CAD DRAFTER

A DEEP DIVE FOR SKILLS-BASED HIRING

REV: 04/04/16

SKILLFUL
A MARKLE INITIATIVE

Occupation Overview: Mechanical Drafters

Foundational Competencies

- **Active Learning:** Understanding the implications of new information for both current and future problem solving and decision making.
- **Active Listening:** Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
- **Mathematics:** Using mathematics to solve problems.
- **Critical Thinking:** Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
- **Complex Problem Solving:** Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
- **Writing:** Communicating effectively in writing as appropriate for the needs of the audience.
- **Monitoring:** Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
- **Operations Analysis:** Analyzing needs and product requirements to create a design.
- **Judgment and Decision Making:** Considering the relative costs and benefits of potential actions to choose the most appropriate one.
- **Coordination:** Adjusting actions in relation to others' actions.

Occupation-Specific Competencies

- **Engineering Software:** Proficiency with computer software related to modeling (e.g., MATLAB, Wonderware, AnSys) and computer-assisted design (e.g., AutoCAD, Mathcad, SCADA).
- **Microsoft Office:** Ability to create and utilize documents using programs such as Microsoft Word, Excel, PowerPoint, and Outlook.
- **Computer Design (Architecture):** Experience with 3D modeling and design programs (CAD Design, Pro/ENGINEER, CATIA), architectural and mechanical drafting, and tool design.
- **Computer Design (Engineering):** Experience with using software (e.g., CAD Design, CATIA, Unigraphics, etc.) to assist with mechanical drafting, drawing preparation, and tool design.
- **Enterprise Resource Planning Software:** Familiarity with using Enterprise Resource Planning software for process design and order management.
- **General Engineering:** Familiarity with processes in mechanical civil engineering, engineering supervision, locomotive engineering, or being an engineer in training.
- **Civil Engineering:** Experience engineering drainage and roadway design and sediment control using Microstation, Geopak, Inroads, and Civil 3D.
- **Machine Tools:** Certification and/or competency with machine tools such as power grinders, milling cutters, drill presses, lathes, calipers, tool dies, and their dial indicators.
- **General Electrical Systems:** Experience with installation, identification and repair of wiring, transformers, and circuit breakers and use of voltmeters, ammeters, and wiring diagrams.
- **Engineering Activities:** Proficiency in all aspects of being an engineer, including management, support, design, and working on projects.

Job Description (Example)

Prepare detailed working diagrams of machinery and mechanical devices, including dimensions, fastening methods, and other engineering information.

- Create graphical representations of mechanical equipment.
- Analyze design or requirements information for mechanical equipment or systems.
- Confer with technical personnel to prepare designs or operational plans.
- Discuss designs or plans with clients.
- Verify mathematical calculations.
- Supervise and train other drafters, technologists, and technicians.

Activities (Example List)

- Develop detailed design drawings and specifications for mechanical equipment, dies, tools, and controls, using computer-assisted drafting (CAD) equipment.
- Lay out and draw schematic, orthographic, or angle views to depict functional relationships of components, assemblies, systems, and machines.
- Coordinate with and consult other workers to design, lay out, or detail components and systems and to resolve design or other problems.
- Check dimensions of materials to be used and assign numbers to the materials.
- Review and analyze specifications, sketches, drawings, ideas, and related data to assess factors affecting component designs and the procedures and instructions to be followed.
- Modify and revise designs to correct operating deficiencies or to reduce production problems.
- Compute mathematical formulas to develop and design detailed specifications for components or machinery using computer-assisted equipment.
- Position instructions and comments onto drawings.
- Lay out, draw, and reproduce illustrations for reference manuals and technical publications to describe operation and maintenance of mechanical systems.

Prioritized Foundational Competencies: Mechanical Drafters

Most Common Required Competencies	
1	**Mathematics:** Using mathematics to solve problems, particularly with detailed design drawings and specifications for mechanical equipment, dies, tools, and controls.
2	**Complex Problem Solving:** Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
3	**Monitoring:** Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action, particularly in terms of quality-control analysis.

Most Common Break Point Competencies	
1	**Critical Thinking:** Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to resolve design or other problems.
2	**Monitoring:** *See previous.*
3	**Active Listening:** Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.

Most Preferred Competencies	
1	**Mathematics:** *See previous.*
2	**Complex Problem Solving:** *See previous.*
3	**Judgment and Decision Making:** Considering the relative costs and benefits of potential actions to choose the most appropriate one.

