

Structural Analysis and Damage Repair

Course Number - 20119

Rationale Statement:

There is a high demand for motivated and creative individuals in the auto-body industry. The desire for the students to receive industry based training at the basic level and step up to higher level of competency in this field is the ultimate goal of this course.

Suggested grade level: 11-12

Topics covered:

- General automotive safety practices
- Inspect and repair frames
- Analyze types of frame damage
- Straighten frame damage
- Align frame and wheels
- Replace or repair structural components

Indicator #1: Automotive technology safety practices.	
Bloom's Taxonomy Level	Standard and Examples
Apply	<p>SA 1.1 Demonstrate automotive technology safety practices.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Demonstrate proper use of protective clothing and safety equipment • Maintain a portfolio record of written safety examinations and equipment examinations • Pass an operational checkout by the instructor.

Indicator #2: Students will demonstrate the processes involved in frame inspection and repair.	
Bloom's Taxonomy Level	Standard and Examples
Apply	<p>SA 2.1 Measure structural damage using tram and self-centering gauges according to manufacturing specifications.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Understand the installation of self-centering gauges • Read the gauges and record the measurements • Use the tram gauge to measure structural damage • Demonstrate the use of gauges in structural repair

Apply	<p>SA 2.2 Straighten and align mash (collapse) damage.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and describe mash damage • Demonstrate how to measure mash damage • Develop a plan to correct it
Apply	<p>SA 2.3 Straighten and align sag damage.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and describe sag damage • Demonstrate how to measure sag damage • Develop a plan to correct it
Apply	<p>SA 2.4 Straighten and align side damage.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and describe side sway damage • Demonstrate how to measure side sway damage • Develop a plan to correct it
Apply	<p>SA 2.5 Straighten and align twist damage.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and describe twist damage • Demonstrate how to measure twist damage • Develop a plan to correct it
Apply	<p>SA 2.6 Straighten and align diamond frame damage.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and describe diamond frame damage • Demonstrate how to measure diamond frame damage • Develop a plan to correct it
Apply	<p>SA 2.7 Restore corrosion protection to repaired or replaced frame areas.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Search and identify any corrosion protection affected by the repairs • Apply corrosion protection to repaired areas

Indicator #3: The student will be able to inspect and repair a frame.	
Bloom's Taxonomy Level	Standard and Examples
Apply	<p>SA 3.1 Realign or replace damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems; in accordance with vehicle manufacturer's specifications/procedures.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify miss aligned steering components through a process of measuring specific points • Know specific measuring points

	<ul style="list-style-type: none"> • Realign or replace damaged steering, suspension and powertrain components • Understand that collision repair shops do a limited amount of mechanical repairs
Apply	<p>SA 3.2 Measure unibody vehicles using a universal measuring system (mechanical, electronic, laser).</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and explain the differences used in a universal measuring system • Set up the different systems for measurement • Read the computer based measurements
Apply	<p>SA 3.3 Straighten and align cowl assembly.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Measure the cowl assembly • Develop a repair plan for cowl assembly • Straighten and align cowl assembly
Apply	<p>SA 3.4 Straighten and align roof rails/headers and roof panels.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Measure windshield and back glass openings for proper roof placement • Develop a repair plan for proper alignment • Straighten and align roof rails/header and roof panels
Apply	<p>SA 3.5 Straighten and align hinge and lock pillars.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Understand how to measure hinge pillars • Develop a repair plan • Straighten and align hinge and lock pillars
Apply	<p>SA 3.6 Straighten and align vehicle openings, floor pans, and rocker panels.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Measure the door openings for proper rocker panel placement • Develop a repair plan • Demonstrate the proper repairs
Apply	<p>SA 3.7 Straighten and align quarter panels and wheelhouse assemblies.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Measure quarter panel alignment • Develop a plan for quarter panel alignment • Demonstrate proper pulling procedures before removing • Straighten and align quarter panel and wheelhouse assemblies
Apply	<p>SA 3.8 Straighten and align rear body sections (including rails and suspension/powertrain mounting points).</p> <p>Examples:</p> <ul style="list-style-type: none"> • Demonstrate proper pulling method before removing • Understand where technicians can section a panel without affecting the integrity of the vehicle • Straighten and align rear body sections

Apply	<p>SA 3.9 Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/powertrain mounting points, etc.).</p> <p>Examples:</p> <ul style="list-style-type: none"> • Demonstrate measuring methods used for upper body measurement • Develop a repair plan for proper alignment • Straighten and align front-end sections
-------	--

Indicator #4: Students will demonstrate the processes used to inspect and replace glass.	
Bloom's Taxonomy Level	Standard and Examples
Analysis	<p>SA 4.1 Inspect vehicles for glass damage and determine manufacturer's specifications for glass window replacement.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Analyze different glass damage • Distinguish if glass damage is accident related • Illustrate different attachment methods used for glass • Illustrate different glass removal methods

Indicator #5: Students will demonstrate the processes used in metal welding and cutting.	
Bloom's Taxonomy Level	Standard and Examples
Apply	<p>SA 5.1 Identify weldable and non-weldable materials used in collision repair and weld and cut high-strength steel and other steels, using manufacturer's specifications/procedures.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify what can be welded versus what can not • Understand the proper cutting procedures used to cut high-strength steel • Demonstrate use of proper cutting equipment
Apply	<p>SA 5.2 Determine the correct GMAW (MIG) welder type for welding situation.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify the correct types of welder type, electrode, wire type, and diameter used in specific welds • Identify the proper gases used for specific metals • Demonstrate proper welder set-up for the job

Apply	<p>SA 5.3 Demonstrate proper angle of the gun to the joint and direction of gun travel for the type of weld being made.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Identify and demonstrate different angles for the different positions of welding • Demonstrate the weld in the flat, horizontal, vertical and overhead positions. • Determine and demonstrate the correct type of weld to be used in the appropriate situation
Apply	<p>SA 5.4 Demonstrate the type of weld for each specific welding operation (continuous, stitch, tack, plug, butt weld with and without backing, and lap joints) according to manufacturer's/industry specifications.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Understand the different types of welds used in the collision repair field • Explain and justify which type of weld will be best for the repair and for the safety of operation of vehicle • Identify the type of weld needed for the repair (continuous, butt weld with backing, plug, etc) • Demonstrate the proper welding application for the repair • Demonstrate visual and destructive safety test for the repair
Comprehension	<p>SA 5.5 Identify different methods of attaching structural components.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Understand the different attachment methods (squeeze type resistance spot welding (STRSW, riveting, structural adhesive, silicone bronze, etc) • Understand where these welds or adhesives are used • Explain why these welds or adhesives are best
Apply	<p>SA 5.6 Clean and prepare the metal to be welded.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Understand the importance of proper metal preparation • Explain the importance of good metal fit-up • Demonstrate metal preparation and fit-up • Apply weld-through primer if necessary and clamp as required

Indicator#6: Students explore career opportunities in the Transportation & Logistics Career Cluster and develop leadership skills.	
Bloom's Taxonomy Level	Standards and Examples
Apply	<p>SA6.1 Demonstrate independent and teamwork skills and explore career opportunities within the industry.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Participate in Skills USA • Understand the importance of teamwork • Identify how many different career opportunities are available through this program • Update student portfolios and personal learning plans