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NIMs

**Duties and Standards
for Duties and Standards
Dismaking Skills**

Level III

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ã September 2000

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Overview^{3/4}Diemaking Skills—Level III

The Level III diemaker builds and assembles complex dies used in the stamping industry. The skills required to be a Level III diemaker include the majority of the machining skills listed in *Duties and Standards for Machining Skills^{3/4}Level III* and all of the diemaking skills listed in *Duties and Standards for Diemaking Skills^{3/4}Level II*. The Level III diemaker will participate in design reviews and will have the responsibility to oversee the building of actual components. He or she will function frequently as a team leader on various diebuilding functions and may supervise the work of Level II diemakers in the building and assembly process. The foundation skills required are Level II machining skills called for in Appendix A of *Duties and Standards for Diemaking Skills—Level II*.

Occupational Description and Benchmarks

Occupational Description

Skills are used by tradespersons who have achieved proficiency in the assembly and manufacturing of complex dies used in the stamping industry. Quality skills, troubleshooting skills, strong job planning and job control skills are critical in this occupation. The general areas of competency include the following:

- Ability to read engineering drawings and visualize the finished product
- Ability to identify, measure, and verify precision parts and components
- High level of proficiency with various hand tools and machine tools
- Broad understanding of the operation of mechanical devices
- Inspection and quality assurance skills
- Ability to troubleshoot all kinds of dies, be they transfer, progressive, or single-hit dies
- Understanding of material flows in draw dies and forming dies
- Understanding of the purpose and use of sensors

Safety and Environment

Safety and environment concerns are responsibilities that cut across all competencies. Skilled workers are expected to know and execute correctly all matters pertaining to safety and environment for these competencies. A diemaker with Level III skills may have modest training or supervision responsibilities.

Job Planning Skills

The first step in job planning is providing customer satisfaction and economic efficiencies, while utilizing the capabilities available in the development of an organized approach to the construction of the die. The general areas of competency in job planning include the following:

- Review the die design and determine the die manufacturing plan.
- Develop the process and plan to meet the die completion date.
- Be aware of costs and avoidance of waste.
- Record step-by-step changes and maintain a record.

Inspection and Quality Control

- Follow and document in-process inspection.
- Use precision measuring devices to inspect components.
- Draw up and follow inspection plan.
- Demonstrate the ability to read and analyze CMM reports and statistical capability studies.

Other Skills and Competencies

- Possess a general knowledge and understanding of electrical, hydraulic, and pneumatic systems.
- Have a basic understanding of stamping presses and related operating equipment.
- Have a basic knowledge of various types of tool steel, coil steels, and other specialty steels.
- Have a basic understanding of CNC equipment and its capabilities.

Framework for Diemaking Skills³/₄LEVEL III

This figure represents the two principal sets of expectations that comprise Level III diemaking skills. The left-hand column is a list of duties that are expected to constitute Level III jobs. The right-hand column is a list of knowledge, skills, abilities, and other characteristics needed to perform the duties.

Occupational Duties	Knowledge, Skills, Abilities, and Other Characteristics
1. Job Planning 1.1 Review Part Print and Customer Quality Standards 1.2 Confirm That Design Reflects Proper Process 1.3 Complete Die in Allotted Time 1.4 Organize Diemaking Activities	1. Written and Oral Communications 1.1 Develop a System to Organize Communications
2. Die Assembly 2.1 Perform Die Assembly	2. Decision Making and Problem Solving 2.1 Apply Mechanical Problem Solving
3. Adjustment 3.1 Perform First Tryout and Correct Problems	3. Social Skills and Personal Qualities 3.1 Manage a Team
4. Final Tryout 4.1 Prepare Die for Final Tryout 4.2 Set Up Die in Tryout Press 4.3 Assure Production Readiness of Die or Tool 4.4 Perform Corrective Actions As Required	4. Engineering Drawings and Sketches 4.1 Use Sketches to Illustrate Engineering Changes
5. Final Runoff 5.1 Participate in Final Runoff 5.2 Review Results and Record Changes Made to Original Die Design	Measurement 5.1 Measure Components for Accuracy
	6. Metalworking Theory 6.1 Know Heat Treating 6.2 Know Purpose of Drawing During Heat Treating
	7. Metalforming Theory 7.1 Calculate Complex Forming Pressures 7.2 Know Nitrogen Manifolds and Their Applications 7.3 Understand Use of Punch and Draw Radii 7.4 Understand Draw Beads and Their Use 7.5 Use Blank Holding Pressures and Standoffs
	8. Sensors 8.1 Understand Sensors and Their Functions
	9. Safety and Environment 9.1 Understand the Safe Operation of All Equipment 9.2 Understand OSHA Requirements 9.3 Understand Hazardous Materials Disposal

