Masonry I

8512 36 weeks / 140 hours

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Acknowledgments

The components of this instructional framework were developed by the following curriculum development panelists:

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Alan Edwards, Owner/Operator, Mechanicsville Masonry, Mechanicsville
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Course Description

Suggested Grade Level: 10 or 11

Students will safely use the hand tools, measuring tools, power tools, and lifting equipment that masons use on the job. Students will lay brick and block, explore the properties of and mix mortar, recognize mathematical concepts, and identify the components of blueprints used in masonry. Students focus on problem-solving and employability skills while performing hands-on, entry-level brick masonry tasks. Students will earn the Occupational Safety and Health Administration (OSHA) 10 card.
As noted in Superintendent's Memo #058-17 (2-28-2017), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.

Task Essentials Table

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

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<td>Comply with federal, state, and local safety requirements.</td>
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<td>Identify personal protective equipment (PPE) requirements.</td>
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<td>Inspect course-specific hand and power tools to visually identify defects.</td>
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<td>Report personal injuries and environmental and equipment safety violations to the appropriate authority.</td>
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<td>Earn the construction industry OSHA 10 card.</td>
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<td>Pass a safety exam for lab/site safety and the use of tools and equipment specific to masonry.</td>
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<td>Using Hand and Power Tools</td>
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<td>Demonstrate how to work with decimals.</td>
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Curriculum Framework

Applying Basic Safety Standards (Core Safety)

Task Number 39
Comply with federal, state, and local safety requirements.

Definition

Compliance should include

- understanding the roles of the Occupational Safety and Health Administration (OSHA), Virginia Occupational Safety and Health (VOSH), and the Environmental Protection Agency (EPA)
- identifying the OSHA Hazard Communication Standard (HCS)
- interpreting the information included on safety data sheets (SDS)
- describing the responsibilities of employers and employees under HCS.

Process/Skill Questions

- Where should hazardous materials be stored?
- What information can be found on an SDS?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00101-15 Basic Safety
Module One (00101-15) explains the importance of safety in the construction and industrial crafts. Trainees will learn how to identify and follow safe work practices and procedures and how to properly inspect and use safety equipment. Trainees will be able to describe the safety
practices associated with elevated work; energy release; and various hazards encountered on job sites.

**NCCER Masonry Standards**

**Level One, Module Two (28106-13): Masonry Safety**
This module describes how to identify the common causes of accidents and the hazards associated with masonry tools, equipment, mortar, and concrete. This module also provides information about how to prevent accidents and hazards on the job site by using personal protective equipment, working safely from elevated surfaces, properly using masonry tools and equipment, and handling masonry materials safely.

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**Task Number 40**

**Identify personal protective equipment (PPE) requirements.**

**Definition**

Identification could include procedures for inspecting, wearing, and removing

- eye protection
- a respirator
- a hard hat
- gloves
- a safety harness
- hearing protection
- safety shoes.

Identification should also include explaining when particular PPE is required

**Process/Skill Questions**

- What are dangerous effects of sun exposure, and how can one significantly prevent these effects?
- Why is wearing jewelry prohibited while in the lab or on the jobsite?

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Task Number 41

Maintain a safe working environment.

Definition

Maintaining safety should result in identifying potential hazards on a jobsite or in the lab, such as

- unstable or improperly erected scaffolding
- electrical hazards
- jobsite debris
- improperly stored materials
- air quality hazards.

When present, hazards must be remedied, in compliance with school and instructor guidelines.

Process/Skill Questions

- What are some examples of jobsite hazards?
- Why is it important to use good housekeeping standards on a jobsite?
- Why is it important to store materials and tools in their proper place?

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Task Number 42

Explain safe working practices around electrical hazards.

Definition

Explanation should include

- identifying equipment used to test electrical circuits
- describing safe working conditions (e.g., grounding, using ground-fault circuit interrupters [GFCIs] and cords)
- demonstrating safe work habits.

Process/Skill Questions

- What is the definition of proximity work?
- What are safe working clearances according to the National Electrical Code (NEC)?
- What are considered safe working conditions and safe working habits?
- What is the unseen hazard with electrical work?

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NCCER Masonry Standards
Task Number 43

Identify emergency first-aid procedures.

Definition

Identification should include standard first-aid procedures and school policies regarding incidents involving

- bodily fluids
- electrical injuries
- eye injuries
- falls
- burns.

Process/Skill Questions

- What steps should be followed in the event of an accident?
- Why is knowing cardiopulmonary resuscitation (CPR) important?
- Why is it important to be certified to administer first aid?
- What are the different classifications (degrees) of electrical burns?

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Task Number 44

Identify the types of fires and the methods used to extinguish them.

Definition

Identification should include classifications of fires (e.g., Classes A, B, C, and D), causes and prevention of fires, types of extinguishers, and, when possible, the demonstrated use of a fire extinguisher, in accordance with government regulations and instructor guidelines.

Process/Skill Questions

- Why do fires have different classifications, and what are they?
- What is the fire triangle?
- What are the three things necessary to start a fire?
- Why is it important to know the classification of a fire when trying to extinguish it?
- Why and how often should extinguishers be inspected?
- What are the classifications of extinguishers?

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Task Number 45
Inspect course-specific hand and power tools to visually identify defects.

**Definition**

Inspection of tools should include

- identifying components of machinery (e.g., guards, blades, moving parts, start/stop switches)
- identifying standard safety procedures (i.e., lab practices and manufacturer recommendations)
- observing a demonstration of the safe operation and use of each piece of machinery in the lab
- identifying tool defects.

**Process/Skill Questions**

- What power tools are used in masonry?
- What should be done before using a power circular saw?
- Why should a power tool always be grounded?

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Task Number 46

Demonstrate lifting and carrying techniques.

Definition

Demonstration involves lifting and carrying materials and equipment and

- lifting with the legs
- keeping the back straight
- holding the load close to the body
- getting help, if necessary.

Process/Skill Questions

- What are common injuries associated with improper lifting techniques?
- What can one do to prevent injury?
- How does proper positioning affect proper technique?

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Task Number 47

Demonstrate safe laddering techniques.

Definition
Demonstration should involve using appropriate conduct and safety procedures while

- using aluminum ladders (e.g., three-point contact)
- carrying ladders (e.g., two people at all times)
- erecting and setting ladders (e.g., using the 4:1 rule)
- identifying types of ladders and the components and safety features of each (e.g., wall or straight, extension, roof, attic, special-purpose, solid-beam, aluminum, wood/aluminum truss ladder, fiberglass).

Teacher resource: Parents and Educators Can Keep Young Workers Safe, U.S. Department of Labor

Process/Skill Questions

- Why are ladders rated for certain weights?
- Why is the apex (highest point) of a stepladder not considered a step?

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Task Number 48

Demonstrate safe scaffolding techniques.

Definition

Demonstration should include inspecting

- settings
• duty ratings
• safety tags.

Process/Skill Questions

• How can one determine the safe weight limit of any particular scaffolding?
• When is scaffolding preferred or required?

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Task Number 49

Report personal injuries and environmental and equipment safety violations to the appropriate authority.

Definition

Report should include

• identifying the violation
• documenting the date when the incident or behavior was observed
• submitting the report to the instructor, supervisor, or the local OSHA inspector.

Process/Skill Questions

• Why is it important to report injuries?
• What are common reporting procedures?
• What are the key components of a report?
• What ethical considerations might be involved when reporting coworkers?
• Why is it important to follow reporting procedures?
• What is liability?

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Task Number 50

Earn the construction industry OSHA 10 card.

Definition

Earning an OSHA 10 card will

• recognize that one has acquired 10 hours of safety instruction
• help teach national standards for personal safety within a lab environment
• validate safety skills to the industry
• help workers become more safety-conscious and responsible.

Process/Skill Questions

• What are the benefits of earning the OSHA 10 card?
• What is OSHA, and how are its standards validated?

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**Task Number 51**

**Pass a safety exam for lab/site safety and the use of tools and equipment specific to masonry.**

**Definition**

Passing should include use of an assessment that measures participation in safety training programs, including safety meetings and demonstrating knowledge and skills gained from program topics (e.g., interpretation of SDS).

**Process/Skill Questions**

- How often should one participate in safety training programs? Why?
- How does insurance affect the requirement of continuous retraining for safety?
- What is *workers’ compensation*?

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**NCCER Core Curriculum: Introductory Craft Skills, 2015**

**00101-15 Basic Safety**
Module One (00101-15) explains the importance of safety in the construction and industrial crafts. Trainees will learn how to identify and follow safe work practices and procedures and how to properly inspect and use safety equipment. Trainees will be able to describe the safety practices associated with elevated work; energy release; and various hazards encountered on job sites.

**NCCER Masonry Standards**
Level One, Module One (28101-13): Introduction to Masonry
This module provides information about basic masonry materials, tools, techniques, and safety precautions; explains how to mix mortar by hand and lay masonry units; and describes the skills, attitudes, and abilities of successful masons.

Level One, Module Two (28106-13): Masonry Safety
This module describes how to identify the common causes of accidents and the hazards associated with masonry tools, equipment, mortar, and concrete. This module also provides information about how to prevent accidents and hazards on the job site by using personal protective equipment, working safely from elevated surfaces, properly using masonry tools and equipment, and handling masonry materials safely.

Using Hand and Power Tools

Task Number 52

Identify hand tools and power tools in masonry.

Definition

Identification could include

- a trowel
- a level
- a brick hammer
- a shovel
- brick tongs
- a chop saw
- a table saw
- hand drills.

Process/Skill Questions

- What are the basic tools used by masons?
- What are the expectations on jobsites regarding tool ownership? How is this different from school?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00103-15 Introduction to Hand Tools
Module Three (00103-15) instructs trainees in the identification, use, and care of hand tools. Developing the knowledge to properly choose and safely use hand tools is an essential part of the construction industry.

**00104-15 Introduction to Power Tools**
Module Four (00104-15) identifies and describes some of the power tools used by construction workers. The construction of each tool is discussed, along with information regarding the safe usage and typical maintenance requirements of power tools.

**NCCER Masonry Standards**

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**Level One, Module Three (28102-13): Masonry Tools and Equipment**
This module describes a variety of hand tools, measuring tools, mortar equipment, power tools and equipment, and lifting equipment that masons use on the job, and also explains how to use these tools correctly and safely. The module also provides instructions for assembling and disassembling scaffolds.

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**Task Number 53**

**Maintain hand and power tools.**

**Definition**

Maintenance should include applying safety awareness and

- describing the rationale for keeping tools in good working order
- replacing tools in the same order and condition they were prior to their use (e.g., cleaning, lubricating, storing)
- making basic adjustments to or replacing worn components with instructor approval, per manufacturer guidelines
- notifying the instructor about heavily worn, broken, or malfunctioning tools
- using the tool only for its intended purpose
- adhering to all safety guidelines from the manufacturer, the instructor, and the school.

**Process/Skill Questions**

- What are safety concerns when using a masonry saw?
- Why should a power tool always be grounded?
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**Applying Mathematics**

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**Task Number 54**

**Demonstrate how to work with whole numbers.**

**Definition**

Demonstration should include

- identifying different whole numbers and their place values
- adding, subtracting, multiplying, and dividing whole numbers
- solving masonry-related problems involving one-, two-, and three-digit whole numbers.

**Process/Skill Questions**

- Why is it important to perform basic mathematical tasks without a calculator?
- What are common masonry situations requiring mathematics?

**NCCER Core Curriculum: Introductory Craft Skills, 2015**
00102-15 Introduction to Construction Math
Module Two (00102-15) introduces trainees to basic math skills needed in the construction environment. The module reviews whole numbers and fractions; working with decimals; the four primary math operations; reading rulers and tape measures; the Imperial and metric units of measurement; basic geometric figures; and area and volume calculations for two-dimensional and three-dimensional objects.

NCCER Masonry Standards

Level One, Module Four (28103-13): Measurements, Drawings, and Specifications
This module provides a review of the calculation of distances and areas common in masonry work, describes the information found on residential construction drawings, and reviews the role of specifications, standards, and codes.

Task Number 55

Demonstrate how to work with fractions.

Definition

Demonstration should include

- defining equivalent fractions
- showing lowest common denominators
- describing improper fractions
- changing improper fractions to mixed numbers
- adding, subtracting, multiplying, and dividing fractions
- solving construction-related problems using fractions.

Process/Skill Questions

- What are common masonry tasks requiring the use of fractions?

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Task Number 56

Demonstrate how to work with decimals.

Definition

Demonstration should include

- describing decimals and their place values
- adding, subtracting, multiplying, and dividing decimals
- solving masonry-related problems using decimal numbers down to the thousandths place.

Process/Skill Questions

- What is the base-10 system? What is its probable origin?

NCCER Core Curriculum: Introductory Craft Skills, 2015

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Task Number 57

Convert between fractions, decimals, and percentages.

Definition
Conversion should include

- decimals to percentages
- percentages to decimals
- fractions to decimals
- decimals to fractions.

**Process/Skill Questions**

- When might masons commonly use conversions?
- When might masons convert a decimal to a percentage?
- When might masons convert a fraction to a decimal or a decimal to a fraction?
- Why might it be easier to multiply a decimal rather than a fraction?

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**Task Number 58**

**Convert measurements between U.S. customary units and metric units of measurement.**

**Definition**

Conversion should include

- U.S. customary and metric measurements of length, weight, volume, and temperature
- sizes of particular measurements relative to their basic units (e.g., deca-, hecto-, kilo-, mega-, deci-, centi-, milli-, and micro-)
- symbols associated with different measurements.
Process/Skill Questions

- What are the processes of converting lengths from one system to another?
- What is the mathematical relationship among the units of length in the metric system? How does this simplify the calculations involved?

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Task Number 59

Identify the geometric formulas for shapes common to masonry.

Definition

Identification should include

- describing the characteristics of angles and geometric shapes
- using formulas to calculate square footage (i.e., area) for rectangles, squares, triangles, and circles
- using formulas to determine perimeter, circumference, diameter, radius, volume, and angle (i.e., slope, grade) for various shapes.

Process/Skill Questions

- What is the calculation for the hypotenuse of a triangle?
- How many degrees are in each angle of an octagon?
- Why is pi a crucial measurement?
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Reading Blueprints

Task Number 60

Identify basic blueprint terms, components, and symbols.

Definition

Identification should include

- components, including
  - title block
  - border
  - drawing area
  - revision block
  - legend
  - scale
- lines of construction, including
  - dimension lines
  - leaders and arrowheads
  - property lines
  - cut lines
  - section cuts
  - hidden lines
  - center lines
object lines

- common abbreviations, symbols, and keynotes.

**Process/Skill Questions**

- What plans are needed to obtain a building permit?
- Why do masons need to understand symbols on construction or building plans?

**NCCER Core Curriculum: Introductory Craft Skills, 2015**

*00105-15 Introduction to Construction Drawings*

Module Five (00105-15) provides trainees with the information and skills needed to read and understand construction drawings. This module includes a set of four oversize drawings, which is included as an *Appendix* in the Trainee Guide. The drawings are also available for download from [www.nccerirc.com](http://www.nccerirc.com).

**NCCER Masonry Standards**

*Level One, Module Four (28103-13): Measurements, Drawings, and Specifications*

This module provides a review of the calculation of distances and areas common in masonry work, describes the information found on residential construction drawings, and reviews the role of specifications, standards, and codes.

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**Task Number 61**

**Identify the purpose of specifications, standards, and codes used in the building industry and the sections that pertain to masonry.**

**Definition**

Identification should include

- building strength
- durability
- safety
- the consequences of building without adherence to codes.

Teacher resource: [Virginia Uniform Statewide Building Code](http://Virginia), Virginia Department of Housing and Community Development

**Process/Skill Questions**
• Why are there building codes? What might happen if there were no building codes?
• What is the difference between strength and durability?

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Identifying and Mixing Masonry Mortars

Task Number 62

Mix masonry mortars manually.

Definition

Mixing should include ingredients that are blended in proper proportion, using a mortar hoe and power mixer, according to industry standards.

Process/Skill Questions

• Why should masonry mortars be measured by volume?
• What is the ratio of masonry mortar to sand?
• How many cubic feet are in one bag of masonry mortar?
• What are the short- and long-term effects of exposure to mortar and its ingredients?

NCCER Masonry Standards

Level One, Module Five (28104-13): Mortar
This module explains the types and properties of mortar and the materials used in the mixture, including admixtures; provides instructions for mixing mortar by machine; and describes how to properly apply and store mortar.

Task Number 63

Describe the ingredients and types of mortar.

Definition

Description should include ingredients such as

- sand
- water
- lime

and types such as

- M
- S
- O
- N.

Process/Skill Questions

- Why is O used in restoration?
- Which mortar is the softest and which is the strongest?

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Task Number 64

Describe properties of plastic and hardened mortar.

Definition
Description should include the type of masonry that plastic and hardened mortar would be used with (e.g., fireplace).

**Process/Skill Questions**

- Why might plastic and hardened mortar be used in a fireplace?

**NCCER Masonry Standards**

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**Task Number 65**

**Mix masonry mortars, using a motorized mixer.**

**Definition**

Mixing should include

- ingredients blended and mixed in proper proportion
- use of a motorized mixer
- adherence, according to industry standards.

**Process/Skill Questions**

- What safety precautions should be taken when using a motorized mixer?
- What are the advantages and disadvantages of using a motorized mixer?
- What mortar equipment is used in masonry?

**NCCER Masonry Standards**

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**Task Number 66**
Identify the common problems found in mortar application and their solutions.

Definition

Identification should include problems such as

- moisture
- color variation
- inconsistencies in mortar batches
- weather conditions (e.g., freezing).

Identification should include solutions such as

- proper storage
- consistent mixing ratios
- additives
- planning (e.g., avoiding certain weather when possible).

Process/Skill Questions

- Why should mortar be covered? How should it be covered?
- How does a mason identify a bad bag of mortar?

NCCER Masonry Standards

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Performing Entry-level Brick Masonry

Task Number 67

Spread mortar.

Definition
Spreading includes cutting mortar from board, loading the trowel, and spreading and furrowing mortar on the wall with uniform thickness and full coverage. Result should support brick in 3/8 inch bed joint.

**Process/Skill Questions**

- Why should one furrow the mortar?
- Why is efficient spreading important to good mortar work?
- Why is it important to spread the mortar?

**NCCER Masonry Standards**

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**Task Number 68**

**Identify the six brick positions.**

**Definition**

Identification should include

- stretcher
- header
- rowlock
- soldier
- sailor
- shiner.

**Process/Skill Questions**

- What are the six brick positions?
- Which position is commonly used on a windowsill?
- Which position is used in the walls of a firebox?

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Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Task Number 69

Apply head joints.

Definition
Application should include mortar administered to either end of the brick to form a 3/8 inch full head joint.

Process/Skill Questions

- What is the function of a head joint?
- Why is it important to have full head joints?

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Task Number 70

Bond a brick wall.
Definition

Bonding should include a wall that is dry bonded with 3/8 inch joints, +/- 1/8 inch.

Process/Skill Questions

- What is bonding?
- Why bond a brick wall?

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Task Number 71

Lay a stretcher course.

Definition

Laying should include whole brick laid end to end.

Process/Skill Questions

- What is the stretcher position for a brick?
- What is a proper alignment of a stretcher?
- What percentage of bricks are laid in the stretcher position?

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Task Number 72

Attach a line.

Definition

Attaching a line to a wall should include a combination of

- line blocks
- line twigs
- line pins.

The line must be tight, secure, and level with the course to be laid.

Process/Skill Questions

- Why should a nail never be used to attach a line?
- How should a line be attached to the line block?
- Which mason pulls the line tight?

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Task Number 73

Lay running bond wall to the line.
Definition

Laying should be done according to instructor guidelines, with brick that must be laid in half lap, level with the line, and with consistent line clearance, keeping the bottom of each brick flush with the top of the course below.

Process/Skill Questions

- Why is it important to keep a space between the line and the brick?
- What is meant by crowding the line?
- How far from the line should the brick be?

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Task Number 74

Gauge masonry wall with mason's scales.

Definition

Gauging should include a scale that must be selected according to type of unit and wall construction, allowing walls to be level with tops of openings, with proper spacing for seals or wire reinforcements.

Process/Skill Questions

- What is the advantage of using scales over using inches and fractions?
- Which scale is used most often in commercial and/or residential construction?

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**Task Number 75**

**Gauge masonry wall with story pole.**

**Definition**

Gauge should include a wall that is scaled, following pre-marked scaling and instructions.

**Process/Skill Questions**

- Why do masons gauge with a story pole?
- What is the approximate height of a story pole?

**NCCER Masonry Standards**

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**Task Number 76**

**Strike joints.**

**Definition**
Striking should include using the proper techniques and tools to compact and finish the face of

- concave joints
- rake joints
- grapevine joints.

### Process/Skill Questions

- What is the benefit of striking mortar joints?
- Why should mortar always be struck when it is at the same consistency?

### NCCER Masonry Standards

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### Task Number 77

**Build a rack-back lead.**

**Definition**

Building should include

- laying a first course of running bond
- laying each succeeding course, racking back a half brick on each end and using one less brick
- maintaining uniform joint width.

**Process/Skill Questions**

- Where are rack-back leads commonly seen?
- What has replaced the rack-back lead?

### NCCER Masonry Standards
**Task Number 78**

**Build a straight lead (brick jamb).**

**Definition**

Building includes

- laying brick on a stretcher bond
- forming a plumb jamb on one end
- racking back a half brick on the opposite end
- maintaining uniform joint width.

**Process/Skill Questions**

- What is meant by *checking the range*?
- Where is the tail located on the lead?

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Task Number 79

Build corners.

Definition

Building should include inside and outside corners that are

- laid out in 90-degree orientation
- plumb and level

while

- racking back a half brick on both tails
- maintaining uniform joint width.

Process/Skill Questions

- What is the angle, in degrees, of most corners?
- When laying standard brick in stretcher position, how much should each course lap the other?

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Task Number 80

Build rectangular brick columns.

Definition

Building should result in columns that are
• 90-degree corners
• level and plumb
• uniform joint width.

Process/Skill Questions

• What architectural purpose do columns serve?
• How are the dimensions of a column defined by the number of bricks?
• How many plumb points are in a rectangular brick column?

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Task Number 81

Identify types and sizes of brick.

Definition

Identification should include

• sizes
  o standard
  o modular standard
  o engineered
  o economy
  o utility
  o special sizes and shapes
• types
  o common brick
  o face brick
  o severe-weather brick
• grades
  o residential
Process/Skill Questions

- What are some types of brick?
- What are the advantages of using large brick?

NCCER Masonry Standards

Level One, Module One (28101-13): Introduction to Masonry
This module provides information about basic masonry materials, tools, techniques, and safety precautions; explains how to mix mortar by hand and lay masonry units; and describes the skills, attitudes, and abilities of successful masons.

Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Laying Brick Positions and Bonds

Task Number 82

Lay an American/common bond pattern.

Definition

Laying should include

- creating a pattern of several courses of stretchers followed by a course of full-length headers at regular intervals (e.g., every sixth course)
- explaining the rationale for laying an American/common bond pattern.

Process/Skill Questions

- Where would the header course be located when laying a common (American) bond?
- How might the word common in common bond be misleading?

NCCER Masonry Standards
Task Number 83

Lay a stack bond pattern.

Definition

Laying should include a panel of stretcher course with each brick laid directly above the one below and head joints vertically aligned.

Process/Skill Questions

- Why is joint reinforcement an important consideration when creating a stack bond pattern?
- Why should a mason handpick his or her brick?

NCCER Masonry Standards

Task Number 84

Lay a soldier course.

Definition

Laying should include a pattern that must consist of stretchers set on end with the face showing on the wall surface.

Process/Skill Questions
• What is a *drunken soldier*?
• Where might one find a soldier course?

**NCCER Masonry Standards**

**Level One, Module Six (28105-13): Masonry Units and Installation Techniques**
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

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**Task Number 85**

**Lay a rowlock course.**

**Definition**
Laying should include course laid on its side so that the face of the brick is facing the top.

**Process/Skill Questions**
- How is a rowlock course properly spaced?
- What are two situations where a rowlock might be used?

**NCCER Masonry Standards**

**Level One, Module Six (28105-13): Masonry Units and Installation Techniques**
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

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**Laying Concrete Masonry Units**

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**Task Number 86**

**Identify block sizes.**
Definition

Identification should include

- four-inch block
- six-inch block
- eight-inch block
- twelve-inch block.

Process/Skill Questions

- How do block types get their names?
- What determines the size of block to use in a given application?

NCCER Masonry Standards

Level One, Module Six (28105-13): Masonry Units and Installation Techniques

This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Task Number 87

Spread mortar on block.

Definition

Spreading should include

- mortar on both sides of the block
- web spread when applicable
- maintaining a uniform thickness to support another unit
- finishing with a 3/8 inch bed joint.

Process/Skill Questions

- What is a shell of a block?
- What determines whether it is necessary to put mortar on the cross webs?

NCCER Masonry Standards
Level One, Module Five (28104-13): Mortar
This module explains the types and properties of mortar and the materials used in the mixture, including admixtures; provides instructions for mixing mortar by machine; and describes how to properly apply and store mortar.

Task Number 88
Apply head joints (block).

Definition
Application should include mortar spread on both sides of one end of the block, maintaining a uniform thickness to form a 3/8 inch head joint.

Process/Skill Questions
- What is a head joint, and what function does it serve?
- How wide should a head joint be?

NCCER Masonry Standards
Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Task Number 89
Lay out a block wall.

Definition
Laying out consists of using a measuring tape or ruler to bond a wall on 16-inch intervals to establish proper spacing of block.

Process/Skill Questions
- Why do masons use a level to lay out a block wall?
- How many blocks should be laid out in an 8-foot wall?
NCCER Masonry Standards

Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Task Number 90

Lay block to the line.

Definition
Laying should include block laid in half lap, level with the line, and with consistent line clearance, keeping the bottom of each block flush with the top of the course below.

Process/Skill Questions
- What is the standard lap when laying concrete masonry units in the stretcher position?
- What are line dogs?

NCCER Masonry Standards

Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Task Number 91

Gauge block walls.

Definition
Gauging must allow block to be laid on 8-inch intervals in height.

Process/Skill Questions
At what intervals are standard blocks laid?
How many courses of block are in the average foundation with a basement?

NCCER Masonry Standards

Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Task Number 92
Describe how to install masonry reinforcement and accessories.
Definition
Description should include
- wall ties
- anchor bolts
- rebar
- dura-wire.

Process/Skill Questions
- Why is reinforcement necessary?
- Why are wall ties necessary?

NCCER Masonry Standards

Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Task Number 93
Describe ways to cut concrete masonry units and brick.

Definition

Descriptions should include cutting with

- hammer
- chisel
- saw.

Process/Skill Questions

- Why is the saw the preferred method for cutting concrete masonry units?
- What are the advantages of using a hammer to cut concrete masonry units?

NCCER Masonry Standards

Level One, Module Six (28105-13): Masonry Units and Installation Techniques
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

Performing Residential Masonry

Task Number 94

Construct brick veneer wall.

Definition

Construction should include wall that

- is plumb and level
- is scaled properly
- includes flashing, weeps, sills, wall ties, and steel lintels if specified in plans.

Constructed wall must meet all local codes.
Process/Skill Questions

- What is *veneer*?
- What is the minimum spacing between the back side of the brick and the wood framing?

NCCER Masonry Standards

**Level One, Module Six (28105-13): Masonry Units and Installation Techniques**
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

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**Task Number 95**

**Form a corbel and racking.**

**Definition**

Formation includes courses of brick projected from the face of the wall, according to plans. To form a racking, courses of brick must be recessed from the face of the wall, according to plans.

**Process/Skill Questions**

- When corbelling a chimney, what determines the maximum amount of corbel allowable?
- What is a *wash cap* or *wash*?

NCCER Masonry Standards

**Level One, Module Six (28105-13): Masonry Units and Installation Techniques**
This module describes characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. This module also provides information about masonry reinforcements and accessories that masons use on the job to lay block and brick professionally and safely.

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**Developing Employability Skills**
Task Number 96

Investigate careers in the masonry field, using the Internet and other sources.

Definition

Investigation should produce options for careers and career pathways in the masonry field and should require

- career preparation information
- opportunities for advancement
- employment trends.

Investigation may include using job databases and matching an individual's abilities, aptitudes, and job expectations with industry standards.

Process/Skill Questions

- What are some job titles directly related to masonry?
- What are some job titles that share skills with those required to be a mason?
- Why is there a shortage of skilled masons?

NCCER Masonry Standards

Level One, Module One (28101-13): Introduction to Masonry
This module provides information about basic masonry materials, tools, techniques, and safety precautions; explains how to mix mortar by hand and lay masonry units; and describes the skills, attitudes, and abilities of successful masons.

SOL Correlation by Task

<p>| Comply with federal, state, and local safety requirements. | English: 10.5, 11.5 |
| History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.14, GOVT.15 |
| Science: CH.1 |
| Identify personal protective equipment (PPE) requirements. | English: 10.5, 11.5 |</p>
<table>
<thead>
<tr>
<th>Maintain a safe working environment.</th>
<th>English: 10.5, 11.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science: CH.1</td>
<td></td>
</tr>
<tr>
<td>Explain safe working practices around electrical hazards.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>Identify emergency first-aid procedures.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>Identify the types of fires and the methods used to extinguish them.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>Science: CH.1</td>
<td></td>
</tr>
<tr>
<td>Inspect course-specific hand and power tools to visually identify defects.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>Demonstrate lifting and carrying techniques.</td>
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<td>Demonstrate safe laddering techniques.</td>
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<tr>
<td>Demonstrate safe scaffolding techniques.</td>
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<tr>
<td>Report personal injuries and environmental and equipment safety violations to the appropriate authority.</td>
<td>English: 10.5, 10.6, 10.7, 11.5, 11.6, 11.7</td>
</tr>
<tr>
<td>Earn the construction industry OSHA 10 card.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>History and Social Science: GOVT.7, GOVT.8</td>
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<tr>
<td>Pass a safety exam for lab/site safety and the use of tools and equipment specific to masonry.</td>
<td>English: 10.5, 11.5</td>
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<tr>
<td>Identify hand tools and power tools in masonry.</td>
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<tr>
<td>Maintain hand and power tools.</td>
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<tr>
<td>Demonstrate how to work with whole numbers.</td>
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<tr>
<td>Demonstrate how to work with fractions.</td>
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<tr>
<td>Demonstrate how to work with decimals.</td>
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<tr>
<td>Convert between fractions, decimals, and percentages.</td>
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<tr>
<td>Convert measurements between U.S. customary units and metric units of measurement.</td>
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<tr>
<td>Identify the geometric formulas for shapes common to masonry.</td>
<td>English: 10.5, 11.5</td>
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<tr>
<td>Mathematics: G.3, G.8, G.11</td>
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<tr>
<td>Identify basic blueprint terms, components, and symbols.</td>
<td>English: 10.5, 11.5</td>
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<tr>
<td>Identify the purpose of specifications, standards, and codes used in the building industry and the sections that pertain to masonry.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>Mix masonry mortars manually.</td>
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<tr>
<td>Describe the ingredients and types of mortar.</td>
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<td>Describe properties of plastic and hardened mortar.</td>
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<tr>
<td>Mix masonry mortars, using a motorized mixer.</td>
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<tr>
<td>Identify the common problems found in mortar application and their solutions.</td>
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<tr>
<td>Spread mortar.</td>
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<tr>
<td>Task</td>
<td>Description</td>
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<td>---------------------------------------------------------------------</td>
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<tr>
<td>Identify the six brick positions.</td>
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<tr>
<td>Apply head joints.</td>
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<tr>
<td>Bond a brick wall.</td>
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<tr>
<td>Lay a stretcher course.</td>
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<tr>
<td>Attach a line.</td>
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<tr>
<td>Lay running bond wall to the line.</td>
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<tr>
<td>Gauge masonry wall with mason's scales.</td>
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<tr>
<td>Gauge masonry wall with story pole.</td>
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<tr>
<td>Strike joints.</td>
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<tr>
<td>Build a rack-back lead.</td>
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<tr>
<td>Build a straight lead (brick jamb).</td>
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<tr>
<td>Build corners.</td>
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<tr>
<td>Build rectangular brick columns.</td>
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<tr>
<td>Identify types and sizes of brick.</td>
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<tr>
<td>Lay an American/common bond pattern.</td>
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<tr>
<td>Lay a stack bond pattern.</td>
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<tr>
<td>Lay a soldier course.</td>
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<tr>
<td>Lay a rowlock course.</td>
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<td>Identify block sizes.</td>
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<td>Spread mortar on block.</td>
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<td>Apply head joints (block).</td>
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**Entrepreneurship Infusion Units**

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked “optional.”

**Teacher Resources**
The National Center for Construction Education and Research (NCCER) provides competencies and objectives as well as modules and lesson plans. Refer to the **masonry craft page on the NCCER website** and access those resources on the right hand side under "Course Planning Tools."
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)
- Construction Masonry—Block Assessment
- Construction Masonry—Brick Assessment
- Core: Introductory Craft Skills Entry-Level Assessment
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- Masonry Examination
- Masonry Level One Entry-Level Assessment
- National Career Readiness Certificate Assessment
- Professional Communications Certification Examination
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Masonry II (8513/36 weeks, 280 hours)

Career Cluster: Architecture and Construction

<table>
<thead>
<tr>
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<th>Occupations</th>
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<tr>
<td></td>
<td>General Contractor</td>
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<tr>
<td></td>
<td>Mason</td>
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<tr>
<td></td>
<td>Tile Installer</td>
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<tr>
<td>Design/Pre-Construction</td>
<td>Building Code Inspector</td>
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<td></td>
<td>Cost Estimator</td>
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<td></td>
<td>Landscape Architect</td>
</tr>
<tr>
<td>Maintenance and Operations</td>
<td>Construction Manager</td>
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<td>Mason</td>
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<tr>
<td></td>
<td>Restoration Technician</td>
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<tr>
<td></td>
<td>Tile Installer</td>
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