Automotive Body Repair and Paint Work

Level-III

Based on October, 2023 Curriculum Version-II

Module Title: Carrying-out Repair Work on Glass and Mirrors

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Nominal Duration: 80 Hours

Prepared by: Ministry of Labor and Skills

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Acronym

OHS

LAP

VIN

Introduction to module

This module covers the competence required to remove and install windscreens, window glasses, internal and rear vision mirror and repairing laminated glass windscreens. The unit involves preparing for the task, selecting and using specialist tools and equipment according to removal and installation procedures, applying rubber sealants, sealants and adhesives according to manufacturer specifications, finishing installing and cleaning the windscreen and window glasses, and completing work place processes and documentation. This module is designed to meet the industry requirement under the Automotive Body Repair and Paint Work level III occupational standard, particularly for the unit of competency: Carrying-out Repair Work on Glass a

This module covers the units:

- vehicle wind shield, glasses and mirrors
- Remove and Install Windscreen and Mirror
- Repairing Chipped and Cracked Laminated Glass Windscreen
- Clean Up Work Area and Maintain Equipment

Learning Objective of the Module

- Understand vehicle wind shield, glasses and mirrors
- Apply Removing and Installing Windscreen and Mirror
- Apply Repairing Chipped and Cracked Laminated Glass Windscreen
- Perform Cleaning Up Work Area and Maintain Equipment

Module Instruction

For effective use this modules 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” giver at the end of each unit
5. Read the identified reference book for Examples and exercise

Unit One: - Vehicle wind shield, glasses and mirrors

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

- Purpose of wind shield, glasses and mirrors
- Purpose of vehicles mirrors
- Types of wind shield & glasses
- Materials of wind shield, glasses and mirrors
- OHS requirement

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:

- Understand purpose of wind shield, glasses and mirrors
- Identify types of wind shield & glasses
- Identify Materials of wind shield, glasses and mirrors
- Apply OHS requirement

1.1. Purpose of wind shield, glasses and mirrors

1.1.1 Purpose of wind shield, glasses

Glass is a transparent substance manufactured by heating a mixture of sand, soda (sodium carbonate), limestone, and other materials to a temperature of about 2,400°F (1,300°C). Today's vehicles are built with a lot of glass for greater visibility. Frequently this glass is broken out or cracked as a result of a collision, air bag deployment, flying gravel, or vandalism. Glass is sometimes considered a structural component of the vehicle, especially the windshield and back glass. It is important for the body shop technician to be familiar with the various techniques to remove and install vehicle glass properly. Broken glass must also be removed before doing major structural repairs to the body

Glass service:-Outside glass specialty shops are often hired to install windshields and back glass. They have glass technicians who are specially trained to install bonded and rubber gasket-held glass on all makes and models of vehicles. However, some large shops do their own glass work, including windshield and back glass replacement. Windshields and rear windows are usually secured in place by rubber weather stripping

or by an adhesive. Generally, moldings are used on the interior and exterior of the body around the glass opening. Interior moldings around glass are called garnish moldings, and exterior moldings around glass are called reveal moldings. These moldings, the windshield wipers, cowl grille, and related parts often must be removed before the windshield will come out

Tempered glass: - is used for side and rear window glass but rarely for windshields. It is a single piece of heat treated glass and has more resistance to impact than regular glass of the same thickness. Unlike laminated glass, tempered glass shatters into tiny pieces when broken. The pieces of glass are small and have a granular texture. Anti-lacerative glass is similar to conventional multilayered glass, but it has one or more additional layers of plastic affixed to the passenger side of the glass. This glass is used in the front windshield only and provides added protection against shattering and cuts during impact

1.2. Purpose of vehicle mirrors

Both outside and inside rearview mirrors can be damaged in collisions. Inside rearview mirrors normally attach to the windshield glass using a quick bond adhesive. Outside rearview mirror housings normally bolt to the door frame. To service an inside rearview mirror, use a sharp putty knife to remove the old mirror mount. Apply heat to the mirror wedge. While it is warm, twist it back and forth with pliers. Use a single-edge razor blade to scrape the area clean on the inside of the windshield. Spray clear primer where the mirror is going to be mounted. Then place a few drops of clear adhesive on the windshield glass and the mounting surface for the mirror. Press and hold the mounting pad or mirror onto the glass without moving it. Hold the mirror or metal pad tight for about a minute. This will secure the mirror or its mounting pad. Sometimes a small Allen wrench is needed to tighten a small screw that holds the mirror to its mounting pad. If the outside rear mirror housing is damaged, the whole assembly is normally replaced (see Fig 1.2)

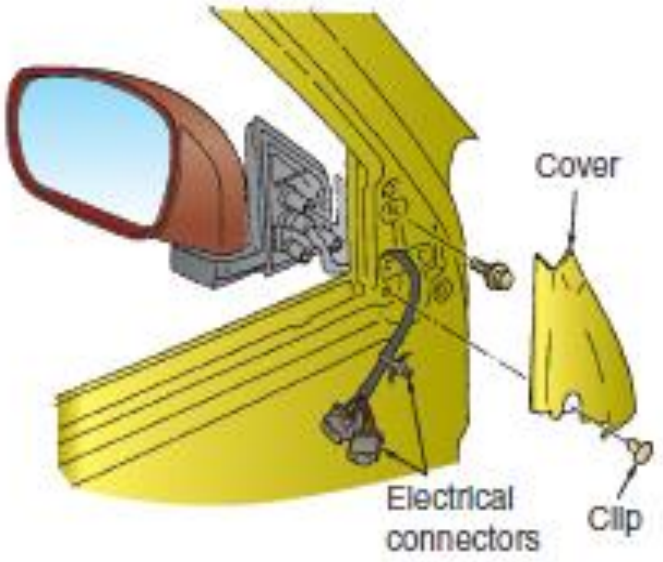

Fig 1.1.Outside rearview mirrors are usually held on by several small bolts or nuts

After removing the door inner trim panel, you can remove the two or three nuts that secure the outer rearview mirror to the door. Make sure you position any rubber gasket properly between the mirror housing and the door skin. Quite often, only the rearview mirror glass is broken. You can purchase and install just the mirror glass. Sometimes the rearview mirror glass is held on with clips, but usually it is adhesive-bonded in place. Use a heat gun to soften the adhesive on the broken mirror. Twist the mounting pad 30 degrees each way until it releases from the glass. Then use a putty knife or similar tool to pry off the old mirror. If the mirror has a heating element, it can be reused if still in working condition. Apply recommended adhesive to the back of the mirror and tape it in place. Allow the adhesive to cure for the recommended amount of time before tape removal.

