Vehicle Painting and Body Repair

Level II

Learning Guide-#35

Unit of Competence: Prepare Vehicle Components for Paint Repairs

Module Title: Preparing Vehicle Components For Paint Repairs

LG Code: EIS VHP2 M011 LO1-LG-35

TTLM Code: EIS VHP2 M011 TTLM 0919v1

LO 1: Prepare for work

Instruction Sheet	Learning Guide #35

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

- Workplace Health and Safety (WHS)requirements
- Using Work instructions method and material type
- Reading and interpreting Job specifications
- Selecting and inspecting quality Materials
- Identifying and checking Tools, equipment, materials for operation.
- determine Procedures to minimize waste material
- Identifying Procedure to maximize energy efficiency

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

- Use Work instructions to determine job requirements, including method and material type.
- read and interpret Job specifications
- Observe Workplace Health and Safety (WHS) requirements, including personal protection needs, throughout the work.
- Select and inspect Materials for quality.
- Identify and check Hand, power tooling and safety equipment for operation.
- Determine Procedures to minimize waste material.
- Identify Procedures for maximizing energy efficiency while completing the job.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5, Sheet 6 and Sheet 7”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3, Self-check 4, Self-check 5 Self-check 6 and Self-check 7” **in page -18, 23, 30,34,40,45 and 51** respectively.

Information Sheet-1	Workplace Health and Safety (WHS)requirements

Introduction

Workplace Health and Safety (WHS), often referred to as Occupational Health and Safety (OH&S) involves the assessment and mitigation of risks that may impact the health, safety or welfare of those in your workplace. This may include the health and safety of your customers, employees, visitors, contractors, volunteers and suppliers. As a business owner there are legal requirements that you must comply with to ensure your workplace meets WHS obligations.

Benefits of WHS in your Workshop

- help you retain staff
- maximize employee productivity
- minimize injury and illness in the workplace
- reduce the costs of injury and workers' compensation
- Ensure you meet your legal obligations and employee responsibilities.

1.1.1 Protective clothing and equipment

Personal protective equipment (PPE) is protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matte

Safety means protecting yourself and others from possible danger and injury. When everyone obeys the rules, the shop is much safer place in which to work than at home.

All equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work and which protects him against one or more risks to his health or safety that is, safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses, hearing protection and respiratory protective equipment provided for most work situations.

1. Work clothes

- Select work clothes that are strong and fits well for ease in work.
- Avoid wearing with exposed belts, buckles and buttons, which can cause damage to the vehicles during work.
- As a safety measure against injury or burns, avoid exposing the bare skin by folding up the sleeves unless absolutely necessary.Make it a habit of always wearing a clean over-all uniform when at work, as oil and dirt on your clothing will cause dirt to the customers vehicle.

Fig:- 1 work clothes

2. Work shoes

Proper footwear must be used during work. It is dangerous to wear sandals or any other type of foot wear that easily slips or soft shoes that may cause injury due to accidentally dropping of objects.

Safety shoes shall have non-slip soles and steel or hardened toecaps

Safety shoes shall have steel-toe caps that make it hard to protect the feet from accidental falling of heavy objects such as engine parts

Fig: 2 - safety shoes

3. Work gloves

When lifting heavy objects or removing hot exhaust pipes, it is advisable to wear gloves, but it is not necessary to practice of wearing them for ordinary maintenance work. Wearing of work gloves while working on the engine running is not advisable, a danger of the gloves being caught by the rotating part.

Fig:-3 gloves

4. Eye and face protection

Eye protection is vital when working in situations that could result in dirt, metal, and liquids being thrown into your face. This includes working around with running engine, when using drill, saw, welder, or grinder, when working around batteries, and hot components.

Fig.4 Eye and face

Fig. welding shield

5. Respiratory protection mask

Respiratory protection such as facemask should be worn when working on brake system or clutches.

Dust particles from these devices contain asbestos materials that can cause lung damage or cancer. It is also used when working with equipment that gives off fumes or steam.

Fig: 5 - Masks

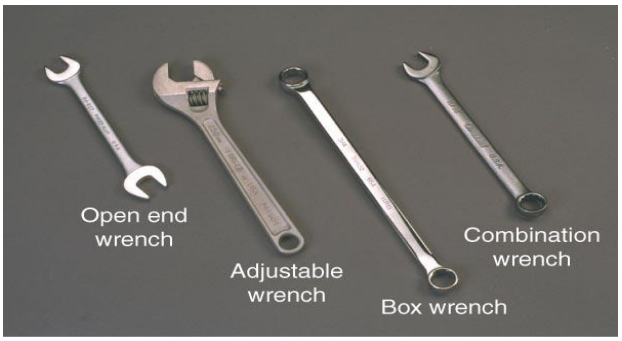
1.1.2 Tools and equipment

Do not use hand tools for any job other than that for which they were specifically designed. For example, never hammer on a file or screwdriver. The tool could break and cause injury. Hand tools should be kept clean and in proper working condition. Greasy, oily hand tools can easily slip out of one's grasp, causing skinned knuckles or broken finger. Wipe tools with a shop rag before putting them away. Dirty tools are unprofessional and dangerous.

I. Hand tools

❖ Wrenches

- Open-end
- Box-end
- Flare nut or line
- Metric or USCS
- Allen

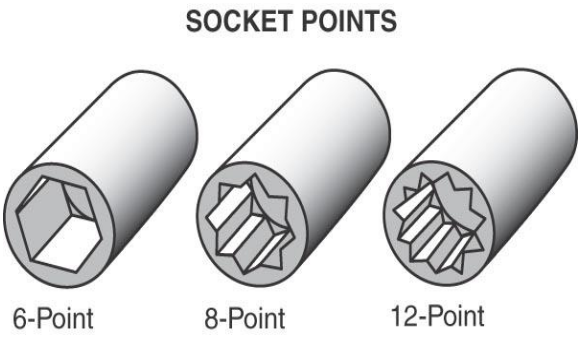


II. Hand Tool Safety

- ✓ Use the proper tool for the job.
- ✓ Use the correct size wrench or socket.
- ✓ Use box-end wrench or socket whenever possible.
- ✓ Always pull on a wrench.

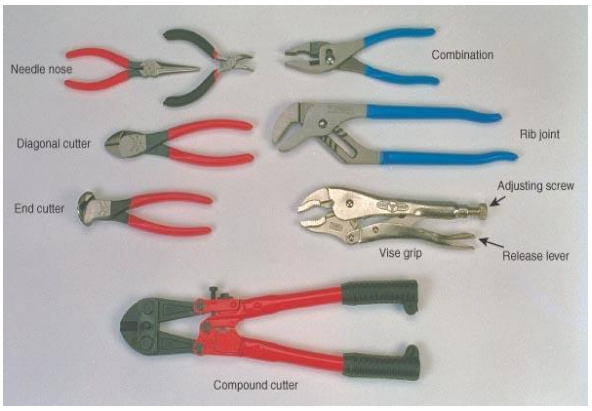
❖ **Ratchets and Sockets**

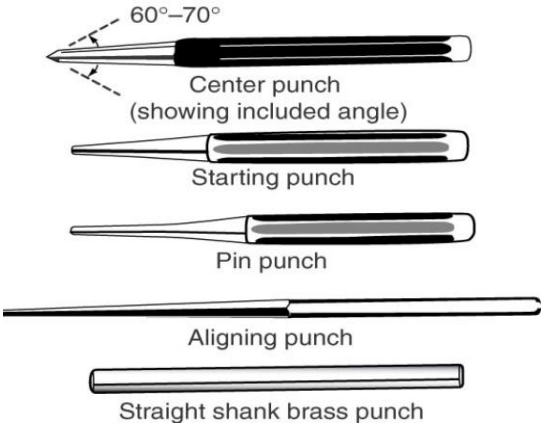
a. Six, eight, or twelve point
b. Deep and shallow
c. Metric or USCS
d. Impact or chrome
e. Swivel sockets

