



AUTOMOTIVE COLLISION REPAIR 47.0600.30

TECHNICAL STANDARDS

An Industry Technical Standards Validation Committee developed and validated these standards on April 8, 2021. Because these standards align with the Automotive Service Excellence (ASE) Task List, students completing the program are eligible to earn the ASE Certification. The Arizona Career and Technical Education Quality Commission, the validating authority for the Arizona Skills Standards Assessment System, endorsed these standards on July 28, 2021.

Note: Arizona's Professional Skills are taught as an integral part of the Automotive Collision Repair program.

The Technical Skills Assessment for Automotive Collision Repair is available SY2021-2022.

Note: In this document i.e. explains or clarifies the content and e.g. provides examples of the content that must be taught.

STANDARD 1.0 PERFORM NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR

- 1.1 Use proper personal safety equipment and take necessary precautions with hazardous operations and materials in accordance with federal, state, and local regulations
- 1.2 Use OEM (Original Equipment Manufacturer/Manufacturing) procedures to identify material and composition of the vehicle being repaired (i.e., mid steel, high strength steel, ultra-high strength steel, aluminum, composites, carbon fiber, etc.)
- 1.3 Use procedures and precautions that apply to the vehicle being repaired
- 1.4 Identify vehicle system precautions and/or inspections and recommended procedure before inspecting or replacing components [i.e., supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/electric/alternative fuel vehicles, locations, etc.]
- 1.5 Perform vehicle clean-up; complete quality control using a checklist on operations performed (e.g., review estimate and develop a repair plan; secure and store any items in the repair area; remove necessary trim and panels for repair, and bag and tag hardware; vacuum glass from doors, quarters, and floors; and wipe clean any materials on panels and interior parts)
- 1.6 Review damage report and analyze damage to determine appropriate methods for overall repair and develop and document a repair plan
- 1.7 Inspect, remove, protect, label, store, inventory, and reinstall exterior trim and moldings
- 1.8 Inspect, remove, protect, label, store, inventory, and reinstall interior trim and components
- 1.9 Inspect, remove, protect, label, store, inventory, and reinstall body panels and components that may interfere with or be damaged during repair
- 1.10 Inspect, remove, protect label, store, inventory, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair
- 1.11 Protect panels, glass, interior parts, and other vehicles adjacent to the repair area
- 1.12 Wash entire vehicle with soap and water and complete pre-repair inspection checklist (e.g., secure and store any items in the way of vehicle repair; remove and store any item removed for repair; bag and tag any hardware for easy reassembly; wash vehicle with soap and water; and cover any adjacent panels, glass, and trim to protect from damage during repair)
- 1.13 Prepare damaged area using water-based and solvent-based cleaners
- 1.14 Remove corrosion protection, undercoating, sealers, and other protective coatings as necessary to perform repairs
- 1.15 Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair

STANDARD 2.0 PERFORM OUTER BODY PANEL REPAIRS, REPLACEMENTS, AND ADJUSTMENTS

- 2.1 Inspect/locate direct, indirect, or hidden damage and direction of impact
- 2.2 Inspect, remove, and replace welded steel panel or panel assemblies
- 2.3 Determine the extent of damage to aluminum body panels and repair, or replace
- 2.4 Inspect, remove, replace, and align hood, hood hinges, and hood latch
- 2.5 Inspect, remove, replace, and align deck lid, lid hinges, and lid latch
- 2.6 Inspect, remove, replace, and align doors, latches, hinges, and related hardware
- 2.7 Inspect, remove, replace, and align tailgates, hatches, liftgates, and sliding doors
- 2.8 Inspect, remove, replace, overhaul, and align bumpers, covers, reinforcement, guards, impact absorbers, and mounting hardware

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- 2.9 Inspect, remove, replace, and align fenders, and related panels
- 2.10 Restore corrosion protection during and after the repair
- 2.11 Replace door skins
- 2.12 Restore sound deadeners and foam materials
- 2.13 Perform panel bonding and weld bonding
- 2.14 Diagnose and repair water leaks, dust leaks, and wind noise
- 2.15 Identify one-time use fasteners
- 2.16 Weld damaged or torn steel body panels and repair broken welds
- 2.17 Inspect, identify labels/decals, and replace as necessary

