

COMPETENCY-BASED OCCUPATIONAL FRAMEWORK FOR REGISTERED APPRENTICESHIP

Industrial Manufacturing Technician

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For more information, contact:

Diana Elliott, PhD, Senior Research Associate, Urban Institute: delliott@urban.org

Robert Lerman, PhD, Institute Fellow, Urban Institute: rlerman@urban.org



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Competency-Based Occupational Frameworks

The Urban Institute, under contract by the U.S. Department of Labor, has worked with employers, subject matter experts, labor unions, trade associations, credentialing organizations and academics to develop Competency-Based Occupational Frameworks (CBOF) for Registered Apprenticeship programs. These frameworks defined the **purpose** of an occupation, the **job functions** that are carried out to fulfill that purpose, the **competencies** that enable the apprentice to execute those job functions well, and the **performance criteria** that define the specific knowledge, skills and personal attributes associated with high performance in the workplace. This organizational hierarchy – Job Purpose – Job Functions – Competencies – Performance Criteria – is designed to illustrate that performing work well requires more than just acquiring discrete knowledge elements or developing a series of manual skills. To perform a job well, the employee must be able to assimilate knowledge and skills learned in various settings, recall and apply that information to the present situation, and carry out work activities using sound professional judgement, demonstrating an appropriate attitude or disposition, and achieving a level of speed and accuracy necessary to meet the employer’s business need.

The table below compares the terminology of Functional Analysis with that of traditional Occupational Task Analysis to illustrate the important similarities and differences. While both identify the key technical elements of an occupation, Functional Analysis includes the identification of behaviors, attributes and characteristics of workers necessary to meet an employer’s expectations.

Framework Terminology	Traditional Task Analysis Terminology
Job Function – the work activities that are carried out to fulfill the job purpose	Job Duties – roles and responsibilities associated with an occupation
Competency – the actions an individual takes and the attitudes he/she displays to complete those activities	Task – a unit of work or set of activities needed to produce some result
Performance Criteria – the specific knowledge, skills, dispositions, attributes, speed and accuracy associated with meeting the employer’s expectations	Sub Task – the independent actions taken to perform a unit of work or a work activity

Although designed for use in competency-based apprenticeship, these Competency-Based Occupational Frameworks also support time-based apprenticeship by defining more clearly and precisely apprentice is expected to learn and do during the allocated time-period.

CBOFs are comprehensive in to encompass the full range of jobs that may be performed by individuals in the same occupation. As employers or sponsors develop their individual apprenticeship programs, they can extract from or add to the framework to meet their unique organizational needs.

Components of the Competency-Based Occupational Framework

Occupational Overview: This section of the framework provides a description of the occupation including its purpose, the setting in which the job is performed and unique features of the occupation.

Work Process Schedule: This section includes the job functions and competencies that would likely be included in an apprenticeship sponsor’s application for registration. These frameworks provide a point of reference that has already been vetted by industry leaders so sponsors can develop new programs knowing that they will meet or exceed the consensus expectations of peers. Sponsors maintain the ability to customize their programs to meet their unique needs, but omission of a significant number of job functions or competencies should raise questions about whether or not the program has correctly identified the occupation of interest.

Cross-cutting Competencies: These competencies are common among all workers, and focus on the underlying knowledge, attitudes, personal attributes and interpersonal skills that are important regardless of the occupation. That said, while these competencies are important to all occupations, the relative importance of some versus is others may change from one occupation to the next. These relative differences are illustrated in this part of the CBOF and can be used to design pre-apprenticeship programs or design effective screening tools when recruiting apprentices to the program.

Detailed Job Function Analysis: This portion of the framework includes considerable detail and is designed to support curriculum designers and trainers in developing and administering the program. There is considerable detail in this section, which may be confusing to those seeking a more succinct, higher-level view of the program. For this reason, we recommend that the Work Process Schedule be the focus of program planning activities, leaving the detailed job function analysis sections to instructional designers as they engage in their development work.

- a. **Related Technical Instruction:** Under each job function appears a list of foundational knowledge, skills, tools and technologies that would likely be taught in the classroom to enable the apprentice’s on-the-job training safety and success.

- b. Performance Criteria: Under each competency, we provide recommended performance criteria that could be used to differentiate between minimally, moderately and highly competent apprentices. These performance criteria are generally skills-based rather than knowledge-based, but may also include dispositional and behavioral competencies.

Using the Competency-Based Occupational Framework to Develop a Registered Apprenticeship Program

When developing a registered apprenticeship program, the Work Process Schedule included in this CBOF provides an overview of the job functions and competencies an expert peer group deemed to be important to this occupation. The Work Process Schedule in this document can be used directly, or modified and used to describe your program content and design as part of your registration application.

When designing the curriculum to support the apprenticeship program – including on the job training and related technical instruction – the information in the Detailed Job Functions section could be helpful. These more detailed job function documents include recommendations for the key knowledge and skill elements that might be included in the classroom instruction designed to support a given job function, and the performance criteria provided under each competency could be helpful to trainers and mentors in evaluating apprentice performance and insuring inter-rater reliability when multiple mentors are involved.

Industrial Manufacturing Technician

Occupational Overview

Occupational Purpose and Context

Entry level Industrial Manufacturing Technicians operate industrial production related equipment, work with manufacturing related tools, and perform work processes related to a wide variety of manufacturing settings. Apprentices will safely learn to set up, operate, monitor, and control production equipment. They will also help improve manufacturing processes and schedules to meet customer requirements. Industrial Manufacturing Technicians provide a baseline foundation for other occupations, including in the job areas of mechatronics and machinists. Industrial Manufacturing Technicians engage in the production of a diverse set of products including, but not limited to, consumer goods, automobiles, medical devices, food products and commercial parts and supplies.

