

Heating, Ventilation, Air Conditioning, and Refrigeration Supplemental Program Resources



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Introduction

This document provides supplemental information for the Heating, Ventilation, Air Conditioning, and Refrigeration program of study. It may be updated or revised as the base program of study, or complementary programs, are updated, added, or removed. Please contact the appropriate Education Programs Professional with any questions.

The Program of Study includes the approved courses, complementary courses, alignment(s) to industry, postsecondary options, and additional information.

The Equipment List for the Heating, Ventilation, Air Conditioning, and Refrigeration program of study is included and, if applicable, additional items used only in the complementary course(s) are noted.

The Crosswalks and Alignments connect and support the Heating, Ventilation, Air Conditioning, and Refrigeration standards for the Architecture and Construction program of study. Complementary course standards are not listed in the crosswalks and alignments.

Program of Study Information

The following program of study information sheet as well as the program structure tables for the courses are provided to be able to print separately for handouts. The information provided is based on the best available information at the time of this document and will be updated as appropriate.

Heating, Ventilation, Air Conditioning, and Refrigeration



The heating, ventilation, air conditioning, and refrigeration program provides students with the opportunity to develop technical skills that are used in the HVACR industry. Areas include an introduction to HVACR, trade mathematics, thermodynamics, components of the refrigeration cycle, basic electricity, introduction to heating and combustion, piping principles, soldering, and brazing, compressors, refrigerants, and metering devices.

Architecture and Construction Career Cluster

Architecture and Construction is focused on careers in designing, planning, managing, building, and maintaining the built environment.

Postsecondary Options

Secondary

- Certificate of Skills Attainment

Certificate/License

- Public Infection Control (WNC)

Associates Degree

- Applied Science (WNC)
- Medical Laboratory Technician (CSN)

Bachelor's Degree

- Biological Science (UNLV, UNR, TMCC, CSN, WNC)
- Public Health (UNLV, UNR, WNC)
- Microbiology & Immunology (UNR)

Master's/Doctoral Degree

- Biological Science (UNLV, UNR)
- Biomedical Engineering (UNR)
- Public Health (UNLV, UNR)



For additional information on this cluster, please contact:

Jennifer Kazarian at jennifer.kazarian@doe.nv.gov

Website: <https://doe.nv.gov/CTE/>

Approved Courses

Heating, Ventilation, Air Conditioning, and Refrigeration I
Heating, Ventilation, Air Conditioning, and Refrigeration II
Heating, Ventilation, Air Conditioning, and Refrigeration II Lab

Complementary Courses

Heating, Ventilation, Air Conditioning, and Refrigeration Advanced Studies
Intermediate Heating, Ventilation, Air Conditioning, and Refrigeration
CTE Work Experience – Architecture and Construction
IRC – Heating, Ventilation, Air Conditioning, and Refrigeration

Work-Based Learning Opportunities

Job Shadowing / Internship / Work Experience / Career Days / Career Fairs / Field Trips / Guest Speakers

Career and Technical Student Organization

SkillsUSA



State Recognized Industry Certifications

Refer to the Governor's Office of Innovation's
[Nevada Eligible Industry Credentialing List](#)

Aligned to Industry			
Occupation	Median Wage Per year	Annual Openings	% Growth
Biochemist	\$102,207	3,200	5.0%
Biomedical Engineer	\$97,410	1,400	6.0%
Biostatistician	\$96,280	5,200	33.0%
Physician/ Surgeon	\$208,000	22,700	3.0%
Laboratory Technician	\$57,800	25,900	11.0%

Source U.S. Bureau of Labor Statistics 2022

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Program Structure for Heating, Ventilation, Air Conditioning, and Refrigeration

The core course sequencing is provided in the following table. Complementary Courses are available and provided later in this document. The following courses provides a completed program of study. The Lab is a complementary course available concurrently with the Heating, Ventilation, Air Conditioning, and Refrigeration II course.

