

Appendix L

TRANSPORTATION, DISTRIBUTION AND LOGISTICS YOUTH APPRENTICESHIP

AUTO COLLISION PATHWAY NON-STRUCTURAL ANALYSIS & REPAIR (UNIT 4)

Unit 4: Auto Collision Pathway

Non-Structural Analysis & Repair

Competency

1. Remove undamaged body panels & components

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Assist to assess the damage to determine what can be repaired and what will need to be replaced
- Based on the damage, determine an organized plan for removal
- Obtain equipment & materials needed
- Review safety & service procedures
- Position vehicle to remove components if necessary
- Remove undamaged, non-structural body panels and components that may interfere with or be damaged during repair
- Remove large external panels first
- Remove the fasteners and parts as required
- Remove parts & fasteners carefully to prevent additional repair or paint touch up
- Take notes, sketches or photos to help ensure proper re-assembly
- Store undamaged parts & fasteners as they removed in an ordered manner
- Store components in appropriate manner depending on their disposition, i.e., for disposal, for re-assembly, for repair, etc.
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Explain why a removal plan is necessary prior to removing parts & fasteners
- List common vehicle components and how they are attached to the vehicle
- Identify various fasteners used in vehicle construction
- Explain how to remove & install nuts and bolts properly
- Explain when specific fasteners are used in vehicle construction
- Describe fastener grading systems
- Explain how to measure thread pitch, length, & diameter of fasteners
- Compare fastener, molding replacement parts and accessory items (e.g., wide adhesive moldings, molding retainers, exterior hardware, door handles)
- Compare tools required to remove fasteners
- Explain the methods used to fasten components
- Discuss nut & bolt torque values
- Identify hose clamps
- Explain why it is a good rule of thumb to keep all parts until the repair is completely finished
- Compare full and partial panel replacement

- Describe how to properly remove non-structural body panels
- List vehicle body items that are recommended for off-vehicle repair

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

2. Remove mechanical and electrical components

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Position vehicle to remove components if necessary
- Remove mechanical and electrical components that may interfere with or be damaged during repair by disconnecting any wires or cables attached to electric window controls, locks or mirrors
- Store components in appropriate manner depending on their disposition, i.e., for disposal, for re-assembly, for repair, etc.
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Explain how to properly and safely disconnect wires and cables attached to mechanical or electrical components
- Explain how to retrieve vehicle codes
- List vehicle mechanical & electrical components that are recommended for off-vehicle repair

Comments:

Unit 4: Auto Collision Pathway

Non-Structural Analysis & Repair

Competency

3. Rough straighten damaged metal panels

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Prepare the surface
- Select appropriate tools and equipment
- Rough straighten damaged metal panels
- Restore contours of damaged panel to a surface condition suitable for metal finishing or body filling
- Straighten panels with dollies, hammers, spoons and picks
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Describe different metals used in vehicle construction
- Explain strength ratings of metals
- Summarize deformation effects of steel impacts
- Identify high & low areas in a damaged panel
- Demonstrate how to use metal straightening tools
- Compare removing dents with various tools such as a suction cup, hammer, dolly, spoon, pick & pry bar, pull rods, etc.
- Explain the process of shrinking metal for straightening

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

4. Remove damaged sections of metal body panels

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove damaged body panels and components safely
- Remove the fasteners as required
- Remove bolted, riveted, adhesive/bonded, and welded panels or panel assemblies
- Assist to determine the extent of damage to substrate (aluminum, magnesium, and composite) body panels
- Remove damaged sections of metal body panels
- Store damage sections in appropriate manner depending on their disposition, i.e., for disposal, for repair, etc.
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Describe how to remove broken bolts and studs
- Compare full and partial panel replacement
- Describe how to properly remove non-structural body panels

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

5. Remove door and all components

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove decorative plugs and screws that hold armrest and other trim pieces

