



Workforce Analysis Report: Energy Sector Jobs in Greater Pittsburgh

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I. Executive Summary

Report Background and Objectives

The Pittsburgh region is home to almost 1,000 companies, 41,000 direct energy jobs, and a \$19 billion economic impact, or 16% of the 10-county region's economy. Coordination across all energy sectors, seen below, is the best way to expand growth throughout the entire industry. Having a compatible workforce in place to meet demand, with appropriate skills and training, will be critical to the region's success.

TRADITIONAL SECTORS	 COAL	<ul style="list-style-type: none">- PA ranks fourth in the U.S. in coal production- High concentration of mining equipment manufacturers and other firms supporting the coal industry- Opportunities to leverage the only fossil fuel national research lab (NETL), only private sector coal R&D firm in the U.S. (CONSOL) and university research (CMU, Pitt, Penn State, WVU)
	 GAS	<ul style="list-style-type: none">- Marcellus Shale is one of the largest new plays in the U.S.; PA ranked 2nd in number of producing gas wells in the U.S.; emergence of Utica Shale increases oil and gas opportunity- Concentration of advanced materials manufacturing, heavy equipment, and chemical firms- Breakthroughs in unconventional drilling combined with continuing improvements to fracking and water treatment
	 NUCLEAR	<ul style="list-style-type: none">- Half of the world's existing reactors based on locally developed technology, resulting in proximate demand for supplies and services- On-going innovation in commercial nuclear power and Naval propulsion research creates regional hub for R&D, complemented with very high concentration of nuclear engineers and technicians
ALTERNATIVE SECTORS	 SOLAR	<ul style="list-style-type: none">- Concentration in glass, materials and electrical components position region as preferred supplier- Developing cost-competitive solar technology by improving glass and solar components
	 WIND	<ul style="list-style-type: none">- Concentration of advanced materials manufacturing, coatings, chemicals, and fiberglass firms- On-going materials research to make wind installations more efficient and cost-effective
CONSERVATION & DISTRIBUTION SYSTEMS	 TRANSMISSION & DISTRIBUTION COMPONENTS	<ul style="list-style-type: none">- Concentration of electronic systems and components for traditional and alternative energy applications- Systems integration breakthroughs are the focus of regional research consortium
	 INTELLIGENT BUILDING TECHNOLOGIES	<ul style="list-style-type: none">- Concentration of electronic systems and components for building technology applications- Academic programs for advancing building technologies

Industry, educators, the public workforce system, and policy-makers need a clear picture of the region's most pressing energy-related workforce needs, especially the anticipated supply and demand of energy-related jobs. With an understanding of common occupations across all energy sectors, talented individuals will begin to understand the "thickness" of job opportunity, the ability to put their hard-won skills to use across a variety of industries and sectors. More potential job-seekers can be encouraged to pursue the education and/or training needed to qualify, therefore helping better balance supply with demand.

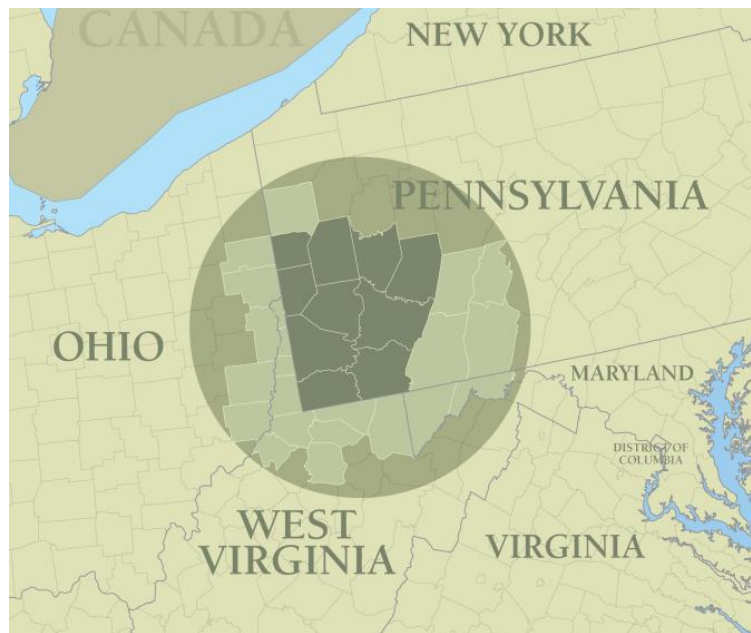
For educators and training providers, a comprehensive understanding of demand will alleviate the need to attempt to offer all things to all students. Instead they will be able to better share industry-sanctioned curriculum, while potentially forming networks of training providers to support individual centers of excellence or areas of specialty, making training both more effective and efficient for training providers. Such an approach could build upon the successful model of ShaleNET, a collaborative which provides training in targeted occupations across the entire Marcellus Shale footprint.

The Allegheny Conference on Community Development (the Conference), in partnership with the Energy Alliance of Greater Pittsburgh (Energy Alliance), engaged Development Dimensions International (DDI) to conduct an occupational analysis, the results of which are documented in the full report. The Energy Alliance, of which the Conference is a co-convenor with Innovation Works, is an initiative of nearly 100 companies, universities, governmental agencies, and non-profits dedicated to making the Greater Pittsburgh region the center of American energy in the 21st century. The occupational analysis was designed to identify “Targeted Jobs” in the 10-county region of Southwestern Pennsylvania and identify the critical knowledge, skills, and abilities required for success in those jobs. DDI is a worldwide expert in talent management and occupational analysis. The Pittsburgh-based company has conducted thousands of occupational analyses over the last 40 years for some of the largest organizations in the world, and has amassed a rich database of the knowledge, skills, and experience required for hundreds of jobs across all industries.

For the purposes of this study, Targeted Jobs were defined as those jobs meeting the following two criteria:

1. Employers in the region anticipate high-volume hiring from the present through 2020.
2. Employers have experienced and expect to continue experiencing difficulty finding applicants with the required skills from within the current available workforce.

While the focus of this analysis has been the 10 counties of southwestern Pennsylvania, the footprint of the Energy Alliance is greater, mirroring that of the Power of 32. The Power of 32 bridges the borders of 32 counties and four states to create a shared vision that covers 17,380 square miles. This larger footprint is home to 1,700 energy establishments responsible for 60,000+ direct energy jobs and a \$25 billion economic impact—direct and indirect—or 15% of the greater region’s economy. The findings of this occupational analysis will be correlated to demand across the additional 22 counties to develop a broader, proactive collaborative focused on increasing the availability of high-demand energy talent.



Target Jobs Identified

An online survey was completed by a cross section of 37 organizations representing all seven energy sectors: Coal, Gas, Nuclear, Solar, Wind, Transmission and Distribution, and Intelligent Building Technologies. Analysis of survey data was conducted to identify Target Jobs for which forecasted hiring volume through 2020 is high and for which employers expressed low confidence in their ability to find candidates with the required knowledge, skills, and experience. The analysis yielded 14 Target Jobs. Interviews and focus groups were conducted with subject matter experts across these organizations to identify the knowledge, skills, and experience needed for each of the Target Jobs.

TARGET JOBS	SAMPLE JOB TITLES
Helpers—Installation, Maintenance, and Repair Workers	Maintenance Technician, Maintenance Mechanic, Building Equipment Operator (BEO), Maintenance Helper, Trades Helper, Well Tender, Facilities Maintenance Technician, Mechanic Helper
Mechanical Engineers	Mechanical Engineer, Design Engineer, Product Engineer, Mechanical Design Engineer, Process Engineer, Equipment Engineer, Design Maintenance Engineer, Systems Engineer
Inspectors, Testers, Sorters, Samplers, and Weighers	Inspector, Quality Inspector, Quality Technician, Quality Assurance Inspector, Quality Control Inspector, Quality Auditor, Picker/Packer, Quality Assurance Auditor, Quality Control Technician
First-Line Supervisors of Construction Trades and Extraction Workers	Construction Supervisor, Construction Foreman, Construction Superintendent, Project Manager, Field Supervisor, Project Superintendent, Job Foreman, Field Operations Supervisor, General Foreman
Electrical Engineers	Electrical Engineer, Electrical Design Engineer, Project Engineer, Electrical Controls Engineer, Test Engineer, Hardware Design Engineer, Circuits Engineer, Electrical Project Engineer
First-Line Supervisors of Production and Operating Workers	Production Supervisor, Manufacturing Supervisor, Team Leader, Shift Supervisor, Production Manager, Supervisor, Assembly Supervisor
Welders, Cutters, Solderers, and Braziers	Welder, Welder-Fitter, Fabricator, Maintenance Welder, MIG Welder, Sub Arc Operator, Brazier, Solderer, Electrical Assembler
Industrial Machinery Mechanics	Maintenance Mechanic, Maintenance Technician, Mechanic, Engineering Technician, Master Mechanic, Industrial Machinery Mechanic, Machine Adjuster, Overhauler, Industrial Electrician, Industrial Mechanic
Sales Managers	Sales Manager, Sales Supervisor, Sales Representative
Heavy and Tractor-Trailer Truck Drivers	Truck Driver, Driver, Over the Road Driver (OTR Driver), Delivery Driver, Road Driver, Semi Truck Driver
Petroleum Engineers	Reservoir Engineer, Petroleum Engineer, Drilling Engineer, Petroleum Production Engineer, Operations Engineer, Completions Engineer
Property and Real Estate Managers (Landman)	Landman, Property Manager, Lease Administration Supervisor, Leasing Manager
Computer-Controlled Machine Tool Operators, Metal and Plastic	Computer Numerical Control (CNC) Operator, CNC Machinist, CNC Lathe Operator, CNC Machine Operator, CNC Mill Operator, CNC Set Up Technician, CNC Set-Up Operator
Machinists	Machinist, Tool Room Machinist, Machine Operator, Machine Repair Person, Machinist Tool and Die, Automation Technician, Gear Machinist, Maintenance Specialist, Set-Up Machinist

Key Findings

While the sample size (37 organizations across all seven energy sectors) is not sufficient to make detailed statistical inferences about levels of demand by specific job and sector, the study's descriptive statistics are of substantial practical significance. As detailed in the full report, the study has clearly and unequivocally identified *14 critical, difficult-to-fill jobs for which nearly 2,000 hires are forecasted between now and 2020*. And that is just for these 37 organizations. The actual number of hires into these jobs across almost 1,000 energy companies in the 10-county region will be much higher. In addition, demand for these occupations is strong in other economic sectors beyond energy, intensifying potential talent shortages. Because we know these jobs are difficult to fill due to shortages of skills in the current workforce, the critical importance of closing the skills gap is clear.

*Target Jobs defined as
High Volume Hiring
Forecasted + Shortage
of Required Skills*

Details from the online jobs survey and complete job profiles for each of the 14 Target Jobs are available in the full report. The following important outcomes and trends underscore the need for proactive, coordinated regional workforce development.

High Volume Hiring – For the period of 2012-2020, over 7,000 hires were forecasted from these 37 organizations alone, with almost 2,000 of those coming from the difficult-to-fill Target Jobs. Approximately 40% of this forecasted hiring volume is attributable to growth in the industry, with the remaining hires linked to attrition/retirements in the current workforce. When we extrapolate those numbers from 37 organizations to the region's additional 900+ existing energy-related organizations, the magnitude of the potential talent shortfall is considerable and reinforces a collective call to action.

Employers Concerned about Workforce Readiness – Organizations expressed serious concerns regarding their ability to fill these Target Jobs with the current available workforce. Survey respondents indicated being highly confident in their ability to fill only 1 of every 5 forecasted Target Job openings. The most common reason for their lack of confidence was the deficiency in technical and/or professional skills required to perform these jobs.

Target Jobs in Multiple Sectors – Each of the 14 difficult-to-fill Target Jobs appear in two or more energy sectors (coal, gas, nuclear, solar, wind, transmission and distribution, and intelligent building technologies).

*High demand,
difficult-to-fill
jobs across
multiple energy
sectors.*

Nine of the 14 Target Jobs appear across three or more sectors. Mechanical Engineers are required across all six sectors.¹ Efforts to build the needed workforce skills for any one of these jobs will have a positive effect across the region's broader energy footprint.

TARGET JOBS	Coal	Gas	Nuclear	Solar	Transmission and Distribution	Wind
Mechanical Engineers	●	●	●	●	●	●
Electrical Engineers	●	●	●		●	●
First-Line Supervisors of Production and Operating Workers	●	●			●	●
Welders, Cutters, Solderers, and Braziers		●	●	●	●	
Computer-Controlled Machine Tool Operators, Metal and Plastic		●			●	●
Helpers—Installation, Maintenance, and Repair Workers		●			●	●
Industrial Machinery Mechanics	●	●			●	
Machinists	●		●	●		
Sales Managers	●	●			●	
First-Line Supervisors of Construction Trades and Extraction Workers	●	●				
Heavy and Tractor-Trailer Truck Drivers		●			●	
Inspectors, Testers, Sorters, Samplers, and Weighers			●	●		
Property, Real Estate Managers (Landman)	●	●				
Petroleum Engineers		●				

As part of the scope of this project, DDI conducted a review of relevant literature. The specific recommendations for action included in this report are based on consideration of the analysis findings and both broad and specific recommendations made in a number of significant national studies.²

¹Survey response from the Intelligent Building and Design sector was not sufficient for inclusion in the cross-sector comparisons.

² For example, see *Pathways to Prosperity*, Harvard Graduate School of Education, February 2011; *Across the Great Divide: Perspectives of CEOs and College Presidents on America's Higher Education and Skills Gap*, Civic Enterprises, Corporate Voices for Working Families in Association with Institute for a Competitive Workforce, U.S. Chamber of Commerce, Peter D. Hart Research Associates, 2011; *The Ill-Prepared U.S. Workforce*, The Conference Board et al, 2009; *STEM: Good Jobs Now and for the Future*, U.S. Department of Commerce 2011; *Building a Science, Technology, Engineering and Math Education Agenda*, National Governors Association, 2011.

Target Jobs: Wages and Required Knowledge, Skills, and Experience

Postsecondary Education – Thirteen of the 14 Target Jobs require certification and/or degrees beyond high school/GED. Additional details regarding reported education requirements can be found in the full report.

TARGET JOBS	Annual Wages ³		Education and Experience Required
	Entry Wage (\$)	Experienced Wage (\$)	
Inspectors, Testers, Sorters, Samplers, and Weighers	25,010	46,580	High School or GED
Heavy and Tractor-Trailer Truck Drivers	30,800	49,640	High School or GED plus Trade School and Certifications
Helpers—Installation, Maintenance, and Repair Workers	17,590	32,890	
Welders, Cutters, Solderers, and Braziers	26,620	41,740	
Computer-Controlled Machine Tool Operators, Metal and Plastic	28,430	41,060	Most positions require Associate Degree
Machinists	28,500	45,390	
Property, Real Estate, and Community Association Managers (Landman)	46,640	88,860	
First-Line Supervisors of Construction Trades and Extraction Workers	49,980	77,850	
First-Line Supervisors of Production and Operating Workers	38,390	67,540	
Mechanical Engineers	60,010	95,570	Bachelor's Degree
Electrical Engineers	60,030	100,790	
Industrial Machinery Mechanics	35,030	53,810	
Sales Managers	61,040	141,580	
Petroleum Engineers	60,150	165,640	

³ From the Pennsylvania Department of Labor and Industry's Center for Workforce Information and Analytics. Data is from the Three Rivers Workforce Investment Area.

