

Automotive Technology Program of Study and Complementary Course Standards



This document was prepared by:

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

www.doe.nv.gov

Draft for Review by the Nevada State Board of Education on
December 15, 2022

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

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

Nevada State Board of Education

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

Nevada Department of Education

Jhone M. Ebert
Superintendent of Public Instruction

Craig Statucki
Interim Deputy Superintendent for Educator Effectiveness and Family Engagement

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

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

Vision

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

Mission

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



Table of Contents

Acknowledgements / Standards Development Members / Business and Industry Validation.....	vii
Introduction	ix
Program Information	1
Content Standard 1.0 Integrate Career and Technical Student Organizations (CTSOs)	2
Content Standard 2.0 Identify and Utilize Safety Procedures and Proper Tools	3
Content Standard 3.0 Perform Basic Vehicle Service.....	4
Content Standard 4.0 Apply Concepts of Engine Repair (A1*).....	5
Content Standard 5.0 Analyze Automatic Transmission/Transaxle for Service (A2*).....	6
Content Standard 6.0 Analyze Manual Drivetrain and Axles for Service (A3*)	7
Content Standard 7.0 Perform Suspension and Steering Service and Repair (A4*).....	8
Content Standard 8.0 Analyze Brake Systems for Service and Repair (A5*)	10
Content Standard 9.0 Analyze Electrical / Electronic Systems (A6*).....	12
Content Standard 10.0 Analyze Heating, Ventilation, and Air Conditioning (HVAC) Systems (A7*).....	14
Content Standard 11.0 Analyze Engine Performance (A8*)	15
Content Standard 12.0 Investigate Transportation Systems	16
Complementary Course Standards	18

* Related ASE Automotive Standards

Acknowledgements

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

Standards Development Members

Name	Occupation/Title	Stakeholder Affiliation	School/Organization
Scott Bennett	Instructor	Postsecondary Educator	College of Southern Nevada, Las Vegas
John Gonzalez	Service Manager	Business and Industry Representative	Findlay Auto Group, Henderson
Tristan Hays	CTE Coordinator	Secondary Educator	Clark County School District
Stephen Ludwig	Instructor	Secondary Educator	Spring Valley High School, Clark County School District
Dawne Smith	Instructor	Secondary Educator	Coronado High School, Clark County School District
Todd Teague	Instructor	Secondary Educator	Edward C Reed High School, Washoe County School District
Paul Tick	CTE Project Facilitator	Secondary Educator	Clark County School District
Scott Tomlinson	Instructor	Secondary Educator	Elko High School, Elko County School District
Adam Tucker	Instructor	Secondary Educator	Shadow Ridge High School, Clark County School District

Business and Industry Validation

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

The Automotive Technology standards were validated through active participation of business and industry representatives on the development team.

The Automotive Technology standards are adapted from the Automotive Service Excellence (ASE) Education Foundation Automobile Program Standards, 2018.

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 Automotive Technology program. These standards are designed for a two-credit course sequence that prepares the student for a technical assessment directly aligned to the standards.

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

The standards are organized as follows:

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

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

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

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

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

Automotive Technology

Program Information

Program of Study: Automotive Technology

Standards Reference Code: AUTO

Career Cluster: Transportation, Distribution, and Logistics

Career Pathway(s): Facility & Mobile Equipment Maintenance

Program Length: 2-year, completed sequentially

CTSO: SkillsUSA

Program Structure Required Program of Study Courses

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

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

Required/ Complementary	Course Title	Abbreviated Name
R	Automotive Technology I	AUTO TECH I
R	Automotive Technology II	AUTO TECH II
C	Automotive Technology II LAB	AUTO TECH II L

CONTENT STANDARD 1.0: INTEGRATE CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSOs)**Performance Standard 1.1: Explore the History and Organization of CTSOs**

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

Performance Standard 1.2: Develop Leadership Skills

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

Performance Standard 1.3: Participate in Community Service

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

Performance Standard 1.4: Develop Professional and Career Skills

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

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

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

CONTENT STANDARD 2.0: IDENTIFY AND UTILIZE SAFETY PROCEDURES AND PROPER TOOLS**Performance Standard 2.1: Demonstrate General Lab Safety Rules and Procedures**

- 2.1.1 Describe general shop safety rules and procedures (i.e., safety test) (12)
- 2.1.2 Utilize safe procedures for handling of tools and equipment (12)
- 2.1.3 Identify and use proper placement of floor jacks and jack stands (12)
- 2.1.4 Identify and use proper procedures for safe vehicle lift operation (12)
- 2.1.5 Utilize proper ventilation procedures for working within the lab/shop area (12)
- 2.1.6 Identify marked safety areas (12)
- 2.1.7 Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment (12)
- 2.1.8 Identify the location and use of eye wash stations (12)
- 2.1.9 Identify the location of the posted evacuation routes (12)
- 2.1.10 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (12)
- 2.1.11 Identify and wear appropriate clothing for lab/shop activities (12)
- 2.1.12 Secure hair and jewelry for lab/shop activities (12)
- 2.1.13 Research safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits (12)
- 2.1.14 Research safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.) (12)
- 2.1.15 Locate and interpret safety data sheets (SDS) (12)

Performance Standard 2.2: Identify and Utilize Proper Tools

- 2.2.1 Identify tools and their usage in automotive applications (12)
- 2.2.2 Identify standard and metric designation (12)
- 2.2.3 Demonstrate safe handling and use of appropriate tools (12)
- 2.2.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment (12)
- 2.2.5 Demonstrate proper use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper) (12)

CONTENT STANDARD 3.0: PERFORM BASIC VEHICLE SERVICE**Performance Standard 3.1: Identify and Utilize Vehicle Service Information**

- 3.1.1 Locate and utilize paper and/or electronic service information (12)
- 3.1.2 Locate and utilize Technical Service Bulletins (TSBs) (12)
- 3.1.3 Demonstrate knowledge of special service messages, quotes, service campaigns/recalls, vehicle/service warranty applications, and service interval recommendations (12)
- 3.1.4 Locate Vehicle Identification Number (VIN) and production date code (12)
- 3.1.5 Analyze Vehicle Identification Number (VIN) information (12)
- 3.1.6 Research other vehicle information labels (tire, emissions, etc.) (12)

Performance Standard 3.2: Prepare a Vehicle for Service

- 3.2.1 Identify information needed and the service requested on a repair order (manual or electronic) (12)
- 3.2.2 Identify purpose and demonstrate proper use of fender covers, seat covers, floor mats, wheel chocks (12)
- 3.2.3 Demonstrate use of the three C's (concern, cause, and correction) (12)
- 3.2.4 Review vehicle service history (12)
- 3.2.5 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction (12)

Performance Standard 3.3: Prepare a Vehicle for the Customer

- 3.3.1 Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, clean interior and exterior, return seat to original position, etc.) (12)

CONTENT STANDARD 4.0: APPLY CONCEPTS OF ENGINE REPAIR (A1*)**Performance Standard 4.1: Demonstrate General Engine Service Techniques**

- 4.1.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins (12)
- 4.1.2 Verify operation of the instrument panel engine warning indicators (12)
- 4.1.3 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action (12)
- 4.1.4 Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert (12)
- 4.1.5 Identify hybrid vehicle internal combustion engine service precautions (12)
- 4.1.6 Install engine covers using gaskets, seals, and sealers as required (22)
- 4.1.7 Inspect, remove, and replace timing belt, chains, or gears; verify correct camshaft timing (22)

Performance Standard 4.2: Perform Cylinder Head and Valve Train Service and Repair

- 4.2.1 Adjust valves (mechanical or hydraulic lifters) (22)

Performance Standard 4.3: Perform Lubrication and Cooling Systems Service and Repair

- 4.3.1 Inspect and test coolant; drain and recover coolant; flush and refill cooling system; fluid type per manufacturer specification (12)
- 4.3.2 Perform oil and filter change (12)
- 4.3.3 Remove, inspect, and replace thermostat and gasket/seal (22)
- 4.3.4 Perform cooling system pressure and dye tests; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action (22)
- 4.3.5 Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment (22)

* Related ASE Automotive Standards

CONTENT STANDARD 5.0: ANALYZE AUTOMATIC TRANSMISSION/TRANSAXLE FOR SERVICE (A2*)**Performance Standard 5.1: Perform General Transmission/Transaxle Service**

- 5.1.1 Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins (12)
- 5.1.2 Check fluid level in a transmission, or a transaxle equipped with a dipstick (12)
- 5.1.3 Check fluid level in a transmission, or a transaxle not equipped with a dipstick (12)
- 5.1.4 Check transmission fluid condition; check for leaks (12)
- 5.1.5 Identify drivetrain component and configuration (22)

Performance Standard 5.2: Perform In-Vehicle Transmission/Transaxle Service and Repair

- 5.2.1 Inspect powertrain mounts (12)
- 5.2.2 Drain and replace fluid and filter(s); use proper fluid type per manufacturer specifications (12)
- 5.2.3 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch (22)

Performance Standard 5.3: Investigate Characteristics of Off-Vehicle Transmission/Transaxle Service and Repair

- 5.3.1 Describe the operational characteristics of transmissions, including a continuously variable transmission (CVT) (22)
- 5.3.2 Describe the operational characteristics of a hybrid vehicle drivetrain (22)

* Related ASE Automotive Standards

CONTENT STANDARD 6.0: ANALYZE MANUAL DRIVETRAIN AND AXLES FOR SERVICE (A3*)**Performance Standard 6.1: Perform General Drivetrain Service**

- 6.1.1 Research vehicle service information, fluid type, vehicle service history, service precautions, and technical service bulletins (12)
- 6.1.2 Check fluid condition; check for leaks (12)
- 6.1.3 Identify manual drivetrain and axle components and configuration (12)
- 6.1.4 Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification (22)

Performance Standard 6.2: Investigate Clutch Systems for Service and Repair

- 6.2.1 Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specification (12)
- 6.2.2 Check for hydraulic system leaks (12)

Performance Standard 6.3: Analyze Transmission/Transaxle Components

- 6.3.1 Describe the operational characteristics of an electronically controlled transmission/transaxle (22)

Performance Standard 6.4: Assess Differential Case Assembly for Service

- 6.4.1 Clean and inspect differential housing; check for leaks; inspect housing vent (12)
- 6.4.2 Check and adjust differential housing fluid level, use proper fluid type per manufacturer specification (12)
- 6.4.3 Drain and fill differential housing; use proper fluid per manufacturer specification (22)

Performance Standard 6.5: Assess Four-wheel Drive/All-wheel Drive Component for Service and Repair

- 6.5.1 Check for leaks at drive assembly seals, check vents; check lube level (12)
- 6.5.2 Inspect front-wheel bearings and locking hubs (22)

* Related ASE Automotive Standards

CONTENT STANDARD 7.0: PERFORM SUSPENSION AND STEERING SERVICE AND REPAIR (A4*)**Performance Standard 7.1: Prepare Vehicle for General Suspension and Steering Systems Service**

- 7.1.1 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins (12)
- 7.1.2 Identify suspension and steering system components and configurations (12)
- 7.1.3 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation (22)

Performance Standard 7.2: Perform Steering Systems Service and Repair

- 7.2.1 Inspect power steering fluid level and condition (12)
- 7.2.2 Inspect for power steering fluid leakage (12)
- 7.2.3 Inspect rack and pinion steering, inner tie rod ends (sockets) and bellows boots (22)
- 7.2.4 Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification (22)
- 7.2.5 Remove, inspect, replace, and/or adjust power steering pump belt (22)
- 7.2.6 Inspect and replace power steering hoses and fittings (22)
- 7.2.7 Inspect steering gear box, pitman arm, relay (center link/intermediate) rod, idler arm and mountings, and steering linkage damper (22)
- 7.2.8 Inspect tie rod ends (sockets), tie rod sleeves, and clamps (22)
- 7.2.9 Inspect upper and lower control arms, bushings, and shafts (22)
- 7.2.10 Inspect and/or replace rebound and jounce bumpers (22)
- 7.2.11 Inspect track bar, strut rods/radius arms, and related mounts and bushings (22)
- 7.2.12 Inspect upper and lower ball joints (with or without wear indicators) (22)
- 7.2.13 Inspect suspension system coil springs and spring insulators (silencers) (22)
- 7.2.14 Inspect suspension system torsion bars and mounts (22)
- 7.2.15 Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links (22)
- 7.2.16 Inspect strut cartridge or assembly, front strut bearing and mount (22)
- 7.2.17 Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms (22)
- 7.2.18 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts (22)
- 7.2.19 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings (22)
- 7.2.20 Inspect electric power-assisted steering (22)
- 7.2.21 Identify hybrid vehicle power steering system electrical circuits and safety precautions (22)
- 7.2.22 Identify and describe the function of steering and suspension control systems, safety precautions and components, (i.e., active suspension, and stability control) (22)

Performance Standard 7.3: Investigate Wheel Alignment Conditions

- 7.3.1 Perform pre-alignment inspection and measure vehicle ride height (22)
- 7.3.2 Describe alignment angles (camber, caster, toe, and steering axis inclination [SAI]) (22)

Performance Standard 7.4: Perform Wheel and Tire Service and Repair

- 7.4.1 Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and air pressure as listed on the tire information placard/label (12)
- 7.4.2 Rotate tires according to manufacturers' recommendations, including vehicles equipped with tire pressure monitoring systems (TPMS) (12)
- 7.4.3 Dismount, inspect, and remount tire on wheel-balance wheel and tire assembly (static or dynamic) (12)
- 7.4.4 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor (TPMS) (12)
- 7.4.5 Inspect tire and wheel assembly for air loss; determine necessary action (12)
- 7.4.6 Repair tire following vehicle manufacturer approved procedure (12)
- 7.4.7 Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps (12)
- 7.4.8 Research/demonstrate the steps to remove and replace sensors in a tire pressure monitoring system (TPMS), including relearn procedure (12)

* Related ASE Automotive Standards

CONTENT STANDARD 8.0: ANALYZE BRAKE SYSTEMS FOR SERVICE AND REPAIR (A5*)**Performance Standard 8.1: Demonstrate Knowledge of General Brake Systems**

- 8.1.1 Research vehicle service information, fluid type, vehicle service history, service precautions, and technical service bulletins (12)
- 8.1.2 Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS) (12)
- 8.1.3 Install wheel and torque lug nuts to manufacturer specifications (12)
- 8.1.4 Identify brake system components and configuration (12)

Performance Standard 8.2: Perform Hydraulic System Service and Repair

- 8.2.1 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings and supports (12)
- 8.2.2 Select, handle, store, and fill brake fluids to proper level, use proper fluid type per manufacturer specification (12)
- 8.2.3 Identify components of hydraulic brake warning light system (12)
- 8.2.4 Test brake fluid for contamination (12)
- 8.2.5 Check master cylinder for internal/external leaks and proper operation (22)
- 8.2.6 Bleed and/or flush brake system (22)

Performance Standard 8.3: Perform Drum Brake Service and Repair

- 8.3.1 Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble (12)
- 8.3.2 Install wheel and torque lug nuts to manufacturer specification (12)
- 8.3.3 Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability (22)
- 8.3.4 Refinish brake drum and measure final drum diameter; compare with specifications (22)
- 8.3.5 Inspect wheel cylinders for leaks and proper operation; remove and replace as needed (22)
- 8.3.6 Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies, wheel bearings; make final checks and adjustments (22)

Performance Standard 8.4: Perform Disc Brake Service and Repair

- 8.4.1 Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action (22)
- 8.4.2 Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action (22)
- 8.4.3 Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action (22)
- 8.4.4 Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks (22)
- 8.4.5 Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout; determine necessary action (22)
- 8.4.6 Remove and reinstall/replace rotor (22)
- 8.4.7 Refinish rotor off vehicle; measure final rotor thickness and compare with manufacturer specification (22)
- 8.4.8 Retract and re-adjust caliper piston on an integral parking brake system (22)
- 8.4.9 Check brake pad wear indicator; determine necessary action (22)
- 8.4.10 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations (22)

Performance Standard 8.5: Analyze Power Assist Units

- 8.5.1 Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum type power booster (22)

Performance Standard 8.6: Perform Miscellaneous Service and Repair (Wheel Bearings, Parking Brakes, Electrical, Etc.)

- 8.6.1 Check operation of brake stop light system (12)
- 8.6.2 Remove, clean, inspect, repack, and install wheel bearings/race; replace seals; install hub and adjust bearings (22)
- 8.6.3 Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed (22)
- 8.6.4 Check parking brake operation and parking brake indicator light system operation; determine necessary action (22)
- 8.6.5 Inspect and replace wheel studs (22)

Performance Standard 8.7: Assess Electronic Brake, Traction, and Stability Control Systems

- 8.7.1 Disable electronic parking brake (22)

* Related ASE Automotive Standards

CONTENT STANDARD 9.0: ANALYZE ELECTRICAL / ELECTRONIC SYSTEMS (A6*)**Performance Standard 9.1: Perform General Electronic Systems Diagnostics and Service**

- 9.1.1 Research vehicle and service information, including vehicle service history, service precautions, and technical service bulletins (12)
- 9.1.2 Identify electrical/electronic system components and configurations (12)
- 9.1.3 Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's law) (22)
- 9.1.4 Use wiring diagrams to trace electrical/electronic circuits (22)
- 9.1.5 Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance (22)
- 9.1.6 Demonstrate knowledge of causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits (22)
- 9.1.7 Use a test light to check operation of electrical circuits (22)
- 9.1.8 Use fused jumper wires to check operation of electrical circuits (22)
- 9.1.9 Measure key-off battery drain (parasitic draw) (22)
- 9.1.10 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action (22)
- 9.1.11 Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repairs) (22)

Performance Standard 9.2: Perform Battery Service

- 9.2.1 Inspect and clean battery; fill battery cells; check and clean battery cables, connectors, clamps, and hold downs; determine necessary action (12)
- 9.2.2 Perform slow/fast battery charge according to manufacturers' recommendations (12)
- 9.2.3 Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply (12)
- 9.2.4 Perform battery state-of-charge test; determine necessary action (22)
- 9.2.5 Confirm proper battery capacity for vehicle application; perform battery capacity test and load test; determine necessary action (22)
- 9.2.6 Maintain or restore electronic memory functions (22)
- 9.2.7 Remove and replace battery cables and battery (22)

Performance Standard 9.3: Perform Starting System Diagnosis, Service, and Repair

- 9.3.1 Perform starter current draw test; determine necessary action (22)
- 9.3.2 Perform starter circuit voltage drop tests; determine necessary action (22)
- 9.3.3 Inspect and test starter relays and solenoids; determine necessary action (22)
- 9.3.4 Remove and install starter in a vehicle (22)
- 9.3.5 Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action (22)

Performance Standard 9.4: Perform Charging System Diagnosis, Service, and Repair

- 9.4.1 Perform charging system output test; determine necessary action (22)
- 9.4.2 Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment (22)
- 9.4.3 Remove, inspect, and/or reinstall generator (alternator) (22)
- 9.4.4 Perform charging circuit voltage drop tests; determine necessary action (22)

Performance Standard 9.5: Perform Light System and Accessories Service and Repair

- 9.5.1 Describe the operation of keyless entry/remote-start systems (12)
- 9.5.2 Verify windshield wiper and washer operation; replace wiper blades (12)
- 9.5.3 Inspect interior and exterior lamps and sockets, including headlights and auxiliary lights (fog lights/driving lights); replace as needed (22)
- 9.5.4 Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators (22)

* Related ASE Automotive Standards

CONTENT STANDARD 10.0: ANALYZE HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEMS (A7*)**Performance Standard 10.1: Demonstrate Knowledge of HVAC Systems**

- 10.1.1 Research vehicle and service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins (12)
- 10.1.2 Identify heating, ventilation, and air conditioning (HVAC) components and configuration (12)

Performance Standard 10.2: Inspect Heating, Ventilation, and Engine Cooling Systems

- 10.2.1 Inspect engine cooling and heater system hoses and pipes; determine necessary action (12)

* Related ASE Automotive Standards

CONTENT STANDARD 11.0: ANALYZE ENGINE PERFORMANCE (A8*)**Performance Standard 11.1: Perform General Engine Service**

- 11.1.1 Research vehicle and service information, including fluid type, vehicle service history, service precautions, and technical service bulletins (12)
- 11.1.2 Perform engine absolute manifold pressure tests (vacuum/boosts); document results (22)
- 11.1.3 Perform cylinder power balance test; document results (22)
- 11.1.4 Perform cylinder cranking and running compression tests; document results (22)
- 11.1.5 Perform cylinder leakage test; document results (22)
- 11.1.6 Verify engine operating temperature (22)
- 11.1.7 Remove and replace spark plugs; inspect secondary ignition components for wear and damage (22)

Performance Standard 11.2: Explore Computerized Controls

- 11.2.1 Retrieve and record diagnostic trouble codes (DTC), on-board diagnostics (OBD) monitor status, and freeze-frame data; clear codes when applicable (22)
- 11.2.2 Describe the use of the OBD monitors for repair verification (22)

Performance Standard 11.3: Assess Fuel, Air Induction, and Exhaust Systems Service and Repair

- 11.3.1 Replace fuel filter(s) where applicable (22)
- 11.3.2 Inspect, service, or replace air filters, filter housings, and intake duct work (22)
- 11.3.3 Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action (22)
- 11.3.4 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action (22)

Performance Standard 11.4: Performance Standard

- 11.4.1 Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action (22)

* Related ASE Automotive Standards

CONTENT STANDARD 12.0: INVESTIGATE TRANSPORTATION SYSTEMS**Performance Standard 12.1: Assess Transportation Systems**

- 12.1.1 Describe the history of the automobile and the effects on society (12)
- 12.1.2 Research the different career opportunities in the transportation career path (12)
- 12.1.3 Investigate new and emerging technologies (12)
- 12.1.4 Analyze workplace situations and use problem-solving techniques to improve the workplace environment (12)

Complementary Course(s)

State Complementary Skill Standards

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

Employability Skills for Career Readiness Standards

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

Complementary Course Standards Contributing Members

Course Contribution(s)	Name	Occupation/Title	Stakeholder Affiliation	School/Organization
Intermediate Automotive Technology	Scott Bennett)	Instructor	Postsecondary Educator	College of Southern Nevada, Las Vegas
Intermediate Automotive Technology	John Gonzalez	Service Manager	Business and Industry Representative	Findlay Auto Group, Henderson
Intermediate Automotive Technology	Tristan Hays	CTE Coordinator	Secondary Educator	Clark County School District
Intermediate Automotive Technology	Stephen Ludwig	Instructor	Secondary Educator	Spring Valley High School, Clark County School District
Intermediate Automotive Technology	Dawnne Smith	Instructor	Secondary Educator	Coronado High School, Clark County School District
Intermediate Automotive Technology	Todd Teague	Instructor	Secondary Educator	Edward C Reed High School, Washoe County School District
Intermediate Automotive Technology	Adam Tucker	Instructor	Secondary Educator	Shadow Ridge High School, Clark County School District

Business and Industry Validation

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

The Intermediate Automotive Technology complementary standards for Automotive Technology program of study were validated through active participation of business and industry representatives on the development team.

The Intermediate Automotive Technology standards are adapted from the Automotive Service Excellence (ASE) Education Foundation Automobile Program Standards, 2018.

Complementary Course Information for Automotive Technology

Program Information

Qualifying Program of Study: Automotive Technology

Career Cluster: Transportation, Distribution, and Logistics

Career Pathway(s): Facility & Mobile Equipment Maintenance

CTSO: SkillsUSA

Grade Level: 11-12

Program Structure for Complementary Course(s)

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)** (except labs that are done concurrently with the second-year course). A program does not have to utilize the complementary courses for students to complete their program of study.

Complementary Course(s)

Required/ Complementary	Course Title	Abbreviated Name
C	Intermediate Automotive Technology	INT AUTO TECH
C	Automotive Technology Advanced Studies	AUTO TECH AS
C	Industry-Recognized Credential – Automotive Technology	IRC AUTO TECH
C	CTE Work Experience – Transportation, Distribution, and Logistics	WORK EXPER TRANS

Complementary Course Standards Intermediate Automotive Technology

CONTENT STANDARD 1.0: ANALYZE AUTOMATIC TRANSMISSION/TRANSAXLE FOR SERVICE (A2*)

Performance Standard 1.1: Perform In-Vehicle Transmission/Transaxle Service and Repair

- 1.1.1 Inspect for leakage at external seals, gaskets, and bushings

CONTENT STANDARD 2.0: ANALYZE MANUAL DRIVETRAIN AND AXLES FOR SERVICE (A3*)

Performance Standard 2.1: Perform Drive Shaft and Half Shaft, Universal and Constant Velocity (CV) Joint Service and Repair

- 2.1.1 Inspect, remove, and/or replace front wheel drive (FWD) bearings, hubs, and seals
- 2.1.2 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints

Performance Standard 2.2: Perform Drive Axle Service and Repair

- 2.2.1 Inspect and replace drive axles wheel studs

CONTENT STANDARD 3.0: ANALYZE BRAKE SYSTEMS FOR SERVICE AND REPAIR (A5*)

Performance Standard 3.1: Perform Hydraulic System Service

- 3.1.1 Measure brake pedal height, travel, and free play (as applicable)

Performance Standard 3.2: Perform Disc Brake Service and Repair

- 3.2.1 Refinish rotor on vehicle; measure final rotor thickness and compare with manufacturer specifications

Performance Standard 3.3: Analyze Power Assist Units

- 3.3.1 Check brake pedal free travel with, and without, engine running to verify proper power booster operation

Performance Standard 3.4: Assess Electronic Brake, Traction and Stability Control Systems

- 3.4.1 Identify traction control/vehicle stability control system components
- 3.4.2 Describe the operation of a regenerative braking system

CONTENT STANDARD 4.0: ANALYZE ELECTRICAL/ELECTRONIC SYSTEMS (A6*)

Performance Standard 4.1: Perform Battery Service

- 4.1.1 Identify safety precautions for high voltage systems of electric or hybrid electric vehicle and diesel vehicles
- 4.1.2 Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery
- 4.1.3 Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

Performance Standard 4.2: Perform Starting System Diagnosis, Service and Repair

- 4.2.1 Demonstrate knowledge of automatic idle-stop/start-stop system

Performance Standard 4.3: Perform Light System and Accessories Service and Repair

- 4.3.1 Aim headlights
- 4.3.2 Identify system voltage and safety precautions associated with high intensity discharge headlights
- 4.3.3 Disable and enable the supplemental restraint system (SRS); verify indicator lamp operation
- 4.3.4 Remove and reinstall door panel

CONTENT STANDARD 5.0: ANALYZE HEATING, VENTILATION AND AIR CONDITIONING (HVAC) (A7*)**Performance Standard 5.1: Inspect Refrigeration System Components**

- 5.1.1 Inspect and replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine necessary action
- 5.1.2 Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions
- 5.1.3 Inspect A/C condenser for airflow restrictions; determine necessary action

Performance Standard 5.2: Inspect Operating Systems and Related Controls

- 5.2.1 Inspect A/C – heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action
- 5.2.2 Identify the source of A/C systems odors

CONTENT STANDARD 6.0: ANALYZE ENGINE PERFORMANCE (A8*)**Performance Standard 6.1: Assess Fuel, Air Induction, and Exhaust Systems Service and Repair**

- 6.1.1 Check and refill diesel exhaust fluid (DEF)

* Related ASE Automotive Standards