Potential Job Titles

Machine Operator, Welder, Machinist, Assembler, Production Worker, CNC Machinist, CNC Operator, Production Operator, CNC Programmer, Production Assembler, Quality Specialist, Tool and Die Maker, Press Operator, Team assemblers, Cutters, Solderers, Brazers, Inspectors, Testers, Sorters, Samplers and Weighers, Fabricators, Slitter-Operator, Technician, Furnace Technician, Machine Technician, Production Unit Leader, Material Handler, Packaging and Filling Machine Operators.

Attitudes and Behaviors

Industrial Manufacturing Technicians should have well developed critical thinking skills to solve problems quickly, be able to identify errors or inconsistencies in product quality, be able to stay focused and observe the work process despite distractions, be able to combine pieces of information to form general rules or conclusions which they should communicate clearly, and be able to arrange objects or actions in an order or pattern related to a specific rule or set of rules.

Apprenticeship Prerequisites

Some apprenticeship programs may require apprentices to pass drug testing prior to commencing the apprenticeships. Other programs may require apprentices to possess a driver's license.

Occupational Pathways

Industrial Manufacturing Technicians may move from production and assembly jobs to quality assurance positions, production control jobs, inventory management positions and supervisory roles.

Certifications, Licensure and Other Credential Requirements

CREDENTIAL	Offered By	Before, During or After Apprenticeship
Forklift Operator's license		
Commercial Driver's License		
CPR Certification		
Certified Production Technician (CPT)	RTI aligned with MSSC: https://www.msscusa.org/certification/production-certification-cpt/	

Job Functions

JOB FUNCTIONS		Core or Optional	Level
1.	Protect self and other workers from accidents and injuries		
2.	Accurately and properly interpret production specifications in order to set up/plan for production run		

3.	Set up, inspect and adjust production equipment prior to the full production run		
4.	Operate production equipment according to production schedule and protocols and meeting all safety requirements		
5.	Produce products that meet or exceed quality, volume and cost requirements		
6.	Shut down, disassemble, and maintain equipment according to manufacturer's and employer's recommendations and protocols		
7.	Contribute to the business goals of the organization through continuous improvement and professional development		

Stackable Programs

This occupational framework is designed to link to the following additional framework(s) as part of a career laddering pathway.

Stackable Programs		Base or Higher Level	Stacks on top of
1.		Base Program	
2.			
3.			
4.			

Options and Specializations

The following options and specializations have been identified for this occupation. Note that those employed in this occupation work in a variety of industries including food and beverage production, aerospace, automotive, chemical, computer and electronic, materials (such as plastics and rubber, or textiles), tool and die, medical equipment and devices, and defense, among many others. Within each of those industries, there may be specializations pertinent to that industry. The list below includes the most common occupations identified through the Bureau of Labor Statistics and by experts in the field. The Work Process Schedule and individual job function outlines indicate which job functions and competencies were deemed by industry advisors to be optional. Work Process Schedules for specializations are included at the end of this document.

Options and Specializations	Option	Specialization
Machine Operator		
Welder, Machinist		
Assembler		
Production Worker		
CNC Machinist		
CNC Operator		
Production Operator		
CNC Programmer		
Production Assembler		
Quality Specialist		
Tool and Die Maker		
Press Operator		
Team assemblers		
Cutters		
Solderers		
Brazers		
Inspectors		

Testers		
Sorters		
Samplers & Weighers		
Fabricators		
Slitter-operator		
Technician		
Furnace technician		
Machine technician		
Production unit leader		
Material handler		
Packaging & filling machine operators		
Packaging & filling machine operators		

Levels

Industry advisors have indicated that individuals in this occupation may function at different levels, based on the nature of their work, the amount of time spent in an apprenticeship, the level of skills or knowledge mastery, the degree of independence in performing the job or supervisory/management responsibilities. These levels may differ by worksite and can be seen as a path for career advancement depending on the occupation and specialization.

Level	Distinguishing Features	Added Competencies	Added Time Requirements
1	Operator		
2	Troubleshooter		
3	Team Leader		
4	Quality Assurance Specialist		

Work Process Schedule

Job Functions and Competencies

WORK PROCESS SCHEDULE		ONET Code: 17-3029.09	
Industrial Manufacturing Technician		RAPIDS Code: 2031 HY	
JOB TITLE:			
LEVEL:		SPECIALIZATION:	
STACKABLE PROGRAM <input type="checkbox"/> yes <input type="checkbox"/> no			
BASE OCCUPATION NAME:			
Company Contact: Name			
Address:		Phone	Email
Apprenticeship Type: <input type="checkbox"/> Competency-Based <input type="checkbox"/> Time-Based <input type="checkbox"/> Hybrid		Prerequisites	
JOB FUNCTION 1: Protect self and other workers from accidents and injuries			
Competencies	Core or Optional	RTI	OJT
A. Follow employer safety requirements, including the consistent and proper use of protective clothing and personal safety devices	Core		
B. Maintain a clean and orderly workplace, storing chemicals and corrosive or combustible materials properly and disposing of waste products according to company policies and local/federal laws and regulations	Core		
C. Use, store and maintain hand-tools properly to eliminate trip hazards, injury, electrocution or damage	Core		
D. Lift supplies and materials using proper body mechanics and assistive devices, such as hoists, lifts, forklifts and straps	Core		

E. Report and respond promptly, safely and appropriately to emergency or hazard situation and troubleshoot any issues that may arise	Core		
F. Use lock-out/tag-out procedures when working with appropriate tools and equipment	Core		
JOB FUNCTION 2: Accurately and properly interpret production specifications in order to set up/plan for production run			
Competencies	Core or Optional	OJT	RTI
A. Outline operational sequence and steps in production process; identify points of transition between different employees or machines in the production area and impact on downstream production	Core		
B. Identify and obtain the appropriate raw materials for use in production	Core		
C. Obtain the necessary tools for performing the production run (such as tools to set up or modify equipment or to prepare or finish production materials)	Core		
D. Set up or program machine according to manufacturer's and/or employer's specifications, seeking support of a qualified programmer or maintenance technician when utilizing appropriate notification procedures	Core		
E. Set up production run based on recommended run time, production intervals, inspection intervals or production requirements	Core		
F. Coordinate production run with others based on supply requirements, product transition and inspection needs, or employer priorities	Core		
G. Notify appropriate individual of concerns regarding production plans, access to raw materials, run time or potential delays in production timing or production quantity/quality	Core		

