Marcellus Shale Occupational Compendium
Background

The Marcellus Shale is a layer of marine sedimentary rock containing largely untapped natural gas reserves. The Marcellus formation covers large parts of New York state, Pennsylvania, and West Virginia, and reaches into Ohio and Virginia as well. Geologists have been aware of the Marcellus Shale’s natural gas deposits for some time, but not until recently have new drilling techniques and rising energy prices made the Marcellus a viable source for natural gas.

Marcellus Shale represents a rapidly growing segment of Pennsylvania’s economy that began in 2008. Much of the research and reporting has been focused around the types of industries associated with it along with industries that prosper as a result.

In 2009, the Center for Workforce Information & Analysis (CWIA) defined the ongoing Marcellus Shale activities by NAICS codes. The definition included a “core” set of industries that perform the main work (drilling and extraction of natural gas), along with a set of “ancillary” industries that are impacted by or ties to this work. This includes sub-contractors, distributors, and suppliers of necessary equipment.

On a monthly basis, the CWIA publishes a *Marcellus Shale Fast Facts* document that is designed to provide a quick analysis or overview of the most current labor market and economic data available related to Marcellus Shale activity.

This report consists of 67 one-page documents that are detailed occupational overviews. These occupations are found within the staffing patterns of Marcellus Shale core and ancillary industries, and have been identified as key to business’s current and future workforce.
### Occupations Included in the Compendium

<table>
<thead>
<tr>
<th>1. Accountants &amp; Auditors</th>
<th>HPO</th>
<th>35. Inspectors, Testers, Samplers &amp; Weighers</th>
<th>HPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Architects</td>
<td></td>
<td>36. Laborers &amp; Material Movers</td>
<td></td>
</tr>
<tr>
<td>3. Architectural &amp; Civil Drafters</td>
<td>HPO</td>
<td>37. Light Truck or Delivery Services Drivers</td>
<td>HPO</td>
</tr>
<tr>
<td>7. Carpenters</td>
<td>HPO</td>
<td>41. Mobile Heavy Equipment Mechanics</td>
<td></td>
</tr>
<tr>
<td>8. Chemical Technicians</td>
<td></td>
<td>42. Office Clerks</td>
<td>HPO</td>
</tr>
<tr>
<td>9. Civil Engineering Technicians</td>
<td></td>
<td>43. Operating Engineers</td>
<td>HPO</td>
</tr>
<tr>
<td>10. Civil Engineers</td>
<td>HPO</td>
<td>44. Paving, Surfacing &amp; Tamping Equipment Operators</td>
<td>HPO</td>
</tr>
<tr>
<td>12. Construction Laborers</td>
<td>HPO</td>
<td>46. Pipelayers</td>
<td></td>
</tr>
<tr>
<td>13. Construction Managers</td>
<td></td>
<td>47. Plumbers, Pipefitters &amp; Steamfitters</td>
<td>HPO</td>
</tr>
<tr>
<td>15. Customer Service Representatives</td>
<td>HPO</td>
<td>49. Pump Operators</td>
<td></td>
</tr>
<tr>
<td>17. Derrick Operators, Oil &amp; Gas</td>
<td></td>
<td>51. Rotary Drill Operators, Oil &amp; Gas</td>
<td>HPO</td>
</tr>
<tr>
<td>18. Earth Drillers</td>
<td></td>
<td>52. Roustabouts, Oil &amp; Gas</td>
<td>HPO</td>
</tr>
<tr>
<td>19. Electrical Engineers</td>
<td></td>
<td>53. Sales Representatives</td>
<td>HPO</td>
</tr>
<tr>
<td>22. Environmental Engineers</td>
<td></td>
<td>56. Service Unit Operators, Oil, Gas &amp; Mining</td>
<td>HPO</td>
</tr>
<tr>
<td>23. Executive Secretaries &amp; Administrative Assistants</td>
<td>HPO</td>
<td>57. Shipping, Receiving &amp; Traffic Clerks</td>
<td>HPO</td>
</tr>
<tr>
<td>24. Explosives Workers, Ordnance Handling Experts &amp; Blasters</td>
<td></td>
<td>58. Supervisors of Construction &amp; Extraction Workers</td>
<td>HPO</td>
</tr>
<tr>
<td>27. General Maintenance &amp; Repair Workers</td>
<td></td>
<td>61. Supervisors of Production &amp; Operating Workers</td>
<td>HPO</td>
</tr>
<tr>
<td>29. Heavy-Truck &amp; Tractor-Trailer Drivers</td>
<td>HPO</td>
<td>63. Surveying &amp; Mapping Technicians</td>
<td></td>
</tr>
<tr>
<td>30. Helpers – Extraction Workers</td>
<td></td>
<td>64. Surveyors</td>
<td></td>
</tr>
<tr>
<td>31. Helpers – Installation, Maintenance &amp; Repair Workers</td>
<td></td>
<td>65. Telecommunications Line Installers</td>
<td>HPO</td>
</tr>
<tr>
<td>32. Industrial Engineers</td>
<td>HPO</td>
<td>66. Welders, Cutters, Solderers &amp; Brazers</td>
<td>HPO</td>
</tr>
<tr>
<td>33. Industrial Machinery Mechanics</td>
<td>HPO</td>
<td>67. Wellhead Pumpers</td>
<td>HPO</td>
</tr>
<tr>
<td>34. Industrial Truck &amp; Tractor Operators</td>
<td>HPO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HPO - This occupation is identified as a High-Priority Occupation in Pennsylvania for 2012-2013
Source Data and How To Use

Occupational Title

Listing of alternative job titles directly associated with the above occupation as provided by employers.
Source: O*Net OnLine

Related Occupations

Occupations where the work environment, knowledge, training, educational requirements and skill sets are similar to the above occupation.
Source: O*Net OnLine

Nature of the Work

An overview of job duties, tasks and responsibilities associated with the above occupation, as well as the equipment, tools, software, etc. to be used by those employed in this occupation (when applicable).
Source: BLS.Gov, Occupational Outlook Handbook (OOH)

Wage Data

Pennsylvania Occupational Wage Data for the above occupation, produced by the Center for Workforce Information and Analysis (CWIA).
Source: PA Workstats, Pennsylvania Occupational Wages, Statewide – May 2011

Employment Data

Pennsylvania 2010-2020 Long-Term Employment Projections for the above occupation, produced by CWIA
Source: PA Workstats, Pennsylvania Occupational Employment, 2010-2020 Long-Term Projections – Statewide

Education & Training

Distribution of those currently employed in the above occupation, based on their education-level or training.
Source: TORQWorks

Knowledge Required

Organized sets of principles and facts applying to the above occupation, as defined by O*Net.
Source: O*Net Online

Skills Required

Developed capacities that facilitate learning or the more rapid acquisition of knowledge applying to the above occupation, as defined by O*Net.
Source: O*Net Online
Marcellus Shale Occupations
Accountants & Auditors

Common Employer Job Titles: Certified Public Accountant (CPA), Staff Accountant, Accounting Manager, Cost Accountant, General Accountant, Accounting Officer, Business Analyst, Accounting Supervisor, Financial Reporting Accountant, Internal Auditor, Auditor-in-Charge, Assurance Manager, Audit Manager

Related Occupations
Actuary, Appraiser, Bank & Loan Officer, Financial Analyst

Nature of the Work
Accountants & auditors prepare, analyze and verify financial documents in order to provide information to their clients.

Public accountants perform a broad range of accounting services for corporations, governments, nonprofit organizations or individuals.

Management accountants record and analyze the financial information of the companies for which they work. Other duties include budgeting, cost management and performance evaluation.

Government accountants & auditors maintain and examine the records of government agencies as well as businesses and individuals whose activities are subject to government regulations.

Internal auditors verify the accuracy of an organization's records. They also check for mismanagement, waste or fraud.

Computers are rapidly changing the nature of accounting work. Special software packages greatly reduce the amount of time spent on tedious manual calculations.

Knowledge Required
Computers & Electronics
Customer & Personal Service
Economics & Accounting
Law & Government
Mathematics

Skills Required
Critical Thinking
Judgment & Decision Making
Monitoring
Reading Comprehension
Systems Analysis

Wage Data
Entry Level Wage 2011: $42,340
Annual Average Wage 2011: $70,650
Experienced Level Wage 2011: $84,800

Employment Data
Estimated Employment 2010: 53,980
Projected Employment 2020: 59,060
Percent Change: 9.4%
Total Openings: 1,668

Education & Training
Associate Degree 4%
Bachelor's Degree 76%
Post-Baccalaureate Certificate 16%
Master's Degree 4%
Marcellus Shale Occupations

Architects

Common Employer Job Titles: Architect, Project Architect, Project Manager, Architectural Project Manager, Principal, Design Architect

Related Occupations

Construction Managers, Engineers, Landscape Architects, Urban & Regional Planners, Interior Designers

Nature of the Work

Architects are responsible for designing places, whether they are private or public; indoors or out; rooms, buildings or complexes. Architects are licensed professionals trained in the art and science of building design who develop the concepts for structures and turn those concepts into images and plans.

Architects create the overall look of buildings and other structures, but the design of a building involves far more than its appearance. Buildings also must be functional, safe and economical and must suit the needs of the people who use them. Architects consider all these factors when they design buildings and other structures.

Architects may be involved in all phases of a construction project, from the initial discussion with the client through the final delivery of the completed structure. Their duties require specific skills—designing, engineering, managing, supervising and communicating with clients and builders. Architects spend a great deal of time explaining their ideas to clients, construction contractors and others. Successful architects must be able to communicate their unique vision persuasively.

Wage Data

<table>
<thead>
<tr>
<th>Wage Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage 2011:</td>
<td>$55,530</td>
</tr>
<tr>
<td>Annual Average Wage 2011:</td>
<td>$82,620</td>
</tr>
<tr>
<td>Experienced Level Wage 2011:</td>
<td>$96,160</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010:</td>
<td>4,080</td>
</tr>
<tr>
<td>Projected Employment 2020:</td>
<td>4,590</td>
</tr>
<tr>
<td>Percent Change:</td>
<td>12.5%</td>
</tr>
<tr>
<td>Total Openings:</td>
<td>134</td>
</tr>
</tbody>
</table>

Education & Training

- Bachelor's Degree: 32%
- Master's Degree: 36%
- Professional Degree: 32%

Knowledge Required

- Design
- Building & Construction
- Engineering & Technology
- Customer & Personal Service
- Administration & Management

Skills Required

- Active Listening
- Critical Thinking
- Complex Problem Solving
- Judgment & Decision Making
Marcellus Shale Occupations
Architectural & Civil Drafters


Related Occupations
Cartographer, Designer, Architect, Engineer

Nature of the Work

Architectural drafters draw structural features of buildings and other structures. They may specialize by the type of structure or material used.

Civil drafters prepare drawings and maps used in major construction or civil engineering projects.

Construction workers use the drawings prepared by the drafters to build buildings, structures and civil engineering projects such as highways, bridges, pipelines, flood control projects and water & sewerage control systems. The drawings specify dimensions, materials to be used and which procedures to follow.

Most drafters now use computer-aided drafting (CAD) systems to prepare drawings. This tool allows drawings to be stored electronically so that revisions or duplications can be made easily. However, manual drafting may still be used for certain applications.

As CAD technology advances and the cost continues to fall, it is likely that almost all drafters will use CAD systems on a regular basis in the future.

Wage Data

Entry Level Wage 2011: $33,410
Annual Average Wage 2011: $46,740
Experienced Level Wage 2011: $53,400

Employment Data

Estimated Employment 2010: 5,130
Projected Employment 2020: 4,660
Percent Change: -9.2%
Total Openings: 99

Education & Training

Associate Degree 11%
Bachelor's Degree 68%
Post-Baccalaureate Certificate 15%
Master's Degree 4%

Knowledge Required

Building & Construction
Computers & Electronics
Design
Engineering & Technology
Mathematics

Skills Required

Active Learning
Active Listening
Complex Problem Solving
Coordination
Mathematics
Marcellus Shale Occupations
Billing & Posting Clerks & Machine Operators

Common Employer Job Titles: Data Processor, Statement Clerk, Statement Distribution Clerk, Statement Services Representative, Data Entry Clerk, Item Processing Clerk, Statement Processor, Reconciling Clerk, Billing Clerk, Accountant, Accounts Payable Clerk, Billing Coordinator, Billing Specialist, Contract Administrator

Related Occupations
Bank Teller, Medical Record Clerk, Receiving Clerk, Reservation Clerk, Statistical Clerk

Nature of the Work
Billing & posting clerks & machine operators use calculators and computers to prepare bills, invoices and itemized statements for billing and record-keeping purposes.

Billing & posting clerks review purchase orders, sales tickets, hospital records or charge slips in order to calculate the total amount owed by a customer.

Billing machine operators print out the bill that is sent to the customer. After they are printed, the bills are verified one last time by the billing clerks.

Computers and specialized billing software allow many clerks to automatically calculate charges and prepare bills all in one step. However, many workers still keep paper records for reference purposes.

Regardless of the size of the organization, clerical workers are increasingly performing a broader variety of tasks than they did in the past.

Wage Data
Entry Level Wage 2011: $24,530
Annual Average Wage 2011: $33,150
Experienced Level Wage 2011: $37,470

Employment Data
Estimated Employment 2010: 25,500
Projected Employment 2020: 27,240
Percent Change: 6.8%
Total Openings: 619

Education & Training
- High School Diploma: 36%
- Some College Courses: 15%
- Associate Degree: 24%
- Bachelor's Degree: 25%

Knowledge Required
- Clerical
- Economics & Accounting
- English Language
- Mathematics

Skills Required
- Active Listening
- Mathematics
- Reading Comprehension
- Speaking
- Writing
Marcellus Shale Occupations

Bookkeeping, Accounting & Auditing Clerks

Common Employer Job Titles: Accounting Clerk, Accounting Assistant, Accounts Payables Clerk, Bookkeeper, Account Clerk, Accounts Payable Clerk, Accounts Receivable Clerk, Account Receivable Clerk, Accounts Payable Specialist, Accounting Associate

Related Occupations

Bank Teller, Medical Record Clerk, Receiving Clerk, Reservation Clerk, Statistical Clerk

Nature of the Work

Bookkeeping, accounting & auditing clerks are an organization’s financial record-keepers. They update and maintain accounting records, including those which tabulate expenditures, receipts, accounts payable and receivable and profit and loss.

