplers, and weighers (528 postings) were also in demand for this sub-group from July through September 2016, nearly doubling demand compared to Q2 this year.

# 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 machining, welding, repair, and inspection are still present in Skilled Trades job postings. Increased demand for managers in Skilled Trades occupations in Kentucky is demonstrated in the posting for skillsets like staff management, project management, customer service, and budgeting. As employers seek more candidates to fill supervisory roles, job postings reflect the need in a continuously evolving list of skills. Advanced technical skills like mathematics, product testing, and programming also appear on Q3 2016's skills list, further illustrating a shift in Skilled Trades employment to more advanced education and technology requirements.

- Repair, inspection, cleaning
- Scheduling, budgeting
- Welding
- Machining, machine operation, Computer Numerical Control (CNC) Experience
- Mathematics
- Plumbing
- Packaging
- Programmable Logic Controller (PLC) Programming
- HVAC
- Product testing
- Customer Service
- Microsoft Office/Excel

## IN-DEMAND EMPLOYABILITY SKILLS

While Skilled Trades workers now need advanced technical skills, they also need to maintain more traditional employability skills that are critical to succeeding in a workplace. Kentucky employers hiring Skilled Trades workers often look for employability skills such as communication, problem solving, computer skills, and the ability to perform physical labor. These types of skills are crucial for Skilled Trades so that they are able to collaborate effectively; especially in demanding supervisory positions.

- Communication skills, positive disposition
- Teamwork, collaboration, building effective relationships
- Troubleshooting, problem solving
- Ability to perform physical labor
- Preventative maintenance, work area maintenance
- Computer skills
- Writing, English proficiency
- Supervisory skills, leadership
- Quality assurance and control
- Detail-oriented, planning, organizational skills
- Multi-tasking, time management
- Cost control

## IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

Of the 2,026 Skilled Trades group job postings that specified a desired experience level during Q3 2016, 93.6% were available to workers with fewer than 5 years of experience. Entry-level Skilled Trades positions are available to Kentucky workers with short-term, post-secondary training in applicable skills, like mathematics, welding, or programming, which will qualify them for one of 1,145 Q3 job postings. Job postings that require more than 5 years of experience (130 in Q3 2016) are 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 333 job postings during Q3 2016.

### Experience in-demand Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



### Education & training in-demand Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



## WAGES

### Advertised wages Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Despite that a majority (57%) of advertised salaries in the Skilled Trades group in Q3 2016 offered less than \$35,000 annually, the average advertised salary for Kentucky Skilled Trades workers was \$41,496. This indicates that the salaries offered in the three higher wage brackets outweighed the more than 650 online ads advertising salaries below \$35,000. Increasing wages can often indicate increasing need as employers are willing to pay more for positions they struggle to fill. Q3's average real-time advertised salary is 9.8% higher than the state's median earnings for Skilled Trades workers (\$37,794) and 29.7% higher than the state's median earnings for all workers (\$32,000). Higher wages in the Skilled Trades group are available with short-term, post-secondary training, as well as advancement to managerial and supervisory roles.



**Less than  
5 years**

**experience most  
in demand for  
Skilled Trades  
positions**

**\$41,496**  
**average  
advertised salary**

**Post-secondary  
training or more is  
required for Skilled  
Trades positions**





## 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

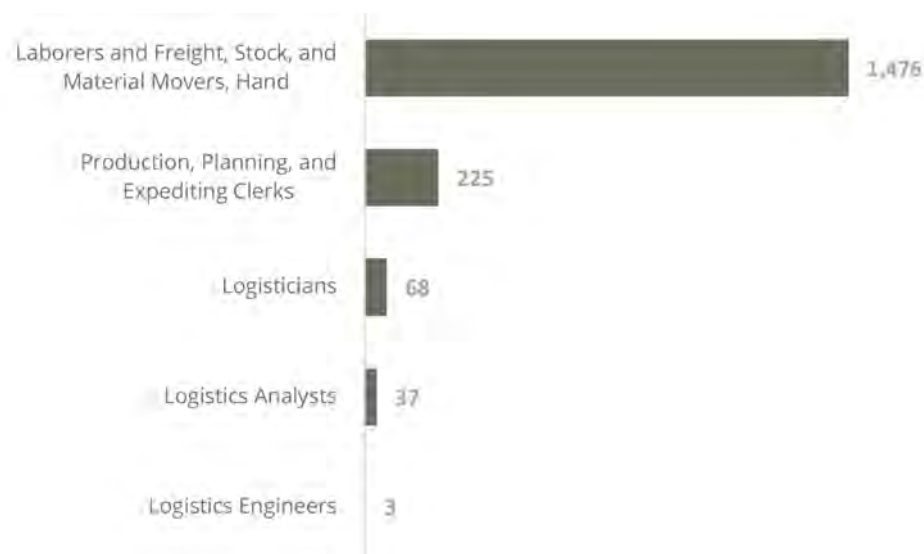
*Logistics Workers ensure transportation optimization of materials within organizations, from designing efficient supply chain processes to engaging in the actual transport of material and freight.*

