Appendix J

MANUFACTURING
YOUTH APPRENTICESHIP

REQUIRED SKILLS CURRICULUM
UNITS 1-3

Unit 1: Required Skills
Core Skills

Competency

1. Apply academic knowledge

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Read and comprehend work related materials

Apply mathematical operations involving whole numbers, fractions, decimals, percentages, formulas and methods of measurement accurately when necessary

Interpret charts, tables, and graphs

Learning Objectives

MATH

Add, subtract, multiply, and divide whole numbers, fractions, decimals and percents

Calculate averages, ratios, proportions, and rates

Convert decimals to fractions, fractions to percents and vice versa

Measure and accurately report measurements of time, temperature, length, width, height, width, perimeter, area, volume, and weight

Use appropriate formulas

Convert measurements correctly (e.g., English (standard) to metric)

Interpret meaning from data

ENGLISH

Use standard English to compile information and prepare written reports

Apply English language correctly (spelling, grammar, structure)

Derive meaning from text through summarizing

Discern meaning from written word

Use acceptable language

Write legibly

SCIENCE

Explain the key elements of the scientific process

Define the differences in qualitative and quantitative measurements

Compare and contrast subjective and objective information

Discriminate between fact and opinion

Comments:

Unit 1: Required Skills
Core Skills

Competency

2. Apply career knowledge

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Demonstrate understanding of career development in the Manufacturing industry
Obtain necessary skills and knowledge to meet position requirements

Learning Objectives

Explain the process for seeking employment
Describe the major functions and duties of the career pathways within the Manufacturing career cluster
Discuss educational, training, and credentialing requirements for a selected job
Research job requirements and characteristics of a selected job
Contrast "positive" and “less positive” aspects of a selected job
Describe opportunities for advanced training in Manufacturing careers

Comments:

Unit 1: Required Skills
Core Skills

Competency

3. Apply manufacturing industry knowledge

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Demonstrate Manufacturing industry systems understanding based on ***current knowledge and training***

Learning Objectives

Define common equipment and purposes used in the following manufacturing processes:

- Machining
- Cutting, drilling, bonding
- Joining and welding
- Finishing and assembly

Explain the function of the following pieces of manufacturing equipment:

- CNC
- Lathe
- Milling Center
- Machine Center
- Router
- Grinder
- Welding equipment
- Jigs and fixtures

Mechanical Systems

- Describe simple machines
- Identify the characteristics of simple machines
- Explain the function of pulleys, gears, and belts
- Explain fluid power
- Illustrate how pressure distributes itself in a closed system

Electrical Systems

- Determine the basic requirements for an electrical circuit to function
- Determine the basic requirements of a series circuit
- Examine the differences and similarities of series and parallel circuits
- Describe the relationship between voltage, current and resistance
- Explore the relationship between electricity and magnetism
- Identify common components used in electronics

HISTORY AND TRENDS

Describe a brief history of modern manufacturing

Examine the current state and future forecast of the manufacturing industry

Describe the impact of technology in the manufacturing industry

Explain how manufacturing affects our standard of living

List the sub-industries within manufacturing
Describe how the global economy is impacting manufacturing

Comments:

Unit 1: Required Skills
Core Skills

Competency
4. Communicate effectively

Performance Standard Condition
Competence will be demonstrated
at the worksite and classroom

Performance Standard Criteria
Performance will be successful when learners:
Use effective oral communication skills
Communicate in bias-free manner
Listen actively to others
Does not overreact in response to anger
Record information in a timely manner
Record written information legibly and accurately
Use email, the Internet, printer, copier, scanner, and fax machine equipment appropriately as applicable
Is sensitive to special, multicultural, and/or multilingual needs

Learning Objectives
GENERAL
Compare verbal and nonverbal behaviors
LISTEN
Discuss effective and active listening skills
WRITTEN
Discern meaning from written instructions
Write clearly to communicate written ideas
Discuss common recording errors and how to avoid them
CUSTOMER
Identify internal and external customers at your facility
Discuss steps to assess customer understanding
Describe the steps to follow when dealing with complaints
TOOLS
Describe technology used in communicating such as, telephone, texting, instant messaging (IM), computers, fax, intercom, beepers, etc.
Explain the proper use and etiquette required for these forms of communication technology
Review the policies and procedures for using written communication tools in your company such as email, Internet, printer, copier, scanner, and/or fax

