

COMPETENCY-BASED OCCUPATIONAL FRAMEWORK FOR REGISTERED APPRENTICESHIP

Woodwork Manufacturing Specialist

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Competency-Based Occupational Frameworks

The Urban Institute, under contract with the US Department of Labor, has worked with employers, subject matter experts, labor unions, trade associations, credentialing organizations, and academics to develop Competency-Based Occupational Frameworks (CBOFs) for Registered Apprenticeship programs. These frameworks define 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 judgment, 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	Subtask: the independent actions taken to perform a unit of work or 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 what an apprentice is expected to learn and do during the allocated time period.

CBOFs are comprehensive 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 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. The detail in this section 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 the Detailed Job Functions section could be helpful. These more detailed job function documents include recommendations for the key knowledge and skills 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.

Woodwork Manufacturing Specialist Occupational Overview

Occupational Purpose and Context

Woodwork manufacturing specialists work in the commercial and residential industries of the private sector. These workers operate computer-controlled machines or robots and/or highly-skilled bench operations to perform several machine functions on wood pieces. They are critical to ensuring the smooth operation of the controlled manufacturing equipment at their worksite. They help make sure that industrial machinery and equipment and the quality of hardware they produce are maintained at the highest possible level, ensuring the productivity and safety of the entire production team. They also oversee quality assurance, verification, and inspection of equipment.

Potential Job Titles

Woodworker; Furniture Maker; Moulder Operator; Wood Miller; Production Millworker; Machine Operator; Machine Set-Up, Operator; Machinist; Millwork Manufacturing Specialist; Cabinet Maker; CNC Operator; CAD Operator/Drafter; Millwork Installer; Bench Carpenter; Estimator.

Attitudes and Behaviors

Woodwork manufacturing specialists should have well developed critical thinking skills to solve problems quickly; display strong interpersonal skills including good listening skills, cultural sensitivity, and teamwork; understand the implications of new information and how to use it in problem solving and decisionmaking; pay attention to specifics or details and record information and stay focused despite distractions; combine pieces of information to form general rules or conclusions; arrange objects or actions in an order or pattern related to a specific rule or set of rules; and work across different departments or positions.

Apprenticeship Prerequisites

Apprentices must have a high school diploma or equivalent. They must also pass physical agility assessments before beginning work. Some apprenticeship programs may require apprentices to pass drug testing before commencing the apprenticeships.

Occupational Pathways

Woodwork manufacturing specialists may move from production and assembly jobs to quality assurance positions, production control jobs, inventory management positions, sales and marketing positions, project management jobs, and supervisory roles.

Certifications, Licensure, and Other Credential Requirements

Credential	Offered by	Before, During, or After Apprenticeship
Measurement, Materials, and Safety Level I	NIMS	During
Job Planning, Benchwork, and Layout Level I	NIMS	During
Drill Press Skills Level I	NIMS	During

Job Functions

Job Functions	Core or Optional
1. Communicates effectively and professionally with colleagues, both internally and externally	Core
2. Demonstrates both effective time and project management	Core
3. Protects self and other workers from accidents and injuries	Core
4. Demonstrates basics of measurement, materials, and safety of products and parts	Core
5. Uses print reading and CAD software to develop shop drawings	Core
6. Shows competency for millwork techniques and fabrication	Core
7. Performs operation and maintenance of CNC and mechatronics operations	Optional
8. Performs coating/finishing operations	Core
9. Performs wood-processing operations	Core
10. Problem solves, diagnoses, and troubleshoots effectively	Core

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. n/a		
2.		
3.		

Options and Specializations

The following options and specializations have been identified for this occupation. 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
Woodworker		
Furniture Maker		
Moulder Operator		
Wood Miller		
Production Millworker		
Machine Operator		
Machine Set-Up, Operator		
Machinist		
Millwork Manufacturing Specialist		
Cabinet Maker		
CNC Operator		
CAD Operator/Drafter		
Millwork Installer		

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, and the degree of independence in performing the job or supervisory/management responsibilities.

Level	Distinguishing Features	Added Competencies	Added Time Requirements
n/a			

Work Process Schedule

WORK PROCESS SCHEDULE		O*NET-SOC Code: 51-7042.00	
Woodwork Manufacturing Specialist (Existing Title: Machine Setter (Woodwork))		RAPIDS Code: 0321CB	
Anticipated completion of apprenticeship program is three (3) years			
Job Title:			
Level:		Specialization:	
Stackable Program: <input type="checkbox"/> Yes <input type="checkbox"/> No			
Base Occupation Name:			
Company Contact:			
Address:		Phone:	Email:
Apprenticeship Type: <input checked="" type="checkbox"/> Competency-based <input type="checkbox"/> Time-based <input type="checkbox"/> Hybrid		Prerequisites:	
Job Function 1: Communicates effectively and professionally with colleagues, both internally and externally			
Competencies	Core or Optional	RTI	OJT
A. Reliably follows others' instructions	Core		
B. Willingly asks questions about things not fully understood	Core		
C. Works with due regard for others' safety	Core		
D. Demonstrates a working knowledge of the company policy manual	Core		
E. Establishes a system of maintaining appropriate notes and reminders and completes any required logs, calibration records, etc.	Core		
F. Ensures proper communications between previous and next shifts, with operations and supervision	Core		
G. Identifies problems and changes that could lead to problems through the exchange of information with operators, supervisors, and others	Core		