Fig 2

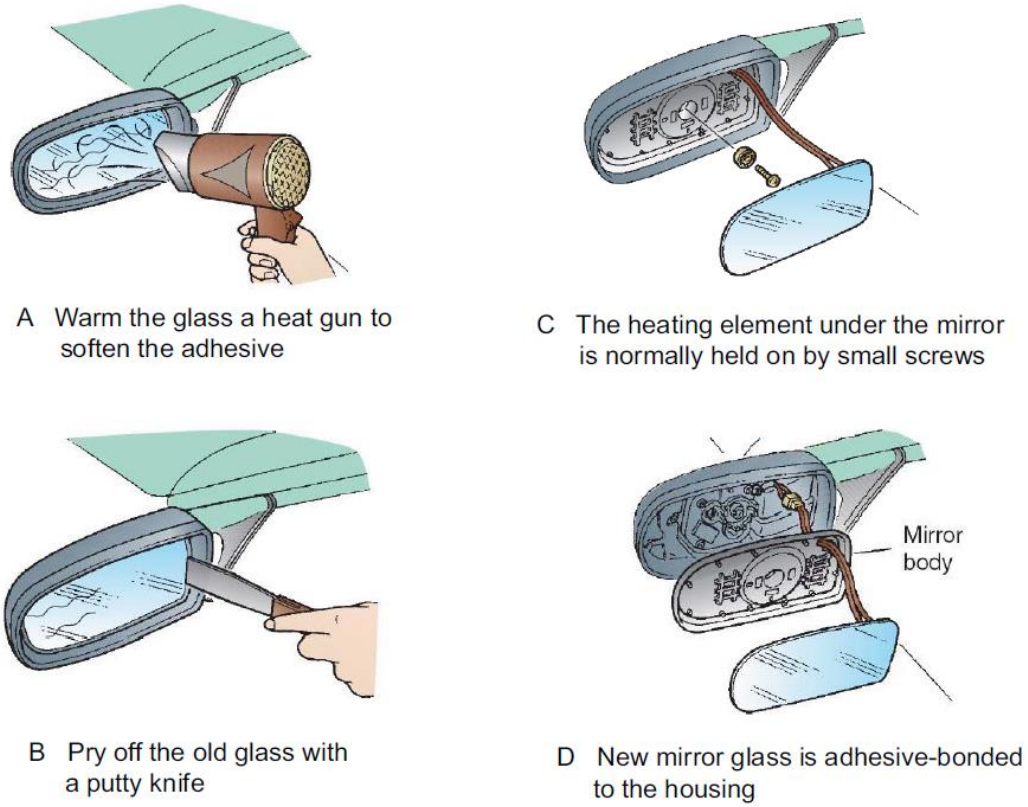

Fig 1.2. Adjustments of station wagon tailgate

1.3. **Types of wind shield & glasses**

1.3.1. Framed type windscreens

This type of glass is actually made up of a piece of **plastic** sandwiched between two layers of glass**.** The three layers are sealed together and any air pockets removed using rollers or vacuum systems.

Fig 1.3. Framed type windscreens

1.3.2. Direct glazed windscreens

Direct Glazing Bonding Techniques

The method of direct glazing of windscreens also known as bonding is very popular with motor manufacturers. This process involves the bonding of glass into the aperture. Some of the advantages claimed for direct glazing are as follows:

1. Increased rigidity and strength caused by integration of the glass into the body of the vehicle reducing the need for supporting members and improving visibility with enlarged glass areas.
2. Weight reduction.
3. Improved aerodynamics by deletion of rubber surrounds aiding fuel economy.
4. A better seal against the weather eliminating the need for resealing and rusting.
5. Increased protection against car and contents thefts. Various bonding materials are used in direct glazing. Some require heating to induce a chemical reaction to create adhesion whilst others will cure at room temperature. Polyurethane and silicone materials are usually supplied as a pump able tape. They are cold cured and the material is dispensed on to the glass through a specially formed nozzle out on the end of a cartridge. This can be done with the aid of a hand operated or compressed air cartridge gun. These materials are highly viscous in their uncured state enabling a high degree of maneuverability within the glass aperture to ensure a good seal.

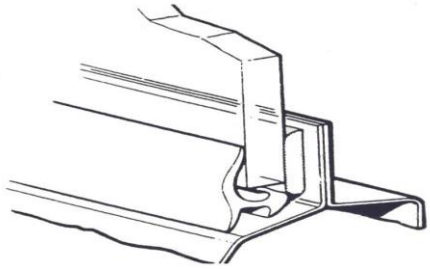

Figure 1.4: Direct Glazing with Moisture-cured Polyurethane

The sealant itself is either one or two component polyurethane. The latter contains an accelerator compatible with the adhesive this is applied evenly to the perimeter of the windscreen (figure 1.4). Once this is achieved the glass is placed into the aperture using glass suckers and aligned before securing. When one component polyurethane is used the car can be driven away in four to six hours:

if a two component polyurethane is used it takes only 30 minutes to cure, allowing the vehicle to be back on the road within an hour of the repair starting.

To remove the glass from the vehicle the bonding material has to be cut. This can be achieved by using piano wire, a special cutter or a hot knife, as follows:

Piano wire

Before using this method of removal there are certain safety precautions that should be observed. Gloves should be worn to protect the hands and safety glasses or goggles should be used for eye protection in the event of the wire or glass breaking. When the finishers or moldings have been removed to expose the bonded area of the glass the wire has to be fed through the bonding. This is done by piercing a hole through the bonding and feeding the wire through with the aid of pliers. Handles can be fixed to the ends of the wire to allow a pulling action (Figure 1.5).

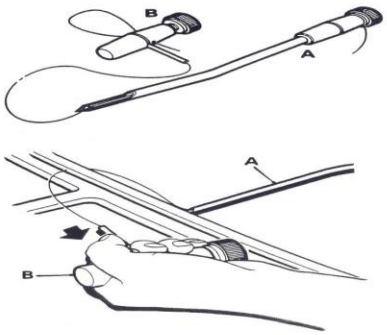

Figure 1.5: Removing Direct Glazing using a Piano Wire

Pneumatic or electric cutter (oscillating)

This is an air or electric powered tool to which special shaped blades to suit specific vehicle models are fitted. The tool removes windscreens that have been bonded with polyurethane adhesives.