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

Required/ Complementary	Course Title	Abbreviated Name	CIP Code	SCED Subject Area	SCED Course Identifier	SCED Course Level	SCED Unit Credit	SCED Course Sequence	SCED Course Number
R	Heating, Ventilation, Air Conditioning, and Refrigeration I	HVACR I	47.0201	17	055	G	1.00	12	17055G1.0012
R	Heating, Ventilation, Air Conditioning, and Refrigeration II	HVACR II	47.0201	17	055	G	1.00	22	17055G1.0022
C	Heating, Ventilation, Air Conditioning, and Refrigeration II LAB	HVACR II L	47.0201	17	055	E	1.00	22	17055E1.0022

The complementary courses are provided in the following table. **The qualifying program of study must be completed prior to enrolling in the complementary course(s).** A program does not have to utilize the complementary courses for students to complete their program of study.

Required/ Complementary	Course Title	Abbreviated Name	CIP Code	SCED Subject Area	SCED Course Identifier	SCED Course Level	SCED Unit Credit	SCED Course Sequence	SCED Course Number
C	Intermediate Heating, Ventilation, Air Conditioning, and Refrigeration	INT HVACR	47.0201	17	055	E	1.00	11	17055E1.0011
C	Heating, Ventilation, Air Conditioning, and Refrigeration Advanced Studies	HVACR AS	47.0201	17	055	E	1.00	11	17055E1.0011
C	Industry Recognized Credential - Heating, Ventilation, Air Conditioning, and Refrigeration	IRC HVACR	47.0102	17	999	E	1	11	17999E1.0011
C	CTE Work Experience - Architecture and Construction	WORK EXPER CONST	99.0002	17	998	G	1.00	11	G1.0011

CIP Code – Classification of Instructional Programs (CIP) Codes

SCED – School Courses for the Exchange of Data that populates the State Infinite Campus System and the System for Accountability Information in Nevada (SAIN)

Course Descriptions

Heating, Ventilation, Air Conditioning, and Refrigeration I

Prerequisite: None

This course will introduce students to Heating, Ventilation, and Air Conditioning (HVAC). Through a hands-on approach, each student will develop basic understanding in the areas of HVAC: safety, blueprint reading, principles that guide installation and service, electrical components, thermodynamics and heat transfer, and an introduction to heating and refrigeration systems. Practical application of safe work habits and the correct use of tools and equipment will be emphasized throughout this course.

Heating, Ventilation, Air Conditioning, and Refrigeration II

Prerequisite: Heating, Ventilation, Air Conditioning, and Refrigeration I

This course is a continuation of Heating, Ventilation, Air Conditioning, and Refrigeration I. This course provides intermediate HVAC students with knowledge and skills in piping principles, compressors, aspects of refrigerants, and metering devices. The appropriate use of technology and industry-standard equipment is an integral part of this course. Upon successful completion of this course, students will have acquired entry-level skills for employment and be prepared for postsecondary education.

Heating, Ventilation, Air Conditioning, and Refrigeration II LAB

Prerequisite: Concurrent enrollment in Heating, Ventilation, Air Conditioning, and Refrigeration II

This course is designed to expand the students' opportunities for applied learning. This course provides an in-depth lab experience that applies the processes, concepts, and principles as described in the classroom instruction. The coursework will encourage students to explore and develop advanced skills in their program area. The appropriate use of technology and industry-standard equipment is an integral part of this course.

Heating, Ventilation, Air Conditioning, and Refrigeration Advanced Studies

Prerequisite: Completion of Heating, Ventilation, Air Conditioning, and Refrigeration Program of Study

This course is offered to students who have completed all content standards in a program and desire to pursue advanced study through investigation and in-depth research. Students are expected to work independently or in a team and consult with their supervising teacher for guidance. The supervising teacher will give directions, monitor, and evaluate the students' topic of study. Coursework may include various work-based learning experiences such as internships and job shadowing, involvement in a school-based enterprise, completion of a capstone project, and/or portfolio development. This course may be repeated for additional instruction and credit.

Intermediate Heating, Ventilation, Air Conditioning, and Refrigeration

Prerequisite: Completion of Heating, Ventilation, Air Conditioning, and Refrigeration Program of Study

This course is a continuation of Heating, Ventilation, Air Conditioning, and Refrigeration II. This course provides advanced HVAC students with knowledge and skills in air distribution systems, heat pumps, common types of duct work, commercial airside systems, indoor air quality and hydronic systems. Through hands-on projects, students develop technical skills that are used throughout the HVAC industry. The appropriate use of technology and industry-standard equipment is an integral part of this course.

Industry-Recognized Credential – Heating, Ventilation, Air Conditioning, and Refrigeration

Prerequisite: Completion of Heating, Ventilation, Air Conditioning, and Refrigeration Program of Study

This course is offered to students who have completed all content standards in a program of study and desire to pursue an Industry-Recognized Credential that aligns with the standards and skills associated with the Heating, Ventilation, Air Conditioning, and Refrigeration Program of Study. This course is designed to expand the students' opportunities to pursue certification aligned with employment standards in the industry aligned with this program of study. The supervising teacher will provide instruction aligned with the certification requirements, monitor progress toward certification, and provide the students with appropriate testing or certification opportunities associated with the intended Industry-Recognized Credential that is the subject of the course. This course may be repeated for additional instruction and credit.

CTE Work Experience – Architecture and Construction

Prerequisite: Completion of Level 2 course in the qualifying program of study

This course is designed to expand the students' opportunities for applied learning. This course provides an in-depth CTE work experience that applies the processes, concepts, and principles as described in the classroom instruction. This course will encourage students to explore and develop advanced skills through work-based learning directly related to the program of study. The course must follow NAC 389.562, 389.564, 389.566 regulations.

Equipment List

This recommended list is based upon a classroom size of 25 students. All costs are estimated and may be adjusted once verified and justified by districts with current quotes. No specific equipment vendor or brand names are endorsed due to various possibilities, but school districts should consult with stakeholders to ensure industry-recognized equipment and software are purchased. The intent of this list is to provide school districts with guidance on the equipment needed to implement the state standards for a Heating, Ventilation, Air Conditioning, and Refrigeration program.

CTE Classroom Equipment

Total:

\$17,210

QTY	ITEM DESCRIPTION	UNIT	TOTAL
25	Student Workstations w/chairs	\$400	\$10,000
1	Teacher Workstation w/chair	\$400	\$400
1	Teacher Computer (enhanced memory/storage, download capable)	\$1,400	\$1,400
1	Presentation Equipment (e.g., interactive whiteboard (IWB), or other interactive display system with software and accessories)	\$3,000	\$3,000
1	Networkable Laser Printer (black/white or color)	\$400	\$400
1	Vertical File Cabinet (lockable)	\$330	\$330
2	Storage Cabinets (36" x 12" x 72") (lockable)	\$300	\$600
2	Bookcases (36" x 12" x 42")	\$115	\$230
2	White Boards (4' x 8')	\$110	\$220
1	Eyewash Station	\$300	\$300
1	Fire Extinguisher	\$130	\$130
1	Sink with Soap Dispenser	\$100	\$100
1	First Aid Kit	\$100	\$100

Program Equipment

Total:

\$53,400

QTY	ITEM DESCRIPTION	UNIT	TOTAL
25	Student Computers	\$1,000	\$25,000
1	Technology Storage/Charging System	\$2,000	\$2,000
1	Gas Cylinder Storage	\$3,500	\$3,500
1	Heavy Duty Shop Toolbox	\$1,100	\$1,100
12	HVAC Simulators – Heating Units	\$1,000	\$12,000
1	Storage Cabinet for Eye Protection Equipment	\$800	\$800
12	HVAC Simulators – Condenser Units	\$750	\$9,000

Supplemental Program Resources

2022

Instructional Materials

Total:

\$3,000

QTY	ITEM DESCRIPTION	UNIT	TOTAL
25	Student Textbooks (Approved by NDE) CTE Instructional Materials list can be found here .	\$100	\$2,500
1	Teacher Textbook Edition and Resources	\$500	\$500

Instructional Supplies

Total:

\$48,000

QTY	ITEM DESCRIPTION	UNIT	TOTAL
Varies	HVAC Simulator Supplies (twin recovery machines, 2 stage direct drive vacuum pumps, refrigerant charging scales, hoses, ratchet wrenches, horizontal conversion kits, down flow conversion kits, multi-position coils, etc.)	\$20,000	\$20,000
Varies	Student Toolboxes with Supplies (toolboxes, nut driver sets, 11-in-1 screwdriver/nut driver/valve core tools, long nose multi-purpose tools, high leverage diagonal cutting pliers, crimping/cutting tools, long nose pliers-side cutting, adjustable wrenches, mini cutters, mini tubing cutters, deburring tools, hex keys for service valve wrench, universal flare/burnishing tools, etc.)	\$10,000	\$10,000
Varies	Project Supplies (acrylonitrile-butadiene-styrene [ABS] pipe, ABS glue, copper pipe and fittings, solder, concrete mortar, cinder blocks, electrical wire, calculators, drywall, tape, texture, lumber, nails, screws, etc.)	\$10,000	\$10,000
Varies	Hand Tools (hammers, chisels, screwdrivers, wrenches, socket sets, pliers, wire cutters, chalk lines, hand saws, files/rasps, utility knives, shovels, picks, clamps, come-alongs, etc.)	\$3,000	\$3,000
Varies	Electrical Training Units (light bulbs, 5-amp single pole switches, metal electrical outlets, 250-volt outlet box lamp holders, microwave fuse holder blocks, various fuses and wire)	\$2,500	\$2,500
Varies	PPE (safety glasses, work gloves, masks etc.)	\$1,000	\$1,000
Varies	Measuring devices (measuring tapes, rulers, plumb bobs, levels)	\$1,000	\$1,000
Varies	Computer Accessories (cases, covers, etc.)	\$500	\$500

Other

Total:

\$300

QTY	ITEM DESCRIPTION	UNIT	TOTAL
1	Occupational Safety and Health Administration (OSHA) Instructor Training	\$300	\$300

Category Totals:

Classroom Equipment	\$17,210
Program Equipment	\$53,400
Instructional Materials	\$3,000
Instructional Supplies	\$48,000
Other	\$300

Estimated Program Total

\$107,890

Crosswalks and Alignments for Program of Study Standards

Crosswalks and alignments are intended to assist the teacher make connections for students between the technical skills within the program and academic standards. The crosswalks and alignments are not intended to teach the academic standards but to assist students in making meaningful connections between their CTE program of study and academic courses. The crosswalks are for the required program of study courses, not the complementary courses.

Crosswalks (Academic Standards)

The crosswalks of the Heating, Ventilation, Air Conditioning, and Refrigeration Standards show connections with the Nevada Academic Content Standards. The crosswalk identifies the performance indicators in which the learning objectives in the Heating, Ventilation, Air Conditioning, and Refrigeration program connect with and support academic learning. The performance indicators are grouped according to their content standard and are crosswalked to the Nevada Academic Content Standards in English Language Arts, Mathematics, and Science.

Alignments (Mathematical Practices)

In addition to connections with the Nevada Academic Content Standards for Mathematics, many performance indicators support the Mathematical Practices. The following table illustrates the alignment of the Heating, Ventilation, Air Conditioning, and Refrigeration Standards Performance Indicators and the Mathematical Practices. This alignment identifies the performance indicators in which the learning objectives in the Heating, Ventilation, Air Conditioning, and Refrigeration program connect with and support academic learning.

Alignments (Science and Engineering Practices)

In addition to connections with the Nevada Academic Content Standards for Science, many performance indicators support the Science and Engineering Practices. The following table illustrates the alignment of the Heating, Ventilation, Air Conditioning, and Refrigeration Standards Performance Indicators and the Science and Engineering Practices. This alignment identifies the performance indicators in which the learning objectives in the Heating, Ventilation, Air Conditioning, and Refrigeration program connect with and support academic learning.

Crosswalks (Common Career Technical Core)

The crosswalks of the Heating, Ventilation, Air Conditioning, and Refrigeration Standards show connections with the Common Career Technical Core. The crosswalk identifies the performance indicators in which the learning objectives in the Heating, Ventilation, Air Conditioning, and Refrigeration program connect with and 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 Heating, Ventilation, Air Conditioning, and Refrigeration Standards are crosswalked to the Architecture and Construction Career Cluster™ and the Maintenance/Operations Career Pathway.

Crosswalk of Heating, Ventilation, Air Conditioning, and Refrigeration Program of Study Standards and the Nevada Academic Content Standards (possibly more than one)

English Language Arts: Language Standards

Nevada Academic Content Standards		Performance Indicators
L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	1.5.2

English Language Arts: Reading Standards for Literacy in Science and Technical Subjects

Nevada Academic Content Standards		Performance Indicators
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.	2.1.15, 3.4.1, 3.4.2
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.	2.1.1, 2.1.4, 2.1.7, 2.1.9, 2.1.14, 2.1.17, 2.2.3, 2.2.4, 2.2.5, 2.3.3, 2.3.4, 2.3.5, 3.3.5, 5.2.2, 5.2.3, 6.2.2, 6.3.1, 6.3.2, 6.3.8
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.	2.1.15
RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.	2.1.15
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	3.1.3, 3.1.4, 3.1.6, 3.3.1, 3.4.5, 4.2.2, 4.2.3, 5.1.2, 5.1.4, 5.2.4, 5.3.1, 5.4.1, 5.4.2, 6.1.3, 6.3.4, 7.1.1, 7.2.1, 7.2.2, 7.2.4, 7.2.5, 8.1.1, 8.1.3, 8.1.4, 8.2.2, 8.3.4, 9.1.1, 9.2.2, 9.2.3, 9.4.1, 9.4.2, 9.4.3, 9.5.1, 9.5.2, 9.5.3, 9.5.4, 9.6.2, 9.6.4, 9.8.3, 9.8.4, 10.1.1, 10.1.2, 10.2.1, 10.2.2, 11.1.1, 11.2.2, 11.4.3, 11.4.4, 11.4.5, 11.5.2

		11.6.1, 11.6.2, 11.9.1 12.1.2, 12.2.3, 12.3.5
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.	2.1.1, 2.1.2, 2.1.9, 2.1.14 2.2.3, 2.2.4, 2.2.5, 2.3.3 2.3.4, 2.3.5, 3.1.1, 3.1.3 3.1.4, 3.1.6, 3.2.7, 3.3.1 3.3.6, 3.4.1, 3.4.2, 3.4.5 4.1.1, 4.1.2, 4.1.3, 4.1.4 4.2.2, 4.2.3, 5.1.2, 5.1.4 5.2.4, 5.3.1, 5.4.1, 5.4.2 6.1.2, 6.1.3, 6.1.5, 6.1.6 6.1.7, 6.1.8, 6.1.16, 6.2.1 6.2.4, 6.2.5, 6.2.6, 6.2.7 6.2.8, 6.2.9, 6.2.10, 6.2.11 6.3.4, 6.3.5, 6.3.6, 7.1.1 7.2.1, 7.2.2, 7.2.4, 7.2.5 8.1.1, 8.1.3, 8.1.4, 8.2.2 8.3.4, 9.1.1, 9.2.2, 9.2.3 9.4.1, 9.4.2, 9.4.3, 9.5.1 9.5.2, 9.5.3, 9.5.4, 9.6.2 9.6.4, 9.8.1, 9.8.2, 9.8.3 9.8.4, 10.1.1, 10.1.2 10.2.1, 10.2.2, 10.4.1 10.4.2, 11.1.1, 11.2.2 11.3.1, 11.3.2, 11.4.2 11.4.3, 11.4.4, 11.4.5 11.5.2, 11.6.1, 11.6.2 11.7.2, 11.8.1, 11.8.2 11.9.1, 11.9.2, 12.1.1 12.1.2, 12.1.3, 12.2.1 12.2.2, 12.2.3, 12.3.1 12.3.2, 12.3.3, 12.3.4 12.3.5

English Language Arts: Speaking and Listening Standards

Nevada Academic Content Standards		Performance Indicators
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.	1.1.1, 1.1.2, 1.2.1, 1.2.4 1.4.2, 1.5.2, 2.1.17, 3.1.1 3.2.7, 3.3.1, 3.4.5, 4.2.2 4.2.3, 5.1.2, 5.1.4, 5.2.4 5.3.1, 5.4.1, 5.4.2, 6.1.3 6.3.4, 7.1.1, 7.2.1, 7.2.2 7.2.4, 7.2.5, 8.1.1, 8.1.3 8.1.4, 8.2.2, 8.3.4, 9.1.1 9.2.2, 9.2.3, 9.4.1, 9.4.2 9.4.3, 9.5.1, 9.5.2, 9.5.3 9.5.4, 9.6.2, 9.6.4, 9.8.3 9.8.4, 10.1.1, 10.1.2 10.2.1, 10.2.2, 11.1.1 11.2.2, 11.4.2, 11.4.3 11.4.4, 11.4.5, 11.5.2 11.6.1, 11.6.2, 11.9.1 12.1.2, 12.2.3, 12.3.5
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.	2.1.9, 2.1.14, 2.2.3, 2.2.4 2.2.5, 2.3.3, 2.3.4, 2.3.5
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.	1.1.1, 1.1.2, 1.2.1, 1.2.4 1.4.2, 2.1.17, 3.4.5, 4.2.2 4.2.3, 5.1.2, 5.1.4, 5.2.4 5.3.1, 5.4.1, 5.4.2, 6.1.3 6.3.4, 7.1.1, 7.2.1, 7.2.2 7.2.4, 7.2.5, 8.1.1, 8.1.3 8.1.4, 8.2.2, 8.3.4, 9.1.1 9.2.2, 9.2.3, 9.4.1, 9.4.2 9.4.3, 9.5.1, 9.5.2, 9.5.3 9.5.4, 9.6.2, 9.6.4, 9.8.3 9.8.4, 10.1.1, 10.1.2 10.2.1, 10.2.2, 11.1.1 11.2.2, 11.4.3, 11.4.4 11.4.5, 11.5.2, 11.6.1 11.6.2, 11.9.1, 12.1.2 12.2.3, 12.3.5
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,	1.1.1, 1.1.2, 1.2.1, 1.2.4 1.4.2, 1.5.2, 2.1.17, 3.2.7 3.4.5, 4.2.2, 4.2.3, 5.1.2 5.1.4, 5.2.4, 5.3.1, 5.4.1

substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.	5.4.2, 6.1.3, 6.3.4, 7.1.1 7.2.1, 7.2.2, 7.2.4, 7.2.5 8.1.1, 8.1.3, 8.1.4, 8.2.2 8.3.4, 9.1.1, 9.2.2, 9.2.3 9.4.1, 9.4.2, 9.4.3, 9.5.1 9.5.2, 9.5.3, 9.5.4, 9.6.2 9.6.4, 9.8.3, 9.8.4, 10.1.1 10.1.2, 10.2.1, 10.2.2 11.1.1, 11.2.2, 11.4.2 11.4.3, 11.4.4, 11.4.5 11.5.2, 11.6.1, 11.6.2 11.9.1, 12.1.2, 12.2.3 12.3.5
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English Language Arts: Writing Standards for Literacy in Science and Technical Subjects

Nevada Academic Content Standards		Performance Indicators
WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	1.2.5, 1.4.1, 2.1.1, 2.1.15 3.1.1, 3.2.7
WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	1.4.4
WHST.11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	1.4.5
WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	4.1.1, 4.1.2, 4.1.3, 4.1.4 6.1.2, 6.1.5, 6.1.6, 6.1.7 6.1.8, 6.1.16, 6.2.1, 6.2.4 6.2.5, 6.2.6, 6.2.7, 6.2.8 6.2.9, 6.2.10, 6.2.11, 6.3.5 6.3.6, 9.8.1, 9.8.2, 10.4.1 10.4.2, 11.3.1, 11.3.2 11.7.2, 11.8.1, 11.8.2 11.9.2, 12.1.1, 12.1.3 12.2.1, 12.2.2, 12.3.1 12.3.2, 12.3.3, 12.3.4 3.4.1, 3.4.2
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	3.3.6, 1.1.2, 1.1.3, 1.4.2 1.4.3, 1.5.2, 3.4.5, 4.1.1 4.1.2, 4.1.3, 4.1.4, 4.2.2 4.2.3, 5.1.2, 5.1.4, 5.2.4

the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	5.3.1, 5.4.1, 5.4.2, 6.1.2 6.1.3, 6.1.5, 6.1.6, 6.1.7 6.1.8, 6.1.16, 6.2.1, 6.2.4 6.2.5, 6.2.6, 6.2.7, 6.2.8 6.2.9, 6.2.10, 6.2.11, 6.3.4 6.3.5, 6.3.6, 7.1.1, 7.2.1 7.2.2, 7.2.4, 7.2.5, 8.1.1 8.1.3, 8.1.4, 8.2.2, 8.3.4 9.1.1, 9.2.2, 9.2.3, 9.4.1 9.4.2, 9.4.3, 9.5.1, 9.5.2 9.5.3, 9.5.4, 9.6.2, 9.6.4 9.8.1, 9.8.2, 9.8.3, 9.8.4 10.1.1, 10.1.2, 10.2.1 10.2.2, 10.4.1, 10.4.2 11.1.1, 11.2.2, 11.3.1 11.3.2, 11.4.2, 11.4.3 11.4.4, 11.4.5, 11.5.2 11.6.1, 11.6.2, 11.7.2 11.8.1, 11.8.2, 11.9.1 11.9.2, 12.1.1, 12.1.2 12.1.3, 12.2.1, 12.2.2 12.2.3, 12.3.1, 12.3.2 12.3.3, 12.3.4, 12.3.5 3.4.1, 3.4.2
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Math: Algebra – Creating Equations

Nevada Academic Content Standards		Performance Indicators
ACED.A.1	Create equations and inequalities in one variable and use them to solve problems.	3.2.15
ACED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	5.2.2, 5.2.3

Math: Algebra – Reasoning with Equations and Inequalities

Nevada Academic Content Standards		Performance Indicators
AREI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	3.2.16

Math: Functions – Linear, Quadratic, and Exponential Models

Nevada Academic Content Standards		Performance Indicators
FLE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.	6.2.2

Math: Geometry – Geometric Measurement and Dimension

Nevada Academic Content Standards		Performance Indicators
GGMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	3.2.8
GGMD.B.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	3.2.10

Math: Geometry – Similarity, Right Triangles, and Trigonometry

Nevada Academic Content Standards		Performance Indicators
GSRT.A.2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	3.2.9

Math: Number & Quantity – Qualities

Nevada Academic Content Standards		Performance Indicators
NQ.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	3.2.8, 3.2.12

NQ.A.2	Define appropriate quantities for the purpose of descriptive modeling.	3.2.8, 3.2.12
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Science HS: Energy

Nevada Academic Content Standards		Performance Indicators
HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).	6.1.7

Alignment of Heating, Ventilation, Air Conditioning, and Refrigeration Standards and the Mathematical Practices

Mathematical Practices	Heating, Ventilation, Air Conditioning, and Refrigeration Performance Indicators
1. Make sense of problems and persevere in solving them.	6.2.2
2. Reason abstractly and quantitatively.	3.2.15 5.2.1
3. Construct viable arguments and critique the reasoning of others.	8.1.3 9.6.4
4. Model with mathematics.	3.1.6; 3.2.13, 3.2.14 6.1.17 11.3.1, 11.3.2
5. Use appropriate tools strategically.	6.2.2; 6.3.8 8.1.5; 8.3.4
6. Attend to precision.	3.2.5, 3.2.6, 3.2.8 5.3.1 9.2.1
7. Look for and make use of structure.	3.2.10-3.2.12, 3.2.16
8. Look for and express regularity in repeated reasoning.	5.2.2, 5.2.3

**Alignment of Heating, Ventilation, Air Conditioning, and Refrigeration Standards
and the Science and Engineering Practices**

Science and Engineering Practices	Heating, Ventilation, Air Conditioning, and Refrigeration Performance Indicators
1. Asking questions (for science) and defining problems (for engineering).	4.1.1-4.1.4 5.1.1, 5.1.2 6.1.16, 6.1.17
2. Developing and using models.	3.1.5, 3.1.6 5.1.1, 5.1.2
3. Planning and carrying out investigations.	5.3.1
4. Analyzing and interpreting data.	6.3.8
5. Using mathematics and computational thinking.	5.2.2; 5.3.1 6.2.1, 6.2.2 11.3.1, 11.3.2
6. Constructing explanations (for science) and designing solutions (for engineering).	5.2.1, 5.2.2; 5.3.1 8.1.3 10.4.1, 10.4.2
7. Engaging in argument from evidence.	11.3.1, 11.3.2
8. Obtaining, evaluating, and communicating information.	2.2.2 4.1.1-4.1.4 5.1.1 6.1.7, 6.1.16 8.1.2 10.4.1

Crosswalks of Heating, Ventilation, Air Conditioning, and Refrigeration Standards and the Common Career Technical Core

Architecture and Construction Career Cluster	Performance Indicators
1. Use vocabulary, symbols and formulas common to architecture and construction.	3.1.1-3.1.6
2. Use architecture and construction skills to create and manage a project.	3.1.6
3. Comply with regulations and applicable codes to establish and manage a legal and safe workplace.	4.2.4
4. Evaluate the nature and scope of the Architecture and Construction Career Cluster™ and the role of architecture and construction in society and the economy.	3.4.1, 3.4.2
5. Describe the roles, responsibilities and relationships found in the architecture and construction trades and professions, including labor/management relationships.	3.4.4, 3.4.5
6. Read, interpret and use technical drawings, documents and specifications to plan a project.	3.1.2
7. Describe career opportunities and means to achieve those opportunities in each of the Architecture and Construction Career Pathways.	3.1.4; 4.2.3

Maintenance/Operations Career Pathway	Performance Indicators
1. Recognize and employ universal construction signs and symbols to function safely in the workplace.	2.1.8-2.1.9
2. Use troubleshooting procedures when solving a maintenance problem in buildings.	7.2.3
3. Apply construction skills when repairing, restoring or renovating existing buildings.	
4. Determine work required to repair or renovate an existing building.	
5. Plan and practice preventative maintenance activities to service existing buildings.	
6. Maintain and inspect building systems to achieve safe and efficient operation of buildings.	