Specific Competencies and Skills Tested in this Assessment:

**Manufacturing Math, Science, and Measurement**
- Apply math functions to solve problems
- Create and interpret graphs and charts commonly used in manufacturing
- Match measurement activities to manufacturing processes
- Demonstrate proper general and precision measurement techniques
- Using mechanical formulas, solve problems involving geometric shapes and metric conversions
- Understand molecular action as a result of temperature extremes, a chemical reaction, or moisture content

**Workplace Safety, Health, and Job Skills**
- Complete forms and paperwork as required
- Identify issues involving basic industrial safety
- Maintain and use protective guards on equipment and machinery
- Use electrical devices correctly and safely
- Identify fire exits, fire-fighting equipment, and procedures
- Determine weight/operating limits of equipment
- Perform periodic checks during operation to ensure proper function
- Identify, safely handle, and properly dispose of chemical, biological and physical hazards
- Demonstrate professional communication and problem-solving skills
- Describe ergonomics and its importance to the manufacturing process

**Quality Assurance**
- Identify components of a manufacturing system and apply continuous quality improvement to the process
- Explain the effect of quality assurance on profit
- Identify statistical tools used in process improvement, including SPC (Statistical Process Control), histogram, and pareto analysis
- Perform inspections

**Blueprint Reading**
- Interpret commonly used abbreviations, terminology, and symbols
- Determine tolerances and dimensions associated with a drawing
- Interpret blueprints to determine appropriate tool usage
- Identify types of lines within a drawing
- Extract information from title blocks and legends
- Identify various views
Manufacturing Technology - PILOT (continued)

Manufacturing Fundamentals, Processes, and Materials
Demonstrate basic mechanical skills
Perform troubleshooting and maintenance procedures
Describe the importance of correct fixturing and workholding devices
Describe the function of specific machine tools
Apply knowledge of flowcharts and assembly lines
Locate and retrieve production materials specific to process flow and delivery schedule
Demonstrate proper use and processes of manufacturing shop tooling
Enter and edit a program in a Computer Numerical Control (CNC) machine
Set up a Computer Numerical Control (CNC) machine
Operate/run a Computer Numerical Control (CNC) machine

Material Handling
Requisition, receive, store, ship, and package materials
Apply knowledge of materials and material handling procedures
Apply knowledge of distribution and transportation methods

Industrial Robotics Systems
Interpret appropriate industrial robotic design features, functions, and applications
Identify basic robotic programming methods
Connect and program digital input and output devices to a robot controller

Computer Use
Apply computer applications in manufacturing processes
Describe various methods of tracking inventory quantities
Perform measurements using digital or electronic gauges interfaced with a CPU

Process Control
Identify a variety of process control applications
Collect and analyze information to determine and improve work processes
Demonstrate knowledge of the LEAN process
Interpret project plans
Appropriately report job status

Purchasing and Resource Identification Activities
Exhibit knowledge of "make or buy" decisions
Demonstrate knowledge of vendor relationships and services

Electronics and Fluid Power
Use various devices to gather electrical measurements (e.g., analog voltmeter, DMM)
Apply knowledge of basic electronics and basic components
Exhibit appropriate electrical wiring techniques
Interpret basic ladder diagrams
Apply knowledge of hydraulic and pneumatic principles
Apply and interpret schematics
Manufacturing Technology - PILOT (continued)

Design Processes
Apply knowledge of drawings using various commands in a Computer Aided Design (CAD) program to generate workpiece geometry
Create a sketch of a multiview drawing given an isometric drawing
Use Computer Aided Manufacturing (CAM) software to generate and post a Computer Numerical Control (CNC) program

Written Assessment:
Administration Time: 3 hours
Number of Questions: 220

Areas Covered:

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<thead>
<tr>
<th>Percentage</th>
<th>Topic</th>
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<tbody>
<tr>
<td>10%</td>
<td>Manufacturing Math, Science, and Measurement</td>
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<tr>
<td>15%</td>
<td>Workplace Safety, Health, and Job Skills</td>
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<tr>
<td>5%</td>
<td>Quality Assurance</td>
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<td>3%</td>
<td>Purchasing and Resource Identification Activities</td>
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<td>12%</td>
<td>Electronics and Fluid Power</td>
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<tr>
<td>5%</td>
<td>Design Processes</td>
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Sample Questions:

Convert 1/16 to a decimal value.
A. 0.0160
B. 0.0063
C. 0.0625
D. 0.0163

Unsafe practices or malfunctions should be immediately reported to
A. other employees
B. the safety engineer
C. the supervisor
D. OSHA

Many companies improve their profits without increasing sales by
A. increasing the work force
B. continuous quality improvements
C. layoffs
D. advertising
True position (part reference) should be established with respect to a
   A. centerline  
   B. datum  
   C. feature  
   D. coordinate

What is a workholding fixture?
   A. a device that moves pieces down the work line  
   B. a device that affixes to the piece being worked on  
   C. a device that holds a workpiece securely for accurate repetition of parts  
   D. a customized or modified bench vise

Paint on the end of a manufactured steel bar serves to
   A. identify the steel producer  
   B. identify the type of steel  
   C. prevent rusting  
   D. improve machinability

A digital caliper connected to a personal computer can be used to
   A. calibrate the computer  
   B. collect statistical process control data  
   C. measure personal computer power consumption  
   D. monitor production rates

The purpose of job status reports is to provide data on
   A. age and utility of production machines  
   B. progress or lack of progress for a job  
   C. predicting future order quantities  
   D. annual performance reviews

The common unit of measurement of inductance is the
   A. henry  
   B. farad  
   C. mho  
   D. ohm

An isometric view can be
   A. cut out to show detail  
   B. dimensioned  
   C. a principle view  
   D. a primary view
Manufacturing Technology – PILOT (continued)

Performance Assessment:
Administration Time: 3 hours and 10 minutes
Number of Jobs: 3

Areas Covered:

54%  **Milling Operations**  
Participants will demonstrate milling operations on a piece of low-carbon steel according to the drawing provided. Steps will include: indicating the vise, determining whether the head is trammed, using rough and finish passes to machine the block, and drilling and tapping a hole.

30%  **Assemble a Multiple Shaft Gear Drive System**  
Participants will follow schematic instructions to mount and level the electric gear motor provided. Steps will include: install, align, mount, level, and check of parts.

16%  **Determining Gauge Block Combinations**  
Participants will wring provided gauge blocks together according to specifications and use height gauge to verify and record heights.

Sample Job:  
**Determining Gauge Block Combinations**

Maximum Job Time: 20 minutes

Participant Activity:  
The participant is to wring gauge blocks together, verify and record combined height of the blocks using a height gauge.