H. Establishes trust and rapport with operators, supervisors, and others	Core		
Job Function 2: Demonstrates both effective time and project management			
Competencies	Core or Optional	RTI	OJT
A. Develops a project plan and tracks progress against the plan, flagging issues and delays as they occur	Core		
B. Develops project contingency plans to respond to unexpected delays and costs, and professionally communicates with customers about alternatives as needed	Core		
C. Verifies in-field measurements against architectural drawings to produce accurate shop drawings	Core		
D. Estimates project costs and timelines, identifying project assumptions and resource costs (supplies, labor)	Optional		
E. Computes material quantities, sizes, weights, and costs	Optional		
F. Develops a project budget based on an approved quote and tracks project progress against the budget, flagging issues and unexpected costs as they arise	Optional		
G. Develops a professional quote for a project and shares with a potential customer for review and approval	Optional		
Job Function 3: Protects self and other workers from accidents and injuries			
Competencies	Core or Optional	RTI	OJT
A. Follows employer safety requirements, including the consistent and proper use of protective clothing and personal safety devices	Core		
B. Maintains 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. Safely uses, stores, and maintains all tools/equipment properly to eliminate injury, electrocution, trip hazards, or damage	Core		
D. Lifts supplies and materials using proper body mechanics and assistive devices, such as hoists, lifts, forklifts, and straps	Core		
E. Reports and responds promptly, safely, and appropriately to emergency or hazard situations and troubleshoots any issues that may arise	Core		
F. Uses lock-out/tag-out procedures when working with appropriate tools and equipment	Core		

Job Function 4: Demonstrates basics of measurement, materials, and safety of products and parts			
Competencies	Core or Optional	RTI	OJT
A. Uses and applies contextual mathematics	Core		
B. Demonstrates layout processes	Core		
C. Uses proper material-processing techniques	Core		
D. Understands material properties	Core		
Job Function 5: Uses print reading and CAD software to develop shop drawings			
Competencies	Core or Optional	RTI	OJT
A. Identifies symbols, notations, and lines to industry standards	Core		
B. Determines dimensions, critical features, and tolerances on architectural/shop drawings	Core		
C. Interprets architectural/shop drawings to industry standards	Core		
D. Uses CAD software to produce and edit architectural/shop drawings	Core		
E. Demonstrates competency in primary drafting procedures	Core		
F. Creates architectural/shop drawings using a variety of CAD software tools and functions	Core		
G. Creates annotative text and dimension styles for use on floor plans, elevations, and construction details	Core		
H. Creates and modifies CAD blocks to use on floor plans, elevations, and construction details	Core		
Job Function 6: Shows competency for millwork techniques and fabrication			
Competencies	Core or Optional	RTI	OJT
A. Processes materials safely and effectively, taking into account material characteristics	Core		
B. Demonstrates the proper selection, identification, and installation of tools	Core		
C. Safely and properly sets up and operates machines/tools	Core		
D. Performs bench operations safely, effectively, and accurately	Core		
E. Installs finished products	Optional		
Job Function 7: Performs operation and maintenance of CNC and mechatronics operations			
Competencies	Core or Optional	RTI	OJT
A. Explains the proper codes and functions	Core		
B. Demonstrates how to write a G code program in order to machine a basic cylindrical part on the CNC lathe	Core		

