

# *Appendix B:* *Instructional Framework*



## Standards Alignment: Common Core / Carpentry

Construction Standards	Common Core Standards	Explanation
<b>Module 00101-09 – Basic Safety</b>	RI 11-12.7, RST 11-12.2	Watch safety videos, read related information on safety, and demonstrate safety procedures.
1. Explain the idea of a safety culture and its importance in the construction crafts.	SL 11-12.1.a, SL 11-12.1.c	Read and understand information, discuss as a group, and ask questions to understand safety processes and procedures.
2. Identify causes of accidents and the impact of accident costs.	SL 11-12.1.a, SL 11-12.1.c	
3. Explain the role of OSHA in job-site safety.	SL 11-12.1.a, SL 11-12.1.c	
4. Explain OSHA's General Duty Clause and 1926 CFR Subpart C.	SL 11-12.1.a, SL 11-12.1.c	
5. Recognize hazard recognition and risk assessment techniques.	SL 11-12.1.a, SL 11-12.1.c	
6. Explain fall protection, ladder, stair, and scaffold procedures and requirements.	SL 11-12.1.a, SL 11-12.1.c F-IF 2, F-IF 4, F-BF 1, F-LE 1, F-LE 5	Demonstration. Extension ladder ratio.
7. Identify struck-by hazards and demonstrate safe working procedures and requirements.		
8. Identify caught-in-between hazards and demonstrate safe working procedures and requirements.		
9. Define safe work procedures to use around electrical hazards.	SL 11-12.1.a, SL 11-12.1.c	
10. Demonstrate the use and care of appropriate personal protective equipment (PPE).		
11. Explain the importance of hazard communications (HazCom) and Material Safety Data Sheets (MSDSs).	SL 11-12.1.a, SL 11-12.1.c	

Construction Standards	Common Core Standards	Explanation
12. Identify other construction hazards on your job site, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires.	SL 11-12.1.a, SL 11-12.1.c	
13. Demonstrate an understanding of safety through the OSHA 10-hour safety course and assessment.	SL 11-12.1.a, SL 11-12.1.c	
<b>Module 00102-09 – Introduction to Construction Math</b> This module introduces mathematical operations commonly used in construction and explains how the metric system and geometry are used in the trade. Trainees will learn how to add, subtract, multiply, and divide whole numbers, fractions, and decimals, as well as how to convert decimals, fractions, and percentages.		
1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.	N-Q 1, N-Q 2, N-Q 3	“Reason quantitatively and use units to solve problems”—put in a construction context with units.
2. Use a standard ruler, a metric ruler, and a measuring tape to measure.	N-RN 3, N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-BF 1, F-BF 2, F-LE 1, F-LE 5	
3. Add, subtract, multiply, and divide fractions.	N-RN 3	
4. Add, subtract, multiply, and divide decimals, with and without a calculator.	N-RN 3, N-Q 1, N-Q 2, N-Q 3	
5. Convert decimals to percentages and percentages to decimals.	N-RN 3, N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-BF 1, F-BF 2, F-LE 1	
6. Convert fractions to decimals and decimals to fractions.	N-RN 3, N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-BF 1, F-BF 2, F-LE 1	
7. Explain what the metric system is and how it is important in the construction trade.	N-RN 3, N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-BF 1, F-BF 2, F-LE 1	
8. Recognize and use metric units of length, weight, volume, and temperature.	N-RN 3, N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-BF 1, F-BF 2, F-LE 1	
9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.	G-CO 5, G-SRT 2, G-SRT 3, G-SRT 5, G-SRT 8, G-GMD 1, G-GMD 3, G-GMD 4, G-MG 1	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 00103-09 – Introduction to Hand Tools</b> This module explains how to inspect and properly use hand tools. Trainees will learn how to identify and take care of basic hand tools.</p>		Some math concepts from above can be reinforced and expanded in teaching the use of some tools.
<p>1. Recognize and identify some of the basic hand tools and their proper uses in the construction trade.</p>	SL 11-12.5, SL 11-12.1.a, RI 11-12.7, RST 11-12.2	Pull evidence from the text. Reading and research.
<p>2. Visually inspect hand tools to determine if they are safe to use.</p>		
<p>3. Safely use hand tools.</p>	RI 11-12.7, RST 11-12.2	
<p><b>Module 00104-09 – Introduction to Power Tools</b> This module introduces power tools commonly used in the construction trade. Trainees will learn how to safely use and properly maintain a variety of power tools.</p>		
<p>1. Identify power tools commonly used in the construction trades.</p>	SL 11-12.5, SL 11-12.1.a, RI 11-12.7, RST 11-12.2	
<p>2. Use power tools safely.</p>		
<p>3. Explain how to maintain power tools properly.</p>	SL 11-12.1.a	
<p><b>Module 00105-09 – Introduction to Construction Drawings</b> This module discusses blueprint terms, components, and symbols. Trainees will learn how to interpret blueprints, recognize classifications of drawings, and use drawing dimensions.</p>		
<p>1. Recognize and identify basic construction drawing terms, components, and symbols.</p>	RST 11-12.4, L 11-12.6, G-MG 1-3	
<p>2. Relate information on construction drawings to actual locations on the print.</p>	SL 11-12.5, G-CO 2, G-CO 3, G-CO 5, G-CO 6, G-SRT 2, G-SRT 5, G-SRT 8, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
<p>3. Recognize different classifications of construction drawings.</p>	RST 11-12.2, L 11-12.6, N-Q 1, N-Q 2, N-Q 3, G-CO 5, G-SRT 2	
<p>4. Interpret and use drawing dimensions.</p>	SL 11-12.1.a, G-CO 5, G-CO 12, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 00106-09 – Basic Rigging</b>            This module introduces the uses of slings and common rigging hardware. Trainees will learn basic inspection techniques, hitch configurations, and load-handling safety practices, as well as how to use American National Standards Institute hand signals.</p>		<p>Read about the information and describe/discuss in class each competencies.</p>
<p>1. Identify and describe the use of slings and common rigging hardware.</p>	<p>RST 11-12.2</p>	
<p>2. Describe basic inspection techniques and rejection criteria used for slings and hardware.</p>	<p>SL 11-12.1.a, S-ID 9, S-IC 6, S-MD 7</p>	
<p>3. Describe basic hitch configurations and their proper connections.</p>	<p>SL 11-12.1.a</p>	
<p>4. Describe basic load-handling safety practices.</p>	<p>SL 11-12.1.a, S-ID 9, S-IC 6, S-MD 7</p>	
<p>5. Demonstrate proper use of American National Standards Institute (ANSI) hand signals.</p>	<p>SL 11-12.1.a</p>	
<p><b>Module 00107-09 – Basic Communication Skills</b>            This module reviews basic communication skills. Trainees will learn how to interpret information in written and verbal form and how to communicate effectively using written and verbal skills.</p>		
<p>1. Interpret information and instructions presented in both verbal and written form.</p>	<p>SL 11-12.4, WHST 11-12.8, W 11-12.8, S-ID 9, S-IC 6, S-MD 7</p>	<p>Conduct research on steps and procedures in order to plan project sheets for the week.</p>
<p>2. Communicate effectively in on-the-job situations using verbal and written skills.</p>	<p>SL 11-12.4, WHST 11-12.8, L 11-12.6, W 11-12.8</p>	<p>Use proper construction terminology for the task at hand.</p>

Construction Standards	Common Core Standards	Explanation
<p><b>Module 00108-09 – Basic Employability Skills</b>            This module discusses basic employability skills. Trainees will learn how to effectively use critical thinking, computer, and relationship skills in the construction industry. This module will also increase trainee awareness of such workplace issues as sexual harassment, stress, and substance abuse.</p>		
<p>1. Explain the role of an employee in the construction industry.</p>	SL 11-12.4, W 11-12.9, S 11-12.9	
<p>2. Demonstrate critical thinking skills and the ability to solve problems using those skills.</p>	SL 11-12.1.c, S-ID 9, S-IC 6, S-MD 7	
<p>3. Demonstrate knowledge of computer systems and explain common uses for computers in the construction industry.</p>		
<p>4. Define effective relationship skills.</p>	SL 11-12.1.b	
<p>5. Recognize workplace issues such as sexual harassment, stress, and substance abuse.</p>	RST 11-12.2	
<p><b>Module 00109-09 – Introduction to Materials Handling</b></p>		
<p>1. Define a load.</p>	SL 11-12.4	
<p>2. Establish a pre-task plan prior to moving a load.</p>	SL 11-12.4, N-Q 1, N-Q 2, N-Q 3, A-REI 1	
<p>3. Use proper materials-handling techniques.</p>		
<p>4. Choose appropriate materials-handling equipment for the task.</p>	S-MD 7	
<p>5. Recognize hazards and follow safety procedures required for materials handling.</p>	RST 11-12.3, S-IC 6	

Construction Standards	Common Core Standards	Explanation
<b>Module 27101-06 – Orientation to the Trade</b> This module introduces the carpentry trainee to the carpentry trade, including the apprenticeship process and the opportunities within the trade.		
2. Identify the aptitudes, behaviors, and skills needed to be a successful carpenter.	RST 11-12.2	
3. Identify the training opportunities within the carpentry trade.	W 11-12.9, RST 11-12.2, S-ID 9, S-IC 6, S-MD 7	Research and write a paper on the career in construction the individual is interested in.
4. Identify the career and entrepreneurial opportunities within the carpentry trade.	RST 11-12.2	
5. Identify the responsibilities of a person working in the construction industry.	W 11-12.9, RST 11-12.2	
6. State the personal characteristics of a professional.	RST 11-12.2	
7. Explain the importance of safety in the construction industry.	SL 11-12.1.a, SL 11-12.1.c	
<b>Module 27102-06 – Building Materials, Fasteners, and Adhesives</b> This module introduces the carpentry trainee to wood building materials, fasteners, and adhesives.		
1. Identify various types of building materials and their uses.	RST 11-12.3, L 11-12.6, S-ID 9, S-IC 6	Read about how to do it in text, use a job sheet to identify the procedures and samples.
2. State the uses of various types of hardwoods and softwoods.	SL 11-12.5, RST 11-12.3, S-ID 9, S-IC 6	
3. Identify the different grades and markings of wood building materials.	RST 11-12.2	
4. Identify the safety precautions associated with building materials.	RST 11-12.2	
5. Describe the proper method of storing and handling building materials.	RST 11-12.3	

Construction Standards	Common Core Standards	Explanation
6. State the uses of various types of engineered lumber.	RST 11-12.3	
7. Calculate the quantities of lumber and wood products using industry-standard methods.	WHST 11-12.6, N-Q 1, N-Q 2, N-Q 3, N-VM 7, A-REI 1, F-IF 4	Research products and produce material list.
8. Describe the fasteners, anchors, and adhesives used in construction work and explain their uses.	RST 11-12.3, L 11-12.6	
<b>Module 27103-06 – Hand and Power Tools</b> This module expands upon the hand and power tool information provided in the Core Curriculum and introduces the carpentry trainee to additional tools used in the carpentry trade.		
1. Identify the hand tools commonly used by carpenters and describe their uses.	RST 11-12.3, L 11-12.6	
2. Use hand tools in a safe and appropriate manner.	S-ID 9, S-IC 6	
3. State the general safety rules for operating all power tools, regardless of type.	RST 11-12.2, SL 11-12.1.a, S-ID 9, S-IC 6	
4. State the general rules for properly maintaining all power tools, regardless of type.	RST 11-12.2, SL 11-12.1.a, S-ID 9, S-IC 6	
5. Identify the portable power tools commonly used by carpenters and describe their uses.	RST 11-12.3	
6. Use portable power tools in a safe and appropriate manner.	S-ID 9, S-IC 6	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27104-06 – Reading Plans and Elevations</b>  This module reviews and builds on the construction drawing (blueprint) material introduced in the Core Curriculum. It also introduces new information and techniques relevant to the carpentry trade for reading construction drawings and specifications.</p>		
1. Describe the types of drawings usually included in a set of plans and list the information found on each type.	RST 11-12.3	
2. Identify the different types of lines used on construction drawings.	SL 11-12.1.c, RST 11-12.2, L 11-12.6, N-Q 1, N-Q 2, N-Q 3	
3. Identify selected architectural symbols commonly used to represent materials on plans.	SL 11-12.1.c, RST 11-12.2, G-CO 6, G-SRT 2, G-GMD 4	
4. Identify selected electrical, mechanical, and plumbing symbols commonly used on plans.	RST 11-12.3	
5. Identify selected abbreviations commonly used on plans.	RST 11-12.3, L 11-12.6	
6. Read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings.	RST 11-12.3, G-CO 5, G-SRT 2	
7. State the purpose of written specifications.	S-IC 6	
8. Identify and describe the parts of a specification.	RST 11-12.3, L 11-12.6	
9. Demonstrate or describe how to perform a quantity takeoff for materials.	N-Q 1, N-Q 2, N-Q 3, N-VM 7, A-SSE 1, A-SSE 2, A-SSE 3, A-CED 1, A-CED 4, A-REI 1, A-REI 2, A-REI 3, F-BF 1, F-LE 1b	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27105-06 – Floor Systems</b>            This module introduces the carpentry trainee to residential floor systems. It covers the materials and general methods used to construct floor systems, with emphasis placed on the platform method of floor framing.</p>		
1. Identify the different types of framing systems.	RST 11-12.2, L 11-12.6	
2. Read and interpret drawings and specifications to determine floor system requirements.	RST 11-12.2	
3. Identify floor and sill framing and support members.	RST 11-12.2, L 11-12.6	
4. Name the methods used to fasten sills to the foundation.	RST 11-12.2	
5. Given specific floor load and span data, select the proper girder/beam size from a list of available girders/beams.	RST 11-12.2, F-IF 4	
6. List and recognize different types of floor joists.	RST 11-12.3	
7. Given specific floor load and span data, select the proper joist size from a list of available joists.	RST 11-12.3, F-IF 4	
8. List and recognize different types of bridging.	RST 11-12.3	
9. List and recognize different types of flooring materials.	RST 11-12.3	
10. Explain the purposes of subflooring and underlayment.	RST 11-12.3	
11. Match selected fasteners used in floor framing to their correct uses.	RST 11-12.3	
12. Estimate the amount of material needed to frame a floor assembly.	RST 11-12.3, A-CED 4, A-REI 1, S-ID 6c, S-ID 7	
13. Demonstrate the ability to: <ul style="list-style-type: none"> <li>• Lay out and construct a floor assembly</li> <li>• Install bridging</li> <li>• Install joists for a cantilever floor</li> <li>• Install a subfloor using butt-joint plywood/OSB panels</li> <li>• Install a single floor system using tongue-and-groove plywood/OSB panels</li> </ul>	G-CO 2, 4, 12, G-SRT 2, G-GMD 4, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 27106-06 – Wall and Ceiling Framing</b> This module introduces the carpentry trainee to the materials and general procedures used in wall and ceiling framing.		
1. Identify the components of a wall and ceiling layout.	RST 11-12.2, N-Q 1, N-Q 2, N-Q 3, G-CO 12	
2. Describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing, and firestops.	G-CO 2, G-CO 4, G-CO12, G-SRT 2, G-GMD 4, G-MG 3	
3. Describe the correct procedure for assembling and erecting an exterior wall.	RST 11-12.3	
4. Identify the common materials and methods used for installing sheathing on walls.	RST 11-12.3	
5. Lay out, assemble, erect, and brace exterior walls for a frame building.	RST 11-12.3, G-CO 2, G-CO 4, G-CO 12, G-SRT 2, G-GMD 4, G-MG 3	
6. Describe wall framing techniques used in masonry construction.	RST 11-12.3, RST 11-12.3	
7. Explain the use of metal studs in wall framing.	RST 11-12.3	
8. Describe the correct procedure for laying out ceiling joists.	RST 11-12.3, G-CO 2, G-CO 4, G-CO 12, G-SRT 2, G-GMD 4, G-MG 3	
9. Cut and install ceiling joists on a wood frame building.		
10. Estimate the materials required to frame walls and ceilings.	WHST 11-12.6, A-CED 4, A-REI 1, S-ID 6c, S-ID 7	
<b>Module 27107-06 – Roof Framing</b> This module introduces the carpentry trainee to the methods and procedures used in roof framing.		
1. Understand the terms associated with roof framing.	RST 11-12.2	
2. Identify the roof framing members used in gable and hip roofs.	RST 11-12.2, G-CO.12, G-CO 5, G-CO 6, G-SRT 2, G-SRT 3, G-SRT 8, G-GPE 5, G-GPE 7, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
3. Identify the methods used to calculate the length of a rafter.	RST 11-12.3, F-IF 4, F-BF 1, F-BF 2, F-BF 3, F-LE 1, F-LE 5, F-TF 7, G-CO 3, G-CO 4, G-CO 5, G-CO 6, G-CO 7, G-CO 8, G-CO 3-8.12, G-SRT 1, G-SRT 2, G-SRT 3, G-SRT 4, G-SRT 5, G-SRT 6, G-SRT 7, G-SRT 8, G-SRT 9, G-SRT 10, G-SRT 11, G-GPE 5, G-GPE 6, G-GPE 7, G-GMD 4, G-MG 1, G-MG 2, G-ME 3	
4. Identify the various types of trusses used in roof framing.	RST 11-12.3	
5. Use a rafter framing square, speed square, and calculator in laying out a roof.	F-IF 4, F-BF 1, F-BF 3, F-LE 1, F-LE 5, F-TF 7, G-CO 3-8, G-CO 3-8.12, G-SRT 1, G-SRT 2, G-SRT 3, G-SRT 4, G-SRT 5, G-SRT 6, G-SRT 7, G-SRT 8, G-SRT 9, G-SRT 10, G-SRT 11, G-GPE 5, G-GPE 6, G-GPE 7, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
6. Identify various types of sheathing used in roof construction.	RST 11-12.3	
7. Frame a gable roof with vent openings.	RST 11-12.3, N-Q 1, N-Q 2, N-Q 3, G-CO 3-8, G-CO 3-8.12, G-SRT 8, G-GPE 6, G-MG 3, F-IF 3, F-BF 1a, F-LE 1	
8. Frame a roof opening.	RST 11-12.3, N-Q 1, N-Q 2, N-Q 3, G-CO 12, G-SRT 8, G-GPE 6, G-MG 3	
9. Erect a gable roof using trusses.	RST 11-12.3	
10. Estimate the materials used in framing and sheathing a roof.	WHST 11-12.6, A-CED 4, A-REI 1, S-ID 6c, S-ID 7	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27108-06 – Introduction To Concrete, Reinforcing Materials, And Forms</b></p> <p>This module introduces the carpentry trainee to various cements and other materials that, when mixed together, form various types of concrete. Concrete volume estimates and concrete forms are also covered. In addition, reinforcement materials such as reinforcement bars, bar supports, and welded-wire fabric are discussed.</p>		
1. Identify the properties of cement.	RST 11-12.2	
2. Describe the composition of concrete.	RST 11-12.2, S-IC 6	
3. Perform volume estimates for concrete quantity requirements.	G-GMD 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
4. Identify types of concrete reinforcement materials and describe their uses.	RST 11-12.2, L 11-12.6	
5. Identify various types of footings and explain their uses.	RST 11-12.2	
6. Identify the parts of various types of forms.	RST 11-12.2, L 11-12.6	
7. Explain the safety procedures associated with the construction and use of concrete forms.	S-IC 6	Show industry collected data helps in the development of safety procedures.
8. Erect, plumb, and brace a simple concrete form with reinforcement.	N-Q 1, N-Q 3, G-CO 12, G-GMD 4, G-MG 1, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 27109-06 – Windows and Exterior Doors</b> This module introduces the carpentry trainee to methods and procedures used in the selection and installation of residential windows and exterior doors.		
1. Identify various types of fixed, sliding, and swinging windows.	RST 11-12.3	
2. Identify the parts of a window installation.	RST 11-12.3	
3. State the requirements for a proper window installation.	RST 11-12.3, N-Q 1, N-Q 2, N-Q 3	
4. Install a pre-hung window.	RST 11-12.3, N-Q 1, N-Q 2, N-Q 3	
5. Identify the common types of exterior doors and explain how they are constructed.	RST 11-12.3	
6. Identify the parts of a door installation.	RST 11-12.3	
7. Identify the types of thresholds used with exterior doors.	RST 11-12.3	
8. Install a pre-hung exterior door.	RST 11-12.3 ,N-Q 1, N-Q 2, N-Q 3	
9. Identify the various types of locksets used on exterior doors and explain how they are installed.	RST 11-12.3	
10. Install a lockset.	RST 11-12.3, N-Q 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 27110-06 – Basic Stair Layout</b> This module introduces the Carpentry trainee to the materials and methods used to construct interior and exterior wooden stairs.	RST 11-12.3	
1. Identify the various types of stairs.	RST 11-12.3, L 11-12.6	
2. Identify the various parts of stairs.	RST 11-12.3	
3. Identify the materials used in the construction of stairs.	RST 11-12.3, L 11-12.6, N-Q 1, N-Q 2	
4. Interpret construction drawings of stairs.	RST 11-12.3, G-GMD 4	
5. Calculate the total rise, number and size of risers, and number and size of treads required for a stairway.	WHST 11-12.6, N-Q 1, N-Q 2, N-Q 3, F-IF 1, F-IF 4, F-BF 1, F-BF 3, F-LE 1, F-LE 5, G-CO 4, G-CO 5, G-CO 6, G-CO 7, G-CO 12, G-SRT 2, G-SRT 8, G-GPE 6, G-GPE 7, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 1, A-REI 1	
6. Lay out and cut stringers, risers, and treads.	RST 11-12.3, N-Q 1, N-Q 2, N-Q 3, G-CO 12, G-GMD 4, G-MG 1, G-MG 3	
7. Build a small stair unit with a temporary handrail.	RST 11-12.3, N-Q 1-3	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27201-07 – Commercial Drawings</b>            This module describes the types and uses of drawings prepared for commercial structures. It provides information about the format and content of commercial drawings and their use in conveying specific construction requirements. It describes the standard format for specifications.</p>		
<p>1. Recognize the difference between commercial and residential construction drawings.</p>	RST 11-12.3, N-Q 1	
<p>2. Identify the basic keys, abbreviations, and other references contained in a set of commercial drawings.</p>	RST 11-12.3, N-Q 1	
<p>3. Accurately read a set of commercial drawings.</p>	RST 11-12.3, N-Q 1, G-GMD 4, G-MG 1, G-MG 3	
<p>4. Identify and document specific items from a door and window schedule.</p>	RST 11-12.3	
<p>5. Explain basic construction details and concepts employed in commercial construction.</p>	RST 11-12.3, G-GMD 4, G-MG 1, G-MG 3	
<p>6. Calculate the floor area of each room in a floor plan.</p>	WHST 11-12.6, N-Q 1, N-Q 2, N-Q 3, G-GPE 7, G-GMD 4, G-MG 1, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27202-07 – Roofing Applications</b>            This module covers the common materials used in residential and light commercial roofing, along with the safety practices and application methods for these materials. It includes shingles, roll roofing, shakes, tiles, and metal and membrane roofs. As well as the selection and installation of roof vents.</p>	RST 11-12.3	
1. Identify the materials and methods used in roofing.		
2. Explain the safety requirements for roof jobs.		
3. Install fiberglass shingles on gable and hip roofs.		
4. Close up a valley using fiberglass shingles.		
5. Explain how to make various roof projections watertight when using fiberglass shingles.		
6. Complete the proper cuts and install the main and hip ridge caps using fiberglass shingles.	N-Q 1, N-Q 2, N-Q 3, G-CO 12	
7. Lay out, cut, and install a cricket or saddle.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-BF 1, F-BF 3, F-LE 1, F-LE 5, F-TF 7, G-CO 3, G-CO 4, G-CO 5, G-CO 6, G-CO 7, G-CO 8, G-CO 12, G-SRT 1, G-SRT 2, G-SRT 3, G-SRT 4, G-SRT 5, G-SRT 6, G-SRT 7, G-SRT 8, G-SRT 9, G-SRT 10, G-SRT 11, G-GPE 5-7, G-GMD 4, G-MG 1, G-MG 3	
8. Install wood shingles and shakes on roofs.		
9. Describe how to close up a valley using wood shingles and shakes.		
10. Explain how to make roof projections watertight when using wood shakes and shingles.		
11. Complete the cuts and install the main and hip ridge caps using wood shakes/shingles.	N-Q 1, N-Q 2, N-Q 3, G-CO 12	
12. Demonstrate the techniques for installing other selected types of roofing materials.	N-Q 1, N-Q 2, N-Q 3, G-CO 12	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27203-07 – Thermal and Moisture Protection</b>            This module covers the selection and installation of various types of insulating materials in walls, floors, and attics. It also covers the uses and installation practices for vapor barriers and weather-proofing materials.</p>		
1. Describe the requirements for insulation.	RST 11-12.3	
2. Describe the characteristics of various types of insulation material.	RST 11-12.3	
3. Calculate the required amounts of insulation for a structure.	WHST 11-12.6,N-Q 1, N-Q 2, N-Q 3, G-GMD 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
4. Install selected insulation materials.	RST 11-12.3	
5. Describe the requirements for moisture control and ventilation.	RST 11-12.3	
6. Install selected vapor barriers.	RST 11-12.3	
7. Describe various methods of waterproofing.	RST 11-12.3	
8. Describe air infiltration control requirements.	RST 11-12.3	
9. Install selected building wraps.	RST 11-12.3	

Construction Standards	Common Core Standards	Explanation
<b>Module 27204-07 – Exterior Finishing</b> This module covers the various types of exterior siding used in residential construction and their installation procedures, including wood, metal, vinyl, and cement board siding.	RST 11-12.3	
1. Describe the purpose of wall insulation and flashing.		
2. Install selected common cornices.		
3. Demonstrate lap and panel siding estimating methods.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
4. Describe the types and applications of common wood siding.		
5. Describe fiber-cement siding and its uses.		
6. Describe the types and styles of vinyl and metal siding.		
7. Describe the types and applications of stucco and masonry veneer finishes.		
8. Describe the types and applications of special exterior finish systems.		
9. Install three types of siding commonly used in your area.		

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27206-07 – Drywall Installation</b>            This module describes the various types of gypsum drywall, their uses, and the fastening devices and methods used to install them. It also contains detailed instructions for installing drywall on walls and ceilings, using nails, drywall screws, and adhesives. It also covers fire- and sound-rated walls.</p>		
1. Identify the different types of drywall and their uses.	RST 11-12.3, F-IF 4	
2. Select the type and thickness of drywall required for specific installations.	RST 11-12.3, F-IF 4	
3. Select fasteners for drywall installation.	RST 11-12.3, F-IF 4	
4. Explain the fastener schedules for different types of drywall installations.	RST 11-12.3, F-IF 4	
5. Perform single-layer and multi-layer drywall installations using different types of fastening systems, including: <ul style="list-style-type: none"> <li>• Nails</li> <li>• Drywall screws</li> <li>• Adhesives</li> </ul>		
6. Install gypsum drywall on steel studs.	RST 11-12.3	
7. Explain how soundproofing is achieved in drywall installations.	RST 11-12.3	
8. Estimate material quantities for a drywall installation.	RST 11-12.3, N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 27207-07 – Drywall Finishing</b> This module covers the materials, tools, and methods used to finish and patch gypsum drywall. It includes coverage of both automatic and manual taping and finishing methods.	RST 11-12.3	
1. State the differences between the six levels of finish established by industry standards and distinguish a finish level by observation.	S-IC 6, S-MD 7	
2. Identify the hand tools used in drywall finishing and demonstrate the ability to use these tools.		
3. Identify the automatic tools used in drywall finishing.		
4. Identify the materials used in drywall finishing and state the purpose and use of each type of material, including: <ul style="list-style-type: none"> <li>• Compounds</li> <li>• Joint reinforcing tapes</li> <li>• Trim material</li> <li>• Textures and coatings</li> </ul>	L 11-12.6	
5. Properly finish drywall using hand tools.		
6. Recognize various types of problems that occur in drywall finishes; identify the causes and correct methods for solving each type of problem.	S-ID 9, S-IC 6	
7. Patch damaged drywall.		Will it crack later?

Construction Standards	Common Core Standards	Explanation
<p><b>Module 27208-07 – Doors and Door Hardware</b>            This module covers the installation of metal doors and related hardware in steel-framed, wood-framed, and masonry walls, along with their related hardware, such as locksets and door closers. It also covers the installation of wooden doors, folding doors, and pocket doors.</p>	RST 11-12.3	
<p>1. Identify various types of door jambs and frames and demonstrate the installation procedures for placing selected door jambs and frames in different types of interior partitions.</p>	N-Q 1, N-Q 3	
<p>2. Identify different types of interior doors.</p>	L 11-12.6	
<p>3. Identify different types of interior door hardware and demonstrate the installation procedures for selected types.</p>		
<p>4. Demonstrate the correct and safe use of the hand and power tools described in this module.</p>		
<p>5. List and identify specific items included on a typical door schedule.</p>		
<p>6. Demonstrate the procedure for placing and hanging a selected door.</p>	N-Q 1, N-Q 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 27210-07 – Window, Door, Floor, and Ceiling Trim</b> This module covers the different types of trim used in finish work. It focuses on the proper methods for selecting, cutting, and fastening trim to provide a professional finished appearance.		
1. Identify the different types of standard moldings and describe their uses.	RST 11-12.3	
2. Make square and miter cuts using a miter box or power miter saw.	RST 11-12.3	
3. Make coped joint cuts using a coping saw.	RST 11-12.3	
4. Select and properly use fasteners to install trim.	RST 11-12.3, F-IF 4	
5. Install interior trim, including: <ul style="list-style-type: none"> <li>• Door trim</li> <li>• Window trim</li> <li>• Base trim</li> <li>• Ceiling trim</li> </ul>	RST 11-12.3	
6. Estimate the quantities of different trim materials required for selected rooms.	WHST 11-12.6, N-Q 1, N-Q 2, N-Q 3, G-GPE 7, G-GMD 4, G-MG 1-3	
<b>Module 27211-07 – Cabinet Installation</b> This module provides detailed instructions for the selection and installation of base and wall cabinets and countertops.	RST 11-12.3	
1. State the classes and sizes of typical base and wall kitchen cabinets.		
2. Identify the cabinet components and hardware and describe their purposes.		
3. Lay out factory-made cabinets, countertops, and backsplashes.	N-Q 1, N-Q 2, N-Q 3, G-CO 12, G-GMD 4, G-MG 1, 3	
4. Explain the installation of an island base.	S-MD 7	Will the anchorage hold up over time as people lean on the island?

**Codes for Common Core English Language Arts and Literacy are:**

L = Language

RI = Reading for Informational Text

RST = Reading for Literacy in Science and Technical Subjects

SL = Speaking and Listening

W = Writing

WHST = Writing for Literacy in History/Social Studies,  
Science, and Technical Subjects

**Codes for Common Core Mathematics are:**

A-SSE = Algebra: Seeing Structure in Expressions

A-CED = Algebra: Creating Equations

A-REI = Algebra: Reasoning with Equations and Inequalities

F-IF = Functions: Interpreting Functions

F-BF = Functions: Building Functions

F-LE = Functions: Linear, Quadratic, and Exponential Models

G-CO = Geometry: Congruence

G-SRT = Similarity, right Triangles, and Trigonometry

G-GMD = Geometry: Geometric Measurement and Dimension

G-MG = Geometry: Modeling with Geometry

N-RN = Number and Quantity: The Real Number System

N-Q = Number and Quantity: Quantities

N-VM = Number and Quantity: Vector and Matrix Quantities

S-ID = Statistics and Probability: Interpreting Categorical and  
Quantitative Data

S-IC = Statistics and Probability: Making Inferences and Justifying  
Conclusions

S-MD = Statistics and Probability: Using Probability to Make  
Decisions

## Standards Alignment: Common Core / Masonry

Construction Standards	Common Core Standards	Explanation
<b>Module 28101-04 - Introduction To Masonry</b>		
1. Discuss the history of masonry.		
2. Describe modern masonry materials and methods.		
3. Explain career ladders and advancement possibilities in masonry work.		
4. Describe the skills, attitudes, and abilities needed to work as a mason.		
5. State the safety precautions that must be practiced at a work site, including the following: <ul style="list-style-type: none"> <li>• Safety practices</li> <li>• Fall-protection procedures</li> <li>• Forklift-safety operations</li> </ul>	WHST 11-12.2, L 11-12.1, L 11-12.2	Write safety procedures for operating a mortar mixer.
6. Perform the following basic bricklaying procedures: <ul style="list-style-type: none"> <li>• Mixing of mortar*</li> <li>• Laying a mortar bed</li> <li>• Laying bricks</li> </ul>	*N-Q 1, N-Q 2, N-Q 3, A-SSE 1, A-CED 1, A-CED 2, A-CED 4, A-REI 1, A-REI 2, A-REI 3, F-IF 4, F-BF 1, F-LE 1b, F-LE 5	Stress all the relationships between rates, ratios, percents, unit conversions in adding water, admixtures, and other components to mortar mix. (Many students have a great deal of trouble with these concepts in math and science classes, but grasp it more easily in a context such as this.)
7. Put on eye protection, respiratory protection, and a safety harness.		
8. Use the correct procedures for fueling and starting a gasoline-powered tool.		
<b>Performance Tasks</b>		
1. Put on eye protection, respiratory protection, and a safety harness.		
2. Demonstrate the ability to properly use a trowel to spread and furrow bed joints and butter head joints.		

