

# Advancing San Diego

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## Skills Criteria: Preferred Providers of Manufacturing Talent CNC Operator/Machinist

Below is a skills-based criteria for CNC machinists developed in partnership with manufacturing industry representatives as part of Advancing San Diego. The criteria was developed using resources provided by the Department of Labor's Competency Clearinghouse for Advanced Manufacturing and National Institute for Metalworking Standards. Education programs providing training aligned with this skills criteria may apply for designation as a Preferred Provider of manufacturing talent through the Advancing San Diego initiative. Applicants provide examples of courses in their programs that teach to each required skill.

**Definition:** Operate computer-controlled tools, machines, or robots to machine or process parts, tools, or other work pieces made of metal, plastic, wood, stone, or other materials. May also set up and maintain equipment. More experienced positions develop programs to control machining or processing of materials by automatic machine tools, equipment, or systems, and may also set up, operate, or maintain equipment.

Technical Skills Requirements (see definitions on page 2)	
<b>Duty Area 1: Machine Setup</b>	
Duty 1.01: Cutting Tool Assembly and Setting	Required
Duty 1.04: Physical Test Cutting	Required
Duty 1.02: Workholding Device Alignment	Bonus
Duty 1.03: Machine Verification and Dry Run	Bonus
<b>Duty Area 2: Machine Operations</b>	
Duty 2.01: Part Loading	Required
Duty 2.02: Process Adjustments	Required
<b>Duty Area 3: Benchwork</b>	
Duty 3.01: Deburring	Required
<b>Duty Area 4: Quality Control</b>	
Duty 4.01: Standardizing	Required
Duty 4.02: Interpretation	Required
Duty 4.02: Measurements	Required
<b>Duty Area 5: Programming, CAD CAM</b>	
Duty 5.01: Process Planning	Required
Duty 5.02: Modeling	Required
Duty 5.03: Toolpath Creation	Required
Duty 5.04: Program Verification	Bonus
Duty 5.05: Documentation	Bonus
Duty 5.06: Coding	Bonus
<b>Duty Area 6: Machine Maintenance</b>	
Duty 6.01: Lube and Coolants	Bonus
<b>Employability Skills Requirements (see definitions on page 2)</b>	
Emotional Intelligence	Required
Communication	Required
Critical Thinking	Required
Collaboration	Required
Dependability	Required
Resourcefulness	Required

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## CNC Operator/Machinist Skills Definitions

### Duty Area 1: Machine Setup

**Duty 1.01: Cutting Tool Assembly and Setting (required)** - Assemble and measure cutting tools.

**Duty 1.04: Physical Test Cuttings (required)** - Verify proven or unproven G-code programs will produce parts to specification.

**Duty 1.02: Workholding Device Alignment (bonus)** - Secure workholding devices to machines with various configurations.

**Duty 1.03: Machine Verification and Dry Run (bonus)** - Verify proven or unproven G-code programs without cutting production parts.

### Duty Area 2: Machine Operations

**Duty 2.01: Part Loading (required)** - Loading parts in workholding devices for operation.

**Duty 2.02: Process Adjustments (required)** - Monitor and maintain part specifications during production.

### Duty Area 3: Benchwork

**Duty 3.01: Deburring (required)** - Deburr part features to specification.

### Duty Area 4: Quality Control

**Duty 4.01: Standardizing (required)** - Standardize hand-held Measuring and Test Equipment (M&TE) to specification to ensure accuracy, repeatability, and reproducibility.

**Duty 4.02: Interpretation (required)** - Read and interpret engineering (mechanical) drawings using GD&T.

**Duty 4.03: Measurements (required)** - Select and use appropriate Measuring and Test Equipment (M&TE) to measure part feature in an accurate, repeatable, and reproducible manner.

### Duty Area 5: Programming, CAD CAM

**Duty 5.01: Process Planning (required)** - Formulate strategies to mill or turn parts.

**Duty 5.02: Modeling (required)** - Create and modify solid models.

**Duty 5.03: Toolpath Creation (required)** - Create toolpaths to mill or turn parts.

**Duty 5.04: Program Verification (bonus)** - Verify G-code programs in a virtual environment.

**Duty 5.05: Documentation (bonus)** - Create technical documents required to communicate instructions required for machine operators to execute programs.

**Duty 5.06: Coding (bonus)** - Write G-code programs to mill or turn parts or qualify workholding device accessories for machine setups.

### Duty Area 6: Machine Maintenance

**Duty 6.01: Lube and Coolants (bonus)** - Perform daily and weekly preventive maintenance.

### Employability skills

**Emotional Intelligence (required)** - Consider the feelings and perspectives of others to infuse empathy and thoughtfulness into all interactions.

**Communication (required)** - Exchange information, feelings and meaning in person or digitally through actions, words, body language, listening and writing to achieve understanding among people.



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**Critical Thinking (required)** - Using imagination and problem solving to apply knowledge or address challenges in new, exciting, and innovative ways.

**Collaboration (required)** - Build helpful, respectful, and productive relationships with others to work toward a common goal.

**Dependability (required)** - Build trust with others by keeping your word. Manage your time by planning and controlling how your work time is spent to achieve goals.

**Resourcefulness (required)** - Relentlessly seeking solutions and opportunities.



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## Skills Criteria: Preferred Providers of Manufacturing Talent Engineering Technicians

Below is a skills-based criteria for entry-level engineering technicians developed in partnership with manufacturing industry representatives as part of Advancing San Diego. The criteria was developed using resources provided by the Department of Labor's Competency Clearinghouse for Advanced Manufacturing and National Institute for Metalworking Standards. Education programs providing training aligned with this skills criteria may apply for designation as a Preferred Provider of manufacturing talent through the Advancing San Diego initiative. Applicants provide examples of courses in their programs that teach to each required skill.

**Definition:** Engineering Technicians operate, test, adjust, repair, and maintain electrical, mechanical, industrial, or production components and associated control systems, usually under the direction of engineering staff.

Technical Skills Requirements (see definitions on page 2)	
<b>Duty Area 1: Control Systems &amp; Components</b>	
Duty 1.01: Maintenance	Required
Duty 1.02: Troubleshooting	Required
Duty 1.03: Improvements	Required
Duty 1.04: Standardizing	Required
Duty 1.05: Measurements	Required
Duty 1.06: Coordination	Required
Duty 1.06: Interpretation	Required
Duty 1.07: Planning	Bonus
Duty 1.08: Programmable logic controllers (PLC)	Bonus
<b>Duty Area 2: Test Plans &amp; Equipment</b>	
Duty 2.01: Implementation	Required
Duty 2.02: Improvements	Required
Duty 2.03: Safety	Required
Duty 2.04: Test Analysis	Required
Duty 2.05: Development	Bonus
Duty 2.06: Execution	Bonus
<b>Duty Area 3: Technical Support</b>	
Duty 3.01: Technical Documentation	Required
Duty 3.02: Technical support	Required
Duty 3.03: Technical Support systems	Bonus
<b>Employability Skills Requirements (see definitions on page 2)</b>	
Emotional Intelligence	Required
Communication	Required
Critical Thinking	Required
Collaboration	Required
Dependability	Required
Resourcefulness	Required

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## Engineering Technicians Skills Definitions

### Duty Area 1: Control Systems & Components

**Duty 1.01: Maintenance (required)** - Inspect and maintain electrical, mechanical, industrial, production, or related systems and components to prevent future failures or restore to serviceable and acceptable operating conditions.

**Duty 1.02: Troubleshooting (required)** - Trace errors within control systems and components.

**Duty 1.03: Improvements (required)** - Evaluate control systems and components for improvements.

**Duty 1.04: Standardizing (required)** - Check Measuring and Test Equipment (M&TE) to ensure accuracy, repeatability, and reproducibility.

**Duty 1.05: Measurements (required)** - Select and use appropriate Measuring and Test Equipment (M&TE) to measure control system and component conditions in an accurate, repeatable, and reproducible manner.

**Duty 1.06: Coordination (required)** - Coordinate maintenance and communicate with others to ensure maintenance and repairs meet operational needs.

**Duty 1.07: Interpretation (required)** - Read, interpret, communicate, and document action, information and instruction from technical documents.

**Duty 1.08: Planning (bonus)** - Formulate maintenance procedures for control systems and components.

**Duty 1.09: PLC (bonus)** - Create and verify programmable logic controllers (PLC) ladder-style programs.

### Duty Area 2: Test Plans & Equipment

**Duty 2.01: Implementation (required)** - Work through test plans developing test equipment into full production manufacturing equipment.

**Duty 2.02: Improvements (required)** - Interpret Engineer's requests and expectations and developed test plans accordingly.

**Duty 2.03: Safety (required)** - Work with internal safety department to get all test equipment safety approved prior to manufacturing using test equipment.

**Duty 2.04: Test Analysis (required)** - Gather test data to analyze root cause, develop reliability models, and investigative techniques.

**Duty 2.05: Development (bonus)** - Develop criteria for test plans, test execution, and information capture for systems and components as a baseline for operational capability assessments.

**Duty 2.06: Execution (bonus)** - Create and execute test plans using international standards.

### Duty Area 3: Technical Support

**Duty 3.01: Technical Documentation (required)** - Assist in technical documentation for the creation of Service Manuals Served on multiple Product Development teams.

**Duty 3.02: Technical Support (required)** - Provide technical support to engineers during development of manufacturing processes. Improve manufacturing efficiency by analyzing technical requirements, equipment, and tooling.

**Duty 3.03: Technical Support Systems (bonus)** - support online technical support system to reduce response times and increase reliability to improve customer support.

### Employability skills

**Emotional Intelligence (required)** - Consider the feelings and perspectives of others to infuse empathy and thoughtfulness into all interactions.



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**Communication (required)** - Exchange information, feelings and meaning in person or digitally through actions, words, body language, listening and writing to achieve understanding among people.

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**Resourcefulness** - Relentlessly seeking solutions and opportunities.