Key Workforce Competencies – In addition to the technical educational requirements identified in this study, there were a range of critical behavioral competencies important for success in each of the 14 Target Jobs. A comprehensive mapping of Target Jobs to behavioral competencies and complete definitions of those competencies is documented in the full report. Some of the developable competencies that appeared most frequently across these jobs included:

- Decision Making
- Safety Awareness
- Communication
- Planning and Organizing
- Contributing to Team Success

These and other workforce competencies should be addressed in specialized curricula and learning tracks for each of the Target Jobs.

Recommendations for Action

1. Industry, the public workforce system, and educational institutions need to collaborate, developing common messaging to effectively *promote the long-term stability and earning potential of these energy-related careers*. A focused effort within energy sectors could have sustained impact.
2. Competition for talent is already tight in many of the occupations identified in this study. Tight supply of talent means energy companies will be competing with other economic sectors. Collaboration among energy companies to market these jobs aggressively, especially to younger talent, as *high-paying, important, and rewarding careers* must become a top priority. Companies in every energy sector need to work together closely to eradicate outdated perceptions of energy jobs, especially those considered middle-skill level. Given the growing global focus on the importance of energy, these jobs can and should be promoted as key contributors to our nation's goal of energy security.
3. In advising both youth and adults on career opportunities, *more emphasis should be placed on occupational competencies and skills*, rather than discussions focused solely on a single industry or sector. As this analysis demonstrates, common skill sets are in high demand across numerous sectors. Such a focus will help talent better understand the depth of job opportunity and can also help create a more agile workforce.
4. *Clear educational pathways between secondary and postsecondary education and training need to be articulated* and far more widely promoted. The traditional dichotomy of college track vs. non-college is no longer a useful construct; the reality is that a 21st-century energy workforce will not only require post-secondary education, but will need to remain in a continuous learning mode.
5. It will be critical to extend awareness of the depth and significance of energy-related economic opportunity—and what will be required from students—to teachers and school administrators focused on grades K-8, not just those serving high school. *Middle and high school students all require a strong grounding in a rigorous STEM (Science, Technology, Engineering, and Math) curriculum*. Increasing technological advances in all aspects of the workplace will demand the kind of literacy developed through STEM coursework. At the same time, it is important to build real-world relevancy into STEM curriculum; such focus can serve a dual purpose of engagement and career awareness.

-
6. *Industry must take the lead* in proactively creating and supporting partnerships with and among regional secondary, technical, and community colleges, helping to ensure effective curricula and learning tracks for each of the Target Jobs. New approaches need to be explored that would cover both the technical and behavioral skills identified in this study. Classroom instruction on “soft skills” (e.g., Decision Making, Communication, Teamwork), not just technical ones, should be accompanied by a workplace experience for students so that they can apply the required competencies in a real-world setting.
 7. Job shadowing, internships, and problem-based learning outside the classroom have all been proven to be effective in creating *greater career awareness in high school students*. This in turn can help students make better informed post-secondary educational choices. A collaborative approach to sponsoring such programs among energy companies could have a significant influence in the region. Company investment in such endeavors is also a strong public statement that the skills being taught are highly valued by employers.
 8. Industry must be much more proactive with educators, guidance counselors, and school administrators to *give greater clarity* to what educational and curricular elements will be required by jobs in a rapidly advancing energy industry. At the same time, students will be best served if they are clearly informed about multiple educational and training alternatives, including promotion of 2+2+2, apprenticeship, and other pathways from high school to career.

II. Survey Process and Results

Timeline Overview

The study began in February 2011 with an initial round of interviews conducted to gather input from regional employers and stakeholders. Based on this information, an online survey was designed and organizations were asked to respond. Interviews and focus groups were then conducted with employers to identify the knowledge, skills, and abilities required in each of the Target Jobs.

- *February-March 2011*: Initial Stakeholder/Employer interviews conducted
- *May-June 2011*: Pilot Survey designed and launched
- *July 2011*: Final survey designed and loaded to online system
- *August 2011*: Database of survey recipients developed
- *September 12, 2011*: Initial invitation letters sent to survey respondents
- *October 4, 2011*: Follow up letter sent to survey respondents
- *October 31-November 4, 2011*: Follow-up calls made to survey respondents
- *Mid-December 2011*: Follow-up calls to HR contacts
- *January 13, 2012*: Survey closed
- *February-May 2012*: Interviews and focus groups scheduled and conducted

Initial interviews and summary of outcomes

Interviews were conducted with senior leaders in each of the following businesses and learning institutions. These interviews were used to help frame the approach for the study and for generating an initial list of jobs to include in the survey phase.

- Alcoa
- Bayer Corporation
- CONSOL Energy, Inc.

-
- Eaton Corporation
 - Elliott Company
 - Flabeg Solar US Corporation
 - Gamesa USA
 - PPG Industries, Inc.
 - Range Resources-Appalachia, LLC
 - Slippery Rock University
 - University of Pittsburgh
 - Westinghouse Electric Company
 - Westmoreland County Community College

Pilot Survey

Based on the results of the interviews, a review of relevant literature and a search on the Department of Labor’s online O*Net database, a baseline list of jobs in the energy sector was compiled and incorporated into an online survey. A pilot survey was launched to 20 organizations, 10 larger and 10 smaller organizations. The purpose of the pilot survey was to confirm that the survey content and format was user-friendly and would yield interpretable results, from organizations of varying sizes and sectors.

A total of eight responses were received from the pilot survey. The sectors and sizes represented are included in Table 1. Based on feedback from the pilot respondents, no modifications were made to the format of the survey, or the questions asked. However six additional job titles were added to the final survey. In both the pilot and the full survey, an “other” option was available for respondents to list jobs not in the survey list.

Table 1.

Organization Size	Sector
Small	Services
Small	Intelligent Building
Small	Wind
Large	Coal
Large	Transmission and Distribution
Large	Natural Gas
Large	Wind/Solar
Large	Nuclear

Data Gathering

The Conference provided an initial database of 769 energy-related companies in the 10-county region. Invitation letters were sent to each organization with instructions detailing how to access the survey. A copy of the invitation letter is contained in *Appendix 1*.

In the survey, respondents were asked to identify up to 10 jobs for which their organization anticipated high volume hiring. Jobs were displayed in the survey as drop-down lists of possible jobs (“other” was one possibility, with a space provided to indicate job title). Respondents were then asked a series of questions about those jobs, including the number of people they had hired recently (2010-2011) and the number of people they anticipated hiring over the next two years (2012-2013) and in the future (2014-2020). They were asked to consider hires due to replacement (turnover, retirement, etc.) and growth. For each of these questions, they were given ranges of hires to select from (e.g., one-10 people, 10-25 people, etc.) A screenshot of the online survey is contained in *Appendix 2*, and a full listing of job titles on the survey is included in *Appendix 3*.

Next they were asked to rate their confidence in finding qualified applicants to fill those open positions, on a scale from 1-5, with 1 = very low confidence and 5 = very high confidence. They were also asked what percentage of these hires would be due to growth and what percentage would be full-time hires.

Finally, they were asked to select their reasons for having low confidence in hiring for any of the positions they listed. They were given the following options and could select none, some, or all of the responses.

- Too many resumes received from unqualified applicants
- Qualified applicants able to find jobs elsewhere with more favorable pay/benefits
- Too much growth in this type of position to keep up with supply of qualified applicants
- Qualified applicants not located in this area/unwilling to relocate
- Applicants deficient in technical/professional skills
- Applicants deficient in fundamental competencies (communication, teamwork, problem solving, etc.)
- Applicants deficient in required education/certifications
- Applicants deficient due to lack of previous experience
- Qualified applicants are unwilling to perform the work due to hours, work conditions, or other requirements

Sample

Ultimately, completed surveys were gathered from 37 organizations. A complete list of participating organizations is included in *Appendix 4*. A summary of the sectors represented by the responding organizations is included in Table 2 below. (Some organizations were identified as belonging to multiple sectors.) Additional steps were taken to reach a broader sample of responding organizations. These steps are summarized in *Appendix 5*.

Table 2.

Sector	Extraction	Supply Chain / Manufacturing	Services	Total
Gas	8	4		12
Transmission and Distribution		6	2	8
Coal	1	4		5
Nuclear		4		4
Wind	1	3		4
Battery		3		3
Solar		2		2
Intelligent Building		1		1
Other / Not Specified	1	3	3	7
Total:	12	30	5	46

In total 74 different jobs were identified with 39 of those identified by more than one respondent. The number of jobs identified per participating organization ranged from one high demand job to 10 high demand jobs (see Table 3 for a summary).

Table 3.

Number of High Demand Jobs Identified (1-10)	Number of Companies
10	3
9	0
8	2
7	2
6	3
5	7
4	5
3	8
2	4
1	3

Summary of Forecasts

Respondents indicated a range of numbers in their forecasted hires that allowed calculating three possible forecasts: Low Estimates, Mid-Point Estimates, and High Estimates. The Low Estimate used the lowest number in each range (e.g., one job if the respondent indicated they would hire one-10 people), the High Estimate used the high end (10, in the example above) and the Mid-point used the middle number in that range (five, in this example).

Table 4.

	Actual Hires 2010-2011	Predicted Hires 2012-2013	Predicted Hires 2014-2020	Total Predicted Hires 2012 - 2020	Average Number of Hires per Company 2012 - 2020
Low Estimate	--	1,960	2,913	4,873	132
Mid-point Estimate	2,567	3,295	4,452	7,747	209
High Estimate	--	4,630	5,990	10,620	287

Overall, these numbers support other projections that there will be continued growth in hiring in the energy sector in the region. It is not clear why the forecast per year drops off in the years 2014-2020, though respondents may have tended to be more conservative when projecting further out given the constant change likely to continue across the energy sectors.

The percentage of these hires anticipated due to growth (versus replacement) varied greatly across responses (see Table 5). Ultimately, regardless of whether a job is available due to an aging and retiring workforce or due to growth in the field—if there are jobs available and it is difficult to find qualified applicants for those positions, the workforce gap will need to be addressed.

Table 5.

Percentage Target Job Hires Due to Growth	Percentage of Total Survey Responses
Less than 10%	25%
10-30%	21%
30-50%	16%
50-75%	13%
Over 75%	24%
Did not answer	1%

Similarly, survey respondents indicated whether hires were anticipated to be full time or part time. The data indicated that the vast majority of hires for Target Jobs will be for full-time positions, as indicated in Table 6.

Table 6.

Percentage Target Job hires expected to be full time (survey response options)	Percentage of Total Survey Responses	Total
100%	71%	71.00%
75%	18%	13.50%
50%	5%	2.50%
25%	2%	0.50%
0%	4%	0.00%
Total percentage of Target Jobs expected to be full time		87.50%

Confidence in Hiring

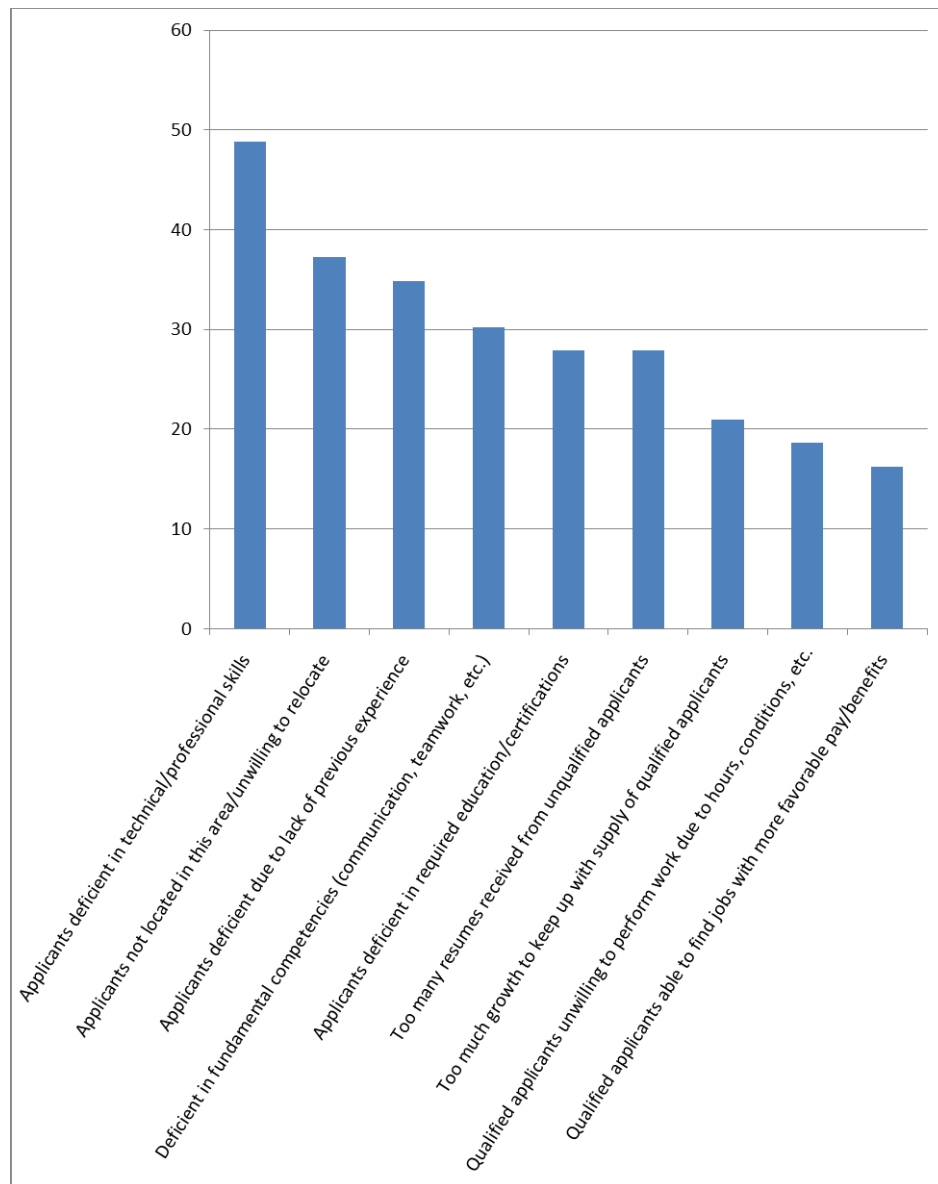
Confidence was calculated both by averaging responses overall and also by weighting those responses by the number of forecasted jobs. *Overall, only 24% of total respondents indicated high or very high confidence in hiring for their open positions. That number dropped to 18% when factoring in the number of job openings forecasted.* A summary of this data is presented in Table 7.

Table 7.

Confidence in Hiring	Percentage of Total Responses	Percentage Weighted by Number of Hires Forecasted
Very Low Confidence	9%	15%
Low Confidence	31%	23%
Moderate Confidence	36%	44%
High Confidence	17%	12%
Very High Confidence	7%	6%

All of the survey options for having low confidence in hiring were selected at least some of the time. These results are presented in Figure 1. The most common reasons cited were “Applicants deficient in technical/ professional skills,” “Qualified applicants not located in this area/unwilling to relocate,” “Applicants deficient in fundamental competencies,” and “Applicants deficient in required education/certifications,” with at least 30% of respondents selecting each of these. This supports the need to develop better training for local applicants to help fill these high-demand jobs in the future.

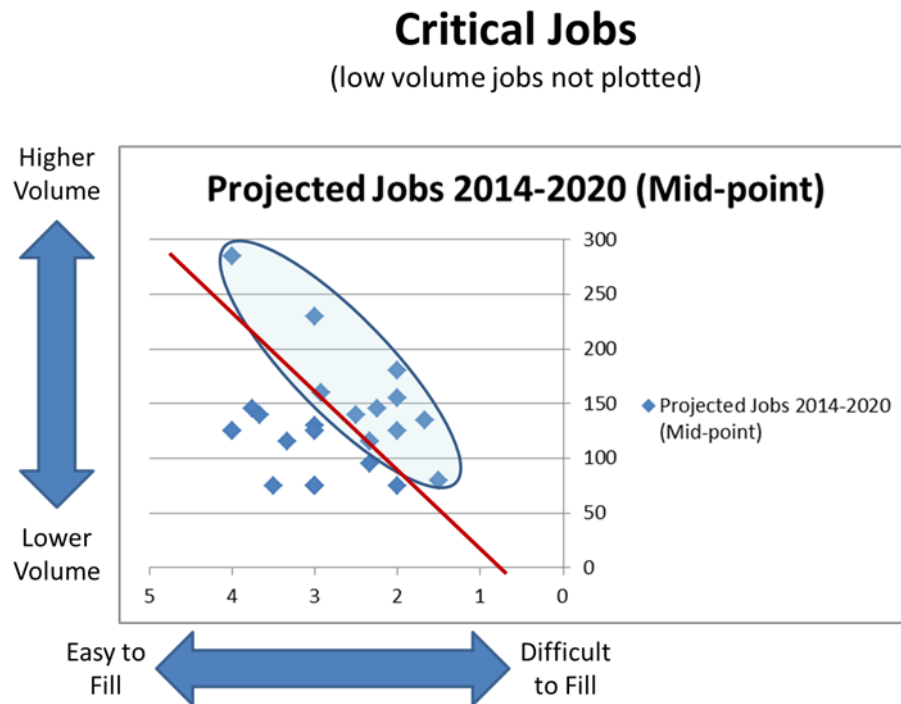
Figure 1.



Process for Identifying Target Jobs

For purposes of this study, it was necessary to identify what the most critical high-demand, hard-to-fill positions in a manner that would take into consideration differences across large and small organizations, projected job volume and confidence (or lack thereof) in the ability to find the required knowledge, skills, and experience within the current workforce. Figure 2 plots the volume of forecasted hires against difficulty to fill. From this perspective, positions plotted above and to the right of the diagonal red line would fit the definition of Target Jobs in the present study.

Figure 2.



Three factors for identifying Target Jobs work combined into a single metric of Target Job Criticality:

1. Overall volume (number of hires projected for 2014-2020)
2. Priority associated with each job relative to other high-demand jobs identified by any given organization
3. Confidence in ability to hire for that job

These factors were designed to balance high volume, without overemphasizing individual large companies, while at the same time incorporating difficulty in hiring. A single metric of Target Job Criticality was calculated by creating and combining three separate ranking methods:

- The total number of projected jobs for 2014-2020 were tallied, and a ranking given to each job title, from highest number of jobs to lowest
- Jobs were given a point count based on the priority given it by the respondents (e.g., If the job was listed as #1 priority job, it received 10 points, #2 job, 9 points, etc.). The total number of points for each job title were tallied and then given a ranking, highest points to lowest points
- Finally, job titles were ranked from lowest to highest in terms of confidence in filling the position

An average of the three rankings was used to tabulate the final Target Job list. Because rankings were from 1 to the highest number, the final Target Job Criticality score was calculated as the inverse: $(1/\text{Average Ranking}) \times 100$.

Target Job List

The list of Target Jobs and their Criticality Score is listed in Table 8. Organizations forecasting to hire from any of the top 14 jobs on this list were identified for the interview stage of the study in which information about key skills, knowledge, and experience areas was gathered.

Table 8.

Target Jobs	Criticality Score	SOC Code
Helpers—Installation, Maintenance, and Repair Workers	33.33	49-9098.00
Mechanical Engineers	11.11	17-2141.00
Inspectors, Testers, Sorters, Samplers, and Weighers	10.00	51-9061.00
First-Line Supervisors of Construction Trades and Extraction Workers	9.71	47-1011.00
Electrical Engineers	9.35	17-2071.00
First-Line Supervisors of Production and Operating Workers	9.09	51-1011.00
Welders, Cutters, Solderers, and Braziers	7.87	51-4121.00
Industrial Machinery Mechanics	7.69	49-9041.00
Sales Managers	7.52	11-2022.00
Heavy and Tractor-Trailer Truck Drivers	6.99	53-3032.00
Petroleum Engineers	6.67	17-2171.00
Property and Real Estate Managers (Landman)	6.67	11-9141.00
Computer-Controlled Machine Tool Operators, Metal and Plastic	6.67	51-4011.00
Machinist	6.37	51-4041.00
Solar Energy Systems Engineers	6.25	17-2199.11
Software Developers, Systems Software	5.78	15-1133.00
Safety/Risk Management Specialists	5.65	13-2099.02

Target Jobs Across Energy Sectors

After Target Jobs were identified as described above, these jobs were cross-referenced by energy sector. Table 9 shows that each Target Job with the exception of Petroleum Engineers was identified by organizations from at least two and up to six different sectors. (Specific numbers of organizations forecasting high volume hires across target jobs/sectors is contained in *Appendix 6*). This underscores the importance of coordinating the development of workforce skills across all energy sectors.

Table 9.

TARGET JOBS	Coal	Gas	Nuclear	Solar	Transmission and Distribution	Wind
Mechanical Engineers	•	•	•	•	•	•
Electrical Engineers	•	•	•		•	•
First-Line Supervisors of Production and Operating Workers	•	•			•	•
Welders, Cutters, Solderers, and Braziers		•	•	•	•	
Computer-Controlled Machine Tool Operators, Metal and Plastic		•			•	•
Helpers—Installation, Maintenance, and Repair Workers		•			•	•
Industrial Machinery Mechanics	•	•			•	
Machinists	•		•	•		
Sales Managers	•	•			•	
First-Line Supervisors of Construction Trades and Extraction Workers	•	•				
Heavy and Tractor-Trailer Truck Drivers		•			•	
Inspectors, Testers, Sorters, Samplers, and Weighers			•	•		
Property, Real Estate Managers (Landman)	•	•				
Petroleum Engineers		•				

The number of forecasted hires for these jobs is listed in Table 10. Again, survey respondents indicated a range of numbers in their forecasted hires that allowed calculating three possible forecasts: Low Range Estimates, Mid-Point Estimates, and High Range Estimates. As with the broader sample, some of these new jobs are due to growth and some due to anticipated retirements and replacements. Specific Target Jobs anticipating high volume hires due to growth include Petroleum Engineers, Mechanics, and Truck Drivers, with an average response of over 50% of their openings being due to growth.

Table 10.

Range of Projected Hires for Target Jobs 2014-2020	Low Range Estimate	Midpoint	High Range Estimate
Property, Real Estate Managers (Landman)	140	195	250
Helpers—Installation, Maintenance, and Repair Workers	111	181	250
Mechanical Engineers	87	164	240
First-Line Supervisors of Construction Trades and Extraction Workers	120	155	190
First-Line Supervisors of Production and Operating Workers	112	151	190
Sales Managers	103	142	180
Inspectors, Testers, Sorters, Samplers, and Weighers	102	136	170
Electrical Engineers	81	131	180
Heavy and Tractor-Trailer Truck Drivers	71	116	160
Software Developers, Systems Software	71	116	160
Petroleum Engineers	61	96	130
Computer-Controlled Machine Tool Operators, Metal and Plastic	51	81	110
Welders, Cutters, Solderers, and Braziers	24	57	90
Industrial Machinery Mechanics	24	57	90
Machinists	23	52	80
Total	1,181	1,830	2,470

As with the broader sample, the vast majority of Target Jobs are projected to be full-time hires (see Table 11).

Table 11.

Percentage Target Jobs expected to be filled with full-time hires	Percentage of Total Responses
100%	77%
75%	15%
50%	4%
25%	0%
0%	4%

Additional Comparisons

To corroborate these findings with other available job forecasts, we obtained data from the Pennsylvania Department of Labor and Industry's Center for Workforce Information and Analytics (CWIA) for the 10-county region. The CWIA data lists the number of job postings in January 2011 and January 2012 and the percentage change across these years (see Table 12). A perfect correlation across these two data sources would not be expected. One is based on previous job posting, the other on forecasted openings. Nonetheless, it is noteworthy that eight of the 11 Target Jobs for which CWIA data were available have experienced a 30% or greater increase in job postings over the most recent calendar year.

Table 12.

Target Jobs	Jan-2011	Jan-2012	Percent Change
Machinists	133	243	82.7%
First-Line Supervisors of Production and Operating Workers	281	507	80.4%
Industrial Machinery Mechanics	34	61	79.4%
First-Line Supervisors of Construction Trades and Extraction Workers	120	205	70.8%
Welders, Cutters, Solderers, and Braziers	107	178	66.4%
Inspectors, Testers, Sorters, Samplers, and Weighers	41	62	51.2%
Heavy and Tractor-Trailer Truck Drivers	846	1,135	34.2%
Mechanical Engineers	200	266	33.0%
Computer-Controlled Machine Tool Operators, Metal and Plastic	62	73	17.7%
Electrical Engineers	187	201	7.5%
Helpers—Installation, Maintenance, and Repair Workers	26	25	-3.8%
Sales Managers	-	-	-
Petroleum Engineers	-	-	-
Property, Real Estate Managers (Landman)	-	-	-

Likewise, the ManpowerGroup recently released its seventh-annual Talent Shortages Survey (May 29, 2012). The top-10 most difficult to fill jobs from that study are listed in Table 13. Five of the Target Jobs identified in the present study are projected to experience shortages not only within the energy sector, but across all sectors.

Table 13.

Jobs	Target Jobs
1. Skilled Trades	●
2. Engineers	●
3. IT Staff	
4. Sales Representatives	
5. Accounting & Finance Staff	
6. Drivers	●
7. Mechanics	●
8. Nurses	
9. Machinists/Machine Operators	●
10. Teachers	

III. Job Analysis Interviews and Focus Groups

Data Gathering

Having identified the Target Jobs, the next phase of the process was to identify the critical skills, knowledge, experience, and education required for each of those jobs. The companies who identified the Target Jobs on their surveys were contacted for a follow-up interview. Several additional companies were identified by the Conference that were likely to be hiring for the Target Jobs. These companies were also contacted for an interview. In the end, interviews and focus groups were conducted with at least two and up to six companies for every Target Job. The exception here was for the job “Inspectors, Testers, Sorters, Samplers, and Weighers” for which only one organization was interviewed.

Baseline competencies for each of the target roles were drawn from DDI’s job analysis database. This database contains rated/ranked competencies from hundreds of job analyses conducted across roles comparable to those in this study. These baseline competencies were incorporated into the interview protocol, and interview participants were asked to indicate the criticality of these competencies and to identify any additional critical competencies.

Baseline information for Knowledge ,Tools, and Experience was drawn from the Department of Labor’s O*Net database. Similarly, interview participants were asked to review these initial lists and add/modify as necessary.

After all interviews were completed, the results were compiled into a role profile for each Target Job. These profiles are listed in Appendix 7. A summary of the behavioral competencies required across the Target Jobs is provided in Appendix 8, and a summary of education requirements is provided in Appendix 9.

Ease of Development of Competencies

Behavioral competencies (Communication, Decision Making, Adaptability, etc.) were one of the key components of the role profiles developed and refined in through the interview process. The concept of “developable” and “less developable” competencies has been used in the selection and assessment processes (to evaluate and weigh competencies) and in the training and development processes.

If a job candidate demonstrates “less than acceptable” skill in a developable competency, an organization might choose to hire the person and build that skill if time and resources are available to develop the employee. Organizations are less likely to select candidates who show “less than acceptable” skill in a competency that is harder to develop or in one for which development time and resources is not available.

The more a competency represents characteristics that are primarily inherited or learned early in life, the more difficult it is to develop that competency later in life. The most developable competencies are skills or knowledge that people can learn with moderate instruction without relying strongly on fundamental cognitive abilities, personality characteristics, or extensive experience.

A summary of the ease of development ratings for competencies identified in this study are listed in Appendix 10. These ratings are derived from DDI’s experience in building systems for the selection and development of personnel against these competencies. Full behavioral definitions for the competencies identified in this study are contained in Appendix 11.

Additional Representative Comments from Interviews and Focus Groups

The interviews conducted in this study were designed to identify and confirm the critical knowledge and skills required for the Target Jobs. During the course of these interviews, addition comments and observations were gathered that offer insight into the challenges and opportunities relating to the existing workforce and the requirements of the energy field. A sampling of those comments is provided here.

- We will be hiring at all levels including skilled laborer jobs, technicians, engineers, supervisory, and managerial positions.
- Business has grown through cycles upturns and downturns in the industry that have caused uneven age demographics. Large number near retirement and recent hires from 2008-09, but fewer mid-career.
- A local welding school closed that has reduced the pool of new welders. Something needs to be done to interest prospective students in the career.
- Hiring organizations need to provide better job previews to ensure fit (working in weather, Tuesday-Saturday shifts, 14-on/14-off shifts, etc.).
- Returning veterans and individuals accustomed to the hour/schedules of agriculture often fit well with non-traditional shift work.
- New hires don’t come in with knowledge of the energy industry. Not enough people going into these fields.
- The biggest problem is there simply aren’t enough young people becoming machinists.

-
- Difficult to hire for even the most basic jobs unless applicant has some fundamental computer skills (to pull up inspection routs, consult online d-base for technical specs, etc.)—so implication is to hire via online application to screen out candidates who are not able to interact with computer.
 - Not enough people know about it and how the machine, tool, process, etc., work. Never saw it in action, never had experience installing it, more or less they must be taught from ground up.
 - It would be great if trade school programs could provide experience in the field so their students could better understand the work
 - Trade schools need to improve their curricula more than any students that we hire from universities for more technical roles, the university programs have not been a problem.
 - Most people with mechanical engineering skills are already working. We posted for an entry/mid-level mechanical engineer three weeks ago, and received four (not qualified) resumes.

Appendices

1 - Invitation Letter to Survey Participants

Dear,

Our region's energy economy is home to more than 700 companies, 105,000 related jobs, and a \$13.7 billion economic impact. Your company is part of this fast-growing success, and I am writing to ask for your help.

The Allegheny Conference is seeking your company's participation in a **multi-sector occupational analysis of energy-related jobs**. Development Dimensions International, Inc. (DDI), a worldwide expert in occupational analysis based in Pittsburgh, has been contracted to perform a survey of businesses actively involved in the energy sector, including materials and supply chains.

DDI will produce an aggregate occupational supply and demand forecast, which we will share with survey participants, telling us the numbers and types of energy-related jobs we can anticipate over the next 3 to 5 years, and where possible, across 5 to 10 years. Most importantly, we will be able to identify those **occupations which will be in the highest demand, and which will be most difficult to fill**.

The analysis will yield specific and detailed information on the skills and knowledge that workers must possess in order to be successful in these high-demand jobs. With these results in hand, qualitative and quantitative data will be used to engage directly community colleges, career and technical schools and other educators to help ensure students are taught the needed skills and knowledge specified by industry. The analysis will also help to inform company recruiting, screening, selection, on-boarding, and training systems.

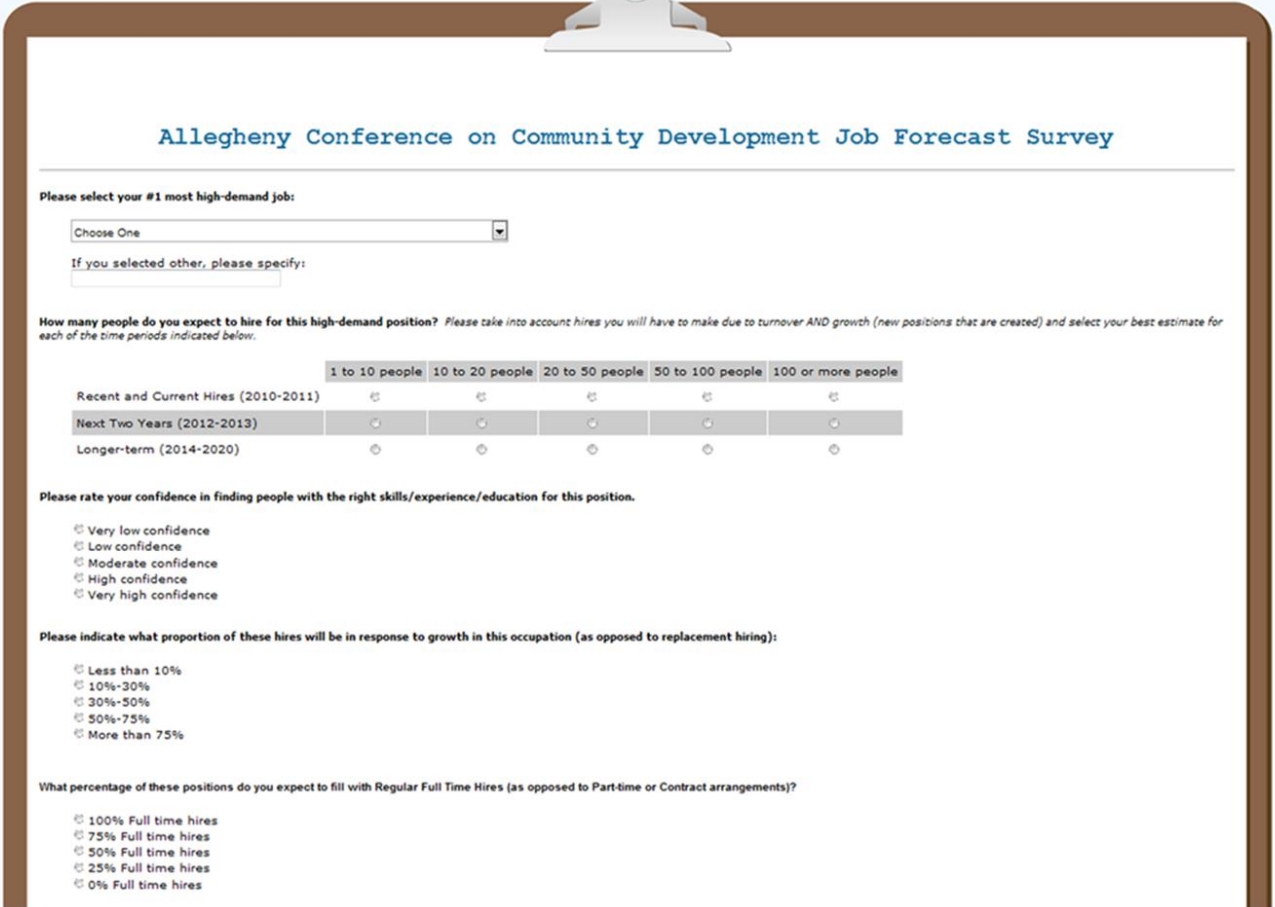
Your company's participation in the survey is important to our success. If you are willing to help us, **please identify the right person within your organization to work with on the survey and e-mail his or her contact information to accd@ddiworld.com**. He or she should have access to information about your projected hiring needs over the next 3 to 5 years, be willing and able to complete an on-line survey, (10–30 minutes), and be available for follow up conversation if needed. In appreciation of their participation, they'll receive a complimentary copy of DDI's most recent *Global Leadership Forecast*.

Thank you very much in advance for your time and cooperation.

Sincerely,

Dennis Yablonsky
Chief Executive Officer

2 - Screenshot of Online Survey



Allegheny Conference on Community Development Job Forecast Survey

Please select your #1 most high-demand job:

Choose One

If you selected other, please specify:

How many people do you expect to hire for this high-demand position? Please take into account hires you will have to make due to turnover AND growth (new positions that are created) and select your best estimate for each of the time periods indicated below.

	1 to 10 people	10 to 20 people	20 to 50 people	50 to 100 people	100 or more people
Recent and Current Hires (2010-2011)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Next Two Years (2012-2013)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Longer-term (2014-2020)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please rate your confidence in finding people with the right skills/experience/education for this position.

☐ Very low confidence
☐ Low confidence
☐ Moderate confidence
☐ High confidence
☐ Very high confidence

Please indicate what proportion of these hires will be in response to growth in this occupation (as opposed to replacement hiring):

☐ Less than 10%
☐ 10%-30%
☐ 30%-50%
☐ 50%-75%
☐ More than 75%

What percentage of these positions do you expect to fill with Regular Full Time Hires (as opposed to Part-time or Contract arrangements)?

☐ 100% Full time hires
☐ 75% Full time hires
☐ 50% Full time hires
☐ 25% Full time hires
☐ 0% Full time hires

3 - Job Titles Included in Online Survey

1. Engineer

- 1.1. Biochemical
- 1.2. Chemical
- 1.3. Civil
- 1.4. Electrical
- 1.5. Environmental
- 1.6. Mechanical
- 1.7. Mining (Mining and Geological Engineers, Including Mining Safety Engineers)
- 1.8. Nuclear
- 1.9. Petroleum
- 1.10. Power
- 1.11. Software
- 1.12. Solar Energy Systems
- 1.13. Wind Energy

2. Manager/Supervisor

- 2.1. Drilling
- 2.2. Engineering
- 2.3. Installation
- 2.4. Maintenance (Mechanic, installer, repairer)
- 2.5. Manufacturing/Operations
- 2.6. Production
- 2.7. Supply chain

3. Operator

- 3.1. Derrick
- 3.2. Equipment
- 3.3. Heavy Equipment
- 3.4. Machine
- 3.5. Nuclear Reactor
- 3.6. Plant & System
- 3.7. Pump
- 3.8. Rig
- 3.9. Robotics
- 3.10. Rotary Drill
- 3.11. Service Unit
- 3.12. Welding and Brazing

4. Technician

- 4.1. Biofuels processing
- 4.2. Chemical
- 4.3. Computer
- 4.4. Electrical
- 4.5. Engineering
- 4.6. Environmental, including Health & Safety
- 4.7. Geological & Petroleum
- 4.8. Laboratory

- 4.9. Land
- 4.10. Installation, Maintenance & Repair
- 4.11. Measurement
- 4.12. Mechanical Engineering
- 4.13. Nuclear
- 4.14. Robotics

5. Miscellaneous

- 5.1. Analyst
- 5.2. Cartographer & Photogrammetrist
- 5.3. Cementer
- 5.4. Chemist
- 5.5. Dispatcher
- 5.6. Drafter
- 5.7. Electrician
- 5.8. Estimator
- 5.9. Geologist
- 5.10. Geophysicist
- 5.11. Inspector
- 5.12. Lawyer (land, energy or other)
- 5.13. Landman
- 5.14. Machinist
- 5.15. Mechanic
- 5.16. Meter Reader
- 5.17. Pipe-Fitter
- 5.18. Programmer (IT)
- 5.19. Rigger
- 5.20. Roustabout
- 5.21. Safety/Risk Management Specialist
- 5.22. Surveyor [removed s]
- 5.23. Tool & Die Maker
- 5.24. Truck Driver
- 5.25. Warehousemen
- 5.26. Welder, cutter, solderer, brazier
- 5.27. Wellhead Pumper

6. Other (separate category for anything not listed here)

4 - Organizations Participating in Online Survey

1. Alle Kiski Industries Inc.
2. Aquion Energy Inc.
3. Atkins
4. Axion Power
5. Bayer MaterialScience LLC
6. Burleson LLP
7. Crane Maintenance/Walter Long
8. Hannon Electric
9. CONSOL Energy Inc.
10. Direct Energy Business
11. Eaton Corp
12. Ecap
13. Electrogrip Co.
14. Ellwood Group, Inc.
15. EQT Corporation
16. Everpower
17. Farnham&Pfile
18. Gerome Manufacturing Company
19. Hamill Manufacturing Co
20. Holtec
21. Kozik Brothers
22. Lanxess
23. Mine Safety Appliances Co
24. Nisource
25. Optimus Technologies
26. Penn Line Service Inc.
27. Peoples Natural Gas Co
28. PFBC
29. PPG Industries Inc.
30. Range Resources
31. Schroeder Industries Inc./Irwin Car
32. Stallion Oilfield Services
33. SpeerCo
34. System One
35. Voxcom
36. Westinghouse
37. XTO Energy Inc. (owned by ExxonMobil)

5 - Response Rates and Sample Size

Due to lower response rates than anticipated after six weeks, follow-up phone calls were made to all companies that had not responded. After an additional six weeks, additional efforts were made through professional organizations and online searches to research and contact HR personnel.

Follow-up phone calls were made to those people who had received a survey, but who had not completed it. In addition, periodic e-mail reminders were sent to all recipients of the original survey link.

- Could not contact: 113 (wrong number, not in business, duplicate entry)
- Did not want to participate: 102
- Left one or more messages, did not hear back: 474
- Sent survey: 80
- Received completed survey: 37

6 - Number of Organizations Forecasting High Volume Hires Across Target Jobs/Sectors

Target Jobs	Coal	Gas	Nuclear	Solar	Transmission and Distribution	Wind	Other
Helpers—Installation, Maintenance, and Repair Workers		3			1	1	3
Mechanical Engineers	3	5	2	2	4	3	1
Inspectors, Testers, Sorters, Samplers, and Weighers			1	1			2
First-Line Supervisors of Construction Trades and Extraction Workers	1	2					1
Electrical Engineers	1	3	1		3	1	2
First-Line Supervisors of Production and Operating Workers	1	2			3	1	
Welders, Cutters, Solderers, and Braziers		1	3	1	1		
Industrial Machinery Mechanics	1	1			1		2
Sales Managers	1	3			1		2
Heavy and Tractor-Trailer Truck Drivers		1			1		1
Petroleum Engineers		3					
Property, Real Estate Managers (Landman)	1	2					1
Computer-Controlled Machine Tool Operators, Metal and Plastic		1			2	1	
Machinist	1		2	1			1

7 - Individual Job Profiles

Helpers—Installation, Maintenance, and Repair Workers
SOC CODE: 49-9098.00

Sample Job Titles

- Maintenance Technician, Maintenance Mechanic, Building Equipment Operator (BEO), Maintenance Helper, Trades Helper, Well Tender, Facilities Maintenance Technician, Mechanic Helper

Job Responsibilities, Tasks and Work Content

- Troubleshoot machines as they break down to determine where the problem is and make necessary repairs to get it back up and running.
- Preventative maintenance as scheduled—change oil, tear down and rebuild motors.
- Basic facility maintenance—overhead cranes, change out lights and light bulbs.
- Cleaning work areas, machines and tools.
- Disassemble broken or defective equipment to facilitate repair and reassemble equipment when repairs are complete.
- Install or replace machinery, equipment, and new or replacement parts and instruments.
- Examine and test machinery, equipment, components, and parts for defects to ensure proper functioning.

Tools and Technology

- Tools used in this occupation:
 - Hammers—Claw hammers; Sledgehammers
 - Hoists—Chain hoists; Hi-los; Power hoists
 - Pneumatic hammer—Air chisels; Jackhammers; Pneumatic hammers
 - Power saws—Circular saws; Saber saws
 - Screwdrivers—Phillips head screwdrivers; Straight screwdrivers
- Technology used in this occupation:
 - Computer aided design CAD software—HVAC tools software
 - Data base user interface and query software—Data logging software
 - Facilities management software—Facility energy management software
 - Spreadsheet and word processing software

Critical Knowledge

- Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.	●							✓
Managing Work (Includes Time Management) —Effectively managing one's time and resources to ensure that work is completed efficiently.	●						✓	
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	●						✓	
Quality Orientation —Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.	●					✓		
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.	●					✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓			
Applied Learning —Assimilating and applying new job-related information in a timely manner.	●				✓			
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓			
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.	●							✓
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.		●			✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.		●			✓			
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.			●				✓	

Education and Experience

- Can come straight out of high school or trade school, but ideally would have experience working in a machine shop, industrial maintenance or repair/maintenance of farm equipment.
- Experience with specific machines is not critical, but must have willingness to learn.

Work Styles and Motivations

- For some jobs in this category, new hires must undergo a rapid learning curve for this role. In some instances these workers deal with specialized machines and need to attend classes to learn how the machines are operated. So applied learning and motivation to understand new mechanical aspects of the equipment is critical.
- Need to be a self-starter who can shadow more experienced workers, ask lots of questions, take good notes and “dive right in.” There is always something that can be worked on in the shop, even if all the machines are up and running.
- Requires constantly adapting to changing situations and prioritizing time spent working on a machine before moving on to another.
- Often requires very physical work, climbing ladders, lifting, and working with tools and safety equipment.
- Need to make independent decisions when supervisors are not available.
- May be required to be on call during weekends and/or work on rotating schedule across six-seven days a week.
- Work ethic and attitude are most critical components.

Mechanical Engineer
SOC CODE: 17-2141.00

Sample Job Titles

- Mechanical Engineer, Design Engineer, Product Engineer, Mechanical Design Engineer, Process Engineer, Equipment Engineer, Design Maintenance Engineer, Systems Engineer

Job Responsibilities, Tasks and Work Content

- Develop designs for new product, create designs to specifications, develop prototypes.
- Document design of product or solution.
- Use quantitative software for simulations and modeling.
- Complete risk analysis or other analysis on costs and benefits of engineering solution.
- Ensure that manufacture of existing design takes place with minimum error or re-work; troubleshoot issues in manufacturing.
- Monitor quality of manufacturing, quantity of re-work.
- Support installation of energy systems (need technical background to understand systems, help design energy solutions).
- Read and interpret blueprints, technical drawings, schematics, or computer-generated reports.
- Assist drafters in developing the structural design of products using drafting tools or computer-assisted design (CAD) or drafting equipment and software.
- Research, design, evaluate, install, operate, and maintain mechanical products, equipment, systems and processes to meet requirements, applying knowledge of engineering principles.
- Confer with engineers or other personnel to implement operating procedures, resolve system malfunctions, or provide technical information.
- Recommend design modifications to eliminate machine or system malfunctions.
- Conduct research that tests or analyzes the feasibility, design, operation, or performance of equipment, components, or systems.
- Investigate equipment failures and difficulties to diagnose faulty operation, and to make recommendations to maintenance crew.
- Develop and test models of alternate designs and processing methods to assess feasibility, operating condition effects, possible new applications and necessity of modification.
- Develop, coordinate, or monitor all aspects of production, including selection of manufacturing methods, fabrication, or operation of product designs.
- Specify system components or direct modification of products to ensure conformance with engineering design and performance specifications.

Tools and Technology

- Tools used in this occupation
 - Coordinate measuring machines — Optical laser scanners
 - Flowmeters — Digital particle image velocimeters; Laser Doppler anemometers; Laser Doppler velocimeters
 - Machine mounts or vibration isolators — Vibration control systems; Vibration isolators
 - Semiconductor process systems — Plasma etchers; Projection lithography equipment; Wafer dicing saws; Wire bonders
 - Signal generators — Function generators; Pattern generators
- Technology used in this occupation
 - Word processing, spreadsheets, e-mail, project management software, materials management and supply chain software (one organization reported supervisors spend approximately 10% of job time working on laptop)

Critical Knowledge

- Engineering and Technology—Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- Design—Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
- Mechanical—Knowledge of machines and tools, including their designs, uses, repair, and maintenance. Understanding of mechanical dynamics, fluid dynamics or thermal dynamics, PLC programming course work or manufacturing related electric knowledge.
- Mathematics—Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
- Customer and Personal Service—Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →			
Building Strategic Working Relationships —Developing and using collaborative relationships to facilitate the accomplishment of work goals.	●						✓
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.	●						✓
Planning and Organizing —Establishing courses of action for self and others to ensure that work is completed efficiently.	●						✓
Building Trust —Interacting with others in a way that gives them confidence in one's intentions and those of the organization.	●					✓	
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓		
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓		
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.	●				✓		
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		●					✓
Continuous Improvement —Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.		●					✓
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.		●					✓
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.		●					✓
Continuous Learning —Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.		●				✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.		●				✓	
Innovation —Generating innovative solutions in work situations; trying different and novel ways to deal with work problems and opportunities.		●			✓		
Formal Presentation —Presenting ideas effectively to individuals or groups when given time to prepare; delivering presentations suited to the characteristics and needs of the audience.			●				✓
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.			●				✓

Education and Experience

- B.S. in Mechanical Engineering required for most positions.
- Most positions are entry level out of a bachelor's program, or with one-two years of experience.

Work Styles and Motivations

- Willingness to learn the organization and the machines.
- Desire to work with and through others.
- Have passion for energy sustainability for green division.
- Ability to speak to non-technical partners or clients, make technical information accessible.
- Fast-paced work environment requires a high level of organization. Contending with many projects at once rather than one or two. May have a dozen projects at one time.
- Some product design work, testing, cost estimating, working with drafters on do 3-D models.

Inspectors, Testers, Sorters, Samplers, Weighers
SOC CODE: 51-9061.00

Sample Job Titles

- Inspector, Quality Inspector, Quality Technician, Quality Assurance Inspector, Quality Control Inspector, Quality Auditor, Picker/Packer, Quality Assurance Auditor, Quality Control Technician

Job Responsibilities, Tasks and Work Content

- Inspect, test, sort, sample, or weigh raw materials or processed, machined, fabricated, or assembled parts or products for defects, wear, and deviations from specifications.
- Discard or reject products, materials, or equipment not meeting specifications.
- Inspect, test, or measure materials, products, installations, or work for conformance to specifications.
- Notify supervisors and other personnel of production problems, and assist in identifying and correcting these problems.
- Record inspection or test data, such as weights, temperatures, grades, or moisture content, and quantities inspected or graded.
- Mark items with details such as grade or acceptance-rejection status.
- Observe and monitor production operations and equipment to ensure conformance to specifications and make or order necessary process or assembly adjustments.
- Measure dimensions of products to verify conformance to specifications, using measuring instruments such as rulers, calipers, gauges, or micrometers.
- Analyze test data, making computations as necessary, to determine test results.

Tools and Technology

- Tools used in this occupation
 - Calibrated resistance measuring equipment—Digital resistance meters; Resistance meters; Resistivity meters
 - Gauges or inspection fixtures—Functional gauges; Optical gauges; Pin gauges; Plug gauges
 - Integrated circuit testers—Backplane testers; Logic test systems; Manufacturing defect analyzers (MDA); Printed circuit board (PCB) testers
 - Leak testing equipment—Bubble leak testers; Calorimetric leak testers; Mass flow leak testers
- Technology used in this occupation
 - Analytical or scientific software—Data analysis software; Tolerance analysis software
 - Industrial control software—Coordinate measuring machine software; Statistical process control (SPC) data collection devices
 - Label making software—Inspection marking systems
 - Optical character reader (OCR) or scanning software—Label inspection systems
 - Spreadsheet software—Microsoft Excel

Critical Knowledge

- Production and Processing—Knowledge of raw materials, production processes, quality control, and other techniques for maximizing effective manufacturing.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.	●							✓
Applied Learning —Assimilating and applying new job-related information in a timely manner.	●				✓			
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓			
Quality Orientation —Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.	●					✓		
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.	●					✓		
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	●						✓	
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.		●			✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.		●			✓			
Managing Work (Includes Time Management) —Effectively managing one's time and resources to ensure that work is completed efficiently.		●					✓	
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		●						✓
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.			●		✓			

Education and Experience

- High school or GED.

Work Styles and Motivations

- Willing and able to constantly monitor processes and products to recognize differences/similarities and detect changes in circumstances or materials.
- Need to make independent decisions when supervisors are not available and communicate relevant information to supervisors and co-workers in a clear and succinct manner.
- Strong and constant attention to detail.
- Must be able to gather information from a variety of relevant sources to make decisions.
- Work ethic and attitude are most critical components.
- Strong motivation to problem solve and inspect equipment, structures or materials to identify the cause of errors or defects.
- May work in environments where sound/noise level is high.
- May require standing and making repetitive motions.

First-Line Supervisors of Construction Trades and Extraction Workers
SOC CODE: 47-1011.00

Sample Job Titles

- Construction Supervisor, Construction Foreman, Construction Superintendent, Project Manager, Field Supervisor, Project Superintendent, Job Foreman, Field Operations Supervisor, General Foreman

Job Responsibilities, Tasks and Work Content

- Lead team of two-20 tradesmen or craftsmen.
- Responsible for everything in the field: Scheduling, coordination, handling conflicts, managing the project.
- Handling paperwork related to project.
- Addressing talent issues.
- Oversee subcontractors.
- Examine and inspect work progress, equipment, and construction sites to verify safety and to ensure that specifications are met.
- Read specifications, such as blueprints, to determine construction requirements or to plan procedures.
- Estimate material or worker requirements to complete jobs.
- Supervise, coordinate, or schedule the activities of construction or extractive workers.
- Confer with managerial or technical personnel, other departments, or contractors to resolve problems or to coordinate activities.
- Coordinate work activities with other construction project activities.
- Order or requisition materials or supplies.
- Locate, measure, and mark site locations or placement of structures or equipment, using measuring and marking equipment.
- Record information such as personnel, production, or operational data on specified forms or reports.
- Assign work to employees, based on material or worker requirements of specific jobs.

Tools and Technology

- Knowledge of tools used by team (varies based on project).
- Computer tools—e-mail, spreadsheet, project management software.

Critical Knowledge

- Building and Construction—Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other projects such as highways and roads.
- Administration and Management—Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.

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- Mathematics—Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
 - Customer and Personal Service—Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
 - Mechanical—Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
 - Public Safety and Security—Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.
 - Design—Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
 - Production and Processing—Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
 - Engineering and Technology—Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
 - Personnel and Human Resources—Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labor relations and negotiation, and personnel information systems.

Behavioral Competencies:

	Essential	Very Important	Important	←Less Developable More Developable →				
Delegating Responsibility —Allocating decision-making authority and/or task responsibility to appropriate others to maximize the organization's and individuals' effectiveness.	●							✓
Aligning Performance for Success —Focusing and guiding others in accomplishing work objectives.	●							✓
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.	●						✓	
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.	●						✓	
Planning and Organizing —Establishing courses of action for self and others to ensure that work is completed efficiently.	●						✓	
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	●						✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.	●					✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓			
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		●						✓
Developing Others —Planning and supporting the development of individuals' skills and abilities so that they can fulfill current or future job/role responsibilities more effectively.		●						✓
Continuous Improvement —Initiating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.		●					✓	
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.		●			✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.		●			✓			

Education and Experience

- Degree in Civil Engineering or Construction Management, or
- Minimum five years field supervision experience with no degree, or
- Bachelor's or Associate degree in related construction field and two years of experience.

Work Styles and Motivations

- This is not a 40-hour-a-week job. Easily work 10–12 hours a day, sometimes six days a week. Type of career where people need to have an amazing work ethic and stamina.
- Sometimes travel may be involved, all week on a project site, home for weekends.
- Tend to be workaholics. "Work hard, play hard" mentality.

Electrical Engineer
SOC CODE: 17-2071.00

Sample Job Titles

- Electrical Engineer, Electrical Design Engineer, Project Engineer, Electrical Controls Engineer, Test Engineer, Hardware Design Engineer, Circuits Engineer, Electrical Project Engineer

Job Responsibilities, Tasks and Work Content

- Technical leadership, hands-on participation in cross functional project team, development of new products. Could include documentation and validation of final product design. Integration of electronic designs with mechanical, optical test and manufacturing capabilities. On-time delivery of deliverables. Responsible for complex electronic hardware design (analog and digital circuit board).
- Automation process control systems—automated manufacturing lines, robotics, programming of robotics, working with Mechanical and Design Engineers to create components of the products, component assembly.
- Fine tuning, upgrading systems, designing systems for different applications of existing products.

Tools and Technology

- Tools used in this occupation
 - Laboratory evaporators, Semiconductor process systems, Signal generators, Spectrometers, Tube furnaces
- Technology used in this occupation
 - Word processing, spreadsheets, e-mail, project management software, materials management and supply chain software (one organization reported supervisors spend approximately 10% of job time working on laptop), Analytical or scientific software, Computer aided design (CAD) software

Critical Knowledge

- Knowledge of energy industry is a plus, but most do not come in with that knowledge.
- Engineering and Technology—Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- Design—Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
- Computers and Electronics—Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
- Mathematics—Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
- Physics—Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →			
Building Strategic Working Relationships —Developing and using collaborative relationships to facilitate the accomplishment of work goals.	●					✓	
Planning and Organizing —Establishing courses of action for self and others to ensure that work is completed efficiently.	●					✓	
Building Trust —Interacting with others in a way that gives them confidence in one's intentions and those of the organization.	●				✓		
Continuous Learning —Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.	●				✓		
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.	●				✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●			✓			
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.	●			✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.	●			✓			
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		●					✓
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.		●					✓
Continuous Improvement —Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.		●				✓	
Formal Presentation —Presenting ideas effectively to individuals or groups when given time to prepare; delivering presentations suited to the characteristics and needs of the audience.		●				✓	
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.		●		✓			
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.		●				✓	
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.			●			✓	
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.			●			✓	
Innovation —Generating innovative solutions in work situations; trying different and novel ways to deal with work problems and opportunities.			●	✓			

Education and Experience

- B.S. in Electrical Engineering required for most positions, M.S. in Electrical Engineering required for senior positions.
- Some positions are entry level out of a bachelor's program, more senior positions require either one to three years' experience, or five-plus years of experience.
- Analog and digital circuit board and layout. Embedded software knowledge.
- Mechanical design experience with servo motors, machine controls, robotics, autocad, etc.

Work Styles and Motivations

- Willingness to learn the organization and the machines.
- Desire to work with and through others.
- Ability to speak to non-technical partners or clients, make technical information accessible.
- Open to change.
- Professionally contend—need to be able to fit in and be good team players, but also have to be strong enough if they believe that the group or a track is wrong, need to professionally contend and make their point without upsetting team.
- Senior level person, will be able to drag personalities into it, do without.
- Creativity.
- Senior level—Global acumen, ability to adapt and understand other cultures.

First Line Supervisor of Production and Operating Workers
SOC CODE: 51-1011.00

Sample Job Titles

- Production Supervisor, Manufacturing Supervisor, Team Leader, Shift Supervisor, Production Manager, Supervisor, Assembly Supervisor

Job Responsibilities, Tasks and Work Content

- Ensure that the machines are up and running and staffed for maximum productivity and that resources are utilized effectively.
- Scheduling of raw materials coming to the machines and scheduling production runs.
- Secure and coordinate project labor. Coordinate labor within the operation based on the need of the projects at hand. Do get involved that the proper labor exists for the projects.
- Interpret specifications, blueprints, job orders, and company policies and procedures for workers.
- Manage and supervise the quality and inspection of products in final stage before they meet their customer.
- May rotate supervision across more than one crew and manage several projects simultaneously.
- Interview and conduct performance appraisals for employees.
- Enforce safety and sanitation regulations.

