

# STRANDS AND STANDARDS

## COLLISION STRUCTURAL REPAIR



### Course Description

This course prepares individuals to perform structural repairs on automobile uni-bodies, fixed glass, and frames. This course is based on the Automotive Service Excellence (ASE) automotive collision task list and the I-CAR training program. Work ethics and productivity are an integral part of the classroom and laboratory activities of this program. (asestudentcertification.com), ([http://pdmdev.i-car.com/pdf/education\\_foundation/natef\\_crosswalk\\_2016.pdf](http://pdmdev.i-car.com/pdf/education_foundation/natef_crosswalk_2016.pdf))

<b>Intended Grade Level</b>	10-12
Units of Credit	0.5 - 1.0
Core Code	40.09.00.00.013
Concurrent Enrollment Core Code	N/A
Prerequisite	Basic Automotive Collision Repair
Skill Certification Test Number	N/A
Test Weight	N/A
<b>License Type</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Automotive Collision Repair
Endorsement 2	N/A
Endorsement 3	N/A

## **STRAND 1**

**Students will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization.**

### **Standard 1**

Student will use communication skills to effectively communicate with others.

- Understand when it is appropriate to listen and to speak.
- Understand and follow verbal and written instructions for classroom and laboratory activities.

### **Standard 2**

Student will effectively use teamwork to respectfully work with others.

- Identify and understand different roles in working with a team.

### **Standard 3**

Student will use critical thinking and problem-solving skills.

- Analyze the cause of the problem.
- Develop a solution to address the problem.
- Implement the plan.
- Evaluate the effectiveness of the plan.

### **Standard 4**

Student will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

- Set and meet goals on attendance and punctuality.
- Prioritize, plan, and manage work to complete assignments and projects on time.

### **Standard 5**

Student will be accountable for results.

- Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
- File a regular written report on progress toward completion of assignments and projects.

### **Standard 6**

Be familiar with the legal requirements and expectations of the course.

- Be familiar with the course disclosure statement and all requirements for successful completion of the course.
- Demonstrate workplace ethics, e.g. fair, honest, disciplined.

## **STRAND 2**

**Students will participate in work-place readiness activities.**

### **Standard 1**

Student will demonstrate employability skills.

- Use a career search network to find career choices.
- Write a resume including a list of demonstrated skills.
- Write a letter of application.
- Complete a job application.
- Participate in an actual or simulated job interview.

### **Standard 2**

Student will participate in a work-based learning experience outside the classroom.

- Student will plan and implement a work-based learning experience aligned with their career goal.

## **STRAND 3**

**Students will understand and demonstrate safety and environmental practices.**

### **Standard 1**

Select and use proper personal safety equipment; take necessary precautions with hazardous operations and materials in accordance with federal, state, and local regulations.

### **Standard 2**

Locate OEM procedures to identify material and composition of the vehicle being repaired (mild steel, high strength steel, ultra-high strength steel, aluminum, etc.).

### **Standard 3**

Locate procedures and precautions that may apply to the vehicle being repaired.

### **Standard 4**

Identify vehicle system precautions and/or inspections to include but not limited to supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/electric/alternative fuel vehicles, locations and recommended procedures before inspecting or replacing components.

### **Standard 5**

Perform vehicle clean-up; complete quality control using a checklist on operations performed.

### **Standard 6**

Understand safety practices related to general shop, personal protection, vehicle lifts, and hand and power equipment.

### **Standard 7**

Understand and identify different fasteners and their applications and repair procedures.

### **Standard 8**

Understand how to select and properly use hand and select power tools.

## **Performance Skills**

Understand and demonstrate safety and environmental practices.

- Select and use proper personal safety equipment; take necessary precautions with hazardous operations and materials in accordance with federal, state, and local regulations.
- Locate OEM procedures to identify material and composition of the vehicle being repaired (mild steel, high strength steel, ultra-high strength steel, aluminum, etc.).
- Locate procedures and precautions that may apply to the vehicle being repaired.
- Identify vehicle system precautions and/or inspections to include but not limited to supplemental restraint system (SRS), advanced driver assistance systems (ADAS), hybrid/electric/alternative fuel vehicles, locations and recommended procedures before inspecting or replacing components.
- Perform vehicle clean-up; complete quality control using a checklist on operations performed.
- Understand safety practices related to general shop, personal protection, vehicle lifts, and hand and power equipment.
- Understand and identify different fasteners and their applications and repair procedures.
- Understand how to select and properly use hand and select power tools.

## **STRAND 4**

**Students will understand and demonstrate frame inspection and repair.**

### **Standard 1**

Measure and diagnose structural damage using a metric tape measure and a tram gauge.

### **Standard 2**

Properly install vehicle on to a frame bench/rack.

### **Standard 3**

Analyze, straighten and align mash (collapse) damage.

### **Standard 4**

Analyze, straighten and align sag damage.

### **Standard 5**

Analyze, straighten and align side sway damage.

### **Standard 6**

Analyze, straighten and align twist damage.

### **Standard 7**

Analyze, straighten and align diamond frame damage.

### **Standard 8**

Remove and replace damaged structural components.

### **Standard 9**

Remove and replace protective coatings; restore corrosion protection to repaired or replaced frame areas and anchoring locations.

### **Standard 10**

Analyze and identify misaligned or damaged steering, suspension, and powertrain mounting points and components.

### **Standard 11**

Align or replace misaligned or damaged steering, suspension, and powertrain mounting points and components.

### **Standard 12**

Identify heat limitations and monitoring procedures for structural components.

### **Standard 13**

Demonstrate an understanding of structural foam applications.

### **Standard 14**

Measure and diagnose structural damage using a three-dimensional measuring system (mechanical, electronic, laser), etc.

### **Standard 15**

Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.

## **Standard 16**

Analyze and identify crush/collapse zones.

## **Performance Skills**

Understand and demonstrate frame inspection and repair.

- Measure and diagnose structural damage using a metric tape measure and a tram gauge.
- Properly install vehicle on to a frame bench/rack.
- Analyze, straighten and align mash (collapse) damage.
- Analyze, straighten and align sag damage.
- Analyze, straighten and align side sway damage.
- Analyze, straighten and align twist damage.
- Analyze, straighten and align diamond frame damage.
- Remove and replace damaged structural components.
- Remove and replace protective coatings; restore corrosion protection to repaired or replaced frame areas and anchoring locations.
- Analyze and identify misaligned or damaged steering, suspension, and powertrain mounting points and components.
- Align or replace misaligned or damaged steering, suspension, and powertrain mounting points and components.
- Identify heat limitations and monitoring procedures for structural components.
- Demonstrate an understanding of structural foam applications.
- Measure and diagnose structural damage using a three-dimensional measuring system (mechanical, electronic, laser), etc.
- Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.
- Analyze and identify crush/collapse zones.

## **STRAND 5**

**Students will understand and demonstrate unibody and unitized structure inspection, measurement, and repair.**

### **Standard 1**

Analyze and identify misaligned or damaged steering, suspension, and powertrain mounting points that can cause vibration, steering, and chassis alignment problems.

### **Standard 2**

Align or replace misaligned or damaged steering, suspension, and powertrain mounting points that can cause vibration, steering and chassis alignment problems.

### **Standard 3**

Measure and diagnose unibody damage using a metric tape measure and tram gauge.

### **Standard 4**

Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system.

### **Standard 5**

Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, and laser, etc.).

### **Standard 6**

Determine the extent of the direct and indirect damage and the direction of impact; plan and document the

methods and sequence of repair.

**Standard 7**

Attach anchoring devices to vehicle; remove or reposition components as necessary.

**Standard 8**

Straighten and align roof rails/headers and roof panels.

**Standard 9**

Straighten and align rocker panels and pillars.

**Standard 10**

Straighten and align vehicle openings, and floor pans.

**Standard 11**

Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points).

**Standard 12**

Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.).

**Standard 13**

Determine structural repair component or replacement recommendations.

**Standard 14**

Identify proper cold stress relief methods.

**Standard 15**

Determine sectioning procedures of a steel body structure.

**Standard 16**

Remove and replace damaged structural components.

**Standard 17**

Determine the extent of damage to aluminum structural components; repair, weld, or replace.

**Standard 18**

Analyze and identify crush/collapse zones.

**Performance Skills**

Understand and demonstrate unibody inspection, measurement, and repair.

- Analyze and identify misaligned or damaged steering, suspension, and powertrain mounting points that can cause vibration, steering, and chassis alignment problems.
- Align or replace misaligned or damaged steering, suspension, and powertrain mounting points that can cause vibration, steering and chassis alignment problems.
- Measure and diagnose unibody damage using a metric tape measure and tram gauge.
- Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system.
- Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, and laser, etc.).
- Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.
- Attach anchoring devices to vehicle; remove or reposition components as necessary.

- Straighten and align roof rails/headers and roof panels.
- Straighten and align rocker panels and pillars.
- Straighten and align vehicle openings, and floor pans.
- Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points).
- Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.).
- Determine structural repair component or replacement recommendations.
- Identify proper cold stress relief methods.
- Determine sectioning procedures of a steel body structure.
- Remove and replace damaged structural components.
- Determine the extent of damage to aluminum structural components; repair, weld, or replace.
- Analyze and identify crush/collapse zones.

## **STRAND 6**

**Students will understand and demonstrate fixed glass removal, reinstallation, or replacement.**

### **Standard 1**

Identify considerations for removal, handling, one time use parts, and installation of advanced glass systems (comfort and safety features).

### **Standard 2**

Remove and reinstall or replace modular glass using recommended materials.

### **Standard 3**

Check for water leaks, dust leaks, and wind noise.

### **Standard 4**

Identify considerations for pre-scan, post-scan, and recalibration procedures.

### **Performance Skills**

Understand and demonstrate fixed glass removal, reinstallation, or replacement.

- Identify considerations for removal, handling, one time use parts, and installation of advanced glass systems (comfort and safety features).
- Remove and reinstall or replace modular glass using recommended materials.
- Check for water leaks, dust leaks, and wind noise.
- Identify considerations for pre-scan, post-scan, and recalibration procedures.

## **STRAND 7**

**Students will understand and demonstrate metal welding, cutting, and joining.**

### **Standard 1**

Identify the considerations for cutting, removing, and welding various types of steel, aluminum, and other metals.

### **Standard 2**

Determine the correct GMAW welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.

### **Standard 3**

Set up, attach work clamp (ground), and adjust the GMAW welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded.

### **Standard 4**

Store, handle, and install high-pressure gas cylinders; test for leaks.

### **Standard 5**

Determine the proper angle of the gun to the joint and direction of gun travel for the type of weld being made.

### **Standard 6**

Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.

### **Standard 7**

Identify hazards; foam coatings and flammable materials prior to welding/cutting procedures.

### **Standard 8**

Protect computers and other electronics/wires prior to welding procedures.

### **Standard 9**

Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required.

### **Standard 10**

Determine the joint type (butt weld with backing, lap, etc.) for weld being made.

### **Standard 11**

Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation.

### **Standard 12**

Perform the following welds: plug, butt weld with and without backing, and fillet etc., in the flat, horizontal, vertical, and overhead positions.

### **Standard 13**

Perform visual evaluation and destructive test on each weld type.

### **Standard 14**

Identify the causes of various welding defects; make necessary adjustments.

### **Standard 15**

Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.

### **Standard 16**

Identify cutting process for different substrates and locations; perform cutting operation.

### **Standard 17**

Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, MIG bronze, rivet bonding, weld bonding, etc.).

## **Performance Skills**

Understand and demonstrate metal welding and cutting.

- Identify the considerations for cutting, removing, and welding various types of steel, aluminum, and other metals.



- Determine the correct GMAW welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.
- Set up, attach work clamp (ground), and adjust the GMAW welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded.
- Store, handle, and install high-pressure gas cylinders; test for leaks.
- Determine the proper angle of the gun to the joint and direction of gun travel for the type of weld being made.
- Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.
- Identify hazards; foam coatings and flammable materials prior to welding/cutting procedures.
- Protect computers and other electronics/wires prior to welding procedures.
- Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required.
- Determine the joint type (butt weld with backing, lap, etc.) for weld being made.
- Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation.
- Perform the following welds: plug, butt weld with and without backing, and fillet etc., in the flat, horizontal, vertical, and overhead positions.
- Perform visual evaluation and destructive test on each weld type.
- Identify the causes of various welding defects; make necessary adjustments.
- Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.
- Identify cutting process for different substrates and locations; perform cutting operation.
- Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, MIG bronze, rivet bonding, weld bonding, etc.).

## **STRAND 8**

**Students will understand and perform damage analysis.**

### **Standard 1**

Position the vehicle for inspection under proper lighting; take photos to identify the vehicle and document damage.

### **Standard 2**

Identify components to be removed to gain access to damaged areas.

### **Standard 3**

Analyze damage to determine appropriate methods for overall repairs.

### **Standard 4**

Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage.

### **Standard 5**

Gather details of the incident/accident necessary to determine the full extent of vehicle damage.

### **Standard 6**

Identify and record pre-existing damage.

### **Standard 7**

Identify and record prior repairs.

### **Standard 8**

Perform visual inspection of structural components.

### **Standard 9**

Identify structural damage using measuring tools and equipment.

### **Standard 10**

Perform visual inspection of non-structural components and members.

### **Standard 11**

Determine parts, components, material type(s) and procedures necessary for a proper repair.

### **Standard 12**

Identify type and condition of finish; determine refinish labor operations as required.

### **Standard 13**

Identify suspension, electrical, and mechanical component physical damage.

### **Standard 14**

Identify safety systems physical damage.

### **Standard 15**

Identify interior component damage.

### **Standard 16**

Identify add-on accessories and modifications.

### **Standard 17**

Identify single (one time) use components.

### **Standard 18**

Identify and document illuminated dash malfunction indicator lamp(s) (MIL).

### **Standard 19**

Perform a pre-repair inspection of the vehicle with the customer. Record fit and finish concerns (color mismatch, factory gaps, unrelated prior damage and prior repairs).

### **Performance Skills**

Understand and perform damage analysis.

- Position the vehicle for inspection under proper lighting; take photos to identify the vehicle and document damage.
- Prepare vehicle for inspection by providing access to damaged areas.
- Analyze damage to determine appropriate methods for overall repairs.
- Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage.
- Gather details of the incident/accident necessary to determine the full extent of vehicle damage.
- Identify and record pre-existing damage.
- Identify and record prior repairs.
- Perform visual inspection of structural components and members.
- Identify structural damage using measuring tools and equipment.
- Perform visual inspection of non-structural components and members.
- Determine parts, components, material type(s) and procedures necessary for a proper repair.
- Identify type and condition of finish; determine refinish labor operations as required.
- Identify suspension, electrical, and mechanical component physical damage.
- Identify safety systems physical damage.
- Identify interior component damage.

- Identify add-on accessories and modifications.
- Identify single (one time) use components.
- Identify and document illuminated dash malfunction indicator lamp(s) (MIL).
- Perform a pre-repair inspection of the vehicle with the customer. Record fit and finish concerns (color mismatch, factory gaps, unrelated prior damage and prior repairs).

## **STRAND 9**

**Students will understand and perform estimating.**

### **Standard 1**

Determine and record customer/vehicle owner information.

### **Standard 2**

Identify and record vehicle identification number (VIN) information, including nation of origin, make, model, restraint system, body type, production date, engine type, and assembly plant.

### **Standard 3**

Identify and record vehicle mileage and options, including trim level, paint code, transmission, accessories, and modifications.

### **Standard 4**

Identify safety systems; determine precautions, inspections and replacement items as required.

### **Standard 5**

Apply appropriate estimating and parts nomenclature (terminology).

### **Standard 6**

Determine and apply appropriate estimating sequence.

### **Standard 7**

Utilize estimating procedure pages.

### **Standard 8**

Apply estimating guide footnotes, headnotes, and line notes as needed.

### **Standard 9**

Identify operations requiring labor value judgment.

### **Standard 10**

Select appropriate labor value for each operation (structural, non-structural, mechanical, and refinish).

### **Standard 11**

Select and price OEM parts, optional OEM parts, aftermarket parts, recycleable/used parts, remanufactured, rebuilt, and reconditioned parts; verify availability, compatibility, and condition.

### **Standard 12**

Determine necessary sublet operations.

### **Standard 13**

Determine included and non-included operations and miscellaneous items.

**Standard 14**

Recognize and apply overlap deductions.

**Standard 15**

Determine additional material and charges.

**Standard 16**

Determine refinishing material and charges.

**Standard 17**

Apply math skills to establish charges and totals.

**Standard 18**

Identify differences between computer generated and manually written estimates.

**Standard 19**

Identify procedures to restore corrosion protection; establish labor values, and material charges.

**Standard 20**

Recognize the cost effectiveness of the repair and determine the approximate vehicle retail, and repair value.

**Standard 21**

Recognize the differences in estimating platforms when using different information provider systems.

**Standard 22**

Verify accuracy of estimate compared to the actual repair and replacement operations.

**Standard 23**

Determine telematic/connectivity of the vehicle and place vehicle in service mode.

**Standard 24**

Identify vehicle safety recalls using the vehicle identification number (VIN).

**Standard 25**

Review damage report and analyze damage to determine appropriate methods for overall repair; communicate with team members to verify accuracy and resolve discrepancies.

**Performance Skills**

Understand and perform estimating.

- Determine and record customer/vehicle owner information.
- Identify and record vehicle identification number (VIN) information, including nation of origin, make, model, restraint system, body type, production date, engine type, and assembly plant.
- Identify and record vehicle mileage and options, including trim level, paint code, transmission, accessories, and modifications.
- Identify safety systems; determine precautions, inspections and replacement items as required.
- Apply appropriate estimating and parts nomenclature (terminology).
- Determine and apply appropriate estimating sequence.
- Utilize estimating procedure pages.
- Apply estimating guide footnotes, headnotes, and line notes as needed.
- Identify operations requiring labor value judgment.
- Select appropriate labor value for each operation (structural, non-structural, mechanical, and refinish).
- Select and price OEM parts, optional OEM parts, aftermarket parts, recycleable/used parts, remanufactured, rebuilt, and reconditioned parts; verify availability, compatibility, and condition.

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

## **STRAND 10**

**Students will understand and perform customer relations and sales skills.**

### **Standard 1**

Introduce yourself, acknowledge and greet customer/client/visitor; offer assistance.

### **Standard 2**

Listen to client; collect information and identify client's concerns, needs and expectations.

### **Standard 3**

Establish cooperative attitude with customer/client.

### **Standard 4**

Deal with dissatisfied customer/client, seek resolution.

### **Standard 5**

Identify customer/client preferred communication method; follow up to keep customer/client informed about parts and the repair process.

### **Standard 6**

Recognize basic claims handling procedures; explain to customer/client.

### **Standard 7**

Project positive attitude and professional appearance.

### **Standard 8**

Provide and review warranty information.

### **Standard 9**

Provide and review technical and consumer protection information.

### **Standard 10**

Estimate and explain duration of out-of-service time.

### **Standard 11**

Demonstrate negotiation skills to obtain a mutual agreement.

### **Standard 12**

Interpret and explain estimate to customer/client.

### **Performance Skills**

Understand and perform customer relations and sales skills.

- Introduce yourself, acknowledge and greet customer/client/visitor; offer assistance.
- Listen to client; collect information and identify client's concerns, needs and expectations.
- Establish cooperative attitude with customer/client.
- Deal with dissatisfied customer/client, seek resolution.
- Identify customer/client preferred communication method; follow up to keep customer/client informed about parts and the repair process.
- Recognize basic claims handling procedures; explain to customer/client.
- Project positive attitude and professional appearance.
- Provide and review warranty information.
- Provide and review technical and consumer protection information.
- Estimate and explain duration of out-of-service time.
- Demonstrate negotiation skills to obtain a mutual agreement.
- Interpret and explain estimate to customer/client.