Arkansas Department of Career Education
Model Framework

Course Title: **Structural Analysis/Damage Repair**

Career Cluster: **Transportation, Distribution & Logistics**

Secondary – Skilled and Technical Sciences		
Course Number	494320	
CIP Number	47.0603	
Grade Level	9-12	
Prerequisite	Click here to enter text.	
Course Type	Elective	
Teacher Certification	567	
CTSO	SKILLS	SKILLS
Facility Requirements	http://arkansasfacilities.arkansas.gov/facilities/academic-facilities-manual	
Industry Certifications	http://www.asestudentcertification.com/	

Course Description

This class is designed to provide the student the opportunity to practice the skills of measuring, straightening and replacing both steel and aluminum panels. Students will learn how to perform point-to-point and three dimensional measuring as well as the proper operation of equipment.

Program Purpose/Structure

The curriculum content framework Collision Repair Technology supports the course that prepares students for the following career roles, which in turn correspond to the CIP (Classification of Instructional Programs) codes listed above. The courses may be sequenced with a variety of career and technical courses to form a specialization to prepare students for careers and support additional education and training in the protective services industry. The Transportation cluster of

programs prepares students for careers in automotive service and repair, aviation maintenance, diesel equipment maintenance and repair, and small engine repair.
Programs within the Transportation cluster are listed as follows:
• Aircraft Pilot Training
• Auto Body Technology — Certified
• Auto Body Repair — Non-Certified
• Automotive Service Technology — Certified
• Automotive Servicing — Non-Certified
• Aviation Maintenance Technology
• Diesel Equipment Technology
• Small Engine Repair
• Career Role CIP Code – 47.0603
• O-NET 15-1041.XX - 49-3021.XX

Laboratory Activities
Click here to enter text.

Special Notes
Click here to enter text.

Career and Technical Student Organization (CTSO)
SkillsUSA

Arkansas Department of Career Education
Student Performance Standards

Course Title: **Structural Analysis/Damage Repair**
Course Number: **494320**
Course Credit: **1**

Structural Analysis/Damage Repair Indicators: At the completion of the course the student will be able to . .

1.0 Demonstrate Appropriate Safety Procedures
- 1.1 Identify and demonstrate safe work practices
- 1.2 Practice personal safety

2.0 Demonstrate Safe Usage of Tools and Equipment
- 2.1 Demonstrate knowledge of shop tools and equipment

3.0 Demonstrate Employability/Leadership Skills
- 3.1 Demonstrate employability skills
- 3.2 Demonstrate leadership skills

4.0 Perform Vehicle Structural Repairs
- 4.1 Demonstrate frame inspection and repair
- 4.2 Demonstrate unibody and unitized structure inspection, measurement, and repair procedures

5.0 Demonstrate Glass Replacement Procedures
- 5.1 Demonstrate diagnostic and repair procedures for fixed glass

6.0 Perform Welding Auto Body Procedures
- 6.1 Demonstrate metal welding and cutting repair procedures

7.0 Prepare Vehicle for Service/Customer
- 7.1 Prepare vehicle for service as listed on the work order
- 7.2 Prepare vehicle for customer

Standard 1.0 Demonstrate Appropriate Safety Procedures			
Performance Indicator 1.1 **Identify and demonstrate safe work practices.**	• **Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
1.1.1 Identify general shop safety rules and procedures.	• Review and assess understanding of posted shop regulations • Post standard expectations of safe shop practices	L11-12.4	CRP1
1.1.2 Utilize safe procedures for handling of tools and equipment.	• Demonstrate proficiency with tools and equipment before performing tasks with the tools	L11-12.4	CRP2
1.1.3 Identify and use proper placement of floor jacks and jack stands.	• Research service information for proper procedure • Demonstrate proficiency in using floor jacks and jack stands before lifting vehicle	R11-12.1	CRP11
1.1.4 Identify and use proper procedures for safe lift operation.	• • Locate and understand lift manufacturer safety information on lift tag • • Refer to service manual for proper lifting points • Demonstrate proficiency operating lift	L11-12.4	CRP11
1.1.5 Utilize proper ventilation procedures for working within the lab/shop area.	• Locate and identify ventilation system for shop • Identify and demonstrate proper use of ventilation procedure • Write paragraph on dangers of asphyxiation	W11-12.2	CRP3
1.1.6 Identify marked safety areas.	• Locate and identify different marked areas in shop • Demonstrate understanding of purpose of marked areas • Draw diagram of marked areas in the shop	SL11-12.5	CRP2 CRP3
1.1.7 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.	• Identify and locate fire extinguishers in shop • Pass a fire safety test • Review evacuation plan and where it is located in the building	SL11-12.2	CRP3

Performance Indicator 1.2 Practice personal safety.	• **Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
1.2.1 Identify the location and use of eye wash stations.	• • Pass a safety procedure test • • Label eye station on diagram of shop	SL11-12.2	CRP3
1.2.2 Identify the location of the posted evacuation routes.	• Pass a safety procedure test. Have students label location of evacuation route on diagram of shop.	SL11-12.2	CRP3
1.2.3 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	• Demonstrate the proper usage of personal protective equipment (PPE) • Post rules including consequences of noncompliance	SL11-12.2 R11-12.7	CRP3 TD5
1.2.4 Identify and wear appropriate clothing for lab/shop activities.	• • Demonstrate appropriate dress before working in shop • • Post rules and logical consequences for noncompliance	SL11-12.2 R11-12.7	CRP3
1.2.5 Secure hair and jewelry for lab/shop activities.	• Identify hair and jewelry safety violations with other students	SL11-12.2 R11-12.7	CRP3 CRP4
1.2.6 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	• Identify areas of possible danger and show video or demonstrate air bag deployment • Emphasize the importance of correctly identifying the yellow and orange circuits	SL11-12.2 R11-12.7 R11-12.6	CRP3 CRP5 CRP11
1.2.7 Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).	• Identify areas of possible danger • Have a live demonstration of a volunteer being tazed by security office so they will understand the shock hazard	SL11-121d	CRP1 CRP12
1.2.8 Locate and demonstrate knowledge of safety data sheets (SDS).	• Location of SDS included in safety test • Identify chemicals and pull up and print SDS sheets on chemicals in the lab area	R11-12.3	CRP11 CRP7

Standard 2.0 Demonstrate Safe Usage of Tools and Equipment			
Performance Indicator 2.1 Demonstrate knowledge of shop tools and equipment.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
2.1.1 Identify tools and their usage in automotive applications.	• Tool identification exercises including hand outs and spot quizzes	R11-12.4	TD2
2.1.2 Identify standard and metric designation.	• Review and identify common tool sizes	R11-12.4 L11-12.6	TD2
2.1.3 Demonstrate safe handling and use of appropriate tools.	• Demonstrate proficiency in the proper application of tools	R11-12.4 L11-12.6	CRP1 CRP3
2.1.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	• Demonstrate proficiency in cleaning and storing tools	R11-12.4 L11-12.6	CRP12

Tools:

http://www.onguardsafetytraining.com/samples/2Automotive%20Hand%20tools.pdf

SAE/Metric:

http://www.sosmath.com/tables/sae/sae.html

http://www.hondachopper.com/garage/sae_to_metric/SAE-Metric_Conversion_Chart.pdf

http://www.engineeringtoolbox.com/wrenches-inches-metric-us-conversion-comparison-d_1607.html

Standard 3.0 Demonstrate Employability/Leadership Skills			
Performance Indicator 3.1 Demonstrate employability skills.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
3.1.1 Demonstrate a good work ethic (i.e., relations with other, dependability, attitude, and personal hygiene).	• Use guest speakers from industry • Utilize career coaches to model appropriate behavior and attitude	SL11-12.1	TD1 CRP1
3.1.2 Demonstrate teamwork.	• Assign paired work placing students in work groups with rotating roles	SL11-12.1b	CRP1 CRP12
3.1.3 Demonstrate job-seeking techniques (i.e., write a resume, search for a job, arrange references, and apply interview techniques)	• Write resume • Have career coach assist in resume building • Complete a job application • Perform mock interview	W11-12.5 W11-12.6	CRP10
3.1.4 Describe legal issues of sexual harassment in the workplace.	• Sexual harassment seminar inviting guest speakers	SL11-12.3	CRP5
3.1.5 Identify employment eligibility requirements (e.g. valid driver's license, background check etc.)	• Guest speaker for job requirements • Review job opening requirements	SL11-12.3	TD5
Performance Indicator 3.2 Demonstrate leadership skills.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
3.2.1 Perform basic parliamentary procedures in a group meeting.	• Have class meetings following Robert Rules of Order	SL11-12.1b	CRP9
3.2.2 Demonstrate an understanding of one's personal values, interpersonal skills, etiquette, effectiveness in oral and written communication and courtesy. Develop and maintain a code of professional ethics.	• • Perform self-evaluation • • Use a professional development manual • Practice communication exercises • Practice writing examples, role-play conflict resolution scenarios	SL11-12.1b	CRP4 CRP9
3.2.3 Maintain a good professional appearance.	• Counsel students on importance of maintaining a positive image • Invite industry representatives to discuss employment standards	SL11-12.3	CRP3
3.2.4 Perform basic tasks related to	• Perform mock interviews	SL11-12.3	CRP9

securing and terminating employees.	• Evaluate employee performance and simulate terminations		TD5
Standard 4.0 Perform Vehicle Structural Repairs			
Performance Indicator 4.1 Demonstrate frame inspection and repair.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
4.1.1 Measure and diagnose structural damage using a tram gauge.	• Instructor demonstrates measuring and diagnosing damage on a vehicle using tram gauges • Perform task while instructor observes	R-11-12.3	CRP2
4.1.2 Attach vehicle to anchoring devices.	• Instructor demonstrates placing vehicle on a frame rack and anchoring • Perform task while instructor observes	R-11-12.3	CRP2
4.1.3 Analyze, straighten and align mash (collapse) damage.	• Use multimedia and collision related material to identify and align a mash (collapse) damage condition on a vehicle	R-11-12.1 SL11-12.5	CRP2 CRP11
4.1.4 Analyze, straighten and align sag damage.	• Use multimedia and collision related material to identify and align a sag damage condition on a vehicle	R-11-12.1 SL11-12.5	CRP2 CRP11
4.1.5 Analyze, straighten and align sidesway damage.	• Use multimedia and collision related material to identify and align a sideway damage condition on a vehicle	R-11-12.1 SL11-12.5	CRP2 CRP11
4.1.6 Analyze, straighten and align twist damage.	• Use multimedia and collision related material to identify and align a twist damage condition on a vehicle	R-11-12.1 SL11-12.5	CRP2 CRP11
4.1.7 Analyze, straighten and align diamond frame damage.	• Use multimedia and collision related material to identify and align a diamond damage condition on a vehicle	R-11-12.1 SL11-12.5	CRP2 CRP11
4.1.8 Remove and replace damaged structural components.	• Use multimedia and collision related material to demonstrate the removal and replacement of damaged structural components	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.1.9 Restore corrosion protection to repaired or replaced frame areas.	• Use multimedia and collision related material to demonstrate the restoration of corrosion protection to repaired or replaced frame areas	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.1.10 Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.	• Use multimedia and collision related material to identify misaligned or damaged steering, suspension, and powertrain components that can cause problems with the vehicle	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.1.11 Align or replace misaligned or damaged steering, suspension, and	• Use multimedia and collision related material to demonstrate replacement or alignment of damaged steering, suspension,	R-11-12.1 R-11-12.3	CRP2 CRP11

powertrain components that can cause vibration, steering, and wheel alignment problems.	and powertrain components that can cause problems with the vehicle	SL11-12.5	
4.1.12 Identify heat limitations for structural components.	• Use multimedia and collision related material to demonstrate heat limitations for structural components	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.1.13 Demonstrate an understanding of structural foam applications.	• Use multimedia and collision related material to show structural foam applications in modern vehicles	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.1.14 Measure and diagnose structural damage using a three-dimensional measuring system (mechanical, electronic, laser), etc.	• Demonstrate proper measuring operations to diagnose structural damage on vehicles using a modern measuring system	R-11-12.3	CRP2
4.1.15 Measure and diagnose structural damage to vehicles using a dedicated (fixture) measuring system.	• Use multimedia, collision related material, or a dedicated measuring system to demonstrate proper measuring procedures to diagnose structural damage on vehicles	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.1.16 Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.	• Use multimedia or an instructor-approved vehicle to show direct and indirect damage from an impact on a vehicle • Write and estimate on vehicle	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.1.17 Analyze and identify crush/collapse zones.	• Demonstrate using multimedia or on an instructor-approved vehicle to show the crush/collapse zones	R-11-12.3	CRP2
Performance Indicator 4.2 Demonstrate unibody and unitized structure inspection, measurement, and repair procedures.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
4.2.1 Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems.	• Use multimedia and collision related material to identify misaligned or damaged steering, suspension, and powertrain components that can cause problems with the vehicle	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.2 Realign or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering and chassis alignment problems.	• Use multimedia and collision related material to demonstrate replacement or alignment of damaged steering, suspension, and powertrain components that can cause problems with the vehicle	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11

4.2.3 Measure and diagnose unibody damage using tram gauge.	• Demonstrate measuring and diagnosing damage on a unibody vehicle using tram gauges. Students perform task while instructor observes	R-11-12.1 R-11-12.3	CRP2 CRP8
4.2.4 Determine and inspect the locations of all suspension, steering, and powertrain component attaching points on the vehicle.	• Use multimedia and collision related material to identify components and attaching points of steering, suspension, and powertrain areas on a vehicle	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.5 Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system.	• Use multimedia, collision related material, or a dedicated measuring system to demonstrate proper measuring procedures to diagnose unibody vehicles	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.6 Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, and laser, etc.).	• Use multimedia, collision related material, or a modern measuring system to demonstrate proper measuring procedures to diagnose unibody vehicles	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.7 Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.	• Instructor demonstrates how to determine extent of damage and make sequential repair plan • Complete task while instructor observes	R-11-12.1 R-11-12.3	CRP2 CRP8
4.2.8 Attach anchoring devices to vehicle; remove or reposition components as necessary.	• Use multimedia or collision related material to demonstrate anchoring attachment devices on a vehicle	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.10 Straighten and align roof rails/headers and roof panels.	• Use mult-media or collision related material to demonstrate straightening and aligning roof rails/headers and roof panels	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.11 Straighten and align hinge and lock pillars.	• Use multimedia or collision related material to demonstrate straightening and aligning hinge and lock pillars	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.12 Straighten and align vehicle openings, floor pans, and rocker panels.	• Use multimedia or collision related material to demonstrate straightening and aligning vehicle openings, floor pans, and rocker panels	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.13 Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points).	• Use multimedia or collision related material to demonstrate straightening and aligning quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points)	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.14 Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and	• Use multimedia or collision related material to demonstrate straightening and aligning front-end sections (aprons, strut towers, upper and lower rails, steering, and	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11

suspension/power train mounting points, etc.).	suspension/power train mounting points, etc.)		
4.2.15 Identify substrate and repair or replacement recommendations.	• Instructor shows students various examples of substrates that they will encounter in the industry	R-11-12.1 R-11-12.3	CRP2
4.2.16 Identify proper cold stress relief methods.	• Instructor will demonstrate proper cold stress release methods while students observe	R-11-12.1 R-11-12.3	CRP2
4.2.17 Repair damage using power tools and hand tools to restore proper contours and dimensions.	• Instructors will demonstrate repairing damage using power tools and hand tools while students observe	R-11-12.1 R-11-12.3	CRP2
4.2.18 Remove and replace damaged sections of steel body structures.	• Use multimedia or collision related material to demonstrate	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.19 Restore corrosion protection to repaired or replaced structural areas.	• Use multimedia or collision related material to demonstrate	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.20 Determine the extent of damage to aluminum structural components; repair, weld, or replace.	• Use multimedia or collision related material to demonstrate	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.21 Analyze and identify crush/collapse zones.	• Use multimedia or collision related material to demonstrate	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
4.2.22 Restore mounting and anchoring locations.	• Use multimedia or collision related material to demonstrate	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11

Standard 5.0 Demonstrate Glass Replacement Procedures			
Performance Indicator 5.1 Demonstrate diagnostic and repair procedures for fixed glass.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
5.1.1 Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials and techniques.	• Use multimedia or collision related material to demonstrate	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
5.1.2 Remove and reinstall or replace modular glass using recommended materials.	• Use mult-media or collision related material to demonstrate	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
5.1.3 Check for water leaks, dust leaks, and wind noise.	• Instructor will demonstrate to students industry approved methods for water leaks, dust leaks, and wind noise • Demonstrate task while instructor observes	R-11-12.1 R-11-12.3	CRP2

Standard 6.0 Perform Welding Auto Body Procedures			
Performance Indicator 6.0 Demonstrate metal welding and cutting repair procedures.	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
6.1.1 Identify weldable and non-weldable substrates used in vehicle construction.	• Use multimedia and collision related materials to show industry applications and procedures	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.2 Weld and cut high-strength steel and other steels.	• Use multimedia and collision related materials to show industry applications and procedures	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.3 Weld and cut aluminum.	• Use multimedia and collision related materials to show industry applications and procedures	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.4 Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.	• Use multimedia and collision related materials to show industry applications and procedures	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.5 Set up and adjust the GMAW (MIG) welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded.	• Instructor demonstrates proper settings on a MIG welder for different substrates and gages of metals • Perform tasks while instructor observes	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.6 Store, handle, and install high-pressure gas cylinders.	• Instructor demonstrates proper handling, storing, and installing gas cylinders related to MIG welders	R-11-12.1 R-11-12.3	CRP2
6.1.7 Determine work clamp (ground) location and attach.	• Demonstrate how to properly ground clamp to a clean, bare metal surface	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.8 Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.	• Demonstrate the use of welding blankets, welding paper, and related materials to protect vehicle from welding splatter	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.9 Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.	• Instructor demonstrates proper settings on a MIG welder for different substrates and gages of metals • Instructor demonstrates correct welding procedures for flat, horizontal, vertical, and overhead positions • Perform tasks while instructor observes	R-11-12.1 R-11-12.3	CRP2 CRP8

6.1.10 Protect computers and other electronic control modules during welding procedures.	• Use multimedia and collision related materials to show industry applications and procedures	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.11 Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required.	• Instructor demonstrates the proper procedures to prep the metal to be welded • Perform task while instructor observes	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.12 Determine the joint type (butt weld with backing, lap, etc.) for weld being made.	• Instructor shows examples of joint welding types • Identify the different types	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.13 Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation.	• Instructor shows examples of different types of welds • Identity welds	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.14 Perform the following welds: continuous, plug, butt weld with and without backing, fillet, etc.	• Instructor demonstrates each type of weld, with and without a backing plate	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.15 Perform visual and destructive tests on each weld type.	• Visually inspect and demonstrate a destructive test on a weld	R-11-12.1 R-11-12.3	CRP2 CRP8
6.1.16 Identify the causes of various welding defects; make necessary adjustments.	• Use multi-media and collision related materials to show welding defects and step to make necessary adjustments	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.17 Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.	• Use multimedia and collision related materials to show causes of contact tip burn-back and failure of wire feed • Show how to make necessary adjustments	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.18 Identify cutting process for different substrates and locations; perform cutting operation.	• Use multimedia and collision related materials to show proper procedures when cutting different substrates • Demonstrate safe cutting procedures in shop/lab	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11
6.1.19 Identify different methods of attaching non-structural components (squeeze type resistant spot welds (STRSW), riveting, non-structural adhesive, silicon bronze, etc.)	• Use multimedia and collision related materials to show different methods of attaching non-structural components	R-11-12.1 R-11-12.3 SL11-12.5	CRP2 CRP11

Standard 7.0 Prepare Vehicle for Service/Customer			
Performance Indicator 7.1 **Prepare vehicle for service as listed on the work order.**	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
7.1.1 Identify information needed and the service requested on a repair order.	• Write and print repair orders • Explain information on repair orders	SL11-12.1a SL11-12.5 W11-12.8	CRP11
7.1.2 Identify purpose and demonstrate proper use of fender covers, mats.	• Establish a policy of using covers and mats • Rotate as service writer and have them install mats and covers	R11-12.2 W11-12.8	CRP2
7.1.3 Demonstrate use of the three C's (concern, cause, and correction).	• List 3 c's on every work order	SL11-12.1b W11-12.8	CRP2
7.1.4 Review vehicle service history.	• Review available service records • Discuss previous repairs and effect on current problem	SL11-12.5	CRP2
7.1.5 Complete work order to include customer information, vehicle identifying information, customer concerns, related service history, cause, and correction.	• Fill out work order on every vehicle • Write and fill out repair orders	W11-12.2	CRP11 CRP4
Performance Indicator 7.2 **Prepare vehicle for customer.**	**Recommended Application/Activity**	**CCSS Standards**	**CCTC Standards**
7.2.1 Ensure vehicle is prepared to return to customer per school or company policy (floor mats, steering wheel cover, etc.).	• Establish a policy of what is done to a vehicle before it is returned to customer • Clean of grease marks or stains etc. • Car is fixed according to work order	R11-12.2 R11-12.9	CRP11 CRP2

Common Core State Standards Grades 9-12

ELA Speaking and Listening Standards Grades 9-10

1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL9-10.1**
    a. 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. **SL9-10.1a**
    b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. **SL9-10.1b**
    c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. **SL9-10.1c**
    d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. **SL9-10.1d**
2. Integrate multiple sources of information presented in diverse media or format(e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. **SL9-10.2**
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. **SL9-10.3**
4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. **SL9-10.4**
5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL9-10.5**

ELA Speaking and Listening Standards Grades 11-12

1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL11-12.1**
    a. 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. **SL11-12.1a**

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. **SL11-12.1b**
c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. **SL11-12.1c**
d. 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. **SL11-12.1d**

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. **SL11-12.2**
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. **SL11-12.3**
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. **SL11-12.4**
5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL11-12.5**

ELA Language Grades 9-10

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies. **L9-10.4**
a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. **L9-10.4a**
b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., analyze, analysis, analytical; advocate, advocacy). **L9-10.4b**
c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology. **L9-10.4c**
d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). **L9-10.4d**
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. **L9-10.6**

ELA Language Grades 11-12

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies. **L11-12.4**
   a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. **L11-12.4a**
   b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., conceive, conception, conceivable). **L11-12.4b**
   c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage. **L11-12.4c**
   d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary **L11-12.4d**
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. **L11-12.6**

Reading Standards for Literacy in Science and Technical Subjects Grades 9-10

1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **R9-10.1**
2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. **R9-10.2**
3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **R9-10.3**
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 9–10 texts and topics. **R9-10.4**
5. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). **R9-10.5**
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. **R9-10.6**
7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **R9-10.7**
8. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **R9-10.8**
9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. **R9-10.9**
10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. **R9-10.10**

Reading Standards for Literacy in Science and Technical Subjects Grades 11-12

1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **R11-12.1**
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. **R11-12.2**
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. **R11-12.3**
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. **R11-12.4**
5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **R11-12.5**
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **R11-12.6**
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. **R11-12.7**
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. **R11-12.8**
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. **R11-12.9**
10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently. **R11-12.10**

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects Grades 9-10

1. Write arguments focused on discipline-specific content. **W9-10.1**
    a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. **W9-10.1a**
    b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. **W9-10.1b**
    c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. **W9-10.1c**
    d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. **W9-10.1d**
    e. Provide a concluding statement or section that follows from or supports the argument presented. **W9-10.1e**

2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **W9-10.2**
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. **W9-10.2a**
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. **W9-10.2b**
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. **W9-10.2c**
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. **W9-10.2d**
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. **W9-10.2e**
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). **W9-10.2f**
3. Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. **W9-10.3**
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
   W9-10.4
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. **W9-10.5**
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. **W9-10.6**
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. **W9-10.7**
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. **W9-10.8**
9. Draw evidence from informational texts to support analysis, reflection, and research. **W9-10.9**
10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. **W9-10.10**

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects Grades 11-12

1. Write arguments focused on discipline-specific content. **W11-12.1**

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. **W11-12.1a**
b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. **W11-12.1b**
c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. **W11-12.1c**
d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. **W11-12.1d**
e. Provide a concluding statement or section that follows from or supports the argument presented. **W11-12.1e**

2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **W11-12.2**
   a. 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. **W11-12.2a**
   b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. **W11-12.2b**
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. **W11-12.2c**
   d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. **W11-12.2d**
   e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). **W11-12.2e**
3. Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. **W11-12.3**
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
   W11-12.4
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. **W11-12.5**
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. **W11-12.6**

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. **W11-12.7**
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. **W11-12.8**
9. Draw evidence from informational texts to support analysis, reflection, and research. **W11-12.9**
10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. **W11-12.10**

Common Career and Technical Core Standards

Transportation, Distribution, & Logistics Career Cluster

Transportation, Distribution, & Logistics Career Cluster Standards (TD)

1. Describe the nature and scope of the Transportation, Distribution, and Logistics Career Cluster and the role of transportation, distribution and logistics in society and the economy. **TD1**
2. Describe the application and use of new and emerging advanced techniques to provide solutions for transportation, distribution, and logistics problems. **TD2**
3. Describe key operational activities required of successful transportation, distribution, and logistics facilities. **TD3**
4. Identify governmental policies and procedures for transportation, distribution, and logistics facilities. **TD4**
5. Describe transportation, distribution, and logistics employee rights and responsibilities and employers' obligations concerning occupational safety and health. **TD5**
6. Describe career opportunities and means to achieve those opportunities in each of the Transportation, Distribution, and Logistics Career Pathways. **TD6**

Facility and Mobile Equipment Maintenance Career Pathway (TD-MTN)

1. Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation. **TD-MTN1**
2. Design ways to improve facility and equipment system performance. **TD-MTN2**

Common Career and Technical Core Career Ready Practices (CCTC CRP)

1. Act as a responsible and contributing citizen and employee. **CRP1**

2. Apply appropriate academic and technical skills. **CRP2**
3. Attend to personal health and financial well-being. **CRP3**
4. Communicate clearly, effectively, and with reason. **CRP4**
5. Consider the environmental, social and economic impacts of decisions. **CRP5**
6. Demonstrate creativity and innovation. **CRP6**
7. Employ valid and reliable research strategies. **CRP7**
8. Utilize critical thinking to make sense of problems and persevere in solving them. **CRP8**
9. Model integrity, ethical leadership, and effective management. **CRP9**
10. Plan education and career path aligned to personal goals.**CRP10**
11. Use technology to enhance productivity. **CRP11**
12. Work productively in teams while using cultural/global competence. **CRP12**