Fig 1.6.Electric Windscreen Cutter

Hot knife

The hot knife can be used by one person cutting from the outside of the vehicle. It can cut round the average bonded windscreen and clean off the excess remaining adhesive while minimizing the risk of damaging the car bodywork. Before use, all trim around the windscreen both inside and outside should be removed. The cutting medium is provided by a heated blade which is placed under the edge of the glass and pulled around the perimeter melting the bonding to release the windscreen. It is used in conjunction with an air supply which constantly blows on to the cutting area of the blade. This prevents the heat dissipating along the blade and gives a constant temperature as well as eliminating smoke and fumes emitted from the cutting operation. Overheating can result in toxic fumes being given off and a charcoal filter mask should be worn as a safety precaution. Before glazing can be replaced the bonding surfaces must be prepared correctly. The residue of the original sealer left in the aperture has to be trimmed to ensure there is a smooth layer for the new sealer to adhere to and to allow the glass to seat in the correct position. Various sealants for windscreen replacements are available.

1.3.3. Butyl sealed windscreens

Butyl is a common sealant that was also used as a windshield adhesive back in the day.

Butyl is a black tacky substance that works well to seal holes but doesn't get used as a windshield adhesive anymore. That is because Butyl tends not to cure to a fully solid-state.

This caused the windshield to have a very weak bond with the car so that during frontal collisions, the glass would actually eject out from the vehicle. Because of this, when adhering the windshield to the car today, manufacturers now use Urethane. Despite this, Butyl is still a good sealant and can be used to seal small holes. It holds up well against shock and temperature extremes

1.3.4. Laminated glass windscreens

Laminated plate glass consists of two thin sheets of glass with a thin layer of clear plastic (vinyl) between them. It is used to make all windshields and some side glass.

The plastic or vinyl material is usually clear to provide an unimpeded view from all angles.

When laminated glass is broken, the plastic material helps to hold the shattered glass in place and prevent it from causing injury

1.3.5. Fixed and movable body glass

The glass in auto body may be either fixed or movable whether fixed or movable, glass that is damaged must be replaced. The replacement procedures differ because fixed and movable glass in vehicles is fitted to the vehicles body in different ways.

- Movable Glass repairs

There are four general repairs that may be needed during automotive glass work on doors and movable glass parts.

1. Replacing regulators
2. Adjusting regulators
3. Replacing glass (Channel type)
4. Replacing glass (through bolt type)

After all sheet metal damage has been pulled in to alignment, bumped and filled in to shape or replaced with new panels. There is still much work to shape or replaced to restore the damage vehicle to its original condition. A very common replacement item on a damaged vehicle is the front or rear bumper. Windshield, back lights, and door windows cracked by a collision also require replacement. In doing so always refer to a manufacturer's manual when in doubt as to the best procedure for replacing the following body accessories.

Replacing glasses

Today's vehicles are built with a good amount of glass that affords great visibility for driving and sight-seeing. Most of the glass built in to the vehicle is centered in the front windshield, the doors and rear windows. Frequently this glass is broken out or cracked as a result of collision, flying gravel, or vandalism. It is therefore, important for the body shop technician to be familiar with the various techniques to remove from areas of major damage before the damage is straightened.

1.1 Materials of wind shield, glasses and mirrors

Sealants, Adhesives, Rubbers and Cleaning materials

Adhesives and sealants means for assembling and adding value to finished products. The importance and prominence that adhesives and sealants have as commercial products are highlighted. The multiple functions played by adhesives and sealants are identified as are the critical procedures required to achieve successful results. The advantages and disadvantages of using these materials are explained and compared to other methods of joining Adhesive—a substance capable of holding at least two surfaces together in a strong and permanent manner.

Sealant a substance capable of attaching to at least two surfaces, thereby, filling the space between them to provide a barrier or protective coating.

Adhesives and sealants are often considered together because they both adhere and seal; both must be resistant to their operating environments; and their properties are highly dependent on how they are applied and processed. Adhesives and sealants also share several common characteristics.

Self-Check 1.1.

Instruction I:-Choose the best answer

1. What is a common name for exterior moldings?

A. Rubber moldings B. Plastic moldings C. Reveal moldings D. Garnish moldings

2. Tempered glass is never used for ___.

A. Windshields B. Rear windows C. Side windows D. Both A and B

3. Windshield wiper arms should be adjusted in this position.

A. up B. down C. Left D. Right

4. What type of glass very closely fits the contours of a vehicle?

A. Modular B. Tempered C. Laminated D. Channel

5. Technician A says it is best to remove the door striker when adjusting door hinges. Technician B says the striker should be adjusted before the door hinges.
Who is correct?

A. Technician A B. Technician B C. Both A and B D. Neither A nor B

6. Gasket glass installation is more common in ___.

A. Older vehicles B. Newer vehicles

C. Vehicles with modular glass D. None of the above

7. Which of the following items is used in the full cutout windshield replacement method?

A. Butyl ribbon sealer B. Setting blocks

C. Utility knife D. All of the above

8. In the partial cutout windshield replacement method, what serves as the base for the new adhesive?

A. Butyl ribbon sealer B. Butyl tapes

C. Masking tape D. The old adhesive

Instruction II: Give answer for the following questions

1) What is automotive glass?

2) Write Types of wind shield & glasses

3) There are four general repairs that may be needed during automotive glass work on doors and movable glass parts. Write these general repairs

4) Write the difference between Fixed and movable body glass

Operation sheet 1.1

Operation Title: Servicing the rear view mirror

Instruction:

- Safe working area
- Properly operated tools and equipment
- Appropriate working cloths fit with the body

Purpose: Ensure the wind shield glass is properly removed

Required tools and equipment: tool kit, Strip locking tool, screw driver,

Consumable Materials: Wind shield glass, Wind shield rubber gasket, Cotton waste , Baniyan cloth, Soap oil

Precautions:

- Wearing proper clothes, eye glass, glove
- Make working area hazard free
- Read and interpret manual which guide you how to use tools and equipment's

Procedures:

Sep 1. Visually inspects the inside and outside rear view mirror.

Step 2. If found damage remove the damaged mirror.

Step 3. To service the inside rear view mirror of the vehicle us a sharp putty knife to remove the old mirror mounting.

Step 4. Apply heat to the mirror wedge while it warm twist it back and forth with pliers.

step5. Clean the area where mirror mounted inside of the wind shield.

Step 6. Spray clear primer where the mirror is going to be mounted.

Step 7 .Place the few drops of clear adhesive on wind shield glass and mounting surface of the mirror.

Step 8. Press and hold the mounting ped without moving it.

Step 9. Hold the mirror or metal pad tight for about a minute.

Step 10. If outside rear mirror both sides are damaged, remove the door inner trim panels

Step 11 .Remove mirror mounting nuts that secure the outer rear view mirror to the door.

Step 12 .Incase mirrors are broken replace the glass with new one.

Step 13. Incase total unit is damaged replace the unit.

Step 14. Make sure rubber gasket is properly positioned between the mirror housing and the door skin.

Step 15. Mount the new outside rear view mirror in its place mount the mounting bolts and tighten as specified tightening pressure.

Step 16. Ensure the rear view mirror is properly mounted and functioning proper mode.

Step 17. Fix door inside trim panel

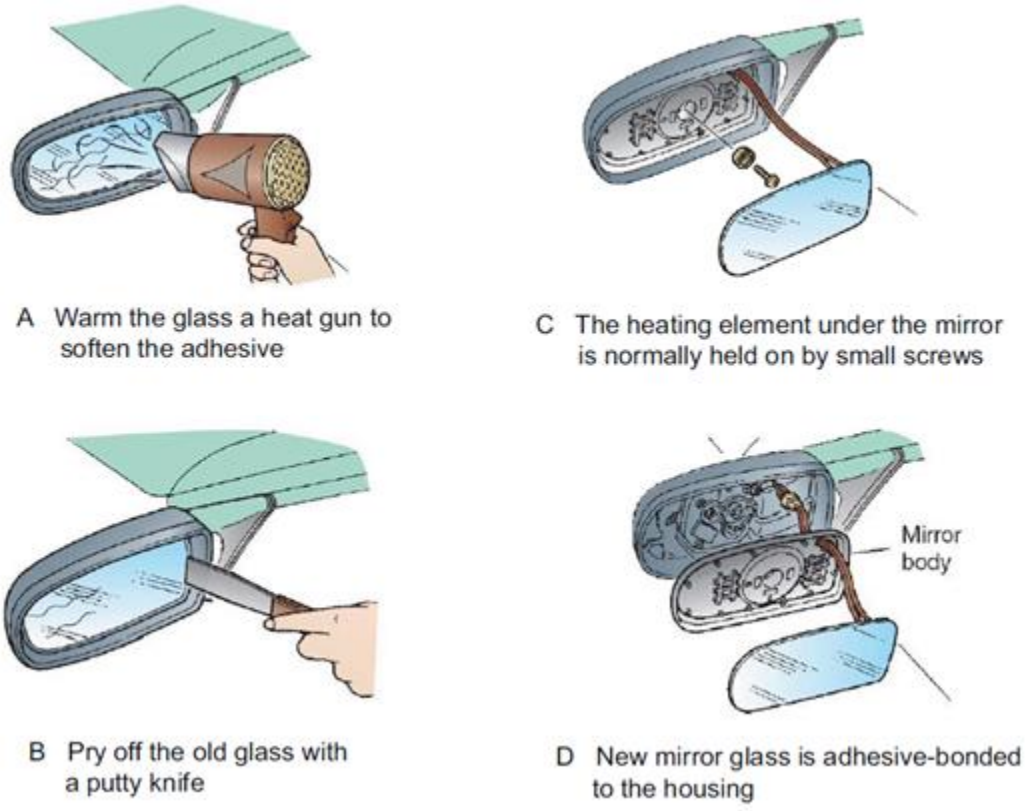

Fig 1.2. Adjustments of station wagon tailgate

Unit Two: - Remove and Install Windscreen and Mirror

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

- Removing Procedure
- Installing Procedure

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:

- Apply Remove Procedure
- Understand Install Procedure

2.1. Removing and Installing Procedure

Task 1: Wind shield glass removing procedure (show in Fig 2.1)

1. Remove the wiper blade.
2. Remove the wiper motor.
3. Remove the rear view mirror.
4. Remove the wind shield glass locking strip.
5. Use the adhesive material to secure the glass in place.
6. Remove the rubber stops and spacers.
7 .Remove the interior and exterior moldings fitted with front and wind shield glass.
8. Use the clip removal tool to release the clip from under the molding lid.
9. Remove the front and rear wind shield glass and place it very safety on a suitable bench.

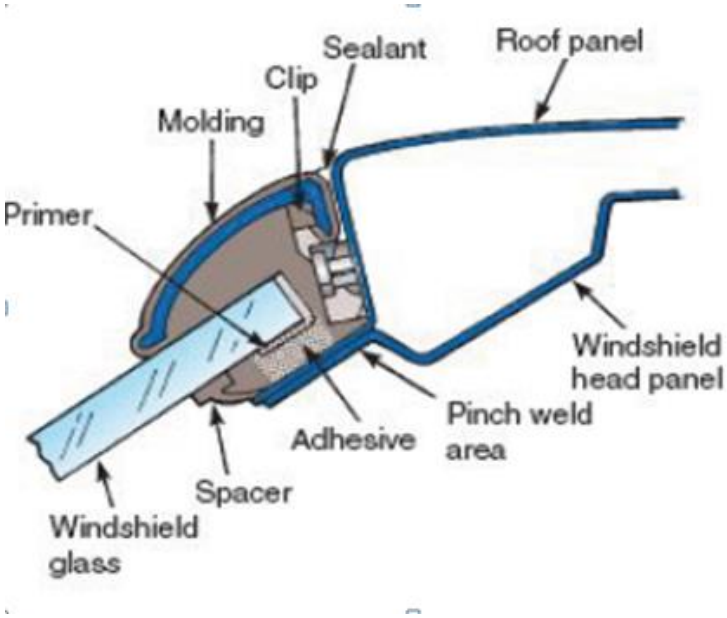

Fig 2.1. Wind shield glass removing procedure

Task 2: Wind shield rubber gasket service procedure as follow

1. Remove the wind shield as mentioned in task 1.
2 Place the tape or marking over the dash board.
3 Remove the rubber molding trim and hardware.
4 Remove the locking strip on the outside of the gasket and pry up the tap and pull tab to open the gasket all the way around the wind shield.
5 Use a putty knife to pry the rubber channel away the pinch weld inside and outside of the vehicle.
6 Remove the wind shield glass and gasket.
7 Clean the wind shield body opening with cleaning solvent.
8 Install the stop blocks and spacers
9 Carefully install the glass on the blocks, center the glass and then check the gap between the glass and the pitch weld. Remove the marking tape around the edges of the glass.
10 Apply sealer in the glass channel and install the gasket on the glass.
11 Insert the cord in the pinch weld groove of the gasket as shown in the Fig 2.

