STRUCTURAL ANALYSIS AND DAMAGE REPAIR

For every task in Structural Analysis and Damage Repair, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle manufacturer's SRS types, locations and recommended procedures before inspecting or replacing components.

I. STRUCTURAL ANALYSIS AND DAMAGE REPAIR

A. Frame Inspection and Repair

1. Measure and diagnose structural damage using a tram gauge. 
2. Attach vehicle to anchoring devices. 
3. Analyze, straighten and align mash (collapse) damage. 
4. Analyze, straighten and align sag damage. 
5. Analyze, straighten and align sideway damage. 
6. Analyze, straighten and align twist damage. 
7. Analyze, straighten and align diamond frame damage. 
8. Remove and replace damaged structural components. 
9. Restore corrosion protection to repaired or replaced frame areas. 
10. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems. 
11. Align or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.
12. Identify or repair heat limitations and monitoring procedures for structural components.

13. Demonstrate an understanding of structural foam applications.

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

15. Measure and diagnose structural damage to vehicles using a dedicated (fixture) measuring system.

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

17. Analyze and identify crush/collapse zones.

18. Restore mounting and anchoring locations.

I. STRUCTURAL ANALYSIS AND DAMAGE REPAIR

B. Unibody and Unitized Structure Inspection, Measurement, and Repair

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

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

3. Measure and diagnose unibody damage using tram gauge.

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

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

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

7. Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.
8. Attach anchoring devices to vehicle; remove or reposition components as necessary.  
9. Straighten and align cowl assembly.  
10. Straighten and align roof rails/headers and roof panels.  
11. Straighten and align hinge and lock pillars.  
12. Straighten and align vehicle openings, floor pans, and rocker panels.  
13. Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points).  
14. Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.).  
15. Identify substrate and repair or replacement recommendations.  
16. Identify proper cold stress relief methods.  
17. Repair damage using power tools and hand tools to restore proper contours and dimensions.  
18. Remove and replace damaged sections of steel body structures.  
19. Restore corrosion protection to repaired or replaced structural areas.  
20. Determine the extent of damage to aluminum structural components; repair, weld, or replace.  
22. Restore mounting and anchoring locations.  

I. STRUCTURAL ANALYSIS AND DAMAGE REPAIR

C. Fixed Glass

1. Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials and techniques.  
2. Remove and reinstall or replace modular glass using recommended materials.  
3. Check for water leaks, dust leaks, and wind noise.
I. STRUCTURAL ANALYSIS AND DAMAGE REPAIR

D. Metal Welding and Cutting

1. Identify weldable and non-weldable substrates used in vehicle construction. HP-I
2. Weld and cut high-strength steel and other steels. HP-I
3. Weld and cut aluminum. HP-G
4. Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation. HP-I
5. 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 being welded. HP-I
6. Store, handle, and install high-pressure gas cylinders. HP-I
7. Determine work clamp (ground) location and attach. HP-I
8. 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. HP-I
9. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. HP-I
10. Protect computers and other electronic control modules during welding procedures. HP-I
11. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required. HP-I
12. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I
13. Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. HP-I
14. Perform the following welds: continuous, plug, butt weld with and without backing, and fillet etc. HP-I
15. Perform visual and destructive tests on each weld type. HP-I
16. Identify the causes of various welding defects; make necessary adjustments. HP-I
17. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. HP-I

18. Identify cutting process for different substrates and locations; perform cutting operation. HP-I

19. Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, silicon bronze, etc.). HP-G

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

For every task in Non-Structural Analysis and Damage Repair (Body Components), the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hearing protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle manufacturer’s SRS types, locations and recommended procedures before inspecting or replacing components.

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

**A. Preparation**

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

2. Inspect, remove, **label**, store, and **reinstall** exterior trim and moldings. HP-I

3. Inspect, remove, **label**, store, and **reinstall** interior trim and components. HP-I

4. Inspect, remove, **label**, store, and **reinstall** body panels and components that may interfere with or be damaged during repair. HP-I

5. Inspect, remove, **label**, store, and **reinstall** vehicle mechanical and electrical components that may interfere with or be damaged during repair. HP-G

6. Protect panels, glass, interior parts, and other vehicles adjacent to the repair area. HP-I

7. Soap and water wash entire vehicle; **complete pre-repair inspection checklist**. HP-I

8. Prepare damaged area using water-based and solvent-based cleaners. HP-I
9. Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs.  

10. Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair.

II. NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)

B. Outer Body Panel Repairs, Replacements, and Adjustments

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

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

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

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

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

6. Inspect, remove, replace, and align doors, latches, hinges, and related hardware.  

7. Inspect, remove, replace and align tailgates, hatches, liftgates and sliding doors.  

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

9. Inspect, remove, replace and align fenders, and related panels.  

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

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

12. Restore corrosion protection.  

13. Replace door skins.  


15. Perform panel bonding and weld bonding.  

16. Diagnose and repair water leaks, dust leaks, and wind noise.
17. Identify one-time use fasteners.  

II. NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)

C. Metal Finishing and Body Filling

1. Remove paint from the damaged area of a body panel.  
2. Locate and repair surface irregularities on a damaged body panel.  
3. Demonstrate hammer and dolly techniques.  
4. Heat shrink stretched panel areas to proper contour.  
5. Cold shrink stretched panel areas to proper contour.  
6. Prepare and apply body filler.  
7. Identify different types of body fillers.  
8. Rough sand body filler to contour; finish sand.  
9. Determine the proper metal finishing techniques for aluminum.  
10. Determine proper application of body filler to aluminum.

II. NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)

D. Moveable Glass and Hardware

1. Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.  
2. Inspect, adjust, repair, remove, reinstall or replace weather-stripping.  
3. Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.  
4. Inspect, remove, reinstall, and align convertible top and related mechanisms.  
5. Initialize electrical components as needed.
II. NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR (BODY COMPONENTS)

E. Metal Welding and Cutting

1. Identify weldable and non-weldable substrates used in vehicle construction. HP-I
2. Weld and cut high-strength steel and other steels. HP-I
3. Weld and cut aluminum. HP-G
4. Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation. HP-I
5. 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 being welded. HP-I
6. Store, handle, and install high-pressure gas cylinders. HP-I
7. Determine work clamp (ground) location and attach. HP-I
8. 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. HP-I
9. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. HP-I
10. Protect computers and other electronic control modules during welding procedures. HP-I
11. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required. HP-I
12. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I
13. Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. HP-I
14. Perform the following welds: continuous, plug, butt weld with and without backing, fillet, etc. HP-I
15. Perform visual and destructive tests on each weld type. HP-I
16. Identify the causes of various welding defects; make necessary adjustments. HP-I
17. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. 

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

19. 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**

1. Identify the types of plastics; determine repairability. 

2. Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures. 

3. Repair rigid, semi-rigid, or flexible plastic panels. 

4. Remove or repair damaged areas from rigid exterior composite panels. 

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

**MECHANICAL AND ELECTRICAL COMPONENTS**

For every task in Mechanical and Electrical Components, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle manufacturer’s SRS types, locations and recommended procedures before inspecting or replacing components. 

**III. MECHANICAL AND ELECTRICAL COMPONENTS**

**A. Suspension and Steering**

1. Perform visual inspection and measuring checks to identify steering and suspension collision damage. 

2. Identify one–time use fasteners. 

3. Clean, inspect, and prepare reusable fasteners.
4. Remove, replace, inspect or adjust power steering pump, pulleys, belts, hoses, fittings and pump mounts.

5. Remove and replace power steering gear (non-rack and pinion type).

6. Inspect, remove, and replace power rack and pinion steering gear and related components.

7. Inspect and replace parallelogram steering linkage components.

8. Inspect, remove and replace upper and lower control arms and related components.

9. Inspect, remove and replace steering knuckle/spindle/hub assemblies (including bearings, races, seals, etc.).

10. Inspect, remove and replace front suspension system coil springs and spring insulators (silencers).

11. Inspect, remove, replace, and adjust suspension system torsion bars, and inspect mounts.

12. Inspect, remove and replace stabilizer bar bushings, brackets, and links.

13. Inspect, remove and replace MacPherson strut cartridge or assembly, upper bearing, and mount.

14. Inspect, remove, and replace rear suspension system transverse links, control arms, stabilizer bars, bushings, and mounts.

15. Inspect, remove, and replace suspension system leaf spring(s and related components.

16. Inspect axle assembly for damage and misalignment.

17. Inspect, remove and replace shock absorbers.

18. Diagnose, inspect, adjust, repair or replace active suspension systems and associated lines and fittings.

19. Measure vehicle ride height and wheel base; determine needed repairs.

20. Inspect, remove, replace, and align front and rear frame (cradles/sub).

21. Diagnose and inspect steering wheel, steering column, and components.
22. Verify proper operation of steering system.  

23. Diagnose front and rear suspension system noises and body sway problems; determine needed repairs.  

24. Diagnose vehicle wandering, pulling, hard steering, bump steer, memory steering, torque steering, and steering return problems; determine needed repairs.  

25. Demonstrate an understanding of suspension and steering alignments (caster, camber, toe, SAI etc.).  

26. Diagnose tire wear patterns; determine needed repairs.  

27. Inspect tires; identify direction of rotation and location; check tire size, tire pressure monitoring system (TPM) and adjust air pressure.  

28. Diagnose wheel/tire vibration, shimmy, tire pull (lead), wheel hop problems; determine needed repairs.  

29. Measure wheel, tire, axle, and hub runout; determine needed repairs.  

30. Reinstall wheels and torque lug nuts.  

III. MECHANICAL AND ELECTRICAL COMPONENTS  

B. Electrical  

1. Check for available voltage, voltage drop and current, and resistance in electrical wiring circuits and components with a DMM (digital multimeter).  

2. Repair electrical circuits, wiring, and connectors.  

3. Inspect, test, and replace fusible links, circuit breakers, and fuses.  

4. Perform battery state-of-charge test and slow/fast battery charge..  

5. Inspect, clean, repair or replace battery, battery cables, connectors and clamps.  

6. Dispose of batteries and battery acid according to local, state, and federal requirements.
7. Identify programmable electrical/electronic components and check for malfunction indicator lamp (MIL); record data for reprogramming before disconnecting battery. HP-I

8. Inspect alignment, adjust, remove and replace alternator (generator), drive belts, pulleys, and fans. HP-I

9. Check operation and aim headlamp assemblies and fog/driving lamps; determine needed repairs. HP-I

10. Inspect, test, and repair or replace switches, relays, bulbs, sockets, connectors, and wires of interior and exterior light circuits. HP-I

11. Remove and replace horn(s); check operation. HP-I

12. Check operation of wiper/washer systems; determine needed repairs. HP-I

13. Check operation of power side and tailgate window; determine needed repairs. HP-I

14. Inspect, remove and replace power seat, motors, linkages, cables, etc. HP-G

15. Inspect, remove and replace components of electric door and hatch/trunk lock. HP-G

16. Inspect, remove and replace components of keyless lock/unlock devices and alarm systems. HP-G

17. Inspect, remove and replace components of electrical sunroof and convertible/retractable hard top. HP-G

18. Check operation of electrically heated mirrors, windshield, back lights, panels, etc.; determine needed repairs. HP-I

19. Demonstrate the proper self-grounding procedures for handling electronic components. HP-I

20. Check for module communication errors using a scan tool. HP-G

21. Use wiring diagrams and diagnostic flow charts during diagnosis of electrical circuit problems. HP-G

22. Identify safe disabling techniques of high voltage systems on hybrid vehicles. HP-G

23. Identify potential safety and environmental concerns associated with hybrid vehicle systems. HP-G
III. MECHANICAL AND ELECTRICAL COMPONENTS

C. Brakes

1. Inspect brake lines, hoses, and fittings for leaks, dents, kinks, rust, cracks or wear; tighten fittings and supports; replace brake lines (double flare and ISO types), hoses, fittings, seals, and supports. HP-I

2. Identify, handle, store, and install appropriate brake fluids; dispose of in accordance with federal, state, and local regulations. HP-G

3. Bleed (manual, pressure, or vacuum) hydraulic brake system. HP-I

4. Pressure test brake hydraulic system; determine needed repair. HP-G

5. Adjust brake shoes or pads; remove and reinstall brake drums or drum/hub assemblies and wheel bearings. HP-I

6. Remove, clean and inspect caliper and rotor assembly and mountings for wear and damage; reinstall. HP-I

7. Check parking brake system operation. HP-I

8. Identify the proper procedures for handling brake dust. HP-G

9. Check for bent or damaged brake system components. HP-G

10. Demonstrate an understanding of various types of advanced braking systems (ABS, hydraulic, electronic, traction and stability control). HP-G

III. MECHANICAL AND ELECTRICAL COMPONENTS

D. Heating and Air Conditioning

1. Identify and comply with environmental regulations relating to refrigerants and coolants. HP-G

2. Maintain and verify correct operation of certified refrigerant recovery and recharging equipment. HP-G

3. Locate and identify A/C system service ports. HP-I

4. Identify, recover, label and store refrigerant from A/C system. HP-G

5. Recycle refrigerant in accordance with EPA regulations. HP-G
6. Evacuate and recharge A/C system; check for leaks.  
7. Select oil type and maintain correct amount in A/C system.  
8. Inspect, adjust, and replace A/C compressor drive belts; check pulley alignment.  
9. Remove and replace A/C compressor; inspect, repair or replace A/C compressor mount.  
10. Inspect, repair or replace A/C system mufflers, hoses, lines, fittings, orifice tube, expansion valve, and seals.  
11. Inspect, test, and replace A/C system condenser and mounts.  
12. Inspect and replace receiver/drier or accumulator/drier.  
13. Inspect and repair A/C component wiring.  
14. Demonstrate an understanding of safe handling procedures associated with high voltage A/C compressors and wiring.

III. MECHANICAL AND ELECTRICAL COMPONENTS

E. Cooling Systems

1. Check engine cooling and heater system hoses and belts; determine needed repairs.  
2. Inspect, test, remove, and replace radiator, pressure cap, coolant recovery system, and water pump.  
3. Recover, refill, and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA regulations.  
4. Remove, inspect and replace fan (both electrical and mechanical), fan sensors, fan pulley, fan clutch, and fan shroud; check operation.  
5. Inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels.  
6. Demonstrate an understanding of hybrid cooling systems.
III. MECHANICAL AND ELECTRICAL COMPONENTS

F. Drive Train

1. Remove, replace, and adjust shift or clutch linkage as required.  
2. Remove, replace, and adjust cables or linkages for throttle valve (TV), kickdown, and accelerator pedal.  
3. Remove and replace electronic sensors, wires, and connectors.  
4. Remove and replace powertrain assembly; inspect, replace, and align powertrain mounts.  
5. Remove and replace drive axle assembly.  
6. Inspect, remove and replace half shafts and axle constant velocity (CV) joints.  
7. Inspect, remove and replace drive shafts and universal joints.  
8. Demonstrate an understanding of safe handling procedures associated with high voltage powertrain components.

III. MECHANICAL AND ELECTRICAL COMPONENTS

G. Fuel, Intake and Exhaust Systems

1. Inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields.  
2. Inspect, remove and replace fuel tank, tank filter, cap, filler hose, pump/sending unit and inertia switch; inspect and replace fuel lines and hoses.  
3. Inspect, remove and replace engine components of air intake systems.  
4. Inspect, remove and replace canister, filter, vent, and purge lines of fuel vapor (EVAP) control systems.

III. MECHANICAL AND ELECTRICAL COMPONENTS

H. Restraint Systems

1. Inspect, remove, and replace seatbelt and shoulder harness assembly and components.  
2. Inspect restraint system mounting areas for damage; repair as needed.
3. Verify proper operation of seatbelt.  
4. Disable and enable Supplemental Restraint System (SRS).  
5. Inspect, remove and replace Supplemental Restraint Systems (SRS) sensors and wiring; ensure sensor orientation.  
6. Verify that Supplemental Restraint System (SRS) is operational.  
7. Inspect, remove, replace and dispose of deployed and non-deployed airbag(s) and pretensioners.  
8. Use Diagnostic Trouble Codes (DTC) to diagnose and repair the Supplemental Restraint System (SRS).  
9. Demonstrate an understanding of advanced restraint systems.

PAINTING AND REFINISHING

For every task in Painting and Refinishing, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

IV. PAINTING AND REFINISHING

A. Safety Precautions

1. Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.  
2. Identify safety and personal health hazards according to OSHA guidelines and the “Right to Know Law”.
3. Inspect spray environment and equipment to ensure compliance with federal, state and local regulations, and for safety and cleanliness hazards.  
4. Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.
5. Select and use a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation

6. 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**

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

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

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

4. Strip paint to bare substrate (paint removal).

5. Dry or wet sand areas to be refinished.

6. Featheredge areas to be refinished.

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

8. Mask and protect other areas that will not be refinished.

9. Mix primer, primer-surfacer or primer-sealer.

10. Identify a complimentary color or shade of undercoat to improve coverage.

11. Apply primer onto surface of repaired area.

12. Apply two-component finishing filler to minor surface imperfections.

13. Block sand area to which primer-surfacer has been applied.

14. Dry sand area to which finishing filler has been applied.

15. Remove dust from area to be refinished, including cracks or moldings of adjacent areas.
16. Clean area to be refinished using a final cleaning solution.   
17. Remove, with a tack rag, any dust or lint particles from the area to be refinished.   
18. Apply suitable sealer to the area being refinished.   
19. Scuff sand to remove nibs or imperfections from a sealer.   
20. Apply stone chip resistant coating.   
21. Restore caulking and seam sealers to repaired areas.   
22. Prepare adjacent panels for blending.   
23. Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures.   
24. Identify metal parts to be refinished; determine the materials needed, preparation, and refinishing procedures.   

C. Spray Gun and Related Equipment Operation

1. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).   
2. Select spray gun setup (fluid needle, nozzle, and cap) for product being applied.   
3. Test and adjust spray gun using fluid, air and pattern control valves.   
4. Demonstrate an understanding of the operation of pressure spray equipment.   

IV. PAINTING AND REFINISHING

D. Paint Mixing, Matching, and Applying

1. Identify color code by manufacturer’s vehicle information label.   
2. Shake, stir, reduce, catalyze/activate, and strain refinish materials.   
3. Apply finish using appropriate spray techniques (gun arc, angle, distance, travel speed, and spray pattern overlap) for the finish being applied.   
4. Apply selected product on test or let-down panel; check for color match.   
5. Apply single stage topcoat.
6. Apply basecoat/clearcoat for panel blending and panel refinishing.  
7. Apply basecoat/clearcoat for overall refinishing.  
8. Remove nibs or imperfections from basecoat.  
9. Refinish rigid or semi-rigid plastic parts.  
10. Refinish flexible plastic parts.  
11. Apply multi-stage coats for panel blending and overall refinishing.  
12. Identify and mix paint using a formula.  
13. Identify poor hiding colors; determine necessary action.  
14. Tint color using formula to achieve a blendable match.  
15. Identify alternative color formula to achieve a blendable match.  
16. Identify the materials equipment, and preparation differences between solvent and waterborne technologies.

IV. PAINTING AND REFINISHING

E. Paint Defects - Causes and Cures

1. Identify blistering (raising of the paint surface, air entrapment); determine the cause(s) and correct the condition.  
2. Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.  
3. Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition.  
4. Identify lifting; determine the cause(s) and correct the condition.  
5. Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition.  
6. Identify orange peel; determine the cause(s) and correct the condition.  
7. Identify overspray; determine the cause(s) and correct the condition.
8. Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition.

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

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

11. Identify contour mapping/edge mapping while finish is drying; determine the cause(s) and correct the condition.

12. Identify color difference (off-shade); determine the cause(s) and correct the condition.

13. Identify tape tracking; determine the cause(s) and correct the condition.

14. Identify low gloss condition; determine the cause(s) and correct the condition.

15. Identify poor adhesion; determine the cause(s) and correct the condition.

16. Identify paint cracking (shrinking, splitting, crowsfeet or line-checking, micro-checking, etc.); determine the cause(s) and correct the condition.

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

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

19. Identify water spotting; determine the cause(s) and correct the condition.

20. Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.

21. Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition.

22. Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition.

23. Identify chalking (oxidation); determine the cause(s) and correct the condition.

24. Identify bleed-through (staining); determine the cause(s) and correct the condition.

25. Identify pin-holing; determine the cause(s) and correct the condition.
26. Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.  

27. Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition.

IV. PAINTING AND REFINISHING

F. Final Detail

1. Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc.  

2. Sand, buff and polish fresh or existing finish to remove defects as required.

3. Clean interior, exterior, and glass.

4. Clean body openings (door jambs and edges, etc.).

5. Remove overspray.

6. **Perform vehicle clean-up; complete quality control using a checklist.**
DAMAGE ANALYSIS, ESTIMATING AND CUSTOMER SERVICE TASK LIST

For every task in Damage Analysis, Estimating and Customer Service, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

A. Damage Analysis

1. Position the vehicle for inspection. HP-G
2. Prepare vehicle for inspection by providing access to damaged areas. HP-G
3. Analyze damage to determine appropriate methods for overall repairs. HP-I
4. Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage. HP-G
5. Gather details of the incident/accident necessary to determine the full extent of vehicle damage. HP-G
6. Identify and record pre-existing damage. HP-I
7. Identify and record prior repairs. HP-G
8. Perform visual inspection of structural components and members. HP-G
9. Identify structural damage using measuring tools and equipment. HP-I
10. Perform visual inspection of non-structural components and members. HP-I
11. Determine parts, components, material type(s) and procedures necessary for a proper repair. HP-I
12. Identify type and condition of finish; determine if refinishing is required. HP-I
13. Identify suspension, electrical, and mechanical component physical damage. HP-G
14. Identify safety systems physical damage. HP-G
15. Identify interior component damage. HP-I
16. Identify damage to add-on accessories and modifications.  
17. Identify single (one time) use components.  

**B. Estimating**

1. Determine and record customer/vehicle owner information.  
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.  
3. Identify and record vehicle options, including trim level, paint code, transmission, accessories, and modifications.  
4. Identify safety systems; determine replacement items.  
5. Apply appropriate estimating and parts nomenclature (terminology).  
6. Determine and apply appropriate estimating sequence.  
8. Apply estimating guide footnotes and headnotes as needed.  
9. Estimate labor value for operations requiring judgment.  
10. Select appropriate labor value for each operation (structural, non-structural, mechanical, and refinish).  
11. Select and price OEM parts; verify availability, compatibility, and condition.  
12. Select and price alternative/optional OEM parts; verify availability, compatibility and condition.  
13. Select and price aftermarket parts; verify availability, compatibility, and condition.  
14. Select and price recyclable/used parts; verify availability, compatibility and condition.  
15. Select and price remanufactured, rebuilt, and reconditioned parts; verify availability, compatibility and condition.
16. Determine price and source of necessary sublet operations. 

17. Determine labor value, prices, charges, allowances, or fees for non-included operations and miscellaneous items. 

18. Recognize and apply overlap deductions, included operations, and additions. 

19. Determine additional material and charges. 

20. Determine refinishing material and charges. 

21. Apply math skills to establish charges and totals. 

22. Interpret computer-assisted and manually written estimates; verify the information is current. 

23. Identify procedural differences between computer-assisted systems and manually written estimates. 

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

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

26. Recognize the differences in estimation procedures when using different information provider systems. 

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

C. Vehicle Construction and Parts Identification 

1. Identify type of vehicle construction (space frame, unibody, body-over-frame). 

2. Recognize the different damage characteristics of space frame, unibody, and body-over-frame vehicles. 

3. Identify impact energy absorbing components. 

4. Identify steel types; determine repairability. 

5. Identify aluminum/magnesium components; determine repairability. 

6. Identify plastic/composite components; determine repairability.
7. Identify vehicle glass components and repair/replacement procedures.   HP-G
8. Identify add-on accessories.   HP-G

D. Customer Relations and Sales Skills

1. Acknowledge and/or greet customer/client.   HP-I
2. Listen to customer/client; collect information and identify customers/client's concerns, needs and expectations.   HP-I
3. Establish cooperative attitude with customer/client.   HP-I
4. Identify yourself to customer/client; offer assistance.   HP-I
5. Deal with angry customer/client   HP-I
6. Identify customer/client preferred communication method; follow up to keep customer/client informed about parts and the repair process.   HP-G
7. Recognize basic claims handling procedures; explain to customer/client.   HP-G
8. Project positive attitude and professional appearance.   HP-I
9. Provide and review warranty information.   HP-I
10. Provide and review technical and consumer protection information.   HP-G
11. Estimate and explain duration of out-of-service time.   HP-G
12. Apply negotiation skills to obtain a mutual agreement.   HP-G
13. Interpret and explain manual or computer-assisted estimate to customer/client.   HP-I
### Task List Priority Item Totals (by area)

#### I. Structural Analysis and Damage Repair

- **HP-I** = 30 (includes 17 welding)  \(95\% = 29\) tasks
- **HP-G** = 32 (includes 2 welding)  \(90\% = 29\) tasks

#### II. Non-Structural Analysis and Damage Repair (Body Components)

- **HP-I** = 45 (includes 17 welding)  \(95\% = 43\) tasks
- **HP-G** = 21 (includes 2 welding)  \(90\% = 19\) tasks

#### III. Mechanical and Electrical Components

- **HP-I** = 34  \(95\% = 32\) tasks
- **HP-G** = 71  \(90\% = 64\) tasks

#### IV. Painting and Refinishing

- **HP-I** = 53  \(95\% = 50\) tasks
- **HP-G** = 30  \(90\% = 27\) tasks

#### V. Damage Analysis, Estimating, Customer Service (DAECS)

- **HP-I** = 27  \(95\% = 26\) tasks
- **HP-G** = 38  \(90\% = 27\) tasks