



**National Institute for Metalworking Skills®**

**Duties and  
Standards  
for  
Metalforming Skills**

Level II—Press Brake Operation

National Institute for Metalworking Skills  
3251 Old Lee Highway, Ste. 205  
Fairfax, VA 22030  
Ph: 703-352-4971  
Fax: 703-352-4991  
[www.nims-skills.org](http://www.nims-skills.org)

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The principal author of this skill standards booklet is Jim Young of Industrial Solutions, who was the overall project coordinator working with the guidance of Robert W. Sherman, Executive Director of the National Institute for Metalworking Skills (NIMS). The technical guidance in developing this standard has been provided by the members of the Metal Fabricating Industry. A significant contribution to the development, editing, and final validation of this document has been made by Charles E. Trott of Northern Illinois University.

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# **Occupational Description and Benchmarks for Metalforming Press Brake Operation—Level II**

## **Occupational Description**

Metalforming skills are used by skilled tradespersons who have achieved proficiency in the handling and placing tooling and materials into service, in the setup and operation of press brake equipment, in quality skills related to metalforming using a press brake, and in some planning and job control skills. There are many types of press brakes in the industry. The distinction of skills of a press brake metalformer is not determined as much by the press brake equipment, as by the types of tooling and ancillary devices he or she is competent to operate. A press brake operator with specific Level I general metalworking skills and a basic knowledge of the different types of tooling used in press brake operations can meet the proficiency requirements of the Level II press brake standard. To achieve Level III press brake skill proficiency the metalformer must master the setup and troubleshooting skills required in the press brake operation.

The following are general areas of competency:

- Blueprint reading;
- Care and use of tooling;
- Handling, use, and installation of materials;
- Operation of press brake equipment;
- Inspection and quality assurance skills; and,
- Work planning and job control.

Safety is a responsibility that cuts across all competencies for the metalformer. Each competency has its own related level of related safety. Skilled press brake operators are expected to know, use, and execute correctly all matters related to safety for these competencies. All performance assessments for these level II press brake competencies will include the skills below as well as the execution of all safety practices.

### **Tooling Skills**

- Verify function of the tooling

### **Work Planning and Job Control Skills**

- Review and interpret job requirements

### **Operation of Press Brake Equipment**

- Ability to operate press brakes with different drive systems  
Ability to operate press brakes with different gage stop systems

**Inspection and Quality Assurance Skills**

- Conduct sample run
- Follow and document inspection procedures for in-process inspection
- Perform visual inspection
- Perform dimensional inspection

**Handling of Materials**

- Locate, identify, transport, and stage stock

**Other Skills and Competencies**

- Adhere to EPA and OSHA guidelines

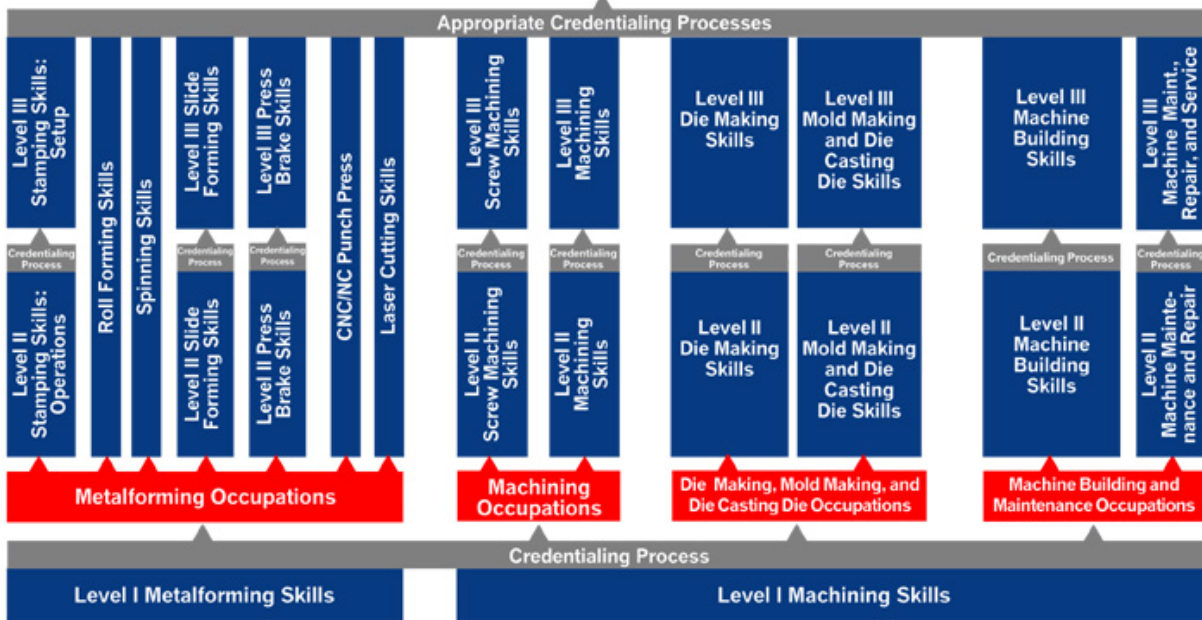
Throughout the Metalforming Skill Standard the phrase “process plan” is used. This phrase should be construed to include the step-by-step instructions for operating procedures and quality plans that include step-by-step inspection plans and data collection instructions.