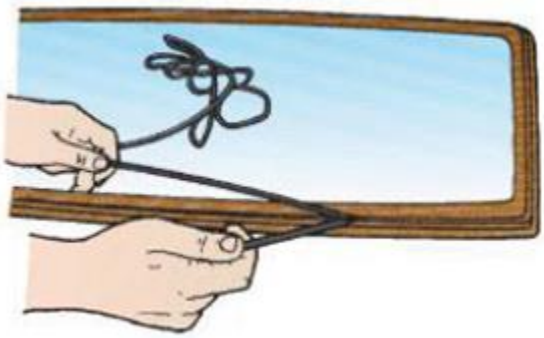

Fig 2.2. Insert the cord in the pinch weld groove of the gasket

12 .Squirt a soapy solution in the pinch weld groove to ease installation.

13 .Apply recommended sealer to the base of the gasket.

14 Install the wind shield glass and gasket assembly in the body opening and center it.

15 Very slowly pull the cord ends so that the gasket slips over the pinch weld flange (see Fig 2).

16 Work the bottom section of the glass in first, then do the sides and finally the top section and apply a small bead of sealer around the body side of the rubber gasket and remove excess sealer.

17 Install the reveal and garnish moldings.

18 Check the wind shield for water leaks using a low pressure steam of water.

19 Start at bottom slowly work up each side and do the top last to help isolate the location of the leak.

20 Use the wind shield locking strip tool to spreads the groove and feeds the strip into the opening of rubber grooves (seeFig 2.3).

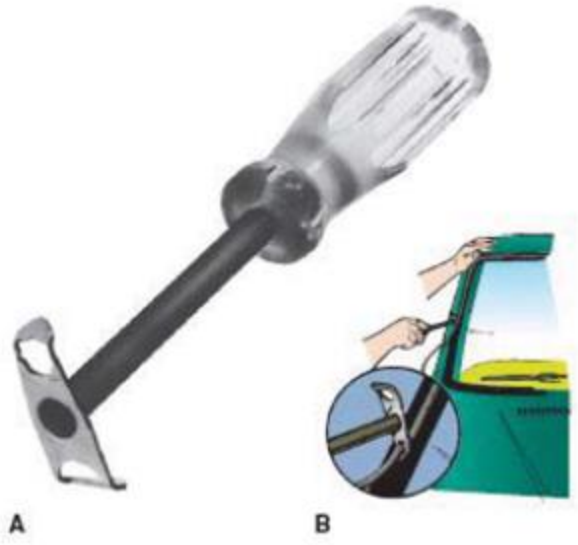

Fig 2.3. Wind shield locking strip tool

21 Ensure the wind shield glass and rubber gasket is properly installed.

- Installing Windscreen

Task 1: Align the wind shield glass into position

1. Soften up the adhesive by using a heat gun.
2. Use the steel wire to remove the glass.
3. Cut excessive adhesive from the glass edge to the pinch weld with a sharp knife.
4 .Attach the one end of the wire to a wooden handle.

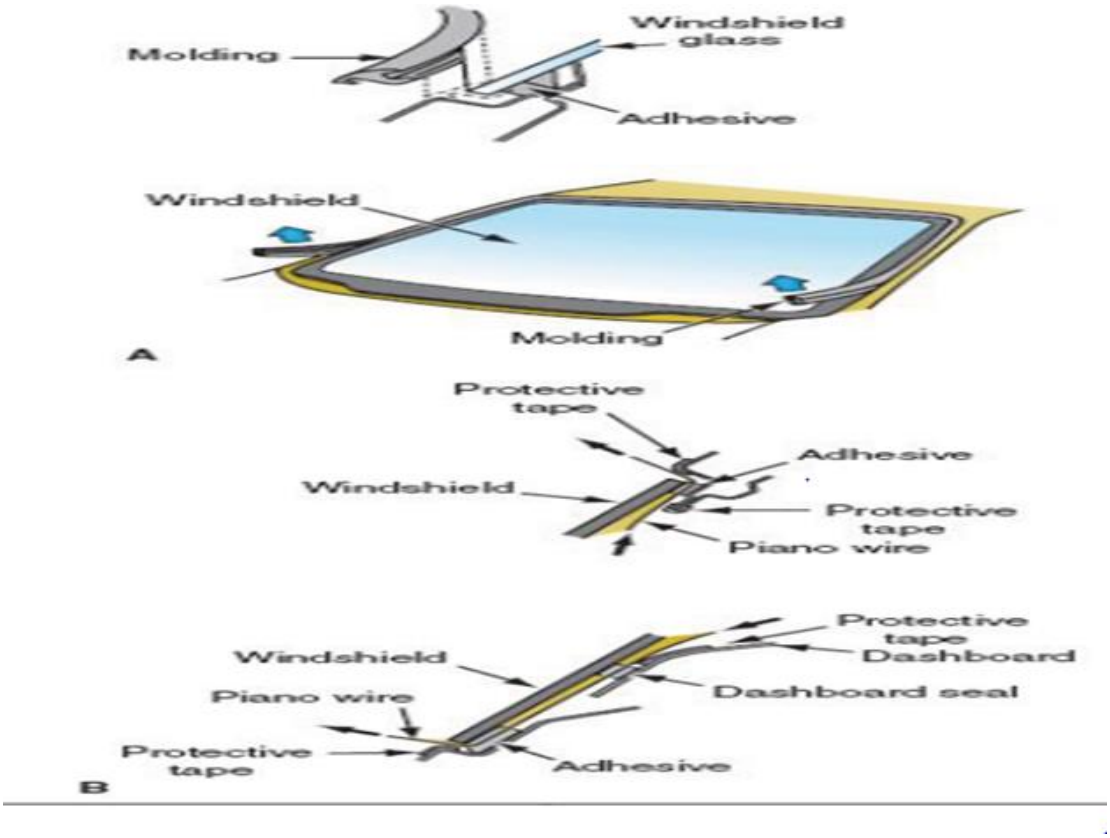

Fig 2.4. Install Windscreen

5. Work the wire back and forth to cut through the solvent.
6. Use the power knife in bottom of the wind shield where is it hard to reach the old adhesive, insert the knife and pull it carefully through the sealant (shown in Fig 2.5).

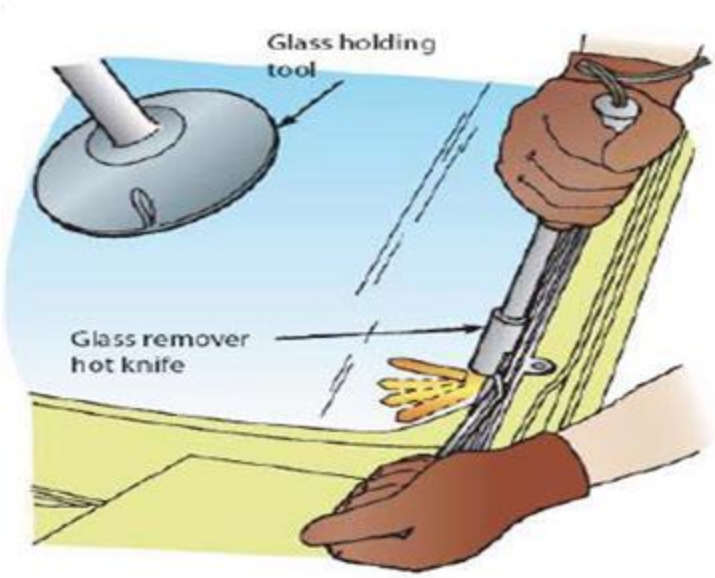

Fig 2.5. Use the power knife in bottom of the wind shield

7 .When the adhesive has been cut remove the glass and place it in safe area

8 .Wear safety goggles and hand gloves when handling glass.

9. Position the new wind shield glass into the opening.

10. Align for uniform fit and adjust setting blocks as needed.

11. Apply urethane on the glass edge 6.4mm of glass

12. Mark the position with a crayon or by applying marking tape

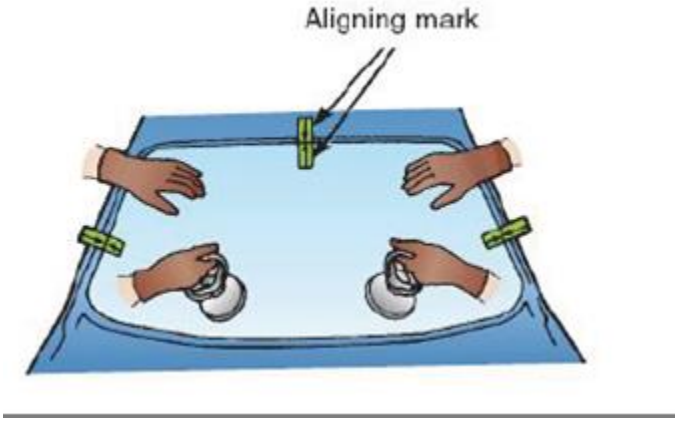

Fig 2.6. Applying marking tape

13. Shift the tape at the edge of the glass and remove the wind shield.

14. Remove the remaining adhesive from the body opening by using a putty knife.
15. Usually inspect all reveal molding clips, replace all broken or rusted clips if bent straighten them.
16. Remove rust with sanding disc and treat the bare metal with a metal conditioner and prime the areas with a urethane primer.
17. Clean the glass and wipe dry with clean cloth.
18. Apply urethane primers to the inside edge of the glass and allow it to dry for few minutes.
19. Ensure that the glass support is in place and comment the flat rubber spacers in place.
20. The spacers should provide equal support around the perimeter of the glass; the spacers on the sides will keep the glass from shifting left or right and align the wind shield.
21. Apply the sealant directly behind the ribbon sealer down on the pitch weld do not apply sealant on antenna lead wires (see Fig 2.7)

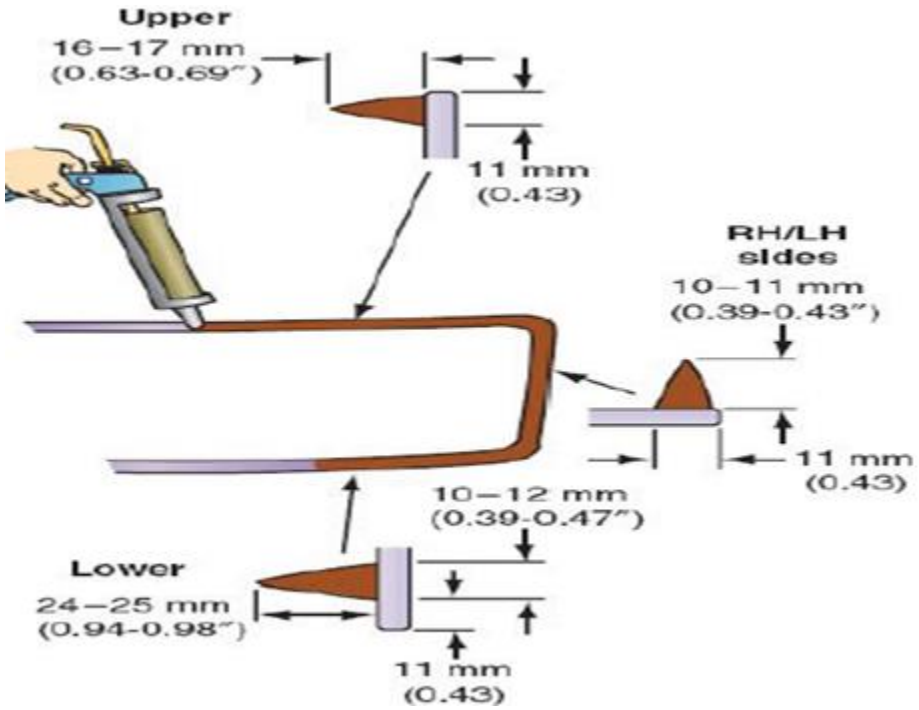

Fig.2.7. Apply the sealant directly behind the ribbon sealer

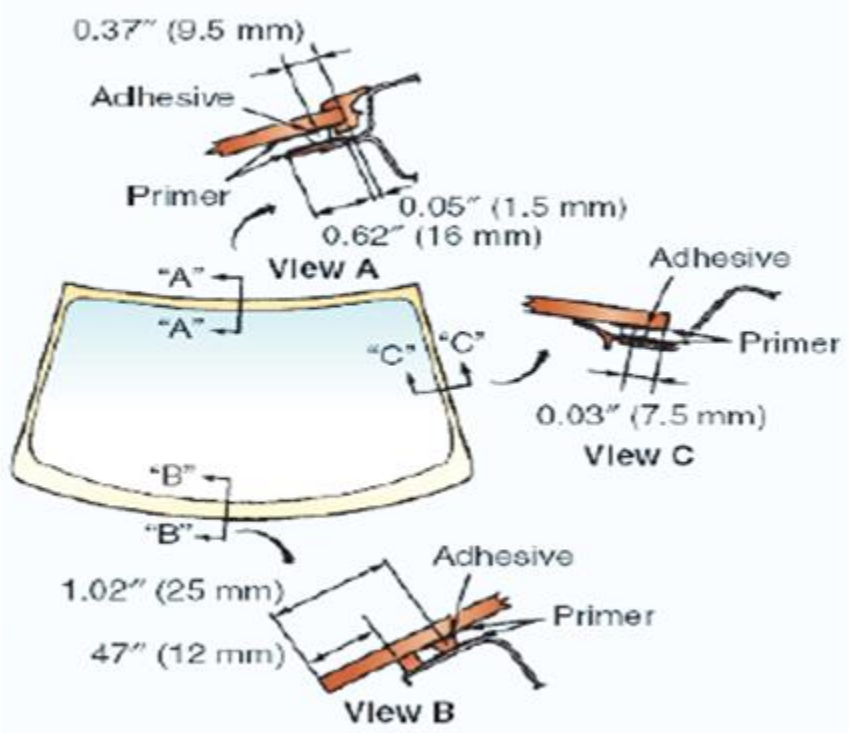

Fig 2.8 .With the help of an assistant carefully position the glass in the body opening using the marking tape as a guide

21 Lay the glass in the body opening and press firmly to properly seal the installation.

22 Shape any adhesive that has squeezed out around the edge of the glass and remove any excess.

Remove the marking tape and protective coverings.

23 Check the glass installation using a water spray does not use direct water on the fresh adhesive.

24 Let water flow over the edges of the glass, if found leak apply additional sealant at the leak point.

25 Allow the adhesive to cure at room temperature 06 to 18 hours. Attach or install all necessary trim parts antenna lead

Operation sheet 2:1

Operation Title: Wind shield glass removing

Instruction:

- Safe working area
- Properly operated tools and equipment
- Appropriate working cloths fit with the body

Purpose: Ensure the wind shield glass is properly removed

Required tools and equipment: tool kit, Strip locking tool, screw driver,

Consumable Materials: Wind shield glass, Wind shield rubber gasket, Cotton waste , Baniyan cloth, Soap oil

Precautions:

- Wearing proper clothes, eye glass, glove
- Make working area hazard free
- Read and interpret manual which guide you how to use tools and equipment's

Procedures:

Step 1.Remove the wiper blade.

Step 2. Remove the wiper motor.

Step3. Remove the rear view mirror.

Step 4. Remove the wind shield glass locking strip.

Step 5. Use the adhesive material to secure the glass in place.

Step 6. Remove the rubber stops and spacers.

Step 7 .Remove the interior and exterior moldings fitted with front and wind shield glass.

Step 8. Use the clip removal tool to release the clip from under the molding lid.

Step 9. Remove the front and rear wind shield glass and place it very safety on a suitable bench.

Quality criteria:

Perform all activities to remove the wind shield glass in accordance with the given procedures

Operation sheet 2:2

Operation Title: Wind shield glass installing

Instruction:

- Safe working area
- Properly operated tools and equipment
- Appropriate working cloths fit with the body

Purpose: Ensure the wind shield glass is properly installing

Required tools and equipment: tool kit, Strip locking tool, screw driver,

Consumable Materials: Wind shield glass, Wind shield rubber gasket, Cotton waste, Baniyan cloth, Soap oil, adhesive

Precautions:

- Wearing proper clothes, eye glass, glove
- Make working area hazard free
- Read and interpret manual which guide you how to use tools and equipment's

Procedures:

Step 1.Soften up the adhesive by using a heat gun.

Step 2. Use the steel wire to remove the glass.

sep3. Cut excessive adhesive from the glass edge to the pinch weld with a sharp knife.

Step 4 .Attach the one end of the wire to a wooden handle

Step 5. Work the wire back and forth to cut through the solvent.

Step 6. Use the power knife in bottom of the wind shield where is it hard to reach the old adhesive, insert the knife and pull it carefully through the sealant

Step7. When the adhesive has been cut remove the glass and place it in safe area

Step8. Wear safety goggles and hand gloves when handling glass.

Step 9. Position the new wind shield glass into the opening.

Step 10. Align for uniform fit and adjust setting blocks as needed.

Step11. Apply urethane on the glass edge 6.4mm of glass

Step12. Mark the position with a crayon or by applying marking tape

Step13. Shift the tape at the edge of the glass and remove the wind shield.

Step14. Remove the remaining adhesive from the body opening by using a putty knife.

Step 15. Usually inspects all reveal molding clips, replace all broken or rusted clips if bent straighten them.

Step16. Remove rust with sanding disc and treat the bare metal with a metal conditioner and prime the areas with a urethane primer.

Step17. Clean the glass and wipe dry with clean cloth.

Step18. Apply urethane primers to the inside edge of the glass and allow it to dry for few minutes.

Step 19 .Ensure that the glass support are in place

Step20. The spacers should provide equal support

Step 21.Apply the sealant directly behind the ribbon sealer down on the pitch weld do not apply sealant on antenna lead wires

Step 22.With the help of an assistant carefully position the glass in the body opening using the marking tape as a guide

Step 23. Lay the glass in the body opening and press firmly to properly seal the installation.

Sep 24. Remove the marking tape and protective coverings

Sep25. The glass installation using a water spray

Sep26. Let water flow over the edges of the glass, if found leak apply additional sealant at the leak point.

Step 27. Allow the adhesive to cure at room temperature 06 to 18 hours.

Attach or install all necessary trim parts antenna lead

Quality criteria:

Perform all activities to installing the wind shield glass in accordance with the given procedures

Unit Three: - Repairing Chipped and Cracked Laminated Glass Windscreen

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

- Visual inspection on vehicle
- Repairing chip or crack
- Identifying tools, equipment and chemicals

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:

- Understand Visual inspection on vehicle
- Perform Repair chip or crack
- Identifying tools, equipment and chemicals

3.1. Visual inspection on vehicle

The inspector begins the inspection by standing at a distance of 120" from the glass surface.

The inspector then moves closer to the glass surface, stopping at the point where the scratch or rub is first detected. If the scratch or rub is visible at a distance of 120", is over 3" long, and is located in the central viewing area (defined as 80% of the length and 80% of the width dimensions centered on the lite of glass) then it is cause for rejection.

3.2. Repair chip or crack

- The System Works, as follows:
  - ✓ All foreign materials and crushed glass are carefully removed from the centre of the damaged area to open up an airway into the break. Certain types of damage may need to be precision drilled.
  - ✓ The patent Pro-Vac injector is filled with the appropriate resin, depending on local temperature and humidity, before being mounted on the screen. The injector is then threaded through the stand until the outer seal makes airtight contact with the screen.

- ✓ The Pro-Vac injector is capable of creating a total vacuum within the damaged area, which is essential for top quality repairs. Using alternative vacuum and pressure cycles, all of the air in the break is withdrawn and the void is filled with resin. Once the damage is optically clear, curing can commence.
- ✓ Using a special ultraviolet lamp, the resin is cured. Once the curing process is complete the repair area is not only optically clear but also structurally sound, in fact is stronger than the glass it replaces.

Red crack fill = Can repair cracks 5cm long

Green polymer 2 = Can repair chips 5mm diameter

Instructions:

- 2 or 3 drops into injector
- 2 bar pressure for 5 mins
- Vacuum for 5 mins
- 2 bar for 10 mins longer if no heat. (heat can be used to speed up repair)
- Release pressure before removing
- Apply patch and turn on ultra violet lamp

fig 4.1.Wurth Glass Repair Kit

Self -Check 3.1

Instruction I:-Give answer for the following questions

1. How to Remove Excess Resin?
2. Repair chip or crack?
3. What is Visual inspection on vehicle?
4. What is Pit Fill?
5. How-to Fill with Resin crack windshield?

Unit Four: - Clean Up Work Area and Maintain Equipment

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

- Removing waste and scrap
- Processing job car
- Identify & tagging technic of faulty tools and equipment

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 Remove waste and scrap
- Perform Process job car
- Apply Identify & tag technic of faulty tools and equipment

4.1. Removing waste and scrap

- Hazardous waste

Hazardous Waste is a solid, liquid or gaseous material which no longer is useful and is being discarded. There are four characteristic waste categories which may apply to your shop wastes

- Flammable Wastes

Easily catches fire and tends to burn rapidly such as paint thinners and cleaning solvents.

- Corrosive Wastes

A chemical or its vapors that can cause a material or living tissue to be destroyed such as battery acid, floor cleaners, caustic paint strippers and aluminum cleaners.

- Reactive Waste

Products containing chemicals that could have hazardous reactions such as gaseous vapors or explosions if combined with air, water, or other substances (usually not produced in auto service shops.)

- Toxic Characteristic Waste

Concentrated chemicals that leach into groundwater at landfills, such as benzene, lead batteries and paint, and mercury batteries.

How to minimize hazardous waste?

- Switch to citrus-based (such as lemon or orange) cleaning solvents.
- Keep hazardous and non-hazardous waste separate to minimize disposal costs.
- Use dry materials such as saw dust, kitty litter or a commercial product for cleaning spills and floors to eliminate hazardous waste water that has to be disposed of properly
- Avoid solvent-based cleaners.
- Recycle and reuse antifreeze.

4.2. Processing job car

A job card is a detailed description of work that is performed for a work order. These specify planning and scheduling information that can be used by your production facility's digital machines. They can have a number of specifications such as capability, class, and category. The job card contains all the important details about your car like your car registration number, VIN, Engine number, your address, mobile phone number, date of registration, job card number etc. There is also an inventory check sheet where dents and scratches in your car are noted.

Inpaspages.com	JOB CARD	DOC No	
		REV No	
		Date	

ORDER STARING DATE	
CUSTOMER	
WORK ODER NO.	

SR. NO	DATE	PRODUCTION LINE DESCRIPTION	TIME (MINUTES)			LOCATION NAME	REMARKS
			START TIME	END TIME	TOTAL TIME		

4.3. Identify & tagging technic of faulty tools and equipment

Tagging is a way of identifying to the user whether or not any glasswork equipment is faulty. Equipment that's found to be unsafe is tagged and removed from use. Defective Equipment means any Equipment that is unsafe or suffers from any design or manufacturing defect which could reasonably be expected to make it unsafe or not of satisfactory quality, fit for its purpose or in accordance with its description.

What should you do if you find a tool defective?

- If a tool is defective, remove it from service, and tag it clearly "Out of service for repair".
- Replace damaged equipment immediately
- Do not use defective tools "temporarily".
- Have tools repaired by a qualified person
- Do not attempt field repairs.

Self-check 4.1

Part-I: - Choose the correct answer

1. _____is a solid, liquid or gaseous material which no longer is useful and is being discarded.

A. Hazardous Waste B. Flammable Wastes C. Corrosive Wastes D. All

2._____ is a detailed description of work that is performed for a work order

A. Flammable Wastes B. job order C. A job card D.A and B

3. _____is a way of identifying to the user whether or not any glasswork equipment is faulty.

A. job order B. A job card C. Tagging D. B and C

4. _____easily catches fire and tends to burn rapidly such as paint thinners and cleaning solvents.

Part-Ii:-Write short answer for the following question

1. How to minimize hazardous waste?

2. What should you do if you find a tool defective?

3. ----------is a detailed description of work that is performed for a work order

Lap Tests

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks accordingly

Name:_____ Starting time:_____

Ending time:_____

Task 1. Service the rear view mirror

Task 2. Align the wind shield glass into position

Task 3. Wind shield glass removing

Reference

1) Technology for the Automotive Trade, Vol. 2", 1980/1989, H. Gerschlr
2) Automotive Mechanics, 10th edition By: Crouse/ Anglin
3) Auto body repair technology
4) Mechanic auto body repair

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