### 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

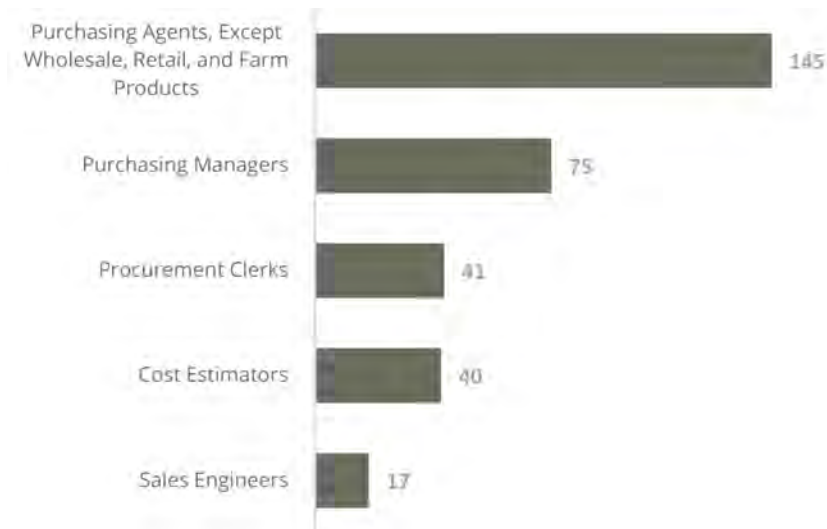
Q3 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

The most in-demand Logistics occupation in Kentucky during Q3 2016 was laborers and freight, stock, and material movers. As the most in-demand lightweighting job in Kentucky overall during Q3, the 1,476 online job ads posted for this position made up 18% of overall lightweighting job demand in the state. Other top Logistics jobs include production, planning, and expediting clerks (225 postings), and logisticians (68 postings).

# ADMINISTRATION



## Top posting jobs Procurement & Purchasing Q3 2016

Data: Burning Glass Technologies

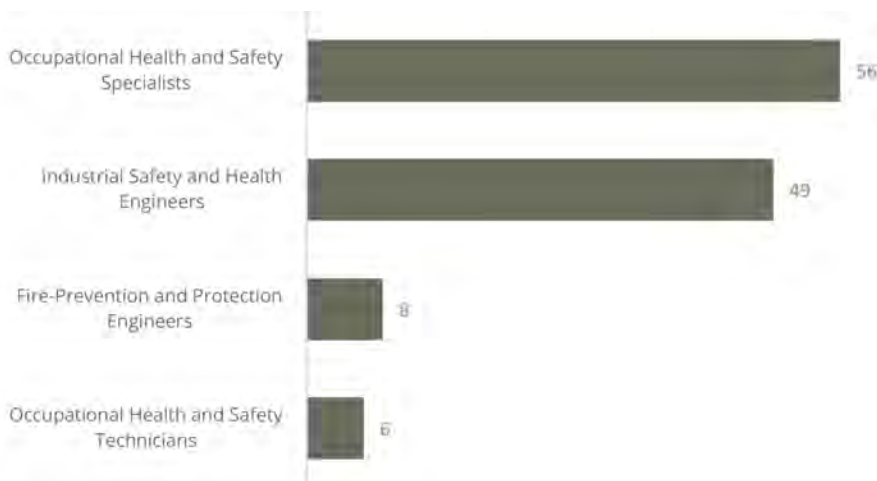
Analysis: Workforce Intelligence Network

Purchasing agents was the top in-demand Procurement & Purchasing occupation in Kentucky during Q3 2016. Cost estimators moved down to 4th place, though still retain the same 40 job postings from Q2 2016. Purchasing managers is the 2nd most in-demand occupation with 75 postings during Q3. Each of these occupations possess skills that are important to the sale and manufacture of lightweight products.

## Top posting jobs Human Safety Q3 2016

Data: Burning Glass Technologies Analysis:  
Workforce Intelligence Network

Demand for occupational health and safety specialists fell during Q3 2016 but the occupation remains the most in-demand in the Human Safety sub-group. Industrial safety and health engineers are the second most in-demand in this category.



# ADMINISTRATION

## IN-DEMAND TECHNICAL SKILLS

Job postings in the Administration occupation group seek skills and experience in purchasing and procurement, logistics and supply chain management, inventory management, and mathematics. Other technical skills that Kentucky employers may seek in Administration workers include forklift/machinery operation, labeling and packaging, customer service, and systems application products (SAP).

- Forklift operation
- Scheduling
- Inventory management, inventory control
- Labeling, packaging, sorting, cleaning
- Purchasing, procurement
- Computer skills: Microsoft Office
- Customer service, customer contact
- Mathematics
- Repair
- Logistics, shipping and receiving, SAP
- Supply chain knowledge
- Occupational health and safety

## IN-DEMAND EMPLOYABILITY SKILLS

Basic skills desired by Kentucky employers hiring Administration workers are focused on communication and organization, problem solving, and quality assurance. Q3 2016 job postings in the Administration group also indicate that these workers should have strong writing and mathematical skills as well as the desire to work as part of a team when applying for positions as purchasing agents, occupational health and safety specialists, and logisticians.

- Communication skills, telephone skills
- Ability to perform physical labor
- Organizational skills, detail-oriented
- English, writing
- Typing
- Planning
- Problem solving
- Teamwork, collaboration, building relationships
- Work area maintenance
- Project management, supervisory skills, meeting deadlines
- Multi-tasking
- Cost control

# ADMINISTRATION

## IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

Many Kentucky employers are seeking workers with entry-level experience, less than 2 years. Workers could work as laborers and material movers, for example, with some short-term training. Other in-demand occupations require more experience and education, for example logisticians, which requires a bachelor's degree. Kentucky employers required a bachelor's degree in 321 Administration postings in Q3 2016.

### Experience in-demand

Q3 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



### Education & training in-demand

Q3 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network



## WAGES

### Advertised wages

Q3 2016

Data: Burning Glass Technologies

Analysis: Workforce Intelligence Network

Only 715 of the Administration group job postings in Kentucky during Q3 2016 advertised an hourly wage or an annual salary. Of those that did, a majority (76.1%) of the job postings advertised salaries less than \$35,000 a year. The mean advertised salary for the occupation group was \$35,214, down from an average of \$37,000 in Q2 2016 postings. This shift to a lower salary could be because of increased demand for laborers moving demand away from positions requiring more education and thus demanding a higher salary.



**0-2 years**

experience most in  
demand for  
Administration  
positions

**\$35,214**

average  
advertised salary

**Post-secondary  
training or more is  
required for  
Administration  
positions**





## 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

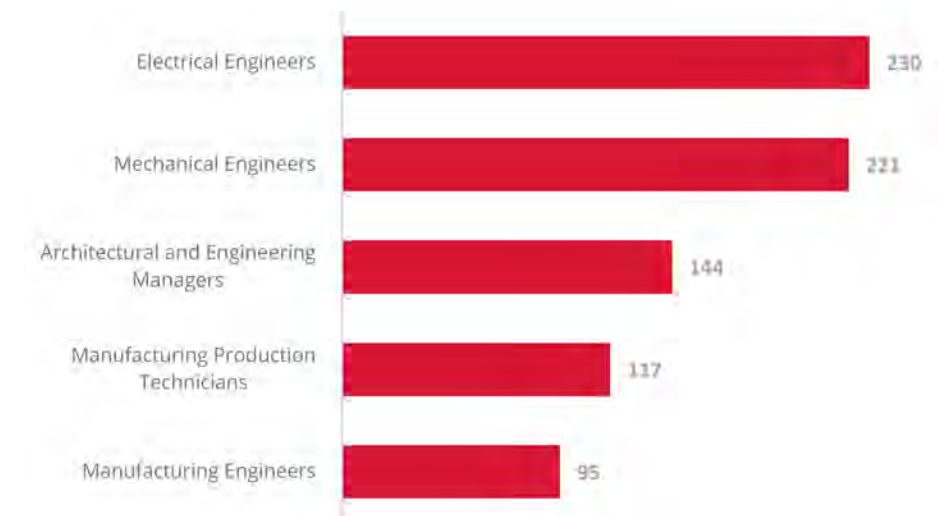
*Electrical & Mechanical Engineers perform duties related to the research, design, development, and testing of mechanical functioning, electrical, and manufacturing equipment, components, or systems for commercial, industrial, military, or scientific use.*

