

## **Collision Repair - NATEF**

### **STRUCTURAL ANALYSIS AND DAMAGE REPAIR**

#### **A. Frame Inspection and Repair**

Diagnose and measure structural damage using tram and self-centering gauges.

Attach vehicle to anchoring devices.

Restore corrosion protection to repaired or replaced frame areas.

Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.

Identify heat limitations in structural components.

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.

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.

Align or replace misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and wheel alignment problems

Restore structural foam.

Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser).

Diagnose and measure structural damage to vehicles using a dedicated (fixture) measuring system.

#### **B. Unibody Inspection, Measurement, and Repair**

Analyze and identify misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and chassis alignment problems.

Diagnose and measure unibody damage using tram and self-centering gauges.

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.

Identify heat limitations in unibody vehicles.

Identify proper cold stress relief methods.

Repair damage using power tools and hand tools to restore proper contours and dimensions.

Restore corrosion protection to repaired or replaced unibody structural areas.

Analyze and identify crush/collapse zones.

Realign or replace misaligned or damaged steering, suspension, and power train components that can cause vibration, steering and chassis alignment problems.

Determine and inspect the locations of all suspension, steering, and power train component attaching points on the vehicle.

Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system.

Diagnose and measure unibody vehicles using a universal measuring system (mechanical, electronic, laser).

Straighten and align cowl assembly.

Straighten and align roof rails/headers and roof panels.  
Straighten and align hinge and lock pillars.  
Straighten and align vehicle openings, floor pans, and rocker panels.  
Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/power train mounting points).  
Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.).  
Remove and replace damaged sections of structural steel body panels.  
Determine the extent of damage to aluminum structural components; repair, weld, or replace.

### **C. Fixed Glass**

Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials.  
Remove and reinstall or replace modular glass using recommended materials.

### **D. Metal Welding and Cutting**

Identify weldable and non-weldable materials used in collision repair.  
Weld and cut high-strength steel and other steels.  
Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.  
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 material being welded.  
Store, handle, and install high-pressure gas cylinders.  
Determine work clamp (ground) location and attach.  
Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.  
Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.  
Protect computers and other electronic control modules during welding procedures.  
Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required.  
Determine the joint type (butt weld with backing, lap, etc.) for weld being made.  
Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation.  
Perform the following welds: continuous, stitch, tack, plug, butt weld with X for each specific welding operation.  
Perform visual and destructive tests 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 materials and locations; perform cutting operation.  
Weld and cut aluminum.  
Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, silicon bronze, etc.)

## **NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)**

### **A. Preparation**

Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.

Inspect, remove, store, and replace exterior trim and moldings.

Inspect, remove, store, and replace interior trim and components.

Inspect, remove, store, and replace non-structural body panels and components that may interfere with or be damaged during repair.

Protect panels, glass, and parts adjacent to the repair area.

Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants from those areas to be repaired.

Remove corrosion protection, undercoatings, sealers, and other protective coatings necessary to perform repairs.

Inspect, remove, and replace repairable plastics and other components that are recommended for off-vehicle repair.

Inspect, remove, store, and replace all vehicle mechanical and electrical components that may interfere with or be damaged during repair.

## **B. Outer Body Panel Repairs, Replacements, and Adjustments**

Determine the extent of direct and indirect damage and direction of impact; develop and document a repair plan.

Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies.

Inspect, remove, replace, and align hood, hood hinges, and hood latch.

Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.

Inspect, remove, replace, and align doors, tailgates, hatches, lift gates, latches, hinges, and related hardware.

Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware.

Inspect, remove, replace and align front fenders, headers, and other panels.

Straighten and rough-out contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pull attachments.

Weld damaged or torn steel body panels; repair broken welds.

Restore corrosion protection.

Restore sound deadeners and foam materials.

Determine the extent of damage to aluminum body panels; repair or replace.

Replace door skins.

Perform panel bonding.

Diagnose and repair water leaks, dust leaks, and wind noise.

## **C. Metal Finishing and Body Filling**

Remove paint from the damaged area of a body panel.

Locate and reduce surface irregularities on a damaged body panel.

Demonstrate hammer and dolly techniques.

Heat shrink stretched panel areas to proper contour.

Cold shrink stretched panel areas to proper contour.

Mix body filler.

Apply body filler; shape during curing.

Rough sand cured body filler to contour; finish sand.

Determine the proper metal finishing techniques for aluminum.

Determine proper application of body filler to aluminum.

#### **D. Moveable Glass and Hardware**

Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.

Diagnose and repair water leaks, dust leaks, and wind noises; inspect, repair, and replace weather-stripping.

Inspect, repair or replace, and adjust removable, manually or power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.

Inspect, remove, reinstall, and align convertible top and related mechanisms.

#### **E. Metal Welding and Cutting**

Identify weldable and non-weldable materials used in collision repair.

Weld and cut high-strength steel and other steels.

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

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 material being welded.

Store, handle, and install high-pressure gas cylinders.

Determine work clamp (ground) location and attach.

Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.

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

Protect computers and other electronic control modules during welding procedures.

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

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

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

Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and fillet.

Perform visual and destructive tests 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 materials and locations perform cutting operation.

Weld and cut aluminum.

Identify different methods of attaching non-structural components (squeeze type resistant spot welds (STRSW), riveting, non-structural adhesive, silicon bronze, etc.)

#### **F. Plastics and Adhesives**

Identify the types of plastics; determine repairability.

Identify the types of plastic repair procedures; clean and prepare the surface of plastic parts.

Replace or repair rigid, semi-rigid, and flexible plastic panels.

Remove or repair damaged areas from rigid exterior composite panels.

Replace bonded rigid exterior composite body panels; straighten or align panel supports.

### **PAINTING AND REFINISHING**

## **A. Safety Precautions**

Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.

Identify safety and personal health hazards according to OSHA guidelines and the "Right to Know Law".

Inspect spray environment to ensure compliance with federal, state and local regulations, and for safety and cleanliness hazards.

Select and use the NIOSH approved personal sanding respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation and applicable state and local

Select and use the NIOSH approved (Fresh Air Make-up System) personal painting/refinishing respirator system. Perform proper maintenance in accordance with OSHA Regulation and applicable state and local

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.).

## **B. Surface Preparation**

Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation.

Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.

Inspect and identify substrate, type of finish, surface condition, and film thickness; develop and document a plan for refinishing using a total product system.

Remove paint finish.

Dry or wet sand areas to be refinished.

Featheredge damaged areas to be refinished.

Apply suitable metal treatment or primer in accordance with total product systems.

Mask and protect other areas that will not be refinished.

Mix primer, primer-surfacer or primer-sealer.

Apply primer onto surface of repaired area.

Apply two-component finishing filler to minor surface imperfections.

Dry or wet sand area to which primer-surfacer has been applied.

Dry sand area to which two-component finishing filler has been applied.

Remove dust from area to be refinished, including cracks or moldings of adjacent areas.

Clean area to be refinished using a final cleaning solution.

Remove, with a tack rag, any dust or lint particles from the area to be refinished.

Apply suitable sealer to the area being refinished when sealing is needed or desirable.

Scuff sand to remove nibs or imperfections from a sealer.

Restore corrosion-resistant coatings, caulking, and seam sealers to repaired areas.

Prepare adjacent panels for blending.

Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials, preparation, and refinishing procedures.

Identify aluminum parts to be refinished; determine the materials, preparation, and refinishing procedures.

Apply stone chip resistant coating.

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

Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).

Check and adjust spray gun operation for HVLP (high volume, low pressure) or LVLP (low volume, low pressure) guns.

Set-up (fluid needle, nozzle, and cap), adjust, and test spray gun using fluid, air, and pattern control valves.

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

Determine type and color of paint already on vehicle by manufacturer's vehicle information label.

Shake, stir, reduce, catalyze/activate, and strain paint.

Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied.

Apply selected product on test and let-down panel; check for color match.

Apply single stage topcoat.

Apply basecoat/clearcoat for panel blending or partial refinishing.

Denib, buff, and polish finishes where necessary.

Apply basecoat/clearcoat for overall refinishing.

Refinish rigid, semi-rigid, and flexible plastic parts.

Apply multi-stage coats for panel blending or overall refinishing.

Identify and mix paint using a formula.

Identify poor hiding colors; determine necessary action.

Tint color using formula to achieve a blendable match.

Identify alternative color formula to achieve a blendable match.

#### **E. Paint Defects - Causes and Cures**

Identify orange peel; determine the cause(s) and correct the condition.

Identify dirt or dust in the paint surface; determine the cause(s) and correct the condition.

Measure mil thickness.

Identify blistering (raising of the paint surface); determine the cause(s) and correct the condition.

Identify blushing (milky or hazy formation); determine the cause(s) and correct the condition.

Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.

Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition.

Identify lifting; determine the cause(s) and correct the condition.

Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition.

Identify overspray; determine the cause(s) and correct the condition.

Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition.

Identify sags and runs in paint surface; determine the cause(s) and correct the condition.

Identify sanding marks (sandscratch swelling); determine the cause(s) and correct the condition.

Identify contour mapping (shrinking and splitting) while finish is drying; determine the cause(s) and correct the condition.  
Identify color difference (off-shade); determine the cause(s) and correct the condition.  
Identify tape tracking; determine the cause(s) and correct the condition.  
Identify low gloss condition; determine the cause(s) and correct the condition.  
Identify poor adhesion; determine the cause(s) and correct the condition.  
Identify paint cracking (crowsfeet or line-checking, micro-checking, etc.); determine the cause(s) and correct the condition.  
Identify corrosion; determine the cause(s) and correct the condition.  
Identify water spotting; determine the cause(s) and correct the condition.  
Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.  
Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition.  
Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition.  
Identify chalking (oxidation); determine the cause(s) and correct the condition.  
Identify bleed-through (staining); determine the cause(s) and correct the condition.  
Identify pin-holing; determine the cause(s) and correct the condition.  
Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.  
Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition.

#### **F. Final Detail**

Buff and polish finish to remove defects as required.  
Clean interior, exterior, and glass.  
Clean body openings (door jambs and edges, etc.).  
Remove overspray.  
Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc.

#### **Complete Portfolio Complete Mock Job Interview**

##### **PERSONAL QUALITIES**

Work Effort  
Safety Habits  
Work Area Organization  
On Task Behavior  
Responsibility  
Initiative  
Team Work  
Respect  
Interpersonal Skills