JOB FUNCTION 3: Set up, inspect and adjust production equipment prior to the full production run

Competencies	Core or Optional	OJT	RTI
A. Set up production equipment to meet production specifications	Core		
B. Inspect production equipment and surrounding work area	Core		
C. Adjust production equipment to meet and maintain production specifications	Core		
D. Notify appropriate individual of potential problems with equipment or machine function, need for routine maintenance, or concerns about unusual sounds, vibrations, smells or production errors	Core		

JOB FUNCTION 4: Operate production equipment according to production schedule and protocols and meeting all safety requirements

Competencies	Core	OJT	RTI
A. Maintain a neat and orderly work-space ensuring that work area is properly marked or cordoned off and eliminating or flagging potential trip hazards created by production materials or products	Core		
B. Plan an appropriate production schedule taking into account availability of raw materials and production capacity of equipment/machines	Core		
C. Utilize raw materials properly, using protective gear and lifting devices as necessary	Core		
D. Use personal protection devices as necessary and maintain proper ergonomic positioning relative to equipment or machines, raw materials and production products	Core		
E. Document run specifications, adjustments, output and quality assurance checks	Core		
F. Apply emergency stop procedures when necessary to avoid personal injury, damage to machinery or facilities, or spoilage of production run	Core		
G. If emergency stop procedures are employed, begin troubleshooting procedures to fix the equipment, including documenting issues with equipment and the production run			

JOB FUNCTION 5: Produce products that meet or exceed quality, volume and cost requirements

Competencies	Core	OJT	RTI
A. Observe production rate as compared to scheduled or projected rate, quantity or volume, and modify as necessary; notify appropriate individual of potential delays, under-production or potential additional capacity	Core		
B. Monitor production quality, including the inspection of parts and products, and troubleshoot if necessary to improve quality and accuracy	Core		
C. Perform product finishing according to production protocols	Core		
D. Document appropriate information, such as product quality parameters, lot numbers or other relevant information	Core		
E. Clearly and openly communicate concerns about quality or quantity of production with appropriate individual and colleagues in the production chain	Core		
F. Adjust to changes in production requirements of schedule	Core		

JOB FUNCTION 6: Shut down, disassemble, and maintain equipment according to manufacturer's and employer's recommendations and protocols

Competencies	Core	OJT	RTI
A. Shut down equipment according to manufacturer's instructions or employer's protocols	Core		
B. Engage emergency shut-down procedures when necessary	Core		
C. Disassemble equipment and components	Core		
D. Clean up tooling, equipment and work spaces	Core		
E. Sanitize equipment according to applicable standards	Core		
F. Note and troubleshoot needed maintenance or repair services and inform appropriate individual or department, if necessary	Core		
G. Follow preventive maintenance schedule and document	Core		

JOB FUNCTION 7: Contribute to the business goals of the organization through continuous improvement and professional development

Competencies	Core	OJT	RTI
A. Determine the impact of production time, material supply, quality and quantity on the business goals of the employer, its supply chain and its customers	Core		
B. Understand the proprietary nature of materials and how it relates to the business goals and functions	Core		
C. Makes constructive suggestions regarding ways to improve the production process, workplace efficiencies or cost control	Core		
D. Participates in cross training activities to expand knowledge and skill set	Core		
E. Helps others learn about the business, the specifics of production and the connection between production and business goals	Core		
F. Participates in the calculation of costs and revenue, as related to production and business goals	Core		

Specialization

Type of Specialization: _____

JOB FUNCTION 1:		Level
Competencies	OJT	RTI
JOB FUNCTION 2:		Level
Competencies	OJT	RTI
JOB FUNCTION 3:		Level
Competencies	OJT	RTI

JOB FUNCTION 4:		Level
Competencies	OJT	RTI
JOB FUNCTION 5:		Level
Competencies	OJT	RTI

Related Technical Instruction Plan

COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	
COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	
COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	

COURSE NAME	Course Number
	Hours

LEARNING OBJECTIVES

[Empty area for Learning Objectives]

COURSE NAME	Course Number
	Hours

LEARNING OBJECTIVES

[Empty area for Learning Objectives]

Cross-Cutting Competencies

COMPETENCY**		0	1	2	3	4	5	6	7	8
Personal Effectiveness	Interpersonal Skills	0	1	2	3	4	5	6	7	8
	Integrity	0	1	2	3	4	5	6	7	8
	Professionalism	0	1	2	3	4	5	6	7	8
	Initiative	0	1	2	3	4	5	6	7	8
	Dependability and Reliability	0	1	2	3	4	5	6	7	8
	Adaptability and Flexibility	0	1	2	3	4	5	6	7	8
	Lifelong Learning	0	1	2	3	4	5	6	7	8
Academic	Reading	0	1	2	3	4	5	6	7	8
	Writing	0	1	2	3	4	5	6	7	8
	Mathematics	0	1	2	3	4	5	6	7	8
	Science & Technology	0	1	2	3	4	5	6	7	8
	Communication	0	1	2	3	4	5	6	7	8
	Critical and Analytical Thinking	0	1	2	3	4	5	6	7	8
	Basic Computer Skills	0	1	2	3	4	5	6	7	8
Workplace	Teamwork	0	1	2	3	4	5	6	7	8
	Customer Focus	0	1	2	3	4	5	6	7	8
	Planning and Organization	0	1	2	3	4	5	6	7	8
	Creative Thinking	0	1	2	3	4	5	6	7	8
	Problem Solving & Decision Making	0	1	2	3	4	5	6	7	8
	Working with Tools & Technology	0	1	2	3	4	5	6	7	8
	Checking, Examining & Recording	0	1	2	3	4	5	6	7	8
	Business Fundamentals	0	1	2	3	4	5	6	7	8
	Sustainable	0	1	2	3	4	5	6	7	8
	Health & Safety	0	1	2	3	4	5	6	7	8

**Cross-cutting competencies are defined in the Competency Model Clearinghouse:

<https://www.careeronestop.org/CompetencyModel/competency-models/building-blocks-model.aspx>

Cross-Cutting Competencies identify transferable skills – sometimes called “soft skills” or “employability skills” – that are important for workplace success, regardless of a person’s occupation. Still, the relative importance of specific cross-cutting competencies differs from occupation to occupation. The Cross-Cutting Competencies table, above, provides information about which of these competencies is most important to be successful in a particular occupation. This information can be useful to employers or intermediaries in screening and selecting candidates for apprenticeship programs, or to pre-apprenticeship providers that seek to prepare individuals for successful entry into an apprenticeship program.

The names of the cross-cutting competencies come from the U.S. Department of Labor’s Competency Model Clearinghouse and definitions for each can be viewed at <https://www.careeronestop.org/CompetencyModel/competency-models/building-blocks-model.aspx>

The scoring system utilized to evaluate the level of competency required in each cross cutting skill aligns with the recommendations of the Lumina Foundation’s Connecting Credentials Framework. The framework can be found at: <http://connectingcredentials.org/wp-content/uploads/2015/05/ConnectingCredentials-4-29-30.pdf>.

Detailed Job Functions

JOB FUNCTION 1: Protect self and other workers from accidents and injuries

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • OSHA requirements for personal and occupational safety • Methods for protecting against the transmission of blood borne pathogens • First aid procedures for cuts, burns, fainting, electrocution, heart attack, etc. • Principles of electricity, current and methods to protect against electrocution and electrical fire. • Methods for working safely in confined spaces • Principles and techniques of first-aid and emergency response • Principles of hazards identification and mitigation • Location, use and interpretation of Material Safety Data Sheets • Risk assessment techniques and protocols • Classification of fire extinguishers • Basic principles of electricity and conductivity 	<ul style="list-style-type: none"> • Lift and move materials properly • Perform lock-out/tag-out procedures • Inspection of parts, equipment, safety devices, tools and production products • Identifying and reducing/eliminating potential hazards • Maintaining situational awareness • Performing risk assessment and risk mitigation activities • Using fire extinguisher to put out fire 	<ul style="list-style-type: none"> • Protective equipment - safety glasses, hard hat, hearing protection devices, safety footwear, fall arrest equipment • Harnesses and lifts • Forklift • Hand tools • Fire extinguishers/blankets • Eye Wash station • Emergency shower

	Core or Optional	Level
Competency A: Follow employer safety requirements, including the consistent and proper use of protective clothing and personal safety devices		
PERFORMANCE CRITERIA		
1. Wears protective eye wear, foot wear, hearing protection devices, etc. as necessary	Core	
2. Observes employer's requirements for preventing entrapment injuries (i.e. keeping hair pulled back, refraining from wearing ties or loose clothing, etc.)	Core	
3. Identifies location of first-aid equipment, including first-aid kits, safety showers, eyewash stations, fire blankets, defibrillators, and related equipment and utilizes promptly and appropriately when necessary	Core	
4. Maintains situational awareness, especially as materials are being moved throughout the building/plant	Core	
5. Follows other applicable OSHA or employer safety regulations	Core	
6. Adheres to employer fire-extinguishing procedures	Core	
7. Uses personal fall arrest equipment when working from an elevated position	Core	
Competency B: Maintain a clean and orderly workplace, storing chemicals and corrosive or combustible materials properly and disposing of waste products according to company policies and local/federal laws and regulations		
PERFORMANCE CRITERIA		
1. Maintain a safe and organized work area	Core	
2. Reviews Material Safety Data Sheets (MSDS) prior to working with hazardous substances	Core	
3. Follows employer-specific safety procedures for identifying and addressing potential hazards	Core	
4. Stores raw and finished materials, as well as chemicals, lubricants, and other substances properly	Core	
5. Disposes of waste products properly and according to OSHA, EPA and company policies	Core	
6. Notifies appropriate individuals immediately in the event of a spill, and reacts swiftly to deploy containment/protection strategies	Core	

7. Operates safely in confined spaces, ensuring that proper ventilation is in place and that appropriate devices are in place to prevent collapse	Core	
Competency C: Use, store and maintain all tools properly to eliminate trip hazards, injury, electrocution or damage		
PERFORMANCE CRITERIA		
1. Obtains appropriate all tools to prepare for job	Core	
2. Examines all tools for integrity and functionality – ensures electrical cords are in good condition, checks locks on tools with interchangeable parts, ensures moving parts are appropriately lubricated and/or cleaned, makes sure that battery powered tools are charged	Core	
3. Uses tools properly, noting instances of malfunction and notifying appropriate person when tool maintenance, repair or replacement is anticipated or needed	Core	
4. Never leaves tools sitting in a place that could pose a trip hazard or other injury hazard (such as on the edge of high shelves); engages locking devices and protective covers on tools where available	Core	
5. Cleans tools after use	Core	
6. Puts tools back to the proper location when finished with them	Core	
Competency D: Lift supplies and materials using proper body mechanics and assistive devices, such as hoists, lifts, forklifts and straps		
PERFORMANCE CRITERIA		
1. Uses proper body mechanics when lifting materials	Core	
2. Selects proper lifting assistance device and inspects for integrity	Core	
3. Secures load properly	Core	
4. Cordons off-loading area to prevent worker injury	Core	
5. Lifts and moves load properly	Core	
6. Operates forklift safely and moves loads without damage	Core	
7. Utilizes safety harnesses when climbing	Core	
8. Avoids creating trip, chemical, or environmental hazards when moving materials	Core	

