

***Building Trades in
Construction Technology Program of Study
and
Complementary Course Standards***



This document was prepared by:

Office of Career Readiness, Adult Learning, and Education Options
Nevada Department of Education
755 N. Roop Street, Suite 201
Carson City, NV 89701

www.doe.nv.gov

Draft for Review by the Nevada State Board of Education on
June 1, 2023

The Nevada Department of Education does not discriminate on the basis of race, color, religion, national origin, sex, disability, sexual orientation, gender identity or expression, or age in its programs and activities and provides equal access to the Boy Scouts and other designated youth groups.

For inquiries, contact the Equity Coordinator at (775) 687-9200.

Nevada State Board of Education

Joseph Arrascada
Dr. René Cantú
Maggie Carlton
Katie Coombs
Dr. Katherine Dockweiler, Vice President
Tamara Hudson
Tim Hughes
Felicia Ortiz, President
Malia Poblete
Dr. Summer Stephens
Mike Walker

Nevada Department of Education

Jhone M. Ebert
Superintendent of Public Instruction

Craig Statucki
Interim Deputy Superintendent for Educator Effectiveness and Family Engagement

Cindi Chang
Interim Director for the Office of Career Readiness, Adult Learning, and Education Options

Denise Burton
Education Programs Professional, Office of Career Readiness, Adult Learning, and Education Options

Vision

All Nevada students are equipped and feel empowered to attain their vision of success

Mission

To improve student achievement and educator effectiveness by ensuring opportunities, facilitating learning, and promoting excellence



Table of Contents

Acknowledgements / Standards Development Members / Business and Industry Validation	vii
Introduction	ix
Program Information	1
Content Standard 1.0 Integrate Career and Technical Student Organizations (CTSOs)	2
Content Standard 2.0 Identify Lab Organization and Safety Procedures	3
Content Standard 3.0 Perform General Construction Skills.....	4
Content Standard 4.0 Apply Fundamental Design Techniques.....	5
Content Standard 5.0 Identify Material Properties and Hardware.....	6
Content Standard 6.0 Apply Electrical Principles	7
Content Standard 7.0 Apply Plumbing Principles	8
Content Standard 8.0 Identify and Apply Manufacturing Processes	9
Content Standard 9.0 Identify Heating, Ventilation, and Air Conditioning (HVAC) Principles.....	11
Content Standard 10.0 Understand and Utilize Framing Systems.....	12
Content Standard 11.0 Utilize Exterior Finish Applications	13
Complementary Courses.....	15
Construction Technology	17
Furniture and Cabinetmaking	21

Acknowledgements

The development of Nevada career and technical education (CTE) standards and assessments is a collaborative effort sponsored by the Nevada Department of Education (NDE) Office of Career Readiness, Adult Learning, and Education Options. The Nevada Department of Education relies on educators and industry representatives who have the technical expertise and teaching experience to develop standards and performance indicators that truly measure student skill attainment. More importantly, the NDE would like to recognize the time and commitment by the writing team members in developing the career and technical standards for Building Trades in Construction Technology.

Standards Development Members

Name	Occupation/Title	Stakeholder Affiliation	School/Organization
Mark Drakulich	Teacher	Secondary Educator	Green Valley High School, Las Vegas
Steven Dudley	Lead Representative	Business and Industry Representative	Carpenters Local 1977, Las Vegas
Nigel Harrison	Instructor	Postsecondary Educator	Western Nevada College, Carson City
Mike LaBruno	Career Connections Outreach Specialist	Business and Industry Representative	SW Council of Carpenters, Las Vegas
Guy Munson	Builder Sales Representative	Business and Industry Representative	Cabinet Works Group, Las Vegas
Kevin Snider	Teacher	Secondary Educator	Centennial High School, Las Vegas
Gordon Thomas	Teacher	Secondary Educator	Spring Creek High School, Spring Creek
Cesar Vega	Teacher	Secondary Educator	East Career and Technical Academy, Las Vegas
Fausto Vega	Teacher	Secondary Educator	East Career and Technical Academy, Las Vegas

Business and Industry Validation

All CTE standards developed through the Nevada Department of Education are validated by business and industry through one or more of the following processes: (1) the standards are developed by a team consisting of business and industry representatives, or (2) a separate review panel is coordinated with industry experts to ensure the standards include the proper content, or (3) nationally recognized standards currently endorsed by business and industry.

The Building Trades in Construction Technology standards were validated through active participation of business and industry representatives on the development team.

Introduction

The standards in this document are designed to clearly state what the student should know and be able to do upon completion of a high school Building Trades in Construction Technology program of study. These standards are designed for a two-credit course sequence that prepares the student for a technical assessment directly aligned to the standards.

These exit-level standards are designed for the student to complete all standards through their completion of a program of study. These standards are intended to guide curriculum objectives for a program of study.

The standards are organized as follows:

- **Content Standards** are general statements that identify major areas of knowledge, understanding, and the skills students are expected to learn in key subject and career areas by the end of the program.
- **Performance Standards** follow each content standard. Performance standards identify the more specific components of each content standard and define the expected abilities of students within each content standard.
- **Performance Indicators** are very specific criteria statements for determining whether a student meets the performance standard. Performance indicators may also be used as learning outcomes, which teachers can identify as they plan their program learning objectives. The indicators are followed by designations that reflect the course sequence (e.g., 12 for the first-year course of a two-year program and 22 for the second-year course, C is to designate the indicators to be taught in the complementary courses) as referenced in the Core Course Sequence table.

The crosswalks and alignments are located in the Program Supplemental Program Resources document. These will show where the performance indicators support the Nevada Academic Content Standards. For individual course descriptions, please reference the Supplemental Program Resource or the Nevada CTE Catalog.

All students are encouraged to participate in the career and technical student organization (CTSO) that relates to the Building Trades in Construction Technology program. CTSOs are co-curricular national organizations that directly reinforce learning in the CTE classroom through curriculum resources, competitive events, and leadership development. CTSOs provide students the ability to apply academic and technical knowledge, develop communication and teamwork skills, and cultivate leadership skills to ensure college and career readiness.

The Employability Skills for Career Readiness identify the skills needed to be successful in all careers and must be taught as an integrated component of all CTE course sequences. These standards are available in a separate document.

The **Standards Reference Code** is only used to identify or align performance indicators listed in the standards to daily lesson plans, curriculum documents, or national standards. The Standards Reference Code is an abbreviated name for the Building Trades in Construction Technology, and the content standard, performance standard and performance indicator are referenced in the program standards. This abbreviated code for identifying standards uses each of these items. For example, BTCT is the Standards Reference Code for Building Trades in Construction Technology. For Content Standard 2, Performance Standard 3 and Performance Indicator 4 the Standards Reference Code would be BTCT.2.3.4.

Building Trades in Construction Technology

Program Information

Program of Study: Building Trades in Construction Technology
Standards Reference Code: BTCT
Career Cluster: Architecture and Construction
Career Pathway(s): Facility & Mobile Equipment Maintenance
Program Length: 2-year, completed sequentially
CTSO: SkillsUSA

Program Structure Required Program of Study Courses

The core course sequencing is provided in the following table. Complementary Courses are available and provided later in this document. The following courses provide a completed program of study. The Lab is a complementary course available concurrently with the Building Trades in Construction Technology II course.

Core Course Sequence (R) with Lab Course(s) (C)

Required/ Complementary	Course Title	Abbreviated Name
R	Building Trades in Construction Technology I	BUILD CONST TECH I
R	Building Trades in Construction Technology II	BUILD CONST TECH II
C	Building Trades in Construction Technology II LAB	BUILD CONST TECH II L

CONTENT STANDARD 1.0: INTEGRATE CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSOs)

Performance Standard 1.1: Explore the History and Organization of CTSOs

- 1.1.1 Discuss the requirements of CTSO participation/involvement as described in Carl D. Perkins Law (12, 22, C)
- 1.1.2 Research nationally recognized CTSOs (12, 22, C)
- 1.1.3 Investigate the impact of federal and state government regarding the progression and operation of CTSOs (e.g., Federal Statutes and Regulations, Nevada Administrative Code [NAC], Nevada Revised Statutes [NRS]) (12, 22, C)

Performance Standard 1.2: Develop Leadership Skills

- 1.2.1 Discuss the purpose of parliamentary procedure (12, 22, C)
- 1.2.2 Demonstrate the proper use of parliamentary procedure (12, 22, C)
- 1.2.3 Differentiate between an office and a committee (12, 22, C)
- 1.2.4 Discuss the importance of participation in local, regional, state, and national conferences, events, and competitions (12, 22, C)
- 1.2.5 Participate in local, regional, state, or national conferences, events, or competitions (12, 22, C)
- 1.2.6 Describe the importance of a constitution and bylaws to the operation of a CTSO chapter (12, 22, C)

Performance Standard 1.3: Participate in Community Service

- 1.3.1 Explore opportunities in community service-related work-based learning (WBL) (12, 22, C)
- 1.3.2 Participate in a service learning (program related) and/or community service project or activity (12, 22, C)
- 1.3.3 Engage with business and industry partners for community service (12, 22, C)

Performance Standard 1.4: Develop Professional and Career Skills

- 1.4.1 Demonstrate college and career readiness (e.g., applications, resumes, interview skills, presentation skills) (12, 22, C)
- 1.4.2 Describe the appropriate professional/workplace attire and its importance (12, 22, C)
- 1.4.3 Investigate industry-standard credentials/certifications available within this Career Cluster™ (12, 22, C)
- 1.4.4 Participate in authentic contextualized instructional activities (12, 22, C)
- 1.4.5 Demonstrate technical skills in various student organization activities/events (12, 22, C)

Performance Standard 1.5: Understand the Relevance of Career and Technical Education (CTE)

- 1.5.1 Make a connection between program standards to career pathway(s) (12, 22, C)
- 1.5.2 Explain the importance of participation and completion of a program of study (12, 22, C)
- 1.5.3 Promote community awareness of local student organizations associated with CTE programs (12, 22, C)

CONTENT STANDARD 2.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES

Performance Standard 2.1: Demonstrate General Lab Safety Rules and Procedures

- 2.1.1 Describe general shop safety rules and procedures (12)
- 2.1.2 Describe the roles of OSHA and EPA in workplace safety (12)
- 2.1.3 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (e.g., hard hats, safety vests, personal protection equipment – PPE) (12)
- 2.1.4 Utilize safe procedures for handling of tools and equipment (12)
- 2.1.5 Operate lab equipment according to safety guidelines (12)
- 2.1.6 Identify and use proper lifting procedures and proper use of support equipment (12)
- 2.1.7 Utilize proper ventilation procedures for working within the lab/shop area (12)
- 2.1.8 Identify marked safety areas (12)
- 2.1.9 Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment (12)
- 2.1.10 Identify the location and use of eye wash stations (12)
- 2.1.11 Identify the location of the posted evacuation routes (12)
- 2.1.12 Identify and wear appropriate clothing for lab/shop activities (12)
- 2.1.13 Secure hair and jewelry for lab/shop activities (12)
- 2.1.14 Demonstrate knowledge of the safety aspects of low and high voltage circuits (12)
- 2.1.15 Locate and interpret material safety data sheets (MSDS) (12)
- 2.1.16 Prepare time or job cards, reports or records (12)
- 2.1.17 Perform housekeeping duties (12)
- 2.1.18 Follow verbal and written instructions to complete work assignments (12)

Performance Standard 2.2: Identify and Utilize Hand Tools

- 2.2.1 Identify hand tools and their appropriate usage (12)
- 2.2.2 Identify standard and metric designation (12)
- 2.2.3 Demonstrate the proper techniques when using hand tools (12)
- 2.2.4 Demonstrate safe handling and use of appropriate tools (12)
- 2.2.5 Demonstrate proper cleaning, storage, and maintenance of tools (12)

Performance Standard 2.3: Identify and Utilize Power Tools and Equipment

- 2.3.1 Identify power tools and their appropriate usage (12)
- 2.3.2 Identify equipment and their appropriate usage (12)
- 2.3.3 Demonstrate proper cleaning, storage, and maintenance of power tools and equipment (12)
- 2.3.4 Demonstrate the proper techniques when using power tools and equipment (12, 22)
- 2.3.5 Demonstrate safe handling and use of appropriate power tools and equipment, including cut speeds and feed rates (12, 22)

CONTENT STANDARD 3.0: PERFORM GENERAL CONSTRUCTION SKILLS

Performance Standard 3.1: Demonstrate Print Reading Practices

- 3.1.1 Identify and explain basic construction drawing terms, components, symbols, and basic elements of a working drawing using industry standard terminology (e.g., annotations, dimensions, line types) (12)
- 3.1.2 Utilize information on the construction drawings (e.g., dimensioning, sectional drawings, fasteners, tables, charts, schedules, assembly drawings, specifications) (12)
- 3.1.3 Recognize different classifications of construction drawings (12)
- 3.1.4 Describe various types of drawings (e.g., working, assembly, pictorial, orthographic, isometric, schematic) (12)
- 3.1.5 Interpret schematic diagrams (e.g., plumbing, electrical, mechanical) (12)
- 3.1.6 Develop a materials list and/or cut list from a working drawing (12)
- 3.1.7 Develop a construction plan of procedure (12)

Performance Standard 3.2: Demonstrate and Apply Mathematical Concepts

- 3.2.1 Add, subtract, multiply, and divide whole numbers, fractions, and decimals with and without a calculator (12)
- 3.2.2 Use a standard ruler, a metric ruler, and a measuring tape to measure (12)
- 3.2.3 Convert decimals to percentages / percentages to decimals and fractions to decimals / decimals to fractions (12)
- 3.2.4 Convert between customary and metric systems (12)
- 3.2.5 Explain the various measurement systems in the construction trades (e.g., volume, area) (12)
- 3.2.6 Calculate standard and metric units of length, weight, volume, and temperature (12)
- 3.2.7 Calculate board feet, square feet, linear feet, arcs, and angles (12, 22)
- 3.2.8 Utilize geometric principles used in the construction industry (e.g., distance, area, volume) (12, 22)

Performance Standard 3.3: Utilize Material Handling Techniques

- 3.3.1 Define a load (12)
- 3.3.2 Establish a pre-task plan prior to moving a load (12)
- 3.3.3 Select appropriate materials-handling equipment for the task (12)
- 3.3.4 Utilize proper materials-handling techniques and storage (12)
- 3.3.5 Recognize hazards and follow safety procedures required for materials handling (12)

Performance Standard 3.4: Explore Career Opportunities

- 3.4.1 Research high skill, high wage, and/or in-demand career opportunities available for craft professionals in the construction industry (12)
- 3.4.2 Research postsecondary training opportunities and requirements (12)
- 3.4.3 Describe how construction careers have impacted today's society and economy (12)
- 3.4.4 Explain the purpose and objectives of an internship, apprenticeship training program and how certified apprentice training can start in high school (22)
- 3.4.5 Describe the skills, attitudes, and abilities needed to work in the construction industry (22)

CONTENT STANDARD 4.0: APPLY FUNDAMENTAL DESIGN TECHNIQUES

Performance Standard 4.1: Identify Elements of Design

- 4.1.1 Identify common sizes in relation to furniture and cabinets (12)
- 4.1.2 Identify and describe Americans with Disabilities Act (ADA) requirements when applicable (22)
- 4.1.3 Utilize client requirements and specifications to create a finish product (22)

Performance Standard 4.2: Demonstrate Measures and Scaling Techniques

- 4.2.1 Identify industry standard units of measure (e.g., standard, decimal, metric) (12)
- 4.2.2 Define industry standard measurement terms (e.g., linear, square ft., tolerance, squareness, concentricity, perpendicular, parallel) (12)
- 4.2.3 Measure to the nearest 1/16th inch with a tape measure (12)

Performance Standard 4.3: Demonstrate Freehand Technical Sketching Techniques

- 4.3.1 Annotate sketches legibly (12)
- 4.3.2 Create a cutting diagram to minimize material waste (22)

Performance Standard 4.4: Apply Job Layout Practices

- 4.4.1 Describe the major responsibilities related to job layout (12)
- 4.4.2 Utilize differential leveling tools and procedures to determine job and building elevations (12)
- 4.4.3 Record layout data and information using accepted practices (12)
- 4.4.4 Check and/or establish 90-degree angles using the 3-4-5 rule or diagonal method (e.g., Pythagorean theorem) (12, 22)
- 4.4.5 Utilize manual or electronic equipment and procedures to take measurements and perform job layout tasks (22)

CONTENT STANDARD 5.0: IDENTIFY MATERIAL PROPERTIES AND HARDWARE

Performance Standard 5.1: Identify Materials and Their Properties

- 5.1.1 Differentiate between raw materials, standard stock, and finished products (12)
- 5.1.2 Differentiate between the various types of material properties and their applications (22)
- 5.1.3 Identify and describe the major materials and their characteristics (e.g., hardwood, softwood, composites, laminates, veneers, edge treatment, metal, steel) (22)

Performance Standard 5.2: Identify Fasteners and Methods

- 5.2.1 Identify and discuss various fasteners (e.g., type, purpose, application) (12)
- 5.2.2 Discuss fastening methods for various materials (e.g., toenailing, countersinking, pocket screws, dowels, biscuits, dominos) (22)
- 5.2.3 Categorize fastening methods by appropriate applications (22)

Performance Standard 5.3: Identify Adhesives and Methods

- 5.3.1 Identify and discuss various adhesives (e.g., glues, contact adhesives, thermosetting) (12)
- 5.3.2 Demonstrate the proper cleanup procedures for specific adhesives (12)
- 5.3.3 List and define common terminology (e.g., open assembly time, closed assembly time, cure time, slip, and shelf life) (22)
- 5.3.4 Discuss adhesive methods for various materials (22)
- 5.3.5 Compare characteristics of adhesives that affect the assembly time, cure time and strength of the product (22)

Performance Standard 5.4: Identify and Utilize Hardware

- 5.4.1 Identify and describe common types of hardware and their applications (12)
- 5.4.2 Layout, install, and adjust hardware (12)
- 5.4.3 Select the hardware for the appropriate application (22)

CONTENT STANDARD 6.0: APPLY ELECTRICAL PRINCIPLES

Performance Standard 6.1: Identify Electrical Safety Procedures

- 6.1.1 Demonstrate safe working practices in the construction environment (12)
- 6.1.2 Explain the purpose of OSHA and how it promotes electrical safety on the job (12)
- 6.1.3 Identify electrical hazards and how to avoid or minimize them in the workplace (12)
- 6.1.4 Explain electrical safety issues concerning lockout/tagout procedures, confined space entry, respiratory protection, and fall protection systems (22)
- 6.1.5 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 (22)

Performance Standard 6.2: Identify Fundamental Electrical Systems

- 6.2.1 Identify the types of materials and schedules used with copper piping (12)
- 6.2.2 Explain the grounding requirements of a residential electric service (12)
- 6.2.3 Select the proper wiring methods for various types of residential construction systems (12)
- 6.2.4 Compute branch circuit loads and explain their installation requirements (12)
- 6.2.5 Discuss the types and purposes of equipment grounding conductors (22)
- 6.2.6 Size outlet boxes and select the proper type for different wiring methods (22)
- 6.2.7 Explain how wiring devices are selected and installed (22)
- 6.2.8 Describe the installation and control of lighting fixtures (22)
- 6.2.9 Install a basic electrical system (22)

CONTENT STANDARD 7.0: APPLY PLUMBING PRINCIPLES

Performance Standard 7.1: Identify Drain, Waste, and Vent (DWV) Systems

- 7.1.1 Explain how waste moves from a fixture through the drain system to the environment (12)
- 7.1.2 Identify the major components of a drainage system and describe their functions (12)
- 7.1.3 Investigate the different types of traps, usages, and applications (12)
- 7.1.4 Discuss significant code and health issues, violations, and consequences related to DWV systems (12)
- 7.1.5 Identify the various types of drain, waste, and vent (DWV) fittings and their applications (22)

CONTENT STANDARD 8.0: IDENTIFY AND APPLY MANUFACTURING PROCESSES

Performance Standard 8.1: Identify Manufacturing Processes

- 8.1.1 Identify and describe the manufacturing processes (e.g., layout, milling, joinery, sanding, assembly, finishing, installation) (12)
- 8.1.2 Discuss cabinet layout and installation techniques (12)
- 8.1.3 Discuss countertop layout, materials, and installation techniques (12)

Performance Standard 8.2: Utilize Layout Principles and Practices

- 8.2.1 Prepare work area for layout (12)
- 8.2.2 Select appropriate materials to complete work assignment (12)
- 8.2.3 Use layout and marking tools as required (12)
- 8.2.4 Layout parts using measurement practices (12)
- 8.2.5 Interpret drawing, sketch, or specification information (22)

Performance Standard 8.3: Utilize Milling Operations

- 8.3.1 Identify terms used with milling tools (e.g., kerf, set, grain, TPI, drilling, boring, counterboring, countersinking) (12)
- 8.3.2 Select the proper milling tools for specific operations (e.g., table saw, drill press, joiner, lathe, band saw, scroll saw, routers) (12)
- 8.3.3 Demonstrate the steps to square a board (12)
- 8.3.4 Demonstrate cutting and handling techniques used for lumber and sheet goods (12)
- 8.3.5 Demonstrate the use of a jig, template, and fixture (22)

Performance Standard 8.4: Utilize Joinery Techniques

- 8.4.1 Identify terms used with joinery techniques (e.g., doweling, biscuits, dominos, tongue & groove, dados, miter, dovetail) (12)
- 8.4.2 Discuss the advantages and disadvantages of joinery types (12)
- 8.4.3 Determine the appropriate joinery applications (22)
- 8.4.4 Select the proper joinery tools and machinery for specific operations (22)
- 8.4.5 Construct various joints (i.e., dado, miter, rabbet, butt) (22)

Performance Standard 8.5: Utilize Sanding Processes and Techniques

- 8.5.1 Identify terms used with sanding processes and techniques (e.g., grit, belt, disc, hand) (12)
- 8.5.2 Properly prepare a surface for a treatment or finish (12)
- 8.5.3 Demonstrate proper application methods for different types of filler materials (12)
- 8.5.4 Utilize the proper health and safety procedures when working with abrasives and fillers (12)
- 8.5.5 Select the proper tool and abrasive for shaping and smoothing materials (22)
- 8.5.6 Select the proper grit sizes and sequences for shaping and smoothing operations (22)

Performance Standard 8.6: Demonstrate Assembly Procedures

- 8.6.1 Identify terms used with assembly procedures (e.g., dry fitting, clamping, gluing) (12)
- 8.6.2 Select the proper assembly tools for specific operations (e.g., c-clamps, bar clamps, pipe clamps, etc.) (12)
- 8.6.3 Demonstrate assembly and clamping procedures (12)
- 8.6.4 Check the squareness of a project (e.g., diagonal method, 3-4-5 method) (12)
- 8.6.5 Use specific quality control criteria to check the accuracy of a project (12)
- 8.6.6 Demonstrate common case construction techniques (e.g., face frame, frameless) (22)
- 8.6.7 Demonstrate common frame and panel construction techniques (e.g., stile, rail, panel) (22)
- 8.6.8 Demonstrate common leg and rail construction techniques (22)
- 8.6.9 Construct a cabinet or furniture drawer and/or door (22)
- 8.6.10 Demonstrate molding and trim usage and installation (22)

Performance Standard 8.7: Demonstrate Finishing Procedures

- 8.7.1 Identify terms and products used in finishing procedures (e.g., staining, clear coating, penetrating oils, gloss, sheen, sealer) (12)
- 8.7.2 Select the proper finishing tools and materials for specific operations (12)
- 8.7.3 Utilize the proper health and safety procedures when working with finishes (12)

**CONTENT STANDARD 9.0: IDENTIFY HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
PRINCIPLES**

Performance Standard 9.1: Identify and Install Floor Systems

- 9.1.1 Explain the basic principles of heating, ventilation, and air conditioning (22)
- 9.1.2 Identify the types of schedules/drawings used in the HVAC trade (22)

CONTENT STANDARD 10.0: UNDERSTAND AND UTILIZE FRAMING SYSTEMS

Performance Standard 10.1: Identify and Install Floor Systems

- 10.1.1 Identify the different types of framing systems (22)
- 10.1.2 Read and interpret drawings and specifications to determine floor system requirements (22)
- 10.1.3 Identify floor and sill framing and support members (22)
- 10.1.4 Describe the methods used to fasten sills to the base (22)
- 10.1.5 Compare and contrast the different types of floor joists (22)
- 10.1.6 Analyze different types of flooring framing materials (22)
- 10.1.7 Explain the purposes of subflooring and underlayment (22)
- 10.1.8 Categorize fasteners used in floor framing (22)
- 10.1.9 Estimate the amount of material needed to frame a floor assembly (22)
- 10.1.10 Lay out and construct a floor assembly (22)
- 10.1.11 Utilize the proper health and safety procedures when working with floor layouts (22)

Performance Standard 10.2: Identify and Install Wall and Ceiling Systems

- 10.2.1 Identify the components of a wall and ceiling layout (22)
- 10.2.2 Describe the procedure for laying out a wall (22)
- 10.2.3 Describe the correct procedure for assembling and erecting an exterior wall (22)
- 10.2.4 Identify the common materials and methods used for installing sheathing (22)
- 10.2.5 Lay out, assemble, erect, and brace exterior walls (22)
- 10.2.6 Describe the correct procedure for laying out ceiling joists (22)
- 10.2.7 Estimate the materials required to frame walls and ceilings (22)
- 10.2.8 Utilize the proper health and safety procedures when working with wall and ceiling layouts (22)

Performance Standard 10.3: Identify and Install Roof Systems

- 10.3.1 Define the terms associated with roof framing (22)
- 10.3.2 Identify the roof framing members used in common roof systems (22)
- 10.3.3 Compare the methods used to lay out and calculate the length of a rafter (22)
- 10.3.4 Use a rafter framing square, speed square, and calculator in laying out a roof (22)
- 10.3.5 Identify various types of sheathing used in roof systems (22)
- 10.3.6 Erect a common roof system (22)
- 10.3.7 Estimate the materials used in framing and sheathing a roof (22)
- 10.3.8 Utilize the proper health and safety procedures when working with roof systems (22)

CONTENT STANDARD 11.0: UTILIZE EXTERIOR FINISH APPLICATIONS

Performance Standard 11.1: Demonstrate Exterior Finishing Applications

- 11.1.1 Compare and contrast exterior finishes based on regional applications (22)
- 11.1.2 Describe the types and purposes of wall insulation and thermal barriers (22)
- 11.1.3 Install one type of siding commonly used (22)
- 11.1.4 Utilize the proper health and safety procedures when working with exterior applications (22)

Complementary Courses

State Complementary Skill Standards

The state complementary skill standards are designed to clearly state what the student should know and be able to do upon completion of a complementary course related to their career and technical education (CTE) program of study. The standards are designed for the student to complete all standards through their completion of the **one-year** complementary courses. **Completion of the qualifying Program of Study is required prior to enrollment in a complementary course.**

Employability Skills for Career Readiness Standards

Students have completed all program content standards and will pursue advanced study through investigation and in-depth research.

Complementary Course Standards Contributing Members

Course Contribution(s)	Name	Occupation/Title	Stakeholder Affiliation	School/Organization
Construction Technology	Mark Drakulich	Teacher	Secondary Educator	Green Valley High School, Las Vegas
Construction Technology	Steven Dudley	Lead Representative	Business and Industry Representative	Carpenters Local 1977, Las Vegas
Construction Technology	Nigel Harrison	Instructor	Postsecondary Educator	Western Nevada College, Carson City
Construction Technology	Mike LaBruno	Career Connections Outreach Specialist	Business and Industry Representative	SW Council of Carpenters, Las Vegas
Construction Technology	Guy Munson	Builder Sales Representative	Business and Industry Representative	Cabinet Works Group, Las Vegas
Construction Technology	Kevin Snider	Teacher	Secondary Educator	Centennial High School, Las Vegas
Construction Technology	Gordon Thomas	Teacher	Secondary Educator	Spring Creek High School, Spring Creek
Construction Technology	Cesar Vega	Teacher	Secondary Educator	East Career and Technical Academy, Las Vegas
Construction Technology	Fausto Vega	Teacher	Secondary Educator	East Career and Technical Academy, Las Vegas

Business and Industry Validation

All CTE standards developed through the Nevada Department of Education are validated by business and industry through one or more of the following processes: (1) the standards are developed by a team consisting of business and industry representatives, or (2) a separate review panel is coordinated with industry experts to ensure the standards include the proper content, or (3) nationally recognized standards currently endorsed by business and industry.

The Construction Technology, and Furniture and Cabinetmaking complementary standards for Building Trade in Construction Technology program of study were validated through active participation of business and industry representatives on the development team.

Complementary Course Information for Building Trade in Construction Technology

Program Information

Qualifying Program of Study: Building Trade in Construction Technology

Career Cluster: Architecture and Construction

Career Pathway(s): Construction

CTSO: SkillsUSA

Grade Level: 11-12

Program Structure for Complementary Courses

The complementary courses are provided in the following table. **The qualifying program of study must be completed prior to enrolling in the complementary courses** (except labs that are done concurrently with the second-year course). A program does not have to utilize the complementary courses for students to complete their program of study.

Complementary Courses

Required/ Complementary	Course Title	Abbreviated Name
C	Construction Technology	CONST TECH
C	Furniture and Cabinetmaking	FURN CAB
C	Building Trade in Construction Technology Advanced Studies	BUILD CONST TECH AS
C	Industry-Recognized Credential – Building Trades in Construction Technology	IRC BUILD CONST TECH
C	CTE Work Experience – Architecture and Construction	WORK EXPER CONST

Complementary Course Standards Construction Technology

CONTENT STANDARD 1.0: PERFORM GENERAL CONSTRUCTION SKILLS

Performance Standard 1.1: Demonstrate Print Reading Practices

- 1.1.1 Explain the purpose of building codes and regulations (e.g., IBC, ICC, NEC, ADA)
- 1.1.2 Research building codes and zoning regulations for a construction project

Performance Standard 1.2: Demonstrate and Apply Mathematical Concepts

- 1.2.1 Produce an estimate of material and labor costs for a project
- 1.2.2 Compare and contrast the cost of a specific project using different materials

CONTENT STANDARD 2.0: APPLY FUNDAMENTAL DESIGN TECHNIQUES

Performance Standard 2.1: Identify Elements of Design

- 2.1.1 Explain the history of cabinetry and furniture styles from the 17th century to today
- 2.1.2 List characteristics of the styles that belong to traditional, provincial, and contemporary designs
- 2.1.3 Identify needs and wants in cabinets and furniture in everyday living (for general construction)
- 2.1.4 Describe the relationship between the function and form of a cabinet or piece of furniture (C)
- 2.1.5 Identify various cabinet styles and components
- 2.1.6 Discuss elements of design (e.g., shapes, textures, lines, colors)
- 2.1.7 Discuss principles of design (e.g., harmony, symmetry, repetitions, balance, proportion)

Performance Standard 2.2: Demonstrate Measures and Scaling Techniques

- 2.2.1 Demonstrate proper use of precision measuring tools (e.g., micrometer, dial-indicator, caliper)

Performance Standard 2.3: Demonstrate Freehand Technical Sketching Techniques

- 2.3.1 Prepare freehand and field sketches
- 2.3.2 Identify appropriate proportions

Performance Standard 2.4: Apply Job Layout Practices

- 2.4.1 Determine approximate distances by pacing

CONTENT STANDARD 3.0: IDENTIFY MATERIAL PROPERTIES AND HARDWARE

Performance Standard 3.1: Identify Materials and Their Properties

- 3.1.1 Define material terminology (e.g., air dry, kiln dry, defects, lumber grade, face grades, sanded)
- 3.1.2 Discuss the impact of material usage on the environment
- 3.1.3 Discuss the impact of environment and climate on materials
- 3.1.4 Explain how production is affected by the availability, quality, and quantity of resources
- 3.1.5 Discuss packing and transportation methods

CONTENT STANDARD 4.0: APPLY ELECTRICAL PRINCIPLES

Performance Standard 4.1: Identify Fundamental Electrical Systems

- 4.1.1 Calculate and select service-entrance equipment (i.e., panel box, load requirements, breakers)
- 4.1.2 Explain the purpose and appropriate usage of ground fault circuit interrupters
- 4.1.3 Explain the purpose and appropriate usage of arc fault circuit interrupters
- 4.1.4 Describe the installation rules for dedicated circuits for various equipment (e.g., ranges, dryers, HVAC system, hot tubs, water heaters)

CONTENT STANDARD 5.0: APPLY PLUMBING PRINCIPLES

Performance Standard 5.1: Identify and Utilize Plastic Pipe and Fittings

- 5.1.1 Identify types of materials and schedules of plastic piping
- 5.1.2 Identify proper and improper applications of plastic piping
- 5.1.3 Identify types of fittings and valves used with plastic piping
- 5.1.4 Identify and determine the kinds of hangers and supports needed for plastic piping
- 5.1.5 Identify the various techniques used in hanging and supporting plastic piping
- 5.1.6 Explain proper procedures for the handling, storage, and protection of plastic pipes
- 5.1.7 Calculate angles, and slope, measure, cut, and join plastic piping (e.g., connectors, glues, solvents)
- 5.1.8 Install a basic plastic piping system
- 5.1.9 Demonstrate the proper cleanup procedures for specific joining materials

Performance Standard 5.2: Identify and Utilize Polyethylene (PEX) Pipe and Fittings

- 5.2.1 Identify the types of materials and schedules used with PEX piping
- 5.2.2 Identify the material properties, storage, and handling requirements of PEX piping
- 5.2.3 Identify the types of fittings and valves used with PEX piping
- 5.2.4 Identify the techniques used in hanging and supporting PEX piping
- 5.2.5 Calculate angles, measure, cut, and join PEX piping
- 5.2.6 Install a basic PEX piping system
- 5.2.7 Identify the hazards, safety precautions, advantages and disadvantages associated with PEX piping

Performance Standard 5.3: Identify and Utilize Copper Pipe and Fittings

- 5.3.1 Identify the types of materials and schedules used with copper piping
- 5.3.2 Identify the material properties, storage, and handling requirements of copper piping
- 5.3.3 Identify the types of fittings and valves used with copper piping
- 5.3.4 Identify the techniques used in hanging and supporting copper piping
- 5.3.5 Calculate angles, measure, cut, and join copper piping
- 5.3.6 Install a basic copper piping system
- 5.3.7 Identify the hazards and safety precautions associated with copper piping

CONTENT STANDARD 6.0: IDENTIFY HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) PRINCIPLES

Performance Standard 6.1: Explore HVAC Opportunities and Techniques

- 6.1.1 Describe what the Clean Air Act means to the HVAC trade
- 6.1.2 Describe types of regulatory codes encountered in the HVAC trade

CONTENT STANDARD 7.0: IDENTIFY AND APPLY MANUFACTURING PROCESSES

Performance Standard 7.1: Identify Manufacturing Processes

- 7.1.1 Discuss the impact of manufacturing processes on the environment
- 7.1.2 Describe lean manufacturing and explain its importance
- 7.1.3 Discuss the use of mass production techniques (e.g., parts duplication)

Performance Standard 7.2: Demonstrate Assembly Procedures

- 7.2.1 Demonstrate laminating techniques (e.g., plastics, veneers, edge treatment)

Performance Standard 7.3: Demonstrate Finishing Procedures

- 7.3.1 Demonstrate proper application methods for different types of finishes
- 7.3.2 Demonstrate clean up procedures for various types of finishing products and equipment

Performance Standard 7.4: Demonstrate Computer Numerical Control (CNC) Procedures

- 7.4.1 Explain the CNC processes and software requirements (e.g., Cartesian coordinates, numeric code, machine code, import/export programs)
- 7.4.2 Determine the appropriate CNC setting for the various types of materials
- 7.4.3 Perform safety inspections of CNC equipment and accessories
- 7.4.4 Set up for CNC operations
- 7.4.5 Operate CNC equipment
- 7.4.6 Perform a straight cut
- 7.4.7 Perform a contoured cut

CONTENT STANDARD 8.0: UNDERSTAND AND UTILIZE FRAMING SYSTEMS

Performance Standard 8.1: Identify and Install Floor Systems

- 8.1.1 Select the proper girder/beam size per construction documents (larger structures)
- 8.1.2 Describe different types of bridging and blocking (larger structures)

Performance Standard 8.2: Identify and Install Wall and Ceiling Systems

- 8.2.1 Cut and install ceiling joists on a wood frame building
- 8.2.2 Describe wall framing techniques used in masonry construction
- 8.2.3 Explain the use of metal studs in a wall framing

Performance Standard 8.3: Identify and Install Roof Systems

- 8.3.1 Identify the various types of trusses used in roof systems
- 8.3.2 Frame a roof opening (e.g., vents, dormers, skylights)

Performance Standard 8.4: Identify and Install Basic Stair Systems

- 8.4.1 Identify the various types of stairs
- 8.4.2 Identify the various parts of stairs
- 8.4.3 Identify the materials used in the construction of a common stair system
- 8.4.4 Interpret construction drawings of stairs
- 8.4.5 Calculate the rise and run for a common stair system (i.e., treads, risers, stringer)
- 8.4.6 Lay out and cut stringers, risers, and treads
- 8.4.7 Build a small stair unit with a temporary handrail
- 8.4.8 Utilize the proper health and safety procedures when working with stair layouts

CONTENT STANDARD 9.0: UTILIZE EXTERIOR FINISH APPLICATIONS

Performance Standard 9.1: Demonstrate Exterior Finishing Applications

- 9.1.1 Identify common cornice types
- 9.1.2 Describe the types and applications of common wood siding
- 9.1.3 Describe fiber cement siding and its uses
- 9.1.4 Describe the types and styles of vinyl and metal siding (C)
- 9.1.5 Describe the types and applications of stucco and masonry veneer finishes
- 9.1.6 Describe the types and applications of special exterior finish systems

Performance Standard 9.2: Demonstrate Roofing Applications

- 9.2.1 Identify the materials and methods used in roofing (i.e., composition, wood, metal, tile)
- 9.2.2 Explain how to ensure various roof projections are watertight
- 9.2.3 Lay out, cut, and install a cricket/saddle and a valley
- 9.2.4 Install roofing materials on gables, hips, and valleys (e.g., composition, wood, metal, tile)
- 9.2.5 Install main and hip ridge caps
- 9.2.6 Utilize the proper health and safety procedures when working with roofing applications

Complementary Course Information for Furniture and Cabinetmaking

CONTENT STANDARD 1.0: PERFORM GENERAL CONSTRUCTION SKILLS

Performance Standard 1.1: Demonstrate and Apply Mathematical Concepts

- 1.1.1 Produce an estimate of material and labor costs for a project
- 1.1.2 Compare and contrast the cost of a specific project using different materials

CONTENT STANDARD 2.0: APPLY FUNDAMENTAL DESIGN TECHNIQUES

Performance Standard 2.1: Identify Elements of Design

- 2.1.1 Explain the history of cabinetry and furniture styles from the 17th century to today
- 2.1.2 List characteristics of the styles that belong to traditional, provincial, and contemporary designs
- 2.1.3 Identify needs and wants in cabinets and furniture in everyday living (for general construction)
- 2.1.4 Describe the relationship between the function and form of a cabinet or piece of furniture
- 2.1.5 Identify various cabinet styles and components
- 2.1.6 Discuss elements of design (e.g., shapes, textures, lines, colors)
- 2.1.7 Discuss principles of design (e.g., harmony, symmetry, repetitions, balance, proportion)

Performance Standard 2.2: Demonstrate Freehand Technical Sketching Techniques

- 2.2.1 Prepare freehand and field sketches
- 2.2.2 Identify appropriate proportions

Performance Standard 2.3: Apply Job Layout Practices

- 2.3.1 Determine approximate distances by pacing

CONTENT STANDARD 3.0: IDENTIFY MATERIAL PROPERTIES AND HARDWARE

Performance Standard 3.1: Identify Materials and Their Properties

- 3.1.1 Define material terminology (e.g., air dry kiln dry, defects, lumber grade, face grades, sanded)
- 3.1.2 Discuss the impact of material usage on the environment
- 3.1.3 Discuss the impact of environment and climate on materials
- 3.1.4 Explain how production is affected by the availability, quality, and quantity of resources
- 3.1.5 Discuss packing and transportation methods

CONTENT STANDARD 4.0: IDENTIFY AND APPLY MANUFACTURING PROCESSES

Performance Standard 4.1: Identify Manufacturing Processes

- 4.1.1 Discuss the impact of manufacturing processes on the environment
- 4.1.2 Describe lean manufacturing and explain its importance
- 4.1.3 Discuss the use of mass production techniques (e.g., parts duplication)

Performance Standard 4.2: Demonstrate Assembly Procedures

- 4.2.1 Demonstrate laminating techniques (e.g., plastic, veneers, edge treatment)

Performance Standard 4.3: Demonstrate Computer Numerical Control (CNC) Procedures

- 4.3.1 Explain the CNC processes and software requirements (e.g., Cartesian coordinates, numeric code, machine code, import/export programs)
- 4.3.2 Determine the appropriate CNC settings for the various types of materials
- 4.3.3 Perform safety inspections of CNC equipment and accessories
- 4.3.4 Set up for CNC operations
- 4.3.5 Operate CNC equipment
- 4.3.6 Perform a straight cut
- 4.3.7 Perform a contoured cut