Bookkeeping clerks, who are usually found in small establishments, handle all aspects of financial transactions. They may also prepare bank deposits and balance receipts.

Accounting clerks perform duties that are more specialized in nature, such as posting transactions and computing interest. Other tasks include reconciling computer reports with manually maintained journals.

Auditing clerks verify the records of transactions that are posted by other workers. They may correct any errors themselves or note the problem and return the work for adjustment.

Computers and specialized accounting software allow clerks to post transactions and balance accounts electronically. As a result, manual posting to general ledgers is becoming obsolete.

Regardless of the size of the organization, clerical workers are increasingly performing a broader variety of tasks than they did in the past.

Wage Data

Entry Level Wage 2011: $23,630
Annual Average Wage 2011: $36,140
 Experienced Level Wage 2011: $42,400

Employment Data

Estimated Employment 2010: 74,600
Projected Employment 2020: 78,390
Percent Change: 5.1%
Total Openings: 1,200

Education & Training

High School Diploma 38%
Some College Courses 32%
Associate Degree 12%
Bachelor’s Degree 18%

Knowledge Required

Clerical
Computers & Electronics
Customer & Personal Service
Economics & Accounting
English Language

Skills Required

Active Learning
Active Listening
Critical Thinking
Learning Strategies
Mathematics

Center for Workforce Information & Analysis
Marcellus Shale Occupations

Bus, Truck & Diesel Engine Mechanics


Related Occupations


Nature of the Work

Bus, truck & diesel engine mechanics are responsible for repairing and maintaining the diesel engines that are found in transportation equipment, such as heavy trucks, buses, locomotives, bulldozers, cranes, road graders, farm tractors and boats.

As more electronic components are used to control diesel engine operation, maintenance becomes more complex. Many diesel mechanics use handheld computers to diagnose problems and adjust engine functions.

It is common for diesel mechanics to perform many different kinds of repairs. They use a variety of tools, including power tools, machine tools, welding equipment, jacks and hoists. Common hand tools are used to work on small parts and hard-to-reach places.

Wage Data

Entry Level Wage 2011: $29,900
Annual Average Wage 2011: $41,300
Experienced Level Wage 2011: $46,990

Employment Data

Estimated Employment 2010: 11,170
Projected Employment 2020: 12,280
Percent Change: 9.9%
Total Openings: 353

Education & Training

Less Than High School Diploma 9%
High School Diploma 40%
Post-Secondary Certificate 40%
Some College Courses 11%

Knowledge Required

Mechanical
Public Safety & Security
Transportation

Skills Required

Equipment Maintenance
Installation
Reading Comprehension
Repairing
Troubleshooting

Center for Workforce Information & Analysis
# Marcellus Shale Occupations

## Carpenters

**Common Employer Job Titles:** Carpenter, Lead Carpenter, Assembler, Finish Carpenter, Construction Worker, Custom Stair Builder, Installer, Production Worker, Trim Carpenter, Concrete Carpenter

### Related Occupations
- Bricklayer, Construction Helper, Stonemason, Tile Setter

### Nature of the Work

Carpenters cut, fit and assemble wood and other materials in the construction of buildings, highways, bridges, docks and industrial plants. They must be familiar with the local building codes.

Each task is somewhat different but the basic steps are the same. Blueprints and other instructions are used to measure, mark and arrange materials. Carpenters then use hand and power tools to cut and shape materials. When finished, carpenters check the accuracy of their final product and make any necessary adjustments.

Individuals with basic overall training are at a distinct advantage because they can switch from residential building to commercial construction to remodeling work, depending on which offers the best opportunities. Those employed outside of the construction industry perform a variety of installation and maintenance work. In manufacturing firms, they may also assist in moving machinery.

### Wage Data

<table>
<thead>
<tr>
<th>Wage Level</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage 2011</td>
<td>$27,880</td>
</tr>
<tr>
<td>Annual Average Wage 2011</td>
<td>$42,370</td>
</tr>
<tr>
<td>Experienced Level Wage 2011</td>
<td>$49,620</td>
</tr>
</tbody>
</table>

### Employment Data

<table>
<thead>
<tr>
<th>Employment Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010</td>
<td>50,340</td>
</tr>
<tr>
<td>Projected Employment 2020</td>
<td>54,930</td>
</tr>
<tr>
<td>Percent Change</td>
<td>9.1%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>1,526</td>
</tr>
</tbody>
</table>

### Education & Training

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than High School Diploma</td>
<td>17%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>39%</td>
</tr>
<tr>
<td>Post-Secondary Certificate</td>
<td>28%</td>
</tr>
<tr>
<td>Other</td>
<td>16%</td>
</tr>
</tbody>
</table>

### Knowledge Required
- Building & Construction
- Design
- Engineering & Technology
- Mathematics

### Skills Required
- Active Listening
- Equipment Selection
- Installation
- Mathematics
- Operations Analysis

---

Center for Workforce Information & Analysis
Chemical technicians work with chemists and chemical engineers, developing and using chemicals and related products and equipment. Generally, there are two types of chemical technicians: research technicians who work in experimental laboratories and process control technicians who work in manufacturing or other industrial plants. Many chemical technicians working in research and development conduct a variety of laboratory procedures, from routine process control to complex research projects. For example, they may collect and analyze samples of air and water to monitor pollution levels, or they may produce compounds through complex organic synthesis. Most process technicians work in manufacturing, testing packaging for design, integrity of materials and environmental acceptability. Often, process technicians who work in plants focus on quality assurance, monitoring product quality or production processes and developing new production techniques. A few work in shipping to provide technical support and expertise.
Marcellus Shale Occupations
Civil Engineering Technicians

Common Employer Job Titles: Civil Engineering Designer, Engineering Assistant, Transportation Engineering Technician, Civil Designer, Engineering Specialist, Civil Engineering Assistant, Construction Analyst

Related Occupations
Cost Estimators, Construction & Building Inspectors, Drafters, Surveyors, Cartographers, Photogrammetrists

Nature of the Work

Engineering technicians use the principles and theories of science, engineering and mathematics to solve technical problems in research and development, manufacturing, sales, construction, inspection and maintenance. Their work is more narrowly focused and application-oriented than that of scientists and engineers. Many engineering technicians assist engineers and scientists, especially in research and development. Others work in quality control, inspecting products and processes, conducting tests or collecting data. In manufacturing, they may assist in product design, development or production. Although many workers who repair or maintain various types of electrical, electronic or mechanical equipment are called technicians, those workers are covered in the handbook section on installation, maintenance and repair occupations.

Engineering technicians who work in research and development build or set up equipment, prepare and conduct experiments, collect data, calculate or record results and help engineers or scientists in other ways, such as making prototype versions of newly designed equipment. They also assist in design work, often using computer-aided design and drafting (CADD) equipment.

Civil engineering technicians help civil engineers plan and oversee the construction of highways, buildings, bridges, dams, wastewater treatment systems and other structures. Some estimate construction costs and specify materials to be used, and some may even prepare drawings or perform land-surveying duties. Others may set up and monitor instruments used to study traffic conditions.

Wage Data

<table>
<thead>
<tr>
<th>Wage Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage 2011:</td>
<td>$33,350</td>
</tr>
<tr>
<td>Annual Average Wage 2011:</td>
<td>$47,440</td>
</tr>
<tr>
<td>Experienced Level Wage 2011:</td>
<td>$54,490</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010:</td>
<td>2,660</td>
</tr>
<tr>
<td>Projected Employment 2020:</td>
<td>3,130</td>
</tr>
<tr>
<td>Percent Change:</td>
<td>17.7%</td>
</tr>
<tr>
<td>Total Openings:</td>
<td>98</td>
</tr>
</tbody>
</table>

Education & Training

<table>
<thead>
<tr>
<th>Education &amp; Training</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Secondary Certificate</td>
<td>41%</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>22%</td>
</tr>
<tr>
<td>Bachelor's Degree</td>
<td>16%</td>
</tr>
<tr>
<td>Other</td>
<td>21%</td>
</tr>
</tbody>
</table>

Knowledge Required

- Building & Construction
- Engineering & Technology
- Mathematics
- Design
- Public Safety & Security

Skills Required

- Reading Comprehension
- Active Listening
- Critical Thinking
- Writing
- Complex Problem Solving

Center for Workforce Information & Analysis
Marcellus Shale Occupations

Civil Engineers

Common Employer Job Titles: Civil Engineer, Engineer, Project Engineer, Project Manager, Structural Engineer, City Engineer, Civil Engineering Manager, Railroad Design Consultant, Research Hydraulic Engineer

Related Occupations

Broadcast & Sound Engineering Technicians, Clinical Laboratory Technologists & Technicians

Nature of the Work

Engineers apply the principles of science and mathematics to develop economical solutions to technical problems. Their work is the link between scientific discoveries and the commercial applications that meet societal and consumer needs.

Many engineers develop new products. During the process, they consider several factors. For example, in developing an industrial robot, engineers specify the functional requirements precisely; design and test the robot’s components; integrate the components to produce the final design; and evaluate the design’s overall effectiveness, cost, reliability and safety. This process applies to the development of many different products, such as chemicals, computers, power plants, helicopters and toys.

In addition to their involvement in design and development, many engineers work in testing, production or maintenance. These engineers supervise production in factories, determine the causes of a component’s failure and test manufactured products to maintain quality. They also estimate the time and cost required to complete projects.

Civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges and water supply and sewage systems. They must consider many factors in the design process, from the construction costs and expected lifetime of a project to government regulations and potential environmental hazards, such as earthquakes and hurricanes. Civil engineering, considered one of the oldest engineering disciplines, encompasses many specialties. The major ones are structural, water resources, construction, transportation and geotechnical engineering. Many civil engineers hold supervisory or administrative positions, from supervisor of a construction site to city engineer. Others may work in design, construction, research and teaching.

Wage Data

Entry Level Wage 2011: $52,840
Annual Average Wage 2011: $77,600
Experienced Level Wage 2011: $89,990

Employment Data

Estimated Employment 2010: 12,830
Projected Employment 2020: 14,450
Percent Change: 12.6%
Total Openings: 423

Education & Training

Bachelor's Degree 86%
Master's Degree 5%
Professional Degree 9%

Knowledge Required

Building & Construction
Engineering & Technology
Mathematics
Design
Public Safety & Security

Skills Required

Reading Comprehension
Active Listening
Critical Thinking
Operations Analysis
Complex Problem Solving
Marcellus Shale Occupations
Construction & Building Inspectors


Related Occupations
Appraiser & Assessor, Carpenter, Electrician, Fire Inspector, Fire Investigator, Plumber, Safety Engineer

Nature of the Work

Construction & building inspectors check for structural quality and fire safety. There are many types of inspectors.

Electrical inspectors check electrical wiring and equipment to be sure they operate properly and safely.

Plumbing inspectors examine pipes, fixtures, water supply and waste systems.

Public works inspectors inspect sewers, dams, bridges and highways.

All inspectors decide if construction complies with building codes. When inspectors find problems, they issue violations or stop-work orders. They notify owners, builders and city building agencies. Inspectors confer with these groups to explain regulations and recommend changes in the construction.

Inspectors may investigate accidents to determine the causes. They then develop ways to prevent future accidents. All inspectors maintain daily logs and inspection records. They also prepare reports.

Wage Data

Entry Level Wage 2011: $34,780
Annual Average Wage 2011: $48,100
Experienced Level Wage 2011: $54,760

Employment Data

Estimated Employment 2010: 5,800
Projected Employment 2020: 6,450
Percent Change: 11.2%
Total Openings: 237

Education & Training

High School Diploma 16%
Post-Secondary Certificate 19%
Bachelor's Degree 29%
Other 36%

Knowledge Required
Building & Construction
Customer & Personal Service
Design
Engineering & Technology
Public Safety & Security

Skills Required
Active Learning
Active Listening
Critical Thinking
Mathematics
Reading Comprehension

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Construction Laborers

Common Employer Job Titles: Laborer, Construction Laborer, Cement Finisher, Construction Worker, Helper, Post Framer, Curb & Gutter Laborer, Drain Layer, Drop Crew Laborer, Punch Out Crew Member

Related Occupations
Forestry Worker, Groundskeeper, Highway Maintenance Worker, Logging Equipment Operator, Roustabout

Nature of the Work

Construction laborers perform tasks that are needed to make the work of skilled construction, maintenance and production workers flow smoothly. They provide much of the physically demanding labor at construction sites. They may operate hand and power tools like air hammers, earth tampers, cement mixers, small mechanical hoists, surveying and measuring equipment and a variety of other equipment and instruments. They clean and prepare sites, dig trenches, set braces to support the sides of excavations, erect scaffolding, clean up rubble and debris and remove asbestos, lead and other hazardous waste materials. They also help assist other craft workers.

Wage Data

- Entry Level Wage 2011: $21,850
- Annual Average Wage 2011: $34,600
- Experienced Level Wage 2011: $40,980

Employment Data

- Estimated Employment 2010: 35,600
- Projected Employment 2020: 40,110
- Percent Change: 12.7%
- Total Openings: 736

Education & Training

Knowledge Required
- Building & Construction
- Design
- Engineering & Technology
- Mathematics
- Mechanical

Skills Required
- Active Learning
- Equipment Selection

Center for Workforce Information & Analysis
Construction managers oversee the organization, scheduling and implementation of various construction projects. They may have job titles such as constructor, construction superintendent, general superintendent, project engineer, project manager, general construction manager or executive construction manager.