Comments:

Unit 1: Required Skills
Core Skills

Competency

5. Act professionally

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Follow oral and written instructions
Is pleasant, courteous, and professional with coworkers and internal and external customers
Appearance and dress are appropriate according to the requirements of the employer
Takes personal responsibility for attendance
Is punctual
Begin work promptly
Organize and prioritizes tasks efficiently
Exhibit positive attitude and commitment to task at hand
Complete assigned tasks accurately and in a timely manner
Take responsibility for actions and decisions
Recognize lack of knowledge and seeks help from information sources
Evaluate work goals periodically with worksite professional
Accept constructive criticism and applies suggestions
Communicate safety, training, and job-specific needs
Adhere to safety rules and regulations

Learning Objectives

Locate and explain written organizational policies, rules and procedures to help employees perform their jobs
Locate and explain your company's employee manual for policies on Appearance, Breaks, Time Off, Cell Phone Use, Weather, Personal Issues, etc.
List qualities of successful Manufacturing employees
Describe how you can demonstrate enthusiasm and commitment at the worksite
Define initiative
Explain ways that you can show initiative at a worksite
Explain methods to evaluate work assignments and prioritize them
Describe how to effectively receive feedback

Comments:

Unit 1: Required Skills
Core Skills

Competency

6. Cooperate with others in a team setting

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Demonstrate respect relating to people
Contribute to a group with ideas, suggestions, and effort
Listen and respond appropriately to team member contributions
Work collaboratively with people from other backgrounds/cultures
Resolve differences for the benefit of the team
Complete their share of tasks necessary to complete a project

Learning Objectives

Explain the functions of each department or unit within the larger organization
Identify roles found in teams such as leader, facilitator, recorder, etc.
List effective meeting management skills
Demonstrate techniques which show respect for others
Describe how to effectively give and receive feedback
Describe conflict resolution methods
Discuss ways to participate within a team setting
Explain how to interact appropriately with diverse ethnic, age, cultural, religious, and economic groups in different situations
Describe how work teams coordinate work flow and help manage resources

Comments:

Unit 1: Required Skills
Core Skills

Competency

7. Think critically

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Recognize the existence of a problem
Apply problem-solving steps
Differentiate between fact and opinion
Consider other viewpoints and perspectives
Apply the principles and strategies of organized thinking
Evaluate information, ideas, and problems
Collect information through probing questions and research
Define the problem
Use techniques such as brainstorming to acquire alternative solutions
Demonstrate comparison skills
Make decisions based on analysis
Present ideas for critical evaluation
Support viewpoints with evidence

Learning Objectives

Describe how to break a problem down in order to brainstorm, evaluate, and analyze possible solutions
Discuss data collection techniques for the problem solving process
Describe how to present a solution with evidence
Explain ways to reach a decision by consensus
Discuss methods to evaluate a solution that has been implemented

Comments:

Unit 1: Required Skills
Core Skills

Competency

8. Exhibit regulatory and ethical responsibilities

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Follow all safety and worksite standards and regulations
Perform legally and ethically by all local, state, and national standards
Use email, the Internet, printer, copier, scanner, and fax machine equipment appropriately and correctly as applicable
Operate within scope of authority adhering to company rules, regulations, and policies as established in employee handbook/procedures
Comply with legal requirements for documentation
Document work processes as required
Record and file appropriate documents in timely manner
Maintain confidentiality of company, customer, and co-worker information
Document reportable incidents to worksite professional immediately, if applicable
Receive, handle, package, and ship materials and product according to shipping laws and regulations if applicable