### 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.*



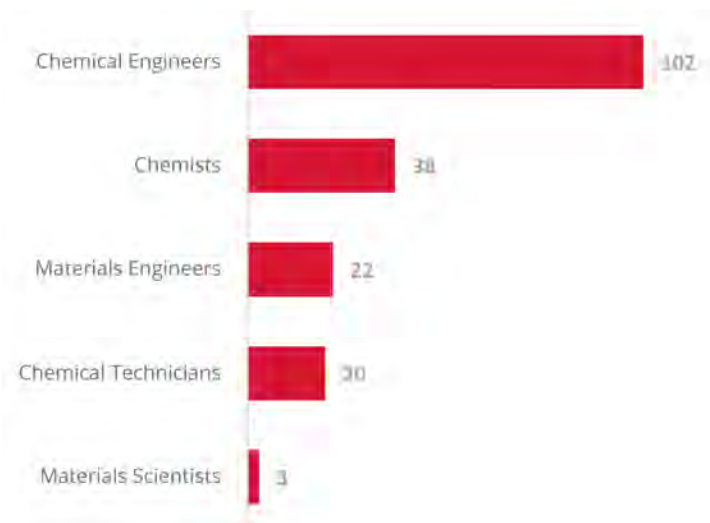
### Top posting jobs

#### Electrical & Mechanical Q3 2016

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

Electrical and Mechanical Engineers with skillsets applicable to lightweighting-related advanced manufacturing are in high demand in Kentucky. Kentucky employers posted 230 online job ads for electrical engineers between July and September 2016 and 221 ads for mechanical engineers.

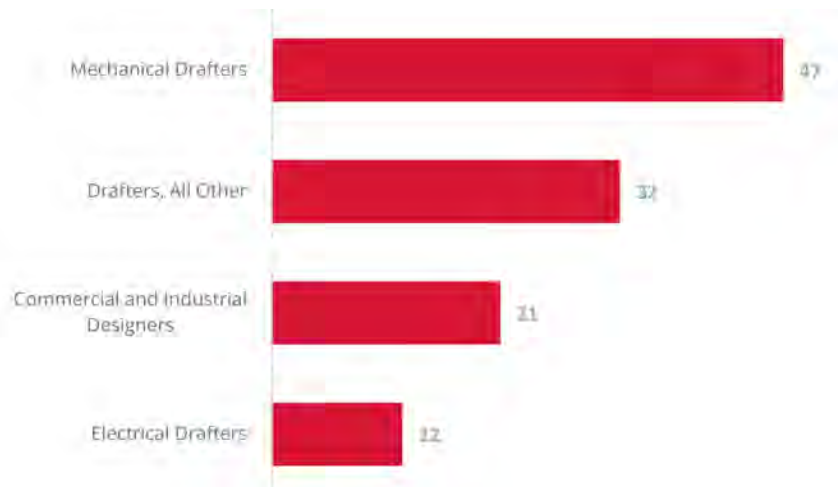
# ENGINEERING & DESIGN



## Top posting jobs Chemical & Metallurgy Q3 2016

Data: Burning Glass Technologies Analysis:  
Workforce Intelligence Network

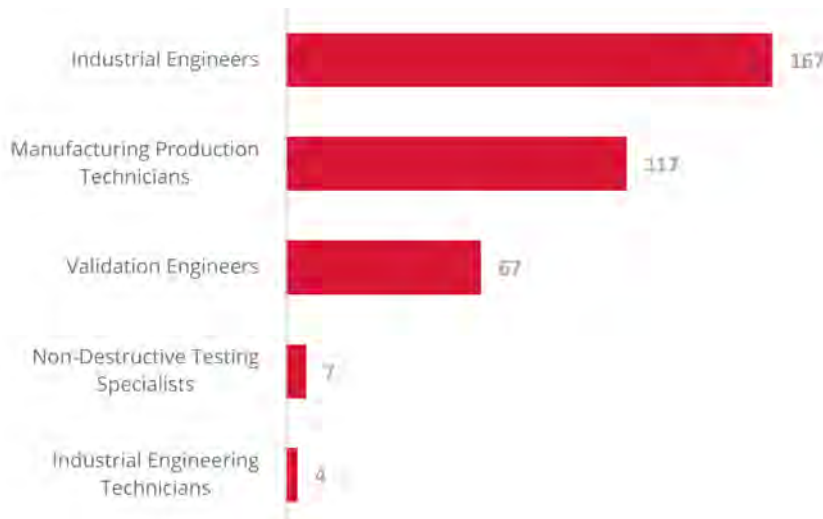
The most in-demand Chemical Engineering & Metallurgy occupation in Kentucky during Q3 2016 was chemical engineers with 102 postings. The next most in-demand occupation was chemists, with 38 postings.



## Top posting jobs Designers & Drafters Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Kentucky employers are seeking a variety of designers and drafters that have skills transferrable to lightweighting-related advanced manufacturing. Mechanical drafters remained the most in-demand during Q3 2016 with 47 postings, down from 68 online job postings in Q2.



## Top posting jobs Process & Testing Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

The most in-demand Process Engineering and Testing occupation during Q3 2016 in Kentucky was industrial engineers (167 postings down from 211 in Q2). Demand is also strong for manufacturing production technicians with 117 postings.

# ENGINEERING&DESIGN

## IN-DEMAND TECHNICAL SKILLS

Engineering occupations demand a broad range of technical skills. Many engineers will be expected to have computer aided drafting and design experience using AutoCAD, programming, and other software-related skills. Knowledge in mechanical and electrical engineering apply to specific engineering roles. Q3 2016 job postings illustrate that supervisory or managerial engineering roles require strong project management, process improvement, and cost control skills.

- Project management
- Budgeting, scheduling, cost control
- CAD/AutoCAD
- Repair, inspection
- Manufacturing processes, process engineering
- Electrical engineering
- Mechanical engineering
- Six Sigma
- Programmable Logic Controller (PLC) programming
- Technical support
- Lean manufacturing
- Schematic diagrams

## IN-DEMAND EMPLOYABILITY SKILLS

Beyond the science, mathematics, and engineering technical skills required for lightweighting-related engineering employment, engineers are expected to possess basic employability skills as well. Kentucky employers seeking to hire engineers during Q3 2016 valued candidates with strong communication and team work skills, research and computer skills (specifically Microsoft Office products), and demonstrated problem solving and project management experience.

- Communication skills
- Troubleshooting, problem solving
- Computer skills: Microsoft Office
- Planning
- Writing
- Organizational skills, detail-oriented
- Quality assurance and control
- Ability to perform physical labor
- Preventive maintenance
- Teamwork, collaboration
- Creativity
- Project planning, project development

# ENGINEERING & DESIGN

## IN-DEMAND EXPERIENCE & EDUCATIONAL ATTAINMENT

According to Q3 2016 job postings in the Engineering & Design occupation group, Eighty-six percent of the Engineering jobs posted in Kentucky during Q3 are available to workers with fewer than 5 years of experience. Engineers, however, are often required to have at least a bachelor's degree: 887 Engineering & Design job postings, 80% of postings in Q3, specified that candidates should have a bachelor's degree. Engineering jobs in technician positions are available to candidates with associate's degrees or other short-term training certificates.

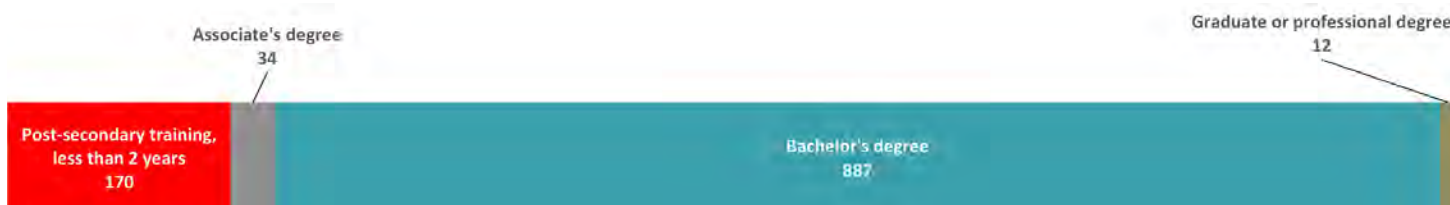
### Experience in-demand Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



### Education & training in-demand Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network



## WAGES

### Advertised wages Q3 2016

Data: Burning Glass Technologies  
Analysis: Workforce Intelligence Network

Only 367 of Q3 2016 postings in the Engineering & Design occupation group advertised salaries. Those postings that did, however, illustrate that these occupations are the highest paid of the lightweighting-related occupations in Kentucky. The high educational attainment required to secure most engineering positions translates into high earnings. Many Q3 postings (44.1%) advertised salaries over \$75,000 per year, and the mean advertised salary was \$65,056. This is down from \$69,802, the average in Q2 postings. The mean advertised salary is more than twice that of Kentucky's median annual earnings for all workers, \$32,000, but 9% lower than the median 2014 salary for Engineering & Design occupations in Kentucky (\$71,635).



**3-5 years**  
experience most in  
demand for  
Engineering &  
Design positions

**\$65,056**  
average  
advertised salary

**A bachelor's  
degree is the most  
in demand  
credential for  
Engineering &  
Design positions**





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