Competency E: Report and respond promptly, safely and appropriately to emergency or hazard situation and troubleshoot any issues that may arise		
PERFORMANCE CRITERIA		
1. Removes self and others from immediate area in the event of a chemical spill, accidental release or other hazard situation	Core	
2. Notifies appropriate individuals when a hazardous situation occurs	Core	
3. Identifies sources of potential hazards and takes action to mitigate them in advance	Core	
4. Uses appropriate containment and protective devices to stop spread of hazard	Core	
5. Responds with appropriate emergency or first-aid equipment	Core	
6. Prevent and respond to fires using appropriate fire extinguisher	Core	
7. Utilize or assist others in using fire-blanket, emergency shower or eyewash station when necessary	Core	
8. Uses CPR or emergency first-aid procedures to sustain life while awaiting first responders	Core	
Competency F: Use lock-out/tag-out procedures when working with appropriate tools and equipment		
PERFORMANCE CRITERIA		
1. Properly shuts off equipment based on manufacturer's or employer's protocol	Core	
2. Identifies and isolates hazardous energy sources and renders them inoperable prior to performing equipment maintenance	Core	
3. Locks down and tags equipment to prevent accidental use	Core	
4. Confirms that maintenance is complete prior to repowering equipment	Core	
5. Repowers and starts equipment according to manufacturer's or employer's protocol	Core	

JOB FUNCTION 2: Accurately and properly interpret production specifications in order to set up/plan for production run

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • CNC programming • Function and use of mechanical and visual controls • Operational sequencing of production • Methods for identifying raw materials • Methods for identifying supply requirements, product transition, and inspection needs • Manufacturer and employer specifications • Production schedules • Principles of hazards identification and mitigation • Risk assessment techniques and protocols • Material suppliers and their roles and responsibilities • Production capacity of machines 	<ul style="list-style-type: none"> • Lift and move materials properly • Inspection of parts, equipment, safety devices, tools and production products • Identifying and reducing/eliminating potential hazards • Maintaining situational awareness • Performing risk assessment and risk mitigation activities • Clear thinking and speaking 	<ul style="list-style-type: none"> • Harnesses and lifts • Forklift • Hand tools • Production machinery

	Core or Optional	Level
Competency A: Outline operational sequence and steps in production process; identify points of transition between different employees or machines in the production area and impact on downstream production		
PERFORMANCE CRITERIA		
1. Follows operational sequence instructions and diagrams	Core	
2. Follows material requirements when selecting and utilizing raw materials	Core	
3. Follows tooling requirements in preparing and processing materials	Core	

4. Follows inspection requirements and guidelines	Core	
5. Follows machine set-up instructions (such as programming)	Core	
Competency B: Identify and obtain the appropriate raw materials for use in production		
PERFORMANCE CRITERIA		
1. Helps ensure raw material flow to completed product	Core	
2. Orders materials from appropriate supplier	Core	
3. Documents the process of obtaining raw materials	Core	
4. Obtains raw materials	Core	
Competency C: Obtain the necessary tools for performing the production run (such as tools to set up or modify equipment or to prepare or finish production materials)		
PERFORMANCE CRITERIA		
1. Gathers appropriate handtools according to needs of production run/finishing	Core	
2. Inspects tools for damage, functionality and integrity	Core	
3. Utilizes well-performing tools and follows procedures for replacing or servicing malfunctioning or broken tools	Core	
4. Ensures that hand tools – including during use - are located where they do not pose a trip hazard or other risk	Core	
Competency D: Set up or program machine according to manufacturer's and/or employer's specifications, seeking support of a qualified programmer or maintenance technician when utilizing appropriate notification procedures		
PERFORMANCE CRITERIA		
1. Selects and assembles tooling, fixtures and equipment according to the operational method sheet and/or employer guide	Core	
2. Installs proper tooling	Core	
3. Verifies tooling	Core	
4. Installs CNC programming	Core	

5. Verifies CNC programming	Core	
6. Performs mechanical set-up	Core	
7. Performs ergonomic set-up, such as proper work heights, weight limits, lifting techniques, appropriate lighting, etc.	Core	
8. Interprets visual controls accurately	Core	
9. Adjusts set-up as needed	Core	
10. Checks set-up and installation with qualified programmer and/or maintenance technician both during set-up and once completed	Core	
11. Notifies supervisor when assistance from qualified programmer and/or maintenance technician is needed	Core	
Competency E: Set up production run based on recommended run time, production intervals, inspection intervals or production requirements		
PERFORMANCE CRITERIA		
1. Acquire the production schedule(s) for the piece(s) of equipment to be operated	Core	
2. Interpret the production schedule accurately	Core	
3. Follows standard work instructions properly	Core	
4. Schedules production runs within the parameters of machine capacity	Core	
Competency F: Coordinate production run with others based on supply requirements, product transition and inspection needs, or employer priorities		
PERFORMANCE CRITERIA		
1. Works with other employees to ensure smooth operation of the production schedule(s) for the piece(s) of equipment to be operated	Core	
2. Informs others of the production schedule(s) for the piece(s) of equipment to be operated	Core	
3. Incorporates feedback based on input from other employees, including when priorities shift and production runs must be altered	Core	

Competency G: Notify appropriate individuals of concerns regarding production plans, access to raw materials, run time or potential delays in production timing or production quantity/quality		
PERFORMANCE CRITERIA		
1. Determine the sufficiency of production plans, the adequacy of raw materials, the run time and possibility of delays in production time or production quantity/quality	Core	
2. Gauge ability to remedy this/these situation(s)	Core	
3. Notify supervisor for need to remedy this/these situation(s) if unable to do so individually	Core	

