Duties and Standards

for

METALFORMING SKILLS

Level I

Approved by

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Developed by

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Occupational Description and Benchmarks for Metalforming

Occupational Description

Metalforming skills are used by skilled tradespersons who have achieved proficiency in the handling and placing of tooling and materials into service, in setup and operation of metal forming equipment, in quality skills related to metal forming, and in some planning and job control skills. A metalformer with specific Level I metalforming skills is ready to operate most metalforming workstations with limited additional training. Level II begins the development of specific skills in metalforming, including the introduction of setup skills. The choices at Level II are stamping, press brake, roll forming, slide forming, laser cutting, and CNC/NC punch press. Many spinning companies may require Machining Skills Level I as a pre-requisite for Spinning Skills Level II.

The following are general areas of competency:

- X Work planning and job control
- X Handling, use, and installation of materials and related fluids
- X Inspection and quality assurance skills
- X Care and use of tooling

Safety is a responsibility that cuts across all competencies for the metalformer. Each competency has its own level of related safety. Skilled metalformers are expected to understand and execute correctly all matters related to safety for these competencies. All performance assessments for these metalforming competencies will include the skills listed below as well as execution of all safety practices.

Tooling Skills

X Identify tooling.
X Verify function of tooling.

Work Planning and Job Control Skills

X Assure that job inspection procedures and tools are available
X Assure that material is staged for successor operations.
X Assure that material handling containers are staged for successor operations.

Handling of Materials and Related Fluids Skills

X Locate, identify, transport, and stage stock.
X Load auxiliary devices.
X Deliver and stage lubricants.
X Deliver and stage coolants.

Operation of Metalforming Equipment

X Operate metalforming equipment.
X Verify the operation of auxiliary devices.
X Provide lubricants and coolants for tooling and machinery.

Inspection and Quality Assurance Skills

X Follow and document inspection procedures for in-process inspection.
X Follow inspection process plans.
X Perform visual inspection.
X Perform dimensional inspection.
X Collect data according to quality control plans.

Other Skills and Competencies

X Operate fork lifts, cranes, and other material handling devices.
X Verify that data are being supplied to the manufacturing control system.
X Adhere to EPA and OSHA guidelines.

Throughout the Metalforming Skill Standard the phrase "process plan" is used. This phrase should be construed to include the step-by-step instructions for setup, operation and quality plans that include step-by-step inspection plans and data collection instructions.

Figure 1. Framework for Level I Metalforming Skills

This figure represents the two principal sets of expectations that comprise Level I Metalforming Skills. The left-hand column is a listing of the duties that expected to constitute Level I jobs. The right-hand column is a listing of the abilities, skills, knowledge, or other characteristics that are needed to perform the duties.

Occupational Duties	Knowledge, Skills, Abilities, and Other Characteristics
1. Job Planning and Management 1.1 Read Job Process Plan 1.2 Identify and Respond to Warning Signals During Production Operations	**1. Written and Oral Communication** 1.1 Reading 1.2 Writing 1.3 Speaking 1.4 Listening
2. Quality Control and Inspection 2.1 Part Inspection 2.2 Process Control	**2. Mathematics** 2.1 Arithmetic 2.2 Applications in Statistics
3. Process Adjustment and Improvement 3.1 Participation in Process Improvement	**3. Decision Making and Problem Solving** 3.1 Applying Decision Rules 3.2 Basic Problem Solving
4. **General Maintenance** 4.1 General Housekeeping and Maintenance 4.2 Preventive Maintenance, Machine Tools 4.3 Adjust Lubrication System, Fill and Refill the Lubrication Systems	**4. Interpersonal Skills and Personal Qualities** 4.1 Interpersonal Skills 4.2 Personal Qualities
5. **Industrial Safety and Environmental Protection** 5.1 Material Movement Handling 5.2 Hazardous Materials Handling and Storage 5.3 Identify and Demo Usage of Machine Safety Equipment 5.4 Lock-Out, Tag-Out Procedures	**5. Engineering Drawings** 5.1 Standard Part Drawings
6. **Career Management and Employment Relations** 6.1 Career Planning 6.2 Job Applications and Interviewing 6.3 Teamwork and Interpersonal Relations 6.4 Organizational Structures and Work Relations 6.5 Employment Relations	**6. Measurement** 6.1 Basic Measuring Instruments 6.2 Precision Measuring Instruments
	7. Safety 7.1 OSHA Regulations
	8. Metalforming Theory 8.1 Understanding Metalforming Equipment 8.2 Material Properties 8.3 Lubricants, Cutting Fluids, and Application 8.4 Identify Types of Tooling 8.5 Material Delivery Systems

Duty Area: 1. Job Planning and Management
Duty Title: 1.1 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.

