



National Institute for Metalworking Skills

CNC/NC PUNCH PRESS SKILL STANDARD

Setup and Operation

**National Institute for Metalworking Skills
PO Box 787
Vienna VA 22183**

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Duty Area: 1. **Job Process Planning**

Duty Title: 1.1 **Verify job specifications.**

Duty: Identify all specifications and requirements that pertain to the job.

Performance Standard: Verify specifications and technical information on the blueprint and process plan. If discrepancies exist, take corrective action as required.

Accuracy Level: N/A

Assessment Equipment and Material: N/A

Workstation: N/A

Material: Blueprint and process plan.

Tooling: N/A

Measuring Instruments: N/A

Reference: Blueprint and process plan.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of verifying job specifications duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
X	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules		8. Safety
X	3.2 Basic Problem Solving		8.1 OSHA Regulations
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 1. Job Process Planning

Duty Title: 1.2 Verify availability of material.

Duty: Confirm that specified material is in inventory and ready for production.

Performance Standard: Check that specified material is of proper type, thickness, size and that the inventory is sufficient for the job. Report any problems to appropriate supervisor.

Accuracy Level: Material requirements in the process plan and blueprint.

Assessment Equipment and Material:

Workstation: N/A

Material: Production material

Tooling: N/A

Measuring Instruments: Caliper, tape measure, hardness tester, height gage, and micrometer.

Reference: Process plan and blueprint.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of verifying availability of materials duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving	X	7.4 Material Types
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 1. Job Process Planning

Duty Title: 1.3 Verify type of machine to be used.

Duty: Verify type of machine to be used according to process plan/setup sheet.

Performance Standard: Confirm machine chosen is the proper size, tonnage and that the machine capabilities match the complexity of the job. If a machine change is required, take appropriate action.

Accuracy Level: Process plan and setup sheet.

Assessment Equipment and Material:

Workstation: Appropriate CNC/NC punch press.

Material: N/A

Tooling: N/A

Measuring Instruments: N/A

Reference: Process plan, setup sheet and operator's manual.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of verifying type of machine duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving	X	7.4 Material Types
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 1. Job Process Planning

Duty Title: 1.4 Verify tooling availability.

Duty: Verify availability of tooling to be used according to process plan, setup sheet and blueprint.

Performance Standard: Confirm that the required tooling is available per required size and die clearance. If a tooling change is required, take appropriate action.

Accuracy Level: Process plan and setup sheet.

Assessment Equipment and Material:

Workstation: Tooling storage area.

Material: N/A

Tooling: N/A

Measuring Instruments: Caliper, rules, and micrometer.

Reference: Process plan, blueprint and setup sheet.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of verifying tool availability duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 1. Job Process Planning

Duty Title: 1.5 Verify or develop an inspection plan.

Duty: Verify existing inspection plan or develop one, if required.

Performance Standard: Verify that the inspection plan monitors all critical dimensions contained in the blueprint and process plan. In addition to dimensions, determine that the plan monitors characteristics which include burrs, slug marks, tooling marks, material conditions, and others. If required, develop the inspection plan.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: N/A

Material: N/A

Tooling: N/A

Measuring Instruments: N/A

Reference: Process plan and blueprint.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of verifying or developing an inspection plan duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
X	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
X	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving	X	7.4 Material Types
	3.1 Applying Decision Rules		
	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 2. **Pre-Setup**

Duty Title: 2.1 **Pull selected tooling and confirm condition.**

Duty: Pull and inspect required tooling.

Performance Standard: Determine proper die clearance per material type and thickness, and pull correct tooling per setup sheet. Inspect tooling for sharpness, punch and die height, and general tool condition and identify any required repairs.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: Tool storage area.

Material: N/A

Tooling: Selected tools.

Measuring Instruments: Micrometer, height gage, and caliper.

Reference: Process plan, blueprint, and setup sheet.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of pulling selected tooling and confirming condition duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 2. **Pre-Setup**

Duty Title: 2.2 **Perform tooling maintenance and repair, as needed.**

Duty: Perform tooling maintenance and repair.