This standard was developed to build on the Machining Level I Skill Standards. Competency requirements for some Level I machining skills, may be necessary for a metalformer meeting the competencies of the Level II Press Brake Skill Standard. The KSAO' from Machining Level I appropriate for Press Brake Level II and Level III are incorporated into these documents.

# A Skills and Credentialing Framework for Careers in Metalworking in the United States

## Capstone Opportunity Fields

Business Owner, Journeyman, General Management, Industrial Management, Engineering Technology, Engineering, Sales and Application Engineer



- The credentialing processes involve performance reviews and written exams on related theory and other knowledge areas to demonstrate competencies.
- Each skill set is based on the most important responsibilities that workers are expected to perform; the credentialing process is modular in design. workers or employers select the modules of skill sets that best meet their career direction or job requirements.



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## FRAMEWORK FOR PRESS BRAKE SKILLS

This figure represents the two principal set of expectations that comprise Press Brake Skills. The left-hand column is a listing of the duties that are expected to constitute Press Brake 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
<p><b>1. Production Plan</b></p> <ul style="list-style-type: none"> <li>1.1 Receive and Understand Instructions</li> <li>1.2 Run Sample Lot and Inspect</li> </ul>	<p><b>1. Written and Oral Communications</b></p> <ul style="list-style-type: none"> <li>1.1 Reading</li> <li>1.2 Writing</li> <li>1.3 Speaking</li> <li>1.4 Listening</li> </ul>
<p><b>2. Operation</b></p> <ul style="list-style-type: none"> <li>2.1 Operate Mechanical Drive Press Brake</li> <li>2.2 Operate a Hydro-Mechanical Drive Press Brake</li> <li>2.3 Operate a Hydraulic Drive-Down Acting Press Brake</li> <li>2.4 Operate a Hydraulic Drive-Up Acting Press Brake</li> <li>2.5 Operate an Electric Drive Press Brake</li> <li>2.6 Batch Processing Between Inspections</li> </ul>	<p><b>2. Mathematics</b></p> <ul style="list-style-type: none"> <li>2.1 Arithmetic</li> </ul>
	<p><b>3. Decision Making and Problem Solving</b></p> <ul style="list-style-type: none"> <li>3.1 Applying Decision Rules</li> <li>3.2 Basic Problem Solving</li> </ul>
	<p><b>4. Group Skills and Personal Qualities</b></p> <ul style="list-style-type: none"> <li>4.1 Group Participation and Teamwork</li> <li>4.2 Personal Qualities</li> </ul>
	<p><b>5. Engineering Drawings and Sketches</b></p> <ul style="list-style-type: none"> <li>5.1 Standard Orthographic Blueprints</li> <li>5.2 GDT Orthographic Blueprints</li> </ul>
	<p><b>6. Measurement</b></p> <ul style="list-style-type: none"> <li>6.1 Basic Measuring Instruments</li> <li>6.2 Precision Measuring Instruments</li> <li>6.3 Surface Plate Instruments</li> </ul>
	<p><b>7. Metalworking Theory</b></p> <ul style="list-style-type: none"> <li>7.1 Material Types and Properties</li> </ul>

**Duty Area: 1. Production Plan**  
**Duty Title: 1.1 Receive and Understand Instructions**

***Duty:***

Receive the job and understand instructions.

***Performance Standard:***

Given a product to be made, job specifications and a process plan, receive, confirm and demonstrate an understanding of job instructions, quality performance requirements and safety features of the operation. Describe the production plan in the appropriate sequence.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* An appropriate press brake.

*Material:* Production part, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.

**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of receiving and understanding instructions.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

**Duty Area:**            **1.    Production Plan**  
**Duty Title:**           **1.2   Run Sample Lot and Inspect**

***Duty:***

Run sample lot of parts and inspect conformity and consistency of parts to blueprint specifications and process plan.

***Performance Standard:***

Given a part to be made, run a sample lot of parts and inspect conformity of parts to blueprint specifications and process plan. Maintain consistency of specifications using proper measuring instruments throughout sample part run.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* Appropriate press brake.

*Material:* Production part, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.

**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of running sample lots and inspecting them for conformance to requirements.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

**Duty Area: 2. Operation**

**Duty Title: 2.1 Operate a Mechanical Drive Press Brake**

***Duty:***

Operate a mechanical drive press brake.

***Performance Standard:***

Given a setup ready for production and verified for safety, using a mechanical drive press brake, consistently produce parts in the manner prescribed by the process plan.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* An appropriate press brake.

*Material:* Production parts, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.

**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of a mechanical drive press brake.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

**Duty Area: 2. Operation**

**Duty Title: 2.2 Operate a Hydro-mechanical Drive Press Brake**

***Duty:***

Operate a hydro-mechanical drive press brake.

***Performance Standard:***

Given a setup ready for production and verified for safety, using a hydro-mechanical drive press brake, consistently produce parts in the manner prescribed by the process plan.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* An appropriate press brake.

*Material:* Production parts, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.



**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of a hydro-mechanical drive press brake.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

**Duty Area: 2. Operation**

**Duty Title: 2.3 Operate a Hydraulic Press Brake: Down-Acting**

***Duty:***

Operate a hydraulic down-acting press brake.

***Performance Standard:***

Given a setup ready for production and verified for safety, using a hydraulic down-acting press brake, consistently produce parts in the manner prescribed by the process plan.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* An appropriate press brake.

*Material:* Production parts, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.

**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of a hydraulic down-acting press brake.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

**Duty Area:** 2. Operation

**Duty Title:** 2.4 Operate a Hydraulic Press Brake: Up-Acting

***Duty:***

Operate a hydraulic up-acting press brake.

***Performance Standard:***

Given a setup ready for production and verified for safety, using a hydraulic up-acting press brake, consistently produce parts in the manner prescribed by the process plan.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* An appropriate press brake.

*Material:* Production parts, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.

**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of a hydraulic up-acting press brake.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

**Duty Area:** 2. Operation  
**Duty Title:** 2.5 Operate an Electric Drive Press Brake

***Duty:***

Operate an electric drive press brake.

***Performance Standard:***

Given a setup ready for production and verified for safety, using an electric drive press brake, consistently produce parts in the manner prescribed by the process plan.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* An appropriate press brake.

*Material:* Production parts, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.

**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of an electric drive press brake.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

**Duty Area: 2. Operation**  
**Duty Title: 2.6 Monitor Batch Processing Between Inspections**

***Duty:***

Monitor batch processing between inspections.

***Performance Standard:***

Given an inspection plan, produce a designated batch of parts, keeping them separate from previously inspected parts. Inspect designated sample from this batch, record required data, and respond to problems that arise due to non-conformance with part specifications.

***Accuracy Level:*** Part specification and process plan.

***Assessment Equipment and Material:***

*Workstation:* An appropriate press brake.

*Material:* Production parts, blueprint and process plan.

*Tooling:* N/A.

*Measuring Instruments:* Caliper, dial indicator, height gage, surface plate, protractor, feeler gage and square. (Manual or electronic measuring instruments.)

*Reference:* Operators Manual.



**Metalforming Skills: Press Brake—Level II**

**KSAO:**

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of monitoring batch processing between inspections.

	<b>1. Written and Oral Communication</b>		<b>5. Engineering Drawing and Sketches</b>
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		<b>6. Measurements</b>
X	1.4 Listening	X	6.1 Basic Measurements
	<b>2. Mathematics</b>	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		<b>7. Metalworking Theory</b>
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	<b>3. Decision Making and Problem Solving</b>		
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	<b>4. Group Skills and Personal Qualities</b>		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

## Appendix A

### Knowledge, Skills, Abilities, and Other Characteristics

An individual planning to meet these standards will be required to perform the basic skills, abilities and other characteristics defined in this section of the standard. These skills include:

Written and Oral Communications  
Mathematics  
Decision Making and Problem Solving  
Social Skills and Personal Skills  
Engineering Drawings and Sketches  
Measurement  
Metalworking Theory

**KSAO Area: 1. Written and Oral Communications**

**KSAO Title: 1.1 Reading**

***KSAO Definition:***

Locates, understands, and interprets written technical and non-technical information in documents commonly found in the metalworking 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.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Read blueprints Read tool inventory Read operators manual
2. Job execution	Benchwork Layout Operate press brake	Read blueprints Read process plan Read operators manual
3. Quality and inspection	Inspection control	Read blueprints Read inspection plan Read sampling plan Read charting instructions
4. Process improvement	Participate in process improvement	Read process plans Read operators manual Read team documents
5. Maintenance	Housekeeping Tooling maintenance	Read checklists Read manuals
6. Safety and environment	Operate press brake materials handling	Read all safety instructions

**KSAO Area: 1. Written and Oral Communications**

**KSAO Title: 1.2 Writing**

***KSAO Definition:***

Communicates technical and non-technical information, messages, and ideas in writing using standard English commonly found in the metalworking 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 this requirement, complete the writing requirement.

***Duty Standard Cross Reference Table:***

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

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Write instructions on the process plan.
2. Job execution	Benchwork Layout	Write a record of job activities
3. Quality and inspection	Inspection Control	Write a record of inspection activities
4. Process improvement	Process adjustment Participate in improvement	Write a record of adjustment and improvement activities
5. Maintenance	Housekeeping Tooling maintenance	Write a record of maintenance activities Complete history forms
6. Safety and environment	Operate Press Brake HazMat handling and storage	Write a record of the activities involving operation of a press brake and handling and storage of hazardous materials

**KSAO Area: 1. Written and Oral Communications**

**KSAO Title: 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 communications aids in conversations, discussions, and group meetings. Understands and responds to listener feed back and asks questions when needed in two-way and group discussions.

***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.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Verbally explain the process plan.
2. Job execution	Benchwork Layout	Explain job execution activities
3. Quality and inspection	Inspection control	Explain inspection procedures. Explain control charts and their role in process control.
4. Process Improvement	Process adjustment Participation in improvement	Propose process remedies Explain selected corrective actions. Explain root cause reasoning
5. Maintenance	Housekeeping Tooling maintenance	Explain the condition of the tools and the maintenance actions taken.
6. Safety and environment	Operation and handling Material handling	Explain actions bearing on safe practices.

**KSAO Area: 1. Written and Oral Communications**  
**KSAO Title: 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 communications 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:***

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Listen to verbal instruction
2. Job execution	Benchwork Layout	Listen to verbal instructions
3. Quality and inspection	Inspection control	Listen to verbal instructions
4. Process improvement	Process adjustment Participation in improvement	Listen to verbal instructions
5. Maintenance	Housekeeping Tooling maintenance	Listen to verbal instructions
6. Safety and environment	Operate press brake Material handling	Listen to verbal instructions

**KSAO Area:** 2. Mathematics  
**KSAO Title:** 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 the arithmetic operation.

***Duty Standard Cross Reference Table:***

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

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Calculate operating times
2. Job execution	Benchmark layout	Calculate necessary dimensions from a blueprint
3. Quality and inspection	Inspection control	Calculate necessary dimensions from a blueprint. Calculate statistics required by control sheet.

**KSAO Area: 3. Decision Making and Problem Solving**

**KSAO Title: 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 Requirements:***

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.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Sequence operations
2. Job execution	Benchwork Layout	Follow the process plan, deviating according to decision rules where necessary
3. Quality and inspection	Inspection Control	Follow the quality plan, deviating according to decision rules where necessary.
4. Process improvement	Process adjustment	Apply checklists and decision rules to process improvement.
5. Maintenance	Housekeeping Tool maintenance	Apply company procedures to housekeeping and tool maintenance.
6. Safety and environment	Operate press brake Material handling	Apply OSHA and EPA decision rules to the operation of equipment and the handling of materials.



**KSAO Area: 3. Decision Making and Problem Solving**

**KSAO Title: 3.2 Basic Problem Solving**

***KSAO Definition:***

Can establish responses to unexpected 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 a checklist of sequential instructions, carry out the duty according to the checklist responding appropriately to problems. Formulate those responses into “if....the....” rules.

***Duty Standard Cross Reference Table:***

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

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Sequence operations, providing alternatives according to availability of tools and equipment.
2. Job execution	Benchwork Layout	Follow a process plan, improvising new methods where unavailability of tooling makes the plan obsolete.

**KSAO Area: 4. Group Skills and Personal Qualities**

**KSAO Title: 4.1 Group Participation and Teamwork**

***KSAO Definition:***

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

***Performance Requirement:***

Works cooperatively with others and contributes to group efforts with ideas, suggestions, and positive feedback to group members. Demonstrates appropriate social and communications skills in resolving conflicts with supervisors, team leaders and team members.

***Duty Standard Cross Reference Table:***

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Work cooperatively in developing a process plan, taking input from supervisors and coworkers.
2. Job execution	Benchwork Layout	Work cooperatively by responding to the need to share common work spaces.

