Assessment Blueprint

General Maintenance - Mechatronics

Test Code: 8479 / Version: 01

Specific Competencies and Skills Tested in this Assessment:

Mechanical Equipment

- Troubleshoot/Repair/Replace brakes and clutches (electromechanical and mechanical)
- Troubleshoot/Repair/Replace gears
- Troubleshoot/Replace belts, sheaves/pulley
- Troubleshoot/Maintain chains and sprockets
- Troubleshoot/Repair/Replace cams
- Troubleshoot/Repair/Replace seals and O-rings
- Troubleshoot/Repair/Replace bearings and bushings
- Troubleshoot/Repair/Replace shafts
- Perform alignment and balancing
- Troubleshoot/Repair/Replace motors (AC and DC)
- Maintain couplings
- Maintain fans
- Install/Maintain valves (cut-off, pressure relief...)

Pneumatic/Hydraulic Equipment

- Troubleshoot/Repair/Replace pneumatic/hydraulic valves
- Troubleshoot/Repair/Replace cylinders and intensifiers
- Troubleshoot/Repair/Replace hoses and tubing
- Adjust pressures and flows mechanically and electronically
- Maintain fluid levels for hydraulic systems
- Replace filters on hydraulic/pneumatic systems
- Troubleshoot/Repair/Replace gauges
- Troubleshoot/Repair/Replace pneumatic/hydraulic pumps
- Troubleshoot/Replace accumulators
- Troubleshoot/Repair/Replace air motors
- Maintain vacuum system on pneumatic equipment
- Maintain filtration systems
- Adjust switches and controls on hydraulic/pneumatic system
- Install/Design hydraulic/pneumatic components to upgrade/enhance systems

Specific Competencies and Skills (continued):

Predictive/Corrective Maintenance

- Perform route-based vibration analysis
- Collect oil samples for analysis
- Interpret and take action on oil analysis
- Perform alignment (laser system)
- Perform balancing
- Perform online motor current analysis
- Perform infrared thermography
- Perform ultrasonic maintenance

Blueprint Reading/Schematics

- Interpret mechanical drawings
- Interpret pneumatic and hydraulic drawings
- Interpret electrical schematics
- Interpret piping and instrumentation diagram (P&ID)

Equipment Controls and Sensors

- Troubleshoot/Replace/Install circuit boards
- Install/Maintain/Troubleshoot photo eyes
- Install/Maintain/Troubleshoot servo motors
- Install/Maintain/Troubleshoot VFD drives (Variable Frequency Drive)
- Install/Maintain/Troubleshoot limit and proximity switches
- Troubleshoot/Calibrate/Adjust and replace sensors and input devices
- Calibrate process control loop (PID)
- Troubleshoot/Replace transducers

Electrical Equipment

- Install/Replace wire
- Install/Maintain solenoid valve
- Install/Maintain relays
- Install/Repair/Replace motor starters
- Install/Replace fuses and circuit breakers
- Operate electrical/electronic test equipment

Specific Competencies and Skills (continued):

Electronic Equipment

- Maintain/Install fiber optics
- Troubleshoot/Repair/Replace vision systems
- Install/Maintain/Troubleshoot bar code readers

Networking

- Use DeviceNet protocol
- Use Data Highway protocol
- Use TCP/IP protocol
- Use ControlNet protocol (Allen Bradley)
- Use FL net protocol (industrial ethernet)

PLC Equipment

- Create/Modify/Monitor PLC programs
- Program/Maintain operator interface software
- Troubleshoot communication systems in PLC
- Replace PLC processor
- Perform backups of PLC software programs
- Install/Maintain PLC hardware
- Edit/Program PLC

NC/CNC Equipment

- Setup CNC equipment
- Troubleshoot tooling/quality problem
- Modify programming language
- Replace components on NC/CNC equipment
- Modify system parameters

Robots

- Install/Maintain/Repair robot systems
- Program/Edit robot software

Resistance Welding

- Perform visual inspection of resistance welding equipment operation
- Align components in resistance welding equipment
- Repair/Replace failed components in resistance welding equipment
- Maintain and troubleshoot gun servos

Specific Competencies and Skills (continued):

Fabricate

- Perform pipefitting tasks
- Operate machining equipment
- Operate welding equipment for fabrication

Computer Literacy

- Use operating systems
- Use computer software
- Use Maintenance Database Systems (LMS, MAXIMO, PeopleSoft, etc.)
- Use Internet and Intranet
- Use laptop for troubleshooting and installation
- Perform computer/workstation hardware repair or installations

Preventative Maintenance

- Perform general housekeeping
- Perform visual inspection of equipment
- Change filters
- Maintain oil and grease levels
- Perform equipment checks
- Monitor floor management development system (FMDS)

Dust and Mist Collectors

- Maintain dust collector (dry and wet filter systems)
- Maintain mist collector

Utilities

- Troubleshoot/Maintain cooling tower
- Troubleshoot/Maintain air compressors
- Maintain HVAC system

Specialized Machinery

- Operate hoist and cranes
- Perform rigging

Metrology

- Operate precision measuring equipment (digital, dial, manual, Metric, and SAE)
- Maintain specialty tools and equipment

Specific Competencies and Skills (continued):
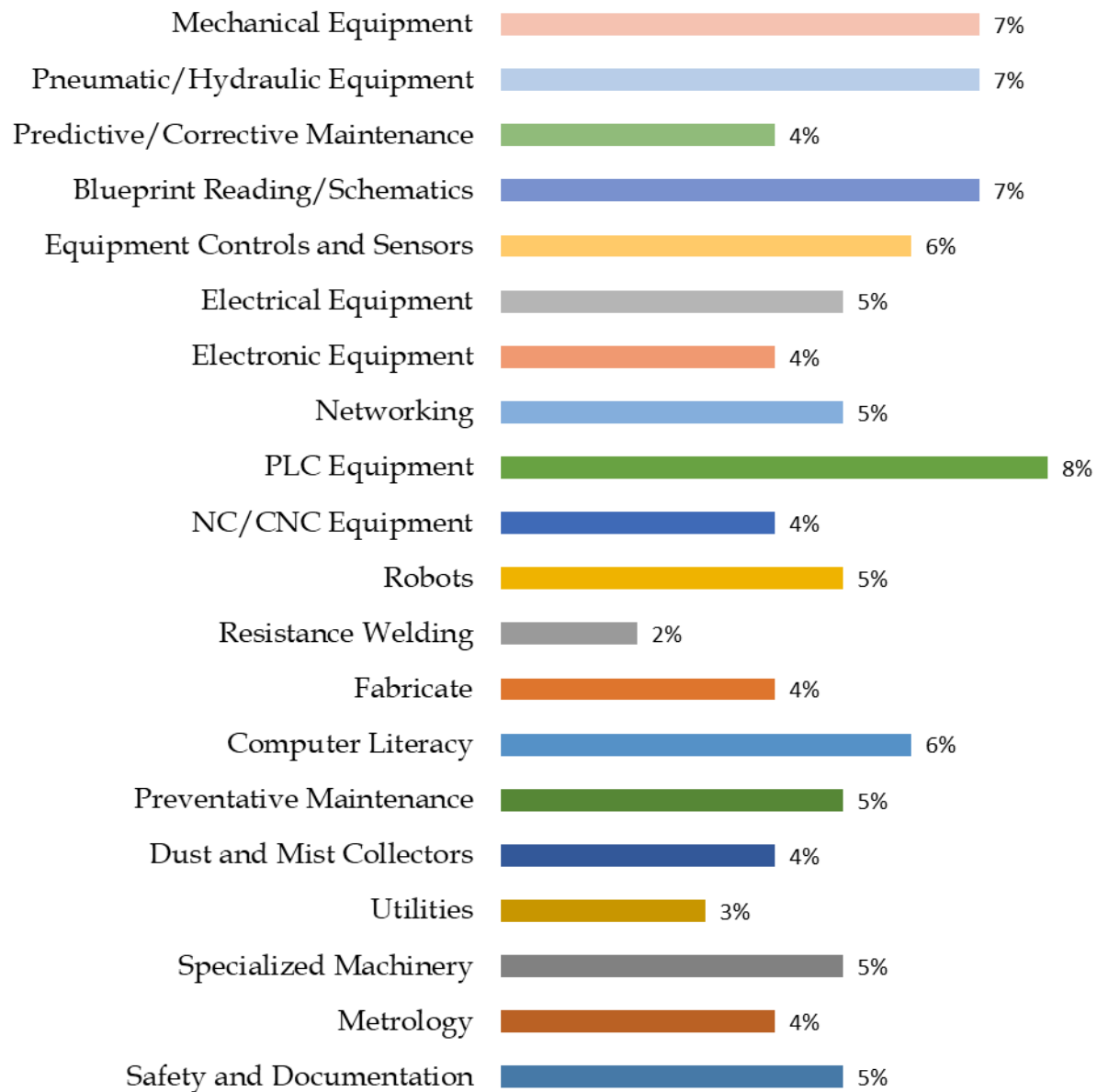
Safety and Documentation

- Demonstrate knowledge of basic safety principles
- Perform pre-shift inspections

Written Assessment:

Administration Time: 3 hours
Number of Questions: 204

Areas Covered:

Area	Percentage
Mechanical Equipment	7%
Pneumatic/Hydraulic Equipment	7%
Predictive/Corrective Maintenance	4%
Blueprint Reading/Schematics	7%
Equipment Controls and Sensors	6%
Electrical Equipment	5%
Electronic Equipment	4%
Networking	5%
PLC Equipment	8%
NC/CNC Equipment	4%
Robots	5%
Resistance Welding	2%
Fabricate	4%
Computer Literacy	6%
Preventative Maintenance	5%
Dust and Mist Collectors	4%
Utilities	3%
Specialized Machinery	5%
Metrology	4%
Safety and Documentation	5%

Sample Questions:

If one branch of a parallel circuit opens, the remaining individual branch currents will
_____.
    A. stop
    B. increase
    C. decrease
    D. stay the same

Which of the following would represent a normally closed pushbutton that is being
used as a STOP button?
    A. XIC
    B. OTE
    C. XIO
    D XOC

What mode switch position allows a program to be modified?
    A. jog
    B. MDI
    C. edit
    D. auto

What is **NOT** a result of proper lubrication?
    A. reduced friction
    B. dissipated heat
    C. limited corrosion
    D. decreased horsepower

What attachment is used in a height gauge to lay out lines?
    A. punch
    B. indicator
    C. scribe
    D. chalk

What is the pitch of a drive chain?
    A. center to center distance of the pins
    B. roller width
    C. chain strength
    D. chain length

Fundamentals of Construction (continued):

When taking an oil sample from a hydraulic tank, you should take from
    A. top
    B. bottom
    C. middle
    D. any of the above

An FL net protocol is
    A. an industrial automation technology standard
    B. a factory language program
    C. an audio communication standard
    D. based on FORTRAN programming language

A vibration analysis of a Dust Collector may be used to detect all of the following EXCEPT
    A. a dirty filter
    B. a dirty fan
    C. bad bearings
    D. loose belts

How many broken wires on a one strand of one rope lay is permissible?
    A. 0
    B. 1
    C. 3
    D. 10