C. Calculates the tooling, coordinates, and toolpaths necessary to machine the part on a CNC lathe	Core		
D. Identifies different aspects of the machine	Core		
E. Applies the Cartesian coordinate system and polar coordinates for a milling process	Core		
F. Locates and identifies all components of the robotic cell, including all equipment, operator interfaces, tooling, perimeter guarding, safety devices, etc.	Core		
G. Understands and practices all safety considerations related to operating the robotic cell	Core		
H. Demonstrates the proper power-up, shut-down, and lock-out sequence of the robotic cell or other equipment	Core		
Job Function 8: Performs coating/finishing operations			
Competencies	Core or Optional	RTI	OJT
A. Recognizes proper surface preparation	Core		
B. Understands chemical properties of coating and surface materials and their interactions with each other	Core		
C. Performs proper safety and workplace protocols in spray booth	Core		
D. Reads and understands safety data sheets	Core		
E. Demonstrates proper handling, storage, and disposal of finishing materials	Core		
Job Function 9: Performs wood-processing operations			
Competencies	Core or Optional	RTI	OJT
A. Performs machine operations	Core		
B. Selects proper tooling/machinery to safely and accurately perform all required processing operations within the specified tolerances on a part print	Core		
C. Calculates cutting speeds and feeds and applies these calculations while performing required operations	Core		
Job Function 10: Problem solves, diagnoses, and troubleshoots effectively			
Competencies	Core or Optional	RTI	OJT
A. Traces defects to the originating sections of their root causes, such as verifying in-field measurements against architectural drawings	Core		
B. Uses critical and logical thinking on a per project basis to analyze, measure, and record to improve manufacturing/installation process	Core		

C. Proposes a remedy, having been given the authorization to implement the process improvement	Core		
D. Conducts a triage level of troubleshooting and communicates findings to appropriate individual	Core		
E. Performs daily, weekly, and monthly preventative maintenance responsibilities	Core		

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	

Cross-Cutting Competencies

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

** The names of the cross-cutting competencies come from the US 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>.

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 who seek to prepare individuals for successful entry into an apprenticeship program.

The scoring system utilized to evaluate competency levels 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: Communicates effectively and professionally with colleagues, both internally and externally

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • OSHA requirements for personal and occupational safety • Methods for working safely in confined spaces • Principles and techniques of first-aid and emergency response • Principles of hazards—identification and mitigation • Risk-assessment techniques and protocols 	<ul style="list-style-type: none"> • Identify and reduce/eliminate potential hazards • Maintain situational awareness • Perform risk-assessment and risk-mitigation activities • Use fire extinguisher to put out fire 	<ul style="list-style-type: none"> • Fire extinguishers/blankets • Eyewash station • Emergency shower

Competency A: Reliably follows others' instructions	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies key personnel in the production process	Core
2. Identifies key facts that should be imparted	Core
3. Clearly discusses production processes with key personnel	Core

Competency B: Willingly asks questions about things not fully understood	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies issues to discuss as soon as they arise	Core
2. Contacts appropriate personnel (coworkers, supervisors) to discuss issues	Core
3. Uses available modes of communication (phone, email) to discuss issues	Core

Competency C: Works with due regard for others' safety	Core or Optional
PERFORMANCE CRITERIA	
1. Wears protective eyewear, footwear, hearing-protection devices, etc., as necessary	Core
2. Observes employer's requirements for preventing injuries	Core
3. Identifies location of first-aid equipment, including first-aid kits, safety showers, eyewash stations, fire blankets, defibrillators, and related equipment, and uses them promptly and appropriately when necessary	Core
4. Maintains situational awareness, especially as equipment is being moved throughout the building or plant	Core
5. Follows other applicable OSHA or employer safety regulations	Core

Competency D: Demonstrates a working knowledge of the company policy manual	Core or Optional
PERFORMANCE CRITERIA	
1. Reads and understands all installation manuals and instructions before doing work	Core
2. Follows all instructions and cautions laid out in the documentation	Core

Competency E: Establishes a system of maintaining appropriate notes and reminders and completes any required logs, calibration records, etc.	Core or Optional
PERFORMANCE CRITERIA	
1. Writes and records the information critical for proper job function	Core
2. Types information into easily accessible computer filing systems	Core

Competency F: Ensures proper communications between previous and next shifts, with operations and supervision	Core or Optional
PERFORMANCE CRITERIA	
1. Demonstrates appropriate interpersonal skills with a supervisor or team leader and other team members to ensure work is smoothly continued from one shift to the next	Core

Competency G: Identifies problems and changes that could lead to problems through the exchange of information with operators, supervisors, and others	Core or Optional
PERFORMANCE CRITERIA	
1. Analyzes the problem(s) and proposes remedies when authorized to carry them out	Core

Competency H: Establishes trust and rapport with operators, supervisors, and others		Core or Optional
PERFORMANCE CRITERIA		
1. Interfaces with team members to discuss work and any issues that may arise		Core

Job Function 2: Demonstrates both effective time and project management

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> Additive manufacturing equipment 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 Inspect parts, equipment, safety devices, tools, and production products Identify and reduce/eliminate potential hazards Maintain situational awareness Perform risk-assessment and risk-mitigation activities Logical thinking Clear oral communication 	<ul style="list-style-type: none"> Harnesses and lifts Forklift Hand tools Production machinery