**KSAO Area: 4. Social Skills and Personal Qualities**

**KSAO Title: 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 tasks.

***Duty Standard Cross Reference Table:***

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

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
3. Quality and inspection	Inspection control	Demonstrate honesty and integrity in reporting the findings of inspection processes.
4. Process improvement	Process adjustment Participating in improvement	Demonstrates attendance and punctuality in attending meetings for the development of process improvements
6. Safety and environment	Operations and handling	Demonstrates perseverance in the operation and the handling of materials according to OSHA requirements and company safety rules.

**KSAO Area: 5. Engineering Drawings and Sketches**  
**KSAO Title: 5.1 Standard Orthographic Blueprints**

***KSAO Definition:***

Interprets orthographic blueprints.

***Performance Requirements:***

Given a standard blueprint and a finished part from that print, prepare a checklist of dimensions necessary to determine the parts compliance.

***Duty Standard Cross Reference Table:***

This table identifies some of the activities that require the Standard Orthographic blueprint KSAO.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Gather geometric and dimensional data from a blueprint to sequence operations.
2. Job execution	Benchwork Layout	Gather geometric and dimensional data from a blueprint to perform a layout.
3. Quality and inspection	Inspection control	Gather geometric and dimensional data from a blueprint to perform the inspection of a finished part.

**KSAO Area: 5. Engineering Drawings and Sketches**  
**KSAO Title: 5.2 GDT Orthographic Blueprints**

***KSAO Definition:***

Interprets GDT orthographic blueprints.

***Performance Requirements:***

Given a GDT blueprint and a finished part from the print, prepare a checklist of dimensions necessary to determine the part's compliance.

***Duty Standard Cross Reference Table:***

This table identifies some of the activities that require the GDT Orthographic Blueprints KSAO.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Gather geometric and dimensional data from a GDT blueprint to sequence operations.
2. Job execution	Benchwork Layout	Gather geometric and dimensional data from a GDT blueprint to perform a layout
3. Quality and inspection	Inspection control	Gather dimensional and geometric data from a GDT blueprint to perform the inspection of a finished part.

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

***KSAO Definition:***

Recognizes and applies basic measuring instruments such as rules, protractors, and basic transfer tools such as simple inside and outside calipers.

***Performance Requirement:***

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

***Duty Standard Cross Reference Table:***

This table identifies some of the activities the require the Basic Measurements KSAO.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
2. Job Execution	Benchwork Layout	Set the length of layout tools using basic instruments.
3. Quality and inspection	Inspection control	Inspect dimensions which call for the use of basic measuring instruments on a finished part.

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

***KSAO Definition:***

Recognizes and applies precision measuring instruments such as micrometers, vernier, dial, and electronic calipers, dial indicators, precision transfer tools such as telescoping gages and adjustable parallels.

***Performance Requirements:***

Given a blueprint and a finished part from the print, as well as a selection of appropriate precision tools, determine a part's compliance on selected dimensions.

***Duty Standard Cross Reference Table:***

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

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job execution	Benchwork Layout	Select appropriate measuring instruments to confirm part compliance.
2. Quality and inspection	Inspection control	Inspect the dimensions of a finished part which call for the use of precision measuring tools.

**KSAO Area: 6. Measurement**  
**KSAO Title: 6.3 Surface Plate Instruments**

***KSAO Definition:***

Recognizes and applies appropriate precision tools and instruments for surface plate work such as precision angle plates and tool blocks, precision transfer gages, and precision height gages.

***Performance Requirement:***

Given a blueprint and a finished part from that print, as well as a surface plate and a selection of surface plate instruments, determine a part's compliance on selected dimensions.

***Duty Standard Cross Reference Table:***

This table identifies one of the activities that require the Surface Plate Instruments KSAO.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
3. Quality and inspection	Inspection control	Inspect a part using surface plate instruments.



**KSAO Area: 7. Metalworking Theory**

**KSAO Title: 7.2 Material Properties**

***KSAO Definition:***

Recognizes common materials and their principal properties. Understands bending characteristics and the ability to withstand bending forces in various ferrous and non-ferrous, magnetic and ductile materials.

***Performance Requirement:***

Given a blueprint and a part to be formed, predict its formability based upon its appearance, call-out on the print, and its supplied hardness value.

***Duty Standard Cross Reference Table:***

This table identifies some of the activities that require the Material Properties KSAO.

<b>Duty Area</b>	<b>Task</b>	<b>Activity</b>
1. Job planning	Prepare a process plan	Predict bending ability based on known properties of a material