

**NEVADA STATE BOARD OF EDUCATION  
NEVADA STATE BOARD FOR CAREER AND TECHNICAL EDUCATION**

**SUPPORTING DOCUMENT**

**SUBJECT:** Approval of State CTE Standards for  
Agricultural Mechanics Technology

<u> / / </u>	Public Workshop
<u> / / </u>	Public Hearing
<u> / / </u>	Regulation Adoption
<u> / X / </u>	Approval
<u> / / </u>	Appointments
<u> / / </u>	Receive
<u> / / </u>	Information/Discussion
<u> / X / </u>	Action

MEETING DATE:	<u> July 23, 2015 </u>
AGENDA ITEM #	<u> 6 f </u>
NUMBER OF ENCLOSURE(S):	<u> 1 </u>

**PRESENTER(S):** Mike Raponi, Director, Office of Career Readiness, Adult Learning & Education Options, Nevada Department of Education

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**RECOMMENDATION:** Approval of the revised State CTE Standards for Architectural Design, Food Science Technology, and Manufacturing Technologies

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**FISCAL IMPACT** (See notes on Page Two): None

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**BUDGET ACCOUNT (FOR PRINTING CHARGES ONLY):** 2676

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**LENGTH OF TIME EXPECTED FOR PRESENTATION (IN MINUTES):** Consent Agenda

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**BACKGROUND:**

New CTE state standards are enclosed for the following CTE programs: Architectural Design, Food Science Technology, and Manufacturing Technologies

The standards for Architecture Design distinguish those programs that focus on design skills in architecture as compared to programs that focus on drafting and design that encompasses mechanical drafting skills. The Food Science Technology standards align to food products and processing, a growing industry in Nevada. The Manufacturing Technologies standards were developed in response to a education pathway program in manufacturing proposed by the Governor's Office of Economic Development. This program will be implemented at Sparks H.S. this fall; Truckee Meadows Community College has developed an aligned AAS program, with opportunities for students to earn articulated credit upon completion of the high school program. Additional high schools are considering implementing this program in the near future.

The content standards, performance standards, and performance indicators for standards are complete and final, pending approval by the State Board of Education. Some **Architectural Design, Food Science Technology, and Manufacturing Technologies**

crosswalks with academic standards and math practices are under development and will be included in the final standards documents.

*ARCHITECTURAL  
DESIGN  
STANDARDS*



This document was prepared by:

Office of Career Readiness, Adult Learning & Education Options  
Nevada Department of Education  
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[www.doe.nv.gov](http://www.doe.nv.gov)

Draft for review by the State Board of Education /  
State Board for Career and Technical Education on  
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Victor Wakefield..... Member  
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**NEVADA DEPARTMENT OF EDUCATION**

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Superintendent of Public Instruction

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**VISION**

*All Nevadans ready for success in the 21<sup>st</sup> century*

**MISSION**

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



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## **ACKNOWLEDGEMENTS**

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## **STANDARDS DEVELOPMENT MEMBERS**

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## **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 was coordinated with industry experts to ensure the standards include the proper content; or (3) the adoption of nationally-recognized standards endorsed by business and industry.

The Architectural Design standards were validated through a complete review by an industry panel.

## **PROJECT COORDINATOR**

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Skilled and Technical Sciences  
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Nevada Department of Education

INTRODUCTION

The standards in this document are designed to clearly state what the student should know and be able to do upon completion of an advanced high school Architectural Design program. These standards are designed for a three-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 crosswalk and alignment section of the document shows where the performance indicators support the Nevada Academic Content Standards in Science (based on the Next Generation Science Standards) and the English Language Arts and Mathematics (based on the Common Core State Standards). Where correlation with an academic content standard exists, students in the Architectural Design program perform learning activities that support, either directly or indirectly, achievement of the academic content standards that are listed.

All students are encouraged to participate in the career and technical student organization (CTSO) that relates to their program area. CTSOs are co-curricular national associations that directly enforce 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 “soft 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.

Program Name	Standards Reference Code
Architectural Design	ARCH

Example: ARCH.2.3.4

Standards	Content Standard	Performance Standard	Performance Indicator
Architectural Design	2	3	4

**CONTENT STANDARD 1.0 : APPLY FUNDAMENTAL ARCHITECTURAL SKILLS**

**PERFORMANCE STANDARD 1.1 : DEMONSTRATE PRINT READING PRACTICES**

- 1.1.1 Interpret basic elements of an architectural drawing (e.g., title block information, dimensions, annotations, line types, and schedules)
- 1.1.2 Identify industry standard architectural symbols
- 1.1.3 Describe various types of drawing views (i.e., plan, elevation, section, detail, and pictorial)
- 1.1.4 Identify drawing sheet classifications (e.g., architectural, civil, electrical, landscape, and mechanical)

**PERFORMANCE STANDARD 1.2 : UTILIZE MATHEMATICAL OPERATIONS AND MEASURING TECHNIQUES**

- 1.2.1 Identify industry standard units of measure
- 1.2.2 Determine appropriate architectural and engineering scales
- 1.2.3 Convert between customary (i.e., SAE and Imperial) and metric units
- 1.2.4 Determine and apply the equivalence between fractions and decimals
- 1.2.5 Measure and calculate distance, object size, area, and volume

**PERFORMANCE STANDARD 1.3 : DEMONSTRATE SKETCHING TECHNIQUES**

- 1.3.1 Prepare sketches using appropriate scale and proportions
- 1.3.2 Create sketches using appropriate architectural symbols
- 1.3.3 Utilize the alphabet of lines (i.e., styles and weights)
- 1.3.4 Annotate sketches legibly using an appropriate architectural lettering style

**PERFORMANCE STANDARD 1.4 : DEMONSTRATE SPATIAL REASONING**

- 1.4.1 Define spatial reasoning
- 1.4.2 Identify spatial reasoning techniques (e.g., mapping, rotating, matching, patterning, and counting)
- 1.4.3 Relate spatial analysis techniques to architecture (e.g., circulation and space planning)
- 1.4.4 Utilize spatial reasoning techniques to solve design problems

<b>CONTENT STANDARD 2.0 : ANALYZE ARCHITECTURAL PROFESSIONAL PRACTICES</b>	
<b>PERFORMANCE STANDARD 2.1 : RESEARCH THE HISTORY OF ARCHITECTURE</b>	
2.1.1	Research and compare various architectural styles and designs used throughout history
2.1.2	Explain how historical innovations have impacted today's society
2.1.3	Describe the significance of major architects and their historical influence on the built environment
<b>PERFORMANCE STANDARD 2.2 : INVESTIGATE CAREER OPPORTUNITIES</b>	
2.2.1	Identify the primary duties and attributes of an architect
2.2.2	Explain the traditional path for becoming an architect
2.2.3	Discuss various architectural career opportunities (e.g., draftsman, designer, project manager, architect, landscape architect, and interior designer)
2.2.4	Differentiate between the relationships of all stakeholders involved in a construction project
<b>PERFORMANCE STANDARD 2.3 : ANALYZE PROFESSIONAL ETHICAL PRACTICES</b>	
2.3.1	Analyze current professional code of ethics
2.3.2	Analyze ethical architectural issues
2.3.3	Describe how ethics influence the architectural design process

**CONTENT STANDARD 3.0 : APPLY DESIGN CONCEPTS**

**PERFORMANCE STANDARD 3.1 : UTILIZE ELEMENTS OF DESIGN**

- 3.1.1 Identify the elements of design (e.g., line, shape, space, form, texture, value, and color)
- 3.1.2 Demonstrate the elements of design through various drawing techniques

**PERFORMANCE STANDARD 3.2 : UTILIZE PRINCIPLES OF DESIGN**

- 3.2.1 Identify the principles of design (e.g., balance, contrast, rhythm, repetition, movement, harmony, emphasis, unity, proportion, and variety)
- 3.2.2 Demonstrate the principles of design through various drawing techniques

**PERFORMANCE STANDARD 3.3 : APPLY THE DESIGN PROCESS**

- 3.3.1 Define the design process
- 3.3.2 Identify the different types of design processes
- 3.3.3 Describe the activities that occur during each phase of the design process
- 3.3.4 Apply the steps of the architectural design process to solve a variety of design problems

**CONTENT STANDARD 4.0 : UTILIZE DIGITAL DRAFTING TECHNIQUES****PERFORMANCE STANDARD 4.1 : UTILIZE BASIC COMPUTER AND IT SKILLS**

- |        |  |
|--------|--|
| 4.1.1  | Identify and define the various digital drafting and modeling options (e.g., CADD/BIM)         |
| 4.1.2  | Use computer hardware and input/output devices to solve drafting problems                      |
| 4.1.3  | Apply file and disk management techniques  |
| 4.1.4  | Import and export data files using various formats   |
| 4.1.5  | Access and use a network to transfer files   |
| 4.1.6  | Demonstrate the use of various storage media   |
| 4.1.7  | Demonstrate basic troubleshooting skills related to fundamental hardware and software problems |
| 4.1.8  | Utilize resources to complete drafting problems  |
| 4.1.9  | Demonstrate personal safety (i.e., electrical and mechanical hazards)                          |
| 4.1.10 | Interpret and utilize acceptable use policies (i.e., network and lab agreements)               |

**PERFORMANCE STANDARD 4.2 : UTILIZE THE CARTESIAN COORDINATE SYSTEM**

- |       |   |
|-------|---|
| 4.2.1 | Describe and utilize the Cartesian Coordinate System to create geometric shapes and objects |
| 4.2.2 | Interpret and define the right-hand rule for the x, y, and z-axes                           |
| 4.2.3 | Calculate input coordinates   |
| 4.2.4 | Utilize appropriate coordinate entry methods (i.e., absolute, relative, and polar)          |

**PERFORMANCE STANDARD 4.3 : CREATE GEOMETRIC CONSTRUCTIONS**

- |       |  |
|-------|--|
| 4.3.1 | Define geometric terms and recognize various geometric shapes by name  |
| 4.3.2 | Use lines, circles, and arcs to construct regular and irregular geometric shapes                             |
| 4.3.3 | Construct angles, to include acute, obtuse, and right angles   |
| 4.3.4 | Divide lines and bisect angles and arcs  |
| 4.3.5 | Construct tangent, concentric, and perpendicular geometric relationships                                     |
| 4.3.6 | Calculate area, perimeter, and volume of geometric shapes to include circle, square, rectangle, and triangle |

**PERFORMANCE STANDARD 4.4 : CREATE AND MODIFY DRAWINGS AND MODELS**

- |       |   |
|-------|---|
| 4.4.1 | Utilize templates   |
| 4.4.2 | Set drafting and modeling settings (e.g., grid, snap, and modes)                              |
| 4.4.3 | Utilize multiple entry methods to invoke CADD/BIM commands (e.g., hot keys, icons, and menus) |
| 4.4.4 | Utilize geometric relationships to ensure accuracy (e.g., endpoint, midpoint, and center)     |
| 4.4.5 | Create and modify objects using CADD/BIM commands   |
| 4.4.6 | Assign properties to objects (e.g., line weight, line types, scale factors, and colors)       |
| 4.4.7 | Produce drawings from sketches  |

**PERFORMANCE STANDARD 4.5 : CREATE DRAWINGS USING ORTHOGRAPHIC PROJECTION**

- 4.5.1 Determine the principle view of an object
- 4.5.2 Project from an existing view to create additional views
- 4.5.3 Identify, create, and arrange the six standard views (using properties of similarities of right angles)
- 4.5.4 Identify, create, and arrange sectional views
- 4.5.5 Identify, create, and arrange primary auxiliary views
- 4.5.6 Apply appropriate measurement units

**PERFORMANCE STANDARD 4.6 : UTILIZE SYMBOLS AND LIBRARIES**

- 4.6.1 Describe the use of symbols
- 4.6.2 Utilize and edit symbols
- 4.6.3 Create and save symbols
- 4.6.4 Assign symbol properties (e.g., attributes, parameters, and constraints)
- 4.6.5 Create and utilize symbol libraries

**PERFORMANCE STANDARD 4.7 : APPLY DIMENSIONS AND ANNOTATIONS**

- 4.7.1 Differentiate between appropriate dimension standards (i.e., ANSI and ISO)
- 4.7.2 Define, create, and modify industry standard text styles
- 4.7.3 Define, create, and modify industry standard dimension styles
- 4.7.4 Place dimensions and annotations using appropriate standards (i.e., ANSI and ISO)
- 4.7.5 Use various dimensioning styles (e.g., aligned, unidirectional, baseline, and datum)

**PERFORMANCE STANDARD 4.8 : CREATE PICTORIAL DRAWINGS**

- 4.8.1 Create oblique drawings
- 4.8.2 Create isometric drawings
- 4.8.3 Create perspective drawings

**PERFORMANCE STANDARD 4.9 : PREPARE ARCHITECTURAL CONSTRUCTION DRAWINGS**

- 4.9.1 Transcribe a floor plan from an existing plan
- 4.9.2 Transcribe a site plan from an existing plan using geographic data (e.g., GIS, maps, and aerials)
- 4.9.3 Draw an exterior elevation utilizing an existing plan
- 4.9.4 Draw a roof plan utilizing an existing plan
- 4.9.5 Draw interior elevations utilizing an existing plan
- 4.9.6 Draw building sections and details utilizing an existing plan
- 4.9.7 Draw an electrical plan utilizing an existing plan
- 4.9.8 Prepare and draft schedules (e.g., window, door, and room)

**PERFORMANCE STANDARD 4.10 : UTILIZE OUTPUT METHODS**

- |         |  |
|---------|--|
| 4.10.1  | Identify and select appropriate drafting media                     |
| 4.10.2  | Utilize sheets/layouts for plotting/printing                       |
| 4.10.3  | Scale sheets/layout views for plotting/printing                    |
| 4.10.4  | Select and utilize appropriate title blocks                        |
| 4.10.5  | Recognize plot/print areas for assigned plotter/printer            |
| 4.10.6  | Utilize plot preview function                                      |
| 4.10.7  | Plot drawings to proper scale                                      |
| 4.10.8  | Plot drawings to various output media (i.e., paper and electronic) |
| 4.10.9  | Reference external files   |
| 4.10.10 | Transmit files electronically                                      |

**CONTENT STANDARD 5.0 : APPLY ARCHITECTURAL DESIGN SKILLS**

**PERFORMANCE STANDARD 5.1 : UTILIZE BUILDING DESIGN CONCEPTS**

- 5.1.1 Compare and contrast residential and commercial building practices
- 5.1.2 Describe the different design considerations (e.g., orientation, solar, climate, and view)
- 5.1.3 Utilize the design process (e.g., problems, constraints, and solutions)
- 5.1.4 Prepare preliminary design sketches
- 5.1.5 List and describe drawings necessary for a building permit
- 5.1.6 Research the importance of construction specifications
- 5.1.7 Create a set of plans per local building permit requirements
- 5.1.8 Review and revise plans throughout the process to ensure the design objective has been met

**PERFORMANCE STANDARD 5.2 : IDENTIFY BUILDING MATERIALS**

- 5.2.1 Identify the materials used in building construction
- 5.2.2 Differentiate between the various types of material properties and their applications
- 5.2.3 Discuss the environmental impact of material usage
- 5.2.4 Explain how construction is affected by the availability, quality, and quantity of resources

**PERFORMANCE STANDARD 5.3 : UTILIZE BUILDING CODES AND REGULATIONS**

- 5.3.1 Identify various building codes and regulations (e.g., ICC, IBC, IRC, ADA, and NEC)
- 5.3.2 Research types of codes and regulations required for building construction
- 5.3.3 Explain the purpose of building codes and regulations
- 5.3.4 Describe how building codes and regulations affect the design process
- 5.3.5 Apply building codes and regulations in a design problem
- 5.3.6 Use mathematical formulas to support proper application of building codes (e.g., tables and schedules)

**PERFORMANCE STANDARD 5.4 : INVESTIGATE GREEN BUILDING STRATEGIES**

- 5.4.1 Identify agencies and their roles in regulating sustainable practices and building efficiency (e.g., USGBC and LEED)
- 5.4.2 Examine national, state, and local energy and efficiency policies
- 5.4.3 Describe how social, environmental, and financial constraints influence the design process
- 5.4.4 Describe the impact of construction on the environment
- 5.4.5 Identify the design practices that can lessen adverse impacts on the environment
- 5.4.6 Research sustainable design practices
- 5.4.7 Summarize techniques for energy efficient construction
- 5.4.8 Diagram the lifecycle of a building

<b>CONTENT STANDARD 6.0: APPLY PRESENTATION SKILLS</b>	
<b>PERFORMANCE STANDARD 6.1: CREATE AND MAINTAIN A PERSONAL PORTFOLIO</b>	
6.1.1	Research the various types of personal portfolios
6.1.2	Explain the purpose of creating personal portfolios (e.g., educational and occupational)
6.1.3	Develop and maintain an architectural portfolio that includes physical and digital works
6.1.4	Describe how portfolios are dynamic and require maintenance
<b>PERFORMANCE STANDARD 6.2: DEVELOP MODELS AND GRAPHICS</b>	
6.2.1	Develop architectural models (e.g., physical and digital)
6.2.2	Display architectural models from various viewpoints
6.2.3	Apply surface textures and materials to models
6.2.4	Create shaded and rendered presentation drawings
6.2.5	Prepare models and graphics to validate a design solution
<b>PERFORMANCE STANDARD 6.3: UTILIZE PRESENTATION SKILLS</b>	
6.3.1	Utilize architectural terminology in presentations
6.3.2	Prepare design ideas for presentation
6.3.3	Perform a visual and verbal presentation utilizing physical and digital work
<b>PERFORMANCE STANDARD 6.4: UTILIZE THE CRITIQUING PROCESS</b>	
6.4.1	Conduct peer and self-evaluations
6.4.2	Understand the elements of the critique process, including a respect for peer work and the ability to give and receive dispassionate criticism

**CROSSWALKS AND ALIGNMENTS OF  
ARCHITECTURAL DESIGN STANDARDS  
AND THE NEVADA ACADEMIC CONTENT STANDARDS  
AND THE COMMON CAREER TECHNICAL CORE STANDARDS**

**CROSSWALKS** (ACADEMIC STANDARDS)

The crosswalk of the Architectural Design Standards shows links to the Nevada Academic Content Standards in Science (based on the Next Generation Science Standards – Disciplinary Core Ideas Arrangement) and the English Language Arts and Mathematics (based on the Common Core State Standards). The crosswalk identifies the performance indicators in which the learning objectives in the Architectural Design program support academic learning. The performance indicators are grouped according to their content standard and are crosswalked to the Nevada Academic Content Standards in Science, English Language Arts, and Mathematics.

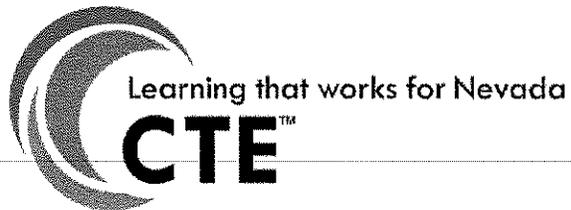
**ALIGNMENTS** (MATHEMATICAL PRACTICES)

In addition to correlation with the Nevada Academic Content Standards for Mathematics, many performance indicators support the Mathematical Practices. The following table illustrates the alignment of the Architectural Design Standards Performance Indicators and the Mathematical Practices. This alignment identifies the performance indicators in which the learning objectives in the Architectural Design program support academic learning.

**CROSSWALKS** (COMMON CAREER TECHNICAL CORE)

The crosswalk of the Architectural Design Standards shows links to the Common Career Technical Core. The crosswalk identifies the performance indicators in which the learning objectives in the Architectural Design program support the Common Career Technical Core. The Common Career Technical Core defines what students should know and be able to do after completing instruction in a program of study. The Architectural Design Standards are crosswalked to the Architecture & Construction Career Cluster™ and the Design/Pre-Construction Career Pathway.

***FOOD SCIENCE TECHNOLOGY  
STANDARDS***



This document was prepared by:

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(Being developed)

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**BUSINESS AND INDUSTRY VALIDATION**

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**PROJECT COORDINATOR**

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Nevada Department of Education

## AGRICULTURE AND NATURAL RESOURCES

### **Program Requirements**

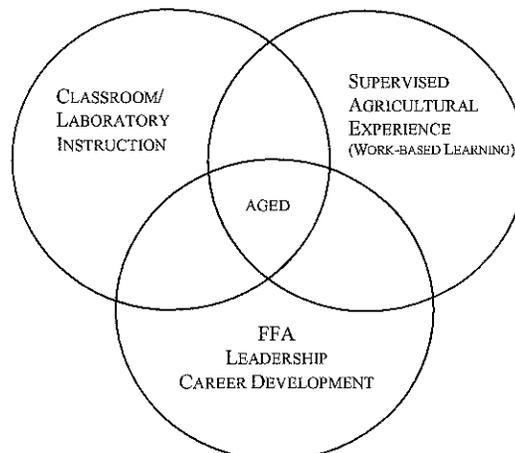
Occupations associated with agriculture production, natural resources, processing and distribution of food and fiber are important to the national interests and provide significant employment opportunities. Occupational education and training in agriculture and agri-business are essential to the continued economic health of Nevada and the nation, as it provides the needed competent and trained work force.

Agriculture education provides high school students with technical and specialized knowledge in production agriculture and natural resources as well as other specific agriculture occupations. The programs are designed to meet students' occupational objectives, interests, and abilities for entry into chosen occupations and can prepare them for advanced education and training. Agriculture education is a coordinated program of group and individual instructional activities consisting of classroom instruction, laboratory experiences, and leadership development. Integral to these activities are FFA (leadership development) and Supervised Agricultural Experience (work-based learning), Nevada Revised Statute 385.110. Federal/Public law#105-225 which was passed in August, 1998, states "Congress of the United States recognizes the importance of the FFA as an integral part of the program of Vocational Agriculture." All students enrolled in Agriculture Education will be recognized as members of the FFA organization. All secondary agriculture education programs and school districts will purchase a curriculum packet consisting of the New Horizons agriculture career and technical magazine, the FFA manual, and the Nevada Record Book on a yearly basis for every student enrolled in agriculture education in their program. Areas of study at the secondary level are divided into Agriculture Science and Specialized Advanced Agriculture Career and Technical Areas.

Agriculture and Society, Plant and Soil Science, Agriculture Mechanical Engineering and Technology, Animal Science, Leadership/FFA, Agriculture Business, Sales, Marketing and Supervised Agricultural Experience, Natural Resources, and Employability are included in the Agriculture Science introduction division.

Instruction in business/specialized agriculture provides training in specific occupational skills, duties, and tasks, as determined by the business and industry needs. Specialized career and technical agriculture programs will include, but are not limited to, the following: ornamental horticulture, floriculture design, turf and landscape management, equine science and technology, forestry technology, wildlife management and enforcement, food science and processing, feedlot management, animal science, Animal Science, agriculture power systems, natural resources and reclamation, mining science and operations, nursery and greenhouse management, landscape architecture, irrigation and chemical management, lawn care and maintenance, and agriculture construction.

### **NEVADA SCHOOL BASED AGRICULTURAL EDUCATION** Model of Instruction



## INTRODUCTION

The standards in this document are designed to clearly state what the student should know and be able to do upon completion of an advanced high school Food Science Technology program. These standards are designed for a three-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 crosswalk and alignment section of the document shows where the performance indicators support the Nevada Academic Content Standards in Science (based on the Next Generation Science Standards) and the English Language Arts and Mathematics (based on the Common Core State Standards). Where correlation with an academic content standard exists, students in the Food Science Technology program perform learning activities that support, either directly or indirectly, achievement of the academic content standards that are listed.

All students are encouraged to participate in the career and technical student organization (CTSO) that relates to their Food Science Technology program. CTOS are co-curricular national associations that directly enforce learning in the CTE classroom through curriculum resources, competitive events, and leadership development. CTOS 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 “soft 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.

Program Name	Standards Reference Code
Food Science Technology	FST

Example: FST.2.3.4

Standards	Content Standard	Performance Standard	Performance Indicator
Food Science Technology	2	3	4

**CONTENT STANDARD 1.0 : FOOD INDUSTRY AND HISTORICAL DEVELOPMENT**

**PERFORMANCE STANDARD 1.1 : EVALUATE THE SIGNIFICANCE AND IMPLICATIONS OF CHANGES AND TRENDS IN THE FOOD PRODUCTS AND PROCESSING INDUSTRY**

- |       |  |
|-------|--|
| 1.1.1 | Discuss historical changes in the food products and processing industry  |
| 1.1.2 | Evaluate current trends in the food products and processing industry (i.e., dietary food guides, niche markets, marketing trends)                                      |
| 1.1.3 | Examine issues of safety and environmental concerns in food products and processing (i.e., Genetically Modified Organisms, microorganisms, contamination, irradiation) |

**PERFORMANCE STANDARD 1.2 : INVESTIGATE INDUSTRY ORGANIZATIONS, GROUPS AND REGULATORY AGENCIES AFFECTING THE FOOD PRODUCTS AND PROCESSING INDUSTRY**

- |       |   |
|-------|---|
| 1.2.1 | Explain the purposes of organizations that are part of and/or regulate the food products and processing industry  |
| 1.2.2 | Determine the relationship between regulatory agencies (i.e., FDA, USDA, CDC, WHO, etc.) and the food products and processing industry  |
| 1.2.3 | Assess the changes in the food products and processing industry brought about by industry organizations or regulatory agencies  |
| 1.2.4 | Discuss the application of industry standards in the food products and processing industry (i.e., American Meat Science Association, Nevada Dairy Commission, Dairy Farmers of America, Nevada Cattlemen's Association) |

<b>CONTENT STANDARD 2.0 : FOOD SAFETY AND SANITATION</b>	
<b>PERFORMANCE STANDARD 2.1 : MANAGE OPERATIONAL PROCEDURES AND CREATE EQUIPMENT AND FACILITY MAINTENANCE PLANS</b>	
2.1.1	Evaluate the Sanitation Standard Operating Procedures (SSOP) of a food products and processing company
2.1.2	Justify the Good Manufacturing Practices (GMP) of a food products and processing company
2.1.3	Develop a basic equipment and facility maintenance program
<b>PERFORMANCE STANDARD 2.2 : IMPLEMENT HAZARD ANALYSIS AND CRITICAL CONTROL POINT (HACCP) PROCEDURES TO ESTABLISH OPERATING PARAMETERS</b>	
2.2.1	Outline procedures to eliminate possible contamination hazards (i.e., physical, chemical, and biological) associated with food products and processing
2.2.2	Explain the implementation of the seven principles of HACCP
2.2.3	Analyze the effectiveness of a food products and processing company's Critical Control Point procedures
<b>PERFORMANCE STANDARD 2.3 : APPLY SAFETY AND SANITATION PROCEDURES IN THE HANDLING, PROCESSING AND STORING OF FOOD PRODUCTS</b>	
2.3.1	Perform quality assurance tests on food products
2.3.2	Evaluate food product handling procedures
2.3.3	Explain the importance of microbiological tests in food product preparation, listing common spoilage and pathogenic microorganisms
2.3.4	Interpret microbiological tests for foodborne pathogens and implement corrective procedures
2.3.5	Discuss documentation procedures in a food products and processing system
<b>PERFORMANCE STANDARD 2.4 : DEMONSTRATE WORKER SAFETY PROCEDURES WITH FOOD PRODUCT AND PROCESSING EQUIPMENT AND FACILITIES</b>	
2.4.1	Outline guidelines for personnel safety in the food products and processing industry
2.4.2	Critique a facility to determine the implementation of safety procedures
2.4.3	Create a successful Crisis Management Program
2.4.4	Participate in an employee safety training (i.e., OSHA 10, <i>ServSafe</i> )
2.4.5	Describe safety in food science laboratories
2.4.6	Demonstrate proper use of common food science equipment

**CONTENT STANDARD 3.0 : THE SCIENCE OF FOOD PRODUCTS AND PROCESSING**

**PERFORMANCE STANDARD 3.1 : APPLY PRINCIPLES OF SCIENCE TO FOOD PROCESSING TO PROVIDE A SAFE, WHOLESOME, AND NUTRITIOUS FOOD SUPPLY**

- |       |   |
|-------|---|
| 3.1.1 | Design a research project in food science using the scientific method   |
| 3.1.2 | Explain how the chemical and physical properties of foods influence nutritional value and eating quality                |
| 3.1.3 | Compare and contrast the nutritive value of food and food groups  |
| 3.1.4 | Differentiate between the common food constituents (i.e., proteins, carbohydrates, fats, vitamins, minerals, and water) |
| 3.1.5 | Compare and contrast food constituents and their relative value to product taste, appearance, etc.                      |
| 3.1.6 | Describe the purpose of common food additives   |

**CONTENT STANDARD 4.0 : FOOD SELECTION AND PROCESSING****PERFORMANCE STANDARD 4.1 : UTILIZE HARVESTING, SELECTION, AND INSPECTION TECHNIQUES TO OBTAIN QUALITY FOOD PRODUCTS FOR PROCESSING**

- |       |   |
|-------|---|
| 4.1.1 | Discuss factors that affect quality and yield grades of food products   |
| 4.1.2 | Perform quality control inspections of raw food products for processing   |
| 4.1.3 | Compare and contrast accepted animal treatment and harvesting techniques  |
| 4.1.4 | Explain desirable and undesirable characteristics of both pre-mortem and post-mortem animals in relation to the production of food products |

**PERFORMANCE STANDARD 4.2 : EVALUATE, GRADE, AND CLASSIFY PROCESSED FOOD PRODUCTS**

- |       |   |
|-------|---|
| 4.2.1 | Evaluate, grade and classify processed meat, eggs, poultry, fish, and dairy products      |
| 4.2.2 | Evaluate, grade and classify processed products from fruits and vegetables                |
| 4.2.3 | Evaluate, grade and classify finished products derived from grains, legumes, and oilseeds |

## **CONTENT STANDARD 5.0 : FOOD PROCESSING AND PRESERVATION**

### **PERFORMANCE STANDARD 5.1 : PROCESS AND PRESERVE FOOD AND FOOD PRODUCTS FOR SALE AND DISTRIBUTION**

- |       |  |
|-------|--|
| 5.1.1 | Use weights and measures to formulate and package food products  |
| 5.1.2 | Evaluate foods prepared for the fresh-food market based on factors such as shelf life, shrinkage, appearance, and weight |
| 5.1.3 | Preserve foods using various methods and techniques  |
| 5.1.4 | Evaluate ready-to-use food products  |
| 5.1.5 | Analyze the foods stored in various packaging materials to retain desirable food qualities                               |
| 5.1.6 | Compare and contrast foods stored under varying conditions for quality, shelf life, and intended use                     |

### **PERFORMANCE STANDARD 5.2 : PRESENT FOOD AND FOOD PRODUCTS FOR SALE AND DISTRIBUTION**

- |       |   |
|-------|---|
| 5.2.1 | Explain the required components of a food label                                       |
| 5.2.2 | Prepare and label foods according to the established standards of regulatory agencies |
| 5.2.3 | Formulate a new food product  |

**CONTENT STANDARD 6.0: MARKETING AND SALES STRATEGIES****PERFORMANCE STANDARD 6.1: EXPLAIN THE BASICS OF DISPLAYS**

- |       |  |
|-------|--|
| 6.1.1 | Create a display of food products for sale   |
| 6.1.2 | Recognize ways of maintaining and increasing the effectiveness of food business displays |

**PERFORMANCE STANDARD 6.2: EXPLAIN THE BASICS OF SALES**

- |       |  |
|-------|--|
| 6.2.1 | Market a food product to a target audience |
| 6.2.2 | Complete a sales invoice                   |
| 6.2.3 | Use proper telephone techniques            |
| 6.2.4 | Properly handle a customer complaint       |
| 6.2.5 | Conduct a customer consultation            |

**CONTENT STANDARD 7.0 : EXPLORE CAREER OPPORTUNITIES**

**PERFORMANCE STANDARD 7.1 : UNDERSTAND EMPLOYMENT FIELDS IN THE FOOD SCIENCE TECHNOLOGY INDUSTRY**

- |       |   |
|-------|---|
| 7.1.1 | List and describe the types of employment opportunities in the Food Science Technology industry |
| 7.1.2 | Explore education and training for different Food Science Technology careers                    |
| 7.1.3 | Understand the process of choosing a career path in the Food Science Technology industry        |

**CONTENT STANDARD 8.0 : LEADERSHIP TRAINING IN FFA****PERFORMANCE STANDARD 8.1 : RECOGNIZE THE TRAITS OF EFFECTIVE LEADERS AND PARTICIPATE IN LEADERSHIP TRAINING THROUGH INVOLVEMENT IN FFA**

- |       |  |
|-------|--|
| 8.1.1 | Expand leadership experience by serving as a chapter officer or on a committee |
| 8.1.2 | Exhibit leadership skills by demonstrating proper parliamentary procedure      |
| 8.1.3 | Participate in a career development event at the local level or above          |

**PERFORMANCE STANDARD 8.2 : UNDERSTAND THE IMPORTANCE OF SCHOOL AND COMMUNITY AWARENESS**

- |       |  |
|-------|--|
| 8.2.1 | Participate in a school improvement or community development project |
|-------|--|

**CONTENT STANDARD 9.0 : SUPERVISED AGRICULTURAL EXPERIENCE (SAE)**

**PERFORMANCE STANDARD 9.1 : UNDERSTAND THE BENEFITS OF AN SAE PROGRAM**

- |       |  |
|-------|--|
| 9.1.1 | Accurately maintain SAE record books                             |
| 9.1.2 | Apply for proficiency award related to SAE program area          |
| 9.1.3 | Actively pursue necessary steps to receive higher degrees in FFA |

**CROSSWALKS AND ALIGNMENTS OF  
FOOD SCIENCE TECHNOLOGY STANDARDS  
AND THE NEVADA ACADEMIC CONTENT STANDARDS  
AND THE COMMON CAREER TECHNICAL CORE STANDARDS**

**CROSSWALKS** (ACADEMIC STANDARDS)

The crosswalk of the Food Science Technology Standards shows links to the Nevada Academic Content Standards in Science (based on the Next Generation Science Standards – Disciplinary Core Ideas Arrangement) and the English Language Arts and Mathematics (based on the Common Core State Standards). The crosswalk identifies the performance indicators in which the learning objectives in the Food Science Technology program support academic learning. The performance indicators are grouped according to their content standard and are crosswalked to the Nevada Academic Content Standards in Science, English Language Arts, and Mathematics.

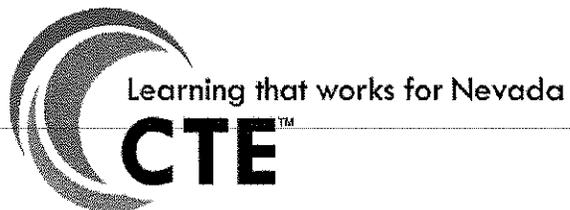
**ALIGNMENTS** (MATHEMATICAL PRACTICES)

In addition to correlation with the Nevada Academic Content Standards for Mathematics, many performance indicators support the Mathematical Practices. The following table illustrates the alignment of the Food Science Technology Standards Performance Indicators and the Mathematical Practices. This alignment identifies the performance indicators in which the learning objectives in the Food Science Technology program support academic learning.

**CROSSWALKS** (COMMON CAREER TECHNICAL CORE)

The crosswalk of the Food Science Technology Standards shows links to the Common Career Technical Core. The crosswalk identifies the performance indicators in which the learning objectives in the Food Science Technology program support the Common Career Technical Core. The Common Career Technical Core defines what students should know and be able to do after completing instruction in a program of study. The Food Science Technology Standards are crosswalked to the Agriculture, Food & Natural Resources Career Cluster™ and the Agriculture, Food & Natural Resources Career Pathway.

***MANUFACTURING  
TECHNOLOGIES  
STANDARDS***



This document was prepared by:

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July 23, 2015

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**VISION**

*All Nevadans ready for success in the 21<sup>st</sup> century*

**MISSION**

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



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## **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 was coordinated with industry experts to ensure the standards include the proper content; or (3) the adoption of nationally-recognized standards endorsed by business and industry.

The Manufacturing Technologies standards were validated through active participation of business and industry representatives on the development team and through a complete review by the Nevada Manufacturing Sector Council.

## **PROJECT COORDINATOR**

Alex Kyser, Education Programs Professional  
Skilled and Technical Sciences  
Office of Career Readiness, Adult Learning & Education Options  
Nevada Department of Education

INTRODUCTION

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Program Name	Standards Reference Code
Manufacturing Technologies	MANUF

Example: MANUF.2.3.4

Standards	Content Standard	Performance Standard	Performance Indicator
Manufacturing Technologies	2	3	4

**CONTENT STANDARD 1.0 : IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES**

**PERFORMANCE STANDARD 1.1 : DEMONSTRATE GENERAL LAB SAFETY RULES AND PROCEDURES**

- 1.1.1 Describe general shop safety rules and procedures
- 1.1.2 Demonstrate knowledge of OSHA and its role in workplace safety
- 1.1.3 Comply with the required use of personal protective equipment (PPE) during lab/shop activities
- 1.1.4 Utilize safe procedures for handling of tools and equipment
- 1.1.5 Operate lab equipment according to safety guidelines
- 1.1.6 Identify and use proper lifting procedures and proper use of support equipment
- 1.1.7 Utilize proper ventilation procedures for working within the lab/shop area
- 1.1.8 Identify marked safety areas
- 1.1.9 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
- 1.1.10 Identify the location and use of eye wash stations
- 1.1.11 Identify the location of the posted evacuation routes
- 1.1.12 Identify and wear appropriate clothing for lab/shop activities
- 1.1.13 Secure hair and jewelry for lab/shop activities
- 1.1.14 Demonstrate knowledge of the safety aspects of high voltage circuits
- 1.1.15 Locate and interpret safety data sheets (SDS)
- 1.1.16 Prepare time or job cards, reports or records
- 1.1.17 Perform housekeeping duties
- 1.1.18 Follow verbal instructions to complete work assignments
- 1.1.19 Follow written instructions to complete work assignments