Competency A: Develops a project plan and tracks progress against the plan, flagging issues and delays as they occur		Core or Optional
PERFORMANCE CRITERIA		
1. Develops a plan for conducting the work, outlining the materials that will be needed, how to procure them, and the timeline of completing the work		Core
2. Sets up clear project tasks and timelines to complement the project plan		Core
3. Tracks project progress against original timeline to check progress		Core
4. Discusses with supervisor and other colleagues issues that arise in project completion that do not adhere to project plan		Core

Competency B: Develops project contingency plans to respond to unexpected delays and costs, and professionally communicates with customers about alternatives as needed	Core or Optional
PERFORMANCE CRITERIA	
1. While developing a project plan, outlines potential delays or issues that might arise	Core
2. Works with team to develop a plan to correct the plan	Core
3. Develops alternatives to project completion, factoring in time and cost	Core
4. Checks the feasibility of these plans with colleagues and supervisors	Core
5. Communicates the need to change project direction with customer in a timely manner	Core

Competency C: Verifies in-field measurements against architectural drawings to produce accurate shop drawings	Core or Optional
PERFORMANCE CRITERIA	
1. Given the necessary job process sheet for a part and verbal instructions, identifies and selects the required measuring instruments and conducts the required inspection procedures	Core
2. Verifies calibrations and sizes of all measuring devices	Core
3. Takes measurements to an accuracy of 1/64 for fractions, .002 for decimals, and ½ degree for angles	Core
4. Reads standard orthographic prints and understands types of lines, title block information, revision levels, abbreviations, symbols, and tolerances	Core
5. Identifies surface defects, burrs, and any adverse conditions such as flat or torn threads, out of round conditions, eccentricity, etc.	Core

Competency D: Estimates project costs and timelines, identifying project assumptions and resource costs (supplies, labor)	Core or Optional
PERFORMANCE CRITERIA	
1. Checks to see if supplies are low	Optional
2. Checks on pricing of supplies from suppliers	Optional
3. Documents the process of obtaining raw materials	Optional

Competency E: Computes material quantities, sizes, weights, and costs	Core or Optional
PERFORMANCE CRITERIA	
1. Helps determine the production costs of product by calculating personnel, equipment, and raw-material usage	Optional
2. Works to determine marginal revenue of product to view how each product is profitable or unprofitable	Optional

3. Informs supervisor of findings	Optional
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Competency F: Develops a project budget based on an approved quote and tracks project progress against the budget, flagging issues and unexpected costs as they arise	Core or Optional
PERFORMANCE CRITERIA	
1. Using company procedure, develops a project budget outlining the cost of completion for the project work	Optional
2. Regularly checks project budget against approved invoices to measure progress	Optional
3. Discusses with supervisor and colleagues any issues that might arise	Optional

Competency G: Develops a professional quote for a project and shares with a potential customer for review and approval	Core or Optional
PERFORMANCE CRITERIA	
1. Using company procedure, develops a project budget outlining the cost of completion for the project work	Optional
2. Works with the company to develop a quote based on this budget	Optional
3. Communicates this quote for approval in a timely manner	Optional

Job Function 3: Protects 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, currents, 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 	<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 • Identify and reduce/eliminate potential hazards • Maintain situational awareness • Perform risk-assessment and risk-mitigation activities • Use 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

Competency A: Follows employer safety requirements, including the consistent and proper use of protective clothing and personal safety devices		Core or Optional
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 eyewear, footwear, hearing-protection devices, etc., as necessary		Core

Competency B: Maintains 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 or Optional
PERFORMANCE CRITERIA	
1. Stores raw and finished materials, as well as chemicals, lubricants, and other substances, properly	Core
2. Disposes of waste products properly and according to OSHA, EPA, and company policies	Core
3. Notifies appropriate individuals immediately in the event of a spill and reacts swiftly to deploy containment/protection strategies	Core
4. 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: Safely uses, stores, and maintains all tools/equipment properly to eliminate injury, electrocution, trip hazards, or damage	Core or Optional
PERFORMANCE CRITERIA	
1. Maintains a safe and organized work area	Core
2. Reviews Material Safety Data Sheets (MSDS) before working with hazardous substances	Core
3. Follows employer-specific safety procedures for identifying and addressing potential hazards	Core

Competency D: Lifts supplies and materials using proper body mechanics and assistive devices, such as hoists, lifts, forklifts, and straps	Core or Optional
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. Uses safety harnesses when climbing	Core
8. Avoids creating trip, chemical, or environmental hazards when moving materials	Core

Competency E: Reports and responds promptly, safely, and appropriately to emergency or hazard situation and troubleshoots any issues that may arise	Core or Optional
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. Prevents and responds to fires using appropriate fire extinguisher	Core
7. Uses or assists others with the 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: Uses lock-out/tag-out procedures when working with appropriate tools and equipment	Core or Optional
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 before performing equipment maintenance	Core
3. Locks down and tags equipment to prevent accidental use	Core
4. Confirms that maintenance is complete before repowering equipment	Core
5. Repowers and starts equipment according to manufacturer's or employer's protocol	Core