Other Evaluation Criteria:
1. Clarity

Accuracy Level:
No errors in interpretation of primary duties.

Assessment Equipment and Material:
Workstation: *N/A.*
Material: A process plan with appropriate supplementary material.
Tooling: *N/A.*
Measuring Instruments: *N/A.*
Reference: *N/A*

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Read Job Process Plan Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking	X	6.1 Basic Measuring Instruments
X	1.4 Listening	X	6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving	X	8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities	X	8.4 Identify Types of Tooling
	4.1 Group Participation	X	8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 1. Job Planning and Management
Duty Title: 1.2 Identify and 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.

Accuracy Level: Job process plan.

Assessment Equipment and Material:

Workstation:	An appropriate metalforming machine and tooling.
Material:	Sheet stock, formed work in process.
Tooling:	Tongs, magnets, suction cups, clamps, and dies.
Measuring Instruments:	Rules, micrometers, verniers, squares, specialty gages, and attribute gages.
Reference:	*N/A*

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Identify and Respond to Warning Signals During Production Operations Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
	1.3 Speaking	X	6.1 Basic Measuring Instruments
X	1.4 Listening	X	6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving	X	8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 2. Quality Control and Inspection
Duty Title: 2.1 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.

Other Evaluation Criteria:
1. N/A

Accuracy Level:
Within a 1/64th for fractions, within .001" for decimals

Assessment Equipment and Material:

Workstation:	A common workbench with a small surface plate.
Material:	A finished part and a matching part inspection blueprint.
Tooling:	Inspection tools and or inspection fixtures
Measuring Instruments:	An appropriate assortment of basic, fixed, precision, and surface plate inspection tools.
Reference:	Geometric Dimensioning and Tolerancing reference book

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Part Inspection Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking	X	6.1 Basic Measuring Instruments
X	1.4 Listening	X	6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving		8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving		8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Note to Standards Readers:
This duty requires the candidate to be able to fill out a data collection sheet (inspection form) with the dimensions actually found on the part.

Duty Area: 2. Quality Control and Inspection
Duty Title: 2.2 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.

Other Evaluation Criteria:
1.N/A

Accuracy Level: Within a 1/64th for fractions, within .001 for decimals.

Assessment Equipment and Material:

Workstation:	A common workbench with a small surface plate.
Material:	An appropriate population of product matching the blueprint specifications and broken up into discrete packages matching the requirements of the sampling plan. X-bar and R charts.
Tooling:	Inspection fixture if appropriate
Measuring Instruments:	Inspection tools sufficient to carry out the sampling and inspection plan.
Reference:	*N/A*

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Process Control Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking	X	6.1 Basic Measuring Instruments
X	1.4 Listening	X	6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving		8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving		8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 3. Process Adjustment and Improvement
Duty Title: 3.1 Participation in Process Improvement

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.

Other Evaluation Criteria:
1. N/A

Accuracy Level: Within a 1/64th for fractions, within .001 for decimals.

Assessment Equipment and Material:
Workstation:	A team conference area.
Material:	Fishbone charts, flip charts, markerboard.
Tooling:	Writing tools, markers
Measuring Instruments:	Relevant measuring instruments for the problem posed.
Reference:	N/A

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Participation in Process Improvement Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking		6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving	X	8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities	X	8.4 Identify Types of Tooling
	4.1 Group Participation	X	8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 4. General Maintenance
Duty Title: 4.1 General Housekeeping and 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.

Other Evaluation Criteria:
1. N/A

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation:	A common workbench, and machine tool work area.
Material:	N/A
Tooling:	Brooms, brushes, shop vacuum, spray bottle, wipes, oil absorbents, and waste containers.
Measuring Instruments:	N/A
Reference:	OSHA guidelines & Material Safety Data Sheets.

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the General Housekeeping and Maintenance Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking		6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules		8.2 Material Properties
X	3.2 Basic Problem Solving	X	8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Note to Standards Readers:
This duty standard will be assessed by a checklist which will be employed as other appropriate duty standards are assessed.

Duty Area: 4. General Maintenance
Duty Title: 4.2 Preventive Maintenance, Metalforming Machine Tools

Duty:
Inspect and assess the general condition of an assigned metalforming machine tool. Make routine adjustments as necessary and as authorized. Report problems which are beyond the scope of your authority to supervision. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given metalforming machine tool.