Construction Standards	Common Core Standards	Explanation
<b>Module 28102-04 - Masonry Tools and Equipment</b>	<b>RST 11-12.4</b>	
1. Identify and name the tools used in performing masonry work.	L 11-12.6	
2. Identify and name the equipment used in performing masonry work.	L 11-12.6	
3. Describe how each tool is used.		
4. Describe how the equipment is used.	S-ID 9	
5. Associate trade terms with the appropriate tools and equipment.		
6. Demonstrate the correct procedures for assembling and disassembling scaffolding according to federal safety regulations, under the supervision of a competent person.	S-MD 7	
<b>Performance Tasks</b>		
1. Identify masonry hand and power tools.	L 11-12.6	
2. Assemble and disassemble scaffolding under the supervision of a competent person, according to federal safety regulations.	S-IC 6	
<b>Module 28103-04 - Measurements, Drawings, and Specifications</b>	<b>RST 11-12.4</b>	Read a blueprint for an outdoor restroom; room addition.
1. Work with denominate numbers.	N-Q 1, N-Q 2, N-Q 3	
2. Read a mason's measure.	N-Q 1, N-Q 2, N-Q 3	
3. Convert measurements in the U.S. Customary (English) system into their metric equivalents.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-IF 8, F-BF 1, F-BF 3, F-LE 1b, A-SSE 3, A-CED 2, A-CED 4, A-REI 1, A-REI 2, A-REI 3	
4. Recognize, identify, and calculate areas, circumferences, and volumes of basic geometric shapes.	G-GMD 3, G-MG 1, G-MG 2, G-MG 3	Estimate material to construct chimney.
5. Identify the basic parts of a set of drawings.	G-GMD 4	
6. Discuss the different types of specifications used in the building industry and the sections that pertain to masonry.	S-IC 6	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Use a mason's rule to measure a space and calculate its volume.	G-MG 3	Estimate material to construct a concrete footing.
2. Use a mason's rule to measure a space and estimate the number of bricks to build a wall across it.	G-MG 1, G-MG 2, G-MG 3	Estimate material to construct a brick wall.
3. Interpret information on blueprints.	G-GMD 4	
<b>Module 28104-04 – Mortar</b>	RST 11-12.3, SL 11-12.1	<b>Troubleshoot mortar problems.</b>
1. Name and describe the primary ingredients in mortar and their properties.		
2. Identify the various types of mortar used in masonry work.		
3. Describe the common admixtures and their uses.		
4. Identify the common problems found in mortar application and their solutions.	S-ID 9, S-IC 6, S-MD 7	
5. Properly set up the mortar mixing area.		
6. Properly mix mortar by hand.	N-Q 1, N-Q 2, N-Q 3, A-SSE 1, A-CED 1, A-CED 2, A-CED 4, A-REI 1, A-REI 2, A-REI 3, F-IF 4, F-BF 1, F-LE 1b, F-LE 5	Mix mortar for inside of a fireplace requires adding fireclay; use different categories (strength) of mortar for different applications.
7. Properly mix mortar with a mechanical mixer.		
<b>Performance Tasks</b>		
1. Properly set up the mortar mixing area.		
2. Properly mix mortar by hand		
3. Properly mix mortar with a mechanical mixer.		

Construction Standards	Common Core Standards	Explanation
<b>Module 28105-04 - Masonry Units and Installation Techniques</b>	RST 11-12.3, SL 11-12.1	<b>Build an outdoor restroom; build a sign.</b>
1. Describe the most common types of masonry units.		
2. Describe and demonstrate how to set up a wall.	G-CO 12	
3. Lay a dry bond.	G-CO 12	
4. Spread and furrow a bed joint, and butter masonry units.		
5. Describe the different types of masonry bonds.	N-Q 1, N-Q 2, N-Q 3, A-SSE 1, G-MG 1, G-MG 2, G-MG 3	
6. Cut brick and block accurately.	N-Q 1, N-Q 2, N-Q 3	
7. Lay masonry units in a true course.	N-Q 1, N-Q 2, N-Q 3, G-CO 12	
<b>Performance Tasks</b>		
1. Lay a dry bond.		
2. Accurately cut masonry units with a brick set and masonry hammer, a block set and mash, and a masonry hammer, power saw, and splitter.	N-Q 1, N-Q 2, N-Q 3	
3. Spread, edge, and furrow bed joints.		
4. Butter bricks and blocks and place them on a bed joint.		
5. Lay masonry units in courses that are true for height, level, plumb, and straightness.	N-Q 1, N-Q 2, N-Q 3, G-CO 12	
6. Build a rackback corner lead.	G-CO 12	
7. Lay masonry units to the line.		
<b>Module 28201-05 – Residential Plans and Drawing Interpretation</b>		
1. Explain the organization of residential plans and drawings.		
2. Interpret dimensions and scales on drawings.	F-LE 1b, N-Q 1	
3. Interpret information on residential plans.	N-Q 1, G-GMD 4, G-MG 1, G-MG 3	
4. Estimate material quantities from plans and drawings.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. From a plan, calculate the square footage of one elevation, including openings.	N-Q 1, N-Q 3, G-GPE 7, G-GMD 4, G-MG 1, G-MG 3	
2. Estimate the amount of brick and mortar from that same elevation.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, F-IF 4, F-IF 5	
3. Estimate the size and number of lintel block for that same elevation.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
<b>Module 28202-05 – Residential Masonry</b>		
2. Identify and explain the characteristics, uses, and installation techniques for brick pavers.		
3. Lay out and build steps, patios, and decks made from masonry units.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
4. Lay out and build chimneys and fireplaces.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
<b>Module 28203-05 – Grout and Other Reinforcement</b>		
1. Name and describe the primary ingredients in grout and their properties.	S-ID 9, S-IC 6	Give some information about how standards developed (materials testing, etc.).
2. Identify the different types of grout used in masonry work.	S-ID 9, S-IC 6	
3. Describe the common admixtures and their uses.	S-ID 9, S-IC 6	
4. Describe the use of steel bar reinforcement in masonry construction.	S-ID 9, S-IC 6	
5. Apply grout in low and high lifts using the proper techniques.	S-ID 9, S-IC 6, S-MD 7	
6. Place grout in a hollow block wall and rod it into place.		
<b>Performance Tasks</b>		
1. Place grout in a hollow block wall and rod in place.		
<b>Module 28204-05 – Metal Work in Masonry</b>		
1. Describe the uses and installation of vertical reinforcement.	S-ID 9, S-IC 6, S-MD 7	
2. Describe the uses and installation of different types of horizontal joint reinforcements and ties.	S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
3. Describe the uses and installation of different anchors, fasteners, and embedded items.	S-ID 9, S-IC 6, S-MD 7	
4. Install hollow metal frames.		
5. Describe the functions of sills and lintels.	S-ID 9, S-IC 6, S-MD 7	
6. Install sills and lintels.		
7. Install metal hardware.		
<b>Performance Tasks</b>		
3. Lay one wythe of brick against one side of the frame.		
4. Install hardware cloth unit ties in every other course.		
<b>Module 28205-05 – Advanced Laying Techniques</b>	RST 11-12.3, SL 11-12.1	Build an arch entrance way.
1. Recognize the structural principles and fundamental uses of basic types of walls.	S-ID 9, S-IC 6, S-MD 7	
2. Recognize the requirement for, and function of, control joints and expansion joints.	S-ID 9, S-IC 6, S-MD 7	
3. Build various types of walls using proper reinforcement, jointing, and bonding techniques.		
5. Identify and explain the different types of masonry arches used today.		
6. Lay out a semicircular arch and a jack arch.	G-CO 12, G-C 2, G-C 4, G-C 5, G-GMD 1, G-GMD 4, G-MG 1, G-MG 3	
<b>Performance Tasks</b>		
1. Lay a wythe of brick against a block wythe or wood frame to make a composite wall. Use ties and a collar joint.	N-Q 1, N-Q 2, N-Q 3, G-CO 6, G-CO 12, G-GMD 4, G-MG 1-3	
2. Lay out specialty structures and arches.	N-Q 1, N-Q 2, N-Q 3, G-CO 6, 12, G-C 2, G-C 4, G-C 5, G-GMD 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 28206-05 – Construction Techniques and Moisture Control</b>		Evaluate a project under construction against specifications.
1. Explain and demonstrate techniques for constructing masonry around windows, doors, and other openings.		Give some information about how standards developed (materials testing, etc.).
2. Explain the requirements for wall bracing, and demonstrate the techniques used to construct pilasters and other types of bracing.		
3. Identify the various types of insulation used in conjunction with masonry construction, and explain installation techniques.		
4. Identify the need for moisture control in various types of masonry construction, and demonstrate the techniques used to eliminate moisture problems.		
5. Construct corbeling in a double-wythe wall.		
6. Join intersecting walls.		
7. Install flashing.		
<b>Performance Tasks</b>		
1. Construct a four-course corbel starting at the fifth course of a double-wythe wall.		
2. Construct an intersecting block wall joined with wire mesh or metal lath.		
3. Install a row of flashing in an anchored veneered wall.		
<b>Module 28207-05 – Construction Inspection and Quality Control</b>	SL 11-12.1	
1. Describe industry standards for quality control.	S-ID 9, S-IC 6, S-MD 7	
2. Describe how to build masonry sample panels and prisms.		

Construction Standards	Common Core Standards	Explanation
<b>Module 28301-05 – Masonry in High-Rise Construction</b>		
1. Recognize and explain the use of high-rise construction equipment.		
2. Identify construction sequence in high-rise construction.		
3. State the safety procedures in high-rise construction.		
5. Properly put on a safety harness, lanyard, and lifeline.		
6. Demonstrate hand signals used for lifting materials.		
<b>Module 28302-05 – Specialized Materials and Techniques</b>		
1. Explain the various techniques used to provide adequate protection during hot- and cold-weather masonry construction.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
2. Describe all-weather construction techniques.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
3. Describe techniques for surface-bonding mortar.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
4. Demonstrate techniques for construction of stone walls and other stone building surfaces.	N-Q 1, N-Q 3	
5. Demonstrate basic knowledge of various building materials such as glass block and refractory brick.		

Construction Standards	Common Core Standards	Explanation
<b>Module 28303-05 – Repair and Restoration</b>	RST 11-12.3	Repair a chimney.
1. Recognize signs of deterioration in masonry structures.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
2. Describe the causes of efflorescence, cracking, and faulty mortar joints.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
3. Describe the procedures for preventing and correcting efflorescence, cracking, and faulty mortar joints.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
4. Describe the procedures for preventing and correcting water damage in basements.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
5. Describe the procedures for rebuilding fireplaces.	S-ID 9, S-IC 6, S-MD 7	Give some information about how standards developed (materials testing, etc.).
6. Replace a damaged brick in a wall.		
7. Repair mortar joints.		
<b>Performance Tasks</b>		
1. Replace a damaged brick in a wall.		
2. Repair mortar joints in a brick wall by tuckpointing.		
<b>Module 28304-05 – Commercial Drawings</b>	RST 11-12.4	Build a commercial sign from a drawing.
1. Recognize the difference between commercial and residential construction drawings.	N-Q 1	
2. Identify the basic keys, abbreviations, and other references contained in a set of commercial drawings.	N-Q 1	
3. Accurately read a set of commercial drawings.	N-Q 1, G-GMD 4, G-MG 1, G-MG 3	
4. Explain basic construction details and concepts employed in commercial construction.	G-GMD 4, G-MG 1, G-MG 3	
<b>Performance Tasks</b>		
2. Calculate the floor area of each room in a floor plan.	N-Q 1, N-Q 3, G-GPE 7, G-GMD 4, G-MG 1, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 28305-05 – Estimating</b>		Build an outdoor restroom.
1. Explain and apply basic materials estimating procedures for concrete block and brick construction.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, F-IF 3, F-IF 4, F-IF 5, F-IF 8, F-BF 1, F-LE 1, F-LE 5	
2. Explain and apply basic estimating procedures for reinforcements, ties, and other materials.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, F-IF 3, F-IF 4, F-IF 5, F-IF 8, F-BF 1, F-LE 1, F-LE 5	
3. Explain and apply procedures for estimating quantities of mortar and mortar materials.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, F-IF 3, F-IF 4, F-IF 5, F-IF 8, F-BF 1, F-LE 1, F-LE 5	
<b>Performance Tasks</b>		
2. Complete a set of estimating worksheets.		
<b>Module 28306-05 – Site Layout—Distance Measurement and Leveling</b>		
2. Convert measurements stated in feet and inches to equivalent measurements stated in decimal feet, and vice versa.	N-Q 1, N-Q 2, N-Q 3	
6. Recognize, use, and properly care for tools and equipment associated with differential leveling.		
7. Use a builder’s level or transit and differential leveling procedures to determine site and building elevations.	N-Q 1, N-Q 2, N-Q 3, G-CO 6, G-CO 12, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
9. Check and/or establish 90-degree angles using the 3–4–5 rule.	N-Q 1, N-Q 2, N-Q 3, G-CO 5, G-CO 6, G-CO 12, G-SRT 5, G-SRT 8, G-GMD 4, G-MG 1, G-MG 3	Build an outdoor restroom (or any building with a square corner).
<b>Performance Tasks</b>		
6. Use a builder’s level, leveling rods, and differential leveling procedures to determine site and building elevations.	N-Q 1, N-Q 2, N-Q 3, G-CO 6, G-CO 12, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
9. Check and/or establish 90-degree angles using the 3–4–5 rule.	N-Q 1, N-Q 2, N-Q 3, G-CO 5, G-CO 6, G-CO 12, G-SRT 5, G-SRT 8, G-GMD 4, G-MG 1, G-MG 3	Build an outdoor restroom (or any building with a square corner).

Construction Standards	Common Core Standards	Explanation
<b>Module 28307-05 – Introductory Skills for the Crew Leader</b>		
1. Discuss current issues and organizational structure in the construction industry today.		
2. Understand and incorporate leadership skills into work habits, including communication, motivation, team building, problem solving, and decision-making skills.	SL 11-12.1	
3. Demonstrate an awareness of safety issues, including the cost of accidents and safety regulations.	W 11-12.3, W 11-12.4	Write an accident report.
5. Show a basic understanding of the planning process, scheduling, and cost and resource control.	A-CED 1, A-CED 2, A-CED 3, N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-IF 5, F-IF 6, F-LE 1, S-IC 6	
<b>Performance Tasks</b>		
1. Lay a wythe of brick against a block wythe or wood frame to make a composite wall. Use ties and a collar joint.	N-Q 1, N-Q 2, N-Q 3, G-CO 6, G-CO 12, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
2. Lay out specialty structures and arches.	N-Q 1, N-Q 2, N-Q 3, G-CO 6, G-CO 12, G-C 2, G-C 4, G-C 5, G-GMD 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

**Codes for Common Core English Language Arts and Literacy are:**

L = Language

RST = Reading for Literacy in Science and Technical Subjects

SL = Speaking and Listening

WHST = Writing for Literacy in History/Social Studies,  
Science, and Technical Subjects

**Codes for Common Core Mathematics are:**

A-SSE = Algebra: Seeing Structure in Expressions

A-CED = Algebra: Creating Equations

A-REI = Algebra: Reasoning with Equations and Inequalities

F-IF = Functions: Interpreting Functions

F-BF = Functions: Building Functions

F-LE = Functions: Linear, Quadratic, and Exponential Models

G-CO = Geometry: Congruence

G-SRT = Similarity, right Triangles, and Trigonometry

G-C = Geometry: Circles

G-GMD = Geometry: Geometric Measurement and Dimension

G-MG = Geometry: Modeling with Geometry

N-Q = Number and Quantity: Quantities

S-ID = Statistics and Probability: Interpreting Categorical and  
Quantitative Data

S-IC = Statistics and Probability: Making Inferences and Justifying  
Conclusions

S-MD = Statistics and Probability: Using Probability to Make  
Decisions

## Standards Alignment: Common Core / Electrical Trades

Construction Standards	Common Core Standards	Explanation
<i>Module 26101-08 – Orientation To The Electrical Trade</i>		
1. Describe the apprenticeship/training process for electricians.	RST 11-12.2	
2. Describe various career paths/opportunities one might follow in the electrical trade.	RST 11-12.2	
3. Define the various sectors of the electrical industry.		
4. State the tasks typically performed by an electrician.		
5. Explain the responsibilities and aptitudes of an electrician.	RST 11-12.2	
<i>Module 26102-08 – Electrical Safety</i>		
1. Recognize safe working practices in the construction environment.		
2. Explain the purpose of OSHA and how it promotes safety on the job.	RST 11-12.2	
3. Identify electrical hazards and how to avoid or minimize them in the workplace.	RST 11-12.8	Set up various hazards in the lab and have the students identify the hazard and hypothesize the outcome.
4. Explain safety issues concerning lockout/tagout procedures, confined space entry, respiratory protection, and fall protection systems.	RST 11-12.7	The students must explain LO/TO procedures from an initiator point of view.
5. Develop a task plan and a hazard assessment for a given task and select the appropriate PPE and work methods to safely perform the task.	S-ID 9, S-IC 6, S-MD 7, RST 11-12.9	Show industry collected data helps in the development of safety procedures.