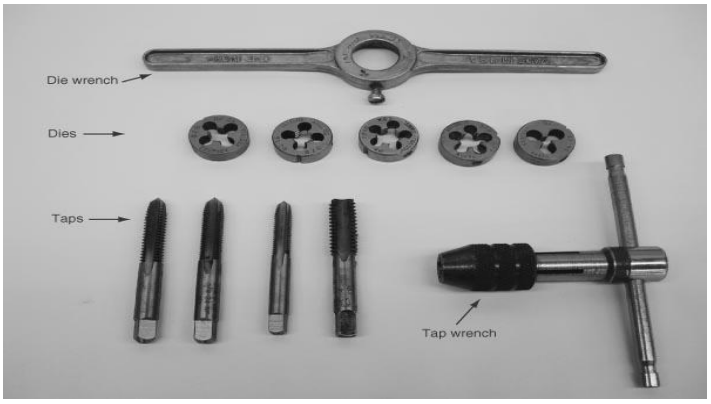


❖ Screwdrivers and Pliers

- Screwdrivers
- Pliers
- Hammers and mallets

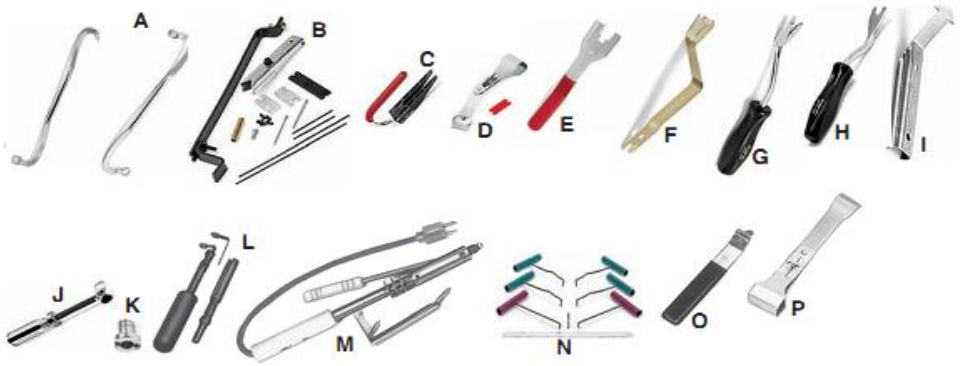






❖ **Door handle tool**

Interior door handles are often secured to the door panel by wire spring clips. These clips, shaped like horseshoes, fit over the handle shaft and hold the handle tightly against the interior panel trim. Clip pullers, or door handle tools, (below) are needed to reach.



A. Door hinge bolt wrenches
B. Door removal kit
C. Door panel remover (GM and Ford)
D. Door panel remover
E. Door handle tool (GM, some Fords)
F. Door handle tool (Chrysler)
G. Trim pad remover (GM, Ford, Chrysler)
H. Trim pad remover (GM)
I. Window molding release tool
J. Windshield locking strip installation tool
K. Window sash nut spanner socket
L. Windshield remover
M. Hot-tip windshield removing kit
N. Windshield wiper removal tool
O. Windshield wiper tool
P. All-purpose window scraper

1.1.3 Workplace environment and safety

Environmental safety includes those procedures that protect people and the Earth's resources (land, water, and air) from toxic chemicals. Persons working in body and/or paint shops are often exposed to dangerous levels of various gases, dusts, and vapors. Because of this exposure, control measures should be established for air contaminants and other hazardous substances.

Do not breathe contaminated air! Proper ventilation is very important in areas where caustics, degreasers, under-coats, sanding dust, and finishes are used. The vapors from thinners used in most paints have a narcotic effect, and long-term exposure can cause serious illness. Ventilation can be provided by means of an air-changing system, extraction floors, or central dust extraction systems.

These systems use large fans to pull contaminated air out of the paint booth or work area.

For the spray booth, adequate air replacement is necessary not only to promote

evaporation and drying of paint materials, but also to remove harmful mists and vapors. Always remember to turn on the air exchange system when working in the paint booth or paint mixing room

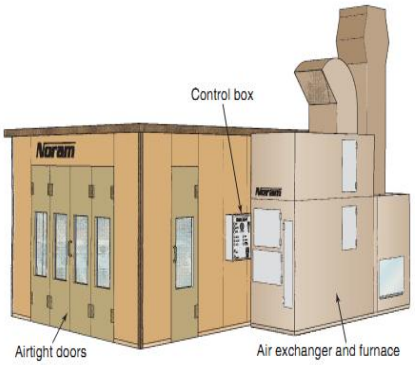


FIGURE ; This paint booth has a large air exchange unit. It pulls fresh air through the booth for breathing and pulls airborne contaminants away from fresh paint. Make sure the air exchanger is turned on anytime you work in a paint booth.

Prevention

The most useful preventative measure to reduce employee occupational risk is to make health and safety awareness an everyday practice with your staff. Proactive activities managed by you will prevent or minimize the risk of occurrences. Undertaking proactive activities will contribute to maintaining legislative and internal compliance, while fostering a positive work group culture based on safety awareness. In addition, regularly conducted information sessions will remind staff of their own responsibilities for health and safety. Proactive workplace safety activities include:

- conduct regular hazard inspections in your work area
- Observe any patterns in your staff that may indicate health/safety issues and seek advice and support from your corporate support units.
- support workplace investigations as they will make a difference to future workplace health and safety
- Having health and safety as an ongoing agenda item for team meetings, such as a discussion on organizational policy and procedures, outcomes of workplace inspections and reviews of incident or hazard reports by team members.

A healthy work environment is about more than being safe. A Healthy workplace is one where employees in addition to feeling secure and enjoying a safe physical work environment;

- feel recognized for the work they do
- enjoy a positive social environment that encourages respect, fosters a sense of belonging and purpose
- enjoy an appropriate balance between work and home-life responsibilities;
- have the ability to influence their work and become involved in the decision-making process
- are given opportunities for personal, intellectual and professional growth

1.1.4. Handling of material

Material handling is a necessary and significant component of any productive activity. It is something that goes on in every plant all the time.

Material handling means providing the right amount of the right material, in the right condition, at the right place, at the right time, in the right position and for the right cost, by using the right method. It is simply picking up, moving, and lying down of materials through manufacture.

It applies to the movement of raw materials, parts in process, finished goods, packing materials, and disposal of scraps

Material Handling is the field concerned with solving the pragmatic problems involving the movement, storage, control and protection of materials, goods and products throughout the processes of cleaning, preparation, manufacturing, distribution, consumption and disposal of all related materials, goods and their packaging.

Material handling can also consist of sorting and picking, as well as automatic guided vehicles.

Using the following personal protective equipment prevents needless injuries when manually moving materials:

- Hand and forearm protection, such as gloves, for loads with sharp or rough edges.
- Eye protection.

- Steel-toed safety shoes or boots.
- Metal, fiber, or plastic metatarsal guards to protect the ninstep area from impact or compression..

Handling of solvent and other flammable liquid

- Both the body mechanic and refinisher will be working with various solvents to clean surface and equipment and to thin finishes. These solvents are extremely flammable. Fumes in particular can ignite explosively. The following safety practices will help avoid fire and explosion.
- Use only approved explosion proof equipment in hazardous locations.
- Keep all solvent containers closed, except when pouring
- Handle all solvents (or any liquids) with care to avoid spillage. Extra caution should also be used when transferring flammable materials from bulk storage.
- A paint's chemical content includes the following:
  - Pigments
  - Binders
  - Solvents
  - Additives

Figure; Many types of paint additives are available. (A) An adhesion promoter will make the paint adhere or bond to the vehicle more securely. (B) An accelerator will make the paint material cure more quickly when desired. (C) Blending solvent will help dissolve new paint into existing paint when blending color. (D) Toner can be added to paint to help color match more closely.

Figure (A) Plain primer is handy for rapidly priming small repair areas when the area is very smooth and ready for paint. (B) Etching primer is applied to bare metal. It contains acid that will eat into and bond to sheet metal. (C) High-build primer-surfacer is a very thick primer and is ideal for spraying over body filler repair areas. It will build up quickly and is like a spray-on body filler. (D) Corrosion resistor or epoxy primer can be used in place of self-etch or acid-type primer. It will bond to bare metal while resisting corrosion or rust. Epoxy primer-surfacer is similar and is a commonly used product. (E) Water-based primer is de- signed to replace OEM water-based products. All other paint products must be designed to be used with water-based primer.

Figure ; When doing paint or refinish work, always us e complete matching system manufactured by one company. You are then su re tha t all ingredients are compatible and designed to be used together without problems.

1.1.5. Fire-fighting equipment

- Fuels used in modern ICE are highly volatile and require proper handling and

storage.

- Diesel fuel is not as refined and contains active micro-organisms that can cause infections.
- Cleaning solvents and shop rags must be stored and handled properly to prevent fires.