Performance Standard:
Given the preventive maintenance procedures and schedules for a given metalforming machine tool, as well as sufficient instruction and experience to recognize maintenance problems, carry out routine maintenance, report problems which are beyond the scope of authority, fill out the history forms for tracking maintenance. Make an oral presentation explaining the condition of the machine tool and the actions taken.

Other Evaluation Criteria:
1. N/A

Accuracy Level: N/A

Assessment Equipment and Material:
Workstation:	An appropriate metalforming machine.
Material:	Maintenance forms, oil, grease, and shop towels.
Tooling:	Hand tools for minor adjustments of guards and tooling.
Measuring Instruments:	6" rule
Reference:	Written procedures and machine reference manuals

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Preventive Maintenance for Machine Tools Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking	X	6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules		8.2 Material Properties
X	3.2 Basic Problem Solving	X	8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 4. Preventive Maintenance
Duty Title: 4.3 Adjust Lubrication System, Coolants, Fill and Refill the Lube System

Duty:
Fill and refill lubrication and coolant 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 and coolants. May be required to mix lubricants to specific ratios. Perform associated housekeeping and spill-containment responsibilities.

Accuracy Level: NA.

Assessment Equipment and Material:

Workstation:	An appropriate metalforming machine and tooling.
Material:	Oil and lubricants and coolants.
Tooling:	N/A.
Measuring Instruments:	Sight gages and dipsticks.
Reference:	Machine reference manuals; process plan.

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Adjust Lubrication System, Coolants, Fill and Refill the Lube System Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking	X	6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules		8.2 Material Properties
X	3.2 Basic Problem Solving	X	8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 5. Industrial Safety and Environmental Protection
Duty Title: 5.1 Material Movement and Handling

Duty:
Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required.

Performance Standard:
Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, handling and application of coolants, cutting fluids and lubricants.

Other Evaluation Criteria:
1. N/A

Accuracy Level: Completion of all checklist items

Assessment Equipment and Material:

Workstation:	An appropriate metalforming machine and tooling.
Material:	Appropriate materials and containers
Tooling:	Appropriate handling devices
Measuring Instruments:	N/A
Reference:	OSHA guidelines & Material Safety Data Sheets

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Material Movement and Handling Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking		6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving		8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation	X	8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Note to Standards Readers:
Lockout and right-to-know will be accounted for in 5.4. Material handling here means handling of shafts and overhead cranes etc., and personal protection. The candidate should recognize pinch points, cutting points, control points, and capacity limits of hoists and lifts. The Examiner will be supplied with safety and other kinds of observation checklists to ensure consistency and thoroughness.

Duty Area: 5. Industrial Safety and Environmental Protection
Duty Title: 5.2 Hazardous Materials Handling and Storage

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.

Other Evaluation Criteria: *N/A*

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation:	N/A
Material:	A hazardous material and appropriate containers.
Tooling:	Appropriate handling devices.
Measuring Instruments:	Appropriate material identification instruments. Instruments for the measurement of concentration.
Reference:	Relevant EPA and OSHA requirements and Material Safety Data Sheets.

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Hazardous Materials Handling and Storage Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking		6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving	X	8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation	X	8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 5. Industrial Safety and Environmental Protection
Duty Title: 5.3 Identify and Demonstrate Usage of Machine Safety Equipment

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

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

Other Evaluation Criteria: N/A

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation:	An appropriate metalforming machine and tooling.
Material:	N/A
Tooling:	N/A
Measuring Instruments:	N/A
Reference:	Machine reference manuals

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Identify and Demonstrate Usage of Machine Safety.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking		6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules	X	8.2 Material Properties
X	3.2 Basic Problem Solving		8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation	X	8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 5. Industrial Safety and Environmental Protection
Duty Title: 5.4 Lock-Out, Tag-Out Procedures

Duty:
Know lock-out and tag-out procedures

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

Other Evaluation Criteria: *N/A*

Accuracy Level: N/A

Assessment Equipment and Material:
Workstation: An appropriate metalforming machine if possible.
Material:
Tooling:
Measuring Instruments:
Reference: Written procedures

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Lock-Out, Tag-Out Procedures Duty.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking		6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
	2.1 Arithmetic	X	7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving	X	8.1 Metalforming Equipment
X	3.1 Applying Decision Rules		8.2 Material Properties
X	3.2 Basic Problem Solving		8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

Duty Area: 6. Career Management and Employment Relations
Duty Title: 6.1 Career Planning

Duty:
Develop and explain a short-term career plan and resume. Describe entry level positions and career paths in different metalforming industries. e.g. stamping, fabrication, spinning, etc.

Performance Standard:
Given written information, presentations, and informational interviews with industry representatives on career opportunities in the Metalforming industry, develop a short-term career plan (1-4 years) including career objectives, training and education, and employment opportunities. Develop a resume appropriate for the Metalforming industry based on the career plan. Make an oral presentation of the career plan and resume. Be able to list entry level positions in the metalforming industry and give examples of career paths for a segment of the industry.

Duty Area: 6. Career Management and Employment Relations
Duty Title: 6.2 Job Application and Interviewing

Duty:
Complete job application form and demonstrate interviewing skills.

Performance Standard:
Given a job description and a standard application, complete the application form. Identify and demonstrate appropriate interviewing skills in a face-to-face interview with a company representative.

Duty Area: 6. Career Management and Employment Relations
Duty Title: 6.3 Teamwork and Interpersonal Relations

Duty:
Demonstrate appropriate interpersonal skills in job performance evaluations, group communication and decision-making, and conflict resolution.

Performance Standard:
Given written and oral information about a machining technician job in a work unit, demonstrate appropriate interpersonal skills in three simulated cases involving a supervisor or team leader and other team members: (1) receiving feedback on job performance in a formal evaluation process, (2) actively participating in a group decision-making process involving appropriate communication and feedback skills with other team members, and (3) resolving conflicts with supervisors and team members.

Note: The second simulation will be related to the performance of Duty Standard 4.2- Participation in Process Improvement.

Duty Area: 6. Career Management and Employment Relations
Duty Title: 6.4 Organizational Structures and Work Relations

Duty:
Identify and explain the major departments or functions in a Metalforming company and how they affect production units.

Performance Standard:
Given written materials and a formal orientation to a Metalforming company for technicians, explain the major responsibilities of each department or unit in the company and the effect of each unit on the job performance of metalforming technicians in production jobs. Answer five questions about how common production problems affect these other units in the company.

Duty Area: 6. Career Management and Employment Relations
Duty Title: 6.5 Employment Relations

Duty:
Understand and explain employment rights and responsibilities in Metalforming companies.

Performance Standard:
Given written and verbal information on employment rights and responsibilities (similar to those contained in employee handbooks), answer questions about hiring and promotion requirements, dismissal and layoff policies, compensation schedules and amounts, and substance abuse policies.

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the Career Management and Employee Relations Duties.

	1. Written and Oral Communication		**5. Engineering Drawings**
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		**6. Measurement**
X	1.3 Speaking		6.1 Basic Measuring Instruments
X	1.4 Listening		6.2 Precision Measuring Instruments
	2. Mathematics		**7. Safety**
X	2.1 Arithmetic		7.1 OSHA Regulations
	2.2 Applied Statistics		**8. Metalforming Theory**
	3. Decision Making and Problem Solving		8.1 Metalforming Equipment
X	3.1 Applying Decision Rules		8.2 Material Properties
X	3.2 Basic Problem Solving		8.3 Lubricants and Cutting Fluids
	4. Group Skills and Personal Qualities		8.4 Identify Types of Tooling
	4.1 Group Participation		8.5 Material Delivery Systems
X	4.2 Personal Qualities		

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Knowledge, Skills, Abilities, and Other Characteristics

KSAO Area: 1. Written and Oral Communication
KSAO: 1.1 Reading

KSAO Definition:
Locates, understands, and interprets written technical and non-technical information in documents commonly found in the Metalforming industry. These documents contain short and simple sentences, paragraphs and passages, phrases, quantitative information, specialized vocabulary, graphs, charts, schedules, simple instructions, and multi-step directions. All documents are written in standard English.

Performance Requirement:
Given a specific duty to perform and the necessary written information contained on relevant documents and information sheets, locate and read the necessary information and use this information to plan, execute, and evaluate the duty and answer questions about the content or meaning of the written information.

Duty Standard Cross Reference Table

This table identifies some of the activities that require the Reading KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Read process plans/job routing sheet. Read machine safety manuals
2. Quality Control and Inspection	Part Inspection Process Control	Read blueprints. Read process plans. Read charting instructions
3. Process Adjustment and Improvement	Participation in process control	Read blueprints. Read process plan. Read sampling plan. Read inspection reports.
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Read maintenance requirements. Read safety warnings. Read housekeeping lists.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Read checklists. Read MSDS documents Read safety instructions. Read manuals.
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Read industry publications Read classified ads Read employee handbooks Read mission statement Read company policies Read team documents

KSAO Area: 1. Written and Oral Communication
KSAO: 1.2 Writing

KSAO Definition:
Communicates technical and non-technical information, messages, and ideas in writing using standard English commonly found in the Metalforming industry. This writing includes the completion of forms, information sheets, reports, group meeting materials, and short memos.

Performance Requirement:
Given a specific duty to perform and the necessary instructions, forms, and materials to complete the writing requirements for that duty, complete the writing requirement.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Writing KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Write a record of production activities.
2. Quality Control and Inspection	Part Inspection Process Control	Write a record of inspection activities.
3. Process Adjustment and Improvement	Participation in process control	Write suggestions for process improvements.
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Write a record of maintenance activities. Fill out history forms.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Log the activities involving the handling and storage of standard and hazardous materials.
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Write resume. Complete a job application.

KSAO Area: 1. Written and Oral Communication
KSAO: 1.3 Speaking

KSAO Definition:

Communicates technical and non-technical detailed information, messages, multi-step directions and ideas through oral communication using standard English and related cues and communication aids in conversations, discussions, and group meetings. Understands and responds to listener feedback and asks questions when needed in two-way and group conversations.

Performance Requirement:

Given a specific duty to perform and the necessary instructions, written documents, and communication aids and materials to complete the speaking requirements for that duty, complete the speaking requirement.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Speaking KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Verbally explain the process plan
2. Quality Control and Inspection	Part Inspection Process Control	Verbally explain the quality control plan
3. Process Adjustment and Improvement	Participation in process control	Verbally explain a change to improve the process
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Verbally explain housekeeping and maintenance requirements
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Verbally explain material movement, hazardous material handling, safety equipment and lock-out, tag-out procedures
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Verbally explain career opportunities, and the importance of teamwork

KSAO Area: 1. Written and Oral Communication
KSAO: 1.4 Listening

KSAO Definition:
Listens for, receives, interprets, and recalls specific details, ideas, and multi-step instructions in verbal presentations, conversations, discussions, and group meetings conducted in standard English and supported by written materials and other communication cues and aids. Uses active listening skills in comprehending simple technical and non-technical verbal information.

Performance Requirement:
Given a specific duty to perform and the necessary written information contained on relevant documents and information sheets, listen for, comprehend, and incorporate oral information in the performance of the duty and answer questions about the content or meaning of the oral information.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Listening KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Demonstrate understanding of a verbal explanation of the job process plan.
2. Quality Control and Inspection	Part Inspection Process Control	Demonstrate understanding of a verbal explanation of the quality control and inspection plan.
3. Process Adjustment and Improvement	Participation in process control	Listen and respond to a discussion on process adjustment and improvement
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Listen to and demonstrate an understanding of the general maintenance requirements
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Listen to and demonstrate an understanding of materials handling and safety requirements
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Listen to and demonstrate an understanding of career opportunities in the metalforming industry.

KSAO Area: 2. Mathematics
KSAO: 2.1 Arithmetic

KSAO Definition:

Performs addition, subtraction, multiplication, and division of whole numbers without a calculator, and performs calculation of fractions and decimals, as well as conversion to metric measurement with or without a calculator.

Performance Requirement:

Given a specific duty to perform requiring arithmetic operations, conduct arithmetic operations.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Arithmetic KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Identify mathematics required in performing the job process plan
2. Quality Control and Inspection	Part Inspection Process Control	Record production numbers Calculate dimensional variations.
3. Process Adjustment and Improvement	Participation in process control	Calculate increases in production from a process improvement that improves machine cycles
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Calculate quantity of lubricant needed in an eight hour shift.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Calculate amount of material needed or used.
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Convert wages between hourly, weekly, monthly, and yearly. Calculate deductions and net pay.

KSAO Area: 2. Mathematics
KSAO: 2.2 Applications of Statistics

KSAO Definition:

Uses standard formulas and arithmetic operations to calculate means, medians, modes, and ranges with or without a calculator.

Performance Requirement:

Given a specific duty to perform requiring the use of formulas and arithmetic operations, conduct the required statistical calculations using standard formulas.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Applications of Statistics KSAO.

Duty Area	Task	Activity
2. Quality Control and Inspection	Part Inspection Process Control	Complete SPC Control Charts and respond to exceptions.
3. Process Adjustment and Improvement	Participation in process control	Use SPC data to assist in process analysis.

KSAO Area: 3. Decision Making and Problem Solving
KSAO: 3.1 Applying Decision Rules

KSAO Definition:
Can follow a set of instructions laid out in a sequence. Can interpret and follow "if….then…." instructions.

Performance Requirement:
Given a specific duty to perform requiring a checklist of sequential instructions, carry out the duty making appropriate entries on the checklist.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Applying Decision Rules KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Follow the process plan, deviating according to decision rules where necessary.
2. Quality Control and Inspection	Part Inspection Process Control	Follow the quality plan, deviating according to decision rules where necessary.
3. Process Adjustment and Improvement	Participation in process control	Follow check lists and decision rules in process improvement.
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Follow company procedures on housekeeping and preventive maintenance.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Apply OSHA and EPA decision rules to the handling of materials and the use of safety equipment.
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Develop a career plan and apply decision rules to consider deviations that might occur.

KSAO Area: 3. Decision Making and Problem Solving
KSAO: 3.2 Basic Problem Solving

KSAO Definition:
Can establish new responses to problems of a simple nature. Can formulate the new responses into a sequence of instructions or a set of "if … then …" rules.

Performance Requirement:
Given a specific duty to perform and being furnished with a checklist of sequential instructions, carry out the duty according to the checklist responding appropriately to problems. Formulate those responses into "if … then …" rules.

Follow these steps in the problem solving process:
1. Identify the Problem
2. Formulate Data Collection
3. Collect Data
4. Analyze Data
5. Develop Solutions
6. Seek Supervisory Approval
7. Implement Solution
8. Follow Up (Evaluate the Effectiveness of the Solution)

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Basic Problem Solving KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Sequence operations, providing alternatives according to availability of tools and equipment
2. Quality Control and Inspection	Part Inspection Process Control	Inspect a part, follow procedures based on inspection results.
3. Process Adjustment and Improvement	Participation in process control	Follow a process plan improvising new methods where unavailability of tooling or equipment makes the plan obsolete
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Determine a course of action when application of procedures does not produce the desired results.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Determine and describe the proper response to the discovery of a safety problem.
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Suggest new course of action based on the occurrence of an unplanned event.

KSAO Area: 4. Interpersonal Skills and Personal Qualities
KSAO: 4.1 Interpersonal Skills

KSAO Definition:
Identify and demonstrate the appropriate interpersonal skills and related personal qualities in the performance of major duties requiring cooperative relations with supervisors, team leaders, and team members.

Performance Requirement:
Demonstrates understanding, friendliness, politeness, and empathy toward others including men and women, and with people from a variety of ethnic, social, and educational backgrounds. Works cooperatively with others and contributes to group efforts with ideas, suggestions, and positive feedback to group members. Demonstrates appropriate interpersonal and communication skills in resolving conflicts with supervisors, team leaders, and team members.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Interpersonal Skills KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Work cooperatively in developing a process plan taking input from supervisors and coworkers
2. Quality Control and Inspection	Part Inspection Process Control	Work cooperatively by participating in cooperative SPC activities
3. Process Adjustment and Improvement	Participation in process control	Work cooperatively in workgroups, developing process improvements
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Work cooperatively in following maintenance and housekeeping requirements
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Work cooperatively in following safety rules, e.g. application of Lock-Out Tag-Out procedures.
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Show proper response in a job interview. Demonstrate good interpersonal behavior in team and work situations.

KSAO Area: 4. Interpersonal Skills and Personal Qualities
KSAO: 4.2 Personal Qualities

KSAO Definition:
Identify and demonstrate the appropriate personal qualities in performing major job duties and maintaining positive employment relations.

Performance Requirement:
Recognizes and demonstrates appropriate codes of conduct and values in the workplace and demonstrates honesty and integrity in exhibiting appropriate workplace behaviors. Assumes responsibility and demonstrates strong work ethic by exerting effort and perseverance in doing work tasks according to high standards. Maintains high standards of attendance, punctuality, and involvement in all major work tasks.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Personal Qualities KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Demonstrate focus and attention to detail in following job routing instructions
2. Quality Control and Inspection	Part Inspection Process Control	Demonstrate honesty and integrity in reporting findings of inspection processes
3. Process Adjustment and Improvement	Participation in process control	Demonstrate attendance and punctuality in attending meetings for the development of process improvement
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Demonstrate focus and attention in following maintenance instructions.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Demonstrate honesty and perseverance in handling materials according to OSHA and EPA requirements
6. Career Management and Employment Relations	Career planning Job application Teamwork Organizational Structures Employment relations	Demonstrate character and respect for others in team activities and employee relations.