Performance Standard: Sharpen, lubricate, adjust or shim to proper height, and assemble tooling in preparation for use in production.

Accuracy Level: According to tooling and machine manufacturer's specifications.

Assessment Equipment and Material:

Workstation: Tool storage or tool maintenance area.

Material: Selected and pulled tooling.

Tooling: Tooling fixtures, hand tools, and surface grinder (with correct grinding wheel).

Measuring Instruments: Micrometer, height gage, and caliper.

Reference: Machine and tooling manuals.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of performing tooling maintenance and repair duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics	X	7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 2. Pre-Setup

Duty Title: 2.3 Pull and inspect materials.

Duty: Inspect and move material to the machine.

Performance Standard: Inspect material type, size and thickness, and position it at the machine for production.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: Required material.

Tooling: N/A

Measuring Instruments: Micrometer, tape measure, hardness tester, height gage, and caliper.

Reference: Process plan, blueprint, and setup sheet.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of pulling and inspecting materials duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving	X	7.4 Material Types
X	3.1 Applying Decision Rules		
X	3.2 Basic Problem Solving		
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: **3** **Setup**

Duty Title: **3.1** **Verify Machine Condition**

Duty: Verify operable condition of machine.

Performance Standard: Check fluid levels, establish that there are no worktable obstructions, that machine is free of debris or slugs, and that controls are ready for operation. Verify that all safety devices and systems are operating.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: Appropriate fluids and lubricants.

Tooling: N/A

Measuring Instruments: N/A

Reference: Manufacturer's machine and maintenance manuals.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of verifying machine condition duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
X	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules		8. Safety
X	3.2 Basic Problem Solving	X	8.1 Safety Requirements
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 3. Setup

Duty Title: 3.2 Install Operating Program

Duty: Install operating program.

Performance Standard: Given program identification on setup sheet, load machine code via tape, diskette or DNC network. Verify that program is properly installed.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: Required program setup sheet.

Tooling: N/A

Measuring Instruments: N/A

Reference: Your company's procedure or operator's manual.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of installing operating programs duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules		8.
X	3.2 Basic Problem Solving		9. Computer
	4. Group Skills and Personal Qualities	X	9.1 Computer Basic Skills
X	4.1 Group Participation and Teamwork	X	9.2 Machine Programming
X	4.2 Personal Qualities		

Duty Area: 3. Setup

Duty Title: 3.3 Install Required Tooling

Duty: Install required tooling per setup sheet.

Performance Standard: Install tooling with correct orientation in assigned stations per setup sheet. If necessary, run test hit to verify proper height of tooling. Modify CNC program if alternate tool stations are selected to optimize setup and run time.

Accuracy Level: Correct orientation and station positions must match program.

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: N/A

Tooling: Appropriate hand-tools.

Measuring Instruments: Caliper, micrometer, height gage, surface plate, and rule.

Reference: Setup sheet, CNC program and operator's manual.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of installing required tooling duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry		7.2
	2.5 Applied Statistics		7.3
	3. Decision Making and Problem Solving		7.4
X	3.1 Applying Decision Rules	X	7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 3. Setup

Duty Title: 3.4 Set material clamps per program

Duty: Position material clamps.

Performance Standard: Position clamps on X axis per setup sheet.

Accuracy Level: Per setup sheet.

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: Clamps.

Tooling: Assorted hand tools.

Measuring Instruments: Scale located on X axis.

Reference: Operator's manual and setup sheet.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of setting material clamps duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
X	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry		7.2
	2.5 Applied Statistics		7.3
	3. Decision Making and Problem Solving	X	7.4
X	3.1 Applying Decision Rules		7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 3. Setup

Duty Title: 3.5 Setup for slug and/or part removal.

Duty: Position slug/part removal equipment (conveyors, scrap pans, etc.)

Performance Standard: Change slug/part containers when running different types of material/parts.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: N/A

Tooling: Scrap pans, conveyors, etc.

Measuring Instruments: N/A

Reference: Operator's manual and setup sheet.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of setting up for slug and/or part removal duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
X	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules	X	7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 3. Setup

Duty Title: 3.6 Material Handling Equipment

Duty: Stage material for maximum safety and efficiency of material handling.