Learning Objectives

GENERAL

Explain the role of the government in regulating and managing the manufacturing industry
Compare national, state and local regulators that oversee the manufacturing industry: Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), the Federal Trade Commission (FTC), etc. as applicable
Identify major manufacturing industry associations: National Association of Manufacturers (NAM), National Council for Advanced Manufacturing, National Center for Manufacturing Sciences (NCMS), National Institute for Metalworking Skills (NIMS), American Welding Society (AWS), Manufacturing Skill Standards Council (MSSC), etc.
Identify the management structure and employees' roles within your organization
Compare copyright, patent, and trademark laws

ETHICAL

Explain the difference between an ethical practice and a legal responsibility
Identify current ethical issues common to the Manufacturing field
Describe ethical work values such as confidentiality, productivity during the day, following safety standards

SAFETY

Define legal and ethical responsibilities for safety procedures
Describe the certification/license requirements to operate specific equipment or perform specific functions

RECORDS

Identify the main functions of documents and documentation

Identify the guidelines for retaining common documents

Comments:

Unit 1: Required Skills
Core Skills

Competency

9. Use resources wisely

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Follow the facility pollution/waste prevention plan
Recycle whenever possible
Dispose of materials appropriately
Dispose of hazards legally and with regard to environmental impact

Learning Objectives

Identify current environmental issues affecting the Manufacturing industry
Define what is meant by making “green” choices
Compare renewable and nonrenewable natural resources
Explain the meaning of sustainable resources use
Identify practices that contribute to sustainability
Describe why wise use of resources at the worksite is important
Give examples of wasteful uses of resources (unnecessary waste and duplication) at the worksite
List materials that can be recycled
Describe materials that require special disposal
Explain purpose of pollution control systems
Relate power generation to energy sources
Compare environmental impact of energy sources (e.g., fuel cells, chemical, wind, hydro, nuclear, electric, mechanical, solar, biological)

Comments:

Unit 1: Required Skills
Core Skills

Competency
10. Use basic technology

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Use communication technology (such as pagers, radios, phone, fax, email, Internet) to access and distribute data and other information within the scope of the job

Follow rules for proper computer and communication technology usage

Use calculating tools such as a computer, calculator, and adding machine correctly

Enter, edit, and store data on computerized equipment according to worksite guidelines

Verify data entry prior to data storage or equipment operation

Learning Objectives

Identify the parts and functions of a computer system using correct terminology including the keyboard, monitor, mouse, printer

Point out the storage device locations on the computer such as the Hard drive, Floppy drive, CD-ROM drive, and Portable File Storage drive, etc

Show the appropriate connections and positioning of peripheral devices such as a mouse, keyboard, monitor, portable devices, and printer

Discuss the importance of backing up computerized files

Compare different forms of communications technology including email, texting, word processing, spreadsheets, database, presentation software, and use of the internet to communicate, search and display information

Describe how to evaluate internet web sites and information for validity and reliability

Explain appropriate and inappropriate uses of email and internet while at work

Comments:

Unit 2: Required Skills
Safety

Competency
1. Follow personal safety requirements

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Participate in all required safety training
Follow all worksite guidelines for personal safety
Apply principles of proper body mechanics when necessary
Report any exposures, injuries, or accidents, personal or to others, immediately, if applicable
Locate and can find key information on Material Safety Data Sheets (MSDS)
Handle and dispose of any hazardous materials appropriately, if applicable
Operate only equipment that he/she is trained on
Adhere to equipment safety standards
Visually inspect equipment to ensure safety compliance and function before operation
Wear the required Personal Protective Equipment (PPE) at all times as required by the worksite for specific tasks

Learning Objectives

Discuss the regulatory purpose and responsibility of the Occupational Safety and Health Administration (OSHA)
List your rights as a worker according to OSHA
Explain the procedure to follow in case of an exposure, injury, or accident to self or to another
Explain ways your company prevents accidents
List engineering controls that are taken to protect workers from accidents
Describe safe and unsafe work habits and their implications
List safety hazards at your facility
Explain potential hazards associated with blood borne pathogens
Explain the ergonomic impact of work techniques
Describe proper techniques for lifting loads
Describe the Material Safety Data Sheet (MSDS) and its purpose
Discuss the procedures of handling and disposing of hazardous material
List mechanical, chemical, electrical, compressed air, and equipment safety hazards at your facility
Explain how Lock Out/Tag Out procedures prevent accidents
Define the Personal Protective Equipment (PPE) required for specific tasks in your facility
Explain the use of safety equipment such as eyeball washers and chemical safety showers and when you would use them
Describe ways to prevent burns

Comments:

Unit 2: Required Skills
Safety

Competency

2. Maintain a safe work environment

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Comply with posted safety warnings and symbols
Identify unsafe conditions and/or work habits and reports them to the worksite professional immediately, if applicable
Help maintain a clean and safe working environment free of debris and obstacles
Clean, organize, put away items in the work area
Safely identify, handle, store, and use hazardous materials according to company procedure, if applicable
Report any indications of insects or pests

Learning Objectives

List the major components of a facility safety program
List the different state and federal agencies that provide regulatory oversight at your facility for personal safety, environmental safety, and equipment safety
List accident and fire prevention techniques
Describe posted safety warnings and symbols and what they mean
Describe safe and unsafe work habits and their implications
Discuss the importance of keeping the work area and tools/equipment clean
List mechanical, electrical, and equipment safety hazards at your facility
Discuss how to identify and report unsafe conditions in your facility
Discuss safety procedures to prevent accidents
Describe the requirements at your facility for safety training and auditing
Assess need for good housekeeping practices
List accident and fire prevention techniques
List hazards that contribute to injury due to slips, trips, or falls
Outline compliance requirements of sanitation and health inspections

Comments:

Unit 2: Required Skills
Safety

Competency

3. Demonstrate professional role to be used in an emergency

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Participate in emergency safety simulations and drills
Outline the company's policy and procedure for worksite incidents, accidents, electrical, fire, tornado, bomb threats, robbery, hostage situations, and other emergency situations
Identify the closest fire alarms and emergency exits in the assigned worksite area
Identify the fire extinguishers in the assigned worksite area
Identify appropriate alarms and procedures for using alarms
Contact emergency personnel according to company requirements in the event of an emergency
Document any emergency incidents according to company requirements

Learning Objectives

Describe the procedures in your company to report an emergency
Review your company procedures for responding to exposures, injuries, accidents, spills, fire, tornado, bomb threat, robbery, hostage situations, etc.
Demonstrate how to use the fire blanket and/or fire extinguisher
Explain the evacuation plan for the worksite
Indicate the demeanor necessary during an emergency
Identify methods to cope with emergency situations
Name the resources for assistance in crimes or accidents
Locate and explain use of first aid emergency care kits
Detail steps to use in medical emergencies requiring First Aid, CPR, and/or Heimlich maneuver
Locate and explain use of spill kits, if applicable to worksite
Explain who in your facility can give first aid care in the event of an emergency
Explain the local protocols in place with local law enforcement
Explain the role of the Hazardous Materials (HAZMAT) team
Detail how to access help in a robbery or terrorist situation
Explain the use of safety equipment such as eyeball washers and chemical safety showers and when you would use them

Comments:

Unit 3: Required Skills
Manufacturing Fundamentals

Competency

1. Focus on customer needs

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Identify internal and external customers impacted by the production process
Satisfy internal and external customer's expectations
Collaborate with team to provide responses and solutions to meet the requirements, requests, and concerns of internal and external customers
Assist worksite professional to keep internal and external customers informed of project progress and decisions that may affect them

Learning Objectives

Identify the internal and external customers in your facility
Describe the role of sales and marketing operations in your facility
Describe how production requirements are determined from the product specifications
Explain the importance of continual customer contact about product specifications
Describe facility issues that may impact customer needs being met
Explore why a consumer buys a product
Evaluate how customer service affects purchases
Explain why manufacturers need to be able to customize products

Comments:

Unit 3: Required Skills
Manufacturing Fundamentals

Competency

2. Measure using various instruments

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Consider the degree of precision required by the part feature
Choose correct measuring instrument for task
Verify equipment is available for use and in working order
Verify equipment is current for preventative maintenance and/or calibration
Inspect tools and work area for safety considerations
Clean and adjust measuring instrument prior to use
Measure correctly and accurately
- With gages, calipers, and micrometer instruments
- With semi-precision and precision layout tools
- With digital gages

Confirm measurement to given specification
Record measurement correctly including unit of measurement
Calibrate, clean, and store measuring instruments properly as required

Learning Objectives

Add, subtract, multiply, and divide whole numbers, fractions, decimals and percents
Calculate averages, ratios, proportions, and rates
Convert decimals to fractions, fractions to percents and vice versa
Compare accuracy and precision when using measuring equipment
Identify various calipers, micrometer instruments, and layout tools and their applications
Identify digital measuring gages and instruments and their applications
Describe how to read and interpret gages
Measure and accurately report measurements of time, temperature, distance, length, width, height, width, perimeter, area, volume, weight, velocity and speed
Use appropriate formulas
Convert measurements correctly (e.g., English (US standard) to metric)

Comments:

Unit 3: Required Skills
Manufacturing Fundamentals

Competency

3. Operate tools and equipment safely

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Operate only equipment that he/she is trained on
Choose correct tool or equipment for the task
Follow and complete any tool check list
Verify tool/equipment is available for use and in working order
Verify tool/equipment is current for preventative maintenance and/or calibration
Verify safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
Inspect tool/equipment and work area for safety considerations
Set up and prepare tool/equipment for safe operation:
- Lubrication and fluid level checks
- Air and pressure supplies
- Power supply

Wear the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
Operates tool/equipment safely with guarding devices in the manner required for the job task
Checks accuracy of tool/equipment operation with first run
Monitor tool/equipment for safe operation while operating
Compare tool/equipment performance regularly to optimal equipment operations
Follow facility procedures for clean up and shut down after use
Perform any required preventative maintenance procedures
Investigate and promptly reports abnormal tool/equipment conditions
Properly shuts down and labels any tool/equipment that is not operating as expected
Follow Lock Out/Tag Out procedures as applicable
Document use and maintenance as required

Learning Objectives

Distinguish between common hand tools including hammers, wrenches, pliers, punches, taps, and dies
List the various tools and equipment used at your worksite such as cutting and non-cutting hand tools, sawing machines, pedestal (bench) grinders, drill presses, vertical milling machines, CNC equipment, lathes, molding equipment, etc.
Give examples of manufacturing processes that use fixtures
Define jig or fixture
Describe the classes of jigs or fixtures
Compare open and closed jigs

Outline applications of each tool and equipment
Describe and demonstrate the safety requirements for each tool and equipment
Discuss start up and shut down procedures for each tool/equipment you will operate
Explain the purpose of preventative maintenance
Describe emergency shutdown procedures for the tool/equipment you will operate
Explain how to recognize and address malfunctions for the tool/equipment you will operate
Describe how to recognize wear and tear on equipment components
Describe how to select lubricants and coolants as applicable
Compare costs, advantages, and disadvantages of Computer Numerical Control (CNC) tools versus Manually set tools and equipment
List the safeguards that apply to the equipment used in your facility for tools, automated machines, material handling equipment, and lifts
List which tools and equipment require safety certification
Explain Lock Out/Tag Out indications and procedures in your facility

Comments:

Unit 3: Required Skills
Manufacturing Fundamentals

Competency

4. Practice quality assurance principles

Performance Standard Condition

Competence will be demonstrated

at the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

Inspect and/or test materials/piece/product at all stages of production to determine quality or condition

Monitor materials, processes, equipment, tools, and products throughout the production process for safety and quality specifications

Inspect final product/piece to ensure it meets specifications

Promptly identify and segregate materials and/or product that do not meet specification

Communicate with worksite professional if materials and/or product do not meet requirements

Document all quality checks

Learning Objectives

Explain and analyze the quality approval process used in the Manufacturing industry

Describe the roles and responsibilities for quality in your facility

List the major stages involved in producing products

Explain the procedures for rejecting sub-standard products

Define terms used in quality assurance

Explain quality systems such as SPC, Six Sigma, TQM, ISO9000

Describe the impact of quality standards on manufacturing

Describe the major components of the ISO 9000 standards

Describe how materials are selected and tested for product requirements

Comments: