# 2024 Automotive Collision Repair

## Program Standards

### CONTENT STANDARD 1.0: PROFESSIONAL ORGANIZATIONS AND LEADERSHIP

Performance Standard 1.1: Student Leadership in Career Technical Student Organizations (CTSO) and Professional Associations

1.1.1 Explore the role of professional organizations and/or associations in the automotive collision and repair industry.
1.1.2 Define the value, role, and opportunities provided through career technical student organizations.
1.1.3 Engage in career exploration and leadership development.

### CONTENT STANDARD 2.0: CAREERS

Performance Standard 2.1: Explore Careers

2.1.1 Describe the career opportunities and career paths in the transportation industry and the automotive collision repair industry.
2.1.2 Identify educational and credential requirements for career pathways in the industry.
2.1.3 Research new and emerging vehicle technologies and trends.

### CONTENT STANDARD 3.0: SAFETY PROCEDURES AND PROPER TOOLS

Performance Standard 3.1: General Lab Safety Rules and Procedures

3.1.1 Describe general lab/shop safety rules and procedures (i.e., safety test).
3.1.2 Identify general lab/shop safety hazards.
3.1.3 Describe the use and placement of floor jacks and jack stands.
3.1.4 Identify and use proper procedures for safe vehicle lift operation.
3.1.5 Describe proper ventilation procedures for working within the lab/shop area.
3.1.6 Describe marked safety areas.
3.1.7 Identify the location and the types of fire extinguishers and other fire safety equipment.
3.1.8 Describe the procedures for using fire extinguishers and other fire safety equipment.
3.1.9 Describe the location and use of eye wash stations.
3.1.10 Identify the location of the posted evacuation routes.
3.1.11 Comply with the required use of personal protective equipment (PPE) during lab/shop activities.
3.1.12 Wear appropriate clothing for lab/shop activities.
3.1.13 Secure hair and jewelry for lab/shop activities.
3.1.14 Describe safety aspects of supplemental restraint systems (SRS), Advanced Driver Assistance Systems (ADAS), hybrid vehicles, alternative fuel vehicles, electric vehicles, and high-voltage circuits.
3.1.15 Describe the location and purpose of safety data sheets (SDS).

Performance Standard 3.2: Tool Identification, Use, and Safety

3.2.1 Identify the correct tool for a specific application or repair.
3.2.2 Describe whether a tool or repair uses standard or metric designation.
3.2.3 Demonstrate safe handling and use of tools.
3.2.4 Describe the need for cleaning, storing, maintaining, and removing (i.e., lockout/tagout) tools and equipment.
3.2.5 Demonstrate use of precision measuring tools (e.g., tram gauges, mil thickness gauge) and when they should be used.

### CONTENT STANDARD 4.0: DAMAGE ANALYSIS, ESTIMATING, AND CUSTOMER SERVICE

Performance Standard 4.1: Vehicle Construction and Parts

4.1.1 Identify type of vehicle construction (i.e., unibody, body-on-frame).

4.1.2 Compare the different damage characteristics of unibody, and body-on-frame vehicles.
4.1.3 Identify impact energy absorbing components.
4.1.4 Identify damage to types of steel; determine reparability.
4.1.5 Identify damage to aluminum/magnesium components; determine reparability.
4.1.6 Identify damage to plastic/composite components; determine reparability.
4.1.7 Identify damage to vehicle glass components and repair or replacement procedures.
4.1.8 Identify damage to add-on accessories.

Performance Standard 4.2: Damage Analysis

4.2.1 Visually inspect vehicle to determine the extent of damage, (i.e., pre-repair scan).
4.2.2 Access original equipment manufacturer (OEM) repair procedures and recommended repair methods.
4.2.3 Identify one-time use components.
4.2.4 Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage.
4.2.5 Gather details of the incident/accident necessary to determine the full extent of vehicle damage (i.e., interior, exterior, mechanical).
4.2.6 Document pre-existing damage to the vehicle and prior repairs.
4.2.7 Disassemble a vehicle for repair planning (i.e., blueprinting).
4.2.8 Identify structural damage, using measuring tools and equipment.
4.2.9 Perform visual inspection of structural and non-structural components.
4.2.10 Determine parts, components, material type(s), and procedures necessary for repair.