JOB FUNCTION 3: Set up, inspect and adjust production equipment prior to the full production run

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • CNC programming • Production equipment function and capacity • Purpose of mechanical and visual controls • Visual inspection techniques • Error tolerance levels • Product specifications • Methods for adjusting production run to respond to production errors or insufficiencies 	<ul style="list-style-type: none"> • Set-up and installation • Critical thinking • Inspection of parts, equipment, safety devices, tools and production products • Identifying and reducing/eliminating potential hazards • Maintaining situational awareness • Maintaining a clean and safe work area • Performing risk assessment and risk mitigation activities • Clear thinking and speaking 	<ul style="list-style-type: none"> • Production equipment • Mechanical and visual controls • Tooling, fixtures, and equipment

	Core or Optional	Level
Competency A: Set up production equipment to meet production specifications		
PERFORMANCE CRITERIA		
1. Select and assemble tooling, fixtures and equipment according to the operational method sheet	Core	
2. Install tooling	Core	
3. Verify tooling offsets	Core	
4. Install CNC program	Core	
5. Verify CNC program	Core	
6. Perform mechanical set-up	Core	
7. Perform ergonomic set-up, such as proper work heights, weight limits, lifting techniques, appropriate lighting, etc.	Core	

8. Interpret visual controls accurately	Core	
9. Adjust set-up as needed	Core	
Competency B: Inspect production equipment and surrounding work area		
PERFORMANCE CRITERIA		
1. Visually inspects tooling, fixtures and equipment are properly assembled, installed and in working order	Core	
2. Visually inspects surrounding work area to ensure it is free of hazards, such as spills, obstructions, and loose wires	Core	
3. Ensures work is performed in designated area and does not obstruct adjacent traffic patterns and work areas	Core	
4. Ensures proper ergonomic set-up	Core	
Competency C: Adjust production equipment to meet and maintain production specifications		
PERFORMANCE CRITERIA		
1. Adjusts equipment and tooling to maintain product specifications	Core	
Competency D: Notify appropriate individual of potential problems with equipment or machine function, need for routine maintenance, or concerns about unusual sounds, vibrations, smells or production errors		
PERFORMANCE CRITERIA		
1. Observes equipment for unusual sounds, vibrations or smells	Core	
2. Documents issues or potential problems	Core	
3. Notifies supervisor or appropriate individual of need for repairs	Core	

JOB FUNCTION 4: Operate production equipment according to production schedule and protocols and meeting all safety requirements

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Product cycle times, set-ups and tooling • Employer's standard operating procedures • Knowledge of raw materials and raw material flow • Dimensional, visual, and mechanical inspection • OSHA requirements for personal and occupational safety • Risk assessment techniques and protocols • Principles of hazards identification and mitigation 	<ul style="list-style-type: none"> • Lift and move materials properly • Perform lock-out/tag-out procedures • Inspection of parts, equipment, safety devices, tools and production products • Identifying and reducing/eliminating potential hazards • Maintaining situational awareness • Performing risk assessment and risk mitigation activities • Clear thinking and speaking 	<ul style="list-style-type: none"> • Production equipment • Mechanical and visual controls • Tooling, fixtures, and equipment • Protective equipment - safety glasses, hard hat, hearing protection devices, safety footwear, fall arrest equipment • Forklifts and cranes

	Core or Optional	Level
Competency A: Maintain a neat and orderly work-space ensuring that work area is properly marked or cordoned off and eliminating or flagging potential trip hazards created by production materials or products		
PERFORMANCE CRITERIA		
1. Follow the employer's standard operating procedures for cleaning tools, equipment and work spaces properly	Core	
2. Follow the employer's standard operating procedures for sanitizing equipment properly	Core	
3. Follow industry specific safety procedures around electricity, machines, equipment and manufacturing processes	Core	
4. Work to minimize potential hazards	Core	

Competency B: Plan an appropriate production schedule taking into account availability of raw materials and production capacity of equipment/machines		
PERFORMANCE CRITERIA		
1. Acquires the production schedule(s) for the piece(s) of equipment to be operated by the apprentice	Core	
2. Interprets the production schedule accurately	Core	
3. Follows standard work instructions properly	Core	
4. Demonstrates comprehension of production capacity for machine(s)	Core	
5. Sets up production equipment to meet production specifications	Core	
6. Operates equipment safely and efficiently	Core	
7. Monitors and inspects products and processes	Core	
Competency C: Utilize raw materials properly, using protective gear and lifting devices as necessary		
PERFORMANCE CRITERIA		
1. Identifies and explains raw material flow to completed product	Core	
2. Identifies and explains the work order system	Core	
3. Uses proper material movement process (ex. forklift, crane, etc.)	Core	
4. Wears protective eye wear, foot wear, hearing protection devices, etc. as necessary	Core	
Competency D: Use personal protection devices as necessary and maintain proper ergonomic positioning relative to equipment or machines, raw materials and production products		
PERFORMANCE CRITERIA		
1. Uses and explains the purpose for required personal protective equipment, including but not limited to head, hand, ear, eye, foot, and body protection	Core	
2. Wears protective eye wear, foot wear, hearing protection devices, etc. as necessary	Core	

Competency E: Document run specifications, adjustments, output and quality assurance checks		
PERFORMANCE CRITERIA		
1. Explains the quality program(s) used by employer, including roles and responsibilities of the departments involved	Core	
2. Explains the purpose, steps and expected results of the product inspection process, and the responsible parties	Core	
3. Explains the tools required to perform the inspection process	Core	
4. Verifies and prepare inspection and documentation procedures; update and maintain as needed	Core	
5. Conducts dimensional, visual, and mechanical inspection according to employer documentation and procedures	Core	
6. Verifies conformance to applicable procedure and other approved documents	Core	
7. Explains characteristics of a non-compliant part and the effects on overall quality, including cost and rework	Core	
8. Properly records results of inspection	Core	
9. Provides acceptance or rejection	Core	
10. Moves compliant parts to next operation or shipment	Core	
11. Tags parts that are non-conforming, if required	Core	
12. Identifies root cause of non-conforming product	Core	
13. Recommends corrective action(s)	Core	
Competency F: Apply emergency stop procedures when necessary to avoid personal injury, damage to machinery or facilities, or spoilage of production run		
PERFORMANCE CRITERIA		
1. Follows the employer's standard operating procedures for shutting down equipment properly	Core	
2. Identifies and isolates hazardous conditions.	Core	
3. Locks down and tags equipment to prevent accidental use	Core	
4. Follows industry specific safety procedures around electricity, machines, equipment and manufacturing processes	Core	
5. Minimizes potential hazards	Core	
6. Restarts equipment once situation has been remedied	Core	

Competency G: If emergency stop procedures are employed, begin troubleshooting procedures to fix the equipment, including documenting issues with equipment and the production run		
PERFORMANCE CRITERIA		
1. Notifies appropriate individuals when emergency stop procedure is employed	Core	
2. Identifies sources of potential hazards and takes action to mitigate them in advance	Core	
3. Uses appropriate containment and protective devices to stop spread of hazard	Core	
4. Documents issues with production run thoroughly and completely	Core	
5. Notifies appropriate individual of issues with the equipment and production run	Core	

JOB FUNCTION 5: Produce products that meet or exceed quality, volume and cost requirements

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> Product cycle times, set-ups and tooling Employer's standard operating procedures Production quality standards Inspection and documentation procedures Proper knowledge of tooling Production schedule Dimensional, visual, and mechanical inspection Proper product performance Organization's quality assurance and quality control plan Business impact to employer and customer of production products that do not meet specifications 	<ul style="list-style-type: none"> Inspection of parts, equipment, safety devices, tools and production products Identifying and reducing/eliminating potential hazards Maintaining situational awareness Performing risk assessment and risk mitigation activities Clear thinking and speaking 	<ul style="list-style-type: none"> Production equipment Hand tools Mechanical tools Hard gauges Electronic gauges Automated testing equipment Measuring devices Finishing tools

	Core or Optional	Level
Competency A: Observe production rate as compared to scheduled or projected rate, quantity or volume, and modify as necessary; notify appropriate individual of potential delays, under-production or potential additional capacity		
PERFORMANCE CRITERIA		
1. Acquires the production schedule(s) for the piece(s) of equipment to be operated by the apprentice	Core	
2. Interprets the production schedule accurately	Core	
3. Follows standard work instructions properly	Core	
4. Demonstrates comprehension of production capacity for machine(s)	Core	
5. Sets up production equipment to meet production specifications	Core	
6. Inspects production equipment and surrounding work area	Core	

7. Adjusts production equipment to meet and maintain production specifications	Core	
8. Monitors rate of production as compared to schedule	Core	
9. Notifies supervisor of potential delays, under-production or potential additional capacity	Core	
Competency B: Monitor production quality, including the inspection of parts and products, and troubleshoot if necessary to improve quality and accuracy		
PERFORMANCE CRITERIA		
1. Conducts dimensional, visual, and mechanical inspection according to employer documentation and procedures	Core	
2. Uses appropriate measuring devices to measure component specifications	Core	
3. Compares measured parameters with protocol/specifications to ensure accuracy	Core	
4. Adjusts program or materials to correct production errors	Core	
5. Notifies supervisor if specifications and error tolerance limits cannot be reached	Core	
Competency C: Perform product finishing according to production protocols		
PERFORMANCE CRITERIA		
1. Properly selects and uses the most appropriate tools to perform product finishing tasks	Core	
2. Uses these tools to ensure proper product finishing	Core	
3. Visually and mechanically inspects finished product to ensure that it conforms to specifications	Core	
Competency D: Document appropriate information, such as product quality parameters, lot numbers or other relevant information		
PERFORMANCE CRITERIA		
1. Maintains accurate and complete records of production run	Core	
2. Uses appropriate documentation when machine servicing is needed	Core	
3. Documents unusual occurrences or abnormal machine performance	Core	

Competency E: Clearly and openly communicate concerns about quality or quantity of production with appropriate individual and colleagues in the production chain		
PERFORMANCE CRITERIA		
1. Assist colleagues in performing product finishing, when necessary	Core	
2. Tags parts that are non-conforming, if required	Core	
3. Identifies root cause of non-conforming product	Core	
4. Discusses concerns about the product with appropriate supervisor and colleagues	Core	
Competency F: Adjust to changes in production requirements of schedule		
PERFORMANCE CRITERIA		
1. Interprets and explains to colleagues the steps needed to achieve planned volume for quality and yield	Core	
2. Calculates whether or not sufficient raw materials are available to accommodate adjustment in production volume or schedule	Core	
3. Determines and communicates impact of adjustments to other projects or production runs	Core	
4. Makes necessary adjustments to machine or supplies to accommodate changes	Core	
5. Notifies supervisor of concerns about inability to meet new requirements or schedule	Core	

JOB FUNCTION 6: Shut down, disassemble, and maintain equipment according to manufacturer’s and employer’s recommendations and protocols

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> Principles of electricity, current and methods to protect against electrocution and electrical fire. OSHA requirements for personal and occupational safety First aid procedures for cuts, burns, fainting, electrocution How to assemble and disassemble equipment Employer standard operating procedure Methods of cleaning and sanitizing equipment Understand hierarchy at work location Maintain and document records of machine repairs Methods for preventing transmission of disease (for food and medical production companies) Purpose and types of lubricants and coatings used to maintain equipment and machines Importance of preventive maintenance Importance of record-keeping Preventive maintenance schedules 	<ul style="list-style-type: none"> Perform lock-out/tag-out procedures Read and interpret electrical diagrams and manufacturer’s equipment manuals. Use hand tools to assemble and disassemble machine parts. Interpret assembly diagrams and instructions. Manual dexterity 	<ul style="list-style-type: none"> Production equipment Hand tools Mechanical tools Personal protective equipment – safety glasses, gloves, etc.

	Core or Optional	Level
Competency A: Shut down equipment according to manufacturer's instructions or employer's protocols		
PERFORMANCE CRITERIA		
1. Follows the employer's standard operating procedures for shutting down equipment properly	Core	
2. Identifies and isolates hazardous conditions	Core	
3. Locks down and tags equipment to prevent accidental use	Core	
4. Follows industry specific safety procedures around electricity, machines, equipment and manufacturing processes	Core	
5. Minimizes potential hazards	Core	
Competency B: Engage emergency shut-down procedures when necessary		
PERFORMANCE CRITERIA		
1. Adheres to employer's emergency/hazard response procedures	Core	
2. Identifies location of first-aid materials	Core	
3. Follows other applicable OSHA or employer safety regulations	Core	
4. Adheres to employer fire-extinguishing procedures	Core	
5. Uses personal fall arrest equipment when working from an elevated position	Core	
6. Recommend corrective action(s)	Core	
Competency C: Disassemble equipment and components		
PERFORMANCE CRITERIA		
1. Follows the employer's standard operating procedures for disassembling equipment properly	Core	
2. Follows industry specific safety procedures around electricity, machines, equipment and manufacturing processes	Core	
3. Minimizes potential hazards	Core	

Competency D: Clean up tooling, equipment and work spaces		
PERFORMANCE CRITERIA		
1. Follows the employer's standard operating procedures for cleaning tools, equipment and work spaces properly	Core	
2. Follows industry specific safety procedures around electricity, machines, equipment and manufacturing processes	Core	
3. Minimizes potential hazards	Core	
Competency E: Sanitize equipment according to applicable standards		
PERFORMANCE CRITERIA		
1. Follows the employer's standard operating procedures for sanitizing equipment properly	Core	
2. Follows industry specific safety procedures around electricity, machines, equipment and manufacturing processes	Core	
3. Minimizes potential hazards	Core	
Competency F: Note and troubleshoot needed maintenance or repair services and inform appropriate individual or department, if necessary		
PERFORMANCE CRITERIA		
1. Informs supervisor of equipment malfunctions	Core	
2. Informs proper maintenance personnel of equipment malfunctions	Core	
3. Records equipment malfunctions in log book	Core	
Competency G: Follow preventive maintenance schedule and document		
PERFORMANCE CRITERIA		
1. Uses manufacturers service manual to identify proper service cycles and replacement parts	Core	
2. Tests safety equipment and features	Core	
3. Maintains records regarding machine repairs	Core	
4. Maintains records of machine servicing	Core	
5. Predicts life cycle of wear parts using maintenance data	Core	

JOB FUNCTION 7: Contribute to the business goals of the organization through continuous improvement and professional development

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Product life cycle • Cost-benefit analysis • SWOT analysis • Six sigma goals • Upstream and downstream product development • Production process, cost controls, production time, and product quality • Product business development 	<ul style="list-style-type: none"> • Maintaining situational awareness • Performing risk assessment and risk mitigation activities • Clear thinking and speaking • Critical analysis • Business acumen • Working well in a team 	None

	Core or Optional	Level
Competency A: Determine the impact of production time, material supply, quality and quantity on the business goals of the employer, its supply chain and its customers		
PERFORMANCE CRITERIA		
1. Helps calculate production time, quality and quantity; conducts SWOT analyses	Core	
2. Helps determine the impact of these activities on competitive advantage and the global economy	Core	
3. Looks at methods of continuous improvement to increase production time, quantity, and quality	Core	
4. Gauges the cost of repair and rework	Core	
5. Conduct a cost-benefit analysis	Core	
6. Checks the impact of changes on the supply line	Core	

Competency B: Understand the proprietary nature of materials and how it relates to the business goals and functions		
PERFORMANCE CRITERIA		
1. Identifies how the development of materials relate to business development goals	Core	
Competency C: Makes constructive suggestions regarding ways to improve the production process, workplace efficiencies or cost control		
PERFORMANCE CRITERIA		
1. Identifies lean manufacturing and six sigma goals that can be used to improve the manufacturing process	Core	
2. Looks at the potential implications of using upstream versus downstream processes in acquiring materials	Core	
3. Helps to manage individual or team expectations	Core	
4. Applies appropriate corrections based on team input	Core	
Competency D: Participates in cross training activities to expand knowledge and skill set		
PERFORMANCE CRITERIA		
1. Works with others at site to learn about the production process, cost controls, production time, and product quality	Core	
2. Expands skill set by working and speaking with others in their specific job function	Core	
Competency E: Helps others learn about the business, the specifics of production and the connection between production and business goals		
PERFORMANCE CRITERIA		
1. Clearly explains the findings from the business development and production design to other employees	Core	
2. Helps design manuals to impart knowledge to other employees	Optional	
3. Participates in workshops and discussions to explain knowledge to others	Core	
4. Appropriately communicates findings to supervisor	Core	

Competency F: Participates in the calculation of costs and revenue, as related to production and business goals		
PERFORMANCE CRITERIA		
1. Helps determines the production costs of product by calculating personnel, equipment, and raw material usage	Core	
2. Works to determine marginal revenue of product to view how each product is profitable or unprofitable	Optional	
3. Provides information to supervisor	Core	

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2100 M Street NW
Washington, DC 20037

www.urban.org