



# Collision Repair: Painting & Refinishing

<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>	C20H14
<b>Prerequisite(s):</b>	<i>Introduction to Collision Repair (C20H20), Collision Repair: Non-Structural (C20H13) (optional)</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, Distribution, & Logistics 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 third 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/content/tn/education/career-and-technical-education/work-based-learning.html">https://www.tn.gov/content/tn/education/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/career-and-technical-education/student-industry-certification.html">https://www.tn.gov/education/career-and-technical-education/student-industry-certification.html</a>
<b>Teacher Endorsement(s):</b>	507, 771
<b>Required Teacher Certifications/Training:</b>	ASE B-2 or I-CAR Industry Certification
<b>Teacher Resources:</b>	<a href="https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html">https://www.tn.gov/education/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 (WB) 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.

- **Standards 1.1-1.2** | During a visit to an industry site have the manager talk about safety in the workplace.
- **Standards 2.1-2.2** | Have the students work with a technician on surface preparation.
- **Standard 3.1** | Have the students work with a technician on the spray gun.
- **Standards 4.1-6.1** | Have the students do a project that is supervised or evaluated by a manager at a local company.

## Course Description

*Collision Repair: Painting & Refinishing* is for students who wish to obtain in-depth knowledge and skills in automotive painting and refinishing procedures in preparation for postsecondary training and careers as collision repair technicians. Upon completion of this course, proficient students will be able to develop, document, and implement refinishing plans for given vehicles. Students will read and interpret technical texts to determine, understand, and safely perform appropriate repair techniques and procedures. Standards in this course include surface preparation; spray gun and related equipment operation, paint mixing, matching, and applying; diagnosis and correction of paint defects; and final detailing. 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 Painting & Refinishing (B2). 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 1.2- all
Surface Preparation	2.1- c 2.2 - f, h, j, k, l, m, n, t, u
Spray Gun and Related Equipment Operation	3.1- all
Paint Mixing, Matching, and Applying	4.1- a, m, o

### 2 Credit Option

Content	Standards
Safety	1.1- all 1.2- all
Surface Preparation	2.1- all 2.2 - a, b, c, d, e, f, h, i, j, k, l, m, n, p, q, r, t, u
Spray Gun and Related Equipment Operation	3.1- all
Paint Mixing, Matching, and Applying	4.1- a, b, e, h, l, m, n, o
Final Detail	6.1- c, d, e

## Course Standards

### 1. Safety

- 1.1 Safety Practices: 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.
  - Maintain a portfolio record of safety examinations and equipment examination for which the student has passed an operational checkout by the instructor.
  - Utilize SDSs (safety data sheets) and identify the health hazards associated with hazardous material.

- 1.2 Safety Regulations and Procedures: Locate, read, and interpret federal, state, and local regulations impacting the painting and refinishing of vehicles. Follow **regulations and procedures** to work safely around materials and equipment.
- a. Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations. HP-I
  - b. Identify safety and personal health hazards according to OSHA guidelines and the "Right to Know Law". HP-I
  - c. Inspect spray environment and equipment to ensure compliance with federal, state and local regulations, and for safety and cleanliness hazards. HP-I
  - d. Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation. HP-I
  - e. Select and use a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation. HP-I
  - f. Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.). HP-I

## 2. Surface Preparation

- 2.1 Plan for Preparation: Create and publish a **plan for refinishing** using a total product system. Perform **inspections** to determine the condition of the vehicle. Cite evidence to justify elements of the plan. Consult with others and revise the plan, as needed.
- a. Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation. HP-I
  - b. Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants. HP-I
  - c. Inspect and identify type of finish, surface condition, and film thickness; develop and document a plan for refinishing using a total product system. HP-G
- 2.2 Prepare Surface: Diagram the steps necessary to prepare the surfaces of a vehicle for painting. Create a **list of tools, equipment, and materials** needed for each step of preparation. Create a visual display with supporting text outlining the responsibilities and procedures of the repair technician, noting the appropriate timing of each task. Perform proper **procedures to prepare the surface of a vehicle**.
- a. Strip paint to bare substrate (paint removal). HP-I
  - b. Dry or wet sand areas to be refinished. HP-I
  - c. Featheredge areas to be refinished. HP-I
  - d. Apply suitable metal treatment or primer in accordance with total product systems. HP-I
  - e. Mask and protect other areas that will not be refinished. HP-I
  - f. Mix primer, primer-surfacer or primer-sealer. HP-I
  - g. Identify a complimentary color or shade of undercoat to improve coverage. HP-G
  - h. Apply primer onto surface of repaired area. HP-I
  - i. Apply two-component finishing filler to minor surface imperfections. HP-I
  - j. Block sand area to which primer-surfacer has been applied. HP-I

- k. Dry sand area to which finishing filler has been applied. HP-I
- l. Remove dust from area to be refinished, including cracks or moldings of adjacent areas. HP-I
- m. Clean area to be refinished using a final cleaning solution. HP-I
- n. Remove, with a tack rag, any dust or lint particles from the area to be refinished. HP-I
- o. Apply suitable sealer to the area being refinished. HP-I
- p. Scuff sand to remove nibs or imperfections from a sealer. HP-I
- q. Apply stone chip resistant coating. HP-G
- r. Restore caulking and seam sealers to repaired areas. HP-G
- s. Prepare adjacent panels for blending. HP-I
- t. Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures. HP-I
- u. Identify metal parts to be refinished; determine the materials needed, preparation, and refinishing procedures. HP-I

### 3. **Spray Gun and Related Equipment Operation**

3.1 Spray Gun: Demonstrate the proper procedures involved in operating a **spray gun and related equipment**. Maintain spray guns and related equipment.

- a. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment). HP-I
- b. Select spray gun setup (fluid needle, nozzle, and cap) for product being applied. HP-I
- c. Test and adjust spray gun using fluid, air and pattern control valves. HP-I
- d. Demonstrate an understanding of the operation of pressure spray equipment. HP-G

### 4. **Paint Mixing, Matching, and Applying**

4.1 Painting: Demonstrate **paint mixing** procedures. Differentiate the effects of paint ratios on the color and composition of paint to hypothesize possible outcomes of each ratio. Calculate proper formulations of paint based upon label directions using formulas. Demonstrate in a live setting or in a presentation the ability to follow painting instructions precisely as they pertain to **selection, mixing, handling, and application**. Demonstrate procedures to apply **paint and refinish plastic parts** using the appropriate tools, equipment, and materials.

- a. Identify color code by manufacturer's vehicle information label. HP-I
- b. Shake, stir, reduce, catalyze/activate, and strain refinish materials. HP-I
- c. Apply finish using appropriate spray techniques (gun arc, angle, distance, travel speed, and spray pattern overlap) for the finish being applied. HP-I
- d. Apply selected product on test or let-down panel; check for color match. HP-I
- e. Apply single stage topcoat. HP-G
- f. Apply basecoat/clearcoat for panel blending and panel refinishing. HP-I
- g. Apply basecoat/clearcoat for overall refinishing. HP-G
- h. Remove nibs or imperfections from basecoat. HP-I
- i. Refinish rigid or semi-rigid plastic parts. HP-G
- j. Refinish flexible plastic parts. HP-I
- k. Apply multi-stage coats for panel blending and overall refinishing. HP-G
- l. Identify and mix paint using a formula. HP-I

- m. Identify poor hiding colors; determine necessary action. HP-G
- n. Tint color using formula to achieve a blendable match. HP-I
- o. Identify alternative color formula to achieve a blendable match. HP-I
- p. Identify the materials, equipment, and preparation differences between solvent and waterborne technologies. HP-G

## 5. Paint Defects - Causes and Cures

- 5.1 Paint Defects: Identify a wide array of **paint defects** possible including detailed descriptions, causes, and solutions. Compare and contrast the **characteristics and solutions** of paint defects. Demonstrate **troubleshooting strategies** appropriate for identifying and evaluating paint defects in given scenarios. Document findings in a technical report, citing evidence to recommend and justify the necessary correction procedures and methods to prevent future occurrences. Perform **proper procedures to correct paint defects**.
- a. Identify blistering (raising of the paint surface, air entrapment); determine the cause(s) and correct the condition. HP-G
  - b. Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition. HP-I
  - c. Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition. HP-I
  - d. Identify lifting; determine the cause(s) and correct the condition. HP-G
  - e. Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition. HP-I
  - f. Identify orange peel; determine the cause(s) and correct the condition. HP-I
  - g. Identify overspray; determine the cause(s) and correct the condition. HP-I
  - h. Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition. HP-G
  - i. Identify sags and runs in paint surface; determine the cause(s) and correct the condition. HP-I
  - j. Identify sanding marks or sandscratch swelling; determine the cause(s) and correct the condition. HP-I
  - k. Identify contour mapping/edge mapping while finish is drying; determine the cause(s) and correct the condition. HP-G
  - l. Identify color difference (off-shade); determine the cause(s) and correct the condition. HP-G
  - m. Identify tape tracking; determine the cause(s) and correct the condition. HP-G
  - n. Identify low gloss condition; determine the cause(s) and correct the condition. HP-G
  - o. Identify poor adhesion; determine the cause(s) and correct the condition. HP-G
  - p. Identify paint cracking (shrinking, splitting, crowsfeet or line-checking, micro-checking, etc.); determine the cause(s) and correct the condition. HP-G
  - q. Identify corrosion; determine the cause(s) and correct the condition. HP-G
  - r. Identify dirt or dust in the paint surface; determine the cause(s) and correct the condition. HP-I
  - s. Identify water spotting; determine the cause(s) and correct the condition. HP-G
  - t. Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition. HP-G

- u. Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition. HP-G
- v. Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition. HP-G
- w. Identify chalking (oxidation); determine the cause(s) and correct the condition. HP-G
- x. Identify bleed-through (staining); determine the cause(s) and correct the condition. HP-G
- y. Identify pin-holing; determine the cause(s) and correct the condition. HP-G
- z. Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition. HP-I
- aa. Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition. HP-G

## 6. Final Detail

- 6.1 Final Detail: Explain and demonstrate the proper procedures to complete the **final detailing for painting and refinishing** projects. Create a checklist and guide perform procedures, noting common mistakes to avoid.
- a. Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc. HP-G
  - b. Sand, buff and polish fresh or existing finish to remove defects as required. HP-I
  - c. Clean interior, exterior, and glass. HP-I
  - d. Clean body openings (door jambs and edges, etc.). HP-I
  - e. Remove overspray. HP-I
  - f. Perform vehicle clean-up; complete quality control using a checklist. HP-I

## 7. Management

7.1 Quality Control: Manage **Quality Control** aspects of collision repair work.

7.2 Time Management: Discern cycle times and **determine how much time to spend on each task**.

## 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.