Duty Area: 1. Job Planning

Duty Title: 1.1 Review Part Print and Customer Quality Standards

Duty:

Review part print and customer quality standards to verify that die will be processed correctly and assure part quality.

Performance Standard:

Compare die designs to customer die standards and review quality standards with engineering personnel to reconfirm that all customer quality requirements have been met. Record step-by-step changes and maintain the record.

Accuracy Level: N/A

Assessment Equipment and Materials:

Workstation: Workbench

Materials: N/A

Tooling: N/A

Measuring Equipment: N/A

References: Customer die standard, part print, quality standards, engineering personnel, and *Machinery's Handbook*

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Review Part Print and Customer Quality Standards Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications		7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving		6.2 Know Nitrogen Manifolds and Their Applications
	2.1 Apply Mechanical Problem Solving		7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities		7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team		7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
X	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heating Treating		

Duty Area: **1. Job Planning**
Duty Title: **1.2 Confirm That Design Reflects Proper Process**

Duty:

Review design to assure that the process selected will produce the part to specifications.

Performance Standard:

Given a die to be made, review design to assure that the proper process and design were selected to produce the part. Record step-by-step changes and maintain the record.

Accuracy Level:

Customer specifications

Assessment Equipment and Materials:

Workstation: Workbench

Materials: N\A

Tooling: N\A

Measuring Equipment: N\A

References: Die design, part print, and customer quality standards

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Confirm That Design Reflects Proper Process Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications	X	7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving	X	7.2 Know Nitrogen Manifolds and Their Application
X	2.1 Apply Mechanical Problem Solving	X	7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities	X	7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team	X	7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 1. Job Planning
Duty Title: 1.3 Complete Die in Allotted Time

Duty:

Determine required process to complete die on time.

Performance Standard:

Review design with engineering to determine which components will require wire burning and CNC milling and or duplicating, and create a process plan with a project time line showing critical milestone dates to assure completion in the allotted time.

Accuracy Level: N/A

Assessment Equipment and Materials:

Workstation: Workbench

Materials: N/A

Tooling: Calculator

Measuring Equipment: N/A

References: Die designs, customer part print, process coordinator, engineering personnel, process plan, and *Machinery's Handbook*

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Complete Die in Allotted Time Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications		7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving		7.2 Know Nitrogen Manifolds and Their Application
	2.1 Apply Mechanical Problem Solving		7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities		7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team		7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 1. Job Planning
Duty Title: 1.4 Organize Diemaking Activities

Duty:

Organize and guide activities to assist diemakers, apprentices, and machinists.

Performance Standard:

Organize and guide the activities to assist diemakers, apprentices, and machinists, and assure that the die will produce parts to customer quality standards.

Accuracy Level: N/A

Assessment Equipment and Materials:

Workstation: Workbench

Materials: N/A

Tooling: N/A

Measuring Equipment: N/A

References: Die design, part print, customer quality standard, time line with milestone dates, and
Machinery's Handbook

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Organize Diemaking Activities Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications	X	7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving	X	7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving		7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities	X	7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team	X	7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes	X	8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
X	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
X	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 2. Die Assembly
Duty Title: 2.1 Perform Die Assembly

Duty:

Assemble a die.

Performance Standard:

Given a die to be built with all of the necessary components and required sensors, schedule the work flow and lead the assembly team through a complete die assembly. Record step-by-step changes and maintain a record

Accuracy Level:

Customer specifications and given dimensions on prints.

Assessment Equipment and Materials:

Workstation: Workbench and assembly area

Materials: As specified on bill of materials

Tooling: Common machine and hand tools

Measuring Equipment: Calipers, height gage, gage blocks, straight-edge, micrometers, and scale

References: Die design, part print, customer standards, CAD data, and *Machinery's Handbook*

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Perform Die Assembly Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications		7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving	X	7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving		7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities		7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team		7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
X	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 3. Adjustments
Duty Title: 3.1 Perform First Tryout and Correct Problems

Duty:

Run a first tryout.

Performance Standard:

Set up die in tryout press and following all safety rules, perform first operating tryout. Perform development activities as required. Troubleshoot forming, feeding, piercing, and drawing problems. Panel spot die as required. Recommend any necessary adjustments and take approved actions. Record corrective actions taken.

Accuracy Level:

Part print specifications

Assessment Equipment and Materials:

Workstation: Tryout press

Materials: Tryout stock

Tooling: Tryout press

Measuring Equipment: Scale, calipers, micrometers, and check fixture

References: Die design, part prints, customer standards, press safety instructions, and
Machinery's Handbook

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Perform First Tryout and Correct Problems Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications	X	7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving	X	7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving	X	7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities	X	7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team	X	7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
X	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 4. Final Tryout
Duty Title: 4.1 Prepare Die for Final Tryout

Duty:

Confirm operation and adjust operating mechanisms. Mount all remaining accessories to die set as required.

Performance Standard:

Finalize adjustments to operating mechanisms, install remaining accessories, and confirm their operating condition. Accessories are typically scrap chutes, sensors, or die-set identification. Record step-by-step changes and maintain the record.

Accuracy Level:

Die design and customer specifications

Assessment Equipment and Materials:

Workstation: Workbench and assembly area

Materials: As specified on bill of materials

Tooling: Common machine tools and hand tools

Measuring Equipment: Calipers, height gage, gage blocks, straight-edge, micrometers, and scale

References: Die design, part print, customer standards, CAD data, and *Machinery's Handbook*

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Prepare Die for Final Tryout Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications	X	7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving	X	7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving	X	7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities	X	7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team	X	7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes	X	8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
X	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 4. Final Tryout
Duty Title: 4.2 Set Up Die in Tryout Press

Duty:

Install die in tryout press for a final tryout.

Performance Standard:

Having performed all final adjustments as called for in *Duties and Standards for Diemaking*^{3/4}*Level II*, mount die in tryout press for a final tryout.

Accuracy Levels: N/A

Assessment Equipment and Materials:

Workstation: Tryout press

Materials: Tryout stock

Tooling: Tryout press

Measuring Equipment: Scales and tape measures.

References: Die design, part prints, customer standards, and press safety instructions

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Set Up Die in Tryout Press Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications		7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving		7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving		7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities		7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team		7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 4. Final Tryout
Duty Title: 4.3 Assure Production Readiness of Die or Tool

Duty:

Verify correct operation of the die.

Performance Standard:

Referencing customer standards and die design, assure that all stock feeding problems have been resolved, all slugs fall freely from die and down scrap chutes or between parallels.

Accuracy Levels: N/A

Assessment Equipment and Materials:

Workstation: Tryout press

Materials: Tryout stock

Tooling: Tryout press

Measuring Equipment: Scale, calipers, and micrometers

References: Die design, part prints, customer standards, and press safety instructions

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Assure Production Readiness of Die or Tool Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications		7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving		7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving		7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities		7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team		7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes	X	8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 4. Final Tryout
Duty Title: 4.4 Perform Corrective Actions

Duty:

Perform corrective actions, as required, to assure that stamped part conforms to customer standards and part print.