WINDOW CRANK

- Locate the manual window crank if applicable
- Look behind the window crank and slide the pick under the edge of the metal clip that holds the crank in place
- Remove the clip and pull the crank off

DOOR HANDLE

- Remove the door handle by unscrewing the small screw located in the center
- Gently pull the door handle out until you see the back of the handle
- Unclip the rod from the door handle or unclip the rod from the door lock and remove them both together.
- Unscrew the cap off rear upper corner door panel locks

PANEL

- Locate the panel screws and bolts are before starting
- Roll down the vehicle door window
- Remove all screws and bolts that hold the door panel onto the vehicle
- For snap-in fittings, pry gently on bottom corner of the door panel until the fittings pop out
- Pry up power locks, windows, and mirror adjustment mechanism
- Disconnect plugs
- Pop the door panel off by gently prying on bottom edge of the door panel until it releases
- Pull out and up to completely remove the door panel
- Peel back the paper or water shield to access window regulator if needed
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Compare door construction designs
- Locate and identify parts of a door
- Describe the components of typical vehicle doors
- Point out the locations of typical door panel attachments
- Explain how most car door panels are attached to the car

- Describe the tools to use to remove panels attached with screws, bolts or snap-in fittings
- Discuss when the door needs to be replaced vs. just replacing the door skin

Comments:

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Competency

6. Check door fit & function

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Check door fit and function
- Inspect the car door when it's open
- Make sure the rubber seal is intact and that it hasn't bunched up causing the door to be out of alignment
- Close the door
- Run your finger all the way around the door jamb and look for gaps
- Step away from the car and visually inspect the way the car door aligns with the car's body
- Open the door again & inspect the striker plate
- Inspect all of the bolts holding the door in place
- Use a door jack to support the weight of the door
- Loosen the bolts that hold the door in place
- Move the door as needed to align it
- Tighten the bolts again evenly
- Periodically close the door gently to see if this is helping to realign the door
- Check the door striker pin alignment for proper door closing
- Assess if one of the door hinges is bent; straighten or replace if needed
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Describe what gaps in vehicle doors indicate
- Describe common troubleshooting techniques to realign a car door
- Explain when to replace the door bolts & screws

Comments:

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Competency

7. Remove & install door lock and handle components

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove interior door handle, door arm rest, mirror control knob, window handle regulator, door trim panel components as needed
- Pull Handle Lock
- Place a drop light inside the door
- Pop off the small clip holding the lock rod
- Pry the clip off the lock
- Slide the lock & washer off outside the door
- Refer to service manual for electric door locks to disengage and re-engage electrical connector switch and lock
- Repair or replace components as needed including manual door lock assembly, power door lock assembly, door lock cylinder, bolt-on door handle assembly, and riveted door handle assembly
- Test operation of door lock assembly after repair or replacement
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Locate & identify parts of a lock assembly
- Describe precaution to take when installing door locks and handles on newly painted body panels
- Compare different types of lock mechanisms
- Explain differences in installation based on the type of lock mechanism

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

8. Assist to diagnose and repair water leaks, dust leaks and wind noise

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Assist to test door leaks & noise
- Inspect the weather stripping
- Replace weather stripping if needed
- Seat the new stripping firmly with weather stripping adhesive
- Slip the stripping over the panel lip if applicable stripping slips over
Make sure the joints (where the two ends meet, such as between the door top strips and bottom strips) are neat
- Don't stretch the stripping as you apply
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Describe the different tests that can be used to diagnose leaks- Feel test, sound test, ultrasonic leak detector, chalk test, paper strip test, powder test, water test, soap & water test
- Explain the purpose of weather stripping
- Discuss the components of modern weather stripping
- Describe the characteristics of weather stripping that indicate replacement
- Explain the danger over-stretching weather stripping

Comments:

