

# Collision Repair: Non-Structural

<b>Primary Career Cluster:</b>	Transportation
<b>Course Contact:</b>	<a href="mailto:CTE.Standards@tn.gov">CTE.Standards@tn.gov</a>
<b>Course Code(s):</b>	C20H13
<b>Prerequisite(s):</b>	<i>Introduction to Collision Repair (C20H20)</i>
<b>Credit:</b>	1 – 3 (See Recommended Credit below)
<b>Grade Level:</b>	10 – 12
<b>Elective Focus - Graduation Requirements:</b>	This course satisfies up to three credits of three credits required for an elective focus when taken in conjunction with other Transportation courses.
<b>POS Concentrator:</b>	This course satisfies one out of two required courses that meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
<b>Programs of Study and Sequence:</b>	This course is the second course in the <i>Automotive Collision Repair</i> program of study.
<b>Aligned Student Organization(s):</b>	SkillsUSA: <a href="http://www.skillsusatn.org/">http://www.skillsusatn.org/</a>
<b>Coordinating Work-Based Learning:</b>	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit <a href="https://www.tn.gov/education/educators/career-and-technical-education/work-based-learning.html">https://www.tn.gov/education/educators/career-and-technical-education/work-based-learning.html</a> .
<b>Promoted Tennessee Student Industry Credentials:</b>	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit <a href="https://www.tn.gov/education/educators/career-and-technical-education/student-industry-certification.html">https://www.tn.gov/education/educators/career-and-technical-education/student-industry-certification.html</a>
<b>Teacher Endorsement(s):</b>	507, 771
<b>Required Teacher Certifications/Training:</b>	ASE B-3 or ASE B-4 or I-CAR Industry Certification
<b>Teacher Resources:</b>	<a href="https://www.tn.gov/education/educators/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html">https://www.tn.gov/education/educators/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html</a>  Best for All Central: <a href="https://bestforall.tnedu.gov/">https://bestforall.tnedu.gov/</a>

## Course at a Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career & technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals and use/produce industry specific, informational texts.

### Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course, note this is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management.
- Participate in contests that highlight job skill demonstration. These include Career Pathways Showcase, Job Interview, Collision Damage Appraisal, Collision Repair Technology, and Automotive Refinishing Technology.

### Using a Work-Based Learning (WBL) in Your Classroom

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standard 1.1** | Include a safety briefing in a visit to an industry partner/job site.
- **Standards 2.1-2.2** | Visit a local company and participate in the preparation done by a technician in the shop.
- **Standards 3.1-3.3** | Have the students work with a technician on a real project.
- **Standards 4.1-6.5** | Have the students do a project that is supervised or evaluated by a manager at a local company.
- **Standard 7.1** | Discuss plastics and adhesives with the employee responsible for plastics.

## Course Description

*Collision Repair: Non-Structural* is for students who wish to obtain in-depth knowledge and skills in repair procedures for non-structural repairs in preparation for postsecondary training and careers as collision repair technicians. Upon completion of this course, proficient students will be able to analyze non-structural collision damage and write and revise repair plans. Students will read and interpret technical texts to determine, understand, and safely perform appropriate repair techniques and procedures. Standards in this course include preparing vehicles for repair, removing and replacing panels and body components, metal finishing, body filling, removing and replacing moveable glass and hardware, metal welding and cutting, and repair of plastics. Students completing the *Automotive Collision Repair* program of study will be eligible to take the examination for Automotive Student Excellence (ASE) Student Certification in Collision Repair. Students completing this course will be eligible to take the examination for ASE Professional Certification in Non-Structural Analysis and Damage Repair (B3). Some tasks are assigned a "High Priority (HP)" designation. NATEF accredited programs must include at least 95% of the HP-I (Individual) tasks and 90% of the HP-G (Group) tasks in the curriculum.

## Recommended Credits

If all standards in the course are covered, the course is recommended for three credits. If one or two credits are offered the following options are recommended.

### 1 Credit Option

Content	Standards
Safety	1.1- all
Preparation	2.1- all 2.2- e, f, g
Outer Body Panel Repairs, Replacements, and Adjustments	3.1- all 3.25- b
Metal Welding and Cutting	6.1- f, g, h, 6.2- a 6.3- a, b 6.4- b, c 6.5- b
Plastics and Adhesives	7.1- a, b

### 2 Credit Option

Content	Standards
Safety	1.1- all
Preparation	2.1- all 3.2- all
Outer Body Panel Repairs, Replacements, and Adjustments	3.1- all 3.2- all 3.3- c, g
Metal Finishing and Body Filling	4.1- a, b, c, f, g, h, i, j
Moveable Glass and Hardware	5.1- b
Metal Welding and Cutting	6.1- all 6.2- all 6.3- a, b 6.4- all 6.5- all
Plastics and Adhesives	7.1- all

## Course Standards

### 1. Safety

- 1.1 Safety: Comply with **personal and environmental safety practices** associated with clothing and the use of gloves; respiratory protection; eye protection; hearing protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle manufacturer's SRS types, locations, and recommended procedures before inspecting or replacing components.
- Use and inspect personal protective equipment every time equipment is used.
  - Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
  - Assume responsibilities under HazCom (Hazard Communication) regulations.
  - Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
  - Utilize SDSs (safety data sheets), and identify the health hazards associated with hazardous material.

### 2. Preparation

- 2.1 Damages and plan: Read and interpret a **damage report** and observe **damages**, synthesizing information from both text and observation to create a basic repair plan for a damaged automobile. Create a written overview of the steps necessary to repair the vehicle.
- Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a **repair plan**. HP-I
- 2.2 Prepare a vehicle: Describe and demonstrate the **steps necessary to prepare a vehicle** for non-structural repair. Create a list of tools, equipment, and materials needed for each step of preparation. Describe the responsibilities and procedures of the repair technician, emphasizing safety procedures in each of the following.
- Inspect, remove, label, store, and reinstall exterior trim and moldings. HP-I
  - Inspect, remove, label, store, and reinstall interior trim and components. HP-I
  - Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair. HP-I
  - Inspect, remove, label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair. HP-G
  - Protect panels, glass, interior parts, and other vehicles adjacent to the repair area. HP-I
  - Soap and water wash entire vehicle; complete pre-repair inspection checklist. HP-I
  - Prepare damaged area using water-based and solvent-based cleaners. HP-I
  - Remove corrosion protection, undercoating, sealers, and other protective coatings as necessary to perform repairs.
  - Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair. HP-I

### 3. Outer Body Panel Repairs, Replacements, and Adjustments

3.1 Updated Repair Plan: Determine the direct and indirect/hidden **damage and direction of impact**. Understand various damages incurred on the vehicle. Hypothesize the direction of impact, citing evidence to justify. Use the information to investigate and report on the damage incurred in outer body panels. Review, edit, and revise repair plan generated in standard 2.1, using technology where appropriate.

- a. Determine the extent of direct and indirect/hidden damage and direction of impact; develop and document an **updated repair plan**. HP-I

3.2 Outer Body Panels: Distinguish among the various **panels and components of a vehicle's outer body**. Compare and contrast the tools, equipment, and procedures for inspecting, removing, replacing, and aligning each of the following. Demonstrate the proper steps in inspecting the components of a vehicle's outer body.

- a. Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies. HP-G
- b. Determine the extent of damage to aluminum body panels; repair or replace. HP-G
- c. Inspect, remove, replace, and align hood, hood hinges, and hood latch. HP-I
- d. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch. HP-I
- e. Inspect, remove, replace, and align doors, latches, hinges, and related hardware. HP-I
- f. Inspect, remove, replace and align tailgates, hatches, liftgates, and sliding doors. HP-G
- g. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware. HP-I
- h. Inspect, remove, replace and align fenders, and related panels. HP-I

3.3 Repair Outer Body Panels: Use the proper tools and procedures to **repair outer body panels**.

- a. Straighten contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments. HP-I
- b. Weld damaged or torn steel body panels; repair broken welds. HP-G
- c. Restore corrosion protection. HP-I
- d. Replace door skins. HP-G
- e. Restore sound deadeners and foam materials. HP-G
- f. Perform panel bonding and weld bonding. HP-G
- g. Diagnose and repair water leaks, dust leaks, and wind noise. HP-G
- h. Identify one-time use fasteners. HP-G

### 4. Metal Finishing and Body Filling

4.1 Body Filling and Metal Finishing: Implement the processes, tools, and materials involved in applying **body filling and finishing metal**. Prepare materials for body filler. Apply the minor body repair processes for the damages. Complete the proper repair procedures for given body panel damages.

- a. Remove paint from the damaged area of a body panel. HP-I
- b. Locate and repair surface irregularities on a damaged body panel. HP-I

- c. Demonstrate hammer and dolly techniques. HP-I
- d. Heat shrink stretched panel areas to proper contour. HP-I
- e. Cold shrink stretched panel areas to proper contour. HP-I
- f. Prepare and apply body filler. HP-I
- g. Identify different types of body fillers. HP-G
- h. Rough sand body filler to contour; finish sand. HP-I
- i. Determine the proper metal finishing techniques for aluminum. HP-G
- j. Determine proper application of body filler to aluminum. HP-G

## 5. Moveable Glass and Hardware

- 5.1 Moveable Glass and Hardware: Explain the structure, purpose, and function of **moveable glass and hardware** system components and demonstrate appropriate repairs of each.
- a. Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls. HP-I
  - b. Inspect, adjust, repair, remove, reinstall or replace weather-stripping. HP-G
  - c. Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs. HP-G
  - d. Inspect, remove, reinstall, and align convertible top and related mechanisms. HP-G
  - e. Initialize electrical components as needed. HP-G

## 6. Metal Welding and Cutting

- 6.1 Welding and Cutting: Determine the tools, procedures, and welding methods used to weld and cut aluminum, high-strength steels, and other steels, noting when substrates are weldable. Describe the tools, tool settings, procedures, and methods for welding in a variety of situations. Perform basic **welding and cutting** of aluminum and steel.
- a. Identify weldable and non-weldable substrates used in vehicle construction. HP-I
  - b. Weld and cut high-strength steel and other steels. HP-I
  - c. Weld and cut aluminum. HP-G
  - d. Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation. HP-I
  - e. 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. HP-I
  - f. Store, handle, and install high-pressure gas cylinders. HP-I
  - g. Determine work clamp (ground) location and attach. HP-I
  - h. 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. HP-I
- 6.2 Preparation for Welding: Describe and demonstrate how to **prepare vehicle body components for welding**.
- a. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. HP-I
  - b. Protect computers and other electronic control modules during welding procedures. HP-I

- c. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld through primer if necessary, clamp or tack as required. HP-I
- 6.3 Weld Types: Distinguish among the **various types of weld and joint types**. Emphasizing proper safety equipment and techniques, implement the appropriate tools, equipment, techniques, and procedures to perform a variety of welds.
- a. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I
  - b. Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. HP-I
  - c. Perform the following welds: continuous, plug, butt weld with and without backing, fillet, etc. HP-I
- 6.4 Inspect Welds: Identify and demonstrate basic **inspection and troubleshooting** strategies appropriate for **evaluating welds**. Use the knowledge to remedy any problem with a weld.
- a. Perform visual and destructive tests on each weld type. HP-I
  - b. Identify the causes of various welding defects; make necessary adjustments. HP-I
  - c. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. HP-I
- 6.5 Nonstructural Components: Perform a range of procedures used to cut and attach **nonstructural components**, noting when each method is commonly used.
- a. Identify cutting process for different substrates and locations; perform cutting operation. HP-I
  - b. Identify different methods of attaching nonstructural components (squeeze type resistant spot welds (STRSW), riveting, nonstructural adhesive, silicon bronze, etc.). HP-G

## 7. Plastics and Adhesives

- 7.1 Plastics: Determine damage to **plastic components**. Identify the nature of the problem and **complete appropriate repair**. Describe the types of plastic repair procedures, emphasizing the conditions which require each type of procedure. Select the appropriate repair procedures and justify the selection.
- a. Identify the types of plastics; determine repairability. HP-I
  - b. Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures. HP-I
  - c. Repair rigid, semi-rigid, or flexible plastic panels. HP-I
  - d. Remove or repair damaged areas from rigid exterior composite panels. HP-G
  - e. Replace bonded rigid exterior composite body panels; straighten or align panel supports. HP-G

## 8. New Trends

- 8.1 Hybrid: Apply Automotive Electrical Theory, **Hybrid**, and Electrical Safety realities in the collision repair work.
- 8.2 Driver Assist Systems: Understand how Advanced **Driver Assist Systems** and Operation impact collision repair work.

## Standards Alignment Notes

\*References to other standards include:

- Automotive Service Excellence (ASE) Education Foundation standards for [Collision Repair and Refinish](#).
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
  - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.