Performance Standard 4.3: Estimating Procedures

4.3.1 Document customer (i.e., vehicle owner) information.
4.3.2 Document vehicle identification number (VIN) information, including nation of origin, make, model, restraint system, body type, production date, engine type, and assembly plant.
4.3.3 Soap and water wash entire vehicle.
4.3.4. Complete a pre-repair inspection checklist.
4.3.5 Document vehicle options, including trim level, paint code, transmission, accessories, and modifications.
4.3.6 Identify safety systems, determining replacement items.
4.3.7 Apply estimating and parts nomenclature (i.e., terminology).
4.3.8 Describe the estimating sequence.
4.3.9 Apply estimating guide footnotes and headnotes as needed.
4.3.10 Estimate labor price for each operation prescribed (e.g., structural, non-structural, mechanical, refinish).
4.3.11 Select and price OEM, aftermarket, used, and remanufactured parts; verify availability, compatibility, and condition.
4.3.12 Calculate price and source of necessary sublet operations.
4.3.13 Calculate labor value, prices, charges, allowances, or fees for non-included operations and miscellaneous items.
4.3.14 Apply labor overlap deductions, included operations, and additions.
4.3.15 Determine additional material and charges (e.g., adhesives, corrosion protection, hardware).
4.3.16 Determine refinishing material and charges.
4.3.17 Estimate repair, using estimating guide procedure pages (i.e., P-pages).
4.3.18 Identify industry standard software used to create estimates.
4.3.19 Determine the cost effectiveness of the repair by assessing the approximate vehicle value and repair value.

Performance Standard 4.4: Customer Relations and Sales Skills

4.4.1 Greet the customer and determine needs, concerns, and expectations, remaining responsive and cooperative throughout the service.
4.4.2 Determine preferred customer communication methods.
4.4.3 Describe basic claims-handling procedures to the customer.
4.4.4 Describe warranty information to the customer.
4.4.5 Estimate the time that the vehicle will be out-of-service.
4.4.6 Describe estimate details to the customer.

## CONTENT STANDARD 5.0: NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)

### Performance Standard 5.1: Outer Body Panel Repair, Replacement, and Adjustments

5.1.1 Analyze damage, according to the damage report, to determine appropriate methods for overall repair.
5.1.2 Document a repair plan.
5.1.3 Inspect, remove, label, store, and reinstall exterior trim and moldings.
5.1.4 Inspect, remove, label, store, and reinstall interior trim and components.
5.1.5 Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair.
5.1.6 Inspect, remove, label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair.
5.1.7 Protect panels, glass, interior parts, and other vehicles adjacent to the repair area.
5.1.8 Prepare damaged area using water-based and solvent-based cleaners.
5.1.9 Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs.
5.1.10 Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair.
5.1.11 Inspect, remove, and replace seatbelt and shoulder harness assembly and components.
5.1.12 Inspect restraint system mounting areas for damage; repair as needed.
5.1.13 Test and verify proper operation of seatbelt.
5.1.14 Clean, inspect, and prepare reusable fasteners.

### Performance Standard 5.2: Metal Finishing and Body Filling Techniques

5.2.1 Identify substrate, determining the best repair method.
5.2.2 Repair surface irregularities on a damaged body panel.
5.2.3 Demonstrate hammer-and-dolly techniques and shrinking techniques.
5.2.4 Demonstrate glue tab pulling techniques.
5.2.5 Prepare surface per OEM specifications.
5.2.6 Identify various types of body fillers.
5.2.7 Prepare and apply body filler.
5.2.8 Rough sand body filler to contour and finish sand.

### Performance Standard 5.3: Moveable Glass and Hardware Components

5.3.1 Inspect, adjust, and repair or replace window regulators, run channels, glass, power mechanisms, and related controls.
5.3.2 Inspect, adjust, and repair, remove, reinstall, or replace weather-stripping.
5.3.3 Cycle electrical components as needed.

### Performance Standard 5.4: Metal Welding and Cutting Techniques

5.4.1 Identify weldable and non-weldable substrates used in vehicle construction.
5.4.2 Weld and cut high-strength steel and other steels (e.g., plasma).
5.4.3 Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.
5.4.4 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 that will be welded.
5.4.5 Store, handle, and install high-pressure gas cylinders.

5.4.6 Determine work clamp (ground) location and attach.
5.4.7 Perform welds in the flat, horizontal, vertical, and overhead positions, using the proper angle of the gun to the joint and direction of gun travel per weld type.
5.4.8 Protect adjacent panels, glass, and vehicle interior from welding and cutting operations.
5.4.9 Protect computers and other electronic control modules during welding procedures.
5.4.10 Clean and prepare the metal that will be welded, assure good metal fit-up, apply weld-through primer if recommended, clamp or tack as required.
5.4.11 Determine the best joint type (e.g., butt weld with backing, lap) for various welds.
5.4.12 Determine the type of weld (e.g., continuous, stitch weld, plug) for each specific welding operation.
5.4.13 Perform the following welds: continuous, plug, butt weld with and without backing, and fillet.
5.4.14 Perform visual and destructive tests on each weld type.
5.4.15 Identify the causes of various welding defects, making necessary adjustments.
5.4.16 Identify cause of contact tip burn-back and failure of wire to feed, making necessary adjustments.
5.4.17 Identify different methods of attaching non-structural components (e.g., squeeze-type resistant spot welds [STRSW], riveting/rivet bonding, adhesive, silicon bronze).