Job Function 4: Demonstrates basics of measurement, materials, and safety of products and parts

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Methods for working safely in confined spaces • Principles of hazards—identification and mitigation • Measurement principles • Risk-assessment techniques and protocols • Mathematical calculations and measurements 	<ul style="list-style-type: none"> • Lift and move materials properly • Inspection of parts, equipment, safety devices, tools, and production products • Identify and reduce/eliminate potential hazards • Maintain situational awareness • Perform risk-assessment and risk-mitigation activities • Logical thinking • Clear oral communication 	<ul style="list-style-type: none"> • Blades • Woodworking equipment

Competency A: Uses and applies contextual mathematics	Core or Optional
PERFORMANCE CRITERIA	
1. Determines the situation and which mathematical theory to use	Core
2. Applies the mathematical theory to the situation	Core

Competency B: Demonstrates layout processes	Core or Optional
PERFORMANCE CRITERIA	
1. Chooses and mounts appropriate blades; welds, breaks, and rewelds blades as necessary	Core
2. Accurately measures and marks wood for cutting, drilling, and welding	Core
3. Correctly uses common layout tools (scribers, squares, protractors, etc.)	Core

Competency C: Uses proper material-processing techniques	Core or Optional
PERFORMANCE CRITERIA	
1. Visually inspects tooling, fixtures, and equipment to ensure they are properly assembled, installed, and in working order	Core
2. Adjusts equipment and tooling to maintain product specifications	Core

3. Observes equipment for unusual sounds, vibrations, or smells	Core
4. Documents issues or potential problems	Core
5. Notifies supervisor or appropriate individual of need for repairs	Core
6. Properly selects and uses the most appropriate tools to perform product-finishing tasks	Core
7. Uses these tools to ensure proper product finishing	Core
8. Visually and mechanically inspects finished product to ensure that it conforms to specifications	Core

Competency D: Understands material properties	Core or Optional
PERFORMANCE CRITERIA	
1. Checks the physical properties that are measurable such as density, melting point, conductivity, and coefficient of expansion	Core
2. Checks the mechanical properties such as how the wood performs when different forces are applied to them such as strength, ductility, and wear resistance	Core

Job Function 5: Uses print reading and CAD software to develop shop drawings

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • 3-D and CAD models • Measurement principles • Proper technological usage • Product development • Symbols, dimensions, and drawings 	<ul style="list-style-type: none"> • Logical thinking • Clear oral communication • Critical analysis • Business acumen • Teamwork 	<ul style="list-style-type: none"> • Computer-processing systems • CAD blocks

Competency A: Identifies symbols, notations, and lines to industry standards	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies and distinguishes between different line weights and types	Core
2. Reads and interprets different types of symbols (material, architectural, and relating to sections and elevation)	Core
3. Uses terminology common to the woodwork manufacturing industry	Core

Competency B: Determines dimensions, critical features, and tolerances on architectural/shop drawings	Core or Optional
PERFORMANCE CRITERIA	
1. Interprets scale of shop drawings and adjusts accordingly	Core
2. Determines dimensions and measurements by reading dimension lines	Core
3. Determines cut surfaces by reading hatch lines	Core
4. Reads section views to understand 3-D features	Core
5. Interprets tolerances (length and hole) to prevent error in following shop drawings	Core

Competency C: Interprets architectural/shop drawings to industry standards	Core or Optional
PERFORMANCE CRITERIA	
1. Reads and understands the differences between proposal, working, and shop drawings	Core
2. Interprets instructions of shop drawings	Core
3. Accurately follows the instructions of shop drawings	Core

Competency D: Uses CAD software to produce and edit architectural/shop drawings	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies different types of CAD software and their uses	Core
2. Selects appropriate CAD software for specific shop-drawing project	Core
3. Produces new shop drawings that contain the necessary information to interpret and follow them	Core
4. Edits old shop drawings efficiently	Core
5. Shares drawings and models with teammates and fabricators	Core

Competency E: Demonstrates competency in primary drafting procedures	Core or Optional
PERFORMANCE CRITERIA	
1. Competently creates all parts of shop drawings, both by hand and using CAD software	Core
2. Presents information across multiple views, including sectional, orthographic, and axonometric	Core
3. Indicates dimensions clearly	Core
4. Applies tolerances accurately	Core

Competency F: Creates architectural/shop drawings using a variety of CAD software tools and functions	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies different CAD software tools and their uses	Core
2. Selects appropriate CAD tools and functions for specific projects	Core
3. Produces various kinds of shop drawings	Core
4. Produces shop drawings that require more than one CAD tool and function	Core

Competency G: Creates annotative text and dimension styles for use on floor plans, elevations, and construction details	Core or Optional
PERFORMANCE CRITERIA	
1. Reads and understands annotative text	Core
2. Creates annotative text and dimensions on shop drawings	Core
3. Uses annotative property of CAD to digitally annotate	Core

Competency H: Creates and modifies CAD blocks to use on floor plans, elevations, and construction details	Core or Optional
PERFORMANCE CRITERIA	
1. Creates CAD blocks for repeated content	Core
2. Edits CAD blocks to add attributes or dynamic properties	Core
3. Edits CAD blocks for use on different projects	Core

Job Function 6: Shows competency for millwork techniques and fabrication

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • OSHA requirements for personal and occupational safety • Methods for working safely in confined spaces • Principles of hazards identification and mitigation • Risk-assessment techniques and protocols 	<ul style="list-style-type: none"> • Inspection of parts, equipment, safety devices, tools, and production products • Identify and reduce/eliminate potential hazards • Maintain situational awareness • Perform risk-assessment and risk-mitigation activities • Logical thinking • Clear oral communication 	<ul style="list-style-type: none"> • Millwork tools

Competency A: Processes materials safely and effectively, taking into account material characteristics	Core or Optional
PERFORMANCE CRITERIA	
1. Selects proper feed rate to obtain desired finish and maximize tool life	Core
2. Supports stock at in-feed and out-feed	Core
3. Assumes proper stance and hand position	Core
4. Completes processing in a timely manner	Core

Competency B: Demonstrates the proper selection, identification, and installation of tools	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies and distinguishes between different millwork tools, such as jointers, planers, moulders, hand planes, and flooring finish	Core
2. Selects appropriate tools for a given task	Core

Competency C: Safely and properly sets up and operates machines/tools	Core or Optional
PERFORMANCE CRITERIA	
1. Abides by pre-operation checklist	Core
2. Uses safe hand position and/or push blocks when appropriate	Core
3. Uses appropriate stance for optimum balance and part control	Core
4. Verifies tools are secure and free of defects	Core

Competency D: Performs bench operations safely, effectively, and accurately	Core or Optional
PERFORMANCE CRITERIA	
1. Supports material well at in-feed and out-feed tables	Core
2. Selects proper feed rate to obtain desired finish and maximize tool life	Core
3. Ensures paths of in-feed and out-feed have no obstructions to material and operator	Core
4. Clears machine and cleans work area after operation	Core
5. Wears required OSHA-approved personal protective equipment	Core

Competency E: Installs finished products	Core or Optional
PERFORMANCE CRITERIA	
1. Travels to installation sites	Optional
2. Communicates with clients at the installation sites	Optional
3. Installs a variety of finished millwork products, such as cabinets, standing/running trim, and laminate and wood panels	Optional
4. Renovates or repairs installations as project requires	Optional

Job Function 7: Performs operation and maintenance of CNC and mechatronics operations

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Methods for working safely in confined spaces • Principles and techniques of first-aid and emergency response • Principles of hazards—identification and mitigation • Measurement principles • Risk-assessment techniques and protocols • Mathematical calculations and measurements • Cartesian coordinates • Computer and editor software • G&M codes • Software and coding 	<ul style="list-style-type: none"> • Select proper tools and procedures • Use proper procedures in conducting work • Maintain situational awareness • Perform risk-assessment and risk-mitigation activities • Logical thinking • Clear oral communication • Calculating and drawing shapes 	<ul style="list-style-type: none"> • Computers • Software

Competency A: Explains the proper codes and functions	Core or Optional
PERFORMANCE CRITERIA	
1. Describes the functions and use of basic G codes	Core
2. Describes the functions and use of basic M codes	Core
3. Selects the proper codes for each operation	Core
4. Accurately reads and interprets G and M codes	Core

Competency B: Demonstrates how to write a G code program in order to machine a basic cylindrical part on the CNC lathe	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies coordinates with respect to an origin	Core
2. Calculates and implements speeds and feeds for proper tool life and surface finish	Core
3. Writes a program using the appropriate format for a particular machine control, and works from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used	Core
4. Implements circular interpolation in a program to cut true arcs and circles, using the I&J (arc vector) and R (radius value) methods	Core
5. Implements automatic cutter radius compensation	Core
6. Changes and performs machining on different work planes	Core

7. Programs helical interpolation	Core
8. Forms and solves triangular constructions on a blueprint to find missing coordinates	Core

Competency C: Calculates the tooling, coordinates and toolpaths necessary to machine the part on a CNC lathe	Core or Optional
PERFORMANCE CRITERIA	
1. Calculates and implements speeds and feeds for proper tool life and surface finish	Core
2. Forms and solves triangular constructions on a blueprint to find missing coordinates	Core
3. Identifies and uses menus and icons used in the software package	Core
4. Draws and edits basic geometric shapes and constructions	Core
5. Creates tool paths for contour milling, pocketing, drilling, and tapping	Core
6. Post-processes tool paths into programs	Core

Competency D: Identifies different aspects of the machine	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies and uses the 3-axis vacuum pod	Core
2. Identifies and uses nested machining	Core
3. Identifies and uses the beam saw	Core
4. Identifies and uses aggregate heads	Core
5. Identifies and uses the double end tenoner	Core

Competency E: Applies the Cartesian coordinate system and polar coordinates for a milling process	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies coordinates on a blueprint with respect to a part	Core
2. Calculates and implements speeds and feeds for proper tool life and surface finish	Core
3. Implements linear interpolation in a program to cut straight lines between two points	Core
4. Implements circular interpolation in a program to cut true arcs and circles, using the I&J or R (radius value) methods	Core
5. Writes a program using the appropriate format for a particular machine control, and works from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used	Core

Competency F: Locates and identifies all components of the robotic cell, including all equipment, operator interfaces, tooling, perimeter guarding, safety devices, etc.	Core or Optional
PERFORMANCE CRITERIA	
1. Locates, checks, and fills all applicable lubrication reservoirs, checks for proper oil pressure, and checks that all lubrication points are functioning properly	
2. Installs and qualifies the required tooling for the program	
3. Mounts, locates, and sets the origin of the work piece on a CNC machine	

Competency G: Understands and practices all safety considerations related to operating the robotic cell	Core or Optional
PERFORMANCE CRITERIA	
1. Cleans, maintains, and responds appropriately to safety hazards on all bench work tools and conventional and CNC machine tools	Core
2. Maintains the cleanliness of the general work area	Core
3. Carries out routine maintenance, reports problems that are beyond the scope of authority, and fills out the history forms for tracking maintenance	Core
4. Responds appropriately to safety hazards on all bench work tools and conventional and CNC machine tools	Core
5. Follows tool/machine manufacturer's safety rules and guidelines	Core

Competency H: Demonstrates the proper power-up, shut-down, and lock-out sequence of the robotic cell or other equipment	Core or Optional
PERFORMANCE CRITERIA	
1. Verifies that machine is properly guarded and safety mechanisms are in place and operating before powering up	Core
2. Activates vacuum system and assures stock is properly secured	Core
3. Verifies heads are powered up and rotating correctly	Core
4. Clears machine and cleans work area after use	Core
5. Knows and follows proper lock-out/tag-out procedure	Core

Job Function 8: Performs coating/finishing operations

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • OSHA requirements for personal and occupational safety • Lock-out/tag-out procedures • Methods for working safely in confined spaces • Chemical reactions and properties • Principles of hazards—identification and mitigation • Measurement principles • Risk-assessment techniques and protocols 	<ul style="list-style-type: none"> • Inspection of parts, equipment, safety devices, tools, and production products • Identify and reduce/eliminate potential hazards • Maintain situational awareness • Perform risk-assessment and risk-mitigation activities • Logical thinking • Clear oral communication 	<ul style="list-style-type: none"> • Sanding tools • Rollers and spray guns • Finishing products

Competency A: Recognizes proper surface preparation		Core or Optional
PERFORMANCE CRITERIA		
1. Recognizes appropriate sanding		Core
2. Recognizes the necessary number of coats of oil-based primer		Core
3. Refrains from beginning the finishing process until there is proper surface preparation		Core

Competency B: Understands chemical properties of coating and surface materials and their interactions with each other		Core or Optional
PERFORMANCE CRITERIA		
1. Identifies and distinguishes between different finishing materials such as spray guns and roll coaters		Core
2. Selects coating method to get the desired chemical reaction		Core
3. Tailors finish to each individual surface material		Core
4. Properly thins spray material with consideration for temperature and humidity		Core

Competency C: Performs proper safety and workplace protocols in spray booth		Core or Optional
PERFORMANCE CRITERIA		
1. Follows safe practices for handling finishes in accordance with Material Safety Data Sheets (MSDS)		Core
2. Wears required OSHA-approved personal protective equipment		Core
3. Operates required OSHA engineering controls		Core

4. Uses lock-out/tag-out procedures	Core
5. Completes spraying process in a timely manner	Core

Competency D: Reads and understands safety data sheets	Core or Optional
PERFORMANCE CRITERIA	
1. Reads, understands, and follows Material Safety Data Sheets (MSDS)	Core
2. Reads, interprets, and adjusts measurements according to product data sheets	Core
3. Reads, understands, and follows tool/machine manufacturer's safety rules and guidelines	Core