Classes of Fires

i. Class “A” fires
   - Ordinary combustibles such as wood, paper, and plastics.

ii. Class “B” fires
   - Flammable liquids such as gasoline, oil, grease, and paint.

iii. Class “C” fires
   - Electrical equipment such as electric motors, wiring, and fuse boxes.

iv. Class “D” fires
   - Combustible metals such as aluminum, magnesium, and potassium.

v. Fire extinguishers can be

vi. Class A, B, C, or D. Many are ABC or multipurpose extinguishers

Steps in Using a Fire Extinguisher

1. Pull pin from handle.
2. Aim nozzle at base of fire.
3. Squeeze handle.
4. Sweep entire width of fire.

TABLE 9–1 GUIDE TO EXTINGUISHER SELECTION

	Class of Fire	Typical Fuel Involved	Type of Extinguisher
Class A Fires (green)	**For Ordinary Combustibles** Put out a class A fire by lowering its temperature or by coating the burning combustibles.	Wood Paper Cloth Rubber Plastics Rubbish Upholstery	Water*[1] Foam* Multipurpose dry chemical[4]
Class B Fires (red)	**For Flammable Liquids** Put out a class B fire by smothering it. Use an extinguisher that gives a blanketing, flame-interrupting effect: cover the whole flaming liquid surface.	Gasoline Oil Grease Paint Lighter fluid	Foam* Carbon dioxide[5] Halogenated agent[6] Standard dry chemical[2] Purple K dry chemical[3] Multipurpose dry chemical[4]
Class C Fires (blue)	**For Electrical Equipment** Put out a class C fire by shutting off power as quickly as possible and by always using a nonconducting extinguishing agent to prevent electric shock.	Motors Appliances Wiring Fuse boxes Switchboards	Carbon dioxide[5] Halogenated agent[6] Standard dry chemical[2] Purple K dry chemical[3] Multipurpose dry chemical[4]
Class D Fires (yellow)	**For Combustible Metals** Put out a class D fire of metal chips, turnings, or shavings by smothering or coating with a specially designed extinguishing agent.	Aluminum Magnesium Potassium Sodium Titanium Zirconium	Dry powder extinguishers and agents only

1.1.6. Enterprise first aid

First aid is the immediate treatment or care given to a person suffering from an injury or illness until more advanced care is provided or the person recovers

First aider is a person who has successfully completed a nationally accredited training course or an equivalent level of training that has given them the competencies required to administer first aid.

First aid equipment includes first aid kits and other equipment used to treat injuries and illnesses. First aid facilities include first aid rooms, health centers, clean water supplies and other facilities needed for administering first aid.

All workers must be able to access a first aid kit. This will require at least one first aid kit to be provided at their workplace.

First aid signs

First aid facilities risk assessment will help determine the type of first aid facilities needed. For example, a clean, quiet area within the workplace that affords privacy to an injured or ill person may be

suitable and practicable for some workplaces.

Access to a telephone for contacting emergency services or an emergency call system should be provided as part of all first aid facilities.

FIRST AID ROOMS

A first aid room should be established at the workplace if a risk assessment indicates that it would be difficult to administer appropriate first aid unless a first aid room is provided.

For example, workers who carry out work at workplaces where there is a higher risk of Serious injury or illness occurring that would not only require immediate first aid, but also further treatment by an emergency service, may benefit from having access to a dedicated first aid room.

Providing first aid safely

Before providing first aid to an injured or ill person, first aiders should assume they could be exposed to infection. First aiders should wash their hands with soap and water or apply alcohol-based hand rub before and after administering first aid. First aiders should also wear personal protective equipment to prevent contact with blood and body substances, including disposable gloves. Eye protection, a mask and protective clothing may also be necessary if splashes of blood or body substances are likely to occur.

You should establish procedures to avoid workers becoming ill and exposing others to i illness when handling blood or body substances.

Procedures could include:

- Proper hand hygiene practices
- how to handle and dispose of sharps
- how to clean surfaces and reusable equipment
- how to manage spills and handle and clean soiled laundry
- how to handle and dispose of waste
- when to use personal protective equipment, for example, using resuscitation masks for cardiopulmonary resuscitation.

1.1.7. Hazard control and hazardous material and substances

A hazardous substance is any material that can harm our bodies, either at the time of exposure or later. These substances may be solids, liquids, gases, dusts, or fibers. The toxicity of a substance is the ability of the substance to cause damage to living tissue, illness,

or even death. The degree of toxicity depends on several factors:.

Some chemicals are more toxic than others because of their chemical structure.

Amount. All chemicals are toxic. It is a matter of how much to which you are exposed. For example, some chemicals that are extremely toxic may have beneficial therapeutic value when used in very small amounts in prescription drugs, e.g. strychnine.

Hazardous waste, as determined by the Environmental Protection Agency (EPA), is a solid or liquid that can harm people and the environment. If the waste is on the EPA list of known harmful materials or has one or more of the following characteristics, it is considered hazardous.

1**. Ignitability** means the material or waste fails the ignitability test if it is a liquid with a flash point below140°F or a solid that can spontaneously ignite.

2. **Corrosiveness** means a material or waste is considered corrosive if it dissolves metals and other materials or burns the skin. It is an aqueous solution with a pH of 2 and below, or 12.5 and above. Acids have thelower value and alkalis have the higher value.

3. **Reactivity** means a material reacts violently with water or other materials or releases cyanide gas, hydrogen sulfide gas, or similar gases when exposed to low pH solutions (acid). This also includes material that generates toxic mists, fumes, vapors, and flammable gases.

4. **Toxicity** means a material leaches one or more heavy metals in concentrations greater than 100 times primary drinking water standard concentrations. These heavy metals include lead, cadmium, chromium, and arsenic.

Chemical Handling, Storage, and Disposal

Use the correct protective clothing and equipment for the material. Common personal protective equipment (PPE) includes:

- Gloves that are impervious to the substance you are using .
- Eye protection such as goggles and safety glasses .
- Safety shoes or protective shoe coverings .
- Various types of dust masks or other respirators .

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List at least three Protective clothing and equipment (5paint)?

2._____ is vital when working in situations that could result in dirt, metal, and liquids being thrown into your face 1 point

3. What are Steps in Using a Fire Extinguisher? 1 point

4. What is Material Handling? 1 point

Note: **Satisfactory 5 rating - 8 points** **Unsatisfactory - below 5 and 8 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

1._____

_____

2._____

3..

a_____

b_____

c_____

d_____

4._____

_____

Information Sheet-2	Using Work instructions method and material type

A work instruction is a document that provides specific instruction to carry out activity. A work instruction is a step by step guide to perform a single instruction. A work instruction contains more detail than a procedure and is only created if detailed step by step instructions are needed.

i. Preparation

A proper paint job cannot be rushed – painting your vehicle requires plenty of time, so make sure that you have a few days set aside in order to do the job right.

Step 1: Choose Your Location Wisely

Before you begin any actual painting, you will need to find a suitable location for your DIY project. Make sure your location offers plenty of room for working around your car, and is well ventilated and well lit. Choose a place with electricity and minimal dust. Avoid residential garages, since these often have furnaces or heaters, which pose a fire hazard when coming into contact with paint fumes.

Step 2: Remove rust, dents, and trim

Make sure your paint job does not accentuate any imperfections – fix any visible dents, repair any rust, and remove chrome or plastic trim. Moldings and trim can be replaced after painting is complete.

f. Sanding

Step 3: Sand

Give your paint a smooth and even surface onto which it can adhere – sand your entire vehicle using circular motions, either all the way to the bare metal, to the original primer, or at least enough for your new coat of paint to adhere to.

If you are short on time, the 3rd option will suffice – however, you will get the best results from sanding down to bare metal.

Step 4: Clean

Using a rag and denatured alcohol or mineral spirits, wipe down all surfaces of your vehicle thoroughly, to remove any oil residue and ready it for painting.

Step 5: Tape Surfaces

Use masking tape and newspaper to cover the surfaces of your vehicle that you don't want painted, including mirrors, window trim, glass, grills and door handles.

g. Priming

Step 6: Prime

If you have sanded down your vehicle to the bare metal, you will want to use a corrosion-resistant and self-etching primer in order to prime the surface of your car.

Step 7: Allow primer to cure

If you removed any rust, make sure to prime these properly by feathering them until they are smooth and applying enough primer to the areas. Allow all primer to cure thoroughly, according to instructions on the container.

Step 8: Sand once more

Sand the newly primed surfaces once more, but be sure not to sand too much and expose the metal surface again.

Step 9: Wipe down

Wipe the primed surfaces with a rag slightly dampened with thinner.

h. Painting

When you are ready for painting, make sure to follow manufacturer's directions and prepare the paint for spraying.

Step 10: Paint

Holding your spray gun approximately 6 inches away from your vehicle's surface, and using a side-to-side sweeping motion, apply paint in thin and even coats. Typically, it will take three to four coats to completely cover the surface. Be sure to follow the manufacturer's drying time – this can vary from 20 minute to an hour.

Step 11: Sand and Wipe

Before you apply your last coat, sand the surfaces once more to remove powdery residue, then wipe with a clean rag.

Step 12: Apply lacquer

Apply a clear coat lacquer, using the same painting technique.

Step 13: Remove masking tape

Remove masking tape while the clear coat is still wet, then allow the clear coat to dry according to your manufacturer.

Step 14: Buff

Using circular motions complete your paint job by buffing out all painted surfaces. What's more, you can use a rubbing compound to bring out a glossy finish.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the space provided

1. What is work instruction? (2point)
2. What is the work instruction for Priming? (2point)

Note: **Satisfactory rating – 3 and 4 points** **Unsatisfactory - below 3 and 4 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

1. _____

   _____

2. …

   a_____

   b_____

   c_____

   d_____

Information Sheet-3	Reading and interpreting Job specifications

Job Description

Job description includes basic job-related data that is useful to advertise a specific job and attract a pool of talent. It includes information such as job title, job location, reporting to and of employees, job summary, nature and objectives of a job, tasks and duties to be performed, working conditions, machines, tools and equipments to be used by a prospective worker and hazards involved in it.

Purpose of Job Description

- The main purpose of job description is to collect job-related data in order to advertise for a particular job. It helps in attracting, targeting, recruiting and selecting the right candidate for the right job.
- It is done to determine what needs to be delivered in a particular job. It clarifies what employees are supposed to do if selected for that particular job opening.
- It gives recruiting staff a clear view what kind of candidate is required by a particular department or division to perform a specific task or job.
- It also clarifies who will report to whom.

Job Specification

Also known as employee specifications, a job specification is a written statement of educational qualifications, specific qualities, level of experience, physical, emotional, technical and communication skills required to perform a job, responsibilities involved in a job and other unusual sensory demands. It also includes general health, mental health, intelligence, aptitude, memory, judgment, leadership skills, emotional ability, adaptability, flexibility, values and ethics, manners and creativity, etc.

Purpose of Job Specification

- Described on the basis of job description, job specification helps candidates analyze whether are eligible to apply for a particular job vacancy or not.
- It helps recruiting team of an organization understand what level of qualifications, qualities and set of characteristics should be present in a candidate to make him or her eligible for the job opening.
- Job Specification gives detailed information about any job including job responsibilities, desired technical and physical skills, conversational ability and much more.
- It helps in selecting the most appropriate candidate for a particular job.

Job description and job specification are two integral parts of job analysis. They define a job fully and guide both employer and employee on how to go about the whole process of recruitment and selection. Both data sets are extremely relevant for creating a right fit between job and talent, evaluate performance and analyze training needs and measuring the worth of a particular job.

Employees in this job repair and refinish damaged bodies and body parts of state owned or leased motorized vehicles, such as automobiles, buses, light trucks, and vans according to repair manuals, using hand tools and power tools.

There are three classifications in this job.

Position Code Title – Automotive Body Repairer-E

Automotive Body Repairer 8

This is the intermediate level. The employee works in a developing capacity with increased responsibility for performing a range of automotive body repair and refinish assignments under general observation of a journey or supervisory level employee.

Automotive Body Repairer E9

This is the journey level. The employee performs a full range of automotive repair or refinishing assignments using independent judgment to make decisions requiring the application of procedures and practices to specific work situations.

Position Code Title – Automotive Body Repairer-A

Automotive Body Repairer 10

This is the advanced level. The employee functions as a crew leader, overseeing the work of lower-level Automotive Body Repairers or prisoner crews, and performs journey-level assignments.

NOTE: Employees generally progress through this series to the experienced level based on satisfactory performance and possession of the required experience.

JOB DUTIES

NOTE: The job duties listed are typical examples of the work performed by positions in this job classification. Not all duties assigned to every position are included, nor is it expected that all positions will be assigned every duty.

- Examines damaged vehicles and prepares cost estimates on damages and repairs.
- Requisitions supplies and parts; maintains records related to the work.
- Replaces, repairs, and bumps out damaged bodies and parts of automotive vehicles.
- Aligns bodies, doors, and frames.
- Fills dents with body plastic.
- Prepares and paints auto bodies.
- Fits and installs glass in windshields, doors, and windows.
- Repairs and/or installs body upholstery accessories and equipment.
- Checks for and repairs water and dust leaks.
- Welds and brazes auto bodies.
- May assist in training lower-level workers in auto body repair techniques.
- Performs related work as assigned.

Additional Job Duties

Automotive Body Repairer 10 (Crew Leader)

Provides instruction and training in the proper methods and processes necessary to perform the work.

Lays out, assigns, and inspects the work of skilled Automotive Body Repairers;

- Performs complex auto body repair.
- Prepares cost and material estimates.
- Keeps records and prepares reports of work and time involved.
- Makes certain that equipment is properly serviced; keeps records; and makes reports on the condition of tools, equipment and supplies.
- Requisitions tools, equipment, and repair materials used in the work.
- Works with insurance claims adjusters regarding accidents.

JOB QUALIFICATIONS

Knowledge, Skills, and Abilities

NOTE: Developing knowledge is required at the intermediate level, considerable knowledge is required at the experienced level, and thorough knowledge is required at the advanced level.

- Ability to use necessary hand tools and shop machines.
- Ability to use and maintain paint spraying equipment.
- Ability to use welding equipment.
- Ability to fit and install glass.
- Ability to communicate effectively.
- Additional Knowledge, Skills, and Abilities

Working Conditions

- Some jobs require an employee to work outdoors as well as in an office or a laboratory.
- Some jobs require an employee to work in an environment that involves exposure to

- unpleasant and noxious fumes and odors.
- Some jobs require an employee to work where there is a significant chance of injury.

Physical Requirements

- The job duties require an employee to move heavy objects.
- The job duties require an employee to bend or reach for extended periods.
- The job duties require an employee to bend or stoop in confined spaces.

Example 1

JOB CODE, POSITION TITLES AND CODES, AND COMPENSATION INFORMATION

Job Code	Job Code Description
AUTBODRPR	Automotive Body Repairer

Position Title	Position Code	Pay Schedule
Automotive Body Repairer-E	AUTORPRE	A31-009
Automotive Body Repairer-A	AUTORPRA	A31-012

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the purpose of Purpose of Job Description (2 points)
2. What are the purpose of Purpose of Job specification(2 points)
3. List out at least 5 Automotive Body Repairer Job Duties 2 points)

Note: **Satisfactory rating – 4 and 6 points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

   _____

2. _____

   _____

3.

   a_____

   b_____

   c_____

   d_____

   e _____

Information Sheet-4	Selecting and inspecting quality Materials

Inspection is an important tool to achieve quality concept. It is necessary to assure confidence to manufacturer and aims satisfaction to customer. Inspection is an indispensable tool of modern manufacturing process. It helps to control quality, reduces manufacturing costs, eliminate scrap losses and assignable causes of defective work.

The inspection and test unit is responsible for appraising the quality of incoming raw materials and components as well as the quality of the manufactured product or service. It checks the components at various stages with reference to certain predetermined factors and detecting and sorting out the faulty or defective items. It also specified the types of inspection devices to use and the procedures to follow to measure the quality characteristics.

Inspection only measures the degree of conformance to a standard in the case of variables.

In the case of attributes inspection merely separates the nonconforming from the conforming.

Inspection does not show why the nonconforming units are being produced.

Inspection is the most common method of attaining standardization, uniformity and quality of workmanship.

Purpose of Inspection

- To distinguish good lots from bad lots.
- To distinguish good pieces from bad pieces.
- To determine if the process is changing.
- To determine if the process is approaching the specification limits.
- To rate quality of product.
- To rate accuracy of inspectors.
- To measure the precision of the measuring instrument.
- To secure products-design information.
- To measure process capability.

Methods of Inspection

There are two methods of inspection. They are: 100% inspection and sampling inspection.

1. 100% inspection

This type will involve careful inspection in detail of quality at each strategic point or stage of manufacture where the test is involved is non-destructive and every piece is separately inspected.

It requires more number of inspectors and hence it is a costly method. There is no sampling error. This is subjected to inspection error arising out of fatigue, negligence, difficulty of supervision etc. Hence, completer accuracy of influence is seldom attained. It is suitable only when a small number of pieces are there or a very high degree of quality is required. Example: Jet engines, aircraft, medical and scientific equipment.

2. Sampling inspection

In this method randomly selected samples are inspected. Samples taken from different patches of products are representatives. If the sample proves defective, the entire concerned is to be rejected or recovered. Sampling inspection is cheaper and quicker. It requires less number of Inspectors. It is subjected to sampling errors but the magnitude of sampling error can be estimated.

In the case of destructive test, random or sampling inspection is desirable. This type of inspection governs wide currency due to the introduction of automatic machines or equipments which are less susceptible to chance variable and hence require less inspection, suitable for inspection of products which have less precision importance and are less costly. **Example**: Electrical bulbs, radio bulbs, washing machine etc**.**

3. Drawbacks of Inspection

Following are the disadvantages of inspection:

- Inspection adds to the cost of the product but not for its value.
- It is partially subjective, often the inspector has to judge whether a products passes or not.
- Fatigue and Monotony may affect any inspection judgment.
- Inspection merely separates good and bad items. It is no way to prevent the production of bad items.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1._____ is an important tool to achieve quality concept. (1 points)

A. 100% inspection C. Material

B. Local maps D. inspection

2. List out at list 3 purposes of Inspection.(5 points)

Note: **Satisfactory rating - 4 and 6 points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2.

A_____

B_____

C_____

Information Sheet-5	Identifying and checking Tools, equipment, materials for operation

Body working tools

Body working tools include some familiar, general purpose metalworking tools as well as specialized tools used only in auto body repair. The following is a description of the most commonly used body work tools.

Hammers

A number of different hammers are useful in the body shop. Many are specially formed for a specific metal shaping operation.

Ball Peen Hammers

The ball peen hammer is a useful, multi-purpose tool for all kinds of work with sheet metal. Heavier than the body hammer, it is used for straightening bent underpinnings, smoothing heavy gauge parts, and roughly shaping body parts. It is sometimes used before work with a body hammer and dolly begins. Several ball peen hammers of different weights will see a lot of use in a body shop.

Figure; **Ball Peen Hammers**

Sledgehammer

A light sledgehammer is an essential tool for the first stages of re-forming damaged thicker metal parts. Those with short handles can be used in tight places.

The sledgehammer can be used to clear away damaged metal when replacing a panel.

Figure ; **Sledgehammer**

Mallets

The rubber mallet gently bumps sheet metal without dam-aging the painted finish. It is often used with the suction cup on soft cave-in–type dents. While you pull upward on the cup, the mallet is used to tap lightly all around the surrounding high spots. A popping sound occurs as the high spots drop and the low spot springs back to its orignal contour.

A steel hammer with rubber tips is another mallet useful in bodywork. The soft-faced hammer, as it is sometimes called, is used to work chrome trim and other delicate parts without marring the finish.

A dead blow hammer has a metal face filled with lead shot (balls) to prevent rebounding. It will not bounce back up after striking

Figure **dead blow hammer**

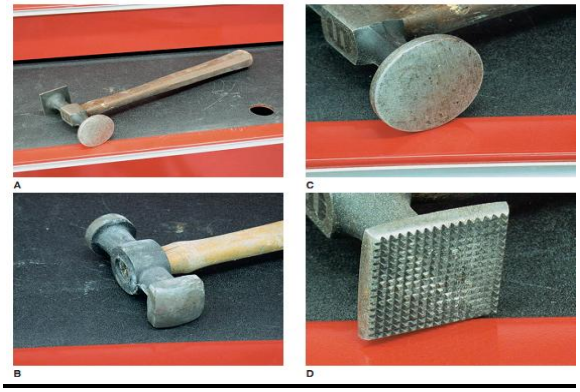


Figure ; A body hammer and dollies are often needed to take minor dents out of sheet metal. Body hammers have specially shaped heads for working sheet metal. Dollies are specially shaped blocks of steel for straightening sheet metal. Body hammers are the primary striking tools used in collision repair. (A) A body hammer has the head shape for working sheet metal. This one has large flat heads for flattening sheet metal. (B) This body hammer has rounded heads for forcing a curve into sheet metal. (C) This body hammer head is flat and smooth for working damage out of sheet metal. (D) The serrated body hammer head will shrink metal after it has been stretched from collision damage.

DOLLIES

The dolly or dolly block is used like a small anvil while body damage is worked out. It is generally held on the backside of a panel being struck with a hammer. Together the hammer and dolly work high spots down and low spots up .

FIGURE ; Study the various dolly block and spoon shapes. The shape should match the contour of the body panel being straightened. (Courtesy of Snap-on Tools Company, www.snapon.com)

BODY SURFACING TOOLS

A number of surfacing tools are used to give a repair its final shape and contour. Some are used to shape the re-paired metal. Others are used to apply and shape plastic body filler and putty.

Figure; A body file is often used to rough cut high spots in body filler after partial curing. This saves sanding time and does not produce sanding dust. Large teeth in the body file will scrape off semi-hard body filler quickly and easily.

A Soft rubber sanding block with handle.

B Thin, soft sanding blocks are used for final sanding.

Figure; Soft sanding blocks are used on surfaces that have already been sanded level. They will support sandpaper but flex to follow the contour of the body panel.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. _____ is a useful, multi-purpose tool for all kinds of work with sheet metal. (2 points)

   A. Dolly C. ball peen hammer

   B. Spray gun D. all

2._____ an essential tool for the first stages of reforming damaged thicker metal parts.(2 points)

   A. ball peen hammer C. Sledgehammer

   B. dead blow hammer D. mallet

3. _____is used like a small anvil while body damage is worked out. .(2 points)

   A. Dolly C. ball peen hammer

   B. Spray gun D. all

Note: **Satisfactory rating - 4 and 6 points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2._____

3._____

Information Sheet-6	determine Procedures to minimize waste material

Automotive Repair Shops

Automobile repair shops produce many types of waste some hazardous, some not necessarily hazardous but still potentially damaging to the environment if not handled properly, and all requiring proper treatment and/or disposal at significant cost to the business. A list of the types of waste that the shop owner or manager must contend with would include:

- solvents (paints and paint thinners)
- antifreeze
- scrap metal
- batteries and other auto parts
- oils and oil filters
- fuels of various types
- acids and alkalis (contaminated rags and towels)

Whatever the nature and characteristics of the waste may be, it all has one thing in common: All waste represents loss of resources and loss of money.

The most effective way to minimize these losses associated with waste is to avoid producing the waste in the first place. This is the concept behind DNREC's Pollution Prevention Program, which has produced this Fact Sheet to assist you and others in the automobile repair business to reduce your losses while at the same time helping to improve the environment.

Businesses throughout the country have implemented waste reduction programs and found that there are many benefits to be gained from such an approach to the management of resources. Reducing the amount of waste your business generates can help you:

- reduce operating costs
- reduce waste disposal costs
- reduce long-term liability
- help sustain environmental quality

- improve workplace safety and health
- project a positive public image

Getting Started

Getting off to a good start is crucial to the success of any endeavor. Here are some important things to consider in undertaking a waste reduction program:

- Make a commitment to pollution prevention. This commitment must start at the top, with the owner or manager of the shop, and extend to every employee.
- Involve the employees in designing and implementing pollution prevention measures.
- Provide training in waste reduction techniques and practices. Don't let this be a one-shot effort -- "periodic refresher courses" will help to increase employees awareness of the importance of waste reduction.
- Establish incentives to encourage workers to use waste reduction techniques and to suggest changes, in design or operating procedures that would further reduce waste generation.
- Assess the shop's waste. Identify sources, types, and amounts of waste being produced. This will make it easier to pinpoint areas where waste reduction techniques can be applied and to measure the success of your efforts.

SIDEBAR: Government records indicate that between 1980 and 1986, 98 million automotive batteries, containing 900,000 tons of lead, went unrecovered.

SIDEBAR: About 2.1 tons of used crankcase oil ends up in our rivers and streams every year. A single quart of motor oil can pollute 250,000-gallons of drinking water.

Establishing Good Housekeeping Practices

Improving a business's housekeeping practices is often the easiest and least expensive way to reduce waste. Good housekeeping includes good inventory control and efficient operating procedures. Here are some housekeeping tips:

- Keep storage and work areas clean and well organized, and keep all containers properly labeled.
- Inspect materials upon delivery, and immediately return unacceptable materials to the supplier.

- Keep accurate records of material usage so that you can measure reductions in use. Mark the purchase date on each container and adopt a “first in, first out” policy so that older materials are used up before new ones are opened; assign someone to distribute and keep track of the materials.
- Locate and repair all leaks to prevent loss of raw materials. Practice preventive maintenance to avoid future losses.
- Keep all containers covered to prevent evaporation and spillage.
- Keep waste streams separate to increase their potential for reuse, recycling, or treatment. Don’t allow nonhazardous materials to become contaminated with hazardous materials, as this will result in all of the waste needing to be treated as hazardous waste.
- Install flow meters, flow control devices, and shut-off nozzles to cut down on water usage.

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List at least Five types of waste that the shop owner or manager must contend with would include? (5paint)?

2. List at least two housekeeping tips? 5 point

Note: **Satisfactory rating - 6 and 10 points** **Unsatisfactory - below 6 and 10 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1.

A_____

B_____

C_____

D_____

E_____

2.

1._____

2 _____

Information Sheet-7	Identifying Procedure to maximize energy efficiency

Wondering where or how to get started in making your workplace **more energy efficient and sustainable**? Here are a few simple ways you can save energy in the workplace and bring positive changes to your working environment:

1. Switch off artificial lights and use natural light

Artificial lights consume power – **natural light is free**. So, limit the use of artificial lighting to the dark areas in the workplace that are out of the sun's reach.

If not in use, switch off the lights at meeting rooms, pantry, reception, corridors, or stairs. If there's nobody in the room for more than a couple of seconds – **kill the lights**!

2. Choose energy efficient light bulbs

Less energy spent means less money wasted on electricity bills. If your workplace does not get enough natural light during the daytime, you can opt for **low wattage lights**.

You can also replace existing bulbs with CFL or LED lights. They consume less power and last for longer periods of time.

3. Choose laptops over desktops

Laptops typically consume less energy compared to desktops, so keep this in mind when buying your workplace equipment. Opt for laptops whenever possible.

The **monitor size** also contributes to the amount of energy consumed. While graphic designers and people from similar lines of work cannot work on small screens, there are a lot of other employees in your company whose work doesn't depend on the huge monitors.

Make the right selection and keep the screen size at a reasonable level when it comes to monitor choice. Smaller monitors spend less.

4. Use hibernation feature on all computers

Advise everyone to put their computers in hibernation mode if they take a break or go to a meeting. This applies to any situation when an employee won't be using it for a long period of time.

The hibernation feature in computers allows users to save existing work as it is and continue working at the exact same point upon return. Employees can set their computers to go into the hibernation mode when they are inactive for several minutes.

5. Use energy saving features of all devices

Make sure that your employees are aware of the **energy-saving features** of appliances and other electronics like the printers, microwaves, and air conditioners.
Most of the modern devices have these options and they are usually very easy to use. In most cases, it is a matter of pressing a button or adjusting a setting feature. Advise everyone to use these features to **help cut energy costs.**

6. Upgrade all outdated equipment

Old electrical equipment that is no longer working at their maximum efficiency could only **draw unnecessary power**, costing you more money. It's best to replace your old office appliances with new certified energy efficient ones.

However, make sure that you **dispose of your old equipment in a proper way** and recycle it. There are a lot of companies that specialize in recycling this type of waste. You just need to find a company that recycles electronic waste near you and call them.

7. Buy energy efficient devices

Energy efficient devices may cost more upfront but they're going to consume less, saving you more money in the long run. Their price is decreasing, because, nowadays, being **energy efficient is becoming a standard** that a lot of companies try to keep.

The secret to getting the most out of your energy efficient devices in the workplace is keeping them properly maintained to avoid having to keep buying new ones.

8. Do an energy audit

It's good to check your workplace's energy consumption and **evaluate your overall energy efficiency** by doing energy audits. This way, you'll know whether you are consuming way too much energy or using just enough to sustain the business operations.

This is also one way to see if your energy saving efforts are working and paying off. There are energy audit companies you can hire and they can help you identify areas where you can trim down your energy consumption.

9. Switch off equipment when not in use

Just like with lights, make sure that you switch off and plug out all equipment when not in use. This includes air conditioners, coffee vending machines, hand dryers, microwaves, printers, copiers, and scanners during weekends or holidays.

These electrical devices continue to drain power even if they are plugged in. This is sometimes called standby energy consumption or vampire energy drain. This type of energy consumption adds hundreds of millions of dollars to annual electricity bills all over Australia.

Making sure all of your devices are plugged out after working hours as this saves energy and reduces your electricity bill.

10. Print only when necessary

Avoid printing files that can be sent via email. There are many ways you can **share** or **store** important files today.

Modern technology gives you a ton of options, including cloud storage, email clients and even ped drives if you insist.

Aside from **reducing paper wastage**, this also helps **cut the total amount of energy consumed** by the printer.

11. Control your heating and cooling

Cutting down on air conditioning could mean significant savings for you. Don't make drastic difference between the temperature outside and the one in your workplace, but keep in mind the conditions of optimum working environment.

12. Promote sustainability in the workplace

Promote sustainability throughout the company. Explain to you employees why it's important and in what ways everyone can benefit from it.

You can start small by sending out a **reminder** for everyone to always check if their computers are unplugged before leaving the office at the end of their shifts.

The secret to reducing energy consumption in the workplace is **getting your employees on board**, making small changes in their daily habits at work.

If you think about it, improving a business' profitability can be as simple as **being wise** with everything you spend money on, like **energy**.

Saving energy in the office doesn't only reduce your electricity bills, but contributes a lot to the environment by lessening carbon pollution, making your workplace worthy of a Green Star.

Moreover, going green definitely **improves your reputation** and has amazing positive effects on your company's image and brand.

Self-Check -7	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List at least four ways you can save energy in the workplace and bring positive changes to your working environment (6ponit)

Note: **Satisfactory rating – 4 and 6points** **Unsatisfactory - below 4 and 6points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

1..

1._____

2._____

3._____

4._____

Reference books

1. A.Robinson and W.A.Liversey,2004. ***THE REPAIR OF MOTOR BODIE***S,
2. Britain (Butterworth-Heinemann publication), Fourth Edition ISBN 0 7506 45172.
3. Porter, Lindsay. ***THE CAR BODY WORK REPAIR MANUAL.*** New edition
4. Robert Scharff and James E.Duffy, 1992. ***MOTOR BODY REPAIR*** .United States Of America, 3rd edition .ISBN 0827368585
5. Scharff.Robert. ***MOTOR AUTO BODY REPAIR.*** Third edition
6. Alan Robinson, 1997. ***THE REPAIR OF VEHICLE BODIES***. British 3rd edition, ISBN 0 7506 0955 9
7. L.C.Rhone, 1983***. TOTAL AUTO BODY REPAIR***. United States of America, second Edition. ISBN 0 02 682110 9
8. A.G.Deroche, 1996***. THE PRENCIPLES OF AUTO BODY REPAIRING AND REPAINTING***. United States of America, sixth Edition. ISBN 0-13- 440033 Alan Robinson, 1993. ***THE REPAIR OF VEHICLE BODIS.*** Great Britain, Second Edition. ISBN 0 7506 0159 0
9. John D. Anderson, JR., 1991. ***FUNDAMENTALS OF AERODAYNAMICS*** Singapore, Second Edition. ISBN 0 07 100767 9

Vehicle Painting and Body Repair Level II

Learning Guide-#36

Unit of Competence: Prepare Vehicle Components for Paint Repairs

Module Title: Preparing Vehicle Components For Paint Repairs

LG Code: EIS VHP2 M011 LO2-LG-36

TTLM Code: EIS VHP2 M011 TTLM 0919v1

LO 2: Prepare vehicle plastic surfaces for painting

Instruction Sheet	Learning Guide #36

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

- Access and interpreting information from manufacturer specification
- Protecting plastic surface by approved method and material
- cleaning Surfaces to be painted
- Protecting and/ or removing components and ancillary fittings and storing securely.
- Preparing Surfaces to be painted
- Noting and reporting Unrecorded damage equipments
- Disposing waste material

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

- Accesses and interpret Information from manufacturer/component supplier specifications.
- Protect Plastic surfaces adjacent to the surfaces to be painted using approved methods and material.
- Clean Surfaces to be painted of contaminants.
- Protect and/or remove and store securely Components and ancillary fittings that can be affected by the painting process.
- Prepare Surfaces to be painted using approved methods, material and equipment.
- Note and report Unrecorded damage to surfaces and ancillary equipment to persons.
- Carry out Surface preparation activities according to industry regulations/guidelines, WHS requirements, legislation and enterprise procedures/policies.
- Waste material is disposed of in accordance with statutory and enterprise requirements

Learning Instructions:

3. Read the specific objectives of this Learning Guide.
4. Follow the instructions described below 3 to 6.
5. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 Sheet5, Sheet 5 Sheet 6, Sheet **7** and Sheet 8”.
6. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4, Self-check 5 , Self-check 6, Self-check 7 and Self-check 8” **in page -60, 65, 72,78,84,77,89,and 95** respectively.
7. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet1” **in page -101.**
8. Do the “LAP test” **in page – 102** (if you are ready).

Information Sheet-1	Accessing and interpreting information from manufacturer specification

1.1. Verbal or written instructions

Verbal Communication

Verbal communication, also known as speaking, is an important form of communication in a healthcare facility. During the course of a work day most healthcare workers spend time talking with coworkers, supervisors, managers, or patients. Planning and organizing your thoughts is a critical part of verbal communication. This involves thinking about who will receive the message and what you want to convey. Making notes before a phone call, having an agenda for a meeting, or researching information you wish to give to someone in advance are all methods you can use to ensure clear communication.

Written Communication Skills

Many employers consider written communication skills to be one of the most important job skills an employee can have. Studies have indicated that the ability to write well seems to be diminishing among students. Therefore, if you can write a message clearly and accurately, those skills will benefit you in the working world

Oral and written instructions

1. Identifying instructions

1. If you are familiar with correction tapes, they all basically work the same way.

Make sure the paper is on a flat surface. Hold the correction dispenser with the green grip on the top so that the index finger can rest on it. Rest the tip of the dispenser against the paper, and with even motion and pressure, drag the tape dispenser across the mistake being corrected. When finished drawing the line, tilt the dispenser forward to cut the tape. Lift the dispenser from the paper. It's simple and easy to use. Answer all the questions based on the text.

1. Why must the dispenser be tilted forward?

2. How should we hold the correction dispenser?

3. What is the similarity between Tipp-Ex correction tape and other correction tapes?

4. How should dragging across the mistake be done?

5. What is the first thing to do when using the correction tape?

2. Oral instructions

Instructions given verbally or spoken words, can be heard Written instructions .

Instructions which can be read; words & pictures, need the ability to interpret

Why are clear instructions to avoid important? Misunderstanding that will lead to errors and work delays, so that better work performance can be achieved.

Instructions for correctly using a chainsaw are shown at the right.

Follow them and live.

Grammar Explanations Examples•

The imperative form of the verb is always the Ahmad, please switch off the light. Base form. It is the same whether it is directed Switch off the light, Ahmad! At one or several people. The subject of an imperative statement is Stand up straight you.

However, we do not say or write you in Not: You stand up straight imperative sentences.