Performance Standard:

Reviewing the layout reports and capabilities studies with engineering and quality control personnel, make the necessary final adjustment to the die required to assure that parts produced meet all part print requirements. Record step-by-step changes and maintain the record.

Accuracy Levels:

As specified in the part print

Assessment Equipment and Materials:

Workstation: Tryout press

Materials: Tryout stock

Tooling: Machine tools

Measuring Equipment: Scale, calipers, micrometers, and check fixture

References: Die design, part prints, customer standards, press safety instructions, and
Machinery's Handbook

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Perform Corrective Actions Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications	X	7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving	X	7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving	X	7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities	X	7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team	X	7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
X	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 5. Final Runoff
Duty Title: 5.1 Participate in Final Runoff

Duty:

Participate in final runoff.

Performance Standard:

Assist in the runoff process at the customer's facility or in-house if a customer facility runoff is not required. Make any final die adjustments at this time. Record any changes and maintain the record.

Accuracy Levels:

Customer specifications and part prints

Assessment Equipment and Materials:

Workstation: Tryout press

Materials: Customer-supplied tryout stock

Tooling: Machine tools and hand tools

Measuring Equipment: Scale, calipers, micrometers, and check fixture

References: Die design, part prints, customer standards, and press safety instructions

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Participate in Final Runoff Duty.

	1. Written and Oral Communications		7. Metalforming Theory
X	1.1 Develop a System to Organize Communications	X	7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving	X	7.2 Know Nitrogen Manifolds and Their Applications
X	2.1 Apply Mechanical Problem Solving	X	7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities	X	7.4 Understand Draw Beads and Their Use
X	3.1 Manage a Team	X	7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
X	4.1 Use Sketches to Illustrate Engineering Changes	X	8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
X	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Duty Area: 5. Final Runoff
Duty Title: 5.2 Review Results and Record Changes Made to Original Die Design

Duty:

Review final runoff results.

Performance Standard:

Review final runoff results and record changes, if any, made to the original die design.

Accuracy Levels: N/A

Assessment Equipment and Materials:

Workstation: Tryout press

Materials: N/A

Tooling: Tryout press

Measuring Equipment: N/A

References: Die design, part prints, customer standards, and press safety instructions

KSAO:

This table represents the kinds of knowledge, skills, abilities, and other characteristics that will be assessed in the performance of the Review Results and Record Changes Made to Original Die Design Duty.

	1. Written and Oral Communications		7. Metalforming Theory
	1.1 Develop a System to Organize Communications		7.1 Calculate Complex Forming Pressures
	2. Decision Making and Problem Solving		7.2 Know Nitrogen Manifolds and Their Applications
	2.1 Apply Mechanical Problem Solving		7.3 Understand Use of Punch and Draw Radii
	3. Social Skills and Personal Qualities		7.4 Understand Draw Beads and Their Use
	3.1 Manage a Team		7.5 Use Blank Holding Pressures and Standoffs
	4. Engineering Drawing and Sketches		8. Electrical, Pneumatic, and Hydraulic Controls
	4.1 Use Sketches to Illustrate Engineering Changes		8.1 Identify Sensors and Their Functions
	5. Measurement		9. Safety and Environment
	5.1 Measure Components for Accuracy	X	9.1 Understand Safe Operation of All Equipment
	6. Metalworking Theory	X	9.2 Understand OSHA Requirements
	6.1 Know Heat Treating	X	9.3 Understand Hazardous Materials Disposal
	6.2 Know Purpose of Drawing During Heat Treating		

Knowledge, Skills, Abilities, and Other Characteristics

- KSAO Area: 1. Written and Oral Communications**
KSAO: 1.1 Develop a System to Organize Communications

KSAO Definition:

Develops a system to organize the communication of job changes and job requirements.