Managers evaluate possible construction methods and determine the most cost-effective plan. They coordinate all construction activities and schedule the time required to meet established deadlines. They also oversee the laborers and tradesman and are responsible for ensuring the safety of employees and the general public.

Meetings are held regularly with owners, trade contractors, architects and other design professionals to monitor and coordinate all phases of the project.
Marcellus Shale Occupations
Cost Estimators

Common Employer Job Titles: Estimator, Cost Estimator, Estimator Project Manager, Project Manager, Construction Estimator, Cost Analyst, Design Consultant, Operations Manager, Sales Engineer

Related Occupations

Nature of the Work
Cost estimators compile and analyze data on all the factors that can influence project costs. Job duties vary widely depending on the type and size of the project.

Within the construction industry, the cost estimation process begins with the decision to submit a bid. After reviewing drawings and specifications, a visit is made to the proposed site. With the information gathered “on-site”, the cost estimator determines equipment needs, sequence of operations and crew size. All of these findings are included in the cost summary.

In manufacturing firms, cost estimators determine the costs associated with making a product. A job usually begins with a request from management. Information is then gathered and analyzed by the cost estimator. The cost of purchasing parts is compared with the cost of manufacturing them to determine which is cheaper.

Although computers cannot be used for the entire estimating process, they can be used for complex mathematical calculations.

Wage Data
Entry Level Wage 2011: $39,050
Annual Average Wage 2011: $60,170
Experienced Level Wage 2011: $70,730

Employment Data
Estimated Employment 2010: 9,450
Projected Employment 2020: 11,490
Percent Change: 21.6%
Total Openings: 386

Education & Training
Associate Degree 14%
Bachelor’s Degree 64%
Master’s Degree 7%
Other 15%

Knowledge Required
Active Listening
Mathematics
Reading Comprehension
Time Management
Writing

Skills Required
Deductive Reasoning
Inductive Reasoning
Information Ordering
Mathematical Reasoning
Oral Comprehension

Center for Workforce Information & Analysis
Customer Service Representatives are responsible for ensuring that their company's customers receive an adequate level of service or help with their questions and concerns. These customers may be individual consumers or other companies, and the nature of their service needs can vary considerably.

Some customer service representatives handle general questions and complaints, whereas others specialize in a particular area. They communicate with customers through a variety of means—either in person, by telephone, e-mail, regular mail correspondence or fax. In handling customers’ complaints, customer service representatives must attempt to resolve the problem according to guidelines established by the company. In some cases, customer service representatives are required to follow up with an individual customer until a question is answered or an issue is resolved.
Marcellus Shale Occupations
Cutting, Punching & Press Machine Operators & Tenders


Related Occupations
Assembler & Fabricator, Computer Controlled Machine Operator, Machinist, Tool & Die Maker

Nature of the Work
Cutting, punching & press machine operators & tenders use a variety of machines to produce metal and plastic items, which are used in many consumer products.

They load workpieces, plastic material or chemical solutions into machines and determine locations of cutting lines, dimensions and tolerances required. They install, align and lock specified machine tools and adjust ram strokes using hand tools. In addition, cutting, punching & press machine operators may examine workpieces for defects and sort them according to the type of flaw. Typically, skilled setup workers are called upon for major adjustments when a problem arises.

Wage Data
Entry Level Wage 2011: $24,040
Annual Average Wage 2011: $33,300
Experienced Level Wage 2011: $37,930

Employment Data
Estimated Employment 2010: 10,120
Projected Employment 2020: 10,140
Percent Change: 0.2%
Total Openings: 77

Education & Training

<table>
<thead>
<tr>
<th>Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than High School Diploma</td>
<td>18%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>80%</td>
</tr>
<tr>
<td>Post-Secondary Certificate</td>
<td>2%</td>
</tr>
</tbody>
</table>

Knowledge Required
Engineering & Technology
Mechanical
Physics
Production & Processing

Skills Required
Equipment Maintenance
Equipment Selection
Installation
Mathematics
Operation & Control
Marcellus Shale Occupations
Derrick Operators, Oil & Gas

Common Employer Job Titles: Rotary Derrick Operator, Well Service Derrick Operator

Related Occupations
Operating Engineers, Rail Car Repairers, Rotary Drill Operators, Roof Bolters, Roustabouts

Nature of the Work
Oil and gas derrick operators inspect derricks for flaws, clean and oil derricks in order to maintain proper working conditions and inspect derricks prior to being raised or lowered. They also listen to mud pumps and regularly check for vibration and other problems to ensure that rig pumps and drilling mud systems are working properly, and repair the pumps and mud tanks when they are not functioning properly.

Wage Data
- Entry Level Wage 2011: $47,240
- Annual Average Wage 2011: $52,220
- Experienced Level Wage 2011: $54,720

Employment Data
- Estimated Employment 2010: 210
- Projected Employment 2020: 420
- Percent Change: 100%
- Total Openings: 25

Education & Training

Knowledge Required
- Education & Training
  - English Composition
  - Mathematics
  - Mechanical

Skills Required
- Active Listening
- Coordination
- Equipment Maintenance
- Equipment Selection
- Operation Monitoring
- Repairing

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Earth Drillers


Related Occupations
Crate & Tower Operators, Farm Equipment Mechanics, Paving, Surfacing & Tamping Equipment Operators

Nature of the Work

Earth drillers monitor drilling operations, checking gauges and listening to equipment to assess drilling conditions and to determine the need to adjust drilling or alter equipment. They are responsible for selecting the appropriate drill for the job, using knowledge of rock or soil conditions.

Earth drillers are responsible for regulating air pressure, rotary speed, and downward pressure, according to the type of rock or concrete being drilled, as well as verifying depths and alignments of boring positions.

Wage Data

<table>
<thead>
<tr>
<th>Level</th>
<th>Wage 2011</th>
<th>Wage 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level</td>
<td>$29,270</td>
<td></td>
</tr>
<tr>
<td>Annual Average</td>
<td>$44,140</td>
<td></td>
</tr>
<tr>
<td>Experienced Level</td>
<td>$51,570</td>
<td></td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Year</th>
<th>Employment</th>
<th>Percent Change</th>
<th>Total Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated 2010</td>
<td>1,240</td>
<td>29%</td>
<td>63</td>
</tr>
<tr>
<td>Projected 2020</td>
<td>1,600</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Education & Training

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than High School Diploma</td>
<td>28%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>46%</td>
</tr>
<tr>
<td>Some College Courses</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>19%</td>
</tr>
</tbody>
</table>

Knowledge Required

- Administration & Management
- Mathematics
- Mechanical
- Public Safety & Security

Skills Required

- Active Listening
- Equipment Maintenance
- Repairing
- Troubleshooting
Marcellus Shale Occupations

Electrical Engineers

Common Employer Job Titles: Electrical Engineer, Electrical Design Engineer, Project Engineer, Electrical Controls Engineer, Test Engineer, Hardware Design Engineer, Circuits Engineer, Electrical Project Engineer

Related Occupations


Nature of the Work

Electrical engineers design, develop, test and supervise the manufacture of electrical equipment. Some of this equipment includes electric motors; machinery controls, lighting and wiring in buildings; radar and navigation systems; communications systems; and power generation, control and transmission devices used by electric utilities. Electrical engineers also design the electrical systems of automobiles and aircraft. Although the terms electrical and electronics engineering often are used interchangeably in academia and industry, electrical engineers traditionally have focused on the generation and supply of power, whereas electronics engineers have worked on applications of electricity to control systems or signal processing. Electrical engineers specialize in areas such as power systems engineering or electrical equipment manufacturing.

Wage Data

<table>
<thead>
<tr>
<th>Wage Level</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$59,330</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$86,610</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$100,250</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Data</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>4,760</td>
</tr>
<tr>
<td>Projected Employment</td>
<td>5,200</td>
</tr>
<tr>
<td>Percent Change</td>
<td>9.2%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>159</td>
</tr>
</tbody>
</table>

Education & Training

- Associate Degree: 13%
- Bachelor’s Degree: 73%
- Master’s Degree: 6%
- Other: 8%

Knowledge Required

- Engineering & Technology
- Mathematics
- Physics
- Computers & Electronics
- Mechanical

Skills Required

- Critical Thinking
- Complex Problem Solving
- Equipment Maintenance
- Judgment & Decision Making

Center for Workforce Information & Analysis
Electrical power-line installers & repairers first construct poles, towers, and underground trenches to carry the wires and cables. To do this, they use a variety of construction equipment. When these structures are completed, line installers string cable along them. For poles or towers, they climb or use truck-mounted buckets to reach the top. Next, they pull up cable by hand from large reels mounted on trucks. Then they set the line in place, and pull it to get the correct amount of tension. Finally, line installers attach the cable to the structure, using hand tools. For electrical power lines, they bolt or clamp insulators onto the poles before attaching the cable. They lay underground cable directly in the trench, or string it through pipes to protect it.

Line installers also set up service for customers. To do this, they string a piece of cable between the customer’s building and the lines running on poles, towers or in trenches. They place wiring in houses, and check that the signals are strong. Line installers may also install a variety of network equipment to maintain the strength of transmissions. In addition, they install transformers, circuit breakers and switches to control and direct the electrical current.

Line installers and repairers also maintain wires and cables. From time to time, they travel in trucks, helicopters or planes to inspect them. Monitoring equipment can often detect errors on the network. When line repairers identify a problem, they travel to its location. There, they repair or replace defective equipment. Bad weather and other events can cause extensive damage to networks. Line installers and repairers must respond quickly to these emergencies to restore service. Repair and installation work may require splicing, or joining, separate pieces of cable.
Marcellus Shale Occupations
Engineering Managers

Common Employer Job Titles: Engineering Manager, Project Engineer, Project Engineering Manager, Project Manager, Director of Engineering, Civil Engineering Manager, Principal Engineer, Process Engineering Manager

Related Occupations
Systems Administrator, Computer Programmer, Mechanical Engineer, Nuclear Engineer

Nature of the Work
Engineering managers plan, direct or coordinate activities in such fields as architecture and engineering or research and development.

Wage Data
Entry Level Wage 2011: $83,330
Annual Average Wage 2011: $127,660
Experienced Level Wage 2011: $149,820

Employment Data
Estimated Employment 2010: 6,000
Projected Employment 2020: 6,340
Percent Change: 5.7%
Total Openings: 151

Education & Training
Bachelor’s Degree 68%
Master’s Degree 20%
Post-Doctoral Training 7%
Other 5%

Knowledge Required
Engineering & Technology
Mathematics
Computers & Electronics
Chemistry
Physics

Skills Required
Critical Thinking
Coordination
Tool Selection
Equipment Maintenance
Judgment & Decision Making
Using the principles of biology and chemistry, environmental engineers develop solutions to environmental problems. They are involved in water and air pollution control, recycling, waste disposal, and public health issues. Environmental engineers conduct hazardous-waste management studies in which they evaluate the significance of the hazard, offer analysis on treatment and containment, and develop regulations to prevent mishaps. They design municipal water supply and industrial wastewater treatment systems. They conduct research on proposed environmental projects, analyze scientific data and perform quality control checks.

Environmental engineers are concerned with local and worldwide environmental issues. They study and attempt to minimize the effects of acid rain, global warming, automobile emissions, and ozone depletion. They also are involved in the protection of wildlife.

Many environmental engineers work as consultants, helping their clients to comply with regulations and to clean up hazardous sites.

Knowledge Required
- Administration & Management
- Engineering & Technology
- Law & Government
- Mathematics
- Public Safety & Security

Skills Required
- Active Listening
- Critical Thinking
- Reading Comprehension
- Science
- Writing
Executive Secretaries & Admin. Assistants

Common Employer Job Titles: Administrative Assistant, Executive Assistant, Executive Secretary, Administrative Secretary, Office Manager, Administrative Coordinator, Administrative Aide, Administrative Associate, Executive Administrative Assistant, Secretary

Related Occupations

Human Resource Assistant, Legal Secretary, Medical Secretary, Paralegals & Legal Assistant, Receptionists & Information Clerk

Nature of the Work

Executive secretaries & administrative assistants are responsible for a variety of administrative and clerical duties necessary to run an organization efficiently.

They may supervise other clerical staff who perform the majority of the organization’s clerical tasks. In addition, they handle the more complex tasks, such as conducting research, preparing statistical reports and training employees.

To complete their duties, secretaries must be familiar with a wide variety of office equipment, including fax machines, photocopiers, telephone systems and personal computers.

Wage Data

Entry Level Wage 2011: $33,560
Annual Average Wage 2011: $47,800
Experienced Level Wage 2011: $54,920

Employment Data

Estimated Employment 2010: 38,470
Projected Employment 2020: 39,630
Percent Change: 3.0%
Total Openings: 631

Education & Training

High School Diploma 28%
Some College Courses 33%
Associate Degree 27%
Other 12%

Knowledge Required

Administration & Management
Clerical
Computers & Electronics
Customer & Personal Service
English Language

Skills Required

Active Listening
Reading Comprehension
Speaking
Time Management
Writing
Marcellus Shale Occupations

Explosives Workers, Ordnance Handling Experts & Blasters

Common Employer Job Titles: Blast Setter, Bomb Technician, Charger, Demolition Expert, Explosives Detonator, Fuse Cutter, Gun Perforator, Nitro Worker, Oil Well Shooter, Shaft Sinker, Shotblaster, Tunnel Worker, Well Shooter

Related Occupations

Petroleum Pump Systems Operators, Riggers, Signal & Track Switch Operators, Structural Iron & Steel Workers

Nature of the Work

Blasters & explosives workers place and detonate explosives to demolish structures or to loosen, remove or displace earth, rock or other materials. They may perform specialized handling, storage and accounting procedures.

Explosive workers insert, pack and pour explosives, such as dynamite, ammonium nitrate, black powder or slurries into blast holes; then shovel drill cuttings, admit water to boreholes and tamp material to compact charges. They tie specified lengths of delaying fuses into patterns in order to time the sequence of explosions.

