

# **Automotive Body Repair and Paint Work Level- IV**

**Based On October, 2023 Curriculum Version- II**



**Module Title: Maintaining Adhesive Bonded  
Structural Damage on Vehicles**

**Module code: EIS BRP4 M06 1023**

**Nominal duration: 70Hours**

**Prepared by: Ministry of Labor and Skills**

**October, 2023  
Addis Ababa, Ethiopia**

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## Acknowledgment

**Ministry of Labor and Skills** wish to extend thanks and appreciation to the many representatives of TVET instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

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## Acronyms

OHS ----- Occupational health safety

MSDS----- Material Safety Data Sheets

PPE -----Personal Protective Equipment

STRSW-----Squeeze type resistant spot welding

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## Introduction to the Module

In automotive body work measurement and quantity estimation of body work project helps to know the quantity of work; to estimate the quantity of material required; to determine the cost of the work; to estimate the expected project completion time and to know the amount of material supplied for body work. This module describes the skills and knowledge required to repair bonded vehicle body panels and structures using an adhesive attachment method.

### This module covers the units:

- Preparing to repair adhesive bonded structural damage
- Removing and replacing bonded sections
- Completing work processes

### Learning Objective of the Module

- Prepare to repair adhesive bonded structural damage
- Remove and replace bonded sections
- Complete work processes

### Module Instruction

For effective use this module trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” given at the end of each unit and
5. Read the identified reference book for Examples and exercise

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## Unit One :- Repairing Adhesive Bonded Structural damage

This unit is developed to provide you the necessary information regarding the following coverage and topics:

- OHS requirements
- Removing and Replacing Bonded Sections
- Checking replacement panels and components.
- Removing bonded panels and structures
- Repairing bonded panels and structures
- Refitting bonded panels and structures.
- Cleaning bonded panels and structures.

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically upon completion of this learning guide, you will be able to:

- Observe OHS requirements and personal protective needs
- Perform Remove and Replace Bonded Sections
- Apply Check replacement panels and components.
- Perform Remove bonded panels and structures
- Perform Repair bonded panels and structures
- Apply Refit bonded panels and structures.
- Make Clean bonded panels and structures.

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### 1.1.OHS requirements

This includes providing clear instructions on how to perform tasks safely, outlining proper use of equipment and machinery, and promoting good ergonomic practices.

#### Personal Protective Equipment (PPE)

PPE used by technician for each of the workshop tasks and operations being conducted as required by the personal protective equipment

Protecting yourself from injury is by wearing of personal protective equipment (PPE) and clothing. These are:

- Wearing eye glasses(goggles)
- Wearing ear protection
- Wearing cap head band or hairnet.
- Wearing proper clothing, shoes, and gloves.

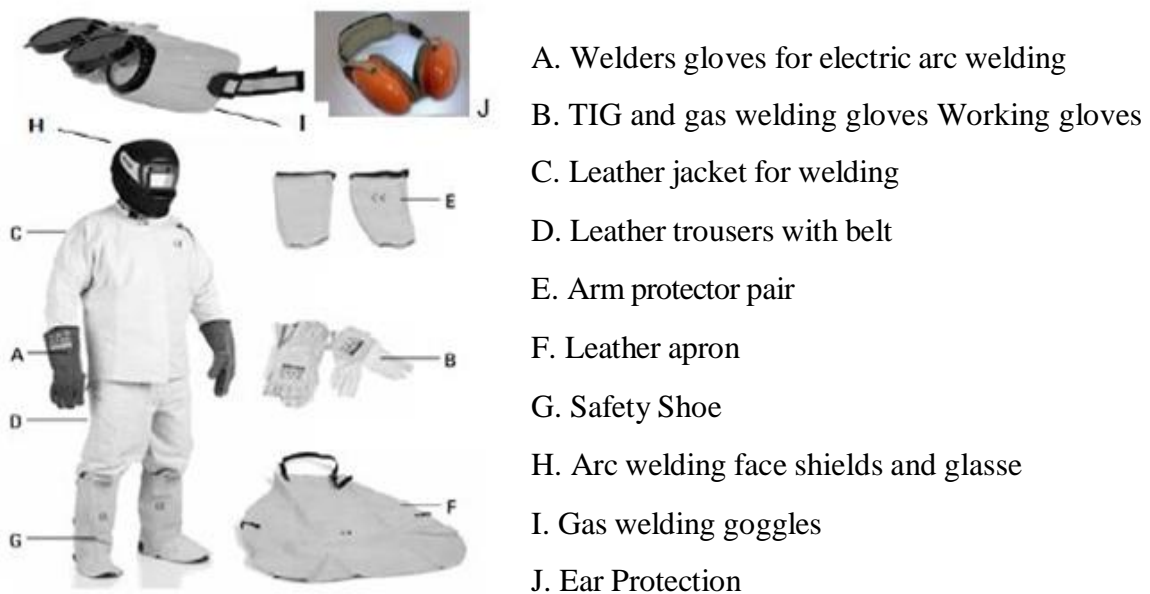


Figure 1 . Personal Protective Equipment

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### **Safe use of tools and equipment**

Material handling is the movement, protection, storage and control of materials and products throughout manufacturing, warehousing, distribution, consumption and disposal

Each shelf should have an anti-roll lip.

Avoid storing chemicals on the floor (even temporarily) or extending into traffic aisles. Liquids should be stored in unbreakable or double-contained packaging, or the storage cabinet should have the capacity to hold the contents if the container breaks.

### **Safe handling of material**

The National Safety Council suggests employers relay the following information to employees to help reduce workplace incidents when handling and moving materials:

Avoid lifting materials from the floor or while seated.