Competency E: Demonstrates proper handling, storage, and disposal of finishing materials	Core or Optional
PERFORMANCE CRITERIA	
1. Thins, mixes, and filters finishing product	Core
2. Adjusts air and fluid knobs to achieve optimal spray rate and fan pattern	Core
3. Leaves spray gun in a clean condition	Core
4. Powers up and down rollers and verifies that all are functioning	Core
5. Loads and unloads material safely out of machine	Core

Job Function 9: Performs wood-processing operations

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Methods for working safely in confined spaces • Principles and techniques of first-aid and emergency response • Principles of hazards identification and mitigation • Measurement principles • Risk-assessment techniques and protocols • Mathematical calculations and measurements 	<ul style="list-style-type: none"> • Select proper tools and procedures • Use proper procedures in conducting work • Maintain situational awareness • Perform risk-assessment and risk-mitigation activities • Logical thinking • Clear oral communication 	<ul style="list-style-type: none"> • Cutting tools • Radial dress parts • Drill press • Raw cut block • Woodworking machine parts

Competency A: Performs machine operations	Core or Optional
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 before performing equipment maintenance	Core
3. Locks down and tags equipment to prevent accidental use	Core
4. Confirms that maintenance is complete before repowering equipment	Core
5. Repowers and starts equipment according to manufacturer's or employer's protocol	Core

Competency B: Selects proper tooling/machinery to safely and accurately perform all required processing operations within the specified tolerances on a part print	Core or Optional
PERFORMANCE CRITERIA	
1. Demonstrates knowledge of machine safety procedures, as well as the identification of machine parts and their function	Core
2. Performs proper cutting tool selection necessary to perform all required operations within the specified tolerances on a part print	Core
3. Demonstrates the proper insert and tool holder selection necessary to perform all required operations within the specified tolerances on a blueprint	Core

Competency C: Calculates cutting speeds and feeds and apply these calculations while performing required operations	Core or Optional
PERFORMANCE CRITERIA	
1. Demonstrates knowledge of safety procedures and the identification of drill press and radial drill press parts and their function	Core
2. Selects, mounts, sets up, holds, and aligns work, using work-holding devices on the drill press to perform the required drill press operations	Core
3. Calculates cutting speeds and feeds and applies these calculations while performing required machining operations on the drill press	Core
4. Performs secondary operations on the semi-finished part within the tolerances specified on the part print	Core

Job Function 10: Problem solves, diagnoses, and troubleshoots effectively

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Troubleshooting techniques • Machine schematics • Fault isolation 	<ul style="list-style-type: none"> • Use proper procedures when working • Maintain situational awareness • Logical thinking • Clear oral communication • Identify problems and correct them • Teamwork 	<ul style="list-style-type: none"> • Meters and test equipment

Competency A: Traces defects to the originating sections of their root causes, such as verifying in-field measurements against architectural drawings	Core or Optional
PERFORMANCE CRITERIA	
1. Understands importance of fault isolation	Core
2. Identifies proper test procedures to locate and isolate faulty parts	Core
3. Uses schematics to isolate problems to one part of a circuit	Core
4. Analyzes malfunction symptoms using the maintenance manual, service bulletins, schematics, and other tools	Core

Competency B: Uses critical and logical thinking on a per project basis to analyze, measure, and record to improve manufacturing/installation process	Core or Optional
PERFORMANCE CRITERIA	
1. Analyzes malfunction symptoms using the maintenance manual, service bulletins, schematics, and other tools	Core
2. Proposes remedies	Core
3. Records the information in an appropriate log	Core

Competency C: Proposes a remedy, having been given the authorization to implement the process improvement	Core or Optional
PERFORMANCE CRITERIA	
1. Analyzes the problem(s), proposes remedies, having been given authorization to carry them out	Core

2. Carries out the cause-and-effect analysis by participating in the development of the appropriate quality control methodology with the team, i.e., fishbone diagram	Core
3. Explains the quality control tool, the corrective actions, and the reasoning connecting the root cause analysis to the remedial actions taken	Core

Competency D: Conducts a triage level of troubleshooting and communicates findings to appropriate individual	Core or Optional
PERFORMANCE CRITERIA	
1. Troubleshoots by identifying key personnel involved in the decision-making process for repairing equipment	Core
2. Appropriately communicates findings to key personnel	Core

Competency E: Performs daily, weekly and monthly preventative maintenance responsibilities	Core or Optional
PERFORMANCE CRITERIA	
1. Follows the company manual to perform checks of equipment and workspace on a frequent basis	Core
2. Logs findings in appropriate manner	Core
3. Notifies colleagues and supervisors of findings	Core

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