**PERFORMANCE STANDARD 1.2 : IDENTIFY AND UTILIZE HAND TOOLS**

- 1.2.1 Identify hand tools and their appropriate usage
- 1.2.2 Identify standard and metric designation
- 1.2.3 Demonstrate the proper techniques when using hand tools
- 1.2.4 Demonstrate safe handling and use of appropriate tools
- 1.2.5 Demonstrate proper cleaning, storage, and maintenance of tools

**PERFORMANCE STANDARD 1.3 : IDENTIFY AND UTILIZE POWER TOOLS AND EQUIPMENT**

- 1.3.1 Identify power tools and their appropriate usage
- 1.3.2 Identify equipment and their appropriate usage
- 1.3.3 Demonstrate the proper techniques when using power tools and equipment
- 1.3.4 Demonstrate safe handling and use of appropriate power tools and equipment
- 1.3.5 Demonstrate proper cleaning, storage, and maintenance of power tools and equipment

<b>CONTENT STANDARD 2.0 : ANALYZE PROFESSIONAL PRACTICES</b>	
<b>PERFORMANCE STANDARD 2.1 : RESEARCH THE HISTORY OF MANUFACTURING</b>	
2.1.1	Research and compare manufacturing techniques used throughout history
2.1.2	Explain how historical innovations have impacted today's society
2.1.3	Describe the significant impacts manufacturing has on the environment
2.1.4	Describe the significant impacts governmental policies have on manufacturing
<b>PERFORMANCE STANDARD 2.2 : INVESTIGATE CAREER OPPORTUNITIES</b>	
2.2.1	Discuss various career opportunities in the manufacturing industry
2.2.2	Differentiate between the relationships of all stakeholders involved in the manufacturing process
2.2.3	Identify the primary duties and attributes of all stakeholders involved in the manufacturing process
2.2.4	Describe the traditional career path needed for all stakeholders involved in the manufacturing industry
<b>PERFORMANCE STANDARD 2.3 : ANALYZE PROFESSIONAL ETHICAL PRACTICES</b>	
2.3.1	Analyze current professional code of ethics
2.3.2	Analyze ethical manufacturing issues
2.3.3	Describe how ethics influence the manufacturing process

**CONTENT STANDARD 3.0 : APPLY FUNDAMENTAL ENGINEERING SKILLS**

**PERFORMANCE STANDARD 3.1 : DEMONSTRATE PRINT READING PRACTICES**

- 3.1.1 Interpret basic elements of a technical drawing (e.g., title block information, dimensions, line types, and 1<sup>st</sup> and 3<sup>rd</sup> angle projection)
- 3.1.2 Identify industry standard symbols (i.e., hydraulic, pneumatic, electrical, welding, and mechanical)
- 3.1.3 Prepare a materials list from a technical drawing
- 3.1.4 Describe various types of drawings (i.e., part, assembly, pictorial, orthographic, isometric, and schematic)
- 3.1.5 Understand dimensioning, sectional drawings, fasteners, tables, charts, and assembly drawings

**PERFORMANCE STANDARD 3.2 : UTILIZE MATHEMATICAL OPERATIONS AND MEASURING TECHNIQUES**

- 3.2.1 Identify industry standard units of measure
- 3.2.2 Convert between customary (i.e., SAE and Imperial) and metric units
- 3.2.3 Determine and apply the equivalence between fractions and decimals
- 3.2.4 Demonstrate proper use of precision measuring tools (i.e., micrometer, dial-indicator, and dial-caliper)
- 3.2.5 Utilize measurement systems to solve real manufacturing problems

**PERFORMANCE STANDARD 3.3 : DEMONSTRATE SPATIAL REASONING AND 3D MODELING TECHNIQUES**

- 3.3.1 Define spatial reasoning
- 3.3.2 Identify spatial reasoning techniques (e.g., mapping, rotating, matching, patterning, and counting)
- 3.3.3 Utilize spatial reasoning techniques to solve design problems
- 3.3.4 Prepare freehand sketches utilizing appropriate proportions
- 3.3.5 Utilize 3D modeling software to solve manufacturing design problems

**PERFORMANCE STANDARD 3.4 : UTILIZE MANUFACTURING COMMUNICATION TOOLS**

- 3.4.1 Utilize informational resources useful in manufacturing
- 3.4.2 Utilize technical writing/reading techniques to communicate
- 3.4.3 Demonstrate the use of office software to perform communication tasks

<b>CONTENT STANDARD 4.0 : APPLY FUNDAMENTAL POWER SYSTEM PRINCIPLES</b>	
<b>PERFORMANCE STANDARD 4.1 : IDENTIFY POWER SYSTEMS</b>	
4.1.1	Define terms used in power systems (e.g., power, work, horsepower, and watts)
4.1.2	Identify the basic power systems
4.1.3	List the basic elements of power systems
4.1.4	Summarize the advantages and disadvantages of various forms of power
4.1.5	Define potential and kinetic energy
4.1.6	Identify forms of potential and kinetic energy
4.1.7	Calculate the efficiency of power systems and conversion devices
4.1.8	Demonstrate the use of an energy conversion device
<b>PERFORMANCE STANDARD 4.2 : IDENTIFY AND UTILIZE BASIC MECHANICAL SYSTEMS</b>	
4.2.1	Locate and explain examples of the six simple machines, their attributes and components
4.2.2	Measure forces and distances related to mechanisms
4.2.3	Calculate mechanical advantage
4.2.4	Design, construct, and test various basic mechanical systems
<b>PERFORMANCE STANDARD 4.3 : IDENTIFY AND UTILIZE BASIC ELECTRICAL SYSTEMS</b>	
4.3.1	Define AC and DC electrical systems and terminology
4.3.2	Discuss the safety concerns of working with electricity
4.3.3	Describe the principles of generation, transmission, distribution, and storage of electricity
4.3.4	Compute values of current, resistance, and voltage using Ohm's law
4.3.5	Identify series, parallel and series-parallel (combination) circuits
4.3.6	Solve series and parallel circuits using basic laws of electricity including Kirchhoff's laws
4.3.7	Introduce single-phase and three-phase AC power
4.3.8	Construct and test simple electrical circuits from a schematic
<b>PERFORMANCE STANDARD 4.4 : IDENTIFY AND UTILIZE BASIC FLUID SYSTEMS</b>	
4.4.1	Define fluid systems (e.g., hydraulic, pneumatic, and vacuum)
4.4.2	Identify and define the components of fluid systems
4.4.3	Compare and contrast hydraulic and pneumatic systems
4.4.4	Identify the advantages and disadvantages of using fluid power systems
4.4.5	Explain the difference between gauge pressure and absolute pressure
4.4.6	Discuss the safety concerns of working with liquids and gases under pressure
4.4.7	Calculate mechanical advantage using Pascal's law
4.4.8	Calculate values in a pneumatic system, using the ideal gas laws
4.4.9	Design, construct, and test various fluid systems

**CONTENT STANDARD 5.0 : IDENTIFY AND APPLY MANUFACTURING PROCESSES**

**PERFORMANCE STANDARD 5.1 : IDENTIFY BASIC MANUFACTURING SYSTEMS**

- 5.1.1 Identify the basic processes, systems, design processes, and materials used in manufacturing
- 5.1.2 Identify and describe the major manufacturing processes
- 5.1.3 Conduct reverse engineering processes to describe the process and materials used to manufacture a given product
- 5.1.4 Describe how different manufacturing processes can be used to produce similar products

**PERFORMANCE STANDARD 5.2 : IDENTIFY MATERIAL PROPERTIES AND SCIENCE**

- 5.2.1 Identify the major material families used in manufacturing
- 5.2.2 Differentiate between the various types of materials and their usage in specific applications
- 5.2.3 Discuss the impact of material usage on the environment
- 5.2.4 Explain how production is affected by the availability, quality, and quantity of resources
- 5.2.5 Differentiate among a raw material standard stock and finished products
- 5.2.6 Analyze the effects of the environmental conditions and manufacturing processes on material properties

**PERFORMANCE STANDARD 5.3 : APPLY ADDITIVE MANUFACTURING PROCESSES**

- 5.3.1 Identify and describe additive manufacturing processes (e.g., casting, molding, and 3D printing)
- 5.3.2 Develop a list of additive operations and identify the sequence needed to make a specific product
- 5.3.3 Construct a 3D model utilizing a design software
- 5.3.4 Print a 3D model utilizing the additive process
- 5.3.5 Research plating and finishing techniques and their uses as an additive process

**PERFORMANCE STANDARD 5.4 : DEMONSTRATE SUBTRACTIVE MANUFACTURING PROCESSES**

- 5.4.1 Identify and describe subtractive manufacturing processes
- 5.4.2 Explain the computer numerical control (CNC) processes and software requirements (e.g., Cartesian coordinates, numeric code, machine code, and import/export programs)
- 5.4.3 Perform safety inspections of subtractive equipment and accessories
- 5.4.4 Demonstrate the ability to use manual and computer numerical control subtractive equipment (e.g., oxy-fuel cutting, plasma cutting, mills, lathes, drill presses, saws, routers, and grinders)
- 5.4.5 Determine appropriate tooling, cutting speeds, and feed rates
- 5.4.6 Develop a list of manual material-cutting operations and identify the sequence needed to make a specific product
- 5.4.7 Utilize manual subtractive equipment to produce a specific product
- 5.4.8 Develop a list of CNC material-cutting operations and identify the sequence needed to make a specific product
- 5.4.9 Utilize a model or drawing to develop and adjust a CNC tool path
- 5.4.10 Utilize CNC subtractive equipment to produce a specific product

**PERFORMANCE STANDARD 5.5: UTILIZE JOINING AND FASTENING MANUFACTURING PROCESSES**

- |       |  |
|-------|--|
| 5.5.1 | Identify and describe joining processes (e.g., forming, forging, and welding)              |
| 5.5.2 | Demonstrate the ability to utilize various mechanical and permanent joining processes      |
| 5.5.3 | Perform safety inspections of welding equipment and accessories                            |
| 5.5.4 | Demonstrate the ability to set-up and operate welding equipment (i.e., SMAW and GMAW)      |
| 5.5.5 | Demonstrate proper fit-up and completion of a welded joint                                 |
| 5.5.6 | Identify various fastening methods (e.g., rivets, adhesive, screws, seams, and spot welds) |
| 5.5.7 | Categorize fastening methods by appropriate applications                                   |
| 5.5.8 | Demonstrate fastening methods on various materials   |
| 5.5.9 | Manufacture a product utilizing joining and fastening processes                            |

**PERFORMANCE STANDARD 5.6: RESEARCH BUSINESS OPERATIONS AND QUALITY CONTROL**

- |       |   |
|-------|---|
| 5.6.1 | Describe the business cycle of manufacturing operations                         |
| 5.6.2 | Discuss the different types of production systems                               |
| 5.6.3 | Discuss the various manufacturing markets (e.g., local, domestic, and global)   |
| 5.6.4 | Describe Lean manufacturing and explain its importance                          |
| 5.6.5 | Describe Just-in-Time systems   |
| 5.6.6 | Identify and describe the importance of shift to shift communications           |
| 5.6.7 | Investigate the importance of quality assurance systems                         |
| 5.6.8 | Research quality control testing methods (e.g., destructive and nondestructive) |

**CONTENT STANDARD 6.0 : APPLY FUNDAMENTAL ELECTRONIC AND INSTRUMENTATION PRINCIPLES**

**PERFORMANCE STANDARD 6.1 : DEMONSTRATE ANALOG AND DIGITAL ELECTRONIC PRINCIPLES**

- 6.1.1 Demonstrate safe use of electricity and lab equipment
- 6.1.2 Understand and demonstrate basic electronic theory
- 6.1.3 Identify electronic components and their applications (e.g., resistors, capacitors, inductors, and transformers)
- 6.1.4 Utilize tools and test equipment appropriately
- 6.1.5 Measure electrical characteristics of voltage, current, and resistance in basic electronic circuits using multi-meters and oscilloscopes
- 6.1.6 Verify Ohm's law and power equations
- 6.1.7 Construct, measure, and analyze simple series, parallel, and series-parallel (combination) circuits
- 6.1.8 Demonstrate appropriate solder and de-solder techniques for electronics and electrical circuits
- 6.1.9 Demonstrate appropriate use of various connectors
- 6.1.10 Construct a simple AC circuit using passive components (i.e., resistors, inductors, and capacitors)
- 6.1.11 Construct a simple AC circuit using active components (i.e., diodes, transistors, and linear devices)
- 6.1.12 Demonstrate the appropriate use of relays and switches
- 6.1.13 Build electronic circuits utilizing basic TTL logic with AND, OR, NAND, NOR, buffer and inverter chips

**PERFORMANCE STANDARD 6.2 : DEMONSTRATE CONTROL TECHNOLOGY AND AUTOMATION PRINCIPLES**

- 6.2.1 Research the history and fundamentals of automation and control systems
- 6.2.2 Identify applications of control logic
- 6.2.3 Distinguish between programmable controllers, their components, and their functions
- 6.2.4 Interpret programming diagrams (e.g., flow charts)
- 6.2.5 Sketch programming diagrams for real world applications
- 6.2.6 Program ladder logic statements to perform a specific task
- 6.2.7 Develop ladder/relay logic application use for a programmable logic controller (PLC) to control industry specific processes
- 6.2.8 Select the most appropriate type of circuit logic for each application
- 6.2.9 Understand varying types of hardware used throughout the industry
- 6.2.10 Apply suitable commands for PLC circuits
- 6.2.11 Apply timer and counter principles to industry-related problems
- 6.2.12 Setup and test PLCs
- 6.2.13 Understand and select proper communication drivers to interface with a PLC system
- 6.2.14 Troubleshoot issues with PLCs
- 6.2.15 Perform basic maintenance with PLCs

**PERFORMANCE STANDARD 6.3 : DEMONSTRATE DIAGNOSTIC AND TROUBLESHOOTING PRACTICES**

- |        |   |
|--------|---|
| 6.3.1  | Explain a diagnostic procedure  |
| 6.3.2  | Identify the components of a safety procedure checklist   |
| 6.3.3  | Utilize all safety procedures necessary before performing a repair (e.g., lock-out/tag-out)   |
| 6.3.4  | Navigate through user software  |
| 6.3.5  | Understand and use software instructions offered in user software   |
| 6.3.6  | Develop a routine maintenance plan  |
| 6.3.7  | Utilize various repair, maintenance, and troubleshooting resources (e.g., print media, electronic, tech support, and local experts) |
| 6.3.8  | Use manufacturer's documentation for troubleshooting  |
| 6.3.9  | Utilize diagnostic tools appropriately  |
| 6.3.10 | Troubleshoot and repair common problems   |

**CROSSWALKS AND ALIGNMENTS OF  
MANUFACTURING TECHNOLOGIES STANDARDS  
AND THE NEVADA ACADEMIC CONTENT STANDARDS  
AND THE COMMON CAREER TECHNICAL CORE STANDARDS**

**CROSSWALKS** (ACADEMIC STANDARDS)

The crosswalk of the Manufacturing Technologies Standards shows links to the Nevada Academic Content Standards in Science (based on the Next Generation Science Standards – Disciplinary Core Ideas Arrangement) and the English Language Arts and Mathematics (based on the Common Core State Standards). The crosswalk identifies the performance indicators in which the learning objectives in the Manufacturing Technologies program support academic learning. The performance indicators are grouped according to their content standard and are crosswalked to the Nevada Academic Content Standards in Science, English Language Arts, and Mathematics.

**ALIGNMENTS** (MATHEMATICAL PRACTICES)

In addition to correlation with the Nevada Academic Content Standards for Mathematics, many performance indicators support the Mathematical Practices. The following table illustrates the alignment of the Manufacturing Technologies Standards Performance Indicators and the Mathematical Practices. This alignment identifies the performance indicators in which the learning objectives in the Manufacturing Technologies program support academic learning.

**CROSSWALKS** (COMMON CAREER TECHNICAL CORE)

The crosswalk of the Manufacturing Technologies Standards shows links to the Common Career Technical Core. The crosswalk identifies the performance indicators in which the learning objectives in the Manufacturing Technologies program support the Common Career Technical Core. The Common Career Technical Core defines what students should know and be able to do after completing instruction in a program of study. The Manufacturing Technologies Standards are crosswalked to the Manufacturing Career Cluster™ and the Production Career Pathway.

**CROSSWALK OF MANUFACTURING TECHNOLOGIES STANDARDS  
AND THE NEVADA ACADEMIC CONTENT STANDARDS**

**CONTENT STANDARD 1.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES**

Performance Indicators	Nevada Academic Content Standards
1.1.1	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>
1.1.2	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p><b><u>English Language Arts: Speaking and Listening Standards</u></b> SL.11-12.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well reasoned exchange of ideas.</p>
1.1.9	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>
1.1.15	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b> RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p> <p>RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</p> <p>RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p>
1.1.16	<p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>

<p>1.1.18</p>	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>                  RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p><b><u>English Language Arts: Speaking and Listening Standards</u></b>                  SL.11-12.1d Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.</p>
<p>1.1.19</p>	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>                  RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>

## CONTENT STANDARD 2.0: ANALYZE PROFESSIONAL PRACTICES

Performance Indicators	Nevada Academic Content Standards
2.1.1	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
2.1.2	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b> SL.11-12.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well reasoned exchange of ideas.</p>
2.1.3	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
2.1.4	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
2.2.1	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b> SL.11-12.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well reasoned exchange of ideas.</p>
2.2.2	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>

<p>2.2.4</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
<p>2.3.1</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
<p>2.3.2</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
<p>2.3.3</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>
	<p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>

## CONTENT STANDARD 3.0: APPLY FUNDAMENTAL ENGINEERING SKILLS

Performance Indicators	Nevada Academic Content Standards
3.1.1	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>            RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</p>
3.1.2	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>            RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</p>
3.1.3	<p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>            WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>
3.1.4	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>            RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>            WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
3.3.3	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>            RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
3.4.1	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>            RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>
3.4.2	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>            RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>            WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
3.4.3	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>            RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>

CONTENT STANDARD 4.0: APPLY FUNDAMENTAL POWER SYSTEM PRINCIPLES

Performance Indicators	Nevada Academic Content Standards
4.1.4	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                      WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
4.1.8	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p><b><u>English Language Arts: Speaking and Listening Standards</u></b>                      SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>
4.2.1	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                      WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
4.2.4	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
4.3.2	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b>                      SL.11-12.2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> <p>SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>
4.3.3	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                      WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>

4.3.8	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>  RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
4.4.3	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
4.4.5	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
4.4.6	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b>  SL.11-12.2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> <p>SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>
4.4.9	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>  RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>

CONTENT STANDARD 5.0: IDENTIFY AND APPLY MANUFACTURING PROCESSES

Performance Indicators	Nevada Academic Content Standards
5.1.3	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
5.1.4	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                      WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
5.2.2	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>                      RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p>
5.2.3	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b>                      SL.11-12.2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> <p>SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                      WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
5.2.4	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                      RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                      WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>
5.2.5	<p><b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b>                      RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p>

5.2.6	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
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5.3.2	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
5.3.5	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
5.4.1	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
5.4.2	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b> SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</p>
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5.4.5	<b><u>English Language Arts: Reading Standards for Literacy in Science and Technical Subjects</u></b> RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
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5.5.1	<b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. <b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
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5.5.7	<b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5.5.8	<b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

5.6.1	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
5.6.2	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b> SL.11-12.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well reasoned exchange of ideas.</p>
5.6.3	<p><b><u>English Language Arts: Speaking and Listening Standards</u></b> SL.11-12.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well reasoned exchange of ideas.</p>
5.6.4	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
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<p>5.6.8</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
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## CONTENT STANDARD 6.0: APPLY FUNDAMENTAL ELECTRONIC AND INSTRUMENTATION PRINCIPLES

Performance Indicators	Nevada Academic Content Standards
6.1.6	<p><b><u>Math: Algebra – Creating Equations</u></b> A-CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.</p> <p><b><u>Math: Algebra – Reasoning with Equations and Inequalities</u></b> A-REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</p> <p><b><u>Math: Functions – Linear, Quadratic, and Exponential Models</u></b> F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context.</p>
6.1.7	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
6.1.10	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
6.1.11	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
6.2.1	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
6.2.4	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b> WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
6.2.6	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
6.2.12	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
6.2.14	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b> RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>

<p>6.3.1</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p><b><u>English Language Arts: Writing Standards for Literacy in Science and Technical Subjects</u></b>                  WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
<p>6.3.3</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>
<p>6.3.8</p>	<p><b><u>English Language Arts: Reading Standards for Literacy</u></b>                  RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>

**ALIGNMENT OF MANUFACTURING TECHNOLOGIES STANDARDS  
AND THE MATHEMATICAL PRACTICES**

Mathematical Practices	Manufacturing Technologies Performance Indicators
1. Make sense of problems and persevere in solving them.	
2. Reason abstractly and quantitatively.	4.1.7; 4.2.2, 4.2.3; 4.3.4, 4.3.6; 4.4.7, 4.4.8 6.1.6
3. Construct viable arguments and critique the reasoning of others.	6.1.6, 6.1.7
4. Model with mathematics.	
5. Use appropriate tools strategically.	3.2.2, 3.2.3, 3.2.4, 3.2.5; 3.3.3, 3.3.5 4.1.7; 4.2.2, 4.2.3; 4.3.4, 4.3.6; 4.4.7, 4.4.8 6.1.5, 6.1.7; 6.2.11
6. Attend to precision.	3.2.2, 3.2.3, 3.2.5; 3.3.3, 3.3.5 4.1.7; 4.2.2, 4.2.3; 4.3.4, 4.3.6; 4.4.7, 4.4.8 6.1.5, 6.1.6
7. Look for and make use of structure.	4.1.7
8. Look for and express regularity in repeated reasoning.	3.3.3

**CROSSWALKS OF MANUFACTURING TECHNOLOGIES STANDARDS  
AND THE COMMON CAREER TECHNICAL CORE**

<b>Manufacturing Career Cluster™ (MN)</b>	<b>Performance Indicators</b>
1. Evaluate the nature and scope of the Manufacturing Career Cluster™ and the role of manufacturing in society and in the economy.	5.2.4, 5.2.3
2. Analyze and summarize how manufacturing businesses improve performance.	5.6.1 - 5.6.8
3. Comply with federal, state and local regulations to ensure worker safety and health and environmental work practices.	1.1.1 - 1.1.19 5.4.3; 5.5.3
4. Describe career opportunities and means to achieve those opportunities in each of the Manufacturing Career Pathways.	2.2.1 - 2.2.4
5. Describe government policies and industry standards that apply to manufacturing.	2.1.4
6. Demonstrate workplace knowledge and skills common to manufacturing.	5.2.1 - 5.5.9

<b>Production Career Pathway (MN-PRO)</b>	<b>Performance Indicators</b>
1. Diagnose production process problems and take corrective action to meet production quality standards.	5.6.7, 5.6.8
2. Manage safe and healthy production working conditions and environmental risks.	1.1.1 - 1.1.19
3. Make continuous improvement recommendations based on results of production process audits and inspections.	5.6.7
4. Coordinate work teams when producing products to enhance production process and performance.	5.6.6
5. Demonstrate the safe use of manufacturing equipment.	1.1.4; 1.3.3, 1.3.4