STANDARD 3.0 PERFORM METAL FINISHING AND BODY FILLING

- 3.1 Prepare a panel for body filler by abrading or removing the coatings; featheredge, refine scratches, and clean the surface before the application of body filler
- 3.2 Locate and repair surface irregularities and straighten contours on a damaged body panel using power tools, hand tools, and weld-on pulling attachments
- 3.3 Demonstrate hammer and dolly techniques
- 3.4 Heat shrink stretched panel areas to proper contour
- 3.5 Cold shrink stretched panel areas to proper contour
- 3.6 Identify body filler defects and correct the cause and conditions (i.e., pinholing, ghosting, staining, over catalyzing, etc.)
- 3.7 Identify different types of body fillers
- 3.8 Shape body filler to contour and finish sanding
- 3.9 Perform proper metal finishing techniques for aluminum
- 3.10 Perform proper application of body filler to aluminum
- 3.11 Locate and repair surface irregularities and straighten contours on a damaged panel using Glue-Pulling Dent Repair (GPDR)
- 3.12 Mix and apply body filler

STANDARD 4.0 DETERMINE MOVEABLE GLASS AND HARDWARE REQUIREMENTS

- 4.1 Inspect, adjust, overhaul, repair, or replace window regulators, run channels, glass, power mechanisms, and related controls
- 4.2 Inspect, adjust, repair, remove, reinstall, or replace weather-stripping
- 4.3 Inspect, remove, repair or replace, and adjust removable power-operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs
- 4.4 Inspect, remove, reinstall, and align convertible top and related mechanisms
- 4.5 Identify or recalibrate electrical components that may need to be initialized

STANDARD 5.0 PERFORM PLASTICS, ADHESIVES, AND WELDING REPARABILITY

- 5.1 Identify the types of plastics and determine reparability
- 5.2 Clean and prepare the surface of plastic parts and identify the types of plastic repair procedures
- 5.3 Repair rigid, semi-rigid, and flexible plastic panels
- 5.4 Remove, replace, or repair damaged areas of rigid exterior composite panels
- 5.5 Replace bonded rigid exterior composite body panels and straighten or align panel supports
- 5.6 Repair plastic parts by welding (e.g., nitrogen and airless)
- 5.7 Perform a single-sided adhesively bonded cosmetic repair
- 5.8 Perform a double-sided adhesively bonded repair
- 5.9 Perform an adhesively bonded or welded tab repair
- 5.10 Shape and reform damaged plastic

STANDARD 6.0 APPLY SAFETY PRECAUTIONS WHEN PAINTING AND REFINISHING

- 6.1 Use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (i.e., gloves, suits, hoods, eye and ear protection, etc.) and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations
- 6.2 Identify safety and personal health hazards according to OSHA guidelines and the Right to Know Law

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- 6.3 Inspect spray environment and equipment to ensure compliance with federal, state, and local regulations, and for safety and cleanliness hazards
- 6.4 Use a NIOSH approved supplied air (Fresh Air Make-up) respirator system and perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation
- 6.5 Perform vehicle clean-up and complete quality control using a checklist on operations performed (e.g., use soap, water, and sponge to wash vehicle, wheel wells, wheels, door jams, hood, and truck jams; dry vehicle using an absorbent towel; clean all glass and chrome; in booth, pick up any loose paper and tape; sweep, clean floor and walls, and remove water from floors and walls with broom and squeegee)