Explosives workers examine blast areas to determine the amounts and kinds of explosive charges needed and to ensure that safety laws are observed. They are responsible for placing safety cones around blast areas to alert other workers of danger zones, and signal workers as necessary to ensure that they clear blast sites prior to explosions.

Wage Data

Entry Level Wage 2011: $37,490
Annual Average Wage 2011: $48,590
Experienced Level Wage 2011: $54,140

Employment Data

Estimated Employment 2010: 210
Projected Employment 2020: 260
Percent Change: 23.8%
Total Openings: 10

Education & Training

High School Diploma 63%
Post-Secondary Certificate 21%
Some College Courses 8%
Other 8%

Knowledge Required

Administration & Management
Customer & Personal Service
Engineering & Technology
Law & Government
Mathematics
Public Safety & Security

Skills Required

Active Learning
Active Listening
Critical Thinking
Equipment Management
Judgment & Decision Making
Monitoring

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Gas Compressor & Pumping Station Operators

Common Employer Job Titles: Gas Booster Engineer, Gas Engineer, Gas Operator, Gas Transfer Operator, Station Engineer

Related Occupations
Gas Plant Operators, Packer & Packagers, Printing Machine Operators

Nature of the Work
Gas compressor and gas pumping station operators transmit, compress or recover gases, such as butane, nitrogen, hydrogen and natural gas. They are responsible for monitoring meters and pressure gauges to determine consumption rate variations, temperatures and pressures. They adjust valves and equipment to obtain specified performance levels.

Gas compressor and gas pumping station operators respond to problems by adjusting control room equipment, and/or instructing other personnel to adjust equipment at problem locations or in other control areas. They take samples of gases and conduct chemical tests in order to determine gas quality and sulfur or moisture content, or send samples to laboratories for analysis.

Wage Data
- Entry Level Wage 2011: $43,600
- Annual Average Wage 2011: $52,420
- Experienced Level Wage 2011: $56,830

Employment Data
- Estimated Employment 2010: 390
- Projected Employment 2020: 480
- Percent Change: 23.1%
- Total Openings: 20

Education & Training
- High School Diploma: 78%
- Post-Secondary Certificate: 11%
- Associate Degree: 11%

Knowledge Required
- Mathematics
- Mechanical
- Production & Processing
- Public Safety & Security

Skills Required
- Critical Thinking
- Equipment Maintenance
- Operation Monitoring
- Repairing
- Troubleshooting

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Gas Plant Operators


Related Occupations

Nature of the Work

Gas plant operators monitor equipment functioning, observe temperature, level and flow gauges and perform regular unit checks, in order to ensure that all equipment is operating as it should. They also monitor transportation and storage of flammable and other potentially dangerous products to ensure that safety guidelines are followed.

Gas plant operators record, review and compile operations records, test results and gauge readings such as temperatures, pressures, concentrations and flows. They adjust temperature, pressure, vacuum, level, flow rate and/or transfer of gas to maintain processes at required levels or to correct problems.

Wage Data

Entry Level Wage 2011: $43,670
Annual Average Wage 2011: $55,890
Experienced Level Wage 2011: $62,000

Employment Data

Estimated Employment 2010: 980
Projected Employment 2020: 1,230
Percent Change: 25.5%
Total Openings: 57

Education & Training

Less Than High School Diploma 5%
High School Diploma 43%
Post-Secondary Certificate 39%
Other 13%

Knowledge Required
Computers & Electronics
Customer & Personal Service
Mechanical
Production & Processing
Public Safety & Security
Transportation

Skills Required
Equipment Maintenance
Equipment Selection
Operation Monitoring
Operation & Control
Reading Comprehension
Troubleshooting

Center for Workforce Information & Analysis
Marcellus Shale Occupations
General Maintenance & Repair Workers


Related Occupations
Carpenter, Electrician, Electronics Installer & Repairer, HVAC Mechanic

Nature of the Work

General maintenance & repair workers inspect and diagnose problems and determine the best way to correct them, frequently checking blueprints, repair manuals and parts catalogs. They also perform routine preventive maintenance and ensure that machines continue to run smoothly, building systems operate efficiently and the physical condition of buildings does not deteriorate.

Those in smaller establishments often do all the repairs except for very difficult or large jobs. In larger workplaces, they may work only in a particular area or do general maintenance.

Wage Data

Entry Level Wage 2011: $23,750
Annual Average Wage 2011: $36,630
Experienced Level Wage 2011: $43,070

Employment Data

Estimated Employment 2010: 60,710
Projected Employment 2020: 63,970
Percent Change: 5.4%
Total Openings: 1,443

Education & Training

High School Diploma 44%
Post-Secondary Certificate 42%
Some College Courses 6%
Other 8%

Knowledge Required
Building & Construction
Design
Engineering & Technology
Mechanical
Public Safety & Security

Skills Required
Active Listening
Critical Thinking
Equipment Maintenance
Equipment Selection
Installation
Marcellus Shale Occupations
General & Operations Managers

Common Employer Job Titles: Operations Manager, General Manager, Director of Operations, Plant Manager, Store Manager, Facilities Manager, Plant Superintendent, Vice President of Operations, Warehouse Manager

Related Occupations
Administrative Services Manager, Chief Executive, Financial Manager, Legislator, Marketing & Sales Manager

Nature of the Work

General & operations managers’ duties and responsibilities include formulating policies, managing daily operations and planning the use of materials and human resources, but are too diverse and general in nature to be classified in any one functional area of management or administration, such as personnel, purchasing or administrative services. In some organizations, the duties of general and operations managers may overlap the duties of chief executive officers.

Wage Data

<table>
<thead>
<tr>
<th>Wage Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage 2011:</td>
<td>$55,810</td>
</tr>
<tr>
<td>Annual Average Wage 2011:</td>
<td>$111,730</td>
</tr>
<tr>
<td>Experienced Level Wage 2011:</td>
<td>$139,690</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010:</td>
<td>51,420</td>
</tr>
<tr>
<td>Projected Employment 2020:</td>
<td>49,730</td>
</tr>
<tr>
<td>Percent Change:</td>
<td>-3.3%</td>
</tr>
<tr>
<td>Total Openings:</td>
<td>956</td>
</tr>
</tbody>
</table>

Education & Training

Knowledge Required
- Administration & Management
- Customer & Personal Service
- English Language
- Law & Government
- Personnel & Human Resources

Skills Required
- Active Listening
- Judgment & Decision Making
- Management of Personnel Resources
- Monitoring
- Time Management

Some College Courses: 11%
Associate Degree: 32%
Bachelor's Degree: 27%
Other: 30%
Marcellus Shale Occupations
Heavy-Truck & Tractor-Trailer Drivers

Common Employer Job Titles: CDL Truck Driver, Class B Driver, Commercial Trailer Truck Driver, Construction Driver, Dump Truck Driver, Highway Truck Driver, Livestock Trucker, Moving Van Driver, Over the Road Driver, Sanitation Truck Driver, Tank Truck Driver, Tow Truck Driver, UPS Driver (United Parcel Service Driver)

Related Occupations
Bus Drivers, Transit & Intercity, Industrial Truck & Tractor Operators, Truck Drivers, Light or Delivery Services

Nature of the Work

Truck drivers are responsible for picking-up and delivering a wide variety of merchandise. The length of their trips depends on the final destination of the goods.

Long-Haul Truck Drivers transport goods from city to city. Employers may choose to use two drivers for trips that last several days. Before leaving their home base, truck drivers inspect their vehicles to make sure that everything is working properly and that necessary safety equipment is aboard.

After these truck drivers reach their destination or complete their operating shift, the U.S. Department of Transportation requires that they complete reports detailing the trip, the condition of the truck and the circumstances of any accidents. In addition, Federal regulations require employers to subject drivers to random alcohol and drug tests while they are on duty.

Wage Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Wage 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$29,630</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$41,920</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$48,070</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010</td>
<td>71,510</td>
</tr>
<tr>
<td>Projected Employment 2020</td>
<td>83,040</td>
</tr>
<tr>
<td>Percent Change</td>
<td>16.1%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>2,575</td>
</tr>
</tbody>
</table>

Knowledge Required

- Computers & Electronics
- Geography
- Law & Government
- Mechanical
- Public Safety & Security

Skills Required

- Equipment Maintenance
- Mathematics
- Operation & Control
- Reading Comprehension
- Speaking
- Writing

Education & Training

<table>
<thead>
<tr>
<th>Education &amp; Training</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than High School Diploma</td>
<td>22%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>53%</td>
</tr>
<tr>
<td>Post-Secondary Certificate</td>
<td>22%</td>
</tr>
<tr>
<td>Some College Courses</td>
<td>3%</td>
</tr>
</tbody>
</table>

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Helpers - Extraction Workers


Related Occupations
Derrick Operators, Roustabouts, Refractory Materials Repairers, Tank Truck & Ship Loaders

Nature of the Work
Extraction worker helpers repair and maintain automotive and drilling equipment, and observe and monitor equipment operation during the extraction process in order to detect any problems. They are also responsible for loading and organizing materials in order to prepare for use. After extraction activities are complete, they clean up work areas and remove debris.

Wage Data
- Entry Level Wage 2011: $24,680
- Annual Average Wage 2011: $30,230
- Experienced Level Wage 2011: $33,010

Employment Data
- Estimated Employment 2010: 1,210
- Projected Employment 2020: 1,920
- Percent Change: 58.7%
- Total Openings: 97

Education & Training
- Less Than High School Diploma: 16%
- High School Diploma: 61%
- Some College Courses: 11%
- Other: 12%

Knowledge Required
- Law & Government
- Mechanical
- Public Safety & Security

Skills Required
- Active Listening
- Equipment Maintenance
- Equipment Selection
- Operation Monitoring
- Repairing
- Speaking

Center for Workforce Information & Analysis
Marcellus Shale Occupations

Helpers - Installation, Maintenance & Repair Workers

Common Employer Job Titles: Automobile Mechanic Helper, Diesel Mechanic Helper, Facilities Maintenance Technician, Laborer, Locksmith Helper, Millwright Helper, Power Washer, Service Planner, Trades Helper

Related Occupations

Control & Valve Installers & Repairers, Mechanical Door Repairers, Mobile Heavy Equipment Mechanics

Nature of the Work

Installation, maintenance & repair worker helpers provide assistance to more skilled workers involved in the adjustment, maintenance, part replacement and repair of tools, equipment and machines. They perform duties such as furnishing tools, materials, and supplies to other workers such as cleaning the work area, machines and tools, and holding materials or tools for other workers. Installation, maintenance & repair worker helpers may also install or replace machinery, equipment and new or replacement parts and instruments, using hand or power tools. Some clean or lubricate vehicles, machinery, equipment, instruments, tools, work areas and other objects, using hand tools, power tools and cleaning equipment.

Wage Data

Entry Level Wage 2011: $17,810
Annual Average Wage 2011: $27,330
Experienced Level Wage 2011: $32,090

Employment Data

Estimated Employment 2010: 6,120
Projected Employment 2020: 6,610
Percent Change: 8.0%
Total Openings: 330

Education & Training

- Less Than High School Diploma: 28%
- High School Diploma: 51%
- Post-Secondary Certificate: 19%
- Other: 2%

Knowledge Required

- Engineering & Technology
- Mathematics
- Mechanical
- Public Safety & Security

Skills Required

- Active Listening
- Equipment Maintenance
- Equipment Selection
- Installation
- Operation Monitoring
- Repairing
Industrial Engineers

Common Employer Job Titles: Industrial Engineer, Process Engineer, Engineer, Operations Engineer, Engineering Manager, Manufacturing Specialist, Plant Engineer, Supply Chain Engineer, Tool Engineer, Production Engineer

Related Occupations
Electrical Engineer, Materials Engineer, Materials Scientist, Mechanical Engineer, Mining & Geological Engineer, Petroleum Engineer

Nature of the Work

Industrial engineers determine the most effective ways to use the basic factors of production — people, machines, materials, information and energy — to make a product or to provide a service. They are mostly concerned with increasing productivity through the management of people, methods of business organization and technology. To solve organizational, production and related problems efficiently, industrial engineers carefully study the product requirements, use mathematical methods to meet those requirements and design manufacturing and information systems.

They develop management control systems to aid in financial planning and cost analysis, and design production planning and control systems to coordinate activities and ensure product quality. They also design or improve systems for the physical distribution of goods and services, as well as determine the most efficient plant locations. Industrial engineers develop wage and salary administration systems and job evaluation programs. Many industrial engineers move into management positions because the work is closely related to the work of managers.

Wage Data

<table>
<thead>
<tr>
<th>Wage Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage 2011:</td>
<td>$54,640</td>
</tr>
<tr>
<td>Annual Average Wage 2011:</td>
<td>$78,470</td>
</tr>
<tr>
<td>Experienced Level Wage 2011:</td>
<td>$90,390</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010:</td>
<td>10,930</td>
</tr>
<tr>
<td>Projected Employment 2020:</td>
<td>12,140</td>
</tr>
<tr>
<td>Percent Change:</td>
<td>11.1%</td>
</tr>
<tr>
<td>Total Openings:</td>
<td>359</td>
</tr>
</tbody>
</table>

Education & Training

- Some College Courses: 17%
- Associate Degree: 13%
- Bachelor’s Degree: 62%
- Post-Baccalaureate Certificate: 8%

Knowledge Required
- Administration & Management
- Engineering & Technology
- Mathematics
- Mechanical
- Production & Processing

Skills Required
- Active Listening
- Complex Problem Solving
- Critical Thinking
- Reading Comprehension
- Time Management
Industrial Machinery Mechanics


Related Occupations
Aircraft Mechanic, Automobile Mechanic, Farm Equipment Mechanic, Mechanic & Repairer Helper, Millwright

Nature of the Work

Industrial machinery mechanics, also called industrial machinery repairers or maintenance machinists, are highly skilled workers who maintain and repair machinery in a plant or factory. To do this effectively, they must be able to detect minor problems and correct them before they become major problems. Computerized maintenance, vibration analysis techniques and self-diagnostic systems are aiding in this task, but mechanics still need years of training and experience to perform effectively.