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Perform a visual inspection on various types of ladders.		
2. Set up a ladder properly to perform a task.	F-IF 2, F-IF4, F-BF 1, F-LE 1, F-LE 5	Extension ladder ratio.
4. Perform a hazard assessment of a job such as replacing the lights in your classroom. <ul style="list-style-type: none"> <li>• Discuss the work to be performed and the hazards involved.</li> <li>• Locate the closest phone to the work site and ensure that the local emergency telephone numbers are either posted at the phone or known by you and your partner(s).</li> <li>• Plan an escape route from the location in the event of an accident.</li> </ul>	RST 11-12.3	
<i>Module 26103-08 – Introduction To Electrical Circuits</i>		
1. Define voltage and identify the ways in which it can be produced.		
2. Explain the difference between conductors and insulators.		
3. Define the units of measurement that are used to measure the properties of electricity.	N-Q 1, N-Q 2, N-Q 3, A-CED 4	
4. Identify the meters used to measure voltage, current, and resistance.	N-Q 1, N-Q 2, N-Q 3	
5. Explain the basic characteristics of series and parallel circuits.	G-GMD 4, G-MG 1	
<i>Module 26104-08 – Electrical Theory</i>		
1. Explain the basic characteristics of combination circuits.		
4. Using Ohm's law, find the unknown parameters in series, parallel, and series-parallel circuits.	N-Q 1, N-Q 2, N-Q 3, A-SSE 1, A-CED 4, A-REI 1	

Construction Standards	Common Core Standards	Explanation
<i>Module 26105-08 – Introduction To The National Electrical Code®</i>		
1. Explain the purpose and history of the NEC®.	RI 11-12.1	
2. Describe the layout of the NEC®.	RI 11-12.4	Draw or write a diagram that lays out the Chapter, article, Parts, and sub-parts of a given code rule. Each student will randomly draw a code rule.
3. Demonstrate how to navigate the NEC®.	RI 11-12.5	
4. Describe the purpose of the National Electrical Manufacturers Association and the NFPA.	RI 11-12.6	In your own words describe the function of these organizations NEMA, NFPA, NECA, IBEW, and IEC.
5. Explain the role of nationally recognized testing laboratories.	RI 11-12.8	What is UL?
<b>Performance Tasks</b>		
1. Use NEC Article 90 to determine the scope of the NEC®. State what is covered by the NEC® and what is not.	RI 11-12.1	
2. Find the definition of the term feeder in the NEC®.	RI 11-12.3	
3. Look up the NEC® specifications that you would need to follow if you were installing an outlet near a swimming pool.	RI 11-12.4	
4. Find the minimum wire bending space for two 1/0 AWG conductors installed in a junction box or cabinet and entering opposite the terminal.	G-MG 1, G-MG 2, G-MG 3, N-Q 1, N-Q 2, N-Q 3, RI 11-12.5	

Construction Standards	Common Core Standards	Explanation
<i>Module 26106-08 – Device Boxes</i>		
1. Describe the different types of nonmetallic and metallic boxes.		
2. Calculate the NEC® fill requirements for boxes under 100 cubic inches.	N-Q 1, N-Q 2, N-Q 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, F-IF 1, F-IF 4, F-IF 5, F-IF 6	
3. Identify the appropriate box type and size for a given application.	N-Q 1, N-Q 2, N-Q 3, F-IF 1, F-IF 2, F-IF 4, F-IF 5, F-IF 6	
4. Select and demonstrate the appropriate method for mounting a given box.	RST 11-12.3	
<b>Performance Tasks</b>		
1. Identify the appropriate box type and size for a given application.		
2. Select the minimum size pull or junction box for the following applications: <ul style="list-style-type: none"> <li>• Conduit entering and exiting for a straight pull</li> <li>• Conduit entering and exiting at an angle</li> </ul>	N-Q 1, N-Q 2, N-Q 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, F-IF 1, F-IF 4, F-IF 5, F-IF 6	
<i>Module 26107-08 – Hand Bending®</i>		
1. Identify the methods for hand bending and installing conduit.	RST 11-12.4	Identify the marks/symbols and their uses on a hand bender.
2. Determine conduit bends.	N-Q 1, N-Q 2, N-Q 3, G-C 2, G-C 5, G-GMD 4, G-GM 1, G-GM 3	
3. Make 90-degree bends, back-to-back bends, offsets, kicks, and saddle bends using a hand bender.	N-Q 1, N-Q 2, N-Q 3, G-C 2, G-C 5, G-GMD 4, G-GM 1, 3RST 11-12.3	
4. Cut, ream, and thread conduit.	N-Q 1, N-Q 2, N-Q 3	
<b>Performance Tasks</b>		
1. Make 90-degree bends, back-to-back bends, offsets, kicks, and saddle bends using a hand bender.	RST 11-12.3	
2. Cut, ream, and thread conduit.		

Construction Standards	Common Core Standards	Explanation
<i>Module 26108-08 – Raceways and Fittings</i>		
1. Identify and select various types and sizes of raceways and fittings for a given application.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-GM 1, G-GM 3	
2. Identify various methods used to fabricate (join) and install raceway systems.	G-GMD 4, G-GM 1, G-GM 3	
3. Identify uses permitted for selected raceways.		
4. Demonstrate how to install a flexible raceway system.		
5. Terminate a selected raceway system.		
6. Identify the appropriate conduit body for a given application.		
<b>Performance Tasks</b>		
1. Identify and select various types and sizes of raceways, fittings, and fasteners for a given application.		
2. Demonstrate how to install a flexible raceway system.		
3. Terminate a selected raceway system.		
4. Identify the appropriate conduit body for a given application.		
<i>Module 26109-08 – Conductors and Cables</i>		
1. From the cable markings, describe the insulation and jacket material, conductor size and type, number of conductors, temperature rating, voltage rating, and permitted uses.	S-IC 6	
2. Determine the allowable ampacity of a conductor for a given application.	N-Q 1, N-Q 2, N-Q 3, S-IC 6	
3. Identify the NEC® requirements for color coding of conductors.	F-IF 1, RST 11-12.9	Identify the use of a conductor based only on its color Could reinforce a function concept here about mapping relationships.
4. Install conductors in a raceway system.	RST 11-12.3	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Install conductors in a raceway system.		
<i>Module 26110-08 – Basic Electrical Construction Drawings</i>		
1. Explain the basic layout of a set of construction drawings.	N-Q 1, N-Q 2, N-Q 3, G-CO 2, G-CO 3, G-CO 5, G-CO 6, G-SRT 2, G-SRT 5, G-SRT 8, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
2. Describe the information included in the title block of a construction drawing.	N-Q 1, N-Q 2, N-Q 3, RST 11-12.4	Interpret the information on the title block.
3. Identify the types of lines used on construction drawings.	G-GMD 4, G-MG 1	
4. Using an architect’s scale, state the actual dimensions of a given drawing component.	N-Q 1, N-Q 2, N-Q 3	
5. Interpret electrical drawings, including site plans, floor plans, and detail drawings.	N-Q 1, N-Q 2, N-Q 3, G-CO 2, G-CO 3, G-CO 5, G-CO 6, G-SRT 2, G-SRT 5, G-SRT 8, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, RST 11-12.4	Decipher the meanings of the various symbols.
6. Interpret equipment schedules found on electrical drawings.	G-GMD 4	
7. Describe the type of information included in electrical specifications.	RST 11-12.4	Locate the spec sheet in a commercial blueprint.
<b>Performance Tasks</b>		
1. Using an architect’s scale, state the actual dimensions of a given drawing component.	N-Q 1, N-Q 2, N-Q 3	
2. Make a material takeoff of the lighting fixtures specified in Performance Profile Sheet 2 using the drawing provided on Performance Profile Sheet 3. The takeoff requires that all lighting fixtures be counted, and where applicable, the total number of lamps for each fixture type must be calculated.	A-CED 1, A-REI 1, F-IF 1, F-IF 2, F-IF 3, F-IF 4, F-IF 5, F-IF 6, F-BF 1, F-BF 2, F-LE 1b, F-LE 2, F-LE 5, RST 11-12.9	

Construction Standards	Common Core Standards	Explanation
Module 26111-08 – Residential Electrical Services		
1. Explain the role of the National Electrical Code® in residential wiring and describe how to determine electric service requirements for dwellings.	S-ID 9, S-IC 6, S-MD 7, RST 11-12.3	Locate the section in the NEC that carries the rules for residential electrical services.
2. Explain the grounding requirements of a residential electric service.	RST 11-12.2	
3. Calculate and select service-entrance equipment.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 1, A-REI 1, F-IF 1, F-IF 2, F-IF 3, F-IF 4, F-IF 5, F-IF 6, F-BF 1, F-BF 2, F-LE 1b, F-LE 2, F-LE 5	
4. Select the proper wiring methods for various types of residences.		
5. Compute branch circuit loads and explain their installation requirements.	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 1, A-REI 1, F-IF 1, F-IF 2, F-IF 3, F-IF 4, F-IF 5, F-IF 6, F-BF 1, F-BF 2, F-LE 1b, F-LE 2, F-LE 5	
6. Explain the types and purposes of equipment grounding conductors.		
7. Explain the purpose of ground fault circuit interrupters and tell where they must be installed.	RST 11-12.2	
8. Size outlet boxes and select the proper type for different wiring methods.	N-Q 1, N-Q 2, N-Q 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, F-IF 1, F-IF 4, F-IF 5, F-IF 6, RST 11-12.4	
9. Describe rules for installing electric space heating and HVAC equipment.	RST 11-12.2	
10. Describe the installation rules for electrical systems around swimming pools, spas, and hot tubs.	RST 11-12.2	
11. Explain how wiring devices are selected and installed.	RST 11-12.2	
12. Describe the installation and control of lighting fixtures.	RST 11-12.2	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
<p>1. For a residential dwelling of a given size, and equipped with a given list of major appliances, demonstrate or explain how to:</p> <ul style="list-style-type: none"> <li>• Compute the lighting, small appliance, and laundry loads.</li> <li>• Compute the loads for large appliances.</li> <li>• Determine the number of branch circuits required.</li> <li>• Size and select the service-entrance equipment (conductors, panelboard, and protective devices).</li> </ul>	N-Q 1, N-Q 2, N-Q 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 1, A-REI 1, F-IF 1, F-IF 2, F-IF 3, F-IF 4, F-IF 5, F-IF 6, F-BF 1, F-BF 2, F-LE 1b, F-LE 2, F-LE 5	Calculate the load for your individual house.
<p>2. Using an unlabeled diagram of a panelboard (Performance Profile Sheet 3), label the lettered components.</p>	RST 11-12.4	
<p>3. Select the proper type and size outlet box needed for a given set of wiring conditions.</p>	N-Q 1, N-Q 2, N-Q 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, F-IF 1, F-IF 4, F-IF 5, F-IF 6	
<i>Module 26112-08 – Electrical Test Equipment</i>		
<p>1. Explain the operation of and describe the following pieces of test equipment:</p> <ul style="list-style-type: none"> <li>• Voltmeter</li> <li>• Ohmmeter</li> <li>• Clamp-on ammeter</li> <li>• Multimeter</li> <li>• Motor and phase rotation testers</li> </ul>	RST 11-12.2  N-Q 1, N-Q 2, N-Q 3	
<p>2. Select the appropriate meter for a given work environment based on category ratings.</p>	N-Q 1, N-Q 2, N-Q 3, RST 11-12.9	From a randomly drawn scenario choose the correct meter for the job.
<p>3. Identify the safety hazards associated with various types of test equipment.</p>		
<b>Performance Tasks</b>		
<p>1. Under instructor supervision, measure the voltage in your classroom from line to neutral and neutral to ground.</p>	N-Q 1, N-Q 2, N-Q 3, RST 11-12.3	

Construction Standards	Common Core Standards	Explanation
2. Under instructor supervision, use an ohmmeter to measure the value of various resistors.	N-Q 1, N-Q 2, N-Q 3, RST 11-12.3	
<i>Module 26202-08 – Motors: Theory and Application</i>		
5. Explain how the direction of a three-phase motor is changed.	S-ID 9, S-IC 6, RST 11-12.2	
9. Describe the methods for determining various motor connections.	S-ID 9, S-IC 6, RST 11-12.2	
<b>Performance Tasks</b>		
1. Collect data from a motor nameplate.	S-ID 9, S-IC 6, RST 11-12.4	
2. Identify various types of motors and their application(s).		
<i>Module 26203-08 – Electric Lighting</i>		
1. Describe the characteristics of light.		
2. Recognize the different kinds of lamps and explain the advantages and disadvantages of each type: <ul style="list-style-type: none"> <li>• Incandescent</li> <li>• Halogen</li> <li>• Fluorescent</li> <li>• High-intensity discharge (HID)</li> </ul>	RST 11-12.9	
3. Properly select and install various lamps in lighting fixtures.		Could reinforce a function concept here about mapping relationships.
4. Recognize and describe the installation requirements for various types of lighting fixtures: <ul style="list-style-type: none"> <li>• Surface-mounted</li> <li>• Recessed</li> <li>• Suspended</li> <li>• Track-mounted</li> </ul>	RST 11-12.9	
5. Recognize ballasts and describe their use in fluorescent and HID lighting fixtures.		

Construction Standards	Common Core Standards	Explanation
6. Explain the relationship of Kelvin temperature to the color of light produced by a lamp.	F-IF 1, F-IF 4, F-IF 5, F-IF 6, F-LE 1, F-LE 2, F-LE 5, RST 11-12.2	
7. Recognize basic occupancy sensors, photoelectric sensors, and timers used to control lighting circuits and describe how each device operates.		
<b>Performance Tasks</b>		
1. Read and interpret information given in lamp manufacturers' catalogs for one or more selected lamps.		
2. Properly select and install lamps into lighting fixtures.		
3. Install one or more of the following lighting fixtures and their associated lamps: <ul style="list-style-type: none"> <li>• Surface-mounted</li> <li>• Recessed</li> <li>• Suspended</li> <li>• Track-mounted</li> </ul>	RST 11-12.3	
<i>Module 26204-08 – Conduit Bending</i>		
1. Describe the process of conduit bending using power tools.	RST 11-12.2	
2. Identify all parts of electric and hydraulic benders.		
3. Bend offsets, kicks, saddles, segmented, and parallel bends.	N-Q 1, N-Q 2, N-Q 3, G-CO 1, G-CO 2, G-CO 4, G-CO 5, G-CO 6, G-CO 12, G-C 2, G-C 4, G-C 5, G-GPE 6, G-GMD 4, G-GM 1, G-GM 3	
4. Explain the requirements of the National Electrical Code® (NEC®) for bending conduit.	RST 11-12.2	
5. Compute the radius, degrees in bend, developed length, and gain for conduit up to six inches.	N-Q 1, N-Q 2, N-Q 3, G-CO 1, G-CO 2, G-CO 4, G-CO 5, G-CO 6, 12, G-C 2, G-C 4, G-C 5, G-GPE 6, G-GMD 4, G-GM 1, G-GM 3	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Use an electric or hydraulic bender to bend a conduit stub-up to an exact distance of 15 1/4" above the deck.	N-Q 1, N-Q 2, N-Q 3, G-CO 1, G-CO 2, G-CO 4, G-CO 5, G-CO 6, G-CO 12, G-C 2, G-C 4, G-C 5, G-GPE 6, G-GMD 4, G-GM 1, G-GM 3, RST 11-12.3	
2. Make an offset in a length of conduit to miss a 10" high obstruction with a clearance between the obstruction and the conduit of not less than 1" nor more than 1 1/2".	N-Q 1, N-Q 2, N-Q 3, G-CO 1, G-CO 2, G-CO 4, G-CO 5, G-CO 6, G-CO 12, G-C 2, G-C 4, G-C 5, G-GPE 6, G-GMD 4, G-GM 1, G-GM 3, RST 11-12.3	
3. Make a saddle in a length of conduit to cross an 8" pipe with 1" clearance between the pipe and the conduit.	N-Q 1, N-Q 2, N-Q 3, G-CO 1, G-CO 2, G-CO 4, G-CO 5, G-CO 6, G-CO 12, G-C 2, G-C 4, G-C 5, G-GPE 6, G-GMD 4, G-GM 1, G-GM 3, RST 11-12.3	
<i>Module 26205-08 – Pull and Junction Boxes</i>		
1. Describe the different types of nonmetallic and metallic pull and junction boxes.		
2. Properly select, install, and support pull and junction boxes and their associated fittings.	N-Q 1, N-Q 2, N-Q 3, A-CED 1, A-CED 4, F-IF 1, F-IF 2, F-IF 4, F-IF 5, F-IF 6, RST 11-12.9	
3. Describe the National Electrical Code® (NEC®) regulations governing pull and junction boxes.	S-IC 6, SL 11-12.4	
4. Size pull and junction boxes for various applications.	N-Q 1, N-Q 2, N-Q 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, F-IF 1, F-IF 2, F-IF 4, F-IF 5, F-IF 6	
5. Understand the NEMA and IP classifications for pull and junction boxes.		
6. Describe the purpose of conduit bodies and Type FS boxes.	SL 11-12.4	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Identify various NEMA boxes.		
2. Properly select, install, and support pull and junction boxes over 100 cubic inches in size.	N-Q 1, N-Q 2, N-Q 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, F-IF 1, F-IF 2, F-IF 4, F-IF 5, F-IF 6	
3. Identify various conduit bodies and fittings.		
<i>Module 26206-08 – Conductor Installations</i>		
1. Explain the importance of communication during a cable-pulling operation.	RST 11-12.2	
2. Plan and set up for a cable pull.		
3. Set up reel stands and spindles for a wire-pulling installation.		
4. Explain how mandrels, swabs, and brushes are used to prepare conduit for conductors.	SL 11-12.4	
5. Properly install a pull line for a cable-pulling operation.		
6. Explain how and when to support conductors in vertical conduit runs.	RST 11-12.2	
7. Describe the installation of cables in cable trays.		
8. Calculate the probable stress or tension in cable pulls.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-CED 4, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
<b>Performance Tasks</b>		
1. Prepare multiple conductors for pulling in a raceway system.		
2. Prepare multiple conductors for pulling using a wire-pulling basket.		

Construction Standards	Common Core Standards	Explanation
<i>Module 26208-08 – Conductor Terminations and Splices</i>		
1. Describe how to make a good conductor termination.	S-ID 9, S-MD 7, RST 11-12.2	
2. Prepare cable ends for terminations and splices and connect using lugs or connectors.	RST 11-12.4	
3. Train cable at termination points.		
4. Understand the National Electrical Code® (NEC®) requirements for making cable terminations and splices.		
5. Demonstrate crimping techniques.		
6. Select the proper lug or connector for the job.		
<i>Module 26209-08 – Grounding and Bonding</i>		
1. Explain the purpose of grounding and bonding and the scope of NEC Article 250.	RST 11-12.2	
2. Distinguish between a short circuit and a ground fault.		
3. Define the National Electrical Code® requirements related to bonding and grounding.		
4. Distinguish between grounded systems and equipment grounding.		
6. Explain the function of the grounding electrode system and determine the grounding electrodes to be used.	RST 11-12.2	
8. Use NEC Table 250.122 to size the equipment grounding conductor for raceways and equipment.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6	
9. Explain the function of the main and system bonding jumpers in the grounding system and size the main and system bonding jumpers for various applications.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, RST 11-12.2	
10. Size the main bonding jumper for a service utilizing multiple service disconnecting means.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, A-CED 1, A-REI 1	
11. Explain the importance of bonding equipment in clearing ground faults in a system.	RST 11-12.2	

Construction Standards	Common Core Standards	Explanation
12. Explain the purposes of the grounded conductor (neutral) in the operation of overcurrent devices.	RST 11-12.2	
<b>Performance Tasks</b>		
1. Using the proper fittings, connect one end of a No. 4 AWG bare copper grounding wire to a length of 3/4" galvanized water pipe and the other end to the correct terminal in a main panelboard.	N-Q 1, N-Q 2, N-Q 3	
2. Install two lengths of Type NM cable in a switch box using Type NM cable clamps: <ul style="list-style-type: none"> <li>• Strip the ends of the cable to conform with NEC® requirements.</li> <li>• Secure the cable in the switch box and tighten the cable clamps.</li> <li>• Connect and secure the equipment grounding conductors according to NEC® requirements, and secure to the switch box with either a ground clip or a grounding screw.</li> </ul>	N-Q 1, N-Q 2, N-Q 3, RST 11-12.3	
3. Size the minimum required grounding electrode conductor for a 200A service fed by 3/0 copper.	N-Q 1, N-Q 2, N-Q 3, F-IF 4	
4. Size the minimum required equipment grounding conductor in each conduit for a 400A feeder gap using two parallel runs of 3/0 copper.	N-Q 1, N-Q 2, N-Q 3, F-IF 4	
5. Size the minimum required bonding jumper for a copper water pipe near a separately derived system (transformer) where the secondary conductors are 500 kcmil copper.	N-Q 1, N-Q 2, N-Q 3, F-IF 4	

Construction Standards	Common Core Standards	Explanation
<i>Module 26210-08 – Circuit Breakers and Fuses</i>		
1. Explain the necessity of overcurrent protection devices in electrical circuits.	RST 11-12.2	
2. Define the terms associated with fuses and circuit breakers.		
3. Describe the operation of a circuit breaker.	RST 11-12.2	
4. Apply the National Electrical Code® (NEC®) requirements for overcurrent devices.	N-Q 1, N-Q 2, N-Q 3, F-IF 4	
5. Describe the operation of single-element and time-delay fuses.		
<b>Performance Tasks</b>		
1. Identify the following on one or more circuit breaker(s) and fuse(s): <ul style="list-style-type: none"> <li>• Number of poles</li> <li>• Load rating</li> <li>• Voltage rating</li> <li>• Amperage interrupting rating</li> </ul>	RST 11-12.4  N-Q 1-3	

Construction Standards	Common Core Standards	Explanation
<i>Module 26211-08 – Control Systems and Fundamental Concepts</i>		
1. Describe the operating principles of contactors and relays.		
2. Select contactors and relays for use in specific electrical systems.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
3. Explain how mechanical contactors operate.		
4. Explain how solid-state contactors operate.		
5. Install contactors and relays according to the NEC® requirements.		
6. Select and install contactors and relays for lighting control.		
7. Read wiring diagrams involving contactors and relays.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
8. Describe how overload relays operate.		
9. Connect a simple control circuit.		
10. Test control circuits.		

Construction Standards	Common Core Standards	Explanation
<i>Module 26301-08 – Load Calculations– Branch and Feeder Circuits</i>		
1. Calculate loads for single-phase and three-phase branch circuits.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
2. Size branch circuit overcurrent protection devices (circuit breakers and fuses) for noncontinuous duty and continuous duty circuits.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
3. Apply derating factors to size branch circuits.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, A-CED 1, A-REI 1	
4. Calculate ampacity for single-phase and three-phase loads.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, A-CED 1, A-CED 2, A-CED 3, A-CED 4, A-REI 1	
5. Use load calculations to determine branch circuit conductor sizes.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, A-CED 1, A-REI 1	
6. Use NEC Table 220.55 to calculate residential cooking equipment loads.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-IC 6, S-MD 7, A-CED 1, A-REI 1	
7. Select branch circuit conductors and overcurrent protection devices for electric heat, air conditioning equipment, motors, and welders.		

Construction Standards	Common Core Standards	Explanation
<i>Module 26302-08 – Conductor Selection and Calculations</i>		
1. Select electrical conductors for specific applications.		
2. Calculate voltage drop in both single-phase and three-phase applications.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
3. Apply National Electrical Code® (NEC®) regulations governing conductors to a specific application.	N-Q 1-3, F-IF 4, , S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1-3	
4. Calculate and apply NEC® tap rules to a specific application.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
5. Size conductors for the load.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
6. Derate conductors for fill, temperature, and voltage drop.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
7. Select conductors for various temperature ranges and atmospheres.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<i>Module 26303-08 – Practical Applications of Lighting</i>		
1. Explain how the lighting terms lumen, candlepower, and footcandle relate to one another.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-LE 5, S-IC 6, A-CED 1-4, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
2. Classify lighting fixtures by type and application.		
3. Identify the general lighting pattern produced by each type of fixture.	G-CO 2, G-SRT 1, G-SRT 2, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
4. Identify the lighting requirements associated with lighting systems used in selected applications such as office buildings, schools, theaters, hazardous areas, etc.		
5. Identify various dimming systems and their components.		
6. Use manufacturers' lighting fixture catalogs to select the appropriate lighting fixtures for specific lighting applications.		Could reinforce a function concept here about mapping relationships.
<b>Performance Tasks</b>		
1. Using manufacturers' catalogs, select the appropriate lighting fixtures for specific lighting situations.		
2. While touring selected structures to observe their lighting systems: <ul style="list-style-type: none"> <li>• Identify the various types of lighting fixtures used.</li> <li>• Explain the specific purpose(s) served by the different fixtures.</li> <li>• Identify the lighting system class of service.</li> </ul>		
<i>Module 26304-08 – Hazardous Locations</i>		
1. Define the various classifications of hazardous locations.		
2. Describe the wiring methods permitted for branch circuits and feeders in specific hazardous locations.	RST 11-12.2	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
<p>1. Using two rigid metal conduit nipples, a sealing fitting, three pieces of No. 12 THHN conductors, and a packing fiber/sealing kit, perform the following operations:</p> <ul style="list-style-type: none"> <li>• Secure one conduit nipple in each end of the seal.</li> <li>• Make sure the required number of threads are engaged.</li> <li>• Pull the three THHN conductors through the nipples and seal so that about 6" is protruding from each nipple.</li> <li>• Pack the fiber following the instructions furnished with the sealing kit.</li> <li>• Mix the sealing compound.</li> <li>• Position the unit in the required location and pour in the sealing compound.</li> </ul>	RST 11-12.3	
<i>Module 26305-08 – Overcurrent Protection</i>		
1. Apply the key National Electrical Code® (NEC®) requirements regarding overcurrent protection.		
2. Check specific applications for conformance to NEC® sections that cover short circuit current, fault currents, interrupting ratings, and other sections relating to overcurrent protection.		
4. Select and size overcurrent protection for specific applications.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<i>Module 26309-08 – Motor Calculations</i>		
1. Size branch circuits and feeders for electric motors.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
2. Size and select overcurrent protective devices for motors.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
<i>Module 26401-08 – Load Calculations – Feeders and Services</i>		
1. Size feeders and services in accordance with National Electrical Code® (NEC®) requirements.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
2. Calculate loads and ampacities for single-phase and three-phase feeders.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, S-ID 9, S-IC 6, S-MD 7, A-CED 1, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
<i>Module 26413-08 – Introductory Skills for the Crewleader</i>		
<i>Chapter One</i>		
1. Discuss the growth and economic conditions of the construction industry.	SL 11-12.4	Research and present findings on emerging markets in the electrical field
2. Describe how workers' values have changed over the years.	SL 11-12.4	
3. Explain the importance of training for construction industry personnel.	RST 11-12.2	
4. List the new technologies available, and discuss how they are helpful to the construction industry.		
5. Identify the gender and minority issues associated with a changing workforce.	SL 11-12.4	
6. Describe what employers can do to prevent workplace discrimination.	RST 11-12.2	
7. Differentiate between formal and informal organizations.	RST 11-12.9	

Construction Standards	Common Core Standards	Explanation
8. Describe the difference between authority and responsibility.		
9. Explain the purpose of job descriptions and what they should include.	RST 11-12.2	
10. Distinguish between company policies and procedures.		
<i>Chapter Two</i>		
1. Explain the role of a crew leader.	RST 11-12.2	
2. List the characteristics of effective leaders.		
3. Be able to discuss the importance of ethics in a supervisor's role.	SL 11-12.4	
4. Identify the three styles of leadership.		
5. Describe the forms of communication.	SL 11-12.4	
6. Explain the four parts of verbal communication.	RST 11-12.2	
7. Demonstrate the importance of active listening.		
8. Illustrate how to overcome the barriers to communication.		
9. List some ways that supervisors can motivate their employees.		
10. Explain the importance of delegating and implementing policies and procedures.	RST 11-12.2	
11. Differentiate between problem solving and decision making.	RST 11-12.9	

Construction Standards	Common Core Standards	Explanation
<i>Chapter Three</i>		
1. Demonstrate an understanding of the importance of safety.		
2. Give examples of direct and indirect costs of workplace accidents.	SL 11-12.4	
3. Identify safety hazards of the construction industry.	RST 11-12.8	
4. Explain the purpose of the Occupational Safety and Health Act (OSHA).		
5. Discuss OSHA inspection programs.		
6. Identify the key points of a safety program.		
9. Explain the importance of having employees trained in first aid and Cardio-Pulmonary Resuscitation (CPR) on the job site.	SL 11-12.4	
<i>Module 26501-09 – Managing Electrical Hazards</i>		
1. Identify types of electrical hazards and locations, and explain related safety guidelines and terms.		
2. Recognize and explain hazard boundaries.		
3. Explain employer and employee responsibilities in recognizing and managing electrical hazards.	RST 11-12.8	
4. List common factors that lead to electrical incidents and explain the importance of using appropriate procedures and safe work practices.	RST 11-12.8	
5. Analyze the electrical hazards of a given task, plan the job, and complete an electrical work permit request.	RST 11-12.8	
6. Select, inspect, and maintain personal protective equipment (PPE) and test equipment used for electrical work.		
7. Explain how to create an electrically safe work condition.	SL 11-12.4	

Construction Standards	Common Core Standards	Explanation
<i>Module 26303-08 – Practical Applications of Lighting</i>		
1. Explain how the lighting terms lumen, candlepower, and footcandle relate to one another.	N-Q 1, N-Q 2, N-Q 3, F-IF 4, F-LE 5, S-IC 6, A-CED 1-4, A-REI 1, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
3. Identify the general lighting pattern produced by each type of fixture.	G-CO 2, G-SRT 1, G-SRT 2, G-GMD 4, G-MG 1, G-MG 2, G-MG 3	
4. Identify the lighting requirements associated with lighting systems used in selected applications such as office buildings, schools, theaters, hazardous areas, etc.		

**Codes for Common Core English Language Arts and Literacy are:**

L = Language

RI = Reading for Informational Text

RST = Reading for Literacy in Science and Technical Subjects

SL = Speaking and Listening

W = Writing

WHST = Writing for Literacy in History/Social Studies,  
Science, and Technical Subjects

**Codes for Common Core Mathematics are:**

A-SSE = Algebra: Seeing Structure in Expressions

A-CED = Algebra: Creating Equations

A-REI = Algebra: Reasoning with Equations and Inequalities

F-IF = Functions: Interpreting Functions

F-BF = Functions: Building Functions

F-LE = Functions: Linear, Quadratic, and Exponential Models

G-CO = Geometry: Congruence

G-SRT = Similarity, right Triangles, and Trigonometry

G-GMD = Geometry: Geometric Measurement and Dimension

G-MG = Geometry: Modeling with Geometry

N-RN = Number and Quantity: The Real Number System

N-Q = Number and Quantity: Quantities

N-VM = Number and Quantity: Vector and Matrix Quantities

S-ID = Statistics and Probability: Interpreting Categorical and  
Quantitative Data

S-IC = Statistics and Probability: Making Inferences and Justifying  
Conclusions

S-CP = Statistics and Probability: Conditional Probability and the  
Rules of Probability

S-MD = Statistics and Probability: Using Probability to Make  
Decisions

## Standards Alignment: Common Core / HVAC

Construction Standards	Common Core Standards	Explanation
<b>Module 03102-07 – Trade Mathematics</b> This module explains how to solve problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature. It also introduces scientific notation, powers, roots, and basic algebra and geometry.		
1. Identify similar units of measurement in both the inch-pound (English) and metric systems and state which units are larger.	A-CED 1, N-Q 1, N-Q 2, N-Q 3	
2. Convert measured values in the inch-pound system to equivalent metric values and vice versa.	A-CED 2, A-CED 4, N-Q 1, N-Q 2, N-Q 3, F-LE 1b	
3. Express numbers as powers of ten.	A-REI 1, N-Q 1, N-Q 2, N-Q 3	
4. Determine the powers and roots of numbers.	A-REI 1, A-REI 2, A-REI 4, N-RN 2	
5. Solve basic algebraic equations.	A-CED 1, A-REI 1, A-REI 2, A-REI 3	
6. Identify various geometric figures.	G-CO 1, G-GMD 4	
7. Use the Pythagorean theorem to make calculations involving right triangles.	G-SRT 8, G-SRT 9, A-CED 4, A-REI 2, A-REI 4	
8. Convert decimal feet to feet and inches and vice versa.	N-Q 1	
9. Calculate perimeter, area, and volume.	N-Q 1, N-Q 2, N-Q 3, G-C 2, G-GPE 7, G-GMD 3	
10. Convert temperature values between Celsius and Fahrenheit.	N-Q 1, N-Q 3, A-CED 4	

Construction Standards	Common Core Standards	Explanation
<b>Module 03103-07 – Copper and Plastic Piping Practices</b> This module covers the selection, preparation, joining, and support of plastic and copper piping and fittings.		
1. State the precautions that must be taken when installing refrigerant piping.	S-IC 6	
2. Select the right tubing for a job.		
3. Cut and bend copper tubing.		
4. Safely join tubing by using flare and compression fittings.		
5. Determine the kinds of hangers and supports needed for refrigerant piping.		
6. State the basic safety requirements for pressure-testing a system once it has been installed.	RST 11-12.3	
7. Identify types of plastic pipe and state their uses.		
8. Cut and join lengths of plastic pipe.		

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Correctly measure the diameter of copper tubing.	N-Q 3	
2. Cut and ream copper tubing using a tubing cutter.		
3. Correctly bend copper tubing using bending tools.		
4. Make a swage joint in a section of copper tubing.		
5. Make and join flare connections.		
6. Join two sections of tubing using a compression fitting.		
7. Cut and join two sections of plastic pipe using appropriate fittings.		
8. Identify correct types of copper pipe for given applications.	S-IC 6	
9. Identify copper pipe sizes and wall thicknesses.		
<b>Module 03104-07 – Soldering and Brazing</b> This module covers the tools, materials, and safety precautions and depicts step-by-step procedures for soldering and brazing piping.		
1. Assemble and operate the tools used for soldering.		
2. Prepare tubing and fittings for soldering.		
3. Identify the purposes and uses of solder and solder fluxes.	S-ID 9, S-IC 6	
4. Solder copper tubing and fittings.		
5. Assemble and operate the tools used for brazing.		
6. Preparing tubing and fittings for brazing.		
7. Identify the purposes and uses of filler metals and fluxes used for brazing.	S-ID 9, S-IC 6	
8. Braze copper tubing and fittings.		
9. Identify the inert gases that can be used safely to purge tubing when brazing.	S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. For both soldering and brazing: <ul style="list-style-type: none"> <li>• Cut tubing to correct length.</li> <li>• Clean tubing and fittings.</li> <li>• Select and apply flux to tubing and fittings.</li> <li>• Assemble tubing and fittings.</li> </ul>		
2. For soldering: <ul style="list-style-type: none"> <li>• Assemble a propane torch.</li> <li>• Light and adjust a propane torch flame.</li> <li>• Select correct solder for the intended soldering job.</li> <li>• Heat joint to the right temperature and apply solder to fill a joint.</li> <li>• Clean and cool a soldered joint.</li> <li>—Solder a joint using butane.</li> <li>—Solder a joint using acetylene.</li> </ul>		
3. For brazing: <ul style="list-style-type: none"> <li>• Assemble an oxyacetylene torch, including selection of the proper size tip for the job.</li> <li>• Light and adjust an oxyacetylene torch flame.</li> <li>• Select correct filler metal rod for the intended brazing application.</li> <li>• After heating and brazing, clean and cool the brazed joint.</li> </ul>		
4. Assemble and operate a pressure regulator system used with an inert gas to purge tubing for brazing.		
5. Assemble a brass-to-copper joint.		

Construction Standards	Common Core Standards	Explanation
<b>Module 03106-07 – Basic Electricity</b> This module covers basic power generation and distribution, electrical components, DC circuits, and electrical safety.		
1. State how electrical power is distributed.	SL 11-12.1a	
2. Describe how voltage, current, resistance, and power are related.	S 11-12.1a, N-Q 1, N-Q 2, N-Q 3, A-CED 4	
3. Use Ohm’s law to calculate the current, voltage, and resistance in a circuit.	A-CED 4	
4. Use the power formula to calculate how much power is consumed by a circuit.	A-CED 4	
5. Describe the difference between series and parallel circuits and calculate loads in each.	SL 11-12.1a, A-CED 1, A-CED 2, A-CED 3, A-CED 4	
6. Describe the purpose and operation of the various electrical components used in HVAC equipment.	SL 11-12.1a	
7. State and demonstrate the safety precautions that must be followed when working on electrical equipment.	SL 11-12.1a, S-ID 9, S-IC 6	
8. Make voltage, current, and resistance measurements using electrical test equipment.	N-Q 1, N-Q 2, N-Q 3	
9. Read and interpret common electrical symbols.	RST 11-12.1, G-GMD 4	
<b>Performance Tasks</b>		
1. Use a multimeter to measure voltage.	N-Q 1, N-Q 2, N-Q 3	
2. Use a multimeter to measure current.	N-Q 1, N-Q 2, N-Q 3	
3. Use a multimeter to measure resistance.	N-Q 1, N-Q 2, N-Q 3	
4. Use a multimeter to check circuit continuity.	N-Q 1, N-Q 2, N-Q 3	
5. Assemble and test series and parallel circuits using a battery, wires, and selected load devices.	G-GPE 6, G-GMD 4, G-MG 2, G-MG 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 03107-07 – Introduction To Cooling</b> This module covers the basic principles of heat transfer, refrigeration, and pressure-temperature relationships and describes the components and accessories used in air conditioned systems.		
1. Explain how heat transfer occurs in a cooling system, demonstrating an understanding of the terms and concepts used in the refrigeration cycle.	A-CED 1, A-CED 2, SL 11-12.1a	
2. Calculate the temperature and pressure relationships at key points in the refrigeration cycle.	A-CED 1, A-CED 2, F-IF 4, F-IF 5, F-IF 6, N-Q 1	Use charts, temperatures, and pressures to determine proper operating pressures.
3. Under supervision, use temperature- and pressure-measuring instruments to make readings at key points in the refrigeration cycle.	A-CED 1, A-CED 2, N-Q 1, N-Q 2, N-Q 3	
4. Identify commonly used refrigerants and demonstrate the proper procedures for handling these refrigerants.	S-ID 9, S-IC 6	
5. Identify the major components of a cooling system and explain how each type works.	S-ID 9, S-IC 6	
6. Identify the major accessories available for cooling systems and explain how each works.	S-ID 9, S-IC 6	
7. Identify the control devices used in cooling systems and explain how each works.	S-ID 9, S-IC 6	
8. State the correct methods to be used when piping a refrigeration system.	SL 11-12.1b	
<b>Performance Tasks</b>		
1. Measure temperatures in an operating air conditioning system.	N-Q 3	
2. Use cylinder color codes to identify refrigerants.		
3. Identify compressors, condensers, evaporators, metering devices, controls, and accessories.		
4. Use service valves to gain access to an air conditioning system in order to measure pressures using a gauge manifold set.	N-Q 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 03108-07 – Introduction To Heating</b> This module covers heating fundamentals, types and designs of furnaces and their components, and basic procedures for installing and servicing furnaces.		
1. Explain the three methods by which heat is transferred and give an example of each.	SL 11-12.1c	
2. Describe how combustion occurs and identify the byproducts of combustion.	SL 11-12.1c	
3. Identify various types of fuels used in heating.		
4. Identify the major components and accessories of an induced draft and condensing gas furnace and explain the function of each component.	S-ID 9, S-IC 6	
5. State the factors that must be considered when installing a furnace.	SL 11-12.1c, S-ID 9, S-IC 6	
6. Identify the major components of a gas furnace and describe how each works.	SL 11-12.1c	
7. With supervision, use a manometer to measure and adjust manifold pressure on a gas furnace.	N-Q 1, N-Q 2, N-Q 3	
8. Describe how an electric furnace works.	RST 11-12.3	
9. With supervision, perform basic furnace preventive maintenance procedures such as cleaning and filter replacement.		
<b>Performance Tasks</b>		
1. Identify the components of an induced draft and condensing gas furnace and state their purpose.	S-ID 9, S-IC 6	
2. With supervision, turn on and check a gas furnace.	S-MD 7	
3. Identify symptoms of combustion problems in a gas furnace and adjust the manifold pressure.	S-ID 9, S-IC 6, S-MD 7	
4. With supervision, perform preventive maintenance procedures on a gas furnace, including filter replacement, cleaning of components, and temperature measurements.	N-Q 2, N-Q 3, S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<b>Module 03202-07 – Chimneys, Vents, and Flues</b>		
This module covers proper venting of fossil-fuel furnaces and the procedures for selecting and installing vents in all types of gas furnaces.		
1. Describe the principles of combustion and explain complete and incomplete combustion.	RST 11-12.1, S-ID 9, S-IC 6, S-MD 7	
2. Describe the content of flue gas and explain how it is vented.	RST 11-12.1	
3. Identify the components of a furnace vent system.		
4. Describe how to select and install a vent system.	RST 11-12.7, S-ID 9, S-IC 6, S-MD 7	
5. Perform the adjustments necessary to achieve proper combustion in a gas furnace.	S-ID 9, S-IC 6, S-MD 7, N-Q 1, N-Q 2, N-Q 3	
6. Describe the techniques for venting different types of furnaces.	RST 11-12.7	
7. Explain the various draft control devices used with natural-draft furnaces.	RST 11-12.7	
8. Calculate the size of a vent required for a given application.	S-ID 9, S-IC 6, S-MD 7, G-GPE 7, G-GMD 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 3, A-CED 4, A-REI 1	
9. Adjust a thermostat heat anticipator.		
<b>Performance Tasks</b>		
1. Measure supply and return temperature and determine the temperature rise of a furnace.	A-CED 1, N-Q 1, N-Q 2, N-Q 3	
2. Adjust a thermostat heat anticipator.		
3. Calculate the correct size and type of PVC pipe using manufacturer's instructions or <i>National Fuel Gas Code</i> or American Gas Association specifications.	S-ID 9, S-IC 6, S-MD 7, G-GPE 7, G-GMD 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 3, A-CED 4, A-REI 1	
4. Calculate the correct size and type of furnace vent connector and metal vent using manufacturer's instructions or <i>National Fuel Gas Code</i> or American Gas Association specifications.	S-ID 9, S-IC 6, S-MD 7, G-GPE 7, G-GMD 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 3, A-CED 4, A-REI 1	

Construction Standards	Common Core Standards	Explanation
<b>Module 03205-07 – Leak Detection, Evacuation, Recovery, and Charging</b> This module introduces the trainee to the leak detection, evacuation, recovery, and charging service procedures used to troubleshoot, repair, and/or maintain proper operation of the mechanical refrigeration systems.		
1. Identify the common types of leak detectors and explain how each is used.	S-ID 9, S-IC 6, S-MD 7	
2. Perform leak detection tests using selected methods.	S-ID 9, S-IC 6, S-MD 7	
3. Identify the service equipment used for evacuating a system and explain why each item of equipment is used.	S-ID 9, S-IC 6, S-MD 7	
4. Perform system evacuation and dehydration.		
5. Identify the service equipment used for recovering refrigerant from a system and for recycling the recovered refrigerant, and explain why each item of equipment is used.		
6. Perform a refrigerant recovery.		
7. Evacuate a system to a deep vacuum.		
8. Identify the service equipment used for charging refrigerant into a system, and explain why each item of equipment is used.	RST 11-12.7	
9. Use nitrogen to purge a system.		
10. Charge refrigerant into a system by the following methods: <ul style="list-style-type: none"> <li>• Weight</li> <li>• Subcooling</li> <li>• Superheat</li> <li>• Charging pressure chart</li> </ul>	F-LE 1b N-Q 1, N-Q 2, N-Q 3  F-IF 4, F-IF 5, F-IF 6	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Identify the common types of leak detectors and explain the advantages and disadvantages associated with each type.	RST 11-12.3	
2. Use selected electronic, ultrasonic, liquid (bubble), and ultraviolet/fluorescent leak detectors to leak test a pressurized operational system.		
3. Under supervision, use a recovery and/or recovery/recycle unit to recover the refrigerant from a system.		
4. Under supervision, use a mixture of nitrogen and a trace amount of HCFC-22 refrigerant to pressurize a refrigerant system in preparation for leak testing.		
5. Under supervision, demonstrate and/or describe how to evacuate a system using the deep vacuum method.	RI 11-12.7	
6. Perform a vacuum leak test on an evacuated system.		
7. Under supervision, demonstrate how to evacuate a system using the triple evacuation method.		
8. Under supervision, demonstrate how to use dry nitrogen as the moisture-absorbing gas when triple evacuating a system.		
9. Under supervision, demonstrate how to charge a system by weight.		
10. Under supervision, demonstrate how to charge a system using the superheat method.		
11. Under supervision, demonstrate how to charge a system using the subcooling method.		
12. Under supervision, demonstrate how to charge a system using the charging pressure charts method.		

Construction Standards	Common Core Standards	Explanation
<b>Module 03206-07 – Alternating Current</b>		
This module introduces the trainee to the production, transmission, and uses of alternating current in the HVAC field.		
1. Describe the operation of various types of transformers.	RST 11-12.3	
2. Explain how alternating current is developed and draw a sine wave.	RST 11-12.3, F-TF 5	
3. Identify single-phase and three-phase wiring arrangements.	G-MG 1	
4. Explain how phase shift occurs in inductors and capacitors.	RST 11-12.3	
5. Describe the types of capacitors and their applications.	RST 11-12.3	
6. Explain the operation of single-phase and three-phase induction motors.	RST 11-12.3	
7. Identify the various types of single-phase motors and their applications.		
8. State and demonstrate the safety precautions that must be followed when working with electrical equipment.	RST 11-12.3, S-ID 9, S-IC 6, S-MD 7	
9. Test AC components, including capacitors, transformers, and motors.		
<b>Performance Tasks</b>		
1. Identify the components used in a given AC circuit and explain their functions.	RST 11-12.3	
2. Identify types of single-phase and three-phase power distribution systems from electrical circuit diagrams.	G-GMD 4, G-MG 1	
3. Following applicable safety practices, test AC components, including transformers, capacitors, and motor windings.	S-ID 9, S-IC 6, S-MD 7	
4. Identify various types of AC motors from schematic diagrams.	G-GMD 4, G-MG 1	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03208-07 – Introduction To Control Circuit Troubleshooting</b>            This module covers the various types of thermostats used in HVAC systems. It also covers hydronic, pneumatic, and digital controls and introduces the trainee to control circuit analysis and troubleshooting.</p>		
1. Explain the function of a thermostat in an HVAC system.	SL 11-12.1c	
2. Describe different types of thermostats and explain how they are used.	SL 11-12.1c	
3. Demonstrate the correct installation and adjustment of a thermostat.		
4. Explain the basic principles applicable to all control systems.	SL 11-12.1c	
5. Identify the various types of electromechanical, electronic, and pneumatic HVAC controls, and explain their function and operation.		
6. Describe a systematic approach for electrical troubleshooting of HVAC equipment and components.	RST11-12.3, S-ID 9, S-IC 6, S-MD 7	
7. Recognize and use equipment manufacturer’s troubleshooting aids to troubleshoot HVAC equipment.	S-ID 9, S-IC 6, S-MD 7	
8. Demonstrate how to isolate electrical problems to faulty power distribution, load, or control circuits.	S-ID 9, S-IC 6, S-MD 7	
9. Identify the service instruments needed to troubleshoot HVAC electrical equipment.		
10. Make electrical troubleshooting checks and measurements on circuits and components common to all HVAC equipment.	N-Q 1, N-Q2, N-Q 3	
11. Isolate and correct malfunctions in a cooling system control circuit.	S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Identify various types of thermostats and explain their operation and uses.	SL 11-12.1c	
2. Install a conventional 24V bimetal thermostat and hook it up using the standard coding system for thermostat wiring.		
3. Check and adjust a thermostat, including heat anticipator setting and indicator adjustment.		
4. Program an electronic programmable thermostat.		
5. Identify electrical, electronic, and pneumatic components and circuits, recognize their diagram symbols, and explain their functions.	G-GMD 4, G-MG 1	
6. Interpret control circuit diagrams.	G-GMD 4, G-MG 1	
7. Perform electrical tests and troubleshooting as follows: <ul style="list-style-type: none"> <li>• Single- and three-phase input voltage measurements</li> <li>• Fuse and circuit breaker checks</li> <li>• Resistive and inductive load checks</li> <li>• Switch and contactor/relay checks</li> <li>• Control transformer checks</li> </ul>	N-Q 1, N-Q 2, N-Q 3, S-ID 9, S-IC 6, S-MD 7	
8. Perform electrical tests and troubleshooting of compressor and fan motors as follows: <ul style="list-style-type: none"> <li>• Start and run capacitor checks</li> <li>• Start relay and start thermistor checks</li> <li>• Open, shorted, and grounded winding check</li> </ul>	S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<b>Module 03209-07 – Troubleshooting Gas Heating</b> This module introduces the trainee to the procedures for recognizing, analyzing, and repairing malfunctions in gas heating equipment.		
1. Describe the basic operating sequence for gas heating equipment.	RST 11-12.3	
2. Interpret control circuit diagrams for gas heating systems.	G-GMD 4, G-MG 1	
3. Describe the operation of various types of burner ignition methods.	RST 11-12.3	
4. Identify the tools and instruments used when troubleshooting gas heating systems.		
5. Demonstrate using the tools and instruments required for troubleshooting gas heating systems.		
6. Isolate and correct malfunctions in gas heating systems.	S-ID 9, S-IC 6, S-MD 7	
<b>Performance Tasks</b>		
1. Develop a checklist for troubleshooting a gas heating appliance.	F-IF 1, F-IF 3, F-IF 4	
2. Select the tools and instruments needed to troubleshoot a gas heating appliance in a given situation.	S-ID 9, S-IC 6, S-MD 7	
3. Analyze control circuit diagram(s) for a selected gas heating appliance.	G-GMD 4, G-MG 1	
4. Isolate and correct malfunctions in a gas heating appliance. <ul style="list-style-type: none"> <li>• Control circuits</li> <li>• Combustion system</li> <li>• Safety controls</li> <li>• Air system</li> </ul>	S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<b>Module 03210-07 – Troubleshooting Cooling</b> This module covers the troubleshooting methods used with cooling systems.		
1. Describe a systematic approach for troubleshooting cooling systems and components.	RST 11-12.3	
2. Isolate problems to electrical and/or mechanical functions in cooling systems.	S-ID 9, S-IC 6, S-MD 7	
3. Recognize and use equipment manufacturer’s troubleshooting aids to troubleshoot cooling systems.	S-ID 9, S-IC 6, S-MD 7	
4. Identify and use the service instruments needed to troubleshoot cooling systems.		
5. Successfully troubleshoot selected problems in cooling equipment.	S-ID 9, S-IC 6, S-MD 7	
6. State the safety precautions associated with cooling troubleshooting.	RST 11-12.8	
<b>Performance Tasks</b>		
1. Develop a checklist for troubleshooting cooling systems.	F-IF 1, F-IF 3, F-IF 4	
2. Select the tools and instruments needed to troubleshoot a cooling system in a given situation.		
3. Analyze control circuit diagram(s) for a selected cooling system.	G-GMD 4, G-MG 1	
4. Isolate and correct malfunctions in a cooling appliance: <ul style="list-style-type: none"> <li>• Electrical problems</li> <li>• Compressor electrical failures</li> <li>• System-related compressor problems</li> <li>• Refrigerant overcharge and undercharge</li> <li>• Evaporator and condenser problems</li> <li>• Metering device problems</li> <li>• Refrigerant lines and accessories</li> <li>• Noncondensibles and contamination</li> </ul>	S-ID 9, S-IC 6, S-MD 7, N-Q 1, N-Q 2, N-Q 3	

Construction Standards	Common Core Standards	Explanation
<b>Module 03211-07 – Heat Pumps</b>		
This module introduces covers operation, installation, and control circuit analysis for heat pumps.		
1. Describe the principles of reverse-cycle heating.	RST 11-12.3	
2. Identify heat pumps by type and general classification.		
3. Describe various types of geothermal water loops and their application.	RST 11-12.3	
4. List the components of heat pump systems.		
5. Describe the role and basic operation of electric heat in common heat pump systems.	RST 11-12.3	
6. Describe common heat pump ratings, such as Coefficient of Performance (COP), Heating Season Performance Factor (HSPF), and Seasonal Energy Efficiency Ratio (SEER).	RST 11-12.3, A-SSE 1, F-IF 5, F-BF 1c, F-LE 5	
7. Demonstrate heat pump installation and service procedures.		
8. Identify and install refrigerant circuit accessories commonly associated with heat pumps.		
9. Analyze a heat pump control circuit.	G-GMD 4, G-MG 1	
10. Isolate and correct malfunctions in a heat pump.	S-ID 9, S-IC 6, S-MD 7	
<b>Performance Tasks</b>		
1. Identify components that are unique to heat pumps and explain the function of each.		
2. Calculate the balance point of a heat pump.	A-CED 1, A-CED 2, A-CED 3, A-CED 4, A-REI 1, A-REI 2, A-REI 3	
3. Simulate the installation procedures for a heat pump.		
4. Perform heat pump servicing procedures.		
5. Analyze a heat pump circuit diagram and perform simulated troubleshooting exercises.	G-GMD 4, G-MG 1, S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03212-07 – Basic Installation And Maintenance Practices</b>            This module introduces the trainee to the basic mechanical procedures commonly performed in HVAC servicing work. Basic maintenance procedures, documentation, and customer relations are also covered.</p>		
1. Identify, explain, and install threaded and non-threaded fasteners.		
2. Identify, explain, remove, and install types of gaskets, packings, and seals.		
3. Identify types of lubricants, and explain their uses.		
4. Use lubrication equipment to lubricate motor bearings.		
5. Identify the types of belt drives, explain their uses, and demonstrate procedures used to install or adjust them.		
6. Identify and explain types of couplings.		
7. Demonstrate procedures used to remove, install, and align couplings.		
8. Identify types of bearings, and explain their uses.		
9. Explain causes of bearing failures.	S-ID 9, S-IC 6, S-MD 7	
10. Demonstrate procedures used to remove and install bearings.		
11. Perform basic preventive maintenance inspection and cleaning procedures.		
12. List ways to develop and maintain good customer relations.		

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Identify different types of threaded fasteners.		
2. Identify non-threaded fasteners.		
3. Identify different types of gaskets.		
4. Identify mechanical seal parts.		
5. Install an oil seal.		
6. Align and properly adjust V-belts.	G-MG 3	
7. Identify different types of drive couplings.		
8. Tighten a four-bolt flange.		
9. Install an expandable anchor bolt.		
10. Identify different types of bearings.		
11. Recognize and use a manual bearing puller to remove a bearing.		
12. Recognize and use a feeler gauge to measure bearing clearances.		
13. Lubricate a bearing using a lever-type grease gun.		
14. Fill out typical forms used for installation and service calls.		

Construction Standards	Common Core Standards	Explanation
<b>Module 03213-07 – Sheet Metal Duct Systems</b> This module introduces sheet metal duct systems and explains how to lay out and install sheet metal and flexible ducts.		
1. Identify and describe the basic types of sheet metal.		
2. Define properties of steel and aluminum alloys.		
3. Describe a basic layout method and perform proper cutting.	G-CO 12, G-GMD 4, RST 11-12.3	
4. Join sheet metal duct sections using proper seams and connectors.	G-MG 3, G-GMD 4	Transitioning from square to round duct.
5. Describe proper hanging and support methods for sheet metal duct.	RST 11-12.3	
6. Describe thermal and acoustic insulation principles.	RST 11-12.3	
7. Select, apply, and seal the proper insulation for sheet metal ductwork.		
8. Describe guidelines for installing components such as registers, diffusers, grilles, dampers, access doors, and zoning accessories.	RST 11-12.3	
9. Install takeoffs and attach flexible duct to a sheet metal duct.		
<b>Performance Tasks</b>		
1. Join duct sections and fittings.		
2. Install takeoffs and attach flexible duct.		

Construction Standards	Common Core Standards	Explanation
<b>Module 03301-08 – Refrigerants and Oils</b> This module covers the refrigerants and oils commonly used in HVAC/R systems. It includes identification and classification of refrigerants, differences between pure and blended refrigerants, types and properties of oils, use and testing of oils, and refrigerant retrofits.		
1. Identify the refrigerants in common use and state the types of applications in which each is used.		
2. Explain the effects of releasing refrigerants into the atmosphere.	S-ID 9, S-IC 6	
3. Explain how refrigerants are classified by their chemical composition.		
4. Describe the color-coding scheme used to identify refrigerant cylinders.	RI 11-12.7, F-IF 1	
5. Describe how azeotropes and near-azeotropes differ from each other and from so-called pure refrigerants.	RST 11-12.3	
6. Interpret a P-T chart for an azeotrope refrigerant.	F-IF 4	
7. Calculate superheat and subcooling.	A-REI 1	
8. Demonstrate refrigerant leak detecting methods.		
9. Identify the different types of oils used in refrigeration systems and explain their relationships to the various refrigerants.		Could reinforce a function concept here about mapping relationships.
10. Explain how to add and remove oil from a system.		
11. Describe how to test oil for contamination.	RST 11-12.3	
12. Perform a refrigerant retrofit.		
<b>Performance Tasks</b>		
1. Interpret a P-T chart for an azeotrope refrigerant.		
2. Calculate superheat and subcooling.		
3. Perform a refrigerant leak detection procedure.		
4. Perform a refrigerant retrofit.		

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03302-08 – Compressors</b>            This module explains the operating principles of the different types of compressors used in comfort air conditioning systems and the basic installation service and repair procedures for these compressors.</p>		
1. Identify the different types of compressors.		
2. Demonstrate or describe the mechanical operation for each type of compressor.		
3. Demonstrate or explain compressor lubrication methods.		
4. Demonstrate or explain methods used to control compressor capacity.		
5. Demonstrate or describe how compressor protection devices operate.		
6. Perform the common procedures used when field servicing open and semi-hermetic compressors, including: <ul style="list-style-type: none"> <li>• Shaft seal removal and installation</li> <li>• Valve plate removal and installation</li> <li>• Unloader adjustment</li> </ul>		
7. Demonstrate the procedures used to identify system problems that cause compressor failures.	S-ID 9, S-IC 6, S-MD 7	
8. Demonstrate the system checkout procedure performed following a compressor failure.		
9. Demonstrate or describe the procedures used to remove and install a compressor.		
10. Demonstrate or describe the procedures used to clean up a system after a compressor burnout.		

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Identify different types of compressor capacity controls.		
2. Identify protection devices commonly used with compressors.		
3. Under supervision, make electrical troubleshooting checks on single-phase and three-phase compressor motors.	S-ID 9, S-IC 6, S-MD 7	
4. Under supervision, use a sealed tube acid/moisture test kit to test a system for the presence of acid and/or moisture.	S-ID 9, S-IC 6, S-MD 7	
5. Under supervision, remove and install a hermetic compressor.		
6. Remove and install a valve plate assembly and head on a semi-hermetic compressor.		
7. Adjust the cylinder unloader on a semi-hermetic compressor.		
<b>Module 03303-08 – Metering Devices</b> This module covers operation and servicing of the various types of fixed-orifice and expansion valve metering devices used in refrigerant systems.		
1. Explain the function of metering devices.	RST 11-12.3	
2. Describe the operation of selected fixed-orifice and expansion valves.	RST 11-12.3	
3. Identify types of expansion valves.		
4. Describe problems associated with replacement of expansion valves.	RST 11-12.3, S-ID 9, S-IC 6, S-MD 7	
5. Describe the procedure for installing and adjusting selected expansion valves.	RST 11-12.3, S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Identify various types of metering devices.		
2. Replace the orifice piston in a piston-type metering device.		
3. Use catalog data to select a replacement metering device.		
4. Install an externally equalized expansion valve, correctly placing the sensing bulb and equalizer tube.		
5. Calculate superheat and adjust an expansion valve to obtain the correct superheat.	A-REI 1	
<b>Module 03311-08 – Troubleshooting Heat Pumps</b> This module introduces the trainee to the procedures for recognizing, analyzing, and repairing malfunctions in heat pumps.		
1. Describe the basic operating sequence for an air-to-air heat pump.	RST 11-12.3	
2. Interpret control circuit diagrams for heat pumps.	RH 11-12.7, G-GMD 4, G-MG 1	
3. Develop a checklist for troubleshooting a heat pump.	F-IF 1, F-IF 3, F-IF 4	
4. Identify the tools and instruments used in troubleshooting heat pumps.		
5. Correctly use the tools and instruments required for troubleshooting heat pumps.		
6. Isolate and correct malfunctions in heat pumps.	S-ID 9, S-IC 6, S-MD 7	
7. Describe the safety precautions associated with servicing heat pumps.	RST 11-12.3	
<b>Performance Tasks</b>		
1. Develop a checklist for troubleshooting a heat pump.	F-IF 1, F-IF 3, F-IF 4	
2. Analyze control circuit diagram(s) for a selected heat pump.	G-GMD 4, G-MG 1	
3. Isolate and correct malfunctions in a heat pump using the correct tools and instruments: <ul style="list-style-type: none"> <li>• Cooling function</li> <li>• Reverse cycle heating function</li> <li>• Defrost cycle</li> <li>• Auxiliary electric heat</li> </ul>	S-ID 9, S-IC 6, S-MD 7	

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03407-09 – Heating And Cooling System Design</b>  This module identifies the factors that affect the heating and cooling loads of a building. It describes the process by which heating and cooling loads are calculated, and shows how load information is used to select heating and cooling equipment, including duct systems.</p>		
1. Identify and describe the steps in the system design process.	G-MG 2, RST 11-12.3	
2. From construction drawings or an actual job site, obtain information needed to complete heating and cooling load estimates.	G-MG 2, S-IC 1, S-IC 4, S-MD 1, S-MD 2, S-MD 4, S-MD 5b, S-MD 7, G-GPE 7, G-GMD 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, N-Q 1, N-Q 2, N-Q 3	
3. Identify the factors that affect heat gains and losses to a building and describe how these factors influence the design process.	G-MG 2, RST 11-12.3, S-ID 9	
4. With instructor supervision, complete a load estimate to determine the heating and/or cooling load of a building.	G-MG 2, G-GPE 7, G-GMD 3, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, A-REI 1, A-REI 2, A-REI 3, F-IF 1, F-IF 4, F-IF 5, F-IF 6, N-Q 1, N-Q 2, N-Q 3	
5. State the principles that affect the selection of equipment to satisfy the calculated heating and/or cooling load.	G-MG.2, RST 11-12.8, S-IC 6	
6. With instructor supervision, select heating and/or cooling equipment using manufacturers' product data.	G-MG 2, S-IC 6	
7. Identify the various types of duct systems and explain why and where each type is used.	G-MG 2, RST 11-12.7	
8. Demonstrate the effect of fittings and transitions on duct system design.	G-MG 2	
9. Use a friction loss chart and duct sizing table to size duct.	G-MG 2, F-IF 4, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, N-Q 1, N-Q 2, N-Q 3	
10. Install insulation and vapor barriers used in duct systems.		
11. Following proper design principles, select and install refrigerant and condensate piping.	G-MG 2	

Construction Standards	Common Core Standards	Explanation
12. Estimate the electrical load for a building and calculate the effect of the comfort system on the electrical load.	G.MG.2, G-GPE 7, G-GMD 3, G-GMD 4, G-MG 1, G-MG 3, A-CED 1, A-CED 2, A-CED 3, A-CED 4, A-REI 1, A-REI 2, A-REI 3, F-IF 1, F-IF 4, F-IF 5, F-IF 6, N-Q 1, N-Q 2, N-Q 3	
<b>Performance Tasks</b>		
1. Develop a list of factors that affect heating and cooling loads.	F-IF 1, F-IF 3	Could reinforce a function concept here about mapping relationships.
2. Develop a floor plan that contains all the information needed to perform a load estimate.		
3. Perform a load estimate using a standardized method.		
4. Use manufacturer’s product data to select the appropriate heating and cooling equipment based on a load estimate and airflow requirements.		
5. Determine the number, location, and sizes of supply outlets and return inlets needed in a building.		
6. Use a friction chart and/or standard duct sizing tables to size the trunk and branch ducts for a selected low-volume air distribution system.		
7. Use a duct design calculator to size the trunk and branch ducts for a selected low-volume air distribution system.		
8. Calculate the total system friction loss (external static pressure) for a selected air distribution system.		

Construction Standards	Common Core Standards	Explanation
<b>Module 03105-07 – Ferrous Metal Piping Practices</b> This module covers various types of iron and steel pipe and fittings, and provides step-by-step instructions for cutting, threading, and joining ferrous piping.		
1. Identify the types of ferrous metal pipes.		
2. Measure the sizes of ferrous metal pipes.	N-Q 1, N-Q 2, N-Q 3	
3. Identify the common malleable iron fittings.		
4. Cut, ream, and thread ferrous metal pipe.		
5. Join lengths of threaded pipe together and install fittings.		
6. Describe the main points to consider when installing pipe runs.	RST 11-12.7	
7. Describe the methods used to join grooved piping.	RST 11-12.7	
<b>Performance Tasks</b>		
1. Identify types of carbon steel pipe.		
2. Identify pipe sizes and weights.	F-IF 4, F-IF 5, F-IF 6, F-BF 1, F-LE 1.b, F-LE 2, F-LE 5	
3. Identify various pipe fittings.		
4. Use five methods for measuring pipe.	N-Q 1, N-Q 2, N-Q 3	
5. Cut, ream, thread, and assemble steel pipe.		

Construction Standards	Common Core Standards	Explanation
<b>Module 03109-07 – Air Distribution Systems</b> This module describes air distribution systems and their components, air flow measurement, duct work installation principles, and the use of instruments for measuring temperature, humidity, pressure, and velocity.		
1. Describe the airflow and pressures in a basic forced-air distribution system.	RST 11-12.3	
2. Explain the differences between propeller and centrifugal fans and blowers.	WHST 11-12.2e	
3. Identify the various types of duct systems and explain why and where each type is used.	RST 11-12.3	
4. Demonstrate or explain the installation of metal, fiberboard, and flexible duct.	RST 11-12.3	
5. Demonstrate or explain the installation of fittings and transitions used in duct systems.	RST 11-12.3	
6. Demonstrate or explain the use and installation of diffusers, registers, and grilles used in duct systems.	RST 11-12.3	
7. Demonstrate or explain the use and installation of dampers used in duct systems.	RST 11-12.3	
8. Demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems.	RST 11-12.3	
9. Identify instruments used to make measurements in air systems and explain the use of each instrument.		
10. Make basic temperature, air pressure, and velocity measurements in an air distribution system.	N-Q 1, N-Q 2, N-Q 3	

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Use a tachometer to measure blower motor rpm.	N-Q 1, N-Q 2, N-Q 3	
2. Read and interpret equivalent length charts and required air volume/duct size charts.	N-Q 1, N-Q 2, N-Q 3, F-IF 4	
3. Assemble duct and fittings.		
4. Assemble flexible duct.		
5. Install insulation and vapor barriers on metal ducts.		
6. Use a manometer to measure static pressure in a duct system.	N-Q 1, N-Q 2, N-Q 3	
7. Use a velometer to measure the velocity of airflow at the output of air system supply diffusers and registers.	N-Q 1, N-Q 2, N-Q 3	
<b>Module 03204-07 – Air Quality Equipment</b> This module covers common accessories used to control air quality, including dehumidifiers, humidifiers, and filters. It also covers energy conservation equipment.		
1. Explain why it is important to control humidity in a building.	RST 11-12.7, S-ID 9, S-IC 6	
2. Recognize the various kinds of humidifiers used with HVAC systems and explain why each is used.	RST 11-12.7, S-ID 9, S-IC 6, S-MD 7	
3. Demonstrate how to install and service the humidifiers used in HVAC systems.		
4. Recognize the kinds of air filters used with HVAC systems and explain why each is used.	RST11-12.7, S-ID 9, S-IC 6, S-MD 7	
5. Demonstrate how to install and service the filters used in HVAC systems.		
6. Use a manometer or differential pressure gauge to measure the friction loss of an air filter.	N-Q 1, N-Q 2, N-Q 3	
7. Identify accessories commonly used with air conditioning systems to improve indoor air quality and reduce energy cost, and explain the function of each, including: <ul style="list-style-type: none"> <li>• Humidity control devices</li> <li>• Air filtration devices</li> <li>• Energy conservation devices</li> </ul>		

Construction Standards	Common Core Standards	Explanation
8. Demonstrate or describe how to clean an electronic air cleaner.	RST 11-12.3	
<b>Performance Tasks</b>		
1. Demonstrate how to inspect, clean, and replace humidifiers.		
2. Inspect disposable/permanent air filters for mechanical damage and cleanliness.		
3. Clean permanent-type air filters.		
4. Measure the differential pressure drop across an air filter with a manometer.		
<b>Module 03214-07 – Fiberglass And Flexible Duct Systems</b> This module introduces fiberglass and flexible duct systems and explains how to lay out and install them.		
1. Identify types of fiberglass duct, including flexible duct.		
2. Describe fiberglass duct layout and some basic fabrication methods.	N-Q 1, N-Q 2, N-Q 3, G-CO 5, G-CO 12, G-GMD 4, G-MG 2, G-MG 3, RST 11-12.3	
3. Describe the various closure methods for sealing fiberglass duct.	RST 11-12.3	
4. Fabricate selected duct modules and fittings using the appropriate tools.	N-Q 1, N-Q 2, N-Q 3, G-CO 5, G-CO 12, G-GMD 4, G-MG 3	
5. Describe hanging and support methods for fiberglass duct.	RST 11-12.7	
6. Describe how to repair major and minor damage to fiberglass duct.	RST 11-12.3	
7. Install takeoffs and attach flexible duct to a fiberglass duct.		
<b>Performance Tasks</b>		
1. Fabricate and assemble fiberglass duct fittings and sections.		
2. Install takeoffs and attach flexible duct.		

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03304-08 – Retail Refrigeration Systems</b></p> <p>This module covers the mechanical refrigeration systems normally found in retail establishments. This equipment includes reach-in and walk-in coolers and freezers, ice machines, and other appliances used in stores, restaurants, and hotels. This module includes a discussion of the refrigeration process and defrost techniques, as well as troubleshooting and maintenance procedures.</p>		
1. Describe the mechanical refrigeration cycle as it applies to retail refrigeration systems.	RST 11-12.3	
2. Explain the differences in refrigerants and applications in low-, medium-, and high-temperature refrigeration systems.	WHST 11-12.2e	
3. Identify and describe the primary refrigeration cycle components used in retail refrigeration systems.	L 11-12.6	
4. Identify and describe the supporting components and accessories used in retail refrigeration systems.	L 11-12.6	
5. Describe the various methods of defrost used in retail refrigeration systems.	L 11-12.6	
6. Identify and describe the applications for the various types of retail refrigeration systems.	L 11-12.6	
7. Describe the control system components used in retail refrigeration systems.	L 11-12.6	
8. Explain the operating sequence of a retail refrigeration system.	RST 11-12.3	
9. Interpret wiring diagrams and troubleshooting charts to isolate malfunctions in retail refrigeration systems.	RH 11-12.7, G-GMD 4, G-MG 1, S-ID 9, S-IC 6, S-MD 7, N-Q 1, N-Q 2, N-Q 3	
<b>Performance Tasks</b>		
1. Clean an ice machine.		
2. Isolate faults in refrigeration and ice machines.		
3. Set up an electric defrost schedule for a refrigeration appliance.		

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03401-09 – Construction Drawings and Specifications</b>  This module covers the techniques for reading and understanding various types of construction drawings, specifications, and other related documents. Emphasis is placed on the types of drawings and specifications that are commonly used by those in the HVAC trade and other closely-related trades. The procedures and documents involved in an HVAC equipment and material takeoff are also covered.</p>		
1. Read HVAC drawings and architect’s plans and explain their relationships.	RH 11-12.7, G-GMD 4, G-MG1, G-MG 2, G-MG 3, N-Q 1, N-Q 2, N-Q 3	
2. Compare mechanical plans with the actual installation of duct and pipe runs, fittings, and sections.	G-GMD 4, G-MG1, G-MG 2, G-MG 3	
3. Interpret specification documents and apply them to the plans.	RH 11-12.7, N-Q 1, N-Q 2, N-Q 3, S-IC 6	
4. Interpret shop drawings and apply them to the plans and specifications.	RH 11-12.7, G-GMD 4, G-MG 1, G-MG 2, G-MG 3, N-Q 1, N-Q 2, N-Q 3	
5. Describe a submittal, its derivation, routing, and makeup.	RST 11-12.8	
6. Develop a field set of as-built drawings.	G-CO 5, G-CO 12, G-SRT 3, G-GMD 4, G-MG1, G-MG 2, G-MG 3, N-Q 1, N-Q 2, N-Q 3	
7. Identify the steps required for transferring design information to component production.	RST 11-12.3, G-CO 5, G-CO 12, G-SRT 3, G-GMD 4, G-MG1, G-MG 2, G-MG 3, N-Q 1, N-Q 2, N-Q 3	
8. Identify, develop, and complete takeoff sheets.	A-CED 1, A-CED 2, A-CED 3, A-CED 4, F-LE 5	
9. List and classify materials most commonly used in HVAC systems.		
10. Complete takeoff procedures for HVAC systems.		

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Identify and interpret a site plan drawing.	RH 11-12.7	
2. Identify and interpret the following on an architectural drawing: <ul style="list-style-type: none"> <li>• Floor plans and details</li> <li>• Elevations</li> <li>• Foundation plan</li> <li>• Reflected ceiling plan</li> </ul>	RH 11-12.7, G-GMD 4	
3. Identify and interpret the following on a plumbing plan drawing: <ul style="list-style-type: none"> <li>• Sanitary plumbing plans</li> <li>• Domestic water plumbing plans</li> <li>• Isometric views</li> <li>• Riser diagrams</li> <li>• Schedules</li> <li>• Specification references</li> <li>• Legends</li> </ul>	RH 11-12.7, G-GMD 4	
4. Identify and interpret the following on a mechanical plan drawing: <ul style="list-style-type: none"> <li>• Hot- and chilled-water coil piping</li> <li>• HVAC piping</li> <li>• Chiller piping/installation</li> <li>• Refrigeration piping schematics</li> <li>• Air handling unit installation/connecting ductwork</li> <li>• Hot- and chilled-water flow diagrams</li> <li>• Schedules</li> <li>• Specification references</li> <li>• Legends</li> </ul>	RH 11-12.7, G-GMD 4	
5. Identify and interpret the following on an electrical plan drawing: <ul style="list-style-type: none"> <li>• Riser diagrams</li> <li>• Schedules</li> <li>• Specification references</li> <li>• Legends</li> </ul>	RH 11-12.7, G-GMD 4	
6. Prepare a request for information (RFI) form.		
7. Identify and interpret the information given in the specifications pertaining to a construction project.	RH 11-12.7	

Construction Standards	Common Core Standards	Explanation
8. Interpret all types of HVAC-related shop drawings.	RH 11-12.7, G-GMD 4	
9. Mark up HVAC mechanical plans to show as-built modifications.	G-GMD 4, G-MG 1	
10. Perform an HVAC equipment and material takeoff and prepare the takeoff forms.	N-Q 1, N-Q 2, N-Q 3, N-VM 7, A-REI 1, A-REI 3, F-IF 4, A-SSE 1, A-SSE 3, F-BF 1, F-LE 1b	
11. Prepare building coordination drawings that show the composite installation of HVAC equipment relative to the equipment installed by other trades, such as the electrical and plumbing trades.	G-GMD 4, G-MG 1	
<b>Module 03403-09 – Indoor Air Quality</b> This module covers indoor air quality and its effect on the health and comfort of building occupants. It provides guidelines for performing a building IAQ survey and identifies the equipment and methods used to test and control indoor air quality.		
1. Explain the need for good indoor air quality.	RST 11-12.7	
2. List the symptoms of poor indoor air quality.		
3. Perform an inspection/evaluation of a building's structure and equipment for potential causes of poor indoor air quality.		
4. Identify the causes and corrective actions used to remedy common indoor air problems.	S-ID 9, S-IC 6, S-MD 7	
5. Identify the HVAC equipment and accessories that are used to sense, control, and/or enhance indoor air quality.		
6. Use selected test instruments to measure or monitor the quality of indoor air.	N-Q 1, N-Q 2, N-Q 3	
7. Clean HVAC air system ductwork and components.		

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Use selected radon monitors and/or test kits.	N-Q 2, N-Q 3	
2. Perform a building indoor air quality (IAQ) inspection/evaluation.		
3. Make air measurements using each of the following: <ul style="list-style-type: none"> <li>• Carbon dioxide (CO<sub>2</sub>) detector/sensor</li> <li>• Carbon monoxide (CO) detector/sensor</li> <li>• Volatile organic compound (VOC) detector/sensor</li> <li>• Combustion analyzer</li> </ul>	N-Q 2, N-Q 3	
4. Use a manufacturer's humidifier capacity chart to find the humidifier capacity needed for various building types and sizes.	F-IF 4	
5. Use a manufacturer's portable dehumidifier capacity chart to find the dehumidifier capacity needed for various building types and sizes.	F-IF 4	
6. Clean and inspect ductwork using one or more approved methods: <ul style="list-style-type: none"> <li>• Contact vacuum</li> <li>• Air washing</li> <li>• Power brushing</li> </ul>		

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03404-09 – Energy Conservation Equipment</b>            This module covers various heat recovery/reclaim devices and other energy conservation equipment. It includes information on their operation as well as maintenance procedures.</p>		
1. Identify selected air-to-air heat exchangers and describe how they operate.		
2. Identify selected condenser heat recovery systems and explain how they operate.		
3. Identify a coil energy recovery loop and explain how it operates.		
4. Identify a heat pipe heat exchanger and explain how it operates.		
5. Identify a thermosiphon heat exchanger and explain how it operates.		
6. Identify a twin tower enthalpy recovery loop system and explain how it operates.		
7. Identify air-side and water-side economizers and explain how each type operates.		
8. Identify selected steam system heat recovery systems and explain how they operate.		
9. Identify an ice bank-type off-peak hours energy reduction system.		
10. Operate selected energy conversion equipment.		
<p><b>Performance Tasks</b></p>		
1. Adjust an economizer for the proper setting in a local area.		

Construction Standards	Common Core Standards	Explanation
<p><b>Module 03408-09 – Commercial And Industrial Refrigeration Systems</b></p> <p>This module expands on the refrigeration system coverage provided in the <i>HVAC Level Three</i> module <i>Retail Refrigeration Systems</i>. It covers large-scale refrigeration systems such as those found in supermarkets, cold storage facilities, packing houses, and food processing plants.</p>		
<p>1. Identify different types of refrigerated coolers and display cases and describe each one’s common application.</p>		
<p>2. Compare the basic components used in commercial/industrial refrigeration systems with those used in retail refrigeration systems.</p>		
<p>3. Identify single, multiple, and satellite compressor systems. Describe the applications, installation considerations, and advantages and disadvantages of each type.</p>		
<p>4. Identify packaged condensing units and unit coolers. Describe their applications, operation, and installation considerations.</p>		
<p>5. Identify two-stage compressors and explain their operation and applications.</p>		
<p>6. Identify the various accessories used in commercial refrigeration systems. Explain why each is used and where it should be installed in the system.</p>		
<p>7. Identify the various refrigeration control devices. Explain the purpose of each type and how it works.</p>		
<p>8. Compare the components used in ammonia systems with those used in halocarbon-based refrigerant systems.</p>		

Construction Standards	Common Core Standards	Explanation
<b>Performance Tasks</b>		
1. Install a packaged condensing unit and/or individual air-cooled condenser in a refrigeration system.		
2. Install a packaged unit cooler and/or individual evaporator in a refrigeration system.		
3. Install two to three selected refrigeration system accessories.		
4. From a selection provided by the instructor, identify the following control devices commonly used in refrigeration systems: <ul style="list-style-type: none"> <li>• Crankcase pressure regulator</li> <li>• Evaporator pressure regulator</li> <li>• Condenser head pressure regulator</li> <li>• Hot gas bypass regulator</li> <li>• Compressor cylinder unloader</li> <li>• Solenoid-controlled unloader</li> </ul>		

**Codes for Common Core English Language Arts and Literacy are:**

L = Language

RH = Reading for Literacy in History/Social Studies

RI = Reading for Informational Text

RST = Reading for Literacy in Science and Technical Subjects

SL = Speaking and Listening

W = Writing

WHST = Writing for Literacy in History/Social Studies,  
Science, and Technical Subjects

**Codes for Common Core Mathematics are:**

A-CED = Algebra: Creating Equations

A-REI = Algebra: Reasoning with Equations and Inequalities

F-IF = Functions: Interpreting Functions

F-BF = Functions: Building Functions

F-LE = Functions: Linear, Quadratic, and Exponential Models

G-CO = Geometry: Congruence

G-SRT = Similarity, right Triangles, and Trigonometry

G-C = Geometry: Circles

G-GMD = Geometry: Geometric Measurement and Dimension

G-MG = Geometry: Modeling with Geometry

N-RN = Number and Quantity: The Real Number System

N-Q = Number and Quantity: Quantities

S-ID = Statistics and Probability: Interpreting Categorical and  
Quantitative Data

S-IC = Statistics and Probability: Making Inferences and Justifying  
Conclusions

S-MD = Statistics and Probability: Using Probability to Make  
Decisions