Make use of available handling aids. Refrain from using sudden or jerky movements

### **Workplace safety policies and procedures**

- Safety glasses, cover goggles, or face shields are required when in any shop area, whether working or not!!
- Shoes must be worn in any shop area. No one wearing sandals will be allowed to enter any shop area. The minimum footwear must cover the entire foot.
- Do not operate any item of equipment unless you are familiar with its operation and have been authorized to operate it. If you have any questions regarding the use of equipment, ask the area supervisor.
- No work may be performed using power tools unless at least two people are in the shop area and can see each other.
- Avoid excessive use of compressed air to blow dirt or chips from machinery to avoid scattering chips. Never use compressed air guns to clean clothing, hair, or aim at another person.
- In case of injury, no matter how slight, report it to the shop supervisor.

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- Do not attempt to remove foreign objects from the eye or body. Report to the Health Center for medical treatment. If chemicals get in the eye(s), wash eye(s) for 15 minutes in an open flow of water before proceeding for medical treatment. In severe cases, notify the Department of Public Safety at 387-5555.
- Machines must be shut off when cleaning, repairing, or oiling.
- Do not wear ties, loose clothing, jewelry, gloves, etc. around moving or rotating machinery. Long hair must be tied back or covered to keep it away from moving machinery. Hand protection in the form of suitable gloves should be used for handling hot objects, glass, or sharp-edged items.
- Wear appropriate clothing for the job (i.e., do not wear short sleeve shirts or short pants when welding).
- Do not work in the shop if tired, or in a hurry.
- Never indulge in horseplay in the shop areas.

### **1.2.Remove and Replace Bonded Sections**

Panel 60 is a two-component structural epoxy cartridge system intended for use in secondary panel bonding (e.g., roof skins, door skins, quarter panels and rear body panels). This document is intended as a general guide for making a successful repair.

**Structural adhesives** depend on the interfacial relationship of the adhesive and the substrate. To optimize the performance the substrate surface preparation is critical. Bonds of high strength on metals, plastics, etc. can be obtained after removal of grease and loose surface deposits, e.g. rust, from the surfaces to be joined, but when maximum strength is required, a more thorough mechanical or a chemical pretreatment is recommended. Surfaces are prepared by one of the following procedures (listed in order of increasing effectiveness):

1. Degrease only.
2. Degrease, abrade, and solvent clean.
3. Degrease and chemically pre-treat

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All contamination must be removed from the surfaces to be joined. This includes dirt, dust, moisture, and all other foreign materials. The surface to be welded must be completely sanded and roughened (there should be no glossy resin finish). The roughened surface should extend at least 1 inch (25mm) beyond the area where the glass/resin will be applied. The bonding should be performed as soon as possible following grinding. Under no circumstances shall the bonding be performed if the area has been contaminated or the grinded surface is older than 12 hours.

After cleaning, care must be taken to avoid contaminating the pretreated surfaces prior to bonding. Contamination may be caused by finger marking, or by cloths which are not perfectly clean, or by using sub-standard degreasing or chemical solutions. Whatever the pretreatment procedure used, it is good practice to bond the surfaces as soon as possible after completion of the pretreatment when surface properties are at their best.

### **Handling**

Special precautions must be taken when working with combinations of aluminum and steel to prevent corrosion.

1. Work areas and tools for aluminum and steel repair should be kept separate to avoid cross contamination of substrates.
2. Tools to be used for multiple substrates should be cleaned thoroughly between uses and inspected regularly.
3. Use proper air ventilation and curtains to control airborne particles.
4. Always use filtered, clean air from the compres

### **Surface preparation**

1. Remove spot-welds by drilling with a spot-weld cutter; remove rivets by drilling or grinding.
2. Remove damaged panel and straighten bent flanges with a hammer and dolly.
3. Clean surfaces to be bonded with SEM Solve or Zero VOC Surface Cleaner per directions.
4. Grind mating flanges with a 36 grit grinding disc at low speed to maintain grinding marks, removing any adhesive or protective coating, such as paint, e-coat or galvanized

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coating. Note: Some manufacturers may recommend leaving the e-coat on the surface of the new replacement panel. If this is the case, omit grinding with 36 grit in step 4 and instead, scuff with a red scuff pad.

5. Blow off and re-clean surfaces with Solve or Zero VOC Surface Cleaner if necessary. Always use lintfree towels when cleaning surfaces to avoid lint and particle contamination.
6. Bonding surfaces should be clean, dry, and free of contamination. Dry-fit all panels before applying adhesive to ensure proper alignment and clearance.
7. While dry-fitting the panel, drill holes for replacement rivets or mark the location of self-piercing rivets per manufacturer instructions.

### **Mixing**

It is highly recommended that adhesives be dispensed through a static mixer. Once mixed, Multi-Purpose Panel Adhesive or Weld-Bond Adhesive should achieve a uniform color. Heat build-up during and after mixing is normal.

1. Place cartridge into a Universal Manual Applicator or Universal Pneumatic Applicator.
2. Remove cartridge tip. To maintain product quality, replace after use.
3. Equalize cartridge by dispensing product until both parts flow equally.
4. Install static mixer.
5. Cut tip to desired application size.
6. Dispense 2-3 inches of test material to make certain color is uniform prior to applying to job.

### **Application**

1. Apply a 3/8" – 1/2" bead of product to both bonding surfaces and tool with a spreader or acid brush covering all exposed bare metal. Use enough material to completely fill the joint when parts are clamped. To assure maximum bond strength, surfaces must be mated and riveted within the adhesive's working time.
2. Clamp panel into place.
3. Install rivets per manufacturer recommendations.
4. Clamps may be removed after rivets have been installed.

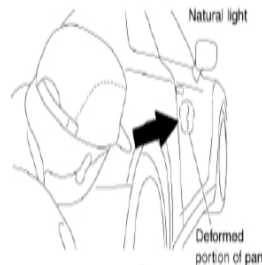
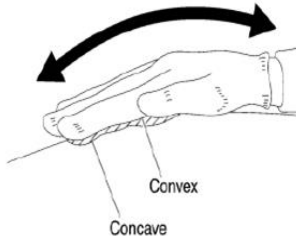
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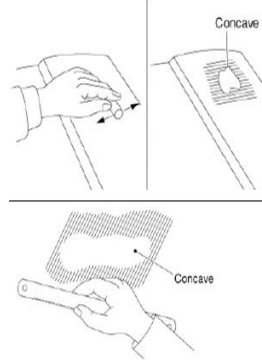
5. Wipe away excess material squeezed out during clamping / riveting process.
6. Allow 4 hours dry time for Multi-Purpose Panel Adhesive and 3 hours dry time for Weld-Bond Adhesive before sanding and top coating with a two-component primer per manufacturers recommendations.

### 1.3. Checking replacement panels and components

#### Damage diagnoses/checking

- Determine the direction and force of impact, and whether damage is confined to the Body
- Inspect the parts along the path of impact, measure the major parts and check body heightsuspension and body damage Impact Effects
- In body-over-frame construction, the passenger area is enclosed with panels of steel attached in the uni-body construction, the metal body panels are welded together to make a unit.
- Damage assessment and repair also differs.



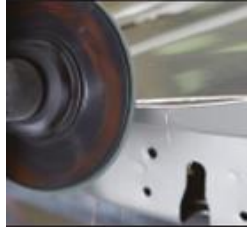


<b>Step 1</b>	<p><b>Visual Check</b></p> <p>Check the affected portion of the panel by carefully examining the deformation in the light reflected on the surface</p>	
<b>Step 2</b>	<p><b>Touch Check</b></p> <p>Lightly place a hand on the surface of the panel and move it forward/backward and right/left to judge by touch with the palm of a hand. Slide and move a hand from an undamaged surface to a damaged part, all the way to the undamaged surface on the other side.</p> <p>NOTE: Wearing work gloves make it easier to</p>	


	tell the difference	
<b>Step 3</b>	<p><b>Check with Tools</b></p> <p>Use of chalk: Rub the panel surface with a piece of chalk held lengthwise. Dents or concave areas in the panel will remain uncolored.</p> <p>Use of hacksaw blade: Scrape the panel surface with the blade teeth. Dents or concave areas will not be scratched.</p> <p>Use of body file: Scrape a body file lightly on the panel. Dents or concave areas will not be scratched. The body file should not be used for grinding. Thickness and strength of the panel will be reduced.</p>	

## 1.4.Removing bonded panels and structures

### 1.4.1.Door skins

**Door Skin Overview:** This repair can be used for a full door skin/panel replacement like you would do for collision repair or a partial replacement such as a lower hem flange repair. In most cases a new door skin will require an overlap joint at the belt line. A partial door skin can also be applied at the lower section of the door using an overlap joint, either way the repair involves removing at least part of the original door skin. The new skin/panel will be installed using Mopar (part # 05083855AA)/ Fusor #112B, structural adhesive with no welding require

<b>Door skin removal</b>		
<b>1</b>	<p><b>Pre-Cleaning</b></p> <p>Pre-wash/clean vehicle prior to disassembly (power wash undercarriage area at repair).</p>	
<b>2</b>	<p><b>Parts Removal</b></p> <p>Remove associated trim and parts. Use molding removal tool to remove and save side moldings and emblems.</p>	
<b>3</b>	<p><b>Hem Flange Grinding</b></p> <p>Use grade 60 fiber-backed abrasive disc to grind outer edge and separate door skin from door frame.</p>	
<b>4</b>	<p><b>Hem Flange Spot Weld Removal</b></p> <p>Use grade 60 file belt to remove any spot welds attaching hem flange to door frame. Use caution when grinding to only grind top panel and avoid cutting into host/</p>	
<b>5</b>	<p><b>Door Skin Spot Weld Removal</b></p> <p>Use grade 60 file belt to remove any spot welds attaching door skin to door frame. Use caution when grinding to only grind top panel and avoid cutting into host/ interior panel</p>	

6	<p><b>Door Skin Removal</b> Separate door skin from door frame. Use a putty knife to help separate skin from adhesive and NVH material on intrusion beam. Heat may be used when required for softening. (Maintain original NVH material whenever possible.)</p>	
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#### 1.4.2. Vehicle turret

##### Vehicle turret overview

Individual roof turret components can be replaced without removing the complete turret assembly. However, if repairs are significant enough to require bench work, or if the assembly is to be replaced, follow the procedure described below for roof turret removal and installation.

##### Removal.

###### (1) Perform the following steps inside cab.

- (a) Remove false ceiling , and handle . If required, remove grip from handle.
- (b) Drain fire truck air system and disconnect air lines from override valve assembly
- (c) Disconnect truck drain hose from drain valve assembly
- (d) Disconnect power cable and joy-stick cable from circuit board and remove cables from roof turret mounting plate

###### (2) Perform the following steps in the area above the truck cab.

- (a) Disconnect siren.
- (b) Remove four clamps attaching wind-shield coolant manifold to cab.
- (c) Remove roof turret supply line and seal at victaulic inlet
- (d) Swing roof turret supply line aside to provide clearance for turret removal.
- (e) Remove 22 screws (2), nuts (3) and washers (4) attaching turret to cab roof. Discard gasket
- (f) Install four eyebolts in tapped holes at each corner of turret (1).
- (g) Attach hoist to eyebolts and lift turret from cab.

**(3) Remove two spot lights and air horn assemblies and set aside.**

**1.4.3. Quarter panel**

**Quarter panel overview:**

The location of the butt joints may be determined by the new replacement panel or the location or severity of the damage. During the panel removal process keep in mind that you may be using parts of the old quarter panel to make your backer panels.

1. Once you have determined where and how the new panel will be installed remove the old sheet metal.
2. Use a hammer and dolly to repair any damage to adjacent mating surfaces.
3. Grind all surfaces where the new panel will be mounted. Final surface preparation should be done using a 36 grit-grinding disk.
4. Dry fit the panel to the vehicle, it is recommended you have someone assist you. Keep in mind where the butt joints will be and make the backer panels to be used at the butt joints. Determine how you will mount and hold the panel in place during installation. Make notes as to where you use clamps and screws so you can place them in the same location during installation.
5. Using Mopar (part # 05083855AA)/ Fusor #112B dispense a small amount of adhesive with out the tip to assure an even flow of adhesive. Place the mixing tip on Mopar / Fusor #112B and purge the adhesive.
6. Apply 3/8 to 1/2 inch of Mopar / Fusor #112B adhesive at the mating surface where the two panels will join.
7. Use a body filler applicator to smooth the adhesive over all prepared mating surfaces making sure to cover all bare metal. Then apply a second bead of adhesive to ensure proper adhesive thickness.
8. Mount the panel to the vehicle, it is recommended you have someone assist you. If the panel needs to be adjusted, slide the panel to achieve proper fit. Do not lift to adjust the panel, lifting will induce air bubbles into the adhesive and weaken the bond.

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9. Install the clamps and screws in the same locations developed during the dry fit process.
10. Remove all excess adhesive squeeze out prior to curing.
11. Apply the spot welds using the squeeze type resistant spot welding (STRSW) immediately or after the adhesive has cured for approximately 2 ½ hours. Once spot welding is completed clamps and/or screws can be removed.
12. If screws were necessary, bevel the screw-holes and prepare the joint and screw holes for the application of waterproof fiber-filled body filler. Complete the repair using conventional body filler.
13. Refinish using your paint supplier's recommendations

#### 1.4.4.Boot floor section

##### Overview:

A typical panel reinforcement repair would be great for a floor pan that has stress cracks from extreme use. The repair consists of stop drilling all stress cracks to stop the cracks from spreading. Fit the new Mopar sheet metal part to the original sheet metal part. Tailor fitting of the new panel will usually be required so the new panel fits perfectly against the old panel. A complete skin coating of structural adhesive will be required between the two panels. Use screws to pull the two panels together, you want them to be as close together as possible. The structural adhesive has a glass bead that determines optimum thickness and restricts complete squeeze out.

##### Preparation:

1. Clean the surface area to be repaired.
2. Stop-drill all cracks in the panel to be repaired.
3. Remove any rust, adhesive, grease, oils, or loose dirt from the surface you are going to bond to. Use a red scruff pad to abrade the surface of both panels. Clean all loose materials from the mating surfaces prior to installation.
4. Fit/tailor the new panel to fit flat under or over the original panel. The way you place the panel will be determined by the access you have. An example would be a floor pan. If you

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need to reinforce the center of the floor pan where you have a drive train restricting access. You may want to install it through the interior to the topside of the floor pan.

5. Dry fit the new panel using screws and clamps, the tighter the two panels fit the stronger the bond will be. The panels must fit perfectly against each other to achieve optimum reinforcement strength.

## 1.5.Repairing bonded panels and structures

### 1.5.1.Welding and bonding

#### Safety Precautions

**Welding:** Comply with all federal, state, and local regulations to avoid any injury due to shock, fires, fumes, sparks, liquids, and equipment must be avoided at all times. All flammable materials or liquids should be stored in tightly sealed labeled containers and used only in well-ventilated areas. No spark producing equipment should be permitted in any area where flammable materials are being handled or stored.

**Adhesives:** Adhesives must comply with all federal, state, and local regulations. Material Safety Data Sheets (MSDS) must be available and understood before adhesives are handled. All personnel should be instructed in the proper procedures to prevent skin contact with solvents, curing agents, and uncured base adhesives, which could cause allergic reactions or sensitization.



**Figure 2.Adhesive bonding**

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## Requirements of a Welding Repair

The number one requirement of any welding or weld bonding repair is to restore the vehicle to its condition. Materials and technology should duplicate original conditions as much as possible. To meet this requirement, the technician must ensure the following: Panel shingling is the same as original. Equivalent sealers or adhesives are utilized. Welds are replaced in the same size, quantity, and location

### Weld-bonding:

1. Remove all paint, primer, corrosion and rust from the surface to be bonded using 36 grit abrasive disc. When preparing aluminum surfaces use 80 grit abrasive disc.
2. Straighten all metal and clamp equipment panels for proper alignment and fit. There should be no tension on the replacement panels.
3. Remove panels from vehicle.
4. Clean areas to be bonded with SCAT #6311, Speedi SCAT #6321/6323 or Aqua SCAT #6351/6354. Other cleaner may leave a film and prevent optimum bonding.
5. When bonding aluminum panels, apply Aluminum Bonding Prep #1154 to the bonding surfaces on the replacement panel and vehicle. Follow instructions on label for application instructions and dry times. Rinse off panel with water and a clean cloth and then dry.
6. Apply Weld Through Primer #4353 per the product instructions to the weld area only. Clean 4353 overspray areas with GP Solvent #4074 where adhesive bonding 1142 will be used. Note: Do not apply 1142 adhesive bond material where 4353 exists.
7. Load 1142 cartridge into 4450 Dual Mix Gun. Remove end plugs and attach the static mixer nozzle (included in package). Attach the static mixer nozzle to the cartridge, slide on the mixer nut, and then tighten. Gun the material until both parts (A & B) are equally flowing from the cartridge. Prior to applying adhesive, dispense a bead of the adhesive approximately the length of the mixer to ensure a proper mix.
8. Apply adhesive to both mating surfaces. Using a spreader, tool out the adhesive to ensure all base metal surfaces are coated.

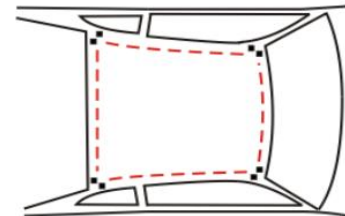
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9. Apply 1142 approximately 1/4” from the inside edge of the replacement panel.
10. Secure panels into proper position within 60 minutes. The adhesive contains glass beads to prevent over clamping and to provide a consistent bondline. If repositioning is needed, slide the panels rather than removing and reapplying. Apply clamps at 12” intervals or closer if necessary. In areas where clamps can’t be applied, use sheet metal screws to hold the panel in place.
11. Tool any adhesive “squeezed out” to seal the outside seam along the bonded edge of the panel.
12. Adhesive is flammable, allow to dry 1.5 - 2.5 hours prior to welding. Weld appropriate areas (see diagrams for specific panel replacement details). Keep any welding to a minimum of 2 inches from the adhesive as it is combustible when cured and will burn.
13. Spray the inside of the quarter at the bonded seams with Amber Rustproofing #4423. 14. Clamps may be removed after welding or after adhesive has set (1.5 - 2.5 hours). Panels may need additional time if temperature is below 75°F. Cure time is 24 hours

**Note:** Times are based on temperatures at 75°F. Cooler temperatures may extend the time, and hotter temperatures may lessen the time

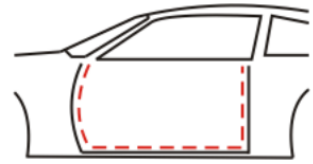
### Roof Panels

Follow vehicle manufacturer’s replacement procedures to prepare the service panel for replacement. Leave a space of two inches at each of the four corners to allow for two plug welds or a two inch lap weld. Use adhesive around entire perimeter of the roof and on the roof bows if applicable. Follow 1142 directions for surface preparation and applying adhesive. NOTE: On extended length van roof panels, 2 - 3 extra plug welds should be placed evenly in each side of the roof panel



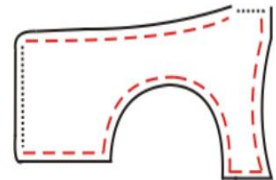
**Door skins:**

Follow vehicle manufacturer’s replacement procedures to prepare the door frame and service panel for replacement. Adhesive may be used on the entire replacement panel. Follow 1142 directions for surface preparation and applying adhesive



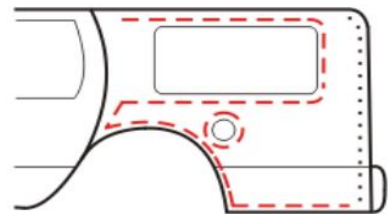
**Quarter Panels:**

Follow vehicle manufacturer’s replacement procedures to prepare the service panel for replacement. Follow vehicle manufacturer’s replacement procedures for welding the joint between the rear body and the quarter panel, as well as the sail panel. Adhesive can be used on all other areas, lower panel, wheel opening, door jamb, and trunk drip rail. Follow 1142 directions for surface preparation and applying adhesive.



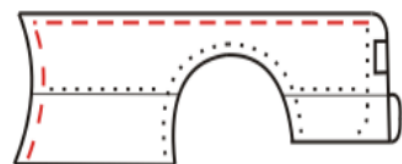
**Utility vehicles and van side quarters:**

Follow vehicle manufacturer’s replacement procedures to prepare the service panel for replacement. Follow vehicle manufacturer’s replacement procedures for welding the rear vertical part of the repair and any joint section of the sail panel. Adhesive can be used on the lowers, the wheel openings, door jamb areas, along the windows and along the area where the roof meets the panel. Follow 1142 directions for surface preparation and applying adhesive



**Pickup truck box sides (inner panel):**

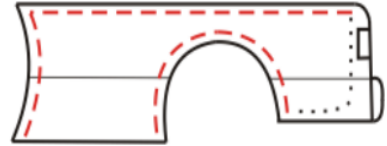
Follow vehicle manufacturer’s replacement procedures to prepare the service panel for replacement. Follow vehicle manufacturer’s replacement procedures for welding the rear vertical section, lower portion of panel attaching to the box and the wheel opening. Adhesive can be used on the top horizontal surface and the front edge of the box side. Follow 1142 directions for surface preparation and applying adhesive. Note:



If the inner and outer panels are already pre-assembled, the adhesive will only be used as the front edge of the box side.

**Pickup truck box sides (outer panel):**

Follow vehicle manufacturer’s replacement procedures to prepare the service panel for replacement. Follow vehicle manufacturer’s replacement procedures for welding the rear



vertical section. Adhesive can be used on the top horizontal surface and the front edge of the box side. Follow 1142 directions for surface preparation and applying adhesive.

**1.5.2.Rivet or screwing and bonding**

Rivet Bonding for Aluminum and Steel Substrates is a process that uses a combination of automotive structural rivets and adhesive to join two pieces of metal of similar or dissimilar composition.

## Surface preparation

1. Remove the old panel using care not to damage remaining panels.

**Tech Tip:** Where original panel is spot welded, use a spot weld removal tool to avoid damage to the mating panel.



2. Clean any remaining adhesive or sealers from bonding flanges. Tech Tip: Refer to repair guidelines before removing any metal coatings (e.g. zinc coatings such as galvanizing). Always completely remove metal coatings leaving a shiny metal surface when using an acrylic adhesive.



3. Using new panel as a guide, confirm all bonding flanges are undamaged and mate up with the replacement panel. Make repairs as needed.



4. Prepare for the panel installation by having all necessary clamping devices on hand and determine if panel will be 100% rivet bonded or if a butt-joint exists which will require MIG-welding or MIG-brazing.

5. Prepare bonding flanges on replacement panel to receive adhesive. Tech Tip: Follow repair guidelines regarding the removal of e-coat and metal coatings on service parts. When removing coatings only do so in the bond area and avoid creating areas which are uncoated after the repair is complete.

6. Clean all bonding flanges with solvent.

**Tech Tip:** Use a quick evaporating solvent, such as acetone or isopropyl alcohol that leaves no residue behind

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## Apply

**7.** Prepare adhesive for application by purging the cartridge and leveling the plungers before installation of the mixing nozzle and running out a bead to ensure a homogeneous mix.

**8.** Apply adhesive to the bonding area. Tech Tip: When using epoxy based adhesives, such as Fusor 208B or Fusor 2098\*, always “butter” both bonding flanges first, and then follow up with application of the adhesive bonding bead. When using an acrylic adhesive, such as Fusor 108B, 108BE\*\* or 112B, do not butter the flanges. Tech Tip: If any MIG welded, or MIG brazed, joints exist hold the adhesive back 1" (25-mm) from the weld zone.

**9.** Install and clamp the panel in position. Tech Tip: Once contact is made with the adhesive, slide the panel to its final position – do not separate panels. Tech Tip: Do not release the clamps until the adhesive has reached its handling strength or panel is mechanically fastened by rivets. Application of heat to epoxies will accelerate the adhesive if desired for quicker clamp removal.

**10.** Install the required rivets and make any necessary welds. Tech Tip: Clamps may be removed as the riveting progresses and when fully riveted, vehicle may be moved even if adhesive has not fully cured. Also, where panel has been previously rivet bonded, new rivet locations need to be shifted to avoid conflict with the original location in underlying panels.



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## Finish

**11.** Before the adhesive begins to cure: Tool any adhesive squeeze out (if using an epoxy); or, Wipe off completely (if using an acrylic or epoxy).



### 1.6. Refitting bonded panels and structures.

Panel 60 is a two-component structural epoxy cartridge system intended for use in secondary panel bonding (e.g., roof skins, door skins, quarter panels and rear body panels). This document is intended as a general guide for making a successful repair.

#### Panel Installation:

1. Remove the cap of the adhesive cartridge by prying the uppermost slot with a flat screwdriver. The cap may be retained for future storage.
2. Properly place the cartridge into the gun. Prior to attaching the mixer, dispense a small amount of adhesive to ensure both sides flow evenly.
3. Attach mixer, and dispense two inches for proper mix.
4. Apply a 3/8- to 1/2-inch bead of adhesive to all areas to be bonded, then spread or brush the adhesive evenly, making sure to cover all surfaces of the bare metal. Note: This eliminates exposed metal, which would be susceptible to corrosion
5. Align the new panel in place, and apply even pressure. After the panel has been positioned, do not pull away from the vehicle. If repositioning is required, slide the panels against one another to ensure no air is trapped in the bond line. Panel 60 # 8007 - White Panel 90 #8051- Black  
Work Time 60 minutes 90 minute Handling Strength  
4 hours at room temperature or 10-15 minutes @ 180°F 4 hours at room temperature or 10-15 minutes @ 180°F Paint Time 8 hours at room temperature or 25-30 minutes @ 180°F 8 hours at room temperature or 25-30 minutes @ 180°F
6. Clamp tightly in place every 4 - 6 inches. Note: Panel 60/90 adhesive incorporates glass bead technology to assure proper panel gap and prevents over-clamping.
7. Install welds in the front plate and the rear post.

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**8.** Clamp a minimum of 4 hours at 23°C / 74°F. Longer clamp times may be necessary if lower temperatures are experienced. Clamp times may be accelerated by use of a heat gun or lamp for 10-15 minutes at 180° F.

**9.** Finish, sand and paint per paint manufacturer’s recommendation.

**10.** For future use of the adhesive, remove cartridge from the gun and either leave on the mixer tip or replace the original cap.

**1. Body panels repair are:**

- a) non-permanently fixed body panels
- b) welded exterior
- c) welded sub-structure panels (e.g. rear quarter panel, rear panel, roof, chassis legs, inner wheel housing, boot floors, complete sill, A post, B post, C post, D post and cross members)
- d) bonded panels (e.g. any panel that is fixed by adhesive bonding as part of the original manufacturer's process or approved repair process)

**2. Fitting methods are:**

- a) Welding
- b) mechanical fastening
- c) adhesive bonding

**3. Tools and Equipment are:**

- a) Workshop equipment
- b) generic hand tools
- c) manufacturer's specified and specialist tools

## 1.7. Cleaning bonded panels and structures

### 1. Product description

Melamine faced board: melamine faced board, two-sided, coated with impregnated paper containing the design, available in different variations (moisture resistant, fire retardant, etc.) for vertical use. HPL board: high-pressure laminate in accordance with EN438-3 is composed of layers of impregnated paper compressed at high pressure and high temperature. HPL boards are available as a top finishing for bonding to a base board (e.g. chipboard, MDF, plywood, etc.) or as a self-supporting Compact HPL board. Melamine faced board and HPL boards are available with a wide range of designs (e.g. solid colours, wood and stone reproductions) with a specific surface finish (e.g. wood structure, pearlescent structure, textile structure, etc.)

### 2. General

Melamine faced board and HPL are easy to clean, provided that they receive regular care. No special cleaning agents are required, but we do recommend using all-purpose cleaner or glass cleaner. Commercially available care products are sufficient, provided that they are used correctly and regularly. Maintenance products containing ethanol, alcohol or propanol can also be used to clean the surface. The use of acetone is also permitted, but it should always be rinsed off with lukewarm water so that the product does not take effect for more than 2 minutes.

### 3. Do not use the following products for care

washing-up liquid Abrasive, aggressive cleaning agents, such as abrasive sponges, steel wool, sand paper Products with hydrogen peroxide Floor cleaners containing linseed oil, washing powder, furniture and plastic cleaners containing silicon, bleach, petroleum-based cleaners, turpentine, solvents (e.g. cellulose thinner), scouring powder and care products containing abrasive components, white spirit Care products containing strong (undiluted) acids, bases and salts High-pressure cleaners Paint stripper

TIP: Always test a new cleaning product on a small spot before cleaning the whole surface.

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#### 4. Instructions for daily care

We recommend removing all greasy marks, marks and dirt as quickly as possible, ideally within 48 hours. The longer the dirt remains on the surface, the more difficult it will be to remove it afterwards (e.g. coffee and wine stains,...). The surface can be cleaned several times a day with general cleaning products such as glass cleaner or all-purpose cleaner, without affecting the

surface. Always clean the entire surface. This will help to prevent the surface from becoming shiny in certain places over time.

#### 5. Instructions for hard-to-remove stains

##### 6. Removal of micro-scratches

Micro-scratches on panels with pronounced surface finishes (deep wood structures) can occur during transport or processing as a result of friction between the panels. We recommend using a forklift truck to move the panels or to do the work manually with 2 people, to prevent two panels from coming into contact with each other. Should small micro-scratches occur due to the friction of two panels, we recommend following this step-by-step plan:

1. Clean the surface with a clean soft cloth and lukewarm water. There is no need to add a cleaning product. Rub in the direction of the structure (instead of across it).
2. Wipe the surface dry with a soft, dry cloth to avoid streaking. Avoid using paper, especially if the surface has deep surface structures. Small pieces of paper may get stuck in the structure of the design.

##### 7. Removal of dust during processing of panels

Your panelling products may come into contact with dust when you process them. On surfaces with deep or pronounced surface structures, the dust can get into the grains of the surface finish. We recommend following this step-by-step plan:

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### **8. Removal of adhesive residues during processing of panels**

Your panelling products may come into contact glue during processing. Use tape to protect your surface when gluing HPL to a substrate. Glue residues are best removed immediately, before the glue has dried and hardened. Do this with lukewarm water and a soft cloth.

### **9. Care of matte or deep surface structures**

Boards with a very deep surface finish can be cleaned by following the general instructions for daily care. It is important not to use paper to clean the surface (paper residue can get stuck in the structure) and to rub in the direction of the structure, and not across it, to prevent the dirt from being rubbed into the structure rather than removed from it.

### **10. Recommendations**

Never place hot objects such as saucepans directly onto the surface. Never use the surface as a cutting board, always use a wooden or plastic cutting board. If in doubt about the procedure that you need to follow to clean the surface or treat specific marks or the use of a specific care product, please contact your local Unilin representative or dealer for expert advice.

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## Self Check .1.1

### Directions:

#### Part 1. Choose the correct answer from the given alternatives

1.....includes well-fitted pants and jackets with all buttons fastened?(3points)

- |                   |                    |
|-------------------|--------------------|
| A. Clothing       | C. Footwear        |
| B. Eye protection | D. Hand protection |

2.....minimize any potential risk for the worker, must be maintained, repaired or replaced and stored correctly (3points)

- |        |          |
|--------|----------|
| A. WHS | C. A & B |
| B. PPE | D. None  |

#### Part II .Give Short Answer

- 1.What is the difference between Adhesives and Abrasives
2. Explain level of vehicle bonded panel damage
3. Write the procedures for removing quarter panels
4. Write the safety prequation on welding & adhesive bonding
- 5.Write the steps for checking the damage replacement bonded panels

## Operation Sheet-1.1

**Operation title:** Door skin removal




**Purpose:** To remove the damaged door skin panels removal




**Instruction:** Perform Removing & installing by applying the steps which is listed below

**Tools and requirement:** Socket set (3'8" ), Phillips screwdriver set, standard screwdriver set, safety goggles, star-shaped socket set, inside door handle clip remover, Allen wrench

**Precaution:** When Removing door skin panels, always follow the manufacturer's specified and specialist tools

**Procedures in doing the task:**

Door skin removal			
<b>Step 1</b>	<b>Pre-Cleaning</b> Pre-wash/clean vehicle prior to disassembly (power wash undercarriage area at repair).		
<b>Step 2</b>	<b>Parts Removal</b> Remove associated trim and parts. Use molding removal tool to remove and save side moldings and emblems.		
<b>Step 3</b>	<b>Hem Flange Grinding</b> Use grade 60 fiber-backed abrasive disc to grind outer edge and separate door skin from door frame.		