After diagnosing the problem, the industrial machinery mechanic disassembles the equipment to repair or replace the necessary parts. Once a repair is made, mechanics perform tests to ensure that the machine is running smoothly.

Because factories and other facilities cannot afford to have industrial machinery out of service for long periods, mechanics may be called to the plant at night or on weekends for emergency repairs. Overtime is common among industrial machinery mechanics – about one-third work over 40 hours a week.

Wage Data

<table>
<thead>
<tr>
<th>Wage Category</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$32,900</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$45,570</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$51,910</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Category</th>
<th>2010/2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>17,140</td>
</tr>
<tr>
<td>Projected Employment</td>
<td>21,230</td>
</tr>
<tr>
<td>Percent Change</td>
<td>23.9%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>738</td>
</tr>
</tbody>
</table>

Education & Training

- Less Than High School Diploma: 17%
- High School Diploma: 24%
- Post-Secondary Certificate: 36%
- Other: 23%

Knowledge Required

- Computers & Electronics
- Engineering & Technology
- Mechanical
- Physics

Skills Required

- Equipment Maintenance & Selection
- Installation
- Operation Monitoring
- Quality Control Analysis
- Repairing
Industrial Truck & Tractor Operators

**Nature of the Work**

Industrial truck & tractor operators drive and control industrial trucks or tractors equipped to move materials around a warehouse, storage yard, factory or construction site. A typical industrial truck, often called a forklift or lift truck, has a hydraulic lifting mechanism and forks. Industrial truck and tractor operators also may operate tractors that pull trailers loaded with materials, goods or equipment within factories and warehouses, or around outdoor storage areas.

Industrial truck & tractor operators may perform other duties as well. Some operators tend machines that automatically stack, load, package or cut materials. They may also hook tow trucks, using hitches and pins, to other equipment. This may include plows, graders and rollers. They maintain their vehicles by making sure that all parts are oiled and that the vehicles have enough fuel. If there are problems with equipment, forklift operators talk with mechanics about them.

**Related Occupations**

Construction Equipment Operator, Crane & Tower Operator, Farm Equipment Operator, Hoist & Winch Operator, Truck Driver

**Knowledge Required**

- English Language
- Mathematics
- Transportation

**Skills Required**

- Active Listening
- Equipment Maintenance
- Mathematics
- Operation & Control
- Reading Comprehension

**Wage Data**

- Entry Level Wage 2011: $24,560
- Annual Average Wage 2011: $33,590
- Experienced Level Wage 2011: $38,100

**Employment Data**

- Estimated Employment 2010: 26,630
- Projected Employment 2020: 27,720
- Percent Change: 4.1%
- Total Openings: 864

**Education & Training**

- Less Than High School Diploma: 13%
- High School Diploma: 73%
- Post-Secondary Certificate: 14%

**Common Employer Job Titles:** Forklift Operator, Material Handler, Fork Lift Operator, Truck Driver, Fork Truck Driver, Lift Truck Operator, Forklift Driver, Fork Lift Technician, Spotter Driver, Fork Lift Driver

---

Center for Workforce Information & Analysis
Inspectors, testers, samplers & weighers use a number of tools to monitor quality standards for manufactured products. They may use sight, sound, feel, smell or taste to check products. Quality checks are involved at every stage of the production process. Quality control inspectors, as they are otherwise known, may examine raw materials, subassemblies or finished products.

After problems have been identified, quality control inspectors may reject defective items, send them for repair or fix minor problems themselves. They record results, compute defect percentages and prepare reports.

Common Employer Job Titles: Inspector, Quality Inspector, Quality Technician, Quality Assurance Inspector, Quality Control Inspector, Quality Auditor, Picker / Packer, Quality Assurance Auditor, Quality Control Supervisor, Quality Control Technician

Related Occupations
Assemblers, Building Inspector, Compliance Office, Construction Inspector, Machine Operators

Nature of the Work
Inspectors, testers, samplers & weighers use a number of tools to monitor quality standards for manufactured products. They may use sight, sound, feel, smell or taste to check products. Quality checks are involved at every stage of the production process. Quality control inspectors, as they are otherwise known, may examine raw materials, subassemblies or finished products.

After problems have been identified, quality control inspectors may reject defective items, send them for repair or fix minor problems themselves. They record results, compute defect percentages and prepare reports.

Wage Data
- Entry Level Wage 2011: $24,790
- Annual Average Wage 2011: $37,770
- Experienced Level Wage 2011: $44,270

Employment Data
- Estimated Employment 2010: 20,390
- Projected Employment 2020: 21,880
- Percent Change: 7.3%
- Total Openings: 593

Education & Training
- Less Than High School Diploma: 7%
- High School Diploma: 62%
- Post-Secondary Certificate: 22%
- Other: 9%

Knowledge Required
- Computers & Electronics
- Design
- Engineering & Technology
- English Language
- Mathematics

Skills Required
- Operation & Control
- Operation Monitoring
- Operations Analysis
- Quality Control Analysis
- Science
Marcellus Shale Occupations
Laborers & Material Movers

Common Employer Job Titles: Material Handler, Warehouse Worker, Laborer, Loader, Receiving Associate, Receiver, Shipping & Receiving Materials Handler, Merchandise Pickup / Receiving Associate, Line Tender, Stock Replenisher

Related Occupations
Hand Packer & Packager, Janitor & Cleaner, Construction Laborer, Groundskeeping Worker

Nature of the Work

Laborers & material movers manually move materials or perform other unskilled general labor. These workers move freight, stock and other materials to and from storage and production areas, loading docks, delivery vehicles, ships and containers.

Their specific duties vary by industry and work setting. Specialized workers within this group include baggage and cargo handlers, who work in transportation industries, and truck loaders and unloaders. In factories, they may move raw materials or finished goods between loading docks, storage areas and work areas as well as sort materials and supplies and prepare them according to their work orders.

Wage Data

Entry Level Wage 2011: $19,160
Annual Average Wage 2011: $28,230
Experienced Level Wage 2011: $32,770

Employment Data

Estimated Employment 2010: 102,590
Projected Employment 2020: 110,170
Percent Change: 7.4%
Total Openings: 4,038

Education & Training

Less Than High School Diploma: 20%
High School Diploma: 70%
Other: 10%

Knowledge Required
Production & Processing

Skills Required
Equipment Selection
Installation
Reading Comprehension
Marcellus Shale Occupations

Light Truck or Delivery Services Drivers

Common Employer Job Titles: Bulk Delivery Driver, Courier, Delivery Driver, Escort Vehicle Driver, Food Service Driver, Local Truck Driver, Mail Messenger Contractor, Order Runner, Package Delivery Driver, Parcel Post Truck Driver, Parts Driver, Pick Up Truck Driver, Route Deliverer, Service Car Driver, Warehouse Driver

Related Occupations

Ambulance Driver, Bus Driver, Heavy-Truck & Tractor-Trailer Driver, Industrial Truck & Tractor Operator

Nature of the Work

Light or delivery services truck drivers deliver or pick up merchandise and packages within a specific area. This may include short “turnarounds” to deliver a shipment to a nearby city, pick up another loaded truck or van and drive it back to their home base the same day. These services may require use of electronic delivery tracking systems to track the whereabouts of the merchandise or packages.

Some local truck drivers have sales and customer service responsibilities. The primary responsibility of driver/sales workers, or route drivers, is to deliver and sell their firm’s products over established routes or within an established territory. They sell goods such as food products, including restaurant takeout items, or pick up and deliver items such as laundry. Their response to customer complaints and requests can make the difference between a large order and a lost customer. Route drivers may also take orders and collect payments.

Wage Data

Entry Level Wage 2011: $18,930
Annual Average Wage 2011: $31,950
Experienced Level Wage 2011: $38,460

Employment Data

Estimated Employment 2010: 39,570
Projected Employment 2020: 41,110
Percent Change: 3.9%
Total Openings: 941

Education & Training

Less Than High School Diploma 23%
High School Diploma 75%
Post-Secondary Certificate 2%

Knowledge Required

Clerical
Geography
Mechanical
Public Safety & Security
Transportation

Skills Required

Extent Flexibility
Far Vision
Reaction Time
Response Orientation
Spatial Orientation
Static Strength
Machinists


Related Occupations

Computer Programmer, Metal Patternmaker, Metalworking Machine Operator, Tool & Die Maker, Welder

Nature of the Work

Machinists use tools, such as lathes and drill presses, to produce and repair precision metal parts. Thorough planning and preparation must be completed before any parts are cut.

Many of today’s machine tools are computer numerically controlled (CNC). They read computer programs and run the production mechanism automatically. Workers who program these machines are often referred to as numerical control machine tool programmers or CNC programmers.

CNC machines enable higher productivity and better quality parts. However, the quality of the product largely depends on the operating program. New programs must be tested to ensure that machinery will function properly and that output will meet specifications.

Wage Data

<table>
<thead>
<tr>
<th>Wage Category</th>
<th>2011 Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$28,900</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$40,150</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$45,780</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Data</th>
<th>2010 Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>17,000</td>
</tr>
<tr>
<td>Projected Employment</td>
<td>18,950</td>
</tr>
<tr>
<td>Percent Change</td>
<td>11.5%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>508</td>
</tr>
</tbody>
</table>

Education & Training

<table>
<thead>
<tr>
<th>Education &amp; Training</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than High School Diploma</td>
<td>15%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>40%</td>
</tr>
<tr>
<td>Post-Secondary Certificate</td>
<td>30%</td>
</tr>
<tr>
<td>Some College Courses</td>
<td>15%</td>
</tr>
</tbody>
</table>

Knowledge Required

Computer & Electronics
Design
Engineering & Technology
Mathematics
Mechanical

Skills Required

Equipment Maintenance & Selection
Operation & Control
Operation Monitoring
Quality Control Analysis

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Mechanical Engineers

Common Employer Job Titles: Mechanical Engineer, Design Engineer, Product Engineer, Mechanical Design Engineer, Process Engineer, Equipment Engineer, Design Maintenance Engineer, Systems Engineer, Chassis Systems Engineer, Commissioning Engineer

Related Occupations
Computer Engineer, Computer Systems Analyst, Engineering Managers, Engineering & Science Technicians, Mathematicians

Nature of the Work
Mechanical engineers research, develop, design, test and manufacture tools, engines and machinery. Specific duties will vary by industry and job function. In most mechanical engineering positions, computers are used to perform complex modeling and simulation.

This is the broadest engineering discipline, extending across many specialties. As a result, mechanical engineers may work in production operations, maintenance or technical sales.

Wage Data
Entry Level Wage 2011: $54,750
Annual Average Wage 2011: $79,300
Experienced Level Wage 2011: $91,570

Employment Data
Estimated Employment 2008: 10,790
Projected Employment 2018: 11,840
Percent Change: 9.7%
Total Openings: 452

Education & Training
Associate Degree 14%
Bachelor's Degree 46%
Master's Degree 23%
Other 17%

Knowledge Required
Building & Construction
Design
Engineering & Technology
English Language
Mathematics

Skills Required
Active Listening
Complex Problem Solving
Critical Thinking
Instructing
Reading Comprehension

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Metal-Refining Furnace Operators & Tenders

Common Employer Job Titles: Central Melt Specialist, Melt Room Operator, Melt Supervisor, Vessel Operator, Arc / Argon Oxygen Decarborization Melter (ARC / AOD Melter), Automatic Furnace Operator, Control Room Operator, Direct Casting Operator, Electric Melt Operator, Utility Person

Related Occupations
Assembler & Fabricator, Computer Controlled Machine Operator, Machinist, Tool & Die Maker

Nature of the Work
Metal-refining furnace operators & tenders use a variety of machines to produce metal items, which are used in many consumer products.

They load materials to be melted or refined to furnaces. They observe operations inside furnaces using television screens to ensure that problems do not occur. They also adjust air and temperature gauges to maintain required temperatures inside the furnace. In addition, metal-refining furnace operators & tenders may draw samples from the furnaces for analysis and calculate types and amounts of materials needed to ensure that materials meet specifications. Typically, skilled setup workers are called upon for major adjustments when a problem arises.

Wage Data
Entry Level Wage 2011: $23,680
Annual Average Wage 2011: $36,590
Experienced Level Wage 2011: $43,040

Employment Data
Estimated Employment 2010: 1,640
Projected Employment 2020: 1,970
Percent Change: 20.1%
Total Openings: 65

Education & Training

<table>
<thead>
<tr>
<th>Education &amp; Training Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than High School Diploma</td>
<td>14%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>69%</td>
</tr>
<tr>
<td>Post-Secondary Certificate</td>
<td>4%</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>13%</td>
</tr>
</tbody>
</table>

Knowledge Required
Mechanical
Physics
Production & Processing

Skills Required
Equipment Maintenance
Equipment Selection
Operation & Control
Operation Monitoring
Marcellus Shale Occupations
Mobile Heavy Equipment Mechanics


Related Occupations

Nature of the Work

Mobile heavy equipment mechanics perform routine maintenance checks on diesel engines and on fuel, brake and transmission systems to ensure peak performance, safety and longevity of the equipment. Maintenance checks and comments from equipment operators usually alert mechanics to problems. With many types of modern heavy and mobile equipment, mechanics can plug hand-held diagnostic computers into onboard computers to diagnose any component needing adjustment or repair. After locating the problem, they rely on their training and experience to use the best possible technique to solve the problem. If necessary, they may partially dismantle the component to examine parts for damage or excessive wear. Then, using hand-held tools, they repair, replace, clean and lubricate parts as necessary. In some cases, mechanics calibrate systems by typing codes into the onboard computer. After reassembling the component and testing it for safety, they put it back into the equipment and return the equipment to the field.

In addition to conducting routine maintenance checks, mobile heavy equipment mechanics perform a variety of other repairs. They diagnose electrical problems and adjust or replace defective components. They also disassemble and repair undercarriages and track assemblies. Occasionally, mechanics weld broken equipment frames and structural parts, using electric or gas welders.

The technology used in heavy equipment is becoming more sophisticated with the increased use of electronic and computer-controlled components. Training in electronics is essential for these mechanics to make engine adjustments and diagnose problems. Training in the use of hand-held computers also is necessary, because computers help mechanics diagnose problems and adjust the functions of components.

Knowledge Required
Customer & Personal Service
Mathematics
Mechanical

Skills Required
Equipment Maintenance
Equipment Selection
Installation
Repairing
Troubleshooting

Wage Data
Entry Level Wage 2011: $33,520
Annual Average Wage 2011: $46,910
Experienced Level Wage 2011: $53,600

Employment Data
Estimated Employment 2010: 4,900
Projected Employment 2020: 5,700
Percent Change: 16.3%
Total Openings: 207

Education & Training
High School Diploma 16%
Post-Secondary Certificate 56%
Some College Courses 13%
Associate Degree 14%
Marcellus Shale Occupations
Office Clerks

Related Occupations
Billing Clerk, Court Clerk, Loan Clerk, Receptionist, Secretary, Typist & Word Processor

Nature of the Work

The daily responsibilities of general office clerks change constantly. Clerks may spend time filing, typing or entering data. They also operate office equipment, prepare mailings, proofread copies and answer telephones. Experienced office clerks are usually given additional responsibilities. In fact, they may be expected to monitor and direct the work of others.

Specific job duties will depend on the experience level of the clerk as well as the type of office in which they are employed.

Wage Data
Entry Level Wage 2011: $19,200
Annual Average Wage 2011: $29,440
Experienced Level Wage 2011: $34,560

Employment Data
Estimated Employment 2010: 151,450
Projected Employment 2020: 160,950
Percent Change: 6.3%
Total Openings: 3,629

Education & Training

Knowledge Required
Clerical
Customer & Personal Service
Economics & Accounting
English Language
Mathematics

Skills Required
Active Listening
Reading Comprehension
Social Perceptiveness
Speaking
Writing
Marcellus Shale Occupations
Operating Engineers


Related Occupations
General Construction Worker, Heavy Equipment Mechanic, Roustabout

Nature of the Work

Operating engineers generally use machines to move objects short distances, such as around a factory or construction site. They use equipment to smooth or grade the ground. They may also dump, remove or spread rock and earth. To run the machines, they move hand levers and foot pedals. They also operate switches and turn dials.

Operating engineers may set up and inspect equipment. They often attach hoses, belts, and other equipment to tractors. They make adjustments to blades, buckets and booms. They use stakes and guidelines on the ground to help them line up their equipment.

Operating engineers are unique because they know how to operate several different types of equipment, such as cranes, bulldozers and hoists.

Bulldozer operators run tractors equipped with attachments, such as blades and cable winches. They dig out dirt, trees and rocks in order to level the ground.

Crane and tower operators lift and move materials using booms and cables supported by towers. They watch for hand signals or listen to radioed instructions from other workers.

Hoist and winch operators lift and pull loads with their equipment.

In addition to operating these machines, some engineers operate valves on air compressors or pumps at construction sites.

Wage Data

Entry Level Wage 2011: $31,320
Annual Average Wage 2011: $45,510
Experienced Level Wage 2011: $52,600

Employment Data

Estimated Employment 2010: 21,890
Projected Employment 2020: 25,100
Percent Change: 14.7%
Total Openings: 828

Education & Training

Less Than High School Diploma 11%
High School Diploma 41%
Post-Secondary Certificate 48%

Knowledge Required

Building & Construction
Mechanical

Skills Required

Equipment Maintenance
Equipment Selection
Operation & Control
Operation Monitoring
Repairing

Center for Workforce Information & Analysis
Operating engineers and other construction equipment operators work with one or several types of power construction equipment. They may operate excavation and loading machines equipped with scoops, shovels, or buckets that dig sand, gravel, earth or similar materials. In addition to operating the familiar bulldozer, they operate trench excavators, road graders and similar equipment. Sometimes, they may drive and control industrial trucks or tractors equipped with forklifts or booms for lifting materials. They also may operate and maintain air compressors, pumps and other power equipment at construction sites.

## Wage Data

<table>
<thead>
<tr>
<th>Category</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$27,180</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$42,460</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$50,110</td>
</tr>
</tbody>
</table>

## Employment Data

<table>
<thead>
<tr>
<th>Category</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>2,330</td>
</tr>
<tr>
<td>Projected Employment</td>
<td>2,700</td>
</tr>
<tr>
<td>Percent Change</td>
<td>15.9%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>85</td>
</tr>
</tbody>
</table>

## Education & Training

- Less Than High School Diploma: 37%
- High School Diploma: 43%
- Post-Secondary Certificate: 18%
- Other: 2%

## Related Occupations

- Industrial Truck & Tractor Operators
- Pile-Driven Operators
- Rail-Track Laying & Maintenance Operators

## Knowledge Required

- Administration & Management
- Building & Construction
- Customer & Personal Service
- Mechanical
- Production & Processing
- Public Safety & Security

## Skills Required

- Coordination
- Critical Thinking
- Judgment & Decision Making
- Monitoring
- Operation & Control
Marcellus Shale Occupations
Petroleum Pump System & Refinery Operators


Related Occupations
Bindery Workers, Gas Plant Operators, Power Plant Operators, Stationary Engineers & Boiler Operators

Nature of the Work
Petroleum pump system operators, refinery operators and gaugers monitor process indicators, instruments, gauges and meters in order to detect and report any possible problems. They read automatic gauges at specified intervals to determine the flow rate of oil into or from tanks and the amount of oil in tanks, as well as to verify that incoming and outgoing products are moving through the correct meters and that meters are working properly.

Petroleum pump system operators read and analyze specifications, schedules, logs, test results and laboratory recommendations to determine how to set equipment controls to produce the required qualities and quantities of products.

Wage Data
Entry Level Wage 2011: $40,860
Annual Average Wage 2011: $56,360
Experienced Level Wage 2011: $64,120

Employment Data
Estimated Employment 2010: 1,600
Projected Employment 2020: 1,590
Percent Change: -0.6%
Total Openings: 52

Education & Training
Less Than High School Diploma 3%
High School Diploma 73%
Some College Courses 6%
Associate Degree 18%

Knowledge Required
Education & Training
Mathematics
Mechanical
Public Safety & Security

Skills Required
Critical Thinking
Equipment Maintenance
Operation Monitoring
Operation & Control
Quality Control Analysis
Troubleshooting

Center for Workforce Information & Analysis
Marcellus Shale Occupations

Pipelayers

Common Employer Job Titles: Drain Layer, Drain Tiler, Fitter, Irrigation System Installer, Irrigation Technician, Pipe Liner, Pipe Wrapping Machine Operator, Sewer Connector, Sewer Pipe Layer, Tile Conduit Layer

Related Occupations

Highway Maintenance Workers, Hunters & Trappers, Pipelayer Helpers, Plumbers, Pipefitters & Steamfitters

Nature of the Work

Pipelayers lay clay, concrete, plastic or cast-iron pipe for drains, sewers, water mains and oil or gas lines. Before laying the pipe, pipelayers prepare and grade the trenches either manually or with machines. After laying the pipe, they weld, glue, cement or otherwise join the pieces together. They perform a combination of other tasks including grade trenches or culverts, position pipe and seal joints.

Wage Data

<table>
<thead>
<tr>
<th>Wage Category</th>
<th>2011 Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$33,500</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$46,610</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$53,160</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Category</th>
<th>2010 Value</th>
<th>2020 Projected Value</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>1,940</td>
<td>2,340</td>
<td>20.6%</td>
</tr>
<tr>
<td>Projected Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Openings</td>
<td></td>
<td>96</td>
<td></td>
</tr>
</tbody>
</table>

Education & Training

Less Than High School Diploma: 72%
High School Diploma: 24%
Post-Secondary Certificate: 2%
Some College Courses: 2%

Knowledge Required

Building & Construction
Mathematics
Mechanical

Skills Required

Active Listening
Equipment Selection
Learning Strategies
Monitoring
Quality Control Analysis

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Plumbers, Pipefitters & Steamfitters

Common Employer Job Titles: Pipe Fitter, Pipefitter, Welder, Steamfitter, Sprinkler Fitter, Equipment Service Associate (ESA), Machine Repairman, Journeyman Pipe Fitter, Millwright, Pipe Welder, Journeyman Plumber

Related Occupations
Boiler Operator, HVAC & Refrigeration Mechanic, Industrial Machinery Repairer, Pipelayer, Sheet-Metal Worker

Nature of the Work
Plumbers, pipefitters & steamfitters install, maintain and repair many different types of pipe systems. Workers generally specialize in one of these areas.

Plumbers install and repair the water, waste disposal, drainage and gas systems in homes and buildings. They also install plumbing fixtures and appliances.

Pipefitters install and repair high and low-pressure pipe systems. They also install automatic controls used to regulate these systems.

Steamfitters install pipe systems that move liquids or gases under high pressure.

Sprinkler-fitters install automatic fire sprinkler systems in buildings.

Depending on the type of project, many different materials and construction techniques are used. However, all plumbers, pipefitters & steamfitters must be able to read building plans or blueprints, follow instructions, lay out the job and work efficiently with the materials and tools of the trade.

Wage Data
Entry Level Wage 2011: $34,510
Annual Average Wage 2011: $52,740
Experienced Level Wage 2011: $61,860

Employment Data
Estimated Employment 2010: 15,380
Projected Employment 2020: 17,190
Percent Change: 11.8%
Total Openings: 625

Education & Training
High School Diploma 26%
Post-Secondary Certificate 69%
Some College Courses 5%

Knowledge Required
Building & Construction
Customer & Personal Service
Design
English Language
Mechanical

Skills Required
Active Learning
Active Listening
Installation
Instructing
Mathematics

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Production, Planning & Expediting Clerks

Common Employer Job Titles: Production Scheduler, Planner, Production Planner, Production Manager, Production Controller, Production Planning Manager, Scheduler, Master Scheduler, Production Control Coordinator, Production Supervisor

Related Occupations
Cost Estimator, Freight Handler, Order Clerk, Shipping & Receiving Clerk, Stock Clerk

Nature of the Work

Production, planning & expediting clerks keep the flow of work and materials running smoothly. They review and deliver production schedules and work orders. Some confer with department supervisors to determine the progress of work and monitor work progress to be sure that the stages of production are completed on time. Clerks also compile reports on the progress of work and any problems that may have slowed down production.

Depending on the work setting, production and planning clerks may have a variety of other tasks. They may schedule workers or estimate production costs, such as for labor or materials. They may route or deliver parts to departments so that workers have the materials to meet quotas. Some keep track of the inventory in departments or schedule the shipment of parts so that materials are available and shipped by vendors on time.

Wage Data

Entry Level Wage 2011: $29,820
Annual Average Wage 2011: $46,470
Experienced Level Wage 2011: $54,790

Employment Data

Estimated Employment 2010: 12,910
Projected Employment 2020: 13,250
Percent Change: 2.6%
Total Openings: 372

Education & Training

High School Diploma 44%
Associate Degree 21%
Bachelor’s Degree 13%
Other 12%

Knowledge Required

Clerical
Economics & Accounting
Mathematics
Production & Processing
Transportation

Skills Required

Coordination
Management of Material Resources
Monitoring
Reading Comprehension
Time Management

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Pump Operators


Related Occupations
Utilities Operator, Electrical Power-Line Installers & Repairers, Meter Readers, Plumbers, Pipefitters, Steamfitters

Nature of the Work

Pump operators tend, control and operate pump and manifold systems that transfer gases, oil or other materials to vessels or equipment. They maintain the equipment and regulate the flow of materials according to a schedule set up by petroleum engineers or production supervisors. Gas compressor and gas pumping station operators operate steam, gas, electric motor or internal combustion engine-driven compressors. They transmit, compress or recover gases, such as butane, nitrogen, hydrogen and natural gas. Wellhead pumpers operate pumps and auxiliary equipment to produce flows of oil or gas from extraction sites.

Wage Data

Entry Level Wage 2011: $24,460
Annual Average Wage 2011: $41,180
Experienced Level Wage 2011: $49,550

Employment Data

Estimated Employment 2010: 700
Projected Employment 2020: 1,250
Percent Change: 78.6%
Total Openings: 76

Education & Training

High School Diploma: 86%
Post-Secondary Certificate: 2%
Associate Degree: 10%
Other: 2%

Knowledge Required
Public Safety & Security
Mechanical
Production & Processing
Computers & Electronics

Skills Required
Operation Monitoring
Monitoring
Critical Thinking
Operation & Control
Quality Control Analysis

Center for Workforce Information & Analysis
Rolling machine operators & tenders use a variety of machines to produce metal and plastic items, which are used in many consumer products.

They adjust and correct machine setups to reshape the products according to specified dimensions and tempers. They may install additional equipment to the machine in order to fabricate the required product. They also monitor machine cycles and mill operation to detect jamming. Typically, skilled setup workers are called upon for major adjustments when a problem arises.
Marcellus Shale Occupations
Rotary Drill Operators, Oil & Gas


Related Occupations
Continuous Mining Machine Operators, Derrick Operators, Loading Machine Operators, Operating Engineers

Nature of the Work

Rotary drill operators observe pressure gauges and move throttles and levers in order to control the speed of rotary tables, and to regulate the pressure of tools at the bottom of boreholes. They also start and examine the operation of slush pumps in order to ensure circulation and consistency of drilling fluid or mud in a well.

Rotary drill operators also use special tools to locate and recover lost or broken bits, casings, and drill pipes from wells. They can also be responsible for maintaining records of footage drilled, location and nature of strata penetrated, materials and tools used, services rendered and time required.

Wage Data

Entry Level Wage 2011: $28,850
Annual Average Wage 2011: $46,080
Experienced Level Wage 2011: $54,700

Employment Data

Estimated Employment 2010: 1,100
Projected Employment 2020: 2,200
Percent Change: 100%
Total Openings: 134

Education & Training

Knowledge Required
Administration & Management
Education & Training
Mathematics
Mechanical
Personnel & Human Resources

Skills Required
Coordination
Critical Thinking
Equipment Maintenance
Instructing
Operation Management
Repairing

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Roustabouts, Oil & Gas

Common Employer Job Titles: Cathead Operator, Connection Worker, Derrick Worker, Dumper-Bailer Operator, Floor Hand, Gang Worker, Gun Perforator Loader, Oil Field Laborer, Rigger, Roughneck, Roustabout Pusher

Related Occupations

Control & Valve Installers & Repairers, Derrick Operators, Motorboat Mechanics, Rail Car Repairers

Nature of the Work

Roustabouts dismantle and repair oil field machinery, boilers, and steam engine parts, using hand tools and power tools. They unscrew or tighten pipes, casing, tubing and pump rods, using hand and power wrenches and tongs and bolt together pump and engine parts.

They are also responsible for walking flow lines to locate leaks, using electronic detectors and making visual inspections. They may be responsible for keeping the pipe deck and main deck areas clean and tidy, as well as clean up spilled oil by bailing it into barrels.

Wage Data

<table>
<thead>
<tr>
<th>Wage Type</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$24,070</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$35,930</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$41,850</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Total Data</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>1,170</td>
</tr>
<tr>
<td>Projected Employment</td>
<td>2,290</td>
</tr>
<tr>
<td>Percent Change</td>
<td>95.7%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>137</td>
</tr>
</tbody>
</table>

Education & Training

<table>
<thead>
<tr>
<th>Education &amp; Training</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than High School Diploma</td>
<td>49%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>41%</td>
</tr>
<tr>
<td>Some College Courses</td>
<td>10%</td>
</tr>
</tbody>
</table>

Knowledge Required

- English Language
- Mechanical
- Physics
- Production & Processing
- Public Safety & Security
- Transportation

Skills Required

- Active Listening
- Critical Thinking
- Equipment Management
- Equipment Selection
- Installation
- Repairing
Marcellus Shale Occupations
Sales Representatives

Common Employer Job Titles: Sales Representative, Account Manager, Sales Manager, Inside Sales Representative, Account Development Manager, Account Executive, Channel Sales Director, Marketing Representative, Sales Director, Distribution Sales Manager

Related Occupations
Buyers & Purchasing Agents, Insurance Sales Agents, Purchasing Managers, Real Estate Agents & Brokers

Nature of the Work
Sales representatives market their company’s products to manufacturers, wholesale and retail establishments and government agencies. They discuss customers’ needs, suggest how their merchandise or services can meet those needs, show samples or catalogs and inform customers about prices and product availability. They may also take orders and resolve any problems or complaints with the merchandise.

Depending on where they work, sales representatives have different job titles. However, these titles are often used interchangeably.

Sales representatives are employed directly by a manufacturer or wholesaler.

Manufacturers’ agents are self-employed sales workers who contract their services to all types of manufacturing companies. Sales engineers, or industrial sales workers, sell technical products for manufacturers and wholesalers. Aided by a laptop computer, they can answer technical and non-technical questions.

Sales representatives who lack technical expertise often work with a technical expert. The technical expert will further explain the product and answer any questions or concerns.

Obtaining new accounts is an important part of the sales representatives’ job. They also analyze sales statistics, prepare reports and handle administrative duties. They must study literature about new and existing products and monitor the sales, prices and products of their competitors.

Wage Data
Entry Level Wage 2011: $35,610
Annual Average Wage 2011: $64,760
Experienced Level Wage 2011: $79,340

Employment Data
Estimated Employment 2010: 77,130
Projected Employment 2020: 82,550
Percent Change: 7.0%
Total Openings: 2,357

Education & Training

High School Diploma 22%
Some College Courses 32%
Bachelor’s Degree 25%
Other 21%

Knowledge Required
Communications & Media
Customer & Personal Service
Education & Training
English Language
Mathematics

Skills Required
Active Listening
Coordination
Critical Thinking
Management of Material Resources
Negotiation

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Scientific & Technical Sales Representatives

Common Employer Job Titles: Sales Representative, Account Manager, Account Executive, Salesman, Outside Sales Representative, Sales Consultant, Account Representative, Customer Account Technician, Inside Sales Person, Marketing Associate

Related Occupations
Buyers & Purchasing Agents, Insurance Sales Agents, Purchasing Managers, Real Estate Agents & Brokers

Nature of the Work

Sales representatives market their company’s products to manufacturers, wholesale and retail establishments and government agencies. They discuss customers’ needs, suggest how their merchandise or services can meet those needs, show samples or catalogs and inform customers about prices and product availability. They may also take orders and resolve any problems or complaints with the merchandise.

Obtaining new accounts is an important part of the sales representatives’ job. They also analyze sales statistics, prepare reports and handle administrative duties. They must study literature about new and existing products and monitor the sales, prices and products of their competitors.

Wage Data

<table>
<thead>
<tr>
<th>Category</th>
<th>2010</th>
<th>2010</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$54,240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$91,890</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$110,710</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Category</th>
<th>2010</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>15,700</td>
<td></td>
</tr>
<tr>
<td>Projected Employment</td>
<td>17,070</td>
<td></td>
</tr>
<tr>
<td>Percent Change</td>
<td>8.7%</td>
<td></td>
</tr>
<tr>
<td>Total Openings</td>
<td>506</td>
<td></td>
</tr>
</tbody>
</table>

Education & Training

- Some College Courses: 14%
- Associate Degree: 22%
- Bachelor’s Degree: 42%
- Other: 22%

Knowledge Required
Chemistry
Computers & Electronics
Design
Economics & Accounting
English Language

Skills Required
Active Listening
Instructing
Negotiation
Persuasion
Speaking

Center for Workforce Information & Analysis
Marcellus Shale Occupations

Secretaries

Common Employer Job Titles: Secretary, Administrative Assistant, Administrative Secretary, Office Assistant, Clerk Typist, Office Manager, Administrative Technician, Department Secretary, Administrative Associate, Administrative Support Assistant (ASA)

Related Occupations

Bookkeeper, Human Resource Specialist, Medical Assistant, Medical Research Technician, Office Manager

Nature of the Work

To complete their duties, secretaries must be familiar with a wide variety of office equipment, including fax machines, photocopiers, telephone systems and personal computers.

Most secretaries schedule appointments, organize files, provide information, train staff, manage projects and produce correspondence. Specific job duties will vary with experience and title.

Office work can lend itself to alternative or flexible working arrangements, such as part-time work or telecommuting — especially if the job requires extensive computer use.

Wage Data

<table>
<thead>
<tr>
<th>Level</th>
<th>Wage 2011</th>
<th>Daily Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level</td>
<td>$22,160</td>
<td>$104</td>
</tr>
<tr>
<td>Annual Average</td>
<td>$31,750</td>
<td>$135</td>
</tr>
<tr>
<td>Experienced Level</td>
<td>$36,550</td>
<td>$158</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2020</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated</td>
<td>94,290</td>
<td>90,870</td>
<td>-3.6%</td>
</tr>
<tr>
<td>Projected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Openings</td>
<td>1,264</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Education & Training

- High School Diploma: 38%
- Post-Secondary Certificate: 16%
- Some College Courses: 36%
- Other: 10%

Knowledge Required

- Administration & Management
- Clerical
- Computer & Electronics
- Customer & Personal Service
- English Language

Skills Required

- Active Listening
- Reading Comprehension
- Social Perception
- Speaking
- Time Management
Marcellus Shale Occupations
Service Unit Operators, Oil, Gas & Mining

Common Employer Job Titles: Cement Pump Operator, Derrick Hand, Driller, Fishing Tool Operator, Pulling Unit Operator, Rigger, Service Unit Operator, Swabber, Well Cleaner, Wireline Operator, Work Over Rig Operator

Related Occupations
Crane & Tower Operators, Dredge Operators, Geological Sample Test Technicians, Marine Engineers

Nature of the Work
Service unit operators for oil, gas & mining operate controls that raise derricks and level rigs. They also observe load variations on strain gauges, mud pumps and motor pressure indicators and listen to engines, rotary chains and other equipment in order to detect faulty operations on unusual well conditions.

Service unit operators also direct drilling crews performing such activities as assembling and connecting pipe, applying weights to drill pipes and drilling around lodged obstacles. They may also drive truck mounted units to the well sites.

Wage Data
Entry Level Wage 2011: $28,140
Annual Average Wage 2011: $48,170
Experienced Level Wage 2011: $58,190

Employment Data
Estimated Employment 2010: 1,040
Projected Employment 2020: 2,130
Percent Change: 104.8%
Total Openings: 131

Education & Training
Less Than High School Diploma 31%
High School Diploma 45%
Post-Secondary Certificate 8%
Some College Courses 16%

Knowledge Required
Customer & Personal Service
   English Language
   Mechanical
   Public Safety & Security

Skills Required
Active Listening
Coordinating
Equipment Maintenance
Instructing
Operation & Control
Repairing
Marcellus Shale Occupations
Shipping, Receiving & Traffic Clerks

Common Employer Job Titles: Car Checker, Distributing Clerk, Express Clerk, Freight Clerk, Freight Forwarder, Fuel Oil Clerk, Logistics Coordinator, Material Handler, Package Sorter, Paper Control Clerk, Receiving Clerk, Route Delivery Clerk, Ship Runner, Shipper Receiver, Sorter, Traffic Coordinator, Vault Worker, Warehouseman

Related Occupations
Mail Clerk, Production & Planning Clerk, Stock Clerk

Nature of the Work
Shipping, receiving & traffic clerks keep records of all goods that are shipped and received. Specific duties will depend on the size of the establishment as well as the level of automation.

Shipping clerks are responsible for preparing and verifying all outgoing shipments. Some also move the goods from the plant to the shipping dock.

Receiving clerks use the original orders and accompanying invoice to determine whether orders have been filled correctly. They may route shipments to the proper department, stockroom or warehouse.

Traffic clerks maintain records on the destination, weight and charges of all incoming and outgoing freight.

Computers handle many shipping and receiving duties. However, clerks in smaller companies still maintain records and prepare shipments by hand.

Wage Data
- Entry Level Wage 2011: $22,790
- Annual Average Wage 2011: $32,760
- Experienced Level Wage 2011: $37,740

Employment Data
- Estimated Employment 2010: 27,330
- Projected Employment 2020: 25,540
- Percent Change: -6.5%
- Total Openings: 697

Education & Training
- High School Diploma: 75%
- Some College Courses: 7%
- Associate Degree: 7%
- Other: 11%

Knowledge Required
- Clerical
- Customer & Personal Service
- English Language
- Production & Processing
- Transportation

Skills Required
- Active Listening
- Mathematics
- Reading Comprehension
- Speaking
- Time Management
- Writing
Supervisors of Construction & Extraction Workers

Common Employer Job Titles: Airport Maintenance Chief, Bricklayer Supervisor, Building Construction Superintendent, Field Assembly Supervisor, Highway Maintenance Supervisor, Mine Captain, Oil Well Services Supervisor, Quarry Supervisor, Rig Manager, Track-Laying Supervisor, Utilities & Maintenance Supervisor

Related Occupations

Aircraft Cargo Handling Supervisor, Landscaping Supervisors, Material Mover Supervisors, Production Worker Supervisors

Nature of the Work

Supervisors of construction & extraction workers coordinate and delegate the work tasks of a project and ensure that they are being fulfilled adequately. They inform workers about company policies, provide employee reviews and recommend disciplinary action. They also meet regularly with management to report any problems and discuss possible solutions. In addition, many also perform the same work as other trades workers.

Computers are used to schedule procedures, monitor worker output, track materials, update inventory and perform other supervisory tasks.

Wage Data

<table>
<thead>
<tr>
<th>Level</th>
<th>Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage 2011:</td>
<td>$44,010</td>
</tr>
<tr>
<td>Annual Average Wage 2011:</td>
<td>$66,410</td>
</tr>
<tr>
<td>Experienced Level Wage 2011:</td>
<td>$77,620</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Year</th>
<th>Employment</th>
<th>Percent Change</th>
<th>Total Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010:</td>
<td>18,070</td>
<td>14.3%</td>
<td>675</td>
</tr>
<tr>
<td>Projected Employment 2020:</td>
<td>20,660</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Diploma</td>
</tr>
<tr>
<td>Associate Degree</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

Knowledge Required

Administration & Management
Engineering & Technology
English Language
Personnel & Human Resources

Skills Required

Active Listening
Coordination
Critical Thinking
Judgment & Decision Making
Management of Personnel Resources
Time Management
Marcellus Shale Occupations

Supervisors of Mechanics, Installers & Repairers


Related Occupations

Supervisors of Production, Transportation, Construction, Sales, Service, Professional & Clerical Workers

Nature of the Work

Supervisors of mechanics, installers & repairers coordinate and delegate the work tasks of a project and ensure that they are being fulfilled adequately. They inform workers about company policies, provide employee reviews and recommend disciplinary action. They also meet regularly with management to report any problems and discuss possible solutions. Some also perform the same work as other trades workers.

Computers are used to schedule procedures, monitor worker output, track materials, update inventory and perform other supervisory tasks. Organizational restructuring and downsizing have increased supervisor responsibilities. As a result, on-the-job stress has also increased in certain fields.

Wage Data

<table>
<thead>
<tr>
<th>Level</th>
<th>Wage 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry</td>
<td>$45,390</td>
</tr>
<tr>
<td>Annual Average</td>
<td>$64,720</td>
</tr>
<tr>
<td>Experienced</td>
<td>$74,390</td>
</tr>
</tbody>
</table>

Employment Data

- Estimated Employment 2010: 14,250
- Projected Employment 2020: 14,970
- Percent Change: 5.1%
- Total Openings: 448

Education & Training

- High School Diploma: 42%
- Post-Secondary Certificate: 31%
- Bachelor's Degree: 8%
- Other: 19%

Knowledge Required

- Administration & Management
- Customer & Personal Service
- Engineering & Technology
- Mechanical
- Personnel & Human Resources
- Production & Producing

Skills Required

- Critical Thinking
- Equipment Maintenance
- Installation
- Management of Personnel Resources
- Reading Comprehension
- Time Management
Marcellus Shale Occupations

Supervisors of Office & Admin. Support Workers

Common Employer Job Titles: Accounting Administrator, Accounts Receivable Manager, Billing Administrator, Booking Supervisor, Call Center Director, Customer Service Director, Field Service Manager, Hospital Admissions Officer, Purchasing & Claims Supervisor, Shipping Receiving Manager, Technical Coordinator

Related Occupations

General Manager, Storage & Distribution Manager, Training & Development Specialist, Transportation Manager

Nature of the Work

Supervisors of office and administrative support workers perform administrative tasks to ensure that their staffs can work efficiently. Duties include allocating assignments, issuing deadlines, overseeing work and evaluating each individual's performance.

Office and administrative support supervisors and managers usually interview and evaluate prospective clerical employees. This includes helping to train new employees in organization and office procedures.

Managers often act as liaisons between the clerical staff and the professional, technical, and managerial staff. Office and administrative support supervisors and managers also may have to resolve interpersonal conflicts among the staff.

Knowledge Required

Administration & Management
Clerical
Education & Training
English Language
Personnel & Human Resources

Skills Required

Management of Personnel Resources
Monitoring
Reading Comprehension
Speaking
Time Management

Wage Data

- Entry Level Wage 2011: $34,630
- Annual Average Wage 2011: $53,290
- Experienced Level Wage 2011: $62,620

Employment Data

- Estimated Employment 2010: 57,280
- Projected Employment 2020: 59,590
- Percent Change: 4.0%
- Total Openings: 1,762

Education & Training

- High School Diploma: 28%
- Some College Courses: 16%
- Bachelor's Degree: 26%
- Other: 30%
Supervisors of production & operating workers coordinate and delegate the work tasks of a project and ensure that they are being fulfilled adequately. They inform workers about company policies, provide employee reviews and recommend disciplinary action. They also meet regularly with management to report any problems and discuss possible solutions. In addition, many also perform the same work as other trades workers.

Computers are used to schedule procedures, monitor worker output, track materials, update inventory and perform other supervisory tasks.

**Nature of the Work**

**Wage Data**

- **Entry Level Wage 2011:** $37,000
- **Annual Average Wage 2011:** $56,440
- **Experienced Level Wage 2011:** $66,160

**Employment Data**

- **Estimated Employment 2010:** 27,370
- **Projected Employment 2020:** 27,410
- **Percent Change:** 0.1%
- **Total Openings:** 362

**Education & Training**

- **High School Diploma:** 44%
- **Some College Courses:** 14%
- **Bachelor’s Degree:** 23%
- **Other:** 19%

**Knowledge Required**

- Administration & Management
- Education & Training
- Mathematics
- Personnel & Human Resources
- Production & Processing

**Skills Required**

- Coordination
- Critical Thinking
- Reading Comprehension
- Speaking
- Time Management

**Related Occupations**

- Aircraft Cargo Handling Supervisor
- Supervisor of Construction Workers
- Supervisor of Landscaping Workers

**Common Employer Job Titles:** Assembly Supervisor, Casting Supervisor, Chemical Processing Supervisor, Die Cast Supervisor, Finishing Supervisor, Head Cook, Incinerator Plant General Supervisor, Machine Assembler Supervisor, Operations Manager, Paper Mill Supervisor, Salvage Engineer, Shop Foreman, Warehouse Supervisor

**Center for Workforce Information & Analysis**
Supervisors of Transportation & Vehicle Operators

Common Employer Job Titles: Auto Servicer, Boatswain, Crane Crew Supervisor, Dock Supervisor, Fleet Manager, Hauling Contractor, Load-Out Supervisor, Material Handling Supervisor, Move Coordinator, Port Steward, Rig Manager, Sanitary Landfill Supervisor, Snow Removing Supervisor, Terminal Manager, Yard Supervisor

Related Occupations

Aircraft Cargo Handling Supervisor, Janitorial Supervisor, Supervisor of Construction Workers, Supervisor of Laborers

Nature of the Work

Supervisors of transportation & vehicle operators coordinate and delegate the work tasks of a project and ensure that they are being fulfilled adequately. They inform workers about company policies, provide employee reviews and recommend disciplinary action. They also meet regularly with management to report any problems and discuss possible solutions. In addition, many also perform the same work as other trades workers.

Computers are used to schedule procedures, monitor worker output, track materials, update inventory and perform other supervisory tasks.

Wage Data

Entry Level Wage 2011: $39,380
Annual Average Wage 2011: $58,360
Experienced Level Wage 2011: $67,850

Employment Data

Estimated Employment 2010: 7,630
Projected Employment 2020: 8,300
Percent Change: 8.8%
Total Openings: 224

Education & Training

High School Diploma 48%
Some College Courses 19%
Bachelor’s Degree 18%
Other 15%

Knowledge Required

Administration & Management
Economics & Accounting
Mathematics
Personnel & Human Resources
Transportation

Skills Required

Active Listening
Coordination
Critical Thinking
Instructing
Mathematics
Speaking

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Surveying & Mapping Technicians

Common Employer Job Titles: Photogrammetrist, Cartographer, Photogrammetric Technician, Compiler, Stereo Compiler, Geographic Information Systems Analyst, Geographic Information Systems Specialist

Related Occupations
Architects, Engineers, Landscape Architects, Environmental Scientists & Specialists, Social Scientists

Nature of the Work
Surveying & mapping technicians are responsible for measuring and mapping the earth’s surface. Surveyors establish official land, airspace and water boundaries. They write descriptions of land for deeds, leases and other legal documents; define airspace for airports; and take measurements of construction and mineral sites. Other surveyors provide data about the shape, contour, location, elevation or dimension of land or land features. Cartographers and photogrammetrists collect, analyze, interpret and map geographic information using data from surveys and photographs. Surveying and mapping technicians assist these professionals by collecting data in the field, making calculations and helping with computer-aided drafting. Collectively, these occupations play key roles in the field of geospatial information.

Wage Data

<table>
<thead>
<tr>
<th>Wage Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage 2011:</td>
<td>$25,760</td>
</tr>
<tr>
<td>Annual Average Wage 2011:</td>
<td>$38,610</td>
</tr>
<tr>
<td>Experienced Level Wage 2011:</td>
<td>$45,030</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment 2010:</td>
<td>1,280</td>
</tr>
<tr>
<td>Projected Employment 2020:</td>
<td>1,340</td>
</tr>
<tr>
<td>Percent Change:</td>
<td>4.7%</td>
</tr>
<tr>
<td>Total Openings:</td>
<td>30</td>
</tr>
</tbody>
</table>

Education & Training

<table>
<thead>
<tr>
<th>Education &amp; Training</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Diploma</td>
<td>39%</td>
</tr>
<tr>
<td>Post-Secondary Certificate</td>
<td>21%</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>21%</td>
</tr>
<tr>
<td>Other</td>
<td>19%</td>
</tr>
</tbody>
</table>

Knowledge Required
Geography
Computers & Electronics
English Language
Design
Mathematics

Skills Required
Reading Comprehension
Active Listening
Critical Thinking
Writing
Active Learning
Surveyors measure distances, directions and angles between points on, above and below the Earth's surface. In the field, they select known survey reference points and determine the precise location of important features in the survey area using specialized equipment. Surveyors also research legal records, look for evidence of previous boundaries and analyze data to determine the location of boundary lines. They are sometimes called to provide expert testimony in court regarding their work or the work of other surveyors. Surveyors also record their results, verify the accuracy of data and prepare plots, maps and reports.

**Related Occupations**

Architects, Engineers, Landscape Architects

**Nature of the Work**

Surveyors measure distances, directions and angles between points on, above and below the Earth's surface. In the field, they select known survey reference points and determine the precise location of important features in the survey area using specialized equipment. Surveyors also research legal records, look for evidence of previous boundaries and analyze data to determine the location of boundary lines. They are sometimes called to provide expert testimony in court regarding their work or the work of other surveyors. Surveyors also record their results, verify the accuracy of data and prepare plots, maps and reports.

**Wage Data**

- Entry Level Wage 2011: $35,070
- Annual Average Wage 2011: $53,570
- Experienced Level Wage 2011: $62,820

**Employment Data**

- Estimated Employment 2010: 1,810
- Projected Employment 2020: 2,070
- Percent Change: 14.4%
- Total Openings: 66

**Education & Training**

- Post-Secondary Certificate: 15%
- Associate Degree: 9%
- Bachelor's Degree: 55%
- Other: 21%

**Knowledge Required**

- Building and Construction
- Design
- Engineering & Technology
- Geography
- Law & Government

**Skills Required**

- Active Listening
- Complex Problem Solving
- Coordination
- Critical Thinking
- Mathematics
- Troubleshooting
Marcellus Shale Occupations
Telecommunications Line Installers

Common Employer Job Titles: Aerial Installer, Block Cableman, Broadband Technician, Cable Installers, Fiber Optic Technician, Jointer, Line Inspector, Line Installer, Network Cable Installer, Power Line Installer & Repairer, Reel Cart Operator, Splicer, Telephone Technician, Television Cable Installer, Toll Lineman, Utility Technician

Related Occupations
Broadcast & Sound Engineering Technician, Electrician, Home Entertainment Equipment Installer, Radio Mechanic

Nature of the Work
Telecommunications line installers & repairers construct and maintain vast networks that provide communications services. Line installers, or line erectors, install new lines and string cables along poles, towers and trenches. Other duties may include setting up service for customers and installing a variety of network equipment. In addition to installation, line erectors also maintain and repair telephone and television cable lines.

Wage Data
- Entry Level Wage 2011: $37,220
- Annual Average Wage 2011: $56,030
- Experienced Level Wage 2011: $65,430

Employment Data
- Estimated Employment 2010: 7,750
- Projected Employment 2020: 8,420
- Percent Change: 8.6%
- Total Openings: 209

Education & Training
High School Diploma 61%
Post-Secondary Certificate 11%
Associate Degree 12%
Other 16%

Knowledge Required
Computers & Electronics
Telecommunications

Skills Required
Equipment Maintenance
Equipment Selection
Installation
Repairing
Troubleshooting

Center for Workforce Information & Analysis
Marcellus Shale Occupations
Welders, Cutters, Solderers & Brazers


Related Occupations
Aircraft Mechanic, Metal & Plastic Processing Worker, Millwright, Tool & Die Maker, Welding & Soldering Machine Operator

Nature of the Work
Welding is the most common way of permanently joining two or more metal parts. There are several different types of welders, including manual, semi-automatic and automatic.

Manual welders control the entire welding process themselves.

Semi-automatic welders use machinery to help perform welding tasks.

Automatic welders monitor a welding machine, which is responsible for performing all welding tasks.

Both solderers and brazers join together components to assemble fabricated metal products. Solderers commonly use a soldering iron, while brazers use a torch or welding machine and flux.

The work of arc, plasma and flame cutters is closely related to that of welders. Instead of joining metals, cutters use heat or an electric arc to cut and trim metal objects. They also dismantle large objects, such as ships and aircraft. Some operate and monitor cutting machines.

Wage Data
Entry Level Wage 2011: $27,830
Annual Average Wage 2011: $37,530
Experienced Level Wage 2011: $42,380

Employment Data
Estimated Employment 2010: 14,320
Projected Employment 2020: 15,780
Percent Change: 10.2%
Total Openings: 528

Education & Training

Knowledge Required
Building & Construction
Engineering & Technology
Mechanical
Production & Processing

Skills Required
Equipment Maintenance
Equipment Selection
Mathematics
Operation & Control
Quality Control Analysis

Center for Workforce Information & Analysis
Marcellus Shale Occupations

Wellhead Pumpers

Common Employer Job Titles: Gauger, Head Pumper, Lease Attendant, Lease Operator, Multi-Skilled Operator, Oilfield Plant & Field Operator, Oil Field Pumper, Oil Well Service Operator, Production Operator, Well Tender

Related Occupations
Gas Compressor & Gas Pumping Station Operators, Utility Meter Readers, Prepress Technicians & Workers

Nature of the Work

Wellhead pumpers monitor control panels during pumping operations in order to ensure that materials are being pumped at the correct pressure, density, rate and concentration. They also operate engines and pumps in order to shut off wells according to production schedules, and to switch flow of oil into storage tanks.

Wellhead pumpers perform routine maintenance on vehicles and equipment and repair gas and oil meters and gauges. They may also supervise oil pumpers and other workers engaged in producing oil from wells.

Wage Data

<table>
<thead>
<tr>
<th>Wage Level</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Wage</td>
<td>$25,090</td>
</tr>
<tr>
<td>Annual Average Wage</td>
<td>$36,430</td>
</tr>
<tr>
<td>Experienced Level Wage</td>
<td>$42,110</td>
</tr>
</tbody>
</table>

Employment Data

<table>
<thead>
<tr>
<th>Employment Measure</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Employment</td>
<td>1,080</td>
</tr>
<tr>
<td>Projected Employment</td>
<td>1,900</td>
</tr>
<tr>
<td>Percent Change</td>
<td>75.9%</td>
</tr>
<tr>
<td>Total Openings</td>
<td>114</td>
</tr>
</tbody>
</table>

Knowledge Required

Mathematics
Mechanical
Production & Processing
Public Safety & Security

Skills Required

Critical Thinking
Equipment Maintenance
Equipment Selection
Operation Monitoring
Operation & Control
Repairing