The imperative form has a number of uses. Use the imperative to: Turn left at the traffic lights. give directions and instruction Don't move!• give orders or commands Please read this article.• make requests (use please in addition to the Read this manual, please. imperative form.) Don't exercise if you feel unwell.• give advice or make suggestions. Be careful! Don't trip over that mat!• give warnings Come to the gym with us tomorrow.• invite someone

1. Writing instructions (signage)

- What does the picture mean?
- Visual graphic secreted to display information to particular audience Do you know that a lot of signage can be found at your workshop?
- Safety sign formats (clockwise from top left): warning sign, prohibition sign, mandatory action sign, and safety information sign.

1.2. Safe work procedures

The purpose of a safe work procedure is to reduce the risk to health and safety in the workplace and reduce the likelihood of an injury by ensuring that employees know how to work safely when carrying out the tasks involved in their jobs.

Dry sanding

- Using vacuum sanders.
- Performing sanding tasks in downdraft or crossdraft prep stations.
- Wearing respirators designed to prevent inhalation of dusts.

Solvent wiping

- Wearing chemical-protective gloves.
- Performing solvent wiping in
- Downdraft or cross draft prep stations or booths.

Solvent wiping

- Wearing respirators that prevent inhalation of organic vapors
- Using the least toxic solvents for wiping.

Wet sanding

- Wearing gloves.
- Wearing gloves, paint s and respirators.

Mixing Paints

- Providing adequate ventilation.
- Using nonhazardous cleaning agents to wash hands and arms.

- Closing all containers of painting materials immediately after their use.

Spraying: (1) spray gun

- Using high-volume, low-pressure (HVLP) spray guns to spray primers, basecoats, and clear coats.
- Consulting with paint distributors and gun manufacturers to determine the HVLP gun settings that optimize transfer efficiencies.

Gun cleaning

- Performing gun cleaning tasks in a well ventilated area.
- Wearing gloves, paint suits, and respirators when cleaning guns.
- Purchasing gun cleaning equipment that painters will use.

Waste management

- Ensuring that recycling operations do not emit significant quantities of solvent vapors into areas in which painters work.
- Ensuring that paint and waste containers are closed throughout the work day.
- Placing waste paint drums atop spill containment pallets.

Health and safety training and management

- Providing initial training to new employees and periodic refresher training to all other employees on important health and safety topics.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What do you mean Verbal Communication? (2point)
2. Discuss briefly Written Communication Skills? (2point)
3. Discuss briefly the Safe work procedures? (2point)

Note: **Satisfactory rating – 4 and 6points** **Unsatisfactory – below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

_____

2._____

_____

_____

3._____

_____

_____

Information Sheet-2	Protecting plastic surface by approved method and material

Types of Plastic Protection Films

Adhesive Type – This is the product identification number of the adhesive used to attach the protective film to the plastic surface.

Tack – Measured in ounces per lateral inch, this defines the level of “stickiness” of a particular adhesive. Because there are many variables at play, the tack level of most adhesives will be expressed as a range of values rather than a single, specific measurement.

Film/ Paper – This indicates the type of plastic or paper that the film is made of.

Reference the following table for a variety of films that provide surface protection for plastics. The headings at the top of the table identify the specific plastic protection films by listing the combination of adhesive type, tack and material used.
Each row of the table is then labeled with the type of plastic surface you want to protect.

Cleaning Interior Plastic

Vacuum the interior. Before you begin, vacuum out your car to remove any debris. Your cleaning products will work much better if you vacuum before getting started. Using a soft brush attachment on the vacuum nozzle will help prevent scratching.

- Remove the floor mats and shake them before you start vacuuming.
- Be extra careful around any knobs or vents. These areas can be easily damaged.

Dust the plastic. Use a soft damp cloth (water only) or soft hand-held dust mop (available in the car care section of any grocery or discount store) to clear away dust. A small, soft-bristled paintbrush works well to clear dust from crevices such as around the gear shift and hand brake, the radio controls and other tight spaces where dust can settle.

- You can also use a soft-bristled toothbrush and Q-tips to clean crevices and hard to reach areas.
- If you used a damp cloth, go back with a dry soft cloth to dry the plastic.

Treat stains. If your plastic is stained, apply a very small amount of mild soap, laundry detergent, or plastic auto cleaner to a damp cloth. Never apply any cleaning solution directly to the plastic. Wipe the area until it is clean. Follow up with a clean, dry rag.

- Always test an inconspicuous piece of plastic before you apply it to all of the plastic in your car.
- If you are using a commercial plastic cleaner, follow the instructions on the packaging.
- Turn the cloth to a clean spot when it begins to show dirt. You do not want to redistribute dirt throughout your car.

Apply a protect ant. Once your plastic is cleaned, apply a protect ant. Visit an automotive store or the automobile section of a large retailer to find a plastic protect ant. Only apply the protect ant to clean surfaces. You do not want to lock in any dirt or grime.

- Again never spray products directly on the plastic. Always use a clean, soft cloth or a foam applicator pad.

Use polish. To add some shine to your plastic, use a plastic polish or an oil such as olive oil or boiled linseed oil. Put some oil or polish on a soft cloth and then rub it into the plastic. Then use a clean soft cloth to rub away any excess product.

- You can purchase boiled linseed oil from a hardware or paint store.
- There are also all-in-one products that act as both a polish and a protect ant. This is convenient and cuts down on the amount of products you have to buy.

Wash your car. Pre-soak your car with water for 5 minutes to remove any stubborn dirt. Place a few drops of a mild liquid soap (e.g. Ivory soap) in a bucket of water and use a sponge or car wash mitt to clean your car. Wash your car in sections and rinse with plain water. Start at the top of your car and work your way down. Once you have cleaned your entire car, rinse the car with water again.

- Clean your car in a shaded area to prevent your car from getting too hot. If the surface of the car is too warm, the soap may dry and you will have to wash your car multiple times.
- Dry your car with a clean, soft, dry towel or drive your car around the block.

Apply a degreaser. Once you have washed the car, spray a light degreaser on a towel and apply it to the plastic areas of your car. Wipe your car using a medium amount of pressure. If the area has buildup, scrub with a brush. Be careful not to scrub the paint.

- Purchase a light degreaser that is safe for cars. Visit your local automotive store or the automotive section of a large retailer like Wal-Mart or Target.
- The degreaser will also remove any buildup from other products that you applied.

Restore dull plastic. Many cars these days have black plastic trim. This trim can begin to look dull and worn. A restoring product will provide a deep clean and restore some of the color. Apply a couple of nickel sized drops of the solution on a soft towel and rub it into the plastic areas using medium pressure.

- These products will remove stains and improve the color.
- Some good products you can try include Poor boy's Trim Restorer, TUF SHINE Black Restore Kit, or Black WOW, or Mother's Back-to-Black cream.
- Always read the instructions before using the product on your car.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. List at list 4 Types of Plastic Protection Films? (8point)

Note: **Satisfactory rating – 5 and 8 points** **Unsatisfactory – below 5 and 8points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____
3. _____
4. _____

Information Sheet-3	cleaning Surfaces to be painted

It can be time consuming running back and forth to the store for expensive cleaning products that you can only use on your car. But keeping your car clean has many benefits and will not only preserve it better from the elements, but it can also have a healthy affect on your mood and self perception. You can avoid expensive cleaning products and enjoy a well maintained car by making use of ingredients you find around the house.

II. Cleaning the Car Exterior

1. **Rinse your car with a hose or bucket.** Try to break loose any buildup and be sure to scrub the entire surface, as removing excess dirtiness will make your job easier overall. Dirt on washing implements can scratch your paint job.

2. **Clean salt and grime off your car with baking soda.** Add one cup of baking soda to a gallon of soapy hot water to make a powerful cutting agent, especially for your car's winter buildup.

III. Remove tree sap with Denatured alcohol, Denatured alcohol also dissipates tar and sap well or you can use peanut butter. Dab peanut butter or solid shortening onto the

affected area of your car and allow it to sit for about a minute. After that, try wiping off with a cloth. This may take a few attempts before you completely remove the sap. Denatured alcohol also dissipates tar and sap well

IV. Wash your car with hair shampoo. Shampoo is a great household cleanser you can use to cut grease and grime on the body of your car. Baby shampoo is ideal, as its gentle ingredients won't harm your car's paint.

V. Mix 2 teaspoons into a 2 gallon (7.6 L) bucket of water. Make sure that you scrub with a soft cloth so you don't scratch your car's paint. Be sure not to use too much shampoo, as undiluted cleaners can also damage your car's paint.

VI. Use a clean dust-mop to reach difficult places. If you have difficulty reaching the roof, hood, or other places, this is a great scrubber that can help you out.

VII. Clean road grime off windshield wipers with rubbing alcohol.

- **Get wet your rag with rubbing alcohol, take the wiper blade in hand, and firmly pull the rag along the rubber edge of the wiper blade.**

I. Cleaning Hard Surfaces and the Center Console

1. **Wipe all surfaces clean with a damp rag.** This will remove excess grunge from the surfaces of your car and prevent you spreading dirtiness to your seats or floor.

2. **Use toothpaste on stains.** Stains on your leather or vinyl seats can be removed by gently scrubbing the affected area with toothpaste. *Always* test your cleaner on a small area. There is a chance that the dye can be affected by the cleaning agent.