<p><b>Step 4</b></p>	<p><b>Hem Flange Spot Weld Removal</b></p> <p>Use grade 60 file belt to remove any spot welds attaching hem flange to door frame.</p> <p>Use caution when grinding to only grind top panel and avoid cutting into host/</p>	
<p><b>Step 5</b></p>	<p><b>Door Skin Spot Weld Removal</b></p> <p>Use grade 60 file belt to remove any spot welds attaching door skin to door frame.</p> <p>Use caution when grinding to only grind top panel and avoid cutting into host/ interior panel</p>	
<p><b>Step 6</b></p>	<p><b>Door Skin Removal</b></p> <p>Separate door skin from door frame. Use a putty knife to help separate skin from adhesive and NVH material on intrusion beam. Heat may be used when required for softening. (Maintain original NVH material whenever possible.)</p>	

**Quality Criteria:** Use the specified tools & use service manual



## Unit Two :-Cleaning Up Work Area and Maintain Equipment

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Cleaning and disposing or recycling work area materials.

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically upon completion of this learning guide, you will be able to:

- Perform Clear and dispose or recycle work area materials.

### 2.1. Cleaning and disposing or recycling work area materials

#### Waste management and disposal

Waste management is the collection, transport, processing or disposal, managing, monitoring and regulation of waste materials. The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management is a distinct practice from resource recovery which focuses on delaying the rate of consumption of natural resources. The management of wastes treats all materials as a single class, whether solid, liquid, gaseous or radioactive substances, and tried to reduce the harmful environmental impacts of each through different methods. Waste types may include solid (non-hazardous)

#### Cleaning work area materials

Cleaning involves sweeping floors, dusting furniture and other surfaces, mopping or washing floors, polishing surfaces, articles and accessories, scrubbing tiles, sinks, toilets, disinfecting drains, rearranging cleaned areas and putting things in their specific place. We can say that cleaning is a process of removing dust, dirt or any other undesirable materials like stains, spots, contents of an ashtray, etc.

We have already discussed in our previous lesson that housekeeping involves cleaning, maintenance and beautification of any premises and that it is one of the most important and regular features in our daily life. Thus we know that any establishment has to be clean, well maintained and presentable at any given moment of time. But how to ensure well maintained

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premises? Cleaning is the most important and primary aspect of housekeeping. It is a process of removing dirt, dust and grime by using methods such as dusting, shaking, sweeping, mopping, washing or polishing. There are certain areas you may clean daily, whereas you may clean other areas occasionally or once /twice in a year. Since there are different types of surfaces like wall, counter tops, marble floors, ceramic tiles, wooden chairs, etc, special cleaning agents are used to clean these specific surfaces. In this chapter, we will discuss these various aspects of cleaning as well as the materials and equipments used for cleaning.

### **Disposing work area materials**

Disposal is an activity of liquidating the unusable / unwanted holdings. It releases valuable storage space and locked up value. It is therefore, necessary to dispose off the unwanted holdings following laid down procedures with due regard to economy and transparency. The unusable/unwanted holdings may consist of the following categories of Scraps:

### **Equipment , Spares and Stores**

After completing rated life and eligible working hours, if the Equipment becomes unserviceable/ Beyond Economic Repairs and required to be replaced with new ones for economic operations, such Equipment are to be declared unserviceable and are to be disposed off observing due procedure. For the purpose of survey off and disposal, Equipment shall mean all types of Equipment Items like HEMMs, UGMMs, Medical Equipment /CHPs/ Survey equipment / Laboratory equipment / Safety equipment / Office equipment etc. and all types of Plant & Machinery. Similarly spare parts and various other stores become unserviceable and are required to be disposed off. Further, the items such as rejects arising out of manufacturing process and various operations, are required to be declared scrap and are to be disposed off observing due procedure.

### **Method of disposing materials**

1. Recycling. Incineration. ...
2. Other thermal treatment plants. Chemical-physical and biological treatment. ...
3. Chemical-physical and biological treatment. Landfills. ...
4. Landfills. Collection and logistics.

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### **Recycling working materials**

Recycling is a dynamic process that restores the life cycle of a material. The iconic recycling symbol has 3 chasing arrows. Each arrow represents one step in the three-step process that completes the recycling loop.

**The first step** is collection. Materials are taken from the curbside or drop-off center.

**The second step** is processing and marketing of recycled materials. Materials are sorted and then sold.

**The third step** is manufacturing. The recyclables are converted into new products and take on a new life as consumer goods. The fourth step is consumer purchase of products made from recycled material.

### **Recycling Circle**

Typically, raw materials are manufactured into products for consumption. Leftovers are then thrown away. This linear process, from extraction of raw materials, to production, then consumption and disposal, has created a waste crisis. To decrease this one-way flow of resources to overburdened waste disposal facilities, materials no longer needed or wanted can be remanufactured.

### **Collection Methods, Source Separation and Mixed Recycling**

The first step in any recycling system begins with separating recyclable materials from those that will be thrown away or reused. How one separates and prepares materials depends on the local collection system and the market specifications.

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## Self -check .2.1

### Part I .Give Short Answer

- 1.What is the difference between cleaning and disposing
2. Write the steps on recycling materials
- 3.Write method of disposing materials
4. List out the cleaning procedure

A. -----

B. -----

C. -----

D. -----

E. -----

.

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## Lap Tests

### Practical Demonstration

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Time started: \_\_\_\_\_ Time finished: \_\_\_\_\_

**Task-1:** Examination and inspect of Panel Damage

**Task-2:** Replace front door trim panels by applying correct technical steps

**Task-3:** Refit the replacement bonded panels by using correct tools

**Task-4:** Repair bonded panels and structures

**Task-5:** Check the bonded panels and structures after installation

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