Tools and Technology

- Tools used in this occupation
 - Hard hats
 - Hazardous material protective apparel—Personal protective clothing
 - Notebook computers
 - Scanners—Laser scanners
 - Touch screen monitors—Operator terminals
- Technology used in this occupation
 - Word processing, spreadsheets, e-mail, project management software, materials management and supply chain software (one organization reported supervisors spend approximately 10% of job time working on laptop)

Critical Knowledge

- Production and Processing—Knowledge of raw materials, production processes, and quality control.
- Mechanical—Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- Engineering and Technology—Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.	●							✓
Developing Others —Planning and supporting the development of individuals' skills and abilities so that they can fulfill current or future job/role responsibilities more effectively.	●							✓
Building Strategic Working Relationships —Developing and using collaborative relationships to facilitate the accomplishment of work goals.	●						✓	
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.	●						✓	
Planning and Organizing —Establishing courses of action for self and others to ensure that work is completed efficiently.	●						✓	
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	●						✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.	●					✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓			
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.	●				✓			
Aligning Performance for Success —Focusing and guiding others in accomplishing work objectives.		●						✓
Building a Successful Team —Using appropriate methods and a flexible interpersonal style to help build a cohesive team; facilitating the completion of team goals.		●						✓
Delegating Responsibility —Allocating decision-making authority and/or task responsibility to appropriate others to maximize the organization's and individuals' effectiveness.		●						✓
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.		●			✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.		●			✓			

Education and Experience

- Depending on complexity of operations being supervised, requirements varied across organizations from High school/GED and one year of operator experience to an undergraduate degree or five-10 years in related job.
- In many cases, the norm was to promote from within when possible.

Work Styles and Motivations

- Must be willing to manage multiple projects/activities simultaneously.
- Must be willing to adapt to different conditions day to day (e.g., power plant one day, roadside work the next) and unannounced schedule changes.
- Often necessary to take a firm stand and deliver difficult messages to maintain organizational policies and procedures. This can at times be difficult to balance with being friendly/social outside of work.
- Dealing with stress and deadlines. Many of the challenges must be met at this level.
- Comfortable communicating with different levels of individuals (including management and state/federal regulators).
- Dealing with contractors from other organizations can be a challenge for project scheduling as multiple contingencies must be managed.

Welders Cutters, Solderers, and Braziers
SOC CODE: 51-4121.00

Sample Job Titles

- Welder, Welder-Fitter, Fabricator, Maintenance Welder, MIG Welder, Sub Arc Operator, Brazier, Solderer, Electrical Assembler

Job Responsibilities, Tasks and Work Content

- May involve both hand welding and machine welding.
- Weld components in flat, vertical, or overhead positions.
- Lay out, position, align, and secure parts and assemblies prior to assembly, using straightedges, combination squares, calipers, and rulers.
- Clamp, hold, tack-weld, heat-bend, grind or bolt component parts to obtain required configurations and positions for welding.
- Monitor the fitting, burning, and welding processes to avoid overheating of parts or warping, shrinking, distortion, or expansion of material.
- Examine workpieces for defects and measure workpieces with straightedges or templates to ensure conformance with specifications.
- Detect faulty operation of equipment or defective materials and notify supervisors.
- Operate safety equipment and maintain safe work habits.

Tools and Technology

- Tools used in this occupation
 - Blow torches — Motorized cutting torches; Pattern cutting torches; Welding torches
 - Gas welding or brazing or cutting apparatus — Brazing equipment; Heliarc welding equipment; Oxyacetylene welding equipment; Portable gas operated arc welders
 - Manlift or personnel lift — Hydraulic truck lifts; Swing stages
 - Welding masks — Hand shields; Welding shields
 - Welding tools — Rod ovens; Storage ovens and hot boxes; Welding guns
 - Workshop presses — Brakes; Portable magnetic drill presses; Punch presses
 - Manual or semi-automatic welding equipment to fuse metal segments, using processes such as gas tungsten arc, gas metal arc, flux-cored arc, plasma arc, shielded metal arc, resistance welding, and submerged arc welding.
- Technology used in this Occupation
 - Analytic or scientific software
 - Computer aided design (CAD) software
 - Database and query software for record keeping

Critical Knowledge

- Mechanical—Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- Design—Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models. (Required for some, optional for some.)

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.	•						✓	
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	•						✓	
Quality Orientation —Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.	•					✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	•				✓			
Applied Learning —Assimilating and applying new job-related information in a timely manner.	•				✓			
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	•				✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.	•				✓			
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		•						✓
Continuous Improvement —Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.		•					✓	
Managing Work (Includes Time Management) —Effectively managing one's time and resources to ensure that work is completed efficiently.		•					✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.		•				✓		
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.		•			✓			
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.			•					✓

Education and Experience

- Depending on the job, specific certifications may be required such as AWS Certification, MIG, TIG, ARC, ASME code certified welder, GTAW / SMAW, etc.
- Some previous welding experience—either work experience or technical training.
- Can learn the specific type of welding on the job – but need a basic understanding of welding.

Work Styles and Motivations

- Must be willing and able to handle the physical aspect of the job. Can be very hot, especially in summer, with all the protective gear.
- Often requires working in small and confined spaces
- Often requires working while standing for long periods
- May require extended periods of time working alone, so needs someone that likes to work by themselves.

Industrial Machinery Mechanics
SOC CODE: 49-9041.00

Sample Job Titles

- Maintenance Mechanic, Maintenance Technician, Mechanic, Engineering Technician, Master Mechanic, Industrial Machinery Mechanic, Machine Adjuster, Overhauler, Industrial Electrician, Industrial Mechanic

Job Responsibilities, Tasks and Work Content

- Maintain the equipment.
- Maintenance of fleet vehicles and equipment.
- Design specialty equipment that is used with some customers. Build some of their own equipment.
- Repair and maintain equipment, build, weld, use wrenches, read equipment specs, follow instructions, inspect.
- Problem solving when there is a problem that isn't a typical problem. Diagnose problems that aren't typical.
- Understand the systems involved in heavy systems, hydraulics and electrical systems.
- Maintain and repair vehicles—from passenger cars to commercial vehicles (could include body, engine, medium and heavy duty diesel).

Tools and Technology

- Tools used in this occupation
 - Hex keys — Allen wrenches; Hex wrenches
 - Micrometers — Inside micrometers; Outside micrometers
 - Power grinders — Cylindrical grinders; Grinding wheels; Precision grinders
 - Thickness measuring devices — Space gauges; Telescoping gauges; Thickness gauges
- Technology used in this occupation
 - Computer aided design CAD software
 - Computer aided manufacturing CAM software
 - Facilities management software
 - Industrial control software
 - Spreadsheet software

Critical Knowledge

- Mechanical—Knowledge of machines and tools, including their designs, uses, repair, and maintenance. Knowledge of hydraulics.
- Electrical and Electronics Controls— Includes trouble shooting, preventative maintenance systems.
- Engineering and Technology—Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services. Familiarity with the systems that power heavy equipment, as well as electrical systems, hydraulic systems, air systems, and fuel systems.

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- Design—Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models. Ability to interpret the schematics and system drawings of equipment.
 - English Language—Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.
 - Production and Processing—Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
 - Building and Construction—Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other projects such as highways and roads.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	●						✓	
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓			
Applied Learning —Assimilating and applying new job-related information in a timely manner.	●				✓			
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.	●				✓			
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		●						✓
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.		●						✓
Managing Work (Includes Time Management) —Effectively managing one's time and resources to ensure that work is completed efficiently.		●					✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.		●				✓		

Education and Experience

- B.S. in Mechanical Engineering required for most positions.
- Most positions are entry level out of a bachelor's program, or with one-two years of experience.
- Comprehend the logic in the systems and understand how they work together with other systems. Read and understand the schematics (blueprints).
- Experience on heavy equipment.

Work Styles and Motivations

- Some garages are 24/7, different shifts.
- Physical, dirty work.

Sales Managers
SOC CODE: 11-2022.00**Sample Job Titles**

- Sales Manager, Sales Supervisor, Sales Representative

Job Responsibilities, Tasks and Work Content

- Meet with potential customers, explain technical aspects of sale.
- Present financial options of sale.
- Negotiate final sale price/contract.
- Supervise and coach a sales team.
- Understand industry to explain products/services to customers.
- Cold call potential customers.
- Generate leads and marketing activities.
- Communicate to customers in the field; understand safety issues in field.
- Represent organization to clients.

Tools and Technology

- Basic computer software
- Sales contact software

Critical Knowledge

- Sales and Marketing—Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.
- Customer and Personal Service—Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
- Economics and Finance—understanding contracts, ability to negotiate, discuss different financial payment options.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Building a Successful Team —Using appropriate methods and a flexible interpersonal style to help build a cohesive team; facilitating the completion of team goals.	●							✓
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.	●							✓
Delegating Responsibility —Allocating decision-making authority and/or task responsibility to appropriate others to maximize the organization's and individuals' effectiveness.	●							✓
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.	●						✓	
Planning and Organizing —Establishing courses of action for self and others to ensure that work is completed efficiently.	●						✓	
Building Trust —Interacting with others in a way that gives them confidence in one's intentions and those of the organization.	●					✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓			
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.	●				✓			
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.		●					✓	
Continuous Learning —Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.		●				✓		
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.		●				✓		

Education and Experience

- B.A. in business.
- Industry knowledge preferred (sometimes required).
- Technical knowledge of products preferred, not required.
- Prior sales experience.
- Past experience with territory, existing customer relationships preferred.

Work Styles and Motivations

- Willingness to travel.
- Willingness to work off-hours (evening, weekend appointments).
- Commission based compensation.
- Interest in meeting people, cold calling, relationship building.
- Managing own time.

Heavy and Tractor Trailer Truck Drivers
SOC CODE: 53-3032.00

Sample Job Titles

- Truck Driver, Driver, Over the Road Driver (OTR Driver), Delivery Driver, Road Driver, Semi Truck Driver

Job Responsibilities, Tasks and Work Content

- Drive construction oriented trucks.
- Also a labor component: Build guardrails, signs on highways, build fence, heavy highway-type work, seeding, mulching, landscaping work.
- Calculating, measuring, blueprint reading.
- Unload the truck.
- Drive the trucks. Often several projects during the day. Sometimes just the same project and work all day. Amount of driving varies. Laboring function is the primary job. Could be doing equal amounts. Labor varies—seeding, mulching, landscape, tools, some calculating, measuring, some blueprint reading. Always supervised. Occasionally work independently. Not directly supervised at all times—general supervision.
- Driving in high volume areas—metro areas like DC—driving skills are important and difficult.
- Drive to site when on-call and emergency request comes in.
- Interact with clients on job sites.

Tools and Technology

- Flatbed trailers—Lowboy trailers; Tilt trailers
- Lifts—Handlifts; Hydraulic lifts; Johnson bars
- Trailer hitches—Sliding fifth wheels; Sliding tandem axles

Critical Knowledge

- Understanding and knowledge of truck driving and rules and regulations. Also required to have an understanding of work processes and how construction workers operate together. Some ability to get along with other people.
- Learn how to build guardrails, install road signage, hydroseeding, learn construction. Learn most of this on the job with experienced employee.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.	●							✓
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	●						✓	
Quality Orientation —Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.	●					✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓			
Applied Learning —Assimilating and applying new job-related information in a timely manner.	●				✓			
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.	●				✓			
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		●						✓
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.		●					✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.		●				✓		
Continuous Improvement —Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.			●				✓	
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.			●		✓			

Education and Experience

- Require Class A certification.
- Either GED or high school diploma.
- Generally have some prior work experience.
- Class B certification in some jobs.
- Prefer Tanker and Hazmat endorsement.

Work Styles and Motivations

- Deadline oriented.
- Physical labor of handling the materials. Lifting (70 lbs. frequently).
- Flexibility to travel.
- Some jobs have on-call component—flexible working hours, including possible weekends, holidays.

Petroleum Engineers
SOC CODE: 17-2171.00

Sample Job Titles

- Reservoir Engineer, Petroleum Engineer, Drilling Engineer, Petroleum Production Engineer, Operations Engineer, Completions Engineer

Job Responsibilities, Tasks and Work Content

- Assess costs and estimate the production capabilities and economic value of oil and gas wells, to evaluate the economic viability of potential drilling sites.
- Develop plans for oil and gas field drilling, and for product recovery and treatment.
- Direct and monitor the completion and evaluation of wells, well testing, or well surveys.
- Analyze data to recommend placement of wells and supplementary processes to enhance production.
- Monitor production rates, and plan rework processes to improve production.
- Interpret drilling and testing information for personnel.
- Specify and supervise well modification and stimulation programs to maximize oil and gas recovery.
- Assist engineering and other personnel to solve operating problems.
- Confer with scientific, engineering, and technical personnel to resolve design, research, and testing issues.
- Coordinate the installation, maintenance, and operation of mining and oil field equipment.

Tools and Technology

- Tools used in this occupation
 - Laptop, notebook computers
- Technology used in this occupation
 - Analytic or scientific software: Computer modeling, Well Flow Dynamics, Engineering formulas
 - Financial analysis software
 - Project management software

Critical Knowledge

- **Engineering and Technology**—Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- **Mathematics**—Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
- **Physics**—Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes.
- **Administration and Management**—Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.
- **Economics and Accounting**—Knowledge of economic and financial principles and practices, for example, to judge well site profitability.
- **Chemistry**—Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →				
Collaboration -- Working effectively and cooperatively with others; establishing and maintaining good working relationships.	●							✓
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.	●							✓
Building Strategic Working Relationships —Developing and using collaborative relationships to facilitate the accomplishment of work goals.	●						✓	
Planning and Organizing —Establishing courses of action for self and others to ensure that work is completed efficiently.	●						✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.	●					✓		
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓			
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.		●						✓
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.		●					✓	
Continuous Learning —Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.		●				✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.		●			✓			
Innovation —Generating innovative solutions in work situations; trying different and novel ways to deal with work problems and opportunities.		●			✓			
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.		●			✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.		●			✓			
Formal Presentation —Presenting ideas effectively to individuals or groups when given time to prepare; delivering presentations suited to the characteristics and needs of the audience.			●				✓	
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.			●				✓	
Information Monitoring —Setting up ongoing procedures to collect and review information needed to manage an organization or ongoing activities within it.			●				✓	

Education and Experience

- Undergraduate degree in Engineering: Petroleum, Chemical, Mechanical preferred. These individuals often brought in initially through internships.

Work Styles and Motivations

- Willingness to recommend innovative improvements to existing processes, procedures and technology.
- Need to continuously make decisions to prioritize and reprioritize work as critical needs arise.
- Interact frequently with field operations personnel.
- Able to spot production issues.
- Able to manage multiple diverse project simultaneously.

Property, Real Estate and Community Association Managers (Landman)
SOC CODE: 11-9141.00

Sample Job Titles

- Landman, Property Manager, Lease Administration Supervisor, Leasing Manager

Job Responsibilities, Tasks and Work Content

- Manage and oversee operations, maintenance, administration, and improvement of commercial or industrial properties.
- Negotiate the sale, lease, or development of property and complete or review appropriate documents and forms.
- Maintain records of sales, rental or usage activity, special permits issued and property availability.
- Prepare detailed budgets and financial reports for properties.
- In more senior roles (non-entry level), coordinate and distribute work assignments for field staff and contract personnel for lease acquisitions.