STANDARD 7.0 PERFORM SURFACE PREPARATION FOR PAINTING AND REFINISHING

- 7.1 Inspect, remove, store, protect, and replace exterior trim and components necessary for proper surface preparation
- 7.2 Wash entire vehicle with soap and water and use appropriate cleaner to remove contaminants
- 7.3 Inspect and identify type of finish, surface condition, and film thickness and develop and document a plan for refinishing using a total product system
- 7.4 Remove paint finish as needed
- 7.5 Sand areas to be refinished
- 7.6 Select appropriate sandpaper to featheredge areas to be refinished
- 7.7 Apply suitable metal treatment or primer in accordance with total product systems
- 7.8 Mask and protect other areas that will not be refinished
- 7.9 Demonstrate different masking techniques (i.e., recess/back masking, foam door type, etc.)
- 7.10 Mix primer, primer surfacer, and primer sealer following the paint technical data sheet instructions according to the manufacturer
- 7.11 Identify a complimentary color or shade of undercoat to improve coverage
- 7.12 Apply primer onto surface of repaired area, demonstrating control of primer application by keeping the areas as small as possible
- 7.13 Apply two-component finishing filler to minor surface imperfections
- 7.14 Guide coat and block sand area with correct grade/grit sandpaper to which primer surfacer has been applied
- 7.15 Dry sand area to which two-component finishing filler has been applied
- 7.16 Remove dust from area to be refinished, including cracks or moldings of adjacent areas
- 7.17 Clean area to be refinished using a recommended final cleaning solution
- 7.18 Use a tack rag to remove any dust or lint particles from the area to be refinished
- 7.19 Apply suitable primer sealer to the area being refinished
- 7.20 Scuff sand to remove nibs or imperfections from a sealer
- 7.21 Apply stone chip resistant coating
- 7.22 Restore caulking and seam sealers to repaired areas and replacement panels as required
- 7.23 Prepare adjacent panels for blending using paint manufacturers procedures
- 7.24 Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures
- 7.25 Identify metal parts to be refinished and determine the materials needed, preparation, and refinishing procedures
- 7.26 Identify chip resistant coatings and texture match
- 7.27 Identify caulking and seam sealers that may need replacement
- 7.28 Identify refinishing guidelines for stationary glass flange areas to be refinished

STANDARD 8.0 PERFORM SPRAY GUN AND RELATED EQUIPMENT OPERATION

- 8.1 Inspect, clean, and determine condition of spray guns and related equipment (e.g., air hoses, regulators, air lines, air source, spray environment, and filters)
- 8.2 Select spray gun setup (e.g., fluid needle, nozzle, and cap) for product being applied
- 8.3 Test and adjust spray gun using fluid, air and pattern control valves
- 8.4 Operate pressure spray equipment

STANDARD 9.0 PERFORM PAINT MIXING, MATCHING, AND APPLYING PROCEDURES

- 9.1 Identify color code by manufacturer's vehicle information label
- 9.2 Identify product expiration dates

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- 9.3 Identify and mix paint using a formula
- 9.4 Shake, stir, reduce, catalyze/activate, and strain refinish materials
- 9.5 Identify the materials equipment and preparation differences between solvent and waterborne technologies
- 9.6 Apply finish using appropriate spray techniques (e.g., gun arc, angle, distance, travel speed, and spray pattern overlap) for the finish being applied
- 9.7 Apply selected product on test or let-down panel with appropriate let-down metal or plastic; check for color match, and properly store and maintain a color catalog
- 9.8 Identify poor hiding colors; determine necessary action
- 9.9 Explain alternate methods of matching color including computerized color matching
- 9.10 Explain the method of paint application of single stage topcoats
- 9.11 Tint color using formula to achieve a blendable match
- 9.12 Identify alternative color formula to achieve a blendable match
- 9.13 Remove nibs or imperfections from basecoat
- 9.14 Apply basecoat/clearcoat for panel blending, panel refinishing, and cut ins
- 9.15 Apply multi-stage coats for panel blending and overall refinishing
- 9.16 Apply basecoat/clearcoat for overall refinishing
- 9.17 Refinish plastic parts

STANDARD 10.0 DETERMINE PAINT DEFECTS, CAUSES, AND CURES

- 10.1 Identify blistering (raising of the paint surface, air entrapment) and correct the cause(s) and the condition
- 10.2 Identify a dry spray appearance in the paint surface and correct the cause(s) and the condition
- 10.3 Identify the presence of fisheyes (crater-like openings) in the finish and correct the cause(s) and the condition
- 10.4 Identify lifting and correct the cause(s) and the condition
- 10.5 Identify clouding (mottling and streaking in metallic finishes) and correct the cause(s) and the condition
- 10.6 Identify orange peel and correct the cause(s) and the condition
- 10.7 Identify overspray and correct the cause(s) and the condition
- 10.8 Identify solvent popping in freshly painted surface and correct the cause(s) and the condition
- 10.9 Identify sags and runs in paint surface and correct the cause(s) and the condition
- 10.10 Identify sanding marks or sand scratch swelling and correct the cause(s) and the condition
- 10.11 Identify contour mapping/edge mapping while finish is drying and correct the cause(s) and the condition
- 10.12 Identify color difference (off-shade) and correct the cause(s) and the condition
- 10.13 Identify tape tracking and correct the cause(s) and the condition
- 10.14 Identify low gloss condition and correct the cause(s) and the condition
- 10.15 Identify poor adhesion and correct the cause(s) and the condition
- 10.16 Identify paint cracking (i.e., shrinking, splitting, crow's feet or line-checking, micro-checking, etc.) and correct the cause(s) and the condition
- 10.17 Identify corrosion and correct the cause(s) and the condition
- 10.18 Identify dirt or dust in the paint surface and correct the cause(s) and the condition
- 10.19 Identify water spotting and correct the cause(s) and the condition
- 10.20 Identify finish damage caused by bird droppings, tree sap, and other natural causes and correct the cause(s) and the condition
- 10.21 Identify finish damage caused by airborne contaminants (e.g., acids, soot, rail dust, and other industrial-related causes) and correct the cause(s) and the condition
- 10.22 Identify die-back conditions (dulling of the paint film showing haziness) and correct the cause(s) and the condition
- 10.23 Identify chalking (oxidation) and correct the cause(s) and the condition
- 10.24 Identify bleed-through (staining) and correct the cause(s) and the condition
- 10.25 Identify pin-holing and correct the cause(s) and the condition
- 10.26 Identify buffing-related imperfections (swirl marks, wheel burns) and correct the condition
- 10.27 Identify pigment flotation (color change through film build) and correct the cause(s) and the condition

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STANDARD 11.0 PERFORM FINAL PAINTING AND REFINISHING DETAIL

- 11.1 Sand, buff, and polish fresh finish to remove defects and texture as required
- 11.2 Sand, buff, and polish existing finish to recondition defects as required and match existing finish
- 11.3 Apply decals, transfers, tapes, stone guards, moldings, and emblems, etc.
- 11.4 Clean interior, exterior, and glass
- 11.5 Clean body openings (i.e., door jambs, gaps, and edges, etc.)
- 11.6 Remove overspray
- 11.7 Perform vehicle clean-up and complete quality control using a checklist on operations performed [e.g., unmask vehicle and place trash in receptacle; steel wool all glass and chrome; (for minor buff, nib sand imperfections in paint, buff imperfections out of panel, and polish areas buffed to remove swirl marks); wash vehicle with soap and water and vacuum interior; and clean glass and apply dressing to tires and trim following safety precautions]
- 11.8 Perform nib sanding to remove small imperfections as required

STANDARD 12.0 PERFORM DAMAGE ANALYSIS

- 12.1 Position the vehicle for inspection under proper lighting, take photos from various angles to identify the vehicle, and document damage
- 12.2 Identify components to be removed to gain access to damaged areas
- 12.3 Analyze damage to determine appropriate methods for overall repairs
- 12.4 Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage
- 12.5 Gather details of the incident/accident necessary to determine the full extent of vehicle damage
- 12.6 Identify and record pre-existing damage
- 12.7 Identify and record prior repairs
- 12.8 Perform visual inspection of structural components and members
- 12.9 Identify structural damage using measuring tools and equipment
- 12.10 Perform visual inspection of non-structural components and members
- 12.11 Determine parts, components, material type(s), and procedures necessary for a proper repair
- 12.12 Identify type and condition of finish and determine refinish labor operations as required
- 12.13 Identify suspension, electrical, and mechanical component physical damage
- 12.14 Identify safety systems physical damage
- 12.15 Identify interior component damage
- 12.16 Identify add-on accessories and modifications
- 12.17 Identify single (one time) use components
- 12.18 Document illuminated dash malfunction indicator lamp(s) (MIL)
- 12.19 Perform a pre-repair inspection of the vehicle with the customer and record fit and finish concerns (e.g., color mismatch, factory gaps, unrelated prior damage and prior repairs)

STANDARD 13.0 PERFORM ESTIMATION

- 13.1 Record customer/vehicle owner information
- 13.2 Record vehicle identification number (VIN) information, including nation of origin, make, model, restraint system, body type, production date, engine type, build data, and assembly plant
- 13.3 Record vehicle mileage and options, including trim level, paint code, transmission, accessories, and modifications
- 13.4 Identify safety systems and determine precautions, inspections, and replacement items as required
- 13.5 Apply appropriate estimating and parts nomenclature (terminology)
- 13.6 Apply appropriate estimating sequence
- 13.7 Utilize estimating procedure pages
- 13.8 Apply estimating footnotes, headnotes, and line notes as needed
- 13.9 Identify operations requiring labor value judgment
- 13.10 Select appropriate labor code for each operation (e.g., structural, non-structural, mechanical, and refinish)
- 13.11 Price OEM parts, optional OEM parts, aftermarket parts, recyclable/used parts, remanufactured, rebuilt, and reconditioned parts and verify availability, compatibility, and condition
- 13.12 Determine necessary sublet operation

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- 13.13 Determine included and non-included operations and miscellaneous items
- 13.14 Recognize and apply overlap deductions
- 13.15 Determine additional material and charges
- 13.16 Determine refinishing material and charges
- 13.17 Apply math skills to establish charges and totals
- 13.18 Identify differences between electronically generated and manually generated estimates
- 13.19 Identify procedures to restore corrosion protection and establish labor values, and material charges
- 13.20 Recognize the cost-effectiveness of the repair and determine the approximate vehicle retail and repair value
- 13.21 Recognize the differences in estimating platforms when using different information provider systems
- 13.22 Verify accuracy of estimate compared to the actual repair and replacement operations
- 13.23 Determine telematic/connectivity of the vehicle and place vehicle in service mode
- 13.24 Identify vehicle safety recalls using the vehicle identification number (VIN)
- 13.25 Review damage report to determine appropriate methods for overall repair and communicate with team members to verify accuracy and resolve discrepancies

STANDARD 14.0 DETERMINE VEHICLE CONSTRUCTION AND PARTS IDENTIFICATION

- 14.1 Identify type of vehicle construction (e.g., unibody, body-over-frame, and alternates)
- 14.2 Recognize the different collision damage between unibody and body-over-frame vehicles
- 14.3 Identify impact energy absorbing components
- 14.4 Identify different types of substrates (i.e., steel types, aluminum, magnesium, plastic, composites, etc.) and determine reparability
- 14.5 Identify vehicle glass components and repair/replacement procedures
- 14.6 Identify add-on accessories

STANDARD 15.0 PERFORM CUSTOMER RELATIONS AND SELLING SKILLS

- 15.1 Introduce yourself and acknowledge, greet, and assist customer/client/visitor
- 15.2 Listen to customer/client, collect information, and identify customers/client's concerns, needs, and expectations
- 15.3 Establish cooperative attitude with customer/client
- 15.4 Empathize with dissatisfied customer/client and seek resolution
- 15.5 Identify customer/client's preferred communication method and frequency to inform customer/client about parts and the repair process
- 15.6 Identify basic claims handling procedures and explain to customer/client (i.e., gathering pertinent customer information, explanation of claim to client, progression of vehicle repair, insurance requirements, etc.)
- 15.7 Project positive attitude and professional appearance
- 15.8 Provide and review warranty information
- 15.9 Provide and review technical and consumer protection information
- 15.10 Estimate and explain duration of out-of-service time
- 15.11 Demonstrate negotiation skills to obtain a mutual agreement
- 15.12 Explain estimate to customer/client (i.e., cost of repairs, insurance deductibles, additional costs as client responsibility, etc.)

STANDARD 16.0 PERFORM METAL WELDING AND CUTTING

- 16.1 Identify the considerations for cutting, removing, and welding various types of steel, aluminum, and other metals
- 16.2 Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation
- 16.3 Set up, attach work clamp (ground), and adjust the GMAW (MIG) welder to "tune" for proper electrode stick out, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded
- 16.4 Perform visual evaluation and destructive test on each weld type (e.g., metal coupons or like substrate)
- 16.5 Store, handle, and install high-pressure gas cylinders; test for leaks
- 16.6 Determine the proper angle of the gun to the joint and direction of gun travel for the type of weld being made
- 16.7 Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations
- 16.8 Identify hazards and foam coatings and flammable materials prior to welding/cutting procedures
- 16.9 Protect computers and other electronic control modules during welding procedures

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- 16.10 Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required
- 16.11 Determine the joint type (i.e., butt weld with backing, lap, etc.) for weld being made
- 16.12 Determine the type of weld (i.e., continuous, stitch weld, plug, etc.) for each specific welding operation
- 16.13 Perform welds (e.g., plug, butt weld with and without backing, and fillet, etc.) in the flat, horizontal, vertical, and overhead positions
- 16.14 Identify the causes of various welding defects and make necessary adjustments
- 16.15 Identify cause of contact tip burn-back and failure of wire to feed and make necessary adjustments
- 16.16 Identify cutting process for different substrates and locations and perform cutting operation
- 16.17 Identify different methods of attaching non-structural components [i.e., squeeze type resistant spot welding (STRSW), riveting, structural adhesive, MIG bronze, rivet bonding, weld bonding, etc.]