

MASONRY 1, 2, 3, 4
COURSE CODES: 6250, 6251, 6252, 6253

PROGRAM DESCRIPTION: Masonry courses enable students to learn to construct interior and exterior walls, columns, doorways, window openings, fireplaces, chimneys, and foundations from brick and concrete block. Along with other activities, students may mix and spread cement and mortar, read blueprints and plans, and estimate materials needed for a project. Other topics may also include how to layout buildings on footings and how to establish grades using a surveying transit. Standards are aligned to the NCCER® Masonry certification.

Provided a student takes Introduction to Construction and scores 70% on all assessments (00101- 8-15), he or she does not have to repeat the NCCER® Core modules in Masonry.

OBJECTIVE: Given the necessary equipment, supplies, and facilities, the student will complete all of the following core standards successfully.

CREDITS: 1 (120 hours), 2 (240 hours) units
per course code

RECOMMENDED GRADE LEVEL: 9 - 12

COMPUTER ACCESS REQUIRED: 1 Computer per student with
Internet access

RECOMMENDED MAXIMUM ENROLLMENT: 16

RESOURCES: Instructional Materials

MASONRY LEVEL 1

A. INTRODUCTION TO MASONRY

Proficient masons demonstrate knowledge of the industry and relevant professional development. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Explore career ladders and advancement possibilities in masonry.
2. Identify the skills, attitudes, and abilities needed to be a successful mason.
3. Describe various types of training in the masonry industry.
4. List Department of Labor (DOL) requirements for apprenticeship.
5. Describe modern masonry materials and techniques.
6. Explain how concrete masonry units (CMUs or block) are used in construction.
7. Explain how clay masonry units (brick) are used in construction.
8. Explain how stone is used in construction.
9. Describe how mortar and grout are used in masonry construction.
10. Describe how wall structures are created using masonry units.

11. Identify the basic safety precautions when working with masonry materials.
12. Explain how to mix mortar and lay masonry units.
13. Demonstrate performance tasks.

B. MASONRY SAFETY

Proficient masons demonstrate appropriate knowledge and skills in masonry safety practices. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify the causes and costs of job accidents.
2. Identify hazards.
3. Demonstrate proper housekeeping techniques.
4. Observe mortar and concrete safety.
5. Observe flammable liquid safety.
6. Identify the proper use of personal protective equipment in masonry.
7. Describe how to use protective lenses and face shields.
8. Describe how to use hearing protection.
9. Describe how to use gloves and respirators.
10. Work safely from elevated surfaces.
11. Explain fall protection procedures.
12. Describe personal fall arrest systems.
13. List basic scaffold safety guidelines.
14. Explain how to protect against falling objects.
15. Use tools and equipment safely.
16. Describe how to use hand tools, saws, mixers, and grinders safely.
17. Describe how to work safely around forklifts.
18. List basic electrical safety guidelines.
19. Describe how to use powder-actuated tools safely.
20. Handle materials properly.
21. Store and stockpile masonry materials.
22. Stack brick.
23. Demonstrate performance tasks.

C. MASONRY TOOLS AND EQUIPMENT

Proficient masons demonstrate appropriate knowledge and skills in the use of masonry tools and equipment. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify hand tools used in masonry.
2. Describe how to use trowels, hammers, chisels, jointers, and brushes.
3. Describe how to use other masonry tools.
4. Identify measures and measuring tools used in masonry.
5. Describe how to use rules and levels.
6. Describe how to use chalk boxes, squares, plumb bobs, and laser levels.

7. Describe how to use corner poles, lines, and fasteners.
8. Identify mortar equipment used in masonry.
9. Describe how to use mortar boxes.
10. Describe how to use mixing accessories.
11. Identify power tools used in masonry.
12. Describe how to use masonry saws, splitters, and grinders.
13. Describe how to use power drills and powder-actuated tools.
14. Identify power equipment used in masonry.
15. Describe how to use a mortar mixer.
16. Describe how to use a masonry pump, vibrator, and hydraulic grout placer.
17. Describe how to use pressurized cleaning equipment.
18. Identify lifting equipment used in masonry.
19. Describe how to use mounted and portable hoists.
20. Describe how to use hydraulic-lift materials trucks.
21. Describe how to use forklifts and pallet jacks.
22. Identify the types of scaffolds and ladders used in masonry.
23. Assemble and disassemble tubular frame scaffold.
24. Demonstrate performance tasks.

D. INTRODUCTION TO MASONRY MATH

Proficient masons demonstrate appropriate knowledge and skills for estimating material quantities. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Explain how to read a six-foot rule.
2. Explain how to read other measuring devices.
3. Explain how to read mason's rules.
4. Identify modular increments.
5. Describe how to determine areas and circumferences.
6. Explain how to use the 3-4-5 ratio to square a corner.
7. Describe how to use the coursing method for block.
8. Describe the square-foot method for block.
9. Explain how to estimate mortar for single- and multi-wythe walls.
10. Explain the coursing method for brick.
11. Explain the square-foot method for brick.
12. Demonstrate performance tasks.

E. MORTAR

Proficient masons demonstrate knowledge and usage of mortar, including properties, materials, and mixing. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Describe the use of portland cement, hydrated lime, and sand.
2. Describe masonry cement.

3. Describe pre-blended mortars.
4. Describe the use of water and admixtures.
5. Describe the types of masonry mortar.
6. Describe properties of plastic and hardened mortar.
7. Describe the effects of improper proportioning and poor-quality materials.
8. Explain the effects of extreme weather and tempering.
9. Describe efflorescence.
10. Describe how to set up and maintain the mixing area.
11. Describe how to mix mortar by hand and with a power mixer.
12. Demonstrate performance tasks.

F. MASONRY UNITS AND INSTALLATION TECHNIQUES

Proficient masons demonstrate knowledge and skills in laying out, bonding, cutting, tooling, cleaning block and brick. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify the characteristics of concrete masonry units.
2. Explain how to set up, lay out, and bond concrete masonry units.
3. Explain how to lay and tool concrete masonry units.
4. Explain how to clean concrete masonry units.
5. Identify the characteristics of brick.
6. Explain how to set up, lay out, and bond brick.
7. Explain how to lay and tool brick.
8. Explain how to clean brick.
9. Explain how to cut with chisels and masonry hammers.
10. Explain how to cut with saws and splitters.
11. Explain how to check units and cuts.
12. Describe how to install masonry reinforcements.
13. Describe how to install masonry accessories.
14. Demonstrate performance tasks.

MASONRY LEVEL 2

A. RESIDENTIAL PLANS AND DRAWING INTERPRETATION

Proficient masons demonstrate knowledge and skills for interpreting residential plans and drawings. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify keys and legends, as well as selected lines, architectural terms, abbreviations, and symbols on residential drawings.
2. Explain how to use scales and dimensions in residential drawings.
3. Explain how to interpret the various types of residential drawings.
4. Explain how to use estimating aids (e.g., rule-of-thumb method.)
5. Explain the purpose of specifications, standards, and codes.

6. Describe the purpose of inspections and testing.
7. Demonstrate performance tasks.

B. RESIDENTAL MASONRY

Proficient masons demonstrate appropriate knowledge and skills for installing masonry for residential and small structure foundations, steps, patios, and decks. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Explain what spread foundations are.
2. Explain what raft and mat foundations are.
3. Explain what foundation walls are.
4. Describe the various types of clay brick pavers.
5. Explain how to install clay brick pavers.
6. Describe the various types of concrete and interlocking pavers.
7. Explain how to install concrete and interlocking pavers.
8. Describe the various types of steps.
9. Explain how to recognize patterns and tread designs.
10. Explain how to build a concrete base.
11. Explain how to set clay brick in steps.
12. Explain how patios and decks are constructed.
13. Explain the key points of workmanship.
14. Demonstrate performance tasks.

C. SITE LAYOUT – DISTANCE MEASUREMENT AND LEVELING

Proficient masons demonstrate appropriate knowledge and skills for appropriate site layout including distance measuring and leveling. The following accountability criteria are considered essential for students in the Masonry program of study.

1. List characteristics of contour lines.
2. Describe layout control points.
3. Explain how to convert between distance-measurement systems.
4. Explain how to place control points and other markers.
5. Describe how to communicate information on control points and other markers.
6. Discuss how control markers are color coded.
7. Explain how to use tapes.
8. Explain how to use range poles.
9. Explain how to use plumb bobs and gammon reels.
10. Explain how to use hand sight levels.
11. Explain how to estimate distances by pacing.
12. Describe how to measure distances electronically.
13. Identify leveling instruments.
14. Describe the use of tripods and leveling rods.
15. Explain how to set up and adjust leveling instruments.
16. Explain how to test the calibration of leveling instruments.
17. Define differential-leveling terminology.

18. Explain the differential-leveling procedure.
19. Explain how field notes are recorded and used.
20. Explain how to transfer elevations up a structure.
21. Explain profile, cross-section, and grid leveling.
22. Explain how to construct batter boards.
23. Describe how to use the 3-4-5 rule.
24. Demonstrate performance tasks.

D. REINFORCED MASONRY

Proficient masons demonstrate appropriate knowledge and skills for the usage of reinforcement materials. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Explain the characteristics of coarse and fine aggregates.
2. Explain the characteristics of admixtures.
3. Explain the role of water content in grout.
4. Explain why compressive strength is important.
5. Explain what mix specifications are and why they are important.
6. Explain the procedures for mixing grout.
7. Explain what low- and high-lift grouting is and how to place grout using this technique.
8. Explain why mortaring of joints for grouted masonry is important.
9. Explain how to use mechanical vibrators with grout.
10. Explain how to cut and bend rebar.
11. Explain how to place rebar in reinforced walls.
12. Explain how to install bond beams and bond beam lintels.
13. Explain how to install precast lintels.
14. Explain how to install piers, pilasters, and columns.
15. Demonstrate performance tasks.

E. ADVANCE LAYING TECHNIQUES

Proficient masons demonstrate appropriate advanced knowledge and skills for installing walls, arches, and other useful structures. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify the structural principles and fundamental uses of different types of wall make-ups (e.g., solid, hollow, cavity, composite.)
2. Identify the uses of control and expansion joints.
3. Lay out and construct various corners and intersections.
4. Lay out and construct toothing, corbeling, intersecting walls, and angled corners.
5. Demonstrate performance tasks.

F. EFFECTS OF ENVIRONMENTAL FACTORS ON MASONRY

Proficient masons demonstrate appropriate knowledge and skills for offsetting the effects of climate on masonry work. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Explain the concept of heat transfer.
2. Explain the purpose of and installation procedures for internal and external insulation.
3. Explain the purpose of and the installation procedures for flashing, weep vents, and waterproofing.
4. Explain the role played by weather data and information in masonry construction.
5. Explain the various techniques used to provide adequate protection during hot- and cold weather masonry construction.
6. Explain techniques used to provide adequate protection in extreme environmental events (e.g., hurricanes, tornadoes, earthquakes).
7. Demonstrate performance tasks.

MASONRY LEVEL 3

A. CONSTRUCTION INSPECTION AND QUALITY CONTROL

Proficient masons demonstrate appropriate knowledge and skills for construction inspection and quality control. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Describe the standards and specifications that apply to masonry units, mortar, grout, and accessories.
2. Describe the standards that apply to laboratory and field testing of masonry construction.
3. Describe how to build sample panels.
4. Describe how to build hollow and grouted masonry prisms.
5. Describe how to prepare and test mortar and grout prisms.
6. Describe how to conduct masonry tests.
7. Describe how to perform sand tests.
8. Describe how to perform mortar consistency tests.
9. Describe how to perform brick absorption tests.
10. Describe why and how standards and codes inspections are performed.
11. Describe why and how materials inspections are performed.
12. Describe the types of observations that are undertaken during construction.
13. Describe why and how construction tolerances are monitored.
14. Demonstrate performance tasks.

B. MASONRY OPENINGS AND METAL WORK

Proficient masons demonstrate appropriate knowledge and skills for installing masonry openings and metal work. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Describe how to use and install door and window frames, windowsills, steel lintels, chases, and recesses.
2. Describe how to use and install ladder and truss joint reinforcement.
3. Describe how to use and install seismic reinforcements.
4. Describe how to use and install flexible and horizontal anchors.
5. Describe how to use and install rigid ties and bolts, bearing plates, saddles, and strap ties.
6. Demonstrate performance tasks.

C. ELEVATED MASONRY

Proficient masons demonstrate appropriate knowledge and skills for installing elevated masonry. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Describe safety precautions related to an elevated work area.
2. Discuss fall protection related to elevated work areas.
3. Describe how to properly brace a concrete masonry wall for wind.
4. Describe how to properly brace a wall for backfill.
5. List the construction sequence for elevated masonry systems.
6. Describe how elevated masonry systems are designed.
7. Identify common interior and exterior walls used for elevated masonry systems.
8. Explain safety precautions and proper hand signals to be observed when working around cranes and material hoists.
9. Explain safety precautions to be observed when moving and stocking materials.
10. Explain safety precautions to be observed when working at elevated workstations.
11. Explain how disposal chutes and waste bins are used when working from elevated workstations.
12. Demonstrate performance tasks.

D. ADVANCE ESTIMATING

Proficient masons demonstrate appropriate knowledge and skills for estimating material quantities. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Describe how to use the coursing method for block.
2. Describe the square-foot method for block.
3. Explain how to estimate mortar for single- and multi-wythe walls.

4. Explain the coursing method for brick.
5. Explain the square-foot method for brick.
6. Explain how to estimate openings and lintels.
7. Explain how to estimate grout.
8. Describe how to allow for openings in an estimate.
9. Explain how to estimate mortar for brick.
10. Explain how to estimate joint reinforcement.
11. Explain how to estimate structural reinforcement.
12. Explain how to estimate masonry ties.
13. Explain how to estimate other masonry units.
14. Explain how to estimate other masonry accessories.
15. Demonstrate performance tasks.

MASONRY LEVEL 4 (ADVANCED)

A. COMMERCIAL DRAWINGS

Proficient masons demonstrate appropriate knowledge and skills for reading and interpreting commercial drawings. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Explain the requirements for commercial drawings.
2. Describe the difference between residential versus commercial standards and codes.
3. List the contents of commercial plans and describe the purpose of each.
4. Identify common views used in commercial drawings.
5. Explain how to read and interpret architectural drawings.
6. Explain how to read and interpret structural drawings.
7. Explain how to read and interpret shop drawings.
8. Define building information modeling and describe its applications.
9. Describe how specifications are written.
10. Explain the format of specifications.
11. Demonstrate performance tasks.

B. SPECIALIZED MATERIALS AND ADVANCED TECHNIQUES

Proficient masons demonstrate appropriate knowledge and skills for installing specialized masonry materials. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify pier-and-panel barrier walls.
2. Identify continuous walls.
3. Identify common types of arches.
4. Explain how to calculate and lay out common arches.
5. Explain how to construct formed arches.
6. Explain how to construct a jack arch.
7. Identify refractory brick shapes and sizes.

8. Explain how to lay refractory brick.
9. Describe the curing and heat-up process for refractory brick.
10. Describe structural glazed tile and its applications.
11. Describe glazed block and its applications.
12. Describe applications and uses of glass block.
13. Identify variations in glass block.
14. Explain how to install glass block.
15. Explain the uses of pre-cast in construction.
16. Demonstrate performance tasks.

C. STONE MASONRY

Proficient masons demonstrate appropriate knowledge and skills for installing stone masonry. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify types of stone.
2. Describe how stone is quarried, safely cut, and finished.
3. Identify hand and power tools used in stone masonry.
4. Identify lifting devices used in stone masonry.
5. Identify fasteners and connectors used in stone masonry.
6. Describe how to estimate stone veneers.
7. Describe how to install adhered stone veneers.
8. Describe how to perform stone volume estimates.
9. Describe how to install stone using anchors and mortar.
10. Demonstrate performance tasks.

D. REPAIR AND RESTORATION

Proficient masons demonstrate appropriate knowledge and skills for repairing and restoring masonry work. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Identify common types of masonry deterioration and their causes.
2. Explain how to inspect existing masonry structures.
3. Explain how to tuck-point a masonry structure.
4. Describe how to repair masonry cracks.
5. Identify staining problems.
6. Explain how to remove old paint.
7. Describe how to clean brick.
8. Explain how to replace brick and mortar joints.
9. Explain how to repair water intrusion.
10. Explain how to repair cracks and localized problems.
11. Explain how to repair chimneys and fireplaces.
12. Demonstrate performance tasks.

E. CHIMNEYS AND FIREPLACES (OPTIONAL)

Proficient masons demonstrate appropriate knowledge and skills for managing crews, including leadership, safety, and project control. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Explain the basic theory of the fireplace.
2. Describe the parts of a fireplace.
3. Explain how to lay out chimneys and fireplaces.
4. Explain how to begin the fireplace.
5. Explain how to finish the fireplace.
6. Describe a multi-opening fireplace.

F. CONSTRUCTION MANAGEMENT (OPTIONAL)

Proficient masons demonstrate appropriate knowledge and skills for managing crews, including leadership, safety, and project control. The following accountability criteria are considered essential for students in the Masonry program of study.

1. Describe the opportunities in the masonry industries.
2. Describe how workers' values change over time.
3. Explain the importance of training and safety for the leaders in the masonry industries.
4. Describe how new technologies are beneficial to the masonry industries.
5. Identify the gender and minority issues associated with a changing workforce.
6. Describe what employers can do to prevent workplace discrimination.
7. Differentiate between formal and informal organizations.
8. Describe the difference between authority, responsibility, and accountability.
9. Explain the purpose of job descriptions and what they should include.
10. Distinguish between company policies and procedures.
11. Describe the role of a crew leader.
12. List the characteristics of effective leaders.
13. Be able to discuss the importance of ethics in a supervisor's role.
14. Identify the three styles of leadership.
15. Describe the forms of communication.
16. Describe the four parts of verbal communication.
17. Describe the importance of active listening.
18. Explain how to overcome the barriers to communication.
19. List ways that leaders can motivate their employees.
20. Explain the importance of delegating and implementing policies and procedures.
21. Distinguish between problem solving and decision making.
22. Explain the importance of safety.
23. Give examples of direct and indirect costs of workplace accidents.
24. Identify safety hazards of the construction industry.

25. Explain the purpose of OSHA.
26. Discuss OSHA inspection procedures.
27. Identify the key points of a safety program.
28. List steps to train employees on how to perform new tasks safely.
29. Identify a crew leader's safety responsibilities.
30. Explain the importance of having employees trained in first aid and cardiopulmonary resuscitation (CPR).
31. Describe the indications of substance abuse.
32. List the essential parts of an accident investigation.
33. Describe ways to maintain employee interest in safety.
34. Distinguish between company policies and procedures.
35. Describe the three phases of a construction project.
36. Define the three types of project delivery systems.
37. Define planning and describe what it involves.
38. Explain why it is important to plan.
39. Describe the two major stages of planning.
40. Explain the importance of documenting job site work.
41. Describe the estimating process.
42. Explain how schedules are developed and used.
43. Identify the two most common schedules.
44. Explain how the critical path method (CPM) of scheduling is used.
45. Describe the different costs associated with building a job.
46. Explain the crew leader's role in controlling costs.
47. Illustrate how to control the main resources of a job: materials, tools, equipment, and labor.
48. Explain the differences between production and productivity and the importance of each.
49. Demonstrate performance tasks.

Student Organizations, Technology Knowledge, Personal Qualities and Skills, and Professional Knowledge are to be embedded in course standards.

STUDENT ORGANIZATIONS

Proficient professionals know the academic subject matter, including professional development. The following accountability criteria are considered essential for students in any program of study.

1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).
2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.
3. Explain the benefits and responsibilities of being a member of a CTSO. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.
4. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.

TECHNOLOGY KNOWLEDGE

Proficient professionals know the academic subject matter, including the ethical use of technology. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.
2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.
3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.
4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; illegal downloading; cyberbullying; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).
5. Discuss legal issues and the terms of use related to copyright laws, Creative Commons, fair use laws, and ethics pertaining to downloading of images, photographs, Creative Commons, documents, video, sounds, music, trademarks, and other elements for personal use.
6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.
7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.

PERSONAL QUALITIES AND EMPLOYABILITY SKILLS

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate creativity and innovation.
2. Demonstrate critical thinking and problem-solving skills.
3. Demonstrate initiative and self-direction.
4. Demonstrate integrity.
5. Demonstrate work ethic.
6. Demonstrate conflict resolution skills.
7. Demonstrate listening and speaking skills.
8. Demonstrate respect for diversity.
9. Demonstrate customer service orientation.
10. Demonstrate teamwork.

PROFESSIONAL KNOWLEDGE

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills. The accountability criteria are considered essential for students in any program of study.

1. Demonstrate global or “big picture” thinking.

2. Demonstrate career and life management skills and goal-making.
3. Demonstrate continuous learning and adaptability skills to changing job requirements.
4. Demonstrate time and resource management skills.
5. Demonstrates information literacy skills.
6. Demonstrates information security skills.
7. Demonstrates information technology skills.
8. Demonstrates knowledge and use of job-specific tools and technologies.
9. Demonstrate job-specific mathematics skills.
10. Demonstrates professionalism in the workplace.
11. Demonstrates reading and writing skills.
12. Demonstrates workplace safety.