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Competency

9. Remove, replace, and align hood, hood hinges, and hood latch/lock

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Obtain assistance from another worksite professional
- Inspect hood latch/lock
- Disconnect any wires and hoses
- Remove cable & replace if needed
- Remove bolts that hold hood to hood hinges
- Inspect bolts & hinges
- If hood is to be replaced, mark hood hinge alignment
- Remove old hood
- Remove damaged hood hinges by unbolting hinges from inner fender panels
- Install new hinges, snug bolts down
- Replace new hood
- Replace hinge bolts, do not tighten
- Align hood to where it needs to be, tighten bolts
- Double check all panels for gaps to assure good alignment
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Compare the different types of hood connectors
- Explain when hinges and latches/locks need to be replaced on hoods
- Describe when hood alignment or replacement is needed
- Discuss the mechanisms, operation & connections of the hood latch/lock
- Explain the importance of proper release cable re-assembly

Comments:

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Competency

10. Remove, replace, and align deck lid, lid hinges, and lid latch/lock

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Obtain assistance from another worksite professional
- Inspect lid latch/lock
- Disconnect any wires and hoses
- Replace if needed
- Remove bolts that hold lid to lid hinges
- Inspect bolts & hinges
- If deck is to be replaced, mark deck hinge alignment
- Remove old deck lid
- Remove damaged deck hinges by unbolting hinges
- Install new hinges, snug bolts down
- Replace new deck lid
- Replace hinge bolts, do not tighten
- Align deck lid to where it needs to be, tighten bolts
- Double check all panels for gaps to assure good alignment
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Compare different types of deck fasteners
- Explain when hinges and latches/locks need to be replaced on lids
- Describe when lid alignment or replacement is needed
- Discuss the mechanisms, operation & connections of the lid latch/lock
- Explain the importance of proper release cable re-assembly

Comments:

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Competency

11. Remove, replace, and align bumpers, reinforcements, guards, absorbers, isolators, and mounting hardware

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove any flexible deflectors
- Remove any wires to fender mounted lights
- Remove all the bolts & fasteners from the bumper/fascia
- Slide bumper/fascia forward & remove
- Locate & remove all fasteners holding the bumper
- In some cases, disconnect the hood release cable & remove the latch assembly
- Remove any additional reinforcements, guards, absorbers, isolators and hardware as needed
- Mask doors or cowl if undamaged
- Install replacement fender
- Hand start the fender bolts; do not tighten
- Shift the fender on its bolts until aligned
- Tighten fender bolts
- Double check all panels for gaps to assure good alignment
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Point out common components and fasteners found on fenders & related components
- Explain the importance of proper release cable re-assembly
- Describe how the fender and related components act to absorb energy in a collision
- Compare fenders today versus fenders on vehicles in the past

Comments:

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Competency

12. Check and adjust clearances of front fenders, headlight mounting panel, and other panels

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- After the fender is secured on the vehicle, let the hood down gently
- Inspect the fit and alignment of the hood with the fender or other panels
- If gaps exist, loosen or remove the appropriate bolt(s)
- Pull the fender back toward the cowl or adjust the other panels as required
- Tighten or replace the mounting bolt(s)
- Double check all panels for gaps to assure good alignment
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Identify parts and assemblies associated with bumpers & fascias
- Describe types of energy absorbers
- Describe the process of fender shimming in adjustments

Comments:

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Competency

13. Remove and reinstall interior door trim panels

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Inspect the door trim panel
- If damaged or loose, remove the door trim panel
- Remove the fabric material from the fabric panel
- Peel the fabric off of the shell of the panel
- Use some sandpaper to remove any foam that remains on the shell
- Lay the new fabric on the panel in the correct position; fold half of it back so the shell is visible
- Spray the adhesive glue on the visible side of the shell and on the underside of the fabric
- Allow it to set until it has dried some
- Fold the fabric over slowly onto the shell; smooth out any wrinkles.
- Repeat the gluing procedure for the other half of the shell and fabric
- Reinstall the repaired or new interior door trim panel using the same screws/clips
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Explain removal procedures for interior door trim
- Explain the precautions to take to ensure that no wrinkles or buckling occurs with the fabric panels
- Compare adhesives used for interior door trim panels
- Explain the functions of the different trim removal tools
- Demonstrate how to use trim removal tools

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

14. Remove and reinstall headliners and other interior panels

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove everything that bolts into the headliner like visors, lights and coat hooks
- Take down the old headliner careful not to rip or bend the headliner
- Slowly move it towards the rear of the car
- Take the headliner out through a door of the car.
- Install the headliner using the opposite steps you took to remove it
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Define headliner
- Describe safety practices related to personal protection, equipment & materials for this process
- Explain removal procedures for interior trim
- Explain the precautions necessary for headliner removal
- Compare bumper moldings, clip-on body side moldings, wheel opening moldings, and side mirror removal processes

Comments:

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Competency

15. Remove and install upholstery and related items

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Peel the fabric off of the shell of the panel
- Use some sandpaper to remove any foam that remains on the shell
- Lay the new fabric on the shell in the correct position; fold half of it back so the shell is visible
- Spray the adhesive glue on the visible side of the shell and on the underside of the fabric
- Allow it to set until it has dried some
- Fold the fabric over slowly onto the shell; smooth out any wrinkles.
- Repeat the gluing procedure for the other half of the shell and fabric
- Trim the left over fabric to 1/4 of an inch long.
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Explain the precautions to take to ensure that no wrinkles or buckling occurs with the fabric panels
- Compare adhesives used for interior panels
- Explain the functions of the different trim removal tools
- Demonstrate how to use trim removal tools

Comments:

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Non-Structural Analysis & Repair

Competency

16. Remove & install door glass & lower channel from door glass

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove the door panel & components gently
- Remove the weatherproofing sheet if applicable
- Remove all broken pieces of glass from the door panel if applicable
- Remove the weather stripping
- Remove any other parts preventing the glass from sliding out
- Unbolt the glass from the regulator
- Remove the clips from the lifting arm bracket
- Vacuum all broken glass from inside the door
- Install the new door glass from the outside or slide it in at an angle
- Bolt new glass to the regulator using washers
- Align door glass
- Reattach weather stripping, trim and door panel
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Identify different types of auto glass
- Compare moveable glass to fixed glass pieces in a vehicle
- Identify vehicle glass components and their basic repair/replacement procedures
- Describe precautions to take to avoid breaking glass
- Discuss proper procedures for removing broken glass
- Identify different types of glass defects and repairable breaks
- Compare & contrast tempered & laminated safety glass
- Describe common methods that window glass is held in place
- Demonstrate how to use glass removal tools
- Compare different window channels & runs

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

17. Remove & install window regulator

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove door panel & components
- Peel away plastic and loosen window glass clamps
- Disconnect wire to motor, if power windows
- Remove bolts holding guide rails and motor
- Lift rails slightly to release from hangers
- Remove window regulator
- Loosen window glass clamps
- Set guides in place by using hangers
- Bolt guides and motor
- Temporarily connect power window switch and carefully raise window regulator until clamps are resting in place under window glass, tighten clamps
- Test before putting panel back on
- Readjust as needed
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Explain how to protect glass before repairs
- Describe types of regulators and drive mechanisms for windows
- Define the purpose of the counterbalance spring

Comments:

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Competency

18. Align door glass

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Align the bottom of the glass with its window track & riser
- Secure the glass to the riser; do not over-tighten
- Roll the window all the way up
- Loosen regulator mounting fasteners and shift regulator and glass as needed
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- List the different types of adhesives used by the auto glass industry
- Compare glass tinting shades & purpose

Comments:

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Competency

19. Remove & install vent & hinged window assembly & glass

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Remove the door panel & components if needed
- Remove the trim piece
- Remove the large door glass if needed
- Remove any screw on the door frame holding the vent window in place
- Drop the vent window frame in the door and pull it out through the large window opening
- Pull off window gasket if needed
- Place the vent glass into the plastic/rubber molding
Unscrew and pull aside the divider on the door between the vent window and main window
- Slide the vent glass assembly (glass and molding) into place
Put back the divider and screw it at the top
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Describe precautions to take while removing & installing vent glass
- Describe how glass is coded & identified
- Compare partial versus full cutout removal of fixed glass