Performance Requirement:

Given a die to build, guide a work team through the die building processes with the use of written work instructions. These instructions should be detailed enough to transfer information from one shift to another as well as from one person to another.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Develop a System to Organize Communications KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Organize work team.
2. Job execution	Build a die.	Communicate job progress.

- KSAO Area: 2. Decision Making and Problem Solving**
KSAO: 2.1 Apply Mechanical Problem Solving

KSAO Definition:

Solves forming, trimming, and piercing problems through the knowledge and understanding of pressures, deflections caused by forces, offsetting opposing forces, calculation of forming, and shearing and stripping pressures.

Performance Requirement:

Given a die to build and to try out, solve mechanical problems related to pressures, thrusts, and material spring-back as required to complete die and qualify stamping to the part print dimensions.

Duty Standard Cross Reference Table:

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

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Review mechanical functions.
2. Job execution	Build a die.	Resolve mechanical issues.

KSAO Area: 3. Social Skills and Personal Qualities

KSAO: 3.1 Manage a Team

KSAO Definition:

Demonstrates the ability to lead a die building team using the appropriate leadership and communication skills.

Performance Requirement:

Given a die to be built, guide a team through the construction plan and obtain agreement on assignments and timetables.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Manage a Team KSAO

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Conduct team meetings.
2. Job execution	Build a die.	Oversee team activities.

KSAO Area: 4. Engineering Drawings and Sketches

KSAO: 4.1 Use Sketches to Illustrate Engineering Changes

KSAO Definition:

Is able to sketch engineering changes for easy understanding.

Performance Requirement:

Given a die to be built and a series of specific design changes, use sketches to illustrate the changes to the die building team members.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Use Sketches to Illustrate Engineering Changes KSAO.

Duty Area	Task	Activity
1. Job planning	Review die design.	Identify possible changes in design.
2. Job execution	Build a die.	Explain die changes.

KSAO Area: 5. Measurement
KSAO: 5.1 Measure Components for Accuracy

KSAO Definition:

Using precision measuring instruments, confirms accuracy of components.

Performance Requirement:

Be able to accurately measure components using both English and metric measuring systems.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Measure Components for Accuracy KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Create an inspection plan.
2. Job execution	Build a die.	Confirm part accuracy.

KSAO Area: 6. Metalworking Theory
KSAO: 6.1 Know Heat Treating

KSAO Definition:

Understands the purpose and effect of heat treating.

Performance Requirement:

Demonstrate the ability to select the proper heat treat requirements for a given material and the required Rockwell hardness for the specific application.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the know Heat Treating KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Determine components requiring heat treating.
2. Job execution	Build a die.	Send components out for heat treating.

KSAO Area: 6. Metalworking Theory
KSAO: 6.2 Know Purpose of Drawing During Heat Treating

KSAO Definition:

Understands the purpose of drawing tool steels to a predetermined Rockwell hardness after heat treating.

Performance Requirement:

Understand the operation and application of a given die detail. Determine the proper Rockwell hardness and proper drawing process for the application.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Know Purpose of Drawing During Heat Treating KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Calculate the required Rockwell hardness.
2. Job execution	Build a die.	Prepare a work order for heat treating.

KSAO Area: 7. Metalforming Theory
KSAO: 7.1 Calculate Complex Forming Pressures

KSAO Definition:

Uses a calculator and engineering equations to calculate approximate forming pressures for complex forming operations.

Performance Requirement:

Given a die to build, verify that the proper pressure pads, springs, and nitrogen cylinders are specified in the die design and bill of materials to adequately control the part during the forming operations.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Calculate Complex Forming Pressures KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Calculate forming pressures.

KSAO Area: 7. Metalforming Theory
KSAO: 7.2 Know Nitrogen Manifolds and Their Applications

KSAO Definition:

Understands the use of nitrogen manifolds in controlling pressures.

Performance Requirement:

Given a die to be built, determine if the use of a nitrogen manifold would enhance pressure control.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Know Nitrogen Manifolds and Their Applications KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Determine use of a manifold.

KSAO Area: 7. Metalforming Theory
KSAO 7.3 Understand Use of Punch and Draw Radii

KSAO Definition:

Understands the function and purpose of the proper draw cavity and punch radii and how they relate to various failures in forming and drawing operations.

Performance Requirement:

Given a die to be built, determine the corrective actions in punch and radii use required to correct crack, splits, wrinkles, and folds in the forming and drawing operation.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Understand Use of Punch and Draw Radii KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Understand use of punch and draw radii.
2. Job execution	Build a die.	Understand use of punch and draw radii to correct problems.

KSAO Area: 7. Metalforming Theory
KSAO: 7.4 Understand Draw Beads and Their Use

KSAO Definition:

Controls the flow of material through the use of draw beads.

Performance Requirement:

Given a die to be built, understand the role of draw beads in controlling material flow to correct cracks, splits, wrinkles, and folds.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Understand Draw Beads and Their Use KSAO.

Duty Area	Task	Activity
2. Job execution	Build a die.	Use draw beads to correct forming problems.

KSAO Area: 7. Metalforming Theory
KSAO: 7.5 Use Blank Holding Pressures and Standoffs

KSAO Definition:

Controls the flow of material through the use of blank holding pressures and standoffs.

Performance Requirement:

Given a die to be built, understand the role of blank holding pressures and standoffs in controlling material flow to correct cracks, splits, and folds.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Use Blank Holding Pressures and Standoffs KSAO.

Duty Area	Task	Activity
2. Job execution	Build a die.	Use blank holding pressures and standoffs to correct forming problems.

KSAO Area 8. Sensors
KSAO: 8.1 Understand Sensors and Their Functions

KSAO Definition:

Understands the role of sensors in safety and control of the die operation.

Performance Requirement:

Understand the types of sensors and their role in safety, material feed, part quality, die operation, and die protection.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the understand Sensors and Their Functions KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Identify needed sensors.
2. Job execution	Build a die.	Install sensors.

KSAO Area: 9. Safety and Environment
KSAO: 9.1 Understand Safe Operation of All Equipment

KSAO Definitions:

Safely operates all equipment in the tool and die shop including tryout presses.

Performance Requirement:

Study all machine operating manuals and OSHA requirements and be able to describe potential hazards and safe operation of all equipment in the tool and die shop and on all tryout presses.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the understand Safe Operation of All Equipment KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Identify all safety hazards.
2. Job execution	Build a die.	Monitor team practices for safety.

KSAO Area: 9. Safety and Environment
KSAO: 9.2 Understand OSHA Requirements

KSAO Definition:

Understands OSHA requirements as they relate to machine guarding and operator protection. Document safety activities required for the team.

Performance Requirement:

Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe work practices in handling materials, operating machines, handling tooling, and handling and applying coolants, cutting fluids, and lubricants.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Understand OSHA Requirements KSAO.

Duty Area	Task	Activity
2. Job execution	Build a die.	Confirm team knowledge of OSHA requirements.

KSAO Area: 9. Safety and Environment
KSAO: 9.3 Understand Hazardous Materials Disposal

KSAO Definition:

Knows the hazards of materials used in the manufacture of machine tools.

Performance Requirement:

Be able to explain the proper handling and disposal of toxic and other hazardous materials such as the types of cutting fluids, coolants, and lubricants.

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the Understand Hazardous Material Disposal KSAO.

Duty Area	Task	Activity
1. Job planning	Develop a die building plan.	Review and identify hazardous materials used on the job.
2. Job execution	Build a die.	Follow EPA guidelines in disposing of hazardous materials.

Appendix A
Technical Work Group
for
Duties and Standards for Diemaking Skills—Level III

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