

Appendix Q

MANUFACTURING YOUTH APPRENTICESHIP

MAINTENANCE, INSTALLATION, & REPAIR: BASIC INDUSTRIAL EQUIPMENT (UNIT 10)

Unit 10: Maintenance, Installation, & Repair Pathway

Basic Industrial Equipment

Competency

1. Maintain schedules, communication, and documentation

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when:

- Learner identifies frequency of maintenance tasks, i.e., daily, every other day, weekly, monthly, yearly, etc.
- Learner updates schedules as maintenance is completed
- Learner schedules preventive and repair maintenance with all internal and external parties with limited disruption to production
- Learner communicates maintenance and repair needs clearly
- Learner uses the correct reporting formats for documentation and communication
- Learner documents maintenance and repair activities accurately
- Learner reports back and documents any maintenance and repair issues in a timely manner
- Maintenance is documented clearly and completely
- Maintenance communication is timely and accurate
- Maintenance communication is documented

Learning Objectives

- Discuss how to schedule repair and maintenance functions with respect to production requirements and production levels
- Explain how communication for repair and maintenance issues demonstrates a knowledge of customer and business needs
- List the parties that need to be involved of repair and maintenance issues
- Describe the importance of documenting communications
- Describe the process of reporting and documenting preventive and corrective actions
- Discuss why preventive/corrective records must be retained

Comments:

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Basic Industrial Equipment

Competency

2. Assist with the identification and diagnosis of equipment problems

Performance Standard Condition

Competence will be demonstrated

- at the worksite and classroom
- While assisting a worksite professional

Performance Standard Criteria

Performance will be successful when:

- Learner ensures that equipment is properly labeled and pulled from production use
- Learner locates and interprets technical drawings for the equipment and process that is under investigation
- Learner locates the equipment reference materials and manuals
- Learner reviews previous preventative maintenance and repair history records on the equipment under investigation
- Learner assists worksite professional to identify the components to be checked for proper operation
- Learner ensures that appropriate safety devices and personal protective equipment are in place prior to diagnosis
- Learner ensures that all labeling and Lock Out/Tag Out procedures are in place prior to diagnosis
- Learner follows all safety requirements and wears appropriate Personal Protective Equipment (PPE) as required
- Learner assists the worksite professional to take appropriate readings using meters and testing equipment
- Learner assists the worksite professional in locating and determining the cause of the problems reported
- Learner assists worksite professional to match suggested remedies with problems for the inoperative systems
- Learner documents testing and evaluation
- Learner ensures that equipment is properly labeled, pulled from production, and communicated regarding repair
- Investigations are complete, timely, and include indication of root cause

Learning Objectives

- Describe how diagrams, schematics, equipment manuals, and equipment specifications are used to determine repair
- Describe the most common causes of tool/equipment failure in your facility
- Explain the meaning of common alarms on equipment at your facility
- Compare what equipment and equipment materials are recyclable and what is not recyclable at your facility
- Describe the purpose, function, and components of diagnostic testing equipment used in your facility

Comments:

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Basic Industrial Equipment

Competency

3. Assist with preventive maintenance and repair of equipment

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- While assisting a worksite professional

Performance Standard Criteria

Performance will be successful when:

- Learner completes scheduled preventive maintenance (PM) tasks in a timely manner
- Learner identifies equipment problems through malfunction or production or quality indicators
- Learner communicates PM or repair needs to production and other applicable parties
- Learner assures that alternative equipment is available if needed by production
- Learner consults worksite professionals, technical drawings, maintenance manuals, and equipment history for PM or repair
- Learner determines type of lubrication requirements
- Learner gathers equipment and supplies needed to perform PM or repair
- Learner ensures that equipment is properly labeled and pulled from production use
- Learner follows appropriate Lock Out/Tag Out procedures prior to performing PM or repair
- Learner follows all safety requirements and wears appropriate Personal Protective Equipment (PPE) as required
- Learner assists worksite professional to follow PM schedule to calibrate and maintain equipment, tools and workstations
- Learner assists worksite professional to isolate system and component failure and to repair equipment problems
- Learner assists worksite professional to identify root cause of problem and develop corrective action plan
- Learner assists worksite professional to re-qualify equipment for operation
- Learner documents preventative actions or repairs completed
- Learner evaluates PM or repair work through follow up

Learning Objectives

- Explain concepts of simple machines and how they apply to disassembly and moving of equipment
- Discuss preventive maintenance methods
- Compare preventive maintenance to predictive maintenance
- Identify when to use preventive action and when to use corrective action
- Explain why verification is essential to prevention and correction
- Describe how diagrams schematics, equipment manuals, and equipment specifications to determine the schedule and process for PM

Comments:

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Basic Industrial Equipment

Competency

4. Assist to identify and diagnose electrical circuit problems

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- While assisting a worksite professional

Performance Standard Criteria

Performance will be successful when:

- Learner follows identification and diagnosis of equipment problems steps
- Learner interprets electrical schematics
- Learner measures current draw
- Learner tests circuit for specified readings to isolate possible causes of fault
- Learner tests for voltage, resistance, open circuits and shorted elements if required
- Learner utilizes electrical tests logically in process of elimination
- Learner assists worksite professional to identify specific cause of the problem in electrical circuits

Learning Objectives

- Compare sources of electricity
- Compare AC and DC circuits
- List units of measure for electrical quantities
- Define voltage, current, and power (wattage)
- Explain how to test voltage, current, and power (wattage)
- Define/apply theory of Ohm's law
- Calculate electrical quantities such as voltage, current, resistance, power and conductance
- Determine how resistance affects an electrical circuit
- Compare resistive series circuits, parallel circuits, and combination circuits
- Compare conductors and insulators
- Describe features, symbols and notations used on electrical schematics
- Describe electrical circuit components and functions
- Describe electrical systems reliability issues including power supply connections, operations, series & parallel circuit function, circuit breaker function, electric motor control, and power overload

Comments:

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Basic Industrial Equipment

Competency

5. Assist to identify and diagnose motor control circuit problems

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- While assisting a worksite professional

Performance Standard Criteria

Performance will be successful when:

- Learner follows identification and diagnosis of equipment problems steps
- Learner interprets single electric motor control diagrams
- Learner assists worksite professional to take appropriate readings on motor control system using meters and testing instruments
- Learner assists worksite professional in locating and determining the cause of problems in motor control system

Learning Objectives

- Explain how motor action relates to the operation of electrical devices
- Compare DC, 3-phase and single phase motors
- Describe motor control circuit components, functions and reliability issues
- Describe proper functioning of belts and chains and their reliability issues including belt drive, chain drive and roller chain drive functions
- Describe features, symbols and notations used on motor control circuit diagrams
- Describe automated machine reliability issues including computerized control processes, logic control circuits, solenoid-operated fluid power valves, electromechanical limit switches, time delay devices, manual controls, and interlock circuits

Comments:

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Basic Industrial Equipment

Competency

6. Use hand tools

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when:

- Learner follows all safety procedures
- Learner selects the appropriate hand tool for the job
- Learner uses hand tools according to established guidelines for the task to be completed
- Learner cuts metal stock with a hand hacksaw
- Learner cuts threads with hand taps and dies
- Learner reams holes with hand reamer
- Learner taps holes using hand tools
- Learner deburrs using hand tools
- Piece(s) meet specification

Learning Objectives

- Distinguish between common hand tools including hammers, wrenches, pliers, punches, taps and dies, etc.
- Identify cutting and non-cutting hand tools
- Compare basic tools and tool-holding devices

Comments:

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Basic Industrial Equipment

Competency

7. Calibrate tools and instruments

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when:

- Learner follows schedule to calibrate tools and instruments
- Learner checks tool/instrument certification regularly by reviewing documentation and through observation of use
- Learner cleans and adjust instruments before calibrating
- Learner calibrates tools and instruments accurately and correctly
- Learner promptly re-calibrates tools out of calibration
- Learner re-qualifies tools and instruments sent out for recalibration or repairs
- Learner labels tools and equipment that have been calibrated
- Learner documents all calibration activities

Learning Objectives

- Examine different types of precision measurement instruments and their uses Define calibration and how it is performed
- Compare and contrast accuracy versus precision
- Explain tolerance
- Describe how tolerances and precisions are developed for a piece/product
- Explain how calibration precision and schedules are determined
- Describe the proper use of selected precision measurement tools
- Explain how to determine and control potential sources of measurement error
- Discuss how to apply calibration methods to control product and process characteristics

Comments:

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Basic Industrial Equipment

Competency

8. Install mechanical fasteners

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when:

- Learner follows preventive maintenance and repair of equipment steps
- Learner selects the appropriate fastener for the application
- Learner installs various fasteners according to specifications
- Learner uses the correct tools to install mechanical fastener

Learning Objectives

- Distinguish between screw thread types and sizes
- Examine and identify different fasteners and their uses

Comments: