Appendix M

ARCHITECTURE AND CONSTRUCTION
YOUTH APPRENTICESHIP

CONSTRUCTION PATHWAY
MASONRY/CONCRETE FUNDAMENTALS (UNIT 6)

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
1. Read blueprints, plans and specifications

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Learn the functionality of blueprints, plans and specifications
- Interpret technical drawings accurately as needed for job task
- Use appropriate masonry terminology
- Identify basic elements of technical drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize a metric scale to properly read a drawing

Learning Objectives:

- *Identify basic design principles*
- Explain where a design professional finds basic Architectural/Structural design codes
- Demonstrate basic drafting skills (AutoCAD)
- Demonstrate blueprint reading skills
- Explain why precision in interpretation is critical
- Demonstrate knowledge of fundamentals of statistics, trigonometry, and algebra and explain their relevance
- Discuss different types of architectural technical drawings
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Identify different lines by name, type, order of usage, and application such as object, hidden, center, section, dimension, extension, cutting plane, short break, long break, phantom
- Compare pictorial format, orthographic projection, sectional views, and detail schedules
- Describe the standard usage of metric (SI) linear units in architectural drafting

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamental Unit

Competency
2. Interpret symbols and procedures

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Explain the role of drawings and specifications
- Identify drawings and symbols used on a drawing
- Apply information from drawings in activities
- Interpret specifications appearing on drawings
- Interpret and convert measurements in terms of actual dimensions requires
- Explain specifications in terms of work requirements

Learning Objectives:

- Explain the role of drawings in relation to quantities, project specifications, and contract documentation
- Explain the role of specifications in relation to quantities, quality of work, contract documentation and payment to contractors
- State the difference between general and project specifications
- Identify drawings in terms of type and application for a masonry process
- Explain the key functions of the drawing in terms of the finished product
- Identify the key users of the drawing in terms of work responsibility
- Interpret symbols and abbreviations in terms of their functions and meanings
- Interpret the layout in terms of the different views shown
- Explain the purpose of each view in terms of the result of the end product

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
3. Identify job prep needs and develop job task plan

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Set up and prepare tool/equipment for safe operation:
- Determine the scope of work:
    - Timetable
    - Work schedule
    - Cleanup process
    - Safety measures
    - Acceptable noise levels
- Articulate how the contractual relationships between all parties involved in the building process are connected to the job plan
- Apply scheduling practices to ensure the successful completion of a construction project
- Show a basic understanding of the planning process, scheduling, and cost and resource control
- Inspect job site after wind or adverse weather conditions

Learning Objectives:

- Explain the process to prepare the site and work with other construction professionals
- Strategize the scope of work for successful project completion
- Identify the importance of planning ahead to prevent problems on site before they occur
- Understand safety inspections to ensure regulations relating to health safety and the environment are adhered to
- Prepare sample project schedule that incorporates sequencing of events
- Prepare a flow chart explaining shop drawing review process
- Describe the approval procedures required for successful completion of a masonry project

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
4. Execute job prep needs as a coordinated effort

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Review the scope and phases of the project with a worksite professional
- Illustrate how to control the main resources of a job:
    - Materials
    - Tools
    - Equipment
    - labor

Learning Objectives:

- Identify the components of building systems needed to complete a construction project
- Define planning and describe what it involves
- Explain why it is important to plan
- Explain the importance of documenting one's work
- Explain the sequence of events for project completion
- Explain how schedules are developed and used
- Define the terms production and productivity and explain why they are important
- Describe how efficiency can affect costs associated with the project
- Explain the supervisors role in controlling costs
- Describe the estimating process and classification of costs (e.g., direct and indirect, fixed and variable, methods and standards)
- Identify the steps to overseeing the running of several projects
- Demonstrate a working knowledge of communicating with a range of people including the client, subcontractor, supplier, the public and the workforce

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
5. Select tools and materials

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Choose the tools they are going to work with taking into consideration the usefulness and portability of the tool
- Choose the appropriate tools and materials to minimize cost while meeting product performance goals

Learning Objectives:

- Identify the hand tools commonly used by carpenters and describe their uses
- Use hand tools in a safe and appropriate manner
- State the general rules for properly maintaining all power tools, regardless of type
- Explain importance of equipment and tool tracking
- Describe ways that a contractor can manage materials
- Compare the value of renting versus purchasing equipment

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
6. Use hand tools and light duty tools

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Use correct hand tools in a safe and appropriate manner
- Demonstrate the general safety rules for operating all power tools, regardless of type
- Use portable power tools in a safe and appropriate manner
- Use stationary power tools in a safe and appropriate manner
- Demonstrate proper handling and storage of tools.

Learning Objectives:

- Identify the hand tools commonly used and describe their uses
- Identify the stationary power tools commonly used by carpenters and describe their uses
- Describe the proper handling and storage of hand and power tools.
- Identify trends in power tool use
- Explain the battery time and voltage in various power tools

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
7. 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 a tool check list
- Inspect tool/equipment and work area for safety considerations
- 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
- Wear the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
- Operate tool/equipment safely with guarding devices in the manner required for the job task
- Investigate and promptly report abnormal tool/equipment conditions
- Properly shut down and label any tool/equipment that is not operating as expected
- Document use and maintenance as required

Learning Objectives:

- Distinguish between common hand tools including trowel, mason hammer, chisel, mashing hammer, masonry power saw, level, steel squares, jointers, chalk lines, and brushes
- 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
- List which tools and equipment require safety certification

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
8. Assist with the installation of materials per job specifications

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Articulate the scope of work
- Retrieve the correct material(s) for the job
- Apply measuring knowledge to procure the material(s)
- Identify labels and read labels on products
- Take direction well
- Assure solid footing
- Lay a dry bond
- Spread and furrow a bed joint, and butter masonry unit
- Cut brick and block accurately
- Lay masonry units in a true course
- Plan sequencing, tools, and equipment needed for the installation
- Identify set up needed
- Consult with worksite professional to verify production schedule, deadlines, and timeframes

Learning Objectives:

- Define the needed materials associated with the various jobs
- Determine effective and active listening skills
- Use acceptable language in the classroom
- Demonstrate writing legibly for all assignments
- Determine technical reading strategies
- Determine proper measuring techniques and explain how to use measuring tools.
- Demonstrate the ability to follow directions from the teacher/mentor in the classroom
- Explain the functions or collaborative nature of each department or unit within the larger organization
- Describe the most common types of masonry units
- Describe and demonstrate how to set up a wall

Comment:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
9. Demonstrate accuracy in measuring using various instruments

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Choose appropriate instrument(s) or aid for measuring task
- Verify instrument is accurate for calibration if applicable
- Use and/or measure as required
- Read measuring instrument(s) accurately
- Scale proportions accurately
- Apply appropriate formula and units for measurements
- Confirm measurement to given specification
- Record measurements using proper symbols
- Calibrate, clean, and store measuring instruments properly as required

Learning Objectives:

- List drafting aids and measuring devices commonly used by architects
- List common measurements used by architects
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural scale
- Explain the impact of error in measurement
- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percent's
- Calculate averages, ratios, proportions, and rates
- 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

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
10. Maintain clean and safe work environment

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Inspect tools and work area for safety considerations
- 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 hazards that contribute to injury due to slips, trips, or falls
- Outline compliance requirements of sanitation and health inspections

Comments:

UNIT 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
11. Clean up work area

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Follow directions based on foreman scope of work plans
- Clean and maintain materials and tools as required
- Store materials and tools properly
- Follow facility procedures for clean-up and shut down after use

Learning Objectives

- Explain the basic clean up procedures at the end of classroom or project build
- Explain the proper storage of tools and materials
- Articulate how a clean work environment supports safety
- Articulate how a clean work environment support efficiency

Comments:

Unit 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
12. Practice quality craftsmanship

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 Masonry/Concrete/Brick and Block 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
- Describe the impact of quality standards in within the Masonry/Concrete/Brick and Block industry
- Describe how materials are selected and tested for product requirements
- Emphasize the importance of getting the job done correctly the first time
- Explain the financial implications of poor craftsmanship

Comments:

Unit 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
13. Assist with cutting brick and block

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria
Performance will be successful when learners:

- Demonstrate the ability to work with brick and block for application
- Demonstrate use of proper tools in cutting brick and block
- Accurately cut brick and block
- Demonstrate the ability to accurately prepare joints
- Assure proper techniques for bonding

Learning Objectives:

- Describes and demonstrates the basic techniques for working with concrete block and brick
- Understand how to apply head joints
- Explain how to spread mortar for bed joints
- Explain how to appropriately lay brick and block to line
- Explain the curing process

Comments:

Unit 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
14. Assist with depositing, spreading, consolidating, and striking of concrete in a form

Performance Standard Condition

Competence will be demonstrated

- At the worksite and classroom

Performance Standard Criteria

Performance will be successful when learners:

- Assist with masonry and installation techniques

Learning Objectives:

- Explain how the properties of concrete are used in construction
- Describe the most common types of masonry units
- Describe how to set up a wall
- Explain how to lay a dry bond
- Describe how to spread and furrow a bed joint
- Explain how to butter masonry units
- Describe the different types of masonry bonds
- Describe how to lay masonry units in a true course
- Describe quality-control tests on concrete influence mix, placement, finishing, durability and performance
- Describe how the wind, heat, or cold affect the curing of the concrete throughout the entire process.

Comments:

Unit 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
15. Lay masonry units to job specification

Performance Standard Condition
Competence will be demonstrated
- At the worksite and classroom

Performance Standard Criteria
Performance will be successful when learners:
- Assist with building a concrete footer
- Assist with setting and aligning forms that hold concrete to the desired pitch and depth
- Assist with preparing units for placement
- Verify the proper construction of forms
- Ensure proper placement onto spacers
- Assist with placing concrete

Learning Objectives:
- Describe basic site layout using levels and measuring tools
- Discuss how to properly locate, grade and build forms and horizontal placement
- Discuss compaction activities on subgrades
- Describe various joints and where to locate them
- Describe various reinforcements and how to place them when ordering concrete
- Describe how concrete is conveyed and placed
- Determine an appropriate pre-placement checklist
- Describe how to use the equipment and tools for placing concrete
- Describe the process of depositing, spreading, consolidating, and striking off concrete in a form
- Define the trade terms to the appropriate processes and equipment

Comments:

Unit 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
16. Assist with selecting the correct types of materials for the job.

Performance Standard Condition
Competence will be demonstrated
- At the worksite and classroom

Performance Standard Criteria
Performance will be successful when learners:
- Assist with the use of mortar applications in a project
- Assist with mixing mortar to the proper consistency for the application
- Assist with selecting the various types of mortar for the specific jobs

Learning Objectives:
- Name and describe the primary ingredients in mortar and their properties
- Identify the various types of mortar used in masonry work
- Describe the common admixtures and their uses
- Identify the common problems found in mortar application and their solutions
- Describe how to properly set up the mortar mixing area
- Describe how to properly mix mortar by hand
- Describe how to properly mix mortar with a mechanical mixer
- Describe the properties of concrete
- Determine how the ingredients of concrete influence mix, placement, finishing, durability and performance
- Mix a test batch on concrete
- Describe how the wind, heat, or cold affect the curing of the concrete throughout the entire process
- Explain the importance of wall bracing
- Identify when and where the materials should be applied
- Describe scaffold basics

Comments:

Unit 6: Construction Pathway
Masonry/Concrete Fundamentals Unit

Competency
17. Perform volume estimates for concrete quantity requirements

Performance Standard Condition
Competence will be demonstrated
- At the worksite and classroom

Performance Standard Criteria
Performance will be successful when learners:
- Assist with applying measurements, drawings, and specifications to a project
- Perform a slum test
- Successfully mix a batch of concrete

Learning Objectives:
- Work with denominate numbers
- Read a mason's measure
- Convert measurements in the English system into metric equivalents
- Recognize, identify, and calculate areas, circumferences, and volumes of basic geometric shapes
- Identify the basic parts of a set of drawings
- Discuss the different types of specifications used in the building industry and the sections that pertain to masonry.
- Describe the basic finishing process
- Describe quality-control tests on concrete influence mix, placement, finishing, durability and performance
- Mix a test batch on concrete

Comments: