RESIDENTIAL BUILDING CONSTRUCTION SKILL STANDARDS

Career & Technical Education

Skills for Employment & Lifelong Learning

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Introduction

The Department of Education has undertaken an ambitious effort to develop statewide occupational skill standards. The standards in this document are for Residential Building Construction programs and are designed to clearly state what the student should know and be able to do upon completion of an advanced high-school program.

The writing team determined that any statewide skill standards for programs that teach residential construction should be designed to teach entry-level and advanced skills related to the construction of a single-family residence. The standards cover the following areas: (1) Site preparation; (2) Foundations, Concrete and Masonry; (3) Carpentry; (4) Plumbing; (5) Electrical systems. The standards also include the math skills students need to be successful in the industry. Safety is incorporated throughout the standards. Lastly, the document includes performance indicators for fundamental employability skills.

These exit-level standards are designed for advanced programs, for students completing the third level of a three- or four-year residential building construction program. Students at the appropriate level of instruction will be expected to demonstrate competence for all performance indicators in the "meets standard" domains for each performance standard. Teachers are encouraged to use them to focus curriculum objectives for entry-level programs, also.

The standards are organized as follows:

Content Standards are general statements that identify major areas of knowledge, understanding, and skills students are expected to learn in key subject and career areas by the end of the program.

Following each Content Standard are a number of **Performance Standards**. Performance Standards identify the more specific components of each content standard and define the expected abilities of students within each content standard.

Each Performance Standard is analyzed into specific **Performance Indicators**. Performance Indicators are very specific criteria statements for determining whether a student exceeds the standard, meets the standard, or whose performance approaches the standard. Performance Indicators may also be used as learning outcomes which teachers can identify as they plan their program learning objectives.

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Residential Building Construction
Performance Level Descriptors

Content Standard 1.0: Students shall demonstrate competence in construction mathematics and blueprint reading.

Performance Standard 1.1	The student will apply mathematics for practical use in carpentry.
EXCEEDS STANDARD	• Estimate labor for all aspects of residential construction using industry tables. • Estimate material costs.
MEETS STANDARD	1.1.1 Layout corners using the Pythagorean Theorem (3-4-5). 1.1.2 Check corner layouts using the diagonal method. 1.1.3 Estimate board feet using formulas and/or tables. 1.1.4 Estimate materials needed for framing (dimensional lumber). 1.1.5 Estimate materials needed for sheathing (square footage). 1.1.6 Estimate materials for roof coverings and trim. 1.1.7 Estimate materials for interior and exterior finishes (yards, square footage, and gallons). 1.1.8 Estimate materials for thermal insulation and barriers.
APPROACHES STANDARD	• Add, subtract, multiply, and divide whole numbers. • Measure to the nearest 1/16 inch. • Add, subtract, multiply and divide fractions, decimals and whole numbers. • Convert fractions to decimals. • Calculate percentages and ratios.

Nevada Academic Standards Correlation:
Math: 1.12.1, 3.12.3, 3.12.5, 4.12.7, 9.12.3

Residential Building Construction
Performance Level Descriptors

Content Standard 1.0: Students shall demonstrate competence in construction mathematics, blueprint reading, and tool/equipment usage.

Performance Standard 1.2	**The student will apply mathematics for practical use in residential plumbing.**
EXCEEDS STANDARD	• Determine minimum pipe size required throughout piping system to all fixtures as indicated on the construction documents. • Estimate material costs.
MEETS STANDARD	1.2.1 Compute pipe offsets using the Pythagorean Theorem. 1.2.2 Apply formulas for finding area and volume. 1.2.3 Determine the total developed length of the water supply piping system. 1.2.4 Calculate the residual pressure at the highest outlet per the requirements of the Plumbing Code. 1.2.5 Calculate the total fixture unit demand for the residence from the fixtures indicated on the blueprints, using the tables of the plumbing code. 1.2.6 Calculate the slope for DWV piping.
APPROACHES STANDARD	• Add, subtract, multiply, and divide whole numbers. • Measure to the nearest 1/16 inch. • Add, subtract, multiply and divide fractions, decimals, and whole numbers. • Convert fractions to decimals. • Calculate percentages and ratios.

Nevada Academic Standards Correlation:
Math: 1.12.1, 1.12.3,3.12.3, 3.12.5, 4.12.7, 5.12.1
Science: 1.12.4

Residential Building Construction
Performance Level Descriptors

Content Standard 1.0: Students shall demonstrate competence in construction mathematics, blueprint reading, and tool/equipment usage.

Performance Standard 1.3	The student will apply mathematics for practical use in residential wiring.
EXCEEDS STANDARD	• Apply formulas to determine amount of power needed for various circuits. • Apply Joule's Law to determine heat production in various circuits and loads. • Estimate material costs.
MEETS STANDARD	1.3.1 Apply Ohm's Law formulas for finding resistance, current flow, and voltage in series, parallel and combination circuits. 1.3.2 Determine fill allotment for conduit and boxes of various sizes. 1.3.3 Apply formulas for area when determining fill allotment. 1.3.4 Estimate the materials needed to complete a residential wiring system. 1.3.5 Calculate the general lighting load in a residential electrical system. 1.3.6 Calculate the large appliance load in a residential electrical system. 1.3.7 Calculate the minimum small appliance load in a residential electrical system.
APPROACHES STANDARD	• Explain Ohm's Law and state its formula. • Add, subtract, multiply, and divide whole numbers. • Measure to the nearest 1/16 inch. • Add, subtract, multiply and divide fractions, decimals and whole numbers. • Convert fractions to decimals. • Calculate percentages and ratios.

Nevada Academic Standards Correlation:
Math: 1.12.1, 1.12.3, 2.12.3, 2.12.4, 3.12.5, 5.12.1
Science: 3.12.4

Residential Building Construction
Performance Level Descriptors

Content Standard 1.0: Students shall demonstrate competence in construction mathematics, blueprint reading, and tool/equipment usage.

Performance Standard 1.4	The student will apply mathematics for practical use in masonry and concrete.
EXCEEDS STANDARD	• Estimate mortar yield. • Estimate labor for various excavation, concrete and masonry projects. • Calculate admixture percentages. • Estimate material costs.
MEETS STANDARD	1.4.1 Apply formulas relating to the applied geometry of points, lines, angles, circles and triangles to layout concrete forms and/or masonry placement. 1.4.2 Apply formulas for area and volume to estimate material removal for light excavation projects. 1.4.3 Apply formulas for area and volume to estimate material for various concrete jobs. 1.4.4 Apply formulas for area and volume to estimate masonry units needed.
APPROACHES STANDARD	• Identify weights and measures used in estimating, proportioning and ordering materials. • Measure to the nearest 1/16 inch. • Add, subtract, multiply and divide fractions, decimals and whole numbers. • Convert fractions to decimals. • Calculate percentages and ratios.

Nevada Academic Standards Correlation:
Math: 3.12.3, 3.12.5, 4.12.5, 4.12.6, 6.12.13, 9.12.8

Residential Building Construction
Performance Level Descriptors

Content Standard 1.0: Students shall demonstrate competence in construction mathematics, blueprint reading, and tool/equipment usage.

Performance Standard 1.5	The student will interpret and apply information from blue prints, schedules and specifications used in the residential construction trades.
EXCEEDS STANDARD	• Demonstrate knowledge and use of computer-aided drafting (CADD). • Complete a construction schedule.
MEETS STANDARD	1.5.1 Identify the elements of working drawings including types of lines, symbols, and views. 1.5.2 Identify and interpret various kinds of plans. 1.5.3 Interpret dimensions from drawings. 1.5.4 Identify blue print specifications. 1.5.5 Identify and use standard electrical symbols and abbreviations. 1.5.6 Draw electrical circuits on a floor plan. 1.5.7 Draw low voltage cable circuits on a floor plan. 1.5.8 Retrieve information from prints concerning forming, framing, insulating, and finishing a residence. 1.5.9 Read and sketch details for framing specialty jobs such as corners, rough-outs (RO's), stairs, and specialty roofs and dormers. 1.5.10 Identify plumbing symbols and abbreviations used in architectural drawings. 1.5.11 Prepare two- and three-dimensional piping sketches. 1.5.12 Identify and use standard symbols and abbreviations used in concrete and masonry. 1.5.13 Prepare a plan for the excavation and forming of footings, foundations and slabs using site and foundation plans. 1.5.14 Use sectional and detail drawings to determine construction detail of the building. 1.5.15 Scale a drawing or blueprint using an architect's scale.
APPROACHES STANDARD	• Identify the two common methods of measurement • Read standard and metric rules. • Identify the differences between architectural and engineering scales. • Identify the relationship between schematic, electrical plan and a pictorial drawing.

Nevada Academic Standards Correlation:
Math: 3.12.1, 4.12.8
English: 5.12.2, 7.12.1

Residential Building Construction
Performance Level Descriptors

Content Standard 2.0: The student shall demonstrate safe work practices and tool/equipment usage while performing operations in the shop lab and job site.

Performance Standard 2.1	The student will demonstrate adherence to general shop and site safety rules including but not limited to those listed in the following performance indicators.
EXCEEDS STANDARD	• Design a safety-improvement plan. • Administer simulated basic first aid procedures for treating cuts, burns, and electrical shock. • Obtain first aid/CPR certification. • Obtain OSHA 10 certification.
MEETS STANDARD	2.1.1 Demonstrate proper use of safety apparel at all times, including but not limited to, eye protection, hearing protection, skin protection, head protection, foot wear, and protection from airborne particulate matter. 2.1.2 Demonstrate the safe handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations (OSHA, EPA, HazCom, & etc.). 2.1.3 Demonstrate continuous awareness of potential hazards to self and others. 2.1.4 Demonstrate appropriate construction-related safety procedures. 2.1.5 Inspect extension cords for the presence of a functional ground connection prior to use. 2.1.6 Place and secure ladders and scaffolding prior to use. 2.1.7 Demonstrate awareness of personnel and activities in the vicinity of the work area. 2.1.8 Report hazards found on the job site to their supervisor. 2.1.9 Erect shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks. 2.1.10 Explain basic first aid procedures for treating cuts, burns, and electrical shock. 2.1.11 Explain the importance of locating underground utilities/hazards before excavation (“Call before you dig”). 2.1.12 Demonstrate proper fall-protection practices and use of safety devices at all times.
APPROACHES STANDARD	• Identify potential general lab and worksite safety hazards. • Identify basic first aid procedures for treating cuts, burns, and electrical shock. • List the regulatory agencies, which govern job-site safety. • List the four classifications of fires. • Identify basic personal protection equipment.

Nevada Academic Standards Correlation:
Science: 20.12.5, 24.12.1, 24.12.2

Residential Building Construction
Performance Level Descriptors

Content Standard 2.0: The student shall demonstrate safe work practices and tool usage while performing operations in the shop lab and job site.

Performance Standard 2.2	**The students will maintain and use hand and power tools to safely achieve industry-accepted results.**
EXCEEDS STANDARD	• Perform advanced maintenance on hand and power tools. • Demonstrate the safe use and care of heavy equipment. • Earn certifications for equipment use (i.e., power-actuated tools, forklifts).
MEETS STANDARD	2.2.1 Demonstrate use of hand tools for assigned tasks. 2.2.2 Demonstrate operation of portable power tools for an assigned task. 2.2.3 Demonstrate operation of stationary power tools for an assigned task. 2.2.4 Perform basic maintenance on hand and power tools. 2.2.5 Demonstrate operation of pneumatic tools. 2.2.6 Demonstrate the safe use and care of hand tools. 2.2.7 Demonstrate the safe use and care of portable power tools. 2.2.8 Inspect power tools for intact guards, shields, insulation, and other protective devices.
APPROACHES STANDARD	• Identify hand and power tools based on the name and intended use.

Residential Building Construction
Performance Level Descriptors

Content Standard 3.0: Students will demonstrate techniques for proper site preparation.

Performance Standard 3.1	**The students will demonstrate proper use of layout and measurement tools in residential construction.**
EXCEEDS STANDARD	• Establish building lines using instruments (transit, laser).
MEETS STANDARD	3.1.1 Use leveling devices. 3.1.2 Demonstrate how to establish grades for residential construction using survey instruments. 3.1.3 Install batter boards. 3.1.4 Square a layout for structure using the Pythagorean Theorem. 3.1.5 Check corner layouts using the diagonal method.
APPROACHES STANDARD	• Identify leveling and layout tools. • Demonstrate how to setup a site level.

Nevada Academic Standards Correlation:
Math: 3.12.2, 4.12.7

Residential Building Construction
Performance Level Descriptors

Content Standard 3.0: Students will demonstrate techniques for proper site preparation.

Performance Standard 3.2	**The student will identify methods of excavation, compaction, and backfill in residential construction.**
EXCEEDS STANDARD	• Demonstrate use of equipment to excavate, compact, and backfill residential structure.
MEETS STANDARD	3.2.1 Identify equipment and methods for compaction. 3.2.2 Explain backfilling methods. 3.2.3 Identify types of backfill materials and their uses. 3.2.4 Describe excavation methods.
APPROACHES STANDARD	• Identify need for excavation, backfill, and compaction. • Identify excavation hazards.

Nevada Academic Standards Correlation:
Science: 1.12.4, 10.12.1, 10.12.6

Residential Building Construction
Performance Level Descriptors

Content Standard 4.0: **The student will demonstrate foundation layout techniques to include setting forms, placing reinforcements and placing concrete/masonry according to construction drawings and specifications.**

Performance Standard 4.1	**The student will interpret construction drawings to layout locations and elevations of concrete/masonry structural elements and reinforcements.**
EXCEEDS STANDARD	• Demonstrate layout requiring radial measurements and curvilinear boundaries.
MEETS STANDARD	4.1.1 Layout location and elevation of concrete/masonry structures, based on construction drawings. 4.1.2 Develop a material take-off in conformance with construction drawings and specifications. 4.1.3 Layout location for steel reinforcements, joints, and embedded items based on construction drawings and specifications. 4.1.4 Correlate symbols in construction drawings for concrete reinforcement and finished details with their physical locations
APPROACHES STANDARD	• List and identify materials and equipment needed for layout and setting forms. • Demonstrate procedures for removal of forms and stakes. • Demonstrate maintenance for reusable forms.

Nevada Academic Standards Correlation:
Math: 3.12.2, 4.12.7, 4.12.8, 7.12.14

Residential Building Construction
Performance Level Descriptors

Content Standard 4.0: **The student will demonstrate foundation layout techniques to include setting forms, placing reinforcements and placing concrete/masonry in conformance to construction drawings and written specifications.**

Performance Standard 4.2	**The student will demonstrate forming techniques in accordance with industry standards.**
EXCEEDS STANDARD	• Mark locations and grades for rough-in by other trades.
MEETS STANDARD	4.2.1 Construct, place and brace forms for concrete as detailed in construction drawings. 4.2.2 Place and secure reinforcement as detailed by construction drawings, building codes, and industry standards. 4.2.3 Place embedded hardware as detailed by construction drawings. 4.2.4 Demonstrate how to establish elevations for concrete structures. 4.2.5 Demonstrate proper removal and care of forms.
APPROACHES STANDARD	• Identify form materials and bracing components. • List fastening and reinforcing components.

Academic Standards Correlation:
Math: 5.12.1
Science: 1.12.4

Residential Building Construction
Performance Level Descriptors

Content Standard 4.0: **The student will demonstrate foundation layout techniques to include setting forms, placing reinforcements and placing concrete/masonry in conformance to construction drawings and written specifications.**

Performance Standard 4.3	**The student will demonstrate techniques for placing concrete.**
EXCEEDS STANDARD	• Demonstrate slump tests. • Calculate volume of concrete needed for irregular and complex concrete applications.
MEETS STANDARD	4.3.1 Describe the sequencing procedures for placing large and small slabs. 4.3.2 Compare and contrast systems for moving concrete to the point of placement in residential construction. 4.3.3 Demonstrate tool and equipment usage for placing concrete. 4.3.4 Calculate the volume of concrete needed in accordance with construction plans. 4.3.5 Techniques for consolidating concrete in slabs and footings. 4.3.6 Demonstrate screeding techniques. 4.3.7 Demonstrate techniques for finishing slabs.
APPROACHES STANDARD	• Explain the purpose for consolidating concrete. • Identify the tools needed for moving and placing concrete.

Nevada Academic Standards Correlation:
Math: 3.12.3, 3.12.5
Science: 4.12.2
English: 4.12.6, 5.12.2, 6.12.2

Residential Building Construction
Performance Level Descriptors

<u>Content Standard 4.0</u>: **The student will demonstrate foundation layout techniques to include setting forms, placing reinforcements and placing concrete/masonry in conformance to construction drawings and written specifications.**

Performance Standard 4.4	**The student will lay masonry units in accordance to plan specifications.**
EXCEEDS STANDARD	• Lay-up leads and corners. • Distinguish the differences between laying decorative masonry and structural masonry units. • Use power tools to shape masonry units.
MEETS STANDARD	4.4.1 Mix mortar with hand/power tools. 4.4.2 Prepare a workstation. 4.4.3 Demonstrate mortar placement and lay masonry units to the line. 4.4.4 Demonstrate use of masonry tools.
APPROACHES STANDARD	• Identify tools for laying masonry units. • Identify the components of mortar mix.

Nevada Academic Standards Correlation:
Math: 3.12.5

Residential Building Construction
Performance Level Descriptors

Content Standard 5.0: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.1	**The student will layout and construct floor systems in compliance with plans and specifications.**
EXCEEDS STANDARD	• Estimate materials to complete a floor system from plans and specifications. • Layout, cut, and install floor openings and special applications. • Layout, cut, and assemble stairs.
MEETS STANDARD	5.1.1 Place a moisture barrier and pest control guard. 5.1.2 Attach a sill plate at top of concrete foundation. 5.1.3 Layout and install rim joists around perimeter of building. 5.1.4 Install intermediate (post/beam) joist support systems. 5.1.5 Layout floor systems according to plans and specifications. 5.1.6 Cut and install floor joists, dimensional lumber, and engineered wood products. 5.1.7 Install a subfloor.
APPROACHES STANDARD	• Identify components of a floor system. • Differentiate between dimension lumber and engineered lumber.

Nevada Academic Standards Correlation:
Math: 3.12.2
Science: 16.12.2

Residential Building Construction
Performance Level Descriptors

Content Standard 5.0: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.2	**The student will layout, construct and raise wall assemblies.**
EXCEEDS STANDARD	• Locate and install special anchorage and support hardware (Simpson) according to plans and specifications. • Estimate materials to complete a wall system from plans and specifications. • Use power-actuated fastening tools • Construct specialty wall types to include balloon framing.
MEETS STANDARD	5.2.1 Demonstrate wall and plate layout, to include rough openings. 5.2.2 Measure and cut materials for a wall system. 5.2.3 Assemble wall components with appropriate use of tools and fasteners. 5.2.4 Square wall systems. 5.2.5 Install wall bracing and shear panels according to code. 5.2.6 Stand and secure walls. 5.2.7 Plumb line and temporarily brace walls. 5.2.8 Describe the uses and applications of metal stud framing.
APPROACHES STANDARD	• Identify and explain the components of a wall system. • Identify tools as to their uses in constructing wall systems. • Recognize common anchorage and support hardware. • Identify various wall types to include bearing, nonbearing and balloon framing.

Nevada Academic Standards Correlation:
Math: 3.12.2, 4.12.7
Science: 16.12.2

Residential Building Construction
Performance Level Descriptors

Content Standard 5.0: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.3	**The student will layout, cut and install roof framing systems.**
EXCEEDS STANDARD	• Frame and erect hip, valley, and jack rafters. • Layout, cut and install a cantilevered roof system. • Layout, cut, and install purlins, dormers and collar beams. • Estimate materials to complete a roof system from plans and specifications.
MEETS STANDARD	5.3.1 Layout, cut, and install ceiling joists. 5.3.2 Layout, cut, and install common rafters. 5.3.3 Frame and erect shed roof system. 5.3.4 Frame and erect gable roof system. 5.3.5 Install blocking, bracing, lookouts, and fascia. 5.3.6 Frame for roof penetrations. 5.3.7 Apply sheathing. 5.3.8 Layout and install trusses "on-center" with specified hardware. 5.3.9 Install temporary and permanent bracing .
APPROACHES STANDARD	• Identify roof types and installation methods. • Identify and explain the components of a roof system. • Identify types of roof trusses.

Nevada Academic Standards Correlation:
Math: 3.12.2

Residential Building Construction
Performance Level Descriptors

<u>Content Standard 5.0</u>: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.4	**The student will layout, cut and install interior finish materials.**
EXCEEDS STANDARD	• Assess extent of damage to gypsum wallboard and choose the appropriate repair method. • Execute recommended methods to repair damaged gypsum wallboard. • Install custom wall finishes. • Estimate materials needed for gypsum wallboard as per plans, using area formula. • Install various types of flooring materials. • Install various types of wall finishing materials.
MEETS STANDARD	5.4.1 Prepare wall to receive wall finishes. 5.4.2 Apply paint to industry standards. 5.4.3 Select use and location of gypsum wallboard with appropriate types. 5.4.4 Cut, fit, and install gypsum wallboard onto a framed wall. 5.4.5 Select and use appropriate fasteners and materials for gypsum wallboard applications according to building codes. 5.4.6 Describe the finishes and textures for gypsum wallboard. 5.4.7 Identify types and uses of flooring materials. 5.4.8 Identify types and uses of wall finishing materials. 5.4.9 Install interior trim.
APPROACHES STANDARD	• Identify tool used in drywall and painting applications. • Describe installation of drywall fasteners.

Nevada Academic Standards Correlation:
Math: 3.12.2, 5.12.1

Residential Building Construction
Performance Level Descriptors

Content Standard 5.0: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.5	**The student will demonstrate techniques for the installation of exterior finishes in residential construction.**
EXCEEDS STANDARD	• Install masonry siding material. • Install metal and vinyl siding.
MEETS STANDARD	5.5.1 Install wood and/or manufactured siding. 5.5.2 Estimate the quantities of wood and manufactured siding required for a given job. 5.5.3 Describe the installation procedures and techniques for masonry siding materials. 5.5.4 Describe installation procedures and techniques for metal and vinyl siding. 5.5.5 Demonstrate preparation techniques for paint and stain. 5.5.6 Apply paint and stain according to specifications.
APPROACHES STANDARD	• Identify types of wood and manufactured siding materials. • Identify types and uses of exterior masonry siding materials. • Identify types and uses of metal and vinyl siding materials. • Identify various paint and stain products.

Academic Standards Correlation:
Math: 1.12.1
Science: 16.12.2

Residential Building Construction
Performance Level Descriptors

Content Standard 5.0: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.6	**The student will demonstrate techniques for the installation of doors and windows.**
EXCEEDS STANDARD	• Install an exterior pre-hung door. • Install a custom pre-hung window.
MEETS STANDARD	5.6.1 Install pre-hung door hardware. 5.6.2 Compare and contrast various types of doors and windows in residential construction. 5.6.3 Install pre-hung windows including flashing. 5.6.4 Install door and window trim. 5.6.5 Install pre-hung interior doors.
APPROACHES STANDARD	• Identify various door and window types. • Identify various door and window trims. • Describe techniques for installing a pre-hung door.

Nevada Academic Standards Correlation:
English: 5.12.2, 6.12.2

Residential Building Construction
Performance Level Descriptors

<u>Content Standard 5.0</u>: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.7	**The student will install thermal insulation and vapor barriers required for the completion of a single-family residence.**
EXCEEDS STANDARD	• Explain the effects of conduction, radiation, and convection on thermal insulation and attic and crawl-space ventilation. • Compare and contrast insulation materials with adequate R-values, according to construction drawings and specifications.
MEETS STANDARD	5.7.1 Caulk and seal joints to prevent infiltration of air and moisture. 5.7.2 Install vents for attic and crawl spaces. 5.7.3 Install various types of floor, wall and ceiling thermal insulation and moisture barriers. 5.7.4 Describe mold-prevention techniques.
APPROACHES STANDARD	• Identify types and forms of insulation. • Explain the importance of vapor and thermal barriers. • Explain the importance of ventilation for attics and crawl spaces.

Residential Building Construction
Performance Level Descriptors

Content Standard 5.0: The student will demonstrate carpentry techniques for the construction of a single-family residence.

Performance Standard 5.8	**The student will install the roofing system required for completion of a single-family residence.**
EXCEEDS STANDARD	• Select roofing material type according to plans and specifications. • Install rain gutters. • Install wood shakes, wood shingles, and tile or metal roofing systems. • Estimate roofing materials needed according to plans and specifications.
MEETS STANDARD	5.8.1 Install the underlayment. 5.8.2 Install a drip edge. 5.8.3 Install valley, wall and roof penetration flashing. 5.8.4 Install asphalt shingles and/or rolled roofing systems.
APPROACHES STANDARD	• Identify common roofing products. • List the steps for installation of a roofing system.

Nevada Academic Standards Correlation:
Math: 3.12.2

Residential Building Construction
Performance Level Descriptors

Content Standard 6.0: The student will demonstrate skills necessary to complete a plumbing system in a single-family residence in accordance with accepted industry standards.

Performance Standard 6.1	**The student will layout the locations of plumbing fixtures and components, and complete a rough and top- out installation of water piping in a single-family residence.**
EXCEEDS STANDARD	• Summarize the code requirements for backflow protection. • Specify the location of water hammer arrestors for protection of the water supply piping. • Draw isometric piping sketch for supply line. • Estimate materials in conformance to the construction drawings and specifications.
MEETS STANDARD	6.1.1 Demonstrate methods of backfilling and compacting of trenches. 6.1.2 Demonstrate joining techniques for metallic and non-metallic water piping materials. 6.1.3 Demonstrate techniques for cutting and deburring of metallic and non-metallic water piping. 6.1.4 Draw isometric piping sketch for supply lines. 6.1.5 Layout and install hot and cold water piping to fixture locations as indicated on the construction documents. 6.1.6 Perform a water and or air pressure test of the installed piping. 6.1.7 Prepare trenches for underground piping installation. 6.1.8 Select materials and fittings for use in water piping. 6.1.9 Prepare rough framing for piping installation. 6.1.10 Install fastened in-place fixture valves. 6.1.11 Install shut-off valves required.
APPROACHES STANDARD	• Identify material, schedule, type and size of pipe and fittings used on both the inside and outside of the building. • Discuss the support requirements for various piping materials.

Nevada Academic Standards Correlation:
Math: 1.12.1, 3.12.2
Science: 2.12.3, 3.12.3

Residential Building Construction
Performance Level Descriptors

Content Standard 6.0: The student will demonstrate skills necessary to complete a plumbing system in a single-family residence in accordance with accepted industry standards.

Performance Standard 6.2	**The student will layout the locations of plumbing fixtures and components, and complete a rough and top out installation of DWV piping in a single-family residence.**
EXCEEDS STANDARD	• Design DWV systems given the location of fixtures as indicated on the construction documents. • Layout the location and elevation of waste piping to plumbing fixtures according to the requirements of the construction drawings. • Prepare a material take-off in conformance to the construction drawings and specifications. • Determine the required location of cleanouts for the DWV piping. • Interpret the requirements of applicable plumbing codes to specify the correct size trap arms required for plumbing fixtures. • Determine the minimum drainage piping sizes required at various locations of a drainage system according to applicable plumbing codes.
MEETS STANDARD	6.2.1 Demonstrate methods of backfilling and compacting of trenches. 6.2.2 Prepare trenches for underground piping installation. 6.2.3 Install and secure drainage piping to fixture locations. 6.2.4 Demonstrate joining techniques for metallic and non-metallic piping materials. 6.2.5 Demonstrate technique for measuring, cutting and deburring of metallic and non-metallic piping material. 6.2.6 Determine the grade of DWV piping using hand levels, laser levels and transits. 6.2.7 Perform a water and or air pressure test of the installed piping. 6.2.8 Select materials and fittings for use in waste or venting. 6.2.9 Install trap arms and vents as indicated according to construction drawings and specifications. 6.2.10 Draw an isometric piping sketch for a DWV system.
APPROACHES STANDARD	• Explain the need for grade in DWV piping. • Identify materials, schedule, type, and size of pipe and fittings used on both the inside and outside of the building. • Discuss the need for connecting to a private or public septic system. • Identify the difference between drainage fittings and vent fittings.

Academic Standards Correlation:
Math: 1.12.1, 3.12.2, 5.12.1
Science: 2.12.3, 3.12.3

Residential Building Construction
Performance Level Descriptors

Content Standard 6.0: **The student will demonstrate skills necessary to complete a plumbing system in a single-family residence in accordance with accepted industry standards.**

Performance Standard 6.3	**The student will install fixtures required for the completion of the water supply and DWV systems of the residence.**
EXCEEDS STANDARD	• Determine the specific cause for leaks and malfunctions in residential fixtures. • Repair or replace malfunctioning fixtures, valves and faucets. • Repair leaks in piping systems.
MEETS STANDARD	6.3.1 Install angle stops at water supply stub outs. 6.3.2 Install fixture traps to trap arms. 6.3.3 Install plumbing fixtures. 6.3.4 Connect the water supply piping to faucets and water closets. 6.3.5 Connect fixture tailpieces to fixtures and to traps. 6.3.6 Check for the proper functioning of fixtures.
APPROACHES STANDARD	• Describe the parts and materials used in setting of plumbing fixtures. • Identify the operating parts of a water closet. • Check for leaks. • Identify angle stops and shut-off valves.

Residential Building Construction
Performance Level Descriptors

Content Standard 7.0: The student will demonstrate skills necessary to complete an electrical system in a single-family residence in accordance with accepted industry standards.

Performance Standard 7.1	**The student will install the service equipment, junction and device boxes, conduits, cables and conductors required for a complete residential electrical installation.**
EXCEEDS STANDARD	• Estimate materials for an electrical system according to the construction drawings and specifications. • Determine the maximum number of outlets allowed on a lighting or receptacle branch circuit. • Use tables in the National Electrical Code (NEC) to determine current capacity of a conductor. • Install service conduit.
MEETS STANDARD	7.1.1 Determine whether or not an electrical circuit is "live." 7.1.2 Prepare rough framing for the installation of electrical cables and conduit. 7.1.3 Layout components to the tolerances indicated on the construction drawings. 7.1.4 Install typical devices, junction boxes and panels. 7.1.5 Install lighting and ceiling fan support boxes according to the NEC. 7.1.6 Install and support cable and conduit typical of residential construction and pull conductors through conduit as required by the NEC. 7.1.7 Splice and tap conductors for the installation of fixtures and devices. 7.1.8 Install low voltage control and communication cables.
APPROACHES STANDARD	• Explain the importance of electrical grounding. • Identify the color code requirements for the grounded (white) and grounding (green) conductors. • Differentiate lighting loads, receptacles loads and appliance loads. • Define demand factor. • Identify different electrical boxes and explain their use. • Identify cables and conductors according to their markings. • Identify cable supports, hardware, and fittings according to their intended use. • Indicate on a floor plan the location of receptacle outlets required to meet the minimum requirements of the NEC Indicate on a floor plan the location of lighting outlets and switches required to meet the minimum requirements of the NEC.

Nevada Academic Standards Correlation:
Math: 3.12.2, 3.12.2, 5.12.1

Residential Building Construction
Performance Level Descriptors

Content Standard 7.0: **The student will demonstrate skills necessary to complete an electrical system in a single-family residence in accordance with accepted industry standards.**

Performance Standard 7.2	**The student will select and install switches and receptacles, and terminate conductors to devices.**
EXCEEDS STANDARD	• Install three- and four-way switches. • Install and label electrical disconnects and fuses as required by the nameplates on equipment. • Install circuit breakers and terminate conductors to the electrical services.
MEETS STANDARD	7.2.1 Demonstrate grounding techniques for all metallic electrical boxes, cabinets and enclosures. 7.2.2 Terminate electrical connections to large appliances. 7.2.3 Select receptacles and switches based on load requirements. 7.2.4 Terminate receptacles, switches, lighting fixtures and other devices. 7.2.5 Terminate equipment grounding and neutral conductor at the electrical service. 7.2.6 Terminate communication and control wiring.
APPROACHES STANDARD	• Explain the procedure for terminating conductors to switches and receptacles. • Identify different electrical devices used in residential construction. • Identify ratings on electrical devices. • Explain the purpose of cover plates and dead fronts.

Academic Standards Correlation:
Science: 3.12.4

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.1	Students shall demonstrate problem-solving skills.
EXCEEDS STANDARD	• Revise a construction plan based on information gained through research of alternative solutions. • Evaluate an action plan for a construction solution. • Develop methods to analyze the advantages and disadvantages of alternative solutions. • Evaluate the benefits of solving a construction problem.
MEETS STANDARD	8.1.1 Solve a construction problem using the appropriate steps in the problem-solving process. 8.1.2 Demonstrate brainstorming techniques. 8.1.3 Examine and explain the advantages and disadvantages of alternative solutions to one or more problems. 8.1.4 Create an action plan based upon a solution to a construction problem. 8.1.5 Identify the benefits of solving a construction problem.
APPROACHES STANDARD	• Identify the basic steps of the problem-solving process. • Identify alternative solutions to a problem. • Identify basic components of an action plan.

Nevada Academic Standards Correlation:
Math: 6.12.7, 6.12.13, 7.12.1, 7.12.6, 7.12.14
Science: 22.12.2, 24.12.5
English: 4.12.6, 6.12.2, 10.12.2, 10.12.3

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.2	Students shall demonstrate critical-thinking skills.
EXCEEDS STANDARD	• Demonstrate the skills necessary to identify, analyze and solve a construction problem. • Formulate, implement and evaluate an action plan. • Analyze how critical-thinking skills affect work performance.
MEETS STANDARD	8.2.1 Identify and explain the essential elements of the critical-thinking process. 8.2.2 Demonstrate critical-thinking skills necessary in the construction process. 8.2.3 Explain how emotional thinking and logical thinking affect decision making in the construction process. 8.2.4 Explain the difference between reliable and unreliable observations and statements of facts. 8.2.5 Recognize patterns or relationships through observation and discovery.
APPROACHES STANDARD	• State the importance of critical thinking in identifying, analyzing, and solving a construction problem. • Identify the difference between opinion and fact. • Define emotional and logical thinking. • Identify steps of critical-thinking.

Nevada Academic Standards Correlation:
Math: 2.12.6, 5.12.4
English: 10.12.1

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.3	Students shall demonstrate the ability to speak, write and listen effectively.
EXCEEDS STANDARD	• Describe and use techniques to improve visual communication. • Identify, research, prepare and deliver a construction-related presentation. • Prepare technical documents. • Present and defend a construction solution. • Compete in a SkillsUSA–VICA job skill demonstration and/or public speaking contest.
MEETS STANDARD	8.3.1 Explain the benefits of effective communication skills in the workplace. 8.3.2 Effectively interpret and respond to verbal and nonverbal instructions. 8.3.3 Demonstrate proper telephone etiquette. 8.3.4 Effectively communicate thoughts, ideas, and information in writing and drawing. 8.3.5 Organize ideas, communicate orally and effectively demonstrate job skills to others. 8.3.6 Locate, understand and interpret written information in documents such as manuals, graphs, schedules, sketches and drawings. 8.3.7 Select and utilize an appropriate medium for conveying messages with dignity and respect. 8.3.8 Organize information into the appropriate format in accordance with standard practices, which includes outlining, proofreading, editing/revising and preparing a final copy. 8.3.9 Demonstrate sensitivity to cultural and physical diversity in communication. 8.3.10 Describe common communication barriers and methods for improving communication.
APPROACHES STANDARD	• Define communication. • Explain the benefits of effective communication in the workplace. • Explain how cultural and physical diversity affect communication. • Identify applicable medium for conveying messages.

Nevada Academic Standards Correlation:
Math: 5.12.1
English: 4.12.6, 6.12.5, 7.12.1, 7.12.3, 7.12.4, 7.12.5

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.4	Students shall demonstrate the ability to select, apply and maintain appropriate technology.
EXCEEDS STANDARD	• Diagnose and make necessary corrections or improvements to a construction schedule. • Critique the use, benefits, and cost of advancements in technology in the construction industry. • Analyze the impact of technological changes on one or more aspects of construction by researching current literature. • Compete in a state-level SkillsUSA–VICA building trades contest. • Complete a construction schedule using scheduling software. • Complete a materials takeoff using estimating software.
MEETS STANDARD	8.4.1 Utilize various electronic research methods. 8.4.2 Create and store construction drawings and office documents. 8.4.3 Investigate and explain the use, benefits and costs of technological developments in the construction environment. 8.4.4 Demonstrate the appropriate use of technology to enhance the efficiency of the construction environment. 8.4.5 Demonstrate routine maintenance and repair of technological equipment.
APPROACHES STANDARD	• Recognize and describe the use of existing scheduling software. • Use an Internet browser to locate specific Web sites.

Nevada Academic Standards Correlation:
Math: 3.12.4

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.5	Students shall demonstrate leadership and teamwork skills.
EXCEEDS STANDARD	• Analyze the stages of group development. • Demonstrate leadership ability within a group or a team. • Compromise and/or build consensus within a group and summarize the decision of the group while maintaining respect for diverse viewpoints. • Complete levels 1-3 of the SkillsUSA–VICA Professional Development Program. • Campaign for a local SkillsUSA–VICA chapter office. • Serve as a committee chair in a local SkillsUSA–VICA chapter.
MEETS STANDARD	8.5.1 Work cooperatively with others when given a group construction project. 8.5.2 Explain traits necessary to effectively lead and influence individuals and groups. 8.5.3 Demonstrate appropriate attitudes and behaviors for effective leadership. 8.5.4 Demonstrate respect for team members, team processes and team goals. 8.5.5 Participate in the implementation of a group's decision and evaluate the results 8.5.6 Demonstrate the qualities of an effective leader and team member. 8.5.7 Describe the importance of a company dress code.
APPROACHES STANDARD	• Explain the importance of groups. • Explain how to organize groups. • Wear appropriate attire.

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.6	Students shall demonstrate sound workplace ethics.
EXCEEDS STANDARD	• Assume responsibility for decisions and actions. • Demonstrate time-management skills and cost-effective practices.
MEETS STANDARD	8.6.1 Develop personal work ethics through a vocational experience. 8.6.2 Describe the importance of ethics practiced in the workplace. 8.6.3 Demonstrate regular attendance, promptness and the willingness to follow instructions and complete an assigned task. 8.6.4 Demonstrate appropriate personal and professional attitudes and behaviors. 8.6.5 Maintain a safe, clean and organized work area. 8.6.6 Demonstrate awareness of legal responsibilities related to individual performance, safety and customer satisfaction. 8.6.7 Explain various types of harassment.
APPROACHES STANDARD	• List the important ethics in the workplace. • Meet attendance standards. • Describe organized workplace. • Identify appropriate responses to unethical actions.

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.7	Students shall demonstrate the ability to effectively manage resources in a high-output workplace.
EXCEEDS STANDARD	• Recognize the individual roles of team members, delegate tasks, and provide feedback on performance. • Acknowledge and utilize the skills, abilities, and input of all members of a team. • Develop an action plan to accomplish tasks within a given time frame.
MEETS STANDARD	8.7.1 Develop time schedules and prioritize tasks for job assignments. 8.7.2 Students will identify the important resources needed at a construction work site. 8.7.3 Organize the material resources and space requirements needed to complete construction projects. 8.7.4 Effectively use technology at its highest level to complete a job assignment. 8.7.5 Demonstrate cooperation and leadership skills in the school and/or work environments. 8.7.6 Use effective time management skills. 8.7.7 Recognize the need for management skills in the workplace with regard to stress, anger management and substance abuse.
APPROACHES STANDARD	• List effective time management skills. • Use technology to complete assignments. • Utilize materials, tools and processes to complete a task related to a career selection. • Read and follow instructions from manuals on the use and care of materials, tools, and equipment. • Maintain a clean, organized, and safe job site. • Identify traits needed for cooperation and leadership in a team at school or in a workplace setting. • Identify the material resources and space requirements needed to complete an assignment.

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.8	Students shall demonstrate career planning and development skills.
EXCEEDS STANDARD	• Develop a community service or job shadowing project. • Develop an education/training plan to fulfill long-term career goals. • Define advantages and disadvantages of self-employment or working for various sizes and types of businesses. • Critique results of a job interview. • Develop a proposal for an organized community-service project. • Compete in a state-level SkillsUSA–VICA job interview contest.
MEETS STANDARD	8.8.1 Prepare a job application. 8.8.2 Prepare a personal résumé. 8.8.3 Complete a personal aptitude and interest inventory. 8.8.4 Participate in a mock job interview. 8.8.5 Establish short-term career goals. 8.8.6 Establish long-term career goals. 8.8.7 Use the Nevada Career Information System (NCIS) or a similar computer-based program to research careers in a chosen field. 8.8.8 Participate in an organized job shadowing activity. 8.8.9 Participate in a community service project. 8.8.10 Construct a career portfolio. 8.8.11 Adhere to workplace requirements, policies, and procedures.
APPROACHES STANDARD	• Locate employment opportunities. • Identify job requirements for entry-level positions in the construction industry. • Identify general conditions for employment. • Identify educational/training requirements for related construction field. • Identify the elements of goal setting. • Identify construction-related careers. • Describe essential job-interview skills. • Identify the components of a career portfolio.

Nevada Academic Standards Correlation:
English: 5.12.5, 6.12.5, 7.12.1, 7.12.3, 7.12.4, 7.12.5, 9.12.1

Residential Building Construction
Employability Skills

Content Standard 8.0: Students shall achieve competence in workplace readiness, career development and lifelong learning.

Performance Standard 8.9	Students shall demonstrate job retention and lifelong learning skills.
EXCEEDS STANDARD	• Maintain an electronic portfolio. • Create a plan for lifelong learning. • Create a presentation illustrating interpersonal skills needed for job retention. • Adapt new knowledge and skills in changing situations. • Analyze how work life is affected by families and how families are affected by work life.
MEETS STANDARD	8.9.1 Maintain an employment/career portfolio. 8.9.2 Explain strategies for balancing work and family roles. 8.9.3 Demonstrate understanding of the need for lifelong. learning in a rapidly changing job market. 8.9.4 Describe strategies to maintain employment in the face of job reductions. 8.9.5 Develop long-term career-planning strategies. 8.9.6 Describe various educational options needed for job retention. 8.9.7 Model sound workplace ethics, such as, loyalty, punctuality and initiative. 8.9.8 Demonstrate interpersonal skills needed for job retention.
APPROACHES STANDARD	• Describe the importance of a portfolio. • Identify options for lifelong learning. • Identify interpersonal skills needed for job retention. • Identify jobs with opportunity for advancement. • Describe the importance of career planning.

Nevada Academic Standards Correlation:
English: 5.12.5, 6.12.5, 7.12.1, 7.12.3, 7.12.4, 7.12.5

CROSSWALK OF RESIDENTIAL BUILDING CONSTRUCTION STANDARDS AND ACADEMIC STANDARDS

MATH STANDARDS

Performance Indicators	Academic Standards
1.1.1	**4.12.7 (Math)** Apply the Pythagorean Theorem, its converse, properties of special right triangles, and right triangle trigonometry to solve practical problems. **9.12.3 (Math)** Use Models to explain the relationship of concepts to procedures.
1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms. **3.12.3 (Math)** Distinguish and differentiate among the structures, language and uses of systems of measures (*e.g., linear, square units, cubic units*); justify and communicate the differences among accuracy, precision, error, and tolerance in measurement; describe how each of these can affect solutions found in problem situations. **3.12.5 (Math)** Use relationships *(e.g., proportions)* and formulas *(indirect measurement)* to determine the measurement of unknown dimension, angles, areas, and volumes to solve problems.
1.2.1	**4.12.7 (Math)** Apply the Pythagorean Theorem, its converse, properties of special right triangles, and right triangle trigonometry to solve practical problems.
1.2.2	**3.12.3 (Math)** Distinguish and differentiate among the structures, language and uses of systems of measures (*e.g., linear, square units, cubic units*); justify and communicate the differences among accuracy, precision, error, and tolerance in measurement; describe how each of these can affect solutions found in problem situations. **3.12.5 (Math)** Use relationships *(e.g., proportions)* and formulas *(indirect measurement)* to determine the measurement of unknown dimension, angles, areas, and volumes to solve problems.
1.2.3	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms. **3.12.3 (Math)** Distinguish and differentiate among the structures, language and uses of systems of measures (*e.g., linear, square units, cubic units*); justify and communicate the differences among accuracy, precision, error, and tolerance in measurement; describe how each of these can affect solutions found in problem situations.
1.2.4	**3.12.3 (Math)** Distinguish and differentiate among the structures, language and uses of systems of measures (*e.g., linear, square units, cubic units*); justify and communicate the differences among accuracy, precision, error, and tolerance in measurement; describe how each of these can affect solutions found in problem situations. **5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.

Performance Indicators	Academic Standards
1.2.5	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms. **1.12.3 (Math)** Apply the properties and theories of the real number system to everyday situations. **5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
1.3.1	**2.12.3 (Math)** Create and use different forms of a variety of equations, proportions, and/or formulas *(e.g., I = PRT or R = I/PT)*, solving for the needed variable as necessary in given situations. **2.12.4 (Math)** Add, subtract, multiply, and factor *(1st and 2nd degree)* polynomials, describing each step in the process and the connection between the algebraic process and the arithmetic process; use simple quadratic equations with integer roots to solve practical and mathematical problems.
1.3.2	**5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
1.3.3	**3.12.5 (Math)** Use relationships *(e.g., proportions)* and formulas *(indirect measurement)* to determine the measurement of unknown dimensions, angles, areas, and volumes to solve problems. **5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
1.3.4, 1.3.5, 1.3.6	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms. **1.12.3 (Math)** Apply the properties and theories of the real number system to everyday situations. **5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
1.3.7	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms. **1.12.3 (Math)** Apply the properties and theories of the real number system to everyday situations.
1.4.1	**4.12.5 (Math)** Use coordinate geometry to graph linear equations, determine slopes of lines, identify parallel and perpendicular lines and find possible solutions to sets of equations; use algebraic techniques to solve problems determined by geometric relationships. **4.12.6 (Math)** Use complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are ct by a transversal, and angles in polygons to solve practical problems.

Performance Indicators	Academic Standards
1.4.2, 1.4.3, 1.4.4	**3.12.5 (Math)** Use relationships *(e.g., proportions)* and formulas *(indirect measurement)* to determine the measurement of unknown dimensions, angles, areas, and volumes to solve problems.
1.4.5	**3.12.3 (Math)** Distinguish and differentiate among the structures, language and uses of systems of measures (*e.g., linear, square units, cubic units*); justify and communicate the differences among accuracy, precision, error, and tolerance in measurement; describe how each of these can affect solutions found in problem situations. **3.12.5 (Math)** Use relationships *(e.g., proportions)* and formulas *(indirect measurement)* to determine the measurement of unknown dimensions, angles, areas, and volumes to solve problems. **6.12.13 (Math)** Use technology, including calculators, to solve problems and verify solutions. **9.12.8 (Math)** Identify, explain, and use mathematics in everyday life.
1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.5	**3.12.1 (Math)** Convert between customary and metric systems; convert among monetary systems.
1.5.6, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.5.11, 1.5.12, 1.5.13, 1.5.14	**4.12.8 (Math)** Use tools, technology, and models to sketch, draw, and construct figures in order to solve problems and to demonstrate the properties of geometric figures.
3.1.1, 3.1.2, 3.1.3	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
3.1.4	**4.12.7 (Math)** Apply the Pythagorean Theorem, its converse, properties of special right triangles, and right triangle trigonometry to solve practical problems.
4.1.1, 4.1.2	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass. **4.12.7 (Math)** Apply the Pythagorean Theorem, its converse, properties of special right triangles, and right triangle trigonometry to solve practical problems.
4.1.3	**4.12.7 (Math)** Apply the Pythagorean Theorem, its converse, properties of special right triangles, and right triangle trigonometry to solve practical problems. **4.12.8 (Math)** Use tools, technology, and models to sketch, draw, and construct figures in order to solve problems and to demonstrate the properties of geometric figures. **7.12.14 (Math)** Explain and evaluate thinking about mathematical ideas and solutions based on the role of definitions, properties, common rules, and symbols in solving problems.
4.1.4	**7.12.14 (Math)** Explain and evaluate thinking about mathematical ideas and solutions based on the role of definitions, properties, common rules, and symbols in solving problems.
4.2.1, 4.2.2, 4.2.3	**5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.

Performance Indicators	Academic Standards
4.3.4	**3.12.3 (Math)** Distinguish and differentiate among the structures, language and uses of systems of measures (*e.g., linear, square units, cubic units*); justify and communicate the differences among accuracy, precision, error, and tolerance in measurement; describe how each of these can affect solutions found in problem situations. **3.12.5 (Math)** Use relationships *(e.g., proportions)* and formulas *(indirect measurement)* to determine the measurement of unknown dimensions, angles, areas, and volumes to solve problems.
4.4.1	**3.12.5 (Math)** Use relationships *(e.g., proportions)* and formulas *(indirect measurement)* to determine the measurement of unknown dimensions, angles, areas, and volumes to solve problems.
5.1.3, 5.1.5, 5.1.6	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
5.2.1, 5.2.2, 5.2.4, 5.2.7	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
5.2.4	**4.12.7 (Math)** Apply the Pythagorean Theorem, its converse, properties of special right triangles, and right triangle trigonometry to solve practical problems.
5.3.1, 5.3.2, 5.3.8	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
5.4.4	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass. **5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
5.5.2	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms.
5.8.1, 5.8.2, 5.8.3, 5.8.4	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
6.1.3, 6.1.4, 6.1.6	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms. **3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
6.2.1	**5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
6.2.4, 6.2.6, 6.2.10	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
6.2.7	**1.12.1 (Math)** Calculate and estimate sums, differences, products, quotients, powers, and roots using mental math, formulas, and algorithms.

Performance Indicators	Academic Standards
7.1.1,7.1.4	**3.12.2 (Math)** Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.
7.1.7	**5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
8.1.1	**6.12.7 (Math)** Apply multi-step, integrated, mathematical problem-solving strategies, persisting until a solution is found or until it is clear that no solution exists. **6.12.13 (Math)** Use technology, including calculators, to solve problems and verify solutions. **7.12.6 (Math)** Interpret and solve word problems without the necessity of key works and phrases
8.1.2	**7.12.1 (Math)** Discuss and exchange ideas about mathematics as a part of learning.
8.1.3, 8.1.4, 8.1.5	**6.12.7 (Math)** Apply multi-step, integrated, mathematical problem-solving strategies, persisting until a solution is found or until it is clear that no solution exists. **7.12.14 (Math)** Explain and evaluate thinking about mathematical ideas and solutions based on the role of definitions, properties, common rules, and symbols in solving problems.
8.2.4	**5.12.4 (Math)** Select and use the measures of central tendency such as means, median, mode and variability including range, distribution and possible outliers that are appropriate for given situations.
8.2.5	**2.12.6 (Math)** Determine the domain and range of linear relations given a graph or a set of ordered pairs; explain their importance in problem solving situations.
8.3.6	**5.12.1 (Math)** Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.
8.4.5	**3.12.4 (Math)** Use and interpret consumer data *(e.g., amortization tables, tax tables, and compound interest charts)* to make informed financial decisions related to practical applications such as budget.

SCIENCE STANDARDS

Performance Indicators	Academic Standards
1.2.4	**1.12.4 (Science)** Investigate and describe the relationship that exists between force, pressure, and area in general, and between pressure and depth in liquids.
1.3.1	**3.12.4 (Science)** Describe the properties of electrical circuits in terms of moving electrons, conductivity, resistance, and electrical potential energy.
2.1.1	**24.12.1 (Science)** Demonstrate personal responsibility for using safety equipment and observing all safety standards.
2.1.5	**20.12.5 (Science)** Identify the type of hazard, estimate the extent and consequences of exposure, and determine the options for reducing or eliminating risks. **24.12.2 (Science)** Use the information found in materials safety data sheets to handle, store and dispose of chemicals properly.
3.2.2, 3.2.3, 3.2.4	**1.12.4 (Science)** Investigate and describe the relationship that exists between force, pressure, and area in general, and between pressure and depth in liquids. **10.12.1 (Science)** Investigate and describe how rocks and minerals have different characteristics that reflect their origins and use. **10.12.6 (Science)** Compare and contrast the geologic features of Nevada and local geological features.
4.2.1, 4.2.2, 4.2.3	**1.12.4 (Science)** Investigate and describe the relationship that exists between force, pressure, and area in general, and between pressure and depth in liquids.
4.3.5, 4.3.6	**4.12.2 (Science)** Investigate and describe how chemical reaction rates depend on conditions in the reacting system, the properties of reacting materials, and the presence of certain rate-regulating chemicals.
5.1.6, 5.2.8, 5.5.1	**16.12.2 (Science)** Investigate and describe the various processes involved in obtaining, using, and recycling materials such as wood products, minerals, food, and manufactured objects.
6.1.2, 6.2.5	**2.12.3 (Science)** Explain how atoms may bond wit one another by transferring or sharing electrons that are farthest from the nucleus. **3.12.3 (Science)** Investigate and describe how waves can superimpose on one another, bend around corners, reflect off surfaces, be absorbed by materials they enter, and change directions when entering a new material.
7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.2.5, 7.2.6	**3.12.4 (Science)** Describe the properties of electrical circuits in terms of moving electrons, conductivity, resistance, and electrical potential energy.

ENGLISH STANDARDS

Performance Indicators	Academic Standards
1.5.13	**5.12.2 (English)** Produce subject-specific technical writing, such as instructions for a shop project or field reports for science. **7.12.1 (English)** Apply the rules of usage, grammar, and capitalization with few significant errors; use modifiers, parallel structure, and subordination correctly in writing.
4.3.1	**4.12.6 (English)** Read and apply multi-step directions to perform complex procedures and tasks.
4.3.2, 5.6.2	**5.12.2 (English)** Produce subject-specific technical writing, such as instructions for a shop project or field reports for science. **6.12.2 (English)** Organize ideas in compositions by selecting and applying structures such as comparison/contrast or cause/effect, which enhance the central idea, theme, or purpose.
8.1.1, 8.1.2	**10.12.2 (English)** Negotiate to arrive at consensus by proposing and examining possible options. **10.12.3 (English)** Identify and practice techniques such as setting time limits for speakers and deadlines for decision making to improve productivity of group discussion.
8.2.2	**10.12.1 (English)** Participate in problem-solving conversations or group discussions by identifying, synthesizing, and evaluating data.
8.3.6	**4.12.6 (English)** Read and apply multi-step directions in order to perform complex procedures and tasks.
8.3.8	**6.12.5 (English)** Edit for use of standard English. **7.12.1 (English)** Apply the rules of usage, grammar, and capitalization with few significant errors; use modifiers, parallel structure, and subordination correctly in writing. **7.12.3 (English)** Use rules of punctuation; manipulate conventions for emphasis in writing. **7.12.4 (English)** Use rules of capitalization. **7.12.5 (English)** Demonstrate conventional spelling.
8.8.1	**6.12.5 (English)** Edit for use of standard English.
8.8.2	**7.12.3(English)** Use rules of punctuation; manipulate conventions for emphasis in writing.
8.8.3	**5.12.5 (English)** Write summaries or abstracts that distill large amounts of information into clear, concise prose. **7.12.4 (English)** Use rules of capitalization.

Performance Indicators	Academic Standards
8.8.4	**7.12.5 (English)** Demonstrate conventional spelling. **9.12.1 (English)** Use specific and varied vocabulary and apply standard English to communicate ideas.
8.8.5	**7.12.1 (English)** Apply the rules of usage, grammar, and capitalization with few significant errors; use modifiers, parallel structure, and subordination correctly in writing.
8.8.10	**5.12.5 (English)** Write summaries or abstracts that distill large amounts of information into clear, concise prose. **6.12.5 (English)** Edit for use of standard English. **7.12.1 (English)** Apply the rules of usage, grammar, and capitalization with few significant errors; use modifiers, parallel structure, and subordination correctly in writing. **7.12.3 (English)** Use rules of punctuation; manipulate conventions for emphasis in writing. **7.12.4 (English)** Use rules of capitalization. **7.12.5 (English)** Demonstrate conventional spelling. **9.12.1 (English)** Use specific and varied vocabulary and apply standard English to communicate ideas.
8.9.1	**5.12.5 (English)** Write summaries or abstracts that distill large amounts of information into clear, concise prose.
8.9.2	**6.12.5 (English)** Edit for use of standard English.
8.9.3	**7.12.1 (English)** Apply the rules of usage, grammar, and capitalization with few significant errors; use modifiers, parallel structure, and subordination correctly in writing. **7.12.3 (English)** Use rules of punctuation; manipulate conventions for emphasis in writing.
8.9.4	**7.12.4 (English)** Use rules of capitalization. **7.12.5 (English)** Demonstrate conventional spelling.