Most Hard-to-Find Competencies	
1	**Operations Analysis:** Analyzing needs and product requirements to create a design using programs such as CAD, AutoCAD, Civil 3D, and Revit.
2	**Monitoring:** *See previous.*
3	**Critical Thinking:** *See previous.*

Most Evolving Competencies	
1	**Operations Analysis:** Evolution driven by emergence of new drafting programs and increasingly-complex customer needs; changes necessitate greater analysis and modification skills to diagnose problems with current design and tailor them to fit consumer needs.
2	**Active Learning:** Evolution driven by the emergence of new technologies (e.g., machine tools, manufacturing processes, and software) and production methods; changes increase value of adaptability, eagerness to learn, and willingness to share new information with co-workers.
3	**Complex Problem Solving:** Evolution due to new machine tools and new manufacturing techniques; changes increase value of judgment and decision making skills, as workers will have to decide from among a greater number of differing solutions.

Prioritized Occupation-Specific Competencies: Mechanical Drafters

Most Common Required Competencies	
1	**Engineering Software:** Proficiency with computer software related to modeling (e.g., MATLAB, Wonderware, AnSys) and computer-assisted design (e.g., AutoCAD, Mathcad, SCADA).
2	**Computer Design (Architecture):** Experience with 3D modeling and design programs(CAD Design, Pro/ENGINEER, CATIA), architectural and mechanical drafting, and tool design.
3	**General Engineering:** Familiarity with processes in mechanical civil engineering, engineering supervision, locomotive engineering, or being an engineer in training.

Most Common Break Point Competencies	
1	**Machine Tools:** Certification and/or competency with machine tools such as power grinders, milling cutters, drill presses, lathes, calipers, tool dies, and their dial indicators.
2	**General Electrical Systems:** Experience with installation, identification and repair of wiring, transformers, and circuit breakers and use of voltmeters, ammeters, and wiring diagrams.
3	**Engineering Activities:** Proficiency in all aspects of being an engineer, including management, support, design, and working on projects.

Most Preferred Competencies	
1	**Engineering Software:** *See previous.*
2	**Machine Tools:** *See previous.*
3	**General Electrical Systems:** *See previous.*

Most Hard-to-Find Competencies	
1	**Enterprise Resource Planning Software:** Familiarity with using Enterprise Resource Planning software for process design and order management.
2	**Engineering Activities:** *See previous.*
3	**Engineering Software:** Proficiency with computer software related to modeling (e.g., MATLAB, Wonderware, AnSys) and computer-assisted design (e.g., AutoCAD, Mathcad, SCADA).

Most Evolving Competencies	
1	**Engineering Software:** Evolution driven by emergence of new computer software and modeling techniques; changes allow drafters more flexibility and control over designs and the expense of greater complexity and unfamiliarity with new technology; changes increase value of adaptability and active learning skills.
2	**Machine Tools:** Evolution driven by ever-increasing presence of new machine tools and manufacturing processes; changes will allow companies to increase output and efficiency; changes will also make it more important to be willing and eager to learn new skills and about new technologies.
3	**Computer Design (Engineering):** Evolution due to new computer programs and drafting techniques; changes place greater importance on engineering software and engineering activities skills.

Occupation Deep Dive: Mechanical Drafters

Job Titles Within This Occupation

- Mechanical Designer
- CAD Operator
- Drafter
- CAD Drafter
- Civil 3D Drafter

Certification and Education Preferences (Example)

- Computer Aided Design (CAD) Certification
- American Society of Mechanical Engineers (ASME) Certified

Tools Used (Example List)

- Computer Aided Drafting/Design (CAD)
- AutoCAD
- Civil 3D
- Revit
- Autodesk
- Microstation

Other Relevant Foundational Competencies

1	Speaking
2	Reading Comprehension
3	Quality Control Analysis
4	Time Management
5	Learning Strategies
6	Social Perceptiveness
7	Instructing
8	Systems Analysis
9	System Evaluation
10	Persuasion
11	Technology Design
12	Programming
13	Management of Personnel Resources
14	Negotiation
15	Service Orientation
16	Operation Monitoring
17	Science
18	Management of Material Resources
19	Troubleshooting
20	Management of Financial Resources
21	Equipment Selection
22	Operation and Control
23	Equipment Maintenance
24	Installation
25	Repairing

Other Relevant Occupation-Specific Competencies

1	General Data Techniques
2	Manufacturing Design
3	Operations Management
4	Construction Management
5	Equipment Maintenance
6	Equipment Repair
7	Plumbing
8	HVAC
9	Industrial Design
10	General Design
11	Hand Tools
12	Welding
13	Manufacturing Standards
14	Manufacturing Processes
15	Machinery
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