Performance Standard: Arrange the work area for safe and efficient material handling and part protection.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: Production material.

Tooling: Carts, skids, tables, boxes, loaders, unloaders, etc.

Measuring Instruments: Rule.

Reference: N/A

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of material handling equipment duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules	X	7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 3. Setup

Duty Title: 3.7 Verify Safety Systems

Duty: Set and verify proper operation of all safety systems.

Performance Standard: Check the table and sheet movement, and machine safety systems for proper setup and operation. Make adjustments as needed.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: Production material.

Tooling: N/A

Measuring Instruments: N/A

Reference: OSHA regulations, Operator's manual and setup sheet.

Metalforming Skills: CNC/NC Punch Press

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of verifying safety systems duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading		5.1 Standard Orthographic Blueprints
X	1.2 Writing		5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening		6.1 Basic Measurements
	2. Mathematics		6.2 Precision Measurements
	2.1 Arithmetic		6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules	X	7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 3. Setup

Duty Title: 3.8 Run And Verify First Article

Duty: Run and verify that first article meets part specifications per blueprint and process plan. If necessary, adjust the machine settings and modify CNC program for optimum machine performance.

Performance Standard: Adjust settings for optimum machine performance after running first article.

Accuracy Level: Part specification according to blueprint and process plan.

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press.

Material: Production material.

Tooling: N/A

Measuring Instruments: CMM, surface plate, dial indicator, height gage, micrometer, tape measure, and caliper.

Reference: Operator's manual, process plan and blueprint.

Metalforming Skills: CNC/NC Punch Press

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 first article duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
X	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules	X	7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities	X	9.1
X	4.1 Group Participation and Teamwork	X	9.2
X	4.2 Personal Qualities		

Duty Area: 4. Production

Duty Title: 4.1 Initiate Production Run

Duty: Initiate production run.

Performance Standard:

Having performed a setup and verified its suitability for production, initiate production and monitor safety systems and part requirements according to the blueprint, process plan and the inspection plan for the job.

Accuracy Level: Part specification, process plan, and inspection plan.

Assessment Equipment and Material:

Workstation: Selected CNC/NC punch press

Material: Production Parts

Tooling: N/A

Measuring Instruments: Micrometer, caliper, surface plate, height gage, rule, and tape measure.

Reference: Blueprint, process and inspection plans.

KSAO:

This table represents the kinds of knowledge, skills, abilities, or other characteristics that will be assessed in the performance of the operation of initiating production run duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic		6.3 Surface Plate Instruments
X	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra		7.1 Tooling
	2.4 Applied Trigonometry		7.2 Material Properties
X	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules	X	7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities		
X	4.1 Group Participation and Teamwork		
X	4.2 Personal Qualities		

Duty Area: 4. **Production**

Duty Title: 4.2 **Troubleshoot Production**

Duty:

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

Performance Standard:

Given a job in production where the process monitoring plan has identified problems in the performance of the run, perform causal analysis. Identify the problems and their causes, and take appropriate corrective action.

Accuracy Level: N/A

Assessment Equipment and Material:

Workstation: An appropriate CNC/NC punch press

Material: Production Parts

Tooling: Assorted hand tools

Measuring Instruments: Micrometer, caliper, surface plate, height gage, rule, and tape measure.

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 operation of trouble shooting production duty.

	1. Written and Oral Communication		5. Engineering Drawing and Sketches
X	1.1 Reading	X	5.1 Standard Orthographic Blueprints
X	1.2 Writing	X	5.2 GDT Orthographic Blueprints
X	1.3 Speaking		6. Measurements
X	1.4 Listening	X	6.1 Basic Measurements
	2. Mathematics	X	6.2 Precision Measurements
X	2.1 Arithmetic	X	6.3 Surface Plate Instruments
	2.2 Applied Geometry		7. Metalworking Theory
	2.3 Applied Algebra	X	7.1 Tooling
	2.4 Applied Trigonometry	X	7.2 Material Properties
X	2.5 Applied Statistics		7.3 Machine Tools
	3. Decision Making and Problem Solving		7.4 Material Types
X	3.1 Applying Decision Rules	X	7.5
X	3.2 Basic Problem Solving	X	8.1
	4. Group Skills and Personal Qualities		
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:

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 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.

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan. Identify requirements of job. Verify machine capabilities.	Read blueprints Read process plan Read part specification Read operator's manual
2,3. Pre-Setup & Setup	Perform setup.	Read blueprints Read process plan Read part specification Read operator's manual
4. Production	Operate a CNC/NC punch press.	Read blueprints Read process plan Read part specification Read operator's manual

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 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 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
2,3. Pre-Setup & Setup	Perform setup.	Record setup activities.
4. Production	Operate a CNC/NC punch press.	Record inspection activities. Record job activities. Record corrective action.

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,1 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 Process Planning	Understand process plan.	Verbally explain it.
2,3. Pre-Setup & Setup	Perform setup.	Verbally explain the setup.
4. Production	Operate a CNC/NC punch press.	Explain execution of the job.

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 Process Planning	Understand process plan.	Listen and understand verbal instructions.
2,3. Pre-Setup & Setup	Perform setup.	Listen and understand verbal instructions.
4. Production	Operate a CNC/NC punch press.	Listen and understand verbal instructions.
4. Production		

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 Process Planning	Understand process plan.	Calculate material supply.
2,3. Pre-Setup & Setup	Perform setup.	Calculate part dimensions from the blueprint.
4. Production	Operate a CNC/NC punch press.	Confirm the calculations.

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

KSAO Definition:

Understands and applies basic geometric concepts and terminology which form the analytical foundation of job planning and execution including planes perpendicularity, Cartesian coordinates, concentricity, parallelism, straightness, flatness, circularity, and symmetry, etc.

Performance Requirement:

Given a specific duty to perform requiring the understanding and use of geometric concepts and terminology, perform the required duty and answer questions about the meaning and use of the geometric principles.

Duty standard Cross Reference Table:

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

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Verify material specifications.
2,3. Pre-Setup & Setup	Perform setup.	Verify first article.
4. Production	Operate a CNC/NC punch press.	Verify part specifications.

KSAO Area: 2. Mathematics
KSAO: 2.5 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
1. Job Process Planning	Understand process plan.	Conduct statistical analysis to confirm plan.
2,3. Pre-Setup & Setup	Perform setup.	Implement SPC plan per quality plan.
4. Production	Operate a CNC/NC punch press.	Use SPC to confirm part conformance.

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 Process Planning	Understand process plan.	Sequence operations.
2,3. Pre-Setup & Setup	Perform setup.	Follow the process plan, deviating according to decision rules where necessary.
4. Production	Operate a CNC/NC punch press.	Follow the process plan deviating according to decision rules where necessary.

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

KSAO Definition:

Can establish new 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 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.

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 Process Planning	Understand process plan.	Sequence operations.
2,3. Pre-Setup & Setup	Perform setup.	Follow the process plan, deviating according to decision rules where necessary.
4. Production	Operate a CNC/NC punch press.	Follow the process plan deviating according to decision rules where necessary.

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

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Work cooperatively in taking input from supervisors and coworkers.
2,3. Pre-Setup & Setup	Perform setup.	Work cooperatively by responding to the need to share common work tools and work spaces.
4. Production	Operate a CNC/NC punch press.	Work cooperatively in work groups, developing process improvements.

KSAO Area: 4. Social 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 Process Planning	Understand process plan.	Assumes responsibility and demonstrates a strong work ethic.
2,3. Pre-Setup & Setup	Perform setup.	Demonstrate honesty and integrity in reporting the findings of inspection processes.
4. Production	Operate a CNC/NC punch press.	Demonstrate attendance and punctuality. Demonstrate honesty and integrity in reporting the findings of inspection processes.

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

KSAO Definition:

Interprets orthographic blueprints.

Performance Requirement:

Given a standard blueprint and a finished part from that 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 Standard Orthographic Blueprint KSAO.

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Gather geometric and dimensional data from a blueprint.
2,3. Pre-Setup & Setup	Perform setup.	Gather geometric and dimensional data from a blueprint.
4. Production	Operate a CNC/NC punch press.	Gather geometric and dimensional data from a blueprint to perform the inspection of a finished part.

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

KSAO Definition:

Interprets GDT orthographic blueprints.

Performance Requirement:

Given a GDT blueprint and a finished part from that 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.

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Gather geometric and dimensional data from a blueprint.
2,3. Pre-Setup & Setup	Perform setup.	Gather geometric and dimensional data from a blueprint.
4. Production	Operate a CNC/NC punch press.	Gather geometric and dimensional data from a blueprint to perform the inspection of a finished part.

KSAO Area: 6. Measurement
KSAO: 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 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 Process Planning	Understand process plan.	Use appropriate measuring instruments to confirm material compliance.
2,3. Pre-Setup & Setup	Perform setup.	Use appropriate measuring instruments to confirm tooling, material, and part compliance.
4. Production	Operate a CNC/NC punch press.	Inspect dimensions which call for the use of basic measuring instruments on a finished part.

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, precision transfer tools such as telescoping gages and adjustable parallels.

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.

Duty Standard Cross Reference Table:

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

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Use appropriate precision measuring instruments to confirm material compliance.
2,3. Pre-Setup & Setup	Perform setup.	Use appropriate precision measuring instruments to confirm tooling, material, and part compliance.
4. Production	Operate a CNC/NC punch press.	Inspect dimensions which call for the use of precision measuring instruments on a finished part.

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

KSAO Definition:

Recognizes and applies appropriately 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, material, and a finished part from that print, as well as a surface plate and a selection of appropriate surface plate instruments, determine the material's and the part's compliance on selected dimensions.

Duty standard Cross Reference Table:

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

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Use appropriate surface plate instruments to confirm material compliance.
2,3. Pre-Setup & Setup	Perform setup.	Use appropriate surface plate instruments to confirm tooling, material, and part compliance.
4. Production	Operate a CNC/NC punch press.	Inspect dimensions which call for the use of surface plate instruments on a finished part.

KSAO Area: 7. Metalworking Theory
KSAO: 7.1 Tooling

KSAO Definition:

Recognizes a wide variety of tooling used in CNC/NC punch press operations including tool holding devices. Understands the appropriate application of these tools and devices.

Performance Requirement:

Given a blueprint and a part to be made, select appropriate tooling and tool-holders to carry out the manufacture of the part.

Duty Standard Cross Reference Table:

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

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Confirm the availability of the appropriate tooling and tool holding devices.
2,3. Pre-Setup & Setup	Perform setup.	Select and install the appropriate tooling and tool holding devices.
4. Production	Operate a CNC/NC punch press.	Monitor condition of the tooling.

KSAO Area: 7. **Metalworking Theory**
KSAO: 7.2 **Material Types And Physical Properties**

KSAO Definition:

Recognize different types of materials and their physical properties. Recognizes differences between ferrous and non-ferrous, magnetic, and ductile materials.

Performance Requirement:

Given a blueprint and a part to be manufactured, predict its manufacturability based upon its appearance and hardness value.

Duty Standard Cross Reference Table:

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

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	Verify that correct material is being used.
2,3. Pre-Setup & Setup	Perform setup.	Verify manufacturability of part per specifications.
4. Production	Operate a CNC/NC punch press.	Confirm manufacturability of material per inspection plan.

KSAO Area: 7. Metalworking Theory

KSAO: 7.5 Machine Type

KSAO Definition:

Performance Requirement:

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the machine type KSAO.

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	
2,3. Pre-Setup & Setup	Perform setup.	
4. Production	Operate a CNC/NC punch press.	

KSAO Area: 7. **Metalworking Theory**
KSAO: 7.6 **Bending Theory**

KSAO Definition:

Performance Requirement:

Duty Standard Cross Reference Table:

This table identifies some of the activities that require the bending theory KSAO.

Duty Area	Task	Activity
1. Job Process Planning	Understand process plan.	
2,3. Pre-Setup & Setup	Perform setup.	
4. Production	Operate a CNC/NC punch press.	