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

20. Assist to repair plastic parts

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

Performance will be successful when learners:

- Determine repairability
- Obtain equipment & materials needed
- Review safety & service procedures
- Remove necessary vehicle components
- Select the appropriate type of repair method (adhesives or welding)
- Clean and prepare the surfaces of plastic parts with the appropriate cleaning materials and methods
- Remove repairable plastics and other parts that are recommended for off-vehicle repair
- Mix the adhesives, if necessary
- Remove excess adhesives or weld material
- Apply filler as necessary
- Retexture plastics to restore original texture
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Identify different types of automotive plastics
- Locate plastic parts on a vehicle
- Identify plastic/composite components and their basic repair/replacement procedures
- Describe types of adhesive best suited for the repair based on the type of damage and plastic composition
- Compare plastic surface preparation for repair depending on the type of plastic (e.g., thermoplastic, thermosetting) being repaired and type of damage (e.g., cuts, tears, punctures)
- Explain the purpose of body filler
- Compare different types of body fillers
- Explain the purpose of hardener
- Describe how to apply body filler

Comments:

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Competency

21. Assist to reshape and shrink flexible exterior plastic parts

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Thoroughly wash and clean the part with plastic cleaner
- Apply heat directly to the distorted area
- Use tools to reshape the piece as needed
- Quick cool the area with cold water on a sponge or rag
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Describe how plastic parts are identified
- Compare plastic welding process such as hot-air, tack, airless, speed, melt-flow, and stitch-tamp welding
- Explain the process for repairing vinyl foam dents
- Compare single-sided and two-sided welds

Comments:

Unit 4: Auto Collision Pathway Non-Structural Analysis & Repair

Competency

22. Clean metal to be welded

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Use sandpaper or wire brush
- Removing any paint or wax
- Use a small grinder to clean any tough spots
- Apply weld-through primer to bare metal mating surfaces, ungalvanized steel or where zinc has been removed
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Describe when to use and when not use certain welding processes for collision repair
- Describe weldable, weld-bonded, and non-weldable materials used in vehicle construction

Comments:

Unit 4: Auto Collision Pathway

Non-Structural Analysis & Repair

Competency

23. Assist to weld metal

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Identify the type of material (e.g., steel, aluminum, plastic) to be cut or welded
- Clean metal to be welded
- Check automobile manufacturer's information regarding the welding process and equipment recommended
- Determine correct welding process
- Adjust the welding equipment for proper operation
- Perform test welds and inspect
- Identify proper welding technique (push, pull, & gun angle)
- Protect surrounding panels, glass and interior
- Protect computers and electronic components
- Perform welding using appropriate type of weld joint
- Perform recommended procedure for type of weld
- Remove damaged structural steel and aluminum components, and weld in replacements
- Remove and install welding/weld-bonded panels
- Inspect for weld defects and make necessary adjustments
- After servicing, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe safety practices related to personal protection, equipment & materials for this process
- Explain the difference between welding, soldering, and brazing
- Compare welding processes such as GMAW (MIG), compression/ resistance spot (STRSW), GTAW (TIG), electrode, wire type, diameter, gas and bonding material
- Explain why extra caution is needed for magnesium parts
- Compare types of welding equipment
- Compare types of welding techniques
- Compare types of welding joints (butt joint, t-joint or lap joint)
- Compare types of welding procedures (continuous, plug, stitch, spot, lap spot or tack)
- Identify the causes of welding defects (burn through, cracks in metal, cratering, porosity, improper penetration, excessive spatter, distortion, and waviness of bead) and how to correct them

- Identify proper cutting processes (abrasive, mechanical, plasma arc) for different materials and locations

Comments: