

**CORE COMPETENCY REQUIREMENTS:  
NIMS CERTIFIED PRESS SETUP OPERATOR - STAMPING**

	<b>APPRENTICE CORE COMPETENCIES</b>	<b>NIMS CREDENTIALS</b>
1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	Metalforming Level I
2.	Awareness of Lock-out and Tag-out Procedures	
3.	Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	General Housekeeping and Maintenance	
5.	Read Job Process Plan	
6.	Identify and Respond to Warning Signals During Production Operations	
7.	Part Inspection	
8.	Process Control	
9.	Explain the Continuous Improvement Process	
10.	Measure, Chart & Evaluate Product Using SPC Principles	
11.	Part Inspection Using Standard Inspection Equipment	At least one of the following: Operate with Single Hit Tooling Operate with Compound Dies Operate with Progressive Dies Operate with Deep Draw Dies Operate with Transfer Dies
12.	Monitor Process, Record Required Production Data, Respond to Problems	
13.	Select, Load and Restart Materials	
14.	Adjust Press and/or Required In-Line Equipment	
15.	Operate Press with Required Tooling	
16.	Adjust Lubrication System, Fill and Refill the Lubrication System	
17.	Set Up and Test Safety Systems	Parts Inspection and Quality Control and at least one of the following: Set Up with Single Hit Tooling Set Up with Compound Dies Set Up with Progressive Dies Set Up with Deep Draw Dies Set Up With Transfer Dies
18.	Set Up and Adjust Lubrication and Coolant Systems	
19.	Set Up and Operate Press with Required Tooling	
20.	Explain and Verify Operation of Sensors	
21.	Explain Press Components and In-Line Components	
22.	Explain Fundamental Die Theory	
23.	Detect Raw Material Defects	
24.	Explain Basic Material Properties and Qualities	
25.	Verify Product Quality	
26.	Troubleshoot Running Processes	

**\*NOTE:** There is not a specific sequence to the implementation of the Core Competencies. The twenty-six Core Competencies and at least one of the four NIMS Credentials, listed above, must be satisfactorily completed to meet the requirements of a NIMS Certified Apprenticeship Program and earn a *Certificate of Completion of Apprenticeship*.

# NIMS CREDENTIAL: METALFORMING LEVEL I

## *Core Competency*

### 1. Identify and Demonstrate Usage of Machine Safety Equipment

#### **NIMS DUTY & PERFORMANCE STANDARD**

**Duty:** Identify and explain the usage of machine guarding and safety equipment such as light curtains, etc.

**Performance Standard:** Given a scenario in which machine guarding procedures are appropriate, describe in detail the application of the procedures.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Identify engineering safeguarding controls on a manually fed and/or coil fed application using a **full** revolution clutch press specific to tooling applicable to the company that may include any of the following guarding devices. This will also include press STOP controls and fundamental press controls:
  - Barrier Guard
  - Type “A” or Type “B” gate
  - Two hand control (dual palm buttons)
  - Pullbacks
  - Restraint
- b. Identify engineering safeguarding controls on a manually fed and/or coil fed application using a part revolution clutch press specific to tooling applicable to the company that may include any of the following guarding devices and basic stop controls of the press. This will also include press STOP controls and fundamental press controls:
  - Barrier guard
  - Presence sensing device
  - Two hand control
  - Pullback
  - Restraint
  - Type “A” or Type “B” gate
- c. Identify engineering safeguarding controls on coil fed press line auxiliaries, i.e., uncoiler, straightener, slack loop, and feeder and output devices.

*Core Competency*

**2. Awareness of Lock-out and Tag-out Procedures**

**Duty:** Understand lock-out and tag-out procedures – lock-out/tag-out awareness.

**Performance Standard:** Given a scenario in which lock-out and tag-out procedures are appropriate, describe in detail the application of the procedures.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Know, identify and understand energy sources, the types and amounts of hazardous energy in the workplace, and the methods and devices used to lock-out (isolate) hazardous energy on the press and press line equipment.
- b. Demonstrate lock-out-tag-out awareness. Locate (trace) all energy sources to make sure they operate the equipment that is to be locked-out. Know plant lock-out-tag-out applications, notification procedures and policies. Identify the difference between “affected personnel” and “authorized personnel.”

*Core Competency*

**3. Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA**

**Duty:** Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines. Document safety activities as required.

**Performance Standard:** Given written and verbal safety instructions detailing the handling and storage of hazardous materials in compliance with OSHA and EPA requirements and guidelines, demonstrate safe workplace practices in the identification, handling, and storage of hazardous materials.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Recognize physical and chemical hazards in the workplace including “Right to Know” and hazardous materials (HAZMAT) use and storage requirements.
- b. Read and understand chemical labeling, coding and signage (HMIS).
- c. Understand the format, content and use of Material Safety Data Sheets (MSDS) – what they are, where they are, how to read them, etc.

### *Core Competency*

#### **4. General Housekeeping & Maintenance**

**Duty:** Keep the duty station clean and safe for work. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.

**Performance Standard:** Given maintenance, cleaning, and housekeeping check lists, as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on an assigned machine. Maintain the cleanliness of the general work area.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

Keep a duty station clean and safe for work by:

- Applying good housekeeping practices and basic concepts of the 5S system in the workplace.
- Segregating scrap/waste by material type and/or grade.
- Explaining the procedure for basic spill containment and cleanup.
- Explaining the procedure for reacting to a safety hazard on an assigned machine.

## *Core Competency*

### **5. Read Job Process Plan**

**Duty:** Read and understand a process plan for a formed metal part.

**Performance Standard:** Given a process plan make the appropriate interpretations required of a machine operator. Make a verbal presentation explaining each of the process plan requirements and steps. Highlight the items of primary importance to the machine operator.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Given a process plan for a stamping operation, the setup/operator must be able to define the following:
  - Part number
  - Type of material
  - Material thickness and width
  - Size of the order
  - Lot size
  - Inspection – gages, inspection sheet, etc.
  - Setup parameters such as shut height, clamping strategy, die location, pass line, etc.

## *Core Competency*

### **6. Identify & Respond to Warning Signals During Production Operations**

**Duty:** While in production, monitor the process, both visually and audibly as required by the process plan, and respond to problems as they arise.

**Performance Standard:** Given a setup and a process plan, perform the monitoring plan and respond to its requirements during the production run. Be aware of monitoring responsibilities not specifically stated on the process plan, but required of all production jobs.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Monitor the operation of the coil fed stamping line and performing quality assurance checks.
- b. Identify and explain the most common causes for adverse coil and material conditions and be able to explain the purpose for slack loop in the coil fed press line.
- c. Recognize common problem indicators on piece parts and be able to state the most likely causes of each indicator. This may relate to broken, damaged, or worn punches or dies resulting in missing or incompletely formed or cut features on a piece part.

### *Core Competency*

## **7. Part Inspection**

**Duty:** Inspect sample parts using precision tools and techniques. Prepare reports on the compliance of the parts.

**Performance Standard:** Given the necessary job process sheets for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedure(s). Complete required written inspection report and make a decision to accept or reject component parts. Provide brief verbal explanation of inspection procedures, results, and decisions.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Take measurements to an accuracy of .001 (decimals) or 1/64<sup>th</sup> of an inch (fractions) and angular measurements to one degree using a precision rule or square, protractor, micrometer, caliper, sine bar, height/depth gauge, dial indicator and/or other available checking fixtures or attribute gauges.
- b. Determine compliance (within stated tolerances) for the dimensions measured and determine if the part is acceptable (within tolerance and visually acceptable) or unacceptable (non-compliant).

## Core Competency

### 8. Process Control

**Duty:** Follow a sampling plan. Inspect the samples for the required data. Enter the data on appropriate charts. Graph the data. Respond to the warning conditions indicated by the process charts.

**Performance Standard:** Given the necessary job process sheets for a part, verbal instructions, and the necessary charts and inspection tools, inspect parts according to the sampling plan, collecting the data required for the process control chart. Working with the supplied control and warning limits, place the data, produce new data as needed, graph the data, and take the *Stop or Go* actions as indicated by the results of producing the process control chart. Provide brief verbal explanation regarding the decision taken.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

Given the necessary job process sheets for a part, verbal instructions and the necessary charts and inspection tools, inspect the parts according to the sampling plan or inspection plan, collect the data required for the process while adhering to the time constraint. Working with the supplied control and warning limits place the data in the appropriate documentation and take *Stop or Go* actions as indicated by the results. Provide a brief verbal explanation supporting the decision taken.

## Core Competency

### 9. Explain the Continuous Improvement Process

**Duty:** As a member of a process team, analyze the performance of a production process. With the team formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustments and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

**Performance Standard:** Given a process plan, blueprint, inspection process plan, verbal instructions, the necessary tools and equipment, and a routine production process having a problem(s), as a team member, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Carry out the cause and

effect analysis by participating in the development of a fishbone diagram with the team. Explain the fishbone diagram, the corrective actions and the reasoning connecting the fishbone root cause analysis to the remedial actions taken.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment and a part having routine problems being processed, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Explain the corrective actions and the reasoning used to perform the diagnosis.
- b. Given a process plan, part print, inspection process plan, verbal instructions, the necessary tool and equipment and a routine production process having a problem(s), propose a remedy(ies), having been given authorization to implement the process improvements(s), carry it out. Carry out the cause and effect analysis by participating in various problem-solving models (i.e., fishbone diagram, Pareto chart, process mapping) with the team. Explain the problem-solving model(s) applied to the corrective actions and the reasoning connecting the root cause analysis to the remedial actions taken.

### *Core Competency*

#### **10. Measure, Chart & Evaluate Product Using SPC Principles**

**Duty:** Measure parts, record on SPC chart, evaluate trends and respond appropriately to production problems identified in the chart.

**Performance Standard:** Given an SPC chart with control limits, make appropriate part measurements, chart the data, monitor and evaluate trend lines, and notify proper authority when adjustments are warranted.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Given the proper documentation, process plan and quantity of piece parts, chart the process using the correct measuring instruments applying SPC process control methodology.

- b. Given the appropriate SPC charts and data, determine if a process is in control or out of control. From the data, suggest a root cause and a corrective action.

## NIMS CREDENTIAL: METALFORMING LEVEL II

### *Core Competency*

#### **11. Part Inspection Using Standard Inspection Equipment**

**Duty:** Given a finished part, set up and perform the inspection of the part using standard inspection equipment.

**Performance Standard:** Given a finished part, process plan, blueprint, as well as access to appropriate inspection equipment, inspect a part's specified dimensions. Produce data necessary to describe the compliance to specified dimensions.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Verify calibrations of hand-held precision measuring devices and instruments to certified standards.
- b. Take measurements to an accuracy in accordance to the part print, inspection plan or process plan. Determine compliance (within stated tolerances) for the dimensions measured and determine if the part is acceptable (within tolerance) or unacceptable (non-compliant). Use attribute gauging where designated determining compliance of part features.
- c. Given a finished part, the apprentice will perform a profile inspection using an optical comparator (in shadow and/or reflection) executing the correct setup and produce data necessary to describe the compliance of the profiles.
- d. Given a finished part, the apprentice will perform an inspection of key characteristics using an already setup, pre-programmed and initialized Coordinate Measuring Machine (CMM) and produce data necessary to describe the compliance of the part's characteristics.

*Core Competency*

**12. Monitor Process, Record Required Production Data, Respond to Problems**

**Duty:** While in production, monitor the process, record data required by the control and quality plan, and respond to problems as they arise whether by physical presentation or by data analysis.

**Performance Standard:** Given a setup verified for safety, correct operation of tooling and waste management, and an appropriate process monitoring plan, perform the monitoring plan and respond to its requirements while performing the production run.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

Name several process control methods and describe the procedure to use each type of process control method.

*Core Competency*

**13. Select, Load and Restart Materials**

**Duty:** Whether prior to production or in production, when necessary, select, load, and restart materials required by the process plan.

**Performance Standard:** Given a setup in production, verified for safety, and with exhausted material supply, select, load, and place back into production a new batch of material.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Describe the proper procedures for raw material handling from the coil storage area to the press line.
- b. Load a new coil or material into an existing setup.

## *Core Competency*

### **14. Adjust Press and/or Required In-Line Equipment**

**Duty:** Adjust feeders to present stock to each tooling station at an appropriate rate. Adjust cradles and payout reels to provide material to other auxiliary devices or tooling. Adjust conveyors, magazines, take-up reels, and unloaders.

**Performance Standard:** Given an operation to be performed, adjust straighteners to present the stock to enter, flow through, and exit the tooling in the most efficient manner. Given a setup to be performed, adjust feeders to advance the stock at the correct pitch to match the requirements of the tooling. Given a setup to perform, adjust a cradle or payout reel to pay out material at a rate that enables smooth and continuous production. Given a setup to perform, adjust conveyors, take-up reels, magazines, and unloaders to handle the output of tooling so that the parts produced are kept from unwarranted post-production damage and scrap material is segregated into appropriate storage containers.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Apprentice is able to identify and explain the purpose of inline equipment such as the uncoiling device, straightener, loop control and feeding unit.
- b. Apprentice is able to adjust the press and all inline equipment such as the uncoiling device, straightener, loop control and feeding unit.

## *Core Competency*

### **15. Operate Press with Required Tooling**

**Duty:** Operate press with various tooling installed for production, including:

- Single-hit tooling.
- Compound die sets.
- Non-sensored progressive die sets.
- Sensored progressive die sets.
- Transfer dies.
- Tooling performing single deep-drawing operations.
- Tooling performing double deep-drawing operations.
- Tooling performing reverse deep-drawing operations.

**Performance Standard:** Given a setup in production using various tooling that is verified for safety, continue to produce parts in the manner prescribed by the process plan, including:

- Single-hit tooling.
- Compound dies.
- Non-sensored progressive dies.
- Sensored progressive dies.
- Transfer dies.
- Single deep-drawing operations.
- Double deep-drawing operations.
- Reverse deep-drawing operations.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Explain TDC, BDC and stroke/cycle and the relationship between the upper and lower die including the necessary controls for safe and efficient operation.
- b. Identify tooling options and distinguish between single-hit/blanking processes, compound dies, progressive dies (sensored or non-sensored), deep draw (single, double or reverse – hand or coil fed) and transfer (hand fed or coil fed).
- c. Safely start-up and operate an existing setup in various modes of operation, and inspect piece parts using hand-held precision measuring devices to an accuracy specified on the part print.

### *Core Competency*

#### **16. Adjust Lubrication System, Fill and Refill the Lubrication System**

**Duty:** Fill and refill the lubrication reservoirs as necessary with appropriate lubricants and fluids. Perform associated housekeeping tasks.

**Performance Standard:** Given a machine and tooling with lube systems, fill the lubrication reservoirs as required by the machine and tooling specifications. Adjust flow rates for the delivery of lubes. Perform associated housekeeping and spill-containment responsibilities.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

Replenish the lubrication, oil, coolant or fluid reservoirs as required by the machine and tooling specifications. Adjust flow rates for the delivery of fluids.

## NIMS CREDENTIAL: METALFORMING LEVEL III

### *Core Competency*

#### 17. Set Up and Test Safety Systems

**Duty:** Set up and test all safety system connected with a production run.

**Performance Standard:** Given a process plan and a setup to be implemented, set up and activate all safety systems called for by the process plan. Verify the correct operation and adjustment of the safety systems.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Identify and state the purpose for a number of typical safeguarding devices found on the manually fed press and coil fed stamping line.
- b. Perform safety procedures that must be followed before operating or setting up a press.
- c. Identify the different types of safety blocks and state their purpose and when they must be used. Unplug the safety plug connected to the safety block and properly position the safety block on the bolster of the press. Explain where the ram must be positioned before unplugging an interlocked safety block. Store the safety block and replace the safety plug in its socket upon completion of setup.
- d. Setup and inspect pullbacks and position point-of-operation safeguarding for hand-fed operations.
- e. Connect, adjust and verify all "point of operation" safeguarding equipment including:
  - Checking the operation of two-hand or foot press operation controls.
  - Testing emergency stop button.
  - Checking the condition of stationary (affixed to the machine) barriers and splashguards.
  - Setting up and positioning moveable or adjustable physical barrier guards.

- Verifying the reliability and function of light curtains, motion detectors, presence-sensing devices, and/or other electronic safeguarding devices.
- Note: Point of operation opening of more than ¼ inch or more.

*Core Competency*

**18. Setup and Adjust Lubrication and Coolant Systems**

**Duty:** Setup and test lubrication and coolant systems. Fill and refill lubrication and coolant reservoirs as necessary with appropriate lubricants and fluids. Perform associated housekeeping tasks.

**Performance Standard:** Given a machine and setup with lube and coolant systems, set up and test the lube and coolant systems. Fill the lubrication and coolant reservoirs as required by the job specifications and machine and tooling requirements. Set flow rates for the delivery of lubes and coolants. Perform associated housekeeping and spill-containment responsibilities.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- Understand the theory and purpose of delivery systems used in metal stamping and metal forming processes (i.e., manual/automatic or centralized, drip, roller, spraying, flooding, etc.).
- Understand the purpose and methods of stock (raw material or blank) lubrication and fluid dispensing systems and how to control lubricant application, surface coverage, mist and waste.
- State the benefits of proper lubrication (i.e., increased press speeds, increased die/tool life, better part quality and cleanliness, reduced scoring and galling, preventing equipment overheating, preventing rust/oxidation, improved formability, etc.).

*Core Competency*

**19. Set Up and Operate Press with Required Tooling**

**Duty:** Set up and operate a press with tooling installed for production, including:

- Single-hit tooling.
- Compound die sets.

- Non-sensored progressive die sets.
- Sensored progressive die sets.
- Transfer dies.
- Tooling performing single deep-drawing operations.
- Tooling performing double deep-drawing operations.
- Tooling performing reverse deep-drawing operations.

**Performance Standard:** Set up production with various tooling, verify for safety, and produce parts in the manner prescribed by the process plan, including;

- Single-hit tooling.
- Compound die sets.
- Non-sensored progressive die sets.
- Sensored progressive die sets.
- Transfer dies.
- Tooling performing single deep-drawing operations.
- Tooling performing double deep-drawing operations.
- Tooling performing reverse deep-drawing operations.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Demonstrate the correct procedure for staging the worksite and preparing the press for setup by:
  - Identifying the type of mechanical press.
  - Having the correct PPE and PPC for the job.
  - Obtaining the correct process documentation (control plan, router, work instructions, etc.) setup plan, gauges, tools, supplies, etc.
  - Verifying the correct material and material characteristics (including thickness and width).
  - Locating the correct die for the job.
  - Clean and remove burrs from the ram, bolster plate and die parallels (if applicable).

- Locate and gather components necessary for proper die clamping.
  - Install the die using the proper clamps and clamping methodology.
- b. Correctly identify the burr side for a sheared edge of a blank and the burr side for a pierced opening in relation to single hit tooling.
- c. Set up a production run with single hit tooling and verify the setup for safety while producing parts in the manner described by the process plan, including the following:
- Identify press components such as controller, ram/slide, bed/bolster, punch/die, main motor, clutch/brake, flywheel, crankshaft, etc.).
  - Starting the press.
  - Selecting the correct mode of operation for both setup and production.
  - Setup, activate, adjust, test/verify, and monitor all safety systems.
  - Monitoring all lubrication devices.
  - Auxiliary equipment setup.
  - Inspect parts according to the rules stated in Process/Quality Plan.
  - If so equipped, demonstrate the correct procedure for setting up a magazine to feed blanks into the single hit tool. Determine if burr orientation and part orientation requires special handling.
- d. Perform a trial stamping and perform any corrective actions, if necessary, including the following:
- Air cushion adjustments.
  - Inspecting for bottom marks, cracks, tears, etc.
  - Formed features that are not fully formed to print specifications.
  - Stock alignment, feed, pilot release, slack loop.
  - Verifying installation of scrap handling equipment, bins, chutes, etc.
  - Perform a safe die removal from the press area.
- e. Given a compound die and the appropriate press, setup the die and produce parts to specifications applying the following knowledge and skill:
- Correctly name the difference between a compound die and an inverted die.

- Identify the burr side for a sheared edge of a blank, and the burr side for a pierced opening and determine how burr orientation differs between a compound die and conventional die.
  - Describe how parts are ejected from a compound die and the function of the “safety margin” relationship between the knockout and shedder. Name the suggested number of piece parts that can be “absorbed” by the safety margin before the die components are fully loaded.
- f. Properly set the following components:
- Shut height, pass line, die location.
  - Knock out bar (positive or compression).
  - Shedder
  - Position of the compound die to avoid offloading the press
  - Part injection sensing system
  - Correct feed (progression), if applicable.
- g. Given a draw die and the appropriate press, setup the die and produce parts to specifications applying the following knowledge and skill sets:
- Define material acronyms common to drawing operations such as DQ, IF, AKDQ and CQ.
  - Define deep draw and reverse drawing.
  - Define the importance of the draw radius, drawing radius, draw bead and velocity of the draw (press speed).
  - Describe the importance of the air cushion, pressure on the material for drawing metal, and the importance of the transfer pins from the air cushion to the die and demonstrate the correct method of setting the pressure of the air cushion.
  - Define common drawing defects such as wrinkling, tearing, shock lines, cracks, puckers and orange peel and provide at least one probable cause. Given a transfer die and the appropriate press, setup the die and produce parts to specifications applying the following knowledge and skill sets:
    - Given a transfer die and a press, check clearances of the transfer fingers and parts for proper piece part transfer.
    - Define the feed rail to bolster relationship and feed rail to slide motion relationship of transfer dies.
    - Check transfer parameters.
- h. Given a progressive die and the appropriate press, setup the die and produce parts to specifications applying the following knowledge and skill:

- Set initial and final shut height, position and align the die in the press.
- Types of clamps and correct clamping procedures.
- Set the feed.
- Set the press counterbalance.
- Set the pilot release.
- Establish the correct slack loop and stock alignment.
- Verification of material and piece part dimensions/characteristics.
- Verify slug drop and part ejection.

### *Core Competency*

#### **20. Explain and Verify Operation of Sensors**

**Duty:** Explain and verify operation of limit, light, proximity, pressure, motion, fiber optic, laser and vibration signature sensors and understand their application and role in safety and die protection.

**Performance Standard:** Given scenarios using various sensors identify the type of sensor, explain their application in each specific case, and verify their correct operation in a setup.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Understand basic electrical and electronic concepts and industrial applications.
- b. Given scenarios using various sensors identify the type of sensor, explain their specific application, and verify their correct operation in a setup.
- c. Ensure that sensing fields targets on the part, part feature, the object, surface, or in the tooling.

### *Core Competency*

#### **21. Explain Press Components and In-Line Components**

**Duty:** Identify and explain the function of the common components of a stamping press and auxiliary equipment.

**Performance Standard:** Given a stamping press and in-line equipment, identify each component, and explain its role and function.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. The apprentice will locate and explain the purpose of the major components of a manually fed mechanical power press and/or a coil fed mechanical power press (including press line auxiliaries).
- b. Describe how a press operates, identify different types of presses (i.e., OBI and straight side press), processes (i.e., single hit, deep draw, progressive, transfer, etc.) and distinguish the differences between a full revolution clutch and a part revolution clutch.
- c. The apprentice will describe and define key terms relating to raw materials such as strip, coil stock, blanks, slugs, scrap, etc.

### *Core Competency*

## **22. Explain Fundamental Die Theory**

**Duty:** Identify and explain die types and die functions.

**Performance Standard:** Given a variety of dies, identify the types of dies and their functions.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Identify types of dies and their function.
- b. Identify components of die assemblies characteristic of that type of die.
- c. Identify the major types of operations performed by die assemblies.

### *Core Competency*

## **23. Detect Raw Material Defects**

**Duty:** Identify and explain common raw material defects such as coil set, camber, crossbow (crown), coil break, edge wave, lamination, and pitting.

**Performance Standard:** Given material staged for production, confirm that it is free of material defects.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

Identify and explain the most common adverse coil or raw material defect conditions and state their probable causes.

### *Core Competency*

#### **24. Explain Basic Material Properties and Qualities**

**Duty:** Identify common materials used in metal stamping and explain their properties and qualities, and how these characteristics affect production.

**Performance Standard:** Given a list of common materials, state their primary properties and qualities and how these characteristics impact production performance.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Name the common mechanical and physical properties of metal (including characteristics, components of a sheared edge and qualities).
- b. Name the element that differentiates ferrous from non-ferrous materials and identify type materials as ferrous or non-ferrous metals given samples of mild steel, stainless steel, aluminum, brass, and copper.
- c. Name the most important quality of a material when separating scrap (type of material).
- d. Identify if a material has a coating or cladding and confirm any special handling requirements needed for processing.
- e. Recognize selected surface defects (e.g., rust/oxidation) that affect formability and/or quality.
- f. Identify basic metal testing processes.

*Core Competency*

**25. Verify Product Quality**

**Duty:** Verify the conformance of a station's product to the process plan's specification for that product prior to full production.

**Performance Standard:** Given a setup verified for safety, correct operation of tooling and waste management, and an appropriate sample of parts produced by the setup, verifies the sample's conformance to the job specifications for that station.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Trial stamping the first piece parts on a manually fed press - Perform the appropriate setup, trial stamp piece parts, inspects the part features and performs corrective actions, if necessary. Prepare the press and the parts handling equipment for each operation.
- b. Trial stamping the first piece parts on a coil fed press - Walk the strip through the die, final checking of press, die and feed, malfunction detectors, auxiliary equipment and safety devices.

*Core Competency*

**26. Troubleshoot Running Processes**

**Duty:** While in production, perform causal analysis on problems as they arise whether by physical presentation or by data analysis.

**Performance Standard:** Given a producing setup verified for safety, an appropriate process monitoring plan, and unspecified problems existing in the performance of the run, perform causal analysis on the problems, identifying the problems and their causes.

**PERFORMANCE OBJECTIVES:** (What an apprentice must know and/or do to perform the work competently).

- a. Systematically review moderately complex problems from multiple perspectives and objectively draw logical conclusions or alternatives before deciding on a solution for each problem.

- b. Gather and review information and may probe deeper to get at the root of a problem. Notices trends, patterns or missing pieces of a problem. Able to link cause-to-effect to come to a viable and practical conclusion.
- c. Perform corrective actions and basic maintenance to bring the process back into compliance or to service the press/press line.