KSAO Area: 5. Engineering Drawings
KSAO: 5.1 Standard Part Drawings

KSAO Definition:
Interprets standard part drawings.

Performance Requirement:
Given a part drawing and a finished part from that print, prepare a checklist of dimensions necessary to determine the part's compliance.

Note:
The term "part drawing" is used here rather than "orthographic print" because skills found in a complete orthographic print reading course are not needed here. What is desired is the ability to read and understand very simple part prints, those designed to convey important features or inspection points to a machine operator or prints designed to differentiate the part on the process plan from other parts

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Standard Part Drawings KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Gather dimensional data from a print
2. Quality Control and Inspection	Part Inspection Process Control	Gather dimensional data from a print to carry out the inspection of a finished part
3. Process Adjustment and Improvement	Participation in process control	Gather dimensional data from a print in order to participate in process improvement
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Demonstrate the ability to follow schematics of lubrication points and reservoirs.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Read and interpret storage and handling diagrams.

KSAO Area: 6. Measurement
KSAO: 6.1 Basic Measuring Instruments

KSAO Definition:
Recognizes and applies basic measuring instruments such as rules, protractors, go-no go gages, gage blocks and checking fixtures.

Performance Requirement:
Given a blueprint and a finished part from that print, as well as a selection of appropriate basic measuring instruments, determine a part's compliance on selected dimensions.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Basic Measurement Instruments KSAO.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Selects correct measuring devices to check material.
2. Quality Control and Inspection	Part Inspection Process Control	Applies correct measuring devices to confirmation of part compliance
3. Process Adjustment and Improvement	Participation in process control	Participate in a discussion on the use of precision measuring instruments to develop a process improvement plan
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Confirm lubricant levels by reading simple measurement devices

KSAO Area: 6. Measurement
KSAO: 6.2 Precision Measuring Instruments

KSAO Definition:
Recognizes and applies precision measuring instruments such as micrometers, vernier, dial, and electronic calipers, dial indicators, telescoping gages, gage blocks, adjustable parallels and optical comparators.

Performance Requirement:
Given a blueprint and a finished part from that print, as well as a selection of appropriate precision tools, determine a part's compliance on selected dimensions. Explain the importance of instrument calibration and its effect on the inspection process. Use a template with an optical comparator to inspect a part.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Precision Measuring Instruments.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Selects correct measuring devices to check material.
2. Quality Control and Inspection	Part Inspection Process Control	Inspect the dimensions of a finished part. Verify valid calibration of measuring tools.
3. Process Adjustment and Improvement	Participation in process control	Participate in a discussion on the use of precision measuring instruments in a process improvement plan

KSAO Area: 7. Safety
KSAO: 7.1 OSHA Regulations

KSAO Definition:
Know the applicable provisions of OSHA regulations in the operation of metal forming equipment.

Performance Requirement:
Demonstrate the ability to carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required. Be able to list and describe personal and machine safety equipment common to the metalforming industry and describe appropriate use.

Duty Standard Cross Reference Table:

This table identifies some of the activities that apply to safe practices and OSHA regulations

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Recognize and explain the purpose of all safety devices specified in the process plan
2. Quality Control and Inspection	Part Inspection Process Control	Follow safety rules during the inspection process.
3. Process Adjustment and Improvement	Participation in process control	Verify that a change in the process does not create a safety hazard
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Explain the relationship of good housekeeping to OSHA and EPA regulations. Handle lubricants in accordance with OSHA and EPA regulations.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of machine and personal safety equipment Lock-Out, Tag-out	Identify and explain all safety rules

KSAO Area: 8. Metalforming Theory
KSAO: 8.1 Understanding Metalforming Equipment

KSAO Definition:
Identify the common components of metalforming machinery and auxiliary equipment. Explain the role of each element of the machine and auxiliary equipment in the metalforming process.

Performance Requirement:
Given a number of specific examples of metalforming machinery and auxiliary equipment, identify the components of the machinery, explain their role, and identify the critical considerations for successful functioning of the system.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require an understanding of metalforming machinery.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Explain how each piece of equipment relates to the execution of job routing instructions.
3. Process Adjustment and Improvement	Participation in process control	Be able to identify the contribution of each piece of equipment to the process of part production.
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Identify equipment noted in house keeping list and instructions. Identify components and function of lube systems.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Use correct terminology for equipment to describe proper safety procedures.

KSAO Area: 8. Metalforming Theory
KSAO: 8.2 Material Properties

KASO Definition:
Understand the prime characteristics of common materials used in metalforming operations.

Performance Requirement:
Given a list of materials, state the primary characteristics of the materials and how these characteristics will affect your operation of the metalforming process. This is not intended to be an introduction to metallurgy. The candidate should understand that there are different metals and grades, and that coatings and dimensional variations demand different handling and affect part quality.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require an understand of material characteristics.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Confirm material compliance with specifications on job routing instructions.
2. Quality Control and Inspection	Part Inspection Process Control	Understand the special handling requirements for certain material.
3. Process Adjustment and Improvement	Participation in process control	Explain the effect of material variation on the quality of the part produced.
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Explain the need to segregate scrap material.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Identify when a hazard might exist as a result of the use of a specific material.

KSAO Area: 8. Metalforming Theory
KSAO: 8.3 Lubricants, Cutting Fluids, and Coolants

KSAO Definition:
Recognizes, selects, and understands the application of appropriate lubricants, cutting fluids and coolants, whether synthetic or organic. Recognizes associated housekeeping, environmental, and safety responsibilities.

Performance Requirement:
Given a process plan or a set of operations, identify the appropriate lubricants, coolants and the delivery system for the operations.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Cutting Fluids and Coolants.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Review and confirm lubricant selections to specifications in the job routing instructions.
3. Process Adjustment and Improvement	Participation in process control	Participate in discussions on a change in lubricant system to modify job process.
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Match correct lubricants to lubrication systems and applications.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Recognize the correct handling and disposal of used lubricants

KSAO Area: 8. Metalforming Theory
KSAO: 8.4 Identify Types of Tooling and Application

KSAO Definition:
Recognizes, and understands the application of different types of tooling for forming and blanking metal.

Performance Requirement:
Given a description of tooling, identify the tooling and describe common uses of this tooling in metalforming and blanking operations.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the understanding of types of metalforming tooling.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Verify tooling selection on the process plan
3. Process Adjustment and Improvement	Participation in process control	Show awareness of tooling changes that could improve the process.
4. General Maintenance	General Housekeeping and maintenance Preventive maintenance Adjust Lubrication System	Explain lubricant needed based tooling being used.

KSAO Area: 8. Metalforming Theory
KSAO: 8.5 Material Delivery Systems

KSAO Definition:
Identify the common components of a material delivery system. Explain the role of each element of the delivery system. Explain the critical considerations that govern the successful functioning of a material handling system.

Performance Requirement:
Given a number of specific examples of material handling systems, identify the components of the systems, explain the role of the components in the system, and identify the critical considerations for successful functioning of each of the systems.

Duty Standard Cross Reference Table:

This table identifies some of the activities that are part of the material delivery system.

Duty Area	Task	Activity
1. Job Planning and Management	Job Process Planning Identify and respond to warning signals	Review and confirm availability of all components of the material delivery system specified
3. Process Adjustment and Improvement	Participation in process control	Participate in discussions on a change of delivery system to improve the process.
5. Industrial Safety and Environmental Protection	Material Movement Hazard materials handling Use of safety equipment Lock-Out, Tag-out	Confirm that the process as specified meets safety requirements

Appendix A
Metalforming Level I
Technical Review Committee

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Dayton Rogers Manufacturing
Minneapolis, MN

Appendix B
Related Metalworking Skill Standards

Machine Building Skills Level II
Machine Building Skills Level III
Machining Skills Level I
Machining Skills Level II
Machining Skills Level III
Metalforming Skills Level I
Metalforming Skills CNC/NC Punch Press Level II
Metalforming Skills Laser Cutting Level II
Metalforming Skills Press Brake Level II
Metalforming Skills Press Brake Level III
Metalforming Skills Roll Forming Level II
Metalforming Skills Slide Forming Level II
Metalforming Skills Slide Forming Level III
Metalforming Skills Metal Spinning Level II
Metalforming Skills Metal Stamping Level II
Metalforming Skills Metal Stamping Level III
Screw Machining Skills Level II
Screw Machining Skills Level III

Other skill standards under development:
Die Making
Machine Maintenance, Repair and Servicing
Moldmaking