### Performance Standards 5.5: Plastic and Adhesives

5.5.1 Identify the types of plastics; determine repairability and procedures.
5.5.2 Clean and prepare the surface of plastic parts.
5.5.3 Demonstrate one-sided, two-sided, and tab repair, using adhesive and nitrogen welding.
5.5.4 Repair rigid, semi-rigid, or flexible plastic panels.
5.5.5 Remove or repair damaged areas from rigid exterior composite panels.
5.5.6 Demonstrate the proper cleanup procedures for specific adhesives.

## CONTENT STANDARD 6.0: STRUCTURAL ANALYSIS

### Performance Standards 6.1: Inspection and Repair Techniques

6.1.1 Describe diagnostic techniques for structural damage.
6.1.2 Describe how vehicles are attached to anchoring devices and subsequent restoration of anchoring locations.
6.1.3 Describe the extent of the direct and indirect damage and the direction of impact.
6.1.4 Document the methods and sequence of structural repair.
6.1.5 Identify crush/collapse zones.
6.1.6 Identify steering and suspension collision damage.

## CONTENT STANDARD 7.0: PAINTING AND REFINISHING TECHNIQUES

### Performance Standards 7.1: Safety Precautions

7.1.1 Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.
7.1.2 Identify safety and personal health hazards according to the Occupational Safety and Health Administration (OSHA) guidelines and the “Right to Know Law.”
7.1.3 Inspect spray environment and equipment to ensure compliance with federal, state, and local regulations, and for safety and cleanliness hazards.
7.1.4 Describe the procedures for safely using a National Institute for Occupational Safety and Health (NIOSH) approved air purifying respirator.
7.1.5 Describe procedures for safely using a NIOSH approved supplied air (i.e., fresh air make-up) respirator system.
7.1.6 Perform maintenance on respirators in accordance with OSHA regulation and applicable state and local regulations.
7.1.7 Select and use appropriate PPE in the painting and refinishing environment.

### Performance Standard 7.2: Surface Preparation Techniques

7.2.1 Inspect, remove, store, and replace exterior trim and components necessary for surface preparation.
7.2.2 Wash with soap and water the entire vehicle, using appropriate cleaner to remove contaminants.
7.2.3 Identify type of finish, surface condition, and film thickness.
7.2.4 Develop a plan for refinishing, using a total product system.
7.2.5 Strip paint to bare substrate (i.e., paint removal).
7.2.6 Dry sand or wet sand areas to be refinished.
7.2.7 Featheredge areas to be refinished.
7.2.8 Apply suitable metal treatment or primer in accordance with total product systems.
7.2.9 Mask and protect other areas that will not be refinished.
7.2.10 Identify types of primers and appropriate application (e.g., UV, urethane, epoxy).
7.2.11 Mix primer-surfacer or primer-sealer.
7.2.12 Identify a complementary color or shade of undercoat to improve coverage.
7.2.13 Apply primer to surface of repaired area.
7.2.14 Apply two-component finishing filler to minor surface imperfections.
7.2.15 Block sand area to which primer-surface has been applied.
7.2.16 Dry sand area to which finishing filler has been applied.
7.2.17 Remove dust from area to be refinished, including cracks or moldings of adjacent areas.
7.2.18 Clean area to be refinished, using a final cleaning solution.
7.2.19 Remove, with a tack rag, any dust or lint particles from the area to be refinished.
7.2.20 Apply suitable sealer to the area being refinished.
7.2.21 Scuff sand to remove nibs or imperfections from a sealer.
7.2.22 Apply stone chip-resistant coating.
7.2.23 Restore caulking and seam sealers to repaired areas.
7.2.24 Prepare adjacent panels for blending.
7.2.25 Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished, determining the materials needed, preparation, and refinishing procedures.
7.2.26 Identify metal parts to be refinished, determining the materials needed, preparation, and refinishing procedures.

Performance Standards 7.3: Spray Gun and Related Equipment Operations

7.3.1 Inspect, clean, and determine the condition of spray guns and related equipment (e.g., air hoses, regulators, air lines, air source) in the spray environment.
7.3.2 Select spray gun and setup (e.g., fluid needle, nozzle, cap) for applied product.
7.3.3 Test and adjust spray gun, using fluid, air, and pattern control valves.
7.3.4 Demonstrate the operation of spray equipment.

Performance Standards 7.4: Paint Mixing, Matching, and Application

7.4.1 Identify color code by manufacturer's vehicle information label.
7.4.2 Shake, stir, reduce, catalyze/activate, and strain refinish materials.
7.4.3 Apply finish, using appropriate spray techniques (e.g., gun arc, angle, distance, travel speed, spray pattern overlap) for the applied finish.
7.4.4 Create sprayout panel and check for color match.
7.4.5 Apply single-stage topcoat.
7.4.6 Apply basecoat/clear coat for panel blending and panel refinishing.
7.4.7 Apply basecoat/clear coat for overall refinishing.
7.4.8 Remove nibs or imperfections from basecoat.
7.4.9 Refinish flexible plastic parts.
7.4.10 Demonstrate knowledge of multi-stage coats for panel blending and overall refinishing.
7.4.11 Create letdown panel for multi-stage finishes.
7.4.12 Mix paint, using a formula.
7.4.13 Identify poor hiding colors, determining necessary action.

7.4.14 Identify alternative color formula to achieve a blended match (e.g., color chips, spectrophotometers).
7.4.15 Identify the materials equipment and the preparation differences between solvent and waterborne technologies.

### Performance Standards 7.5: Paint Defects—Causes and Cures

7.5.1 Identify methods to prevent paint defects (e.g., booth maintenance, air compressor maintenance, employee cleanliness, vehicle cleanliness).
7.5.2 Identify blistering (i.e., raising of the paint surface, air entrapment); determine the cause(s) and correct the condition.
7.5.3 Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.
7.5.4 Identify the presence of fish-eyes (i.e., crater-like openings) in the finish; determine the cause(s) and correct the condition.
7.5.5 Identify lifting; determine the cause(s) and correct the condition.
7.5.6 Identify clouding (i.e., mottling and streaking in metallic finishes); determine the cause(s) and correct the condition.
7.5.7 Identify orange peel; determine the cause(s) and correct the condition.
7.5.8 Identify overspray; determine the cause(s) and correct the condition.
7.5.9 Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition.
7.5.10 Identify sags and runs in paint surface; determine the cause(s) and correct the condition.
7.5.11 Identify sanding marks or sand scratch swelling; determine the cause(s) and correct the condition.
7.5.12 Identify contour mapping/edge mapping while finish is drying; determine the cause(s) and correct the condition.
7.5.13 Identify color difference (i.e., off-shade); determine the cause(s) and correct the condition.
7.5.14 Identify tape tracking; determine the cause(s) and correct the condition.
7.5.15 Identify low-gloss condition; determine the cause(s) and correct the condition.
7.5.16 Identify poor adhesion; determine the cause(s) and correct the condition.
7.5.17 Identify paint cracking (e.g., shrinking, splitting, crow's feet or line-checking, micro-checking); determine the cause(s) and correct the condition.
7.5.18 Identify corrosion; determine the cause(s) and correct the condition.
7.5.19 Identify dirt or dust in the paint surface; determine the cause(s) and correct the condition.
7.5.20 Identify water spotting; determine the cause(s) and correct the condition.
7.5.21 Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.
7.5.22 Identify finish damage caused by airborne contaminants (e.g., acids, soot, rail dust, other industrial-related causes); correct the condition.
7.5.23 Identify die-back conditions (i.e., dulling of the paint film showing haziness); determine the cause(s) and correct the condition.
7.5.24 Identify chalking (i.e., oxidation); determine the cause(s) and correct the condition.
7.5.25 Identify bleed-through (i.e., staining); determine the cause(s) and correct the condition.
7.5.26 Identify pin-holing; determine the cause(s) and correct the condition.
7.5.27 Identify buffing-related imperfections (e.g., swirl marks, wheel burns); correct the condition.

## CONTENT STANDARD 8.0: REASSEMBLY AND TESTING

### Performance Standard 8.1: Predelivery Process

8.1.1 Reapply corrosion protection per OEM recommendations (e.g., cavity wax, undercoat, seam sealer, thin-film technology).

8.1.2 Demonstrate reassembly procedures and test and verify systems (e.g., lighting, windows, doors, safety sensors).
8.1.3 Describe ADAS system check per OEM recommendations.
8.1.4 Describe post-scan and determine recalibrations.
8.1.5 Check for water leaks, dust leaks, and wind noise.
8.1.6 Torque lug nuts to OEM specifications if wheel was removed.

## CONTENT STANDARD 9.0: DETAILING

### Performance Standards 9.1: Detail Procedures

9.1.1 Apply decals, transfers, tapes, and pinstripes.
9.1.2 Sand, buff, and polish fresh or existing finish to remove defects, as required.
9.1.3 Clean interior, exterior, and glass.
9.1.4 Clean body openings (e.g., door jambs, edges).
9.1.5 Remove overspray.
9.1.6 Perform vehicle cleanup.
9.1.7 Complete quality control, using a checklist.