Tools and Technology

- Tools used in this occupation
 - Laptop
 - Two-way radios
- Technology used in this occupation
 - Accounting software
 - Database query software specific to land/lease management
 - Spreadsheets
 - E-mail

Critical Knowledge

- Sales and Marketing—Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.
- Customer and Personal Service—Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
- Administration and Management—Knowledge of business and management principles involved in planning and resource allocation.
- Clerical—Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, and other office procedures and terminology.
- Mathematics—Knowledge of arithmetic, algebra, calculus, statistics, and their applications.
- Economics and Accounting—Knowledge of economic and accounting principles and practices, banking, and the analysis and reporting of financial data.

Behavioral Competencies

	Essential	Very Important	Important	← Less Developable More Developable →				
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.	●							✓
Building Strategic Working Relationships —Developing and using collaborative relationships to facilitate the accomplishment of work goals.	●						✓	
Planning and Organizing —Establishing courses of action for self and others to ensure that work is completed efficiently.	●						✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.	●					✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.	●				✓			
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓			
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.	●				✓			
Collaboration —Working effectively and cooperatively with others; establishing and maintaining good working relationships.		●						✓
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.		●						✓
Formal Presentation —Presenting ideas effectively to individuals or groups when given time to prepare; delivering presentations suited to the characteristics and needs of the audience.		●					✓	
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.		●					✓	
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.		●			✓			
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.		●					✓	
Information Monitoring —Setting up ongoing procedures to collect and review information needed to manage an organization or ongoing activities within it.			●				✓	
Continuous Learning —Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.			●			✓		

Education and Experience

- Reported requirements ranged from some college, associate degree or no degree.
- Equivalent combination of education (e.g., associate degree in land management or related field) and experience to move beyond entry level role.

Work Styles and Motivations

- Willing to be in frequent communication with people outside the organization, representing the organization to customers, the public, government, and other external sources. This information can be exchanged in person, in writing, or by telephone or e-mail.
- Able to make independent decisions without direct supervision.
- Involves resolving conflicts and negotiating with others, handling complaints, settling disputes, and resolving grievances and conflicts.

Computer-Controlled Machine Tool Operators, Metal and Plastic
SOC CODE: 51-4011.00

Sample Job Titles

- Computer Numerical Control (CNC) Operator, CNC Machinist, CNC Lathe Operator, CNC Machine Operator, CNC Mill Operator, CNC Set Up Technician, CNC Set-Up Operator

Job Responsibilities, Tasks and Work Content

- Measure dimensions of finished workpieces to ensure conformance to specifications, using precision measuring instruments, templates, and fixtures.
- Insert control instructions into machine control units to start operation.
- Mount, install, align, and secure tools, attachments, fixtures, and workpieces on machines, using hand tools and precision measuring instruments.
- Calculate machine speed and feed ratios and the size and position of cuts.
- Listen to machines during operation to detect sounds such as those made by dull cutting tools or excessive vibration and adjust machines to compensate for problems.
- Adjust machine feed and speed, change cutting tools, or adjust machine controls when automatic programming is faulty or if machines malfunction.
- Stop machines to remove finished workpieces or to change tooling, setup, or workpiece placement, according to required machining sequences.
- Lift workpieces to machines manually or with hoists or cranes.
- Modify cutting programs to account for problems encountered during operation and save modified programs.
- Remove and replace dull cutting tools.

Tools and Technology

- Tools used in this occupation
 - Micrometers
 - Calipers—Dial calipers; Vernier calipers
 - Gauges or inspection fixtures
 - Lathes
 - Milling machines
 - Turning machines

-
- Technology used in this occupation
 - Computer database for part information and specifications
 - Analytical or scientific software
 - Computer aided design (CAD) software
 - Computer aided manufacturing (CAM) software
 - Project management software
 - Spreadsheet software

Critical Knowledge

- Blueprint reading—can be taught on job, but some prior knowledge useful.
- Mechanical—Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

Behavioral Competencies

	Essential	Very Important	Important	←Less Developable More Developable →			
Continuous Learning —Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.	●					✓	
Managing Work (Includes Time Management) —Effectively managing one's time and resources to ensure that work is completed efficiently.	●					✓	
Quality Orientation —Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.	●					✓	
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.	●				✓		
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.	●				✓		
Collaboration —Working effectively and cooperatively with others; establishing and maintaining good working relationships.		●					✓
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.		●					✓
Information Monitoring —Setting up ongoing procedures to collect and review information needed to manage an organization or ongoing activities within it.		●					✓
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.		●					✓
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.		●				✓	
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.			●				✓
Continuous Improvement —Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.			●				✓
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.			●		✓		

Education and Experience

- Machining trade school program preferred, but not always a requirement.
- GED.
- To be hired straight to a machine, need two to three years experience.

Work Styles and Motivations

- Requires motivation to apply mechanical skills and abilities, changing out tools, making frequent adjustments to machine.
- Carefully follow machine program without deviation—monitor closely to ensure program is performing properly.
- Often involves working alone—little interaction with others.
- More written than verbal communication skills required. Inputting time to track how long a part was worked on, what happened to the part, during the program run, any deviation, etc.
- Requires comfort with keyboarding and work with computers (although jobs do not require workers to lay out code or write programs).

Machinists

SOC CODE: 51-4041.00

Sample Job Titles

- Machinist, Tool Room Machinist, Machine Operator, Machine Repair Person, Machinist Tool and Die, Automation Technician, Gear Machinist, Maintenance Specialist, Set-Up Machinist

Job Responsibilities, Tasks and Work Content

- Calculate dimensions and tolerances using knowledge of mathematics and instruments such as micrometers and calipers.
- Align and secure holding fixtures, cutting tools, attachments, accessories, or materials onto machines.
- Select the appropriate tools, machines, and materials to be used in preparation of machinery work.
- Monitor the feed and speed of machines during the machining process.
- Machine parts to specifications, using machine tools, such as lathes, milling machines, shapers, or grinders.
- Set up, adjust, and operate all of the basic machine tools and many specialized or advanced variation tools to perform precision machining operations.
- Measure, examine, or test completed units to check for defects and ensure conformance to specifications, using precision instruments, such as micrometers.
- Set controls to regulate machining, or enter commands to retrieve, input, or edit computerized machine control media.
- Position and fasten work pieces.
- Maintain industrial machines, applying knowledge of mechanics, shop mathematics, metal properties, layout, and machining procedures.

Tools and Technology

- Tools used in this occupation
 - Calipers—Dial calipers; Hermaphrodite calipers; Outside spring calipers; Vernier calipers
 - Gauges or inspection fixtures—Dial indicators; Planer gauges; Ring gauges; Telescoping gauges
 - Hammers—Ball peen hammers; Composition hammers; Machinists' hammers; Sledgehammers
 - Lathes—Drum lathes; Engine lathes; Flywheel lathes; Turning lathes
 - Milling cutters—Knee mills; Milling angle form cutters; Multi-axis computerized numerical control CNC machines; Undercut tools
- Technology used in this occupation
 - Analytical or scientific software
 - Computer aided design (CAD) software
 - Computer aided manufacturing (CAM) software
 - Project management software
 - Spreadsheet software

Critical Knowledge

- Mechanical—Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- Production and Processing—Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
- Mathematics—Knowledge of arithmetic, algebra, trigonometry, geometry, calculus, statistics, and their applications.
- CNC (Computer/Numerical Control) machine programming.

Behavioral Competencies

	Essential	Very Important	Important	← Less Developable More Developable →				
Collaboration —Working effectively and cooperatively with others; establishing and maintaining good working relationships.	●							✓
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.	●						✓	
Quality Orientation —Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.	●					✓		
Applied Learning —Assimilating and applying new job-related information in a timely manner.	●				✓			
Managing Work (Includes Time Management) —Effectively managing one's time and resources to ensure that work is completed efficiently.		●					✓	
Continuous Improvement —Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.		●					✓	
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.		●				✓		
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.		●			✓			
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.		●			✓			
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.		●			✓			
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.			●					✓
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.			●					✓
Information Monitoring —Setting up ongoing procedures to collect and review information needed to manage an organization or ongoing activities within it.			●				✓	

Education and Experience

- Some college, or high school diploma or equivalent (journeyman papers preferred).
- Applied experience more important than knowledge/theory gained in technical degree.

Work Styles and Motivations

- Requires constant monitoring of gauges, dials, or other indicators to ensure a machine is working properly.
- Troubleshooting is often significant component of job—determining causes of operating errors and then correcting problem.
- May require standing for long periods of time.

8 - Behavioral Competencies Across all Target Jobs

Competency Importance Rating	
	Essential
	Very Important
	Important

	Helpers—Installation, Maintenance, and Repair Workers	Mechanical Engineers	Inspectors, Testers, Sorters, Samplers, Weighers	First Line Supervisor of Construction and Extraction Workers	Electrical Engineers	First Line Supervisor of Production and Operating Workers	Welders	Industrial Machinery Mechanics	Sales Manager	Heavy and Tractor Trailer Truck Driver	Petroleum Engineer	Property, Real Estate, and Community Association Managers (Landman)	Computer-Controlled Machine Tool Operators, Metal and Plastic	Machinist
Adaptability —Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.														
Aligning Performance for Success —Focusing and guiding others in accomplishing work objectives.														
Applied Learning —Assimilating and applying new job-related information in a timely manner.														
Building a Successful Team —Using appropriate methods and a flexible interpersonal style to help build a cohesive team; facilitating the completion of team goals.														
Building Strategic Working Relationships —Developing and using collaborative relationships to facilitate the accomplishment of work goals.														
Building Trust —Interacting with others in a way that gives them confidence in one's intentions and those of the organization.														
Collaboration —Working effectively and cooperatively with others; establishing and maintaining good working relationships.														
Communication —Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.														
Continuous Improvement —Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.														
Continuous Learning —Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.														

	Helpers—Installation, Maintenance, and Repair Workers	Mechanical Engineers	Inspectors, Testers, Sorters, Samplers, Weighers	First Line Supervisor of Construction and Extraction Workers	Electrical Engineers	First Line Supervisor of Production and Operating Workers	Welders	Industrial Machinery Mechanics	Sales Manager	Heavy and Tractor Trailer Truck Driver	Petroleum Engineer	Property, Real Estate, and Community Association Managers (Landman)	Computer-Controlled Machine Tool Operators, Metal and Plastic	Machinist
Contributing to Team Success —Actively participating as a member of a team to move the team toward the completion of goals.														
Customer Focus —Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.														
Decision Making —Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.														
Delegating Responsibility —Allocating decision-making authority and/or task responsibility to appropriate others to maximize the organization's and individuals' effectiveness.														
Developing Others —Planning and supporting the development of individuals' skills and abilities so that they can fulfill current or future job/role responsibilities more effectively.														
Formal Presentation —Presenting ideas effectively to individuals or groups when given time to prepare; delivering presentations suited to the characteristics and needs of the audience.														
Gaining Commitment —Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.														
Initiating Action —Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.														
Innovation —Generating innovative solutions in work situations; trying different and novel ways to deal with work problems and opportunities.														
Managing Work (Includes Time Management) —Effectively managing one's time and resources to ensure that work is completed efficiently.														

	Helpers—Installation, Maintenance, and Repair Workers	Mechanical Engineers	Inspectors, Testers, Sorters, Samplers, Weighers	First Line Supervisor of Construction and Extraction Workers	Electrical Engineers	First Line Supervisor of Production and Operating Workers	Welders	Industrial Machinery Mechanics	Sales Manager	Heavy and Tractor Trailer Truck Driver	Petroleum Engineer	Property, Real Estate, and Community Association Managers (Landman)	Computer-Controlled Machine Tool Operators, Metal and Plastic	Machinist
Quality Orientation —Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.														
Safety Awareness —Identifying and correcting conditions that affect employee safety; upholding safety standards.														
Stress Tolerance —Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.														
Work Standards —Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.														

9 - Ease of Development Table

1 = less able to be developed	2	3	4	5 = more able to be developed
	Adaptability	Building Trust	Building Strategic Work Relationships	Aligning Performance for Success
	Applied Learning	Decision Making	Coaching the Sales Team	Building a Successful Team
	Continuous Learning	Driving for Results	Continuous Improvement	Collaboration
	Initiating Action	Quality Orientation	Customer Focus	Communication
	Innovation		Formal Presentation	Contributing to Team Success
	Sales Disposition		Gaining Commitment	Delegating Responsibility
	Stress Tolerance		Information Monitoring	Developing Others
	Work Standards		Managing Work (includes Time Management)	Technical/Professional Knowledge and Skills
			Planning and Organizing	
			Safety Awareness	
			Sales Ability/Persuasiveness	

10 - Competencies and Full Behavioral Definitions

Adaptability

Maintaining effectiveness when experiencing major changes in work responsibilities or environment; adjusting effectively to work within new work structures, processes, requirements, or cultures.

KEY ACTIONS

- **Tries to understand changes**—Actively seeks information about new work situations; strives to understand the rationale and implications for changes in work responsibilities or environment.
- **Approaches change or newness positively**—Treats change and new situations as opportunities for learning or growth; identifies the benefits of change; speaks positively about the change to others.
- **Adjusts behavior**—Quickly modifies behavior to deal effectively with changes in the work environment; tries new approaches appropriate for new or changed situations; does not persist with ineffective behaviors.

Aligning Performance for Success

Focusing and guiding others in accomplishing work objectives.

Key Actions

- **Sets performance goals**—Collaboratively works with direct reports to set meaningful performance objectives; sets specific performance goals and identifies measures for evaluating goal achievement.
- **Establishes approach**—Collaboratively works with direct reports to identify the behaviors, knowledge, and skills required to achieve goals; identifies specific behaviors, knowledge, and skill areas for focus and evaluation.
- **Creates a learning environment**—As necessary, helps secure resources required to support development efforts; ensures that opportunities for development are available; offers to help individuals overcome obstacles to learning.
- **Collaboratively establishes development plans**—Collaboratively identifies observation or coaching opportunities, training, workshops, seminars, etc., that will help the individual achieve important goals.
- **Tracks performance**—Implements a system or uses techniques to track performance against goals and to track the acquisition and use of appropriate behaviors, knowledge, and skills.
- **Evaluates performance**—Holds regular formal discussions with each direct report to discuss progress toward goals and review performance; evaluates each goal, behavior, knowledge, and skill area.

Applied Learning

Assimilating and applying new job-related information in a timely manner.

Key Actions

- **Actively participates in learning activities**—Takes part in needed learning activities in a way that makes the most of the learning experience (e.g., takes notes, asks questions, completes required tasks).
- **Quickly gains knowledge, understanding, or skill**—Readily absorbs and comprehends new information from formal and informal learning experiences.
- **Applies knowledge or skill**—Puts new knowledge, understanding, or skill to practical use on the job; furthers learning through trial and error.

Building a Successful Team

Using appropriate methods and a flexible interpersonal style to help build a cohesive team; facilitating the completion of team goals.

Key Actions

- **Develops direction**—Ensures that the purpose and importance of the team are clarified (e.g., team has a clear charter or mission statement); guides the setting of specific and measurable team goals and objectives.
- **Develops structure**—Helps to clarify roles and responsibilities of team members; helps ensure that necessary steering, review, or support functions are in place.
- **Facilitates goal accomplishment**—Makes procedural or process suggestions for achieving team goals or performing team functions; provides necessary resources or helps to remove obstacles to team accomplishments.
- **Involves others**—Listens to and fully involves others in team decisions and actions; values and uses individual differences and talents.
- **Informs others on team**—Shares important or relevant information with the team.
- **Models commitment**—Adheres to the team's expectations and guidelines; fulfills team responsibilities; demonstrates personal commitment to the team.

Building Strategic Work Relationships

Developing and using collaborative relationships to facilitate the accomplishment of work goals.

Key Actions

- **Seeks opportunities**—Proactively tries to build effective working relationships with other people.
- **Clarifies the current situation**—Probes for and provides information to clarify situations.
- **Develops others' and own ideas**—Seeks and expands on original ideas, enhances others' ideas, and contributes own ideas about the issues at hand.
- **Subordinates personal goals**—Places higher priority on team or organization goals than on own goals.
- **Facilitates agreement**—Gains agreement from partners to support ideas or take partnership-oriented action; uses sound rationale to explain value of actions.
- **Uses Key Principles**—Establishes good interpersonal relationships by helping people feel valued, appreciated, and included in discussions (enhances self-esteem, empathizes, involves, discloses, supports).

Building Trust

Interacting with others in a way that gives them confidence in one's intentions and those of the organization.

Key Actions

- **Operates with integrity**—Demonstrates honesty; keeps commitments; behaves in a consistent manner.
- **Discloses own positions**—Shares thoughts, feelings, and rationale so that others understand personal positions.
- **Remains open to ideas**—Listens to others and objectively considers others' ideas and opinions, even when they conflict with one's own.
- **Supports others**—Treats people with dignity, respect, and fairness; gives proper credit to others; stands up for deserving others and their ideas even in the face of resistance or challenge.

Collaboration

Working effectively and cooperatively with others; establishing and maintaining good working relationships.

Key Actions

- **Uses Key Principles**—Establishes good interpersonal relationships by helping people feel valued, appreciated, and included in discussions (enhances self-esteem, empathizes, involves, discloses, supports).
- **Subordinates personal goals**—Places higher priority on team or organization goals than on own goals.
- **Volunteers assistance**—Offers to help others achieve goals.

Communication

Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.

Key Actions

- **Organizes the communication**—Clarifies purpose and importance; stresses major points; follows a logical sequence.
- **Maintains audience attention**—Keeps the audience engaged through use of techniques such as analogies, illustrations, humor, an appealing style, body language, and voice inflection.
- **Adjusts to the audience**—Frames message in line with audience experience, background, and expectations; uses terms, examples, and analogies that are meaningful to the audience.
- **Ensures understanding**—Seeks input from audience; checks understanding; presents message in different ways to enhance understanding.
- **Adheres to accepted conventions**—Uses syntax, pace, volume, diction, and mechanics appropriate to the media being used.
- **Comprehends communication from others**—Attends to messages from others; correctly interprets messages and responds appropriately.

Continuous Improvement

Originating action to improve existing conditions and processes; identifying improvement opportunities, generating ideas, and implementing solutions.

Key Actions

- **Identifies opportunities**—Reviews processes to determine any gaps between current outputs and expected requirements.
- **Determines causes**—Identifies conditions that contribute to gaps or key variances; explores relationships between conditions and outcomes; distinguishes causes from symptoms and identifies primary causes.
- **Targets improvement ideas**—Generates ideas for solutions; analyzes the potential effect or impact of each solution; selects appropriate solutions.
- **Implements improvements**—Tests solutions; gathers feedback on effectiveness; reviews results on baseline measures; modifies solutions as appropriate to ensure effectiveness.

Continuous Learning

Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.

Key Actions

- **Targets learning needs**—Seeks and uses feedback and other sources of information to identify appropriate areas for learning.
- **Seeks learning activities**—Identifies and participates in appropriate instructional activities (e.g., courses, reading, self-study, coaching, experiential learning) that help fulfill learning needs.
- **Maximizes learning**—Actively participates in learning activities in a way that makes the most of the experience (e.g., takes notes, asks questions, critically analyzes information, keeps on-the-job application in mind, completes required tasks).
- **Applies knowledge or skill**—Puts new knowledge, understanding, or skill to practical use on the job; furthers learning through trial and error.
- **Takes risks in learning**—Puts self in unfamiliar or uncomfortable situation in order to learn; asks questions at the risk of appearing foolish; takes on challenging or unfamiliar assignments.

Contributing to Team Success

Actively participating as a member of a team to move the team toward the completion of goals.

Key Actions

- **Facilitates goal accomplishment**—Makes procedural or process suggestions for achieving team goals or performing team functions; provides necessary resources or helps to remove obstacles to help the team accomplish its goals.
- **Involves others**—Listens to and fully involves others in team decisions and actions; values and uses individual differences and talents.
- **Informs others on team**—Shares important or relevant information with the team.
- **Models commitment**—Adheres to the team's expectations and guidelines; fulfills team responsibilities; demonstrates personal commitment to the team.

Customer Focus

Ensuring that the customer perspective is a driving force behind business decisions and activities; crafting and implementing service practices that meet customers' and own organization's needs.

Key Actions

- **Seeks to understand customer**—Actively seeks information to understand customer circumstances, problems, expectations, and needs.
- **Identifies customer service issues**—Identifies breakdowns in internal processes and systems that directly impact customer service and retention; expresses concerns to others.
- **Creates customer-focused practices**—Uses understanding of customer needs to institute systems, processes, and procedures to ensure customer satisfaction and to prevent service issues from occurring; promotes customer service as a value.
- **Assures customer satisfaction**—Makes sure that customer solutions, practices, and procedures are carried out and achieve their objectives.

Decision Making

Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.

Key Actions

- **Identifies issues, problems, and opportunities**—Recognizes issues, problems, or opportunities and determines whether action is needed.
- **Gathers information**—Identifies the need for and collects information to better understand issues, problems, and opportunities.
- **Interprets information**—Integrates information from a variety of sources; detects trends, associations, and cause-effect relationships.
- **Generates alternatives**—Creates relevant options for addressing problems/opportunities and achieving desired outcomes.
- **Chooses appropriate action**—Formulates clear decision criteria; evaluates options by considering implications and consequences; chooses an effective option.
- **Commits to action**—Implements decisions or initiates action within a reasonable time.
- **Involves others**—Includes others in the decision-making process as warranted to obtain good information, make the most appropriate decisions, and ensure buy-in and understanding of the resulting decisions.

Delegating Responsibility

Allocating decision-making authority and/or task responsibility to appropriate others to maximize the organization's and individuals' effectiveness.

Key Actions

- **Shares appropriate responsibilities**—Allocates decision-making authority and/or task responsibility in appropriate areas to appropriate individuals (considering positive and negative impact, organizational values and structures, and the enhancement of the individual's knowledge/skills).
- **Defines parameters**—Clearly communicates the parameters of the delegated responsibility, including decision-making authority and any required actions, constraints, or deadlines.
- **Provides support without removing responsibility**—Suggests resources and provides assistance or coaching as needed; expresses confidence in the individual.
- **Stays informed**—Establishes appropriate procedures to keep informed of issues and results in areas of shared responsibility.

Developing Others

Planning and supporting the development of individuals' skills and abilities so that they can fulfill current or future job/role responsibilities more effectively.

Key Actions

- **Collaboratively establishes development goals**—Works with individuals to identify areas for development, understand need for improvement, and set specific development goals.
- **Collaboratively establishes development plans**—Works with individuals to identify options for meeting development goals; explores environmental supports and barriers to development; jointly determines appropriate developmental activities.
- **Creates a learning environment**—Secures resources to support development efforts; ensures that opportunities for development are available; offers assistance to help individuals overcome obstacles to learning.
- **Monitors progress**—Gives individuals specific feedback on their performance related to established goals; highlights key positive and negative performance issues; adjusts plans to ensure development.

Formal Presentation

Presenting ideas effectively to individuals or groups when given time to prepare; delivering presentations suited to the characteristics and needs of the audience.

Key Actions

- **Defines clear goals**—Establishes an objective that clearly reflects the needs of the audience.
- **Follows a logical sequence**—Presents main ideas that support the objective of the presentation, and presents facts, evidence, and details that support the main ideas; delivers information in a logical order to aid understanding.
- **Uses nonverbal communication**—Uses body language (e.g., eye contact and gestures) that is consistent with verbal communication and aids understanding.
- **Uses learning aids**—Uses audio and visual aids to enhance the audience's understanding of content.
- **Listens and responds to questions and objections**—Involves the audience by soliciting questions and their thoughts; clarifies as needed to help achieve the goals of the session.
- **Summarizes the presentation**—Summarizes the main ideas; calls the audience to take action or make decisions, where appropriate.
- **Maintains audience attention**—Keeps the audience engaged through use of techniques such as analogies, illustrations, humor, an appealing style, body language, and voice inflection.

Gaining Commitment

Using appropriate interpersonal styles and techniques to gain acceptance of ideas or plans; modifying one's own behavior to accommodate tasks, situations, and individuals involved.

Key Actions

- **Opens discussions effectively**—Describes expectations, goals, requests, or future states in a way that provides clarity and excites interest.
- **Clarifies the current situation**—Seeks, gives, and summarizes information; ensures that the situation/issue at hand is understood.
- **Develops others' and own ideas**—Presents own ideas; seeks and develops suggestions of others; makes procedural suggestions.
- **Facilitates agreement**—Uses appropriate influence strategies (such as demonstrating benefits or giving rewards) to gain genuine agreement; persists by using different approaches as needed to gain commitment.
- **Closes discussions with clear summaries**—Summarizes outcomes of discussions and establishes next steps if needed.
- **Uses Key Principles**—Establishes good interpersonal relationships by helping people feel valued, appreciated, and included in discussions (enhances self-esteem, empathizes, involves, discloses, supports).

Information Monitoring

Setting up ongoing procedures to collect and review information needed to manage an organization or ongoing activities within it.

Key Actions

- **Identifies monitoring needs**—Determines which processes or areas need to be monitored; identifies what information needs to be obtained.
- **Develops monitoring systems**—Establishes systems to monitor activities or outputs that are easy to use and that provide timely and pertinent information.
- **Implements tracking systems**—Effectively establishes monitoring systems with minimal interruption for other organizational processes.
- **Reviews data**—Collects and reviews data regularly to determine progress, anticipate needs, and make necessary adjustments to personnel or processes.

Initiating Action

Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.

Key Actions

- **Responds quickly**—Takes immediate action when confronted with a problem or when made aware of a situation.
- **Takes independent action**—Implements new ideas or potential solutions without prompting; does not wait for others to take action or to request action.
- **Goes above and beyond**—Takes action that goes beyond job requirements in order to achieve objectives.

Innovation

Generating innovative solutions in work situations; trying different and novel ways to deal with work issues and opportunities.

Key Actions

- **Challenges paradigms**—Identifies implicit assumptions in the way problems or situations are defined or presented; seeks alternative ways to view or define problems; is not constrained by the thoughts or approaches of others.
- **Leverages diverse resources**—Draws upon multiple and diverse sources (individuals, disciplines, bodies of knowledge) for ideas and inspiration.
- **Thinks expansively**—Combines ideas in unique ways or makes connections between disparate ideas; explores different lines of thought; views situations from multiple perspectives; brainstorms multiple approaches/solutions.
- **Evaluates multiple solutions**—Examines numerous potential solutions and evaluates each before accepting any.
- **Ensures relevance**—Targets important areas for innovation and develops solutions that address meaningful work issues.

Managing Work (includes Time Management)

Effectively managing one's time and resources to ensure that work is completed efficiently.

Key Actions

- **Prioritizes**—Identifies more critical and less critical activities and tasks; adjusts priorities when appropriate.
- **Makes preparations**—Ensures that required equipment and/or materials are in appropriate locations so that own and others' work can be completed effectively.
- **Schedules**—Effectively allocates own time to complete work; coordinates own and others' schedules to avoid conflicts.
- **Leverages resources**—Takes advantage of available resources (individuals, processes, departments, and tools) to complete work efficiently.
- **Stays focused**—Uses time effectively and prevents irrelevant issues or distractions from interfering with work completion.

Planning and Organizing

Establishing courses of action for self and others to ensure that work is completed efficiently.

Key Actions

- **Prioritizes**—Identifies more critical and less critical activities and assignments; adjusts priorities when appropriate.
- **Determines tasks and resources**—Determines project/assignment requirements by breaking them down into tasks and identifying types of equipment, materials, and people needed.
- **Schedules**—Allocates appropriate amounts of time for completing own and others' work; avoids scheduling conflicts; develops timelines and milestones.
- **Leverages resources**—Takes advantage of available resources (individuals, processes, departments, and tools) to complete work efficiently; coordinates with internal and external partners.
- **Stays focused**—Uses time effectively and prevents irrelevant issues or distractions from interfering with work completion.

Quality Orientation

Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.

Key Actions

- **Follows procedures**—Accurately and carefully follows established procedures for completing work tasks.
- **Ensures high quality output**—Vigilantly watches over job processes, tasks, and work products to avoid errors, omissions, or defects.
- **Takes action**—Initiates action to correct quality problems or notifies others of quality issues as appropriate.

Safety Awareness

Identifying and correcting conditions that affect employee safety; upholding safety standards.

Key Actions

- **Identifies safety issues and problems**—Detects hazardous working conditions and safety problems; checks equipment and/or work area regularly.
- **Takes corrective action**—Reports or corrects unsafe working conditions; makes recommendations and/or improves safety and security procedures; enforces safety regulations and procedures.
- **Monitors the corrective action**—Monitors safety or security issues after taking corrective action and ensures continued compliance.

Stress Tolerance

Maintaining stable performance under pressure or opposition (such as time pressure or job ambiguity); handling stress in a manner that is acceptable to others and to the organization.

Key Actions

- **Maintains focus**—Stays focused on work tasks and productively uses time and energy when under stress.
- **Maintains relationships**—Presents a positive disposition and maintains constructive interpersonal relationships when under stress.
- **Copes effectively**—Develops appropriate strategies as needed to alter conditions that create stress and to sustain physical and mental health.

Work Standards

Setting high standards of performance for self and others; assuming responsibility and accountability for successfully completing assignments or tasks; self-imposing standards of excellence rather than having standards imposed.

Key Actions

- **Sets standards for excellence**—Establishes criteria and/or work procedures to achieve a high level of quality, productivity, or service.
- **Ensures high quality**—Dedicates required time and energy to assignments or tasks to ensure that no aspect of the work is neglected; works to overcome obstacles to completing tasks or assignments.
- **Takes responsibility**—Accepts responsibility for outcomes (positive or negative) of one's work; admits mistakes and refocuses efforts when appropriate.
- **Encourages others to take responsibility**—Provides encouragement and support to others in accepting responsibility; does not accept others' denial of responsibility without questioning.



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