3. **Swap in rubbing alcohol if toothpaste fails.** Lightly dab your stain after you've tested the alcohol on the surface you will be cleaning.

The more alcohol you use, the harsher the solution will be, and the more likely it will bleach whatever color your car might be dyed.

4. **Make a cleaner for the interior of your car with equal parts water and rubbing alcohol.** Spray this mixture on hard surfaces and then wipe them with used fabric softener sheets so you don't leave lint behind.

5. **Try a solution of one part vinegar with one part linseed oil.** This is another great combination for beating interior dirt and grime. The shine it leaves behind on your leather seats is an added bonus.

6. **Sprinkle some baking soda in your car's ashtray.** This will absorb the smells and odors and keep your car fresh. If you do not smoke, you can leave some baking soda in your ashtray as an air purifier.

7. **Baby wipe the glove compartment of your car.** Clear out any garbage or dust that might have accumulated there. Often, forgotten items, like snacks, spoil in glove compartments and make your car seem less clean than it actually is.

8. **Apply homemade protect ant to vinyl and hard surfaces.** Mix one part fresh lemon juice with two parts olive oil in a small bowl of your choosing. Do not apply this solution to pedals, levers, or anything you need to drive. This protectant leaves behind a smooth seal that you

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the methods to clean the Car Exterior? (5point)
2. What are the method to Clean Hard Surfaces and the Center Console? (5point)

Note: **Satisfactory rating -6 and 10points** **Unsatisfactory – below 6 and 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1.

a._____

b._____

c. _____

2.

a._____

b._____

Information Sheet-4	Protecting and/ or removing components and ancillary fittings and storing securely.

Secure the rear wheels with wheel chocks, and jack up the front of the car so you can place jack stands under designated points on the frame. Give the car a good shake to ensure it's stable - you don't want it falling while you're tugging on things underneath.

As a best practice, you should remove the hood before you start. Contrary to how it may seem, this is actually a simple job that requires only a socket wrench to loosen bolts which hold the hood to its hinges. Make sure you disconnect any washer fluid lines that may be attached to the hood. And you'll need at least one additional person to help you hold and carry the hood as you remove the bolts and lift it off the vehicle.

Keep track of nuts, bolts, and everything else that comes off by putting them in zip lock bags and taping them to whatever items they were removed from as you go.

Disconnect Fuel Lines & Battery

Before you unhook anything else, we recommend starting with the fuel lines. On fuel injected vehicles (pretty much everything built since the late 1980s), it's essential for safety reasons to depressurize the fuel system before disconnecting any fuel system connections. Remove the fuse or relay for your vehicle's fuel pump, then start the engine and let it run until it uses up all the fuel in the lines and stalls. At this point, the fuel system will be depressurized and you can disconnect fuel hoses, pipes, etc.

more details on - https://www.carid.com/articles/how-to-remove-engine.html

Most vehicles feature quick-release style couplings at points throughout the entire fuel system. Unhooking these couplings isn't difficult if you've got properly designed disconnect wrenches. These wrenches feature a slotted opening so the wrench can fit over the fuel line. A flange on one end of the tool is pushed into the fitting to trigger a release inside the end of the coupling piece.

Once you've run the engine to do this, you won't need to start it again. Always disconnect the battery cables next.

If you've got a modern vehicle with crankcase ventilation lines that route excess fuel/vapors back to the fuel tank, don't forget to unhook those.

Tag All Hoses, Lines, And Wiring Connectors

Tagged Wiring Connectors

As you remove each connector under the hood, it's a losing bet to think that you will remember how it all goes back together (ask me how I know). Take the time to tag each connector, using masking tape and a felt pen, as you take it apart. This is in addition to taking as many "before" photos as possible. Tag all hoses and wiring connectors with tape that you can write on - labeling where things normally attach to (you'll thank yourself later) before disconnecting them. Taking a short video of how everything looks before unhooking items may also prove invaluable.

Drain All Fluids

Drain the motor oil and coolant from the engine. And whether you'll be pulling the transmission along with the engine or not, consider draining the tyranny fluid also. Don't forget to unbolt the transmission dipstick tube from your engine block, if your vehicle is so equipped.

Draining Motor Fluids

If you won't be re-using the fluids, put them in containers that are practical and easy to take to a recycling center. It makes good sense to replace old fluids you've drained with new ones when things go back together later. Keep one or two drain buckets on hand under the vehicle because leftover fluids will seep and weep as you work - including out of the transmission when the engine is separated from it.

Disconnect Hoses And Lines

Disconnected Automatic Transmission Hoses

Now that fluids are drained, remove coolant hoses to and from the radiator in the front as well as the heater core in back. You also need to disconnect the automatic transmission hoses or lines that run from transmission to the radiator for cooling purposes. And assuming your power steering reservoir is bolted to the frame of the vehicle, disconnect any hoses running from it to the power steering pump on the engine. Be prepared to catch additional fluid that didn't drain out from other areas.

Unbolt Exhaust System Component

The exhaust system needs to be disconnected from the engine. Here, you have a choice. You might need to disconnect the header pipe (down pipe) from the exhaust manifold, or the manifold itself (two on V-engines) may need to be unbolted from the heads. Check to see which is the better choice on your vehicle.

Exhaust System Components Unbolting

Exhaust bolts will probably have some corrosion around them, so apply rust-penetrating solution and let it soak in for a little while to help break things loose. more details on - https://www.carid.com/articles/how-to-remove-engine.html

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. Discuss briefly the Unbolt Exhaust System Component? (5point)
2. Discuss briefly the Tagged Wiring Connectors? (5point)

Note: **Satisfactory rating - 10points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

_____

2._____

_____

_____

Information Sheet-5	Preparing Surfaces to be painted

The life of a finish and the appearance of that finish will depend considerably up on the condition of the surface over which the paint is applied. In other words, proper surface preparation is the foundation of a good paint job.

Evaluation of Surface condition

The very first job for the refinisher is to correctly identify the surface and over all condition of the existing paint system.

- Clean the area to be inspected
- Look carefully for any signs of surface or other forms of film break down such as checking cracking and blistering (swelling).

Note particularly the gloss level, low gloss will often indicate surface irregularities.

- It must be determined that the old finish has good adhesion & that rust is not developing under the paint film.
  - ➢ To test adhesion, sand through the finish and featheredge a small spot. If the thin edge does not break or crumble, it is reasonable to assume that the old paint will stay on when the refinish colour is applied over it.
  - ➢ Developing rust can be detected by a roughness or pitting of the surface.

❖ The paint on those areas where either poor adhesion or rust is found must be removed to bare metal.

2. Preparing the surface

I. Painted surface in good condition

It is possible to repaint over an existing paint film in good condition whatever the type of finish, providing it is stable and does not react to the solvent of the refinishing paint.

1. Clean the vehicle – to remove mud, dirt, and other water soluble contaminants
2. Clean with wax and grease removers
3. Even if the original paint finish is in good condition it should be lightly sanded with fine sandpaper after washing to remove dead film and to smooth out imperfections.

3. Repaint faults in painted surface-scratches, dings, dents, etc

II. Painted surface in poor condition

If the old finish is badly weathered or scarred, it is not suitable for recoating. When this situation occurs, the old finish should be completely removed.

Removing old paint

There are three common ways of stripping paint from metal surface

1. Sanding or grinding
2. Sand blasting
3. Chemical stripping

1. **Sanding or grinding**-: Machine sanding or grinding is suitable for removing old finish from small areas and gently curved areas.
   - Start with a #24 grit open coated disc, and by holding the face of the disc at a slight angle to the surface, work forward and back ward evenly over the surface.
   - Follow with # 50 or #80 closed coated disc
   - After all the paint is removed with the course grit disc, resand the area with the orbited or dual action sander and #100 grit paper to remove the metal scratches.
   - Then finish sand the panel using #80 girt sand paper

In this way most of the scratches created by the stripping operation will be eliminated.

2. Sand blasting

This method saves time when compared with sanding/grinding and chemical stripping.

It has a further advantage of revealing rusted areas.

Blasters in the shop are one of the two kind's pressure or siphon.

Pressure blasters are pressurized containers filled with abrasive materials (such assilica sand or plastic beads). The sand travels down one hose; the high velocity air comes down on another hose and travel out toward the surface together at tremendous speed and force. In a

siphon blaster, compressed air draws the abrasive from the reservoir by producing suction. The abrasive accelerates and is shot out of the nozzle at the intended surface

3. Chemical stripping

A chemical paint remover is recommended for stripping large areas of paint if environmental regulations allow. It is very effective in those places that a power sander cannot reach and there is no danger of the metal warping

- Before applying paint remover, mask off the area to ensure that the remover does not get on any area that is not to be stripped.

To apply, brush on a heavy coat of paint remover in one direction only to entire area being treated.

Allow the paint remover to sand until the finish is softened

Some paint removers are designed to be neutralized by water. Others are more easily removed with a scraper (putty knife).

Two types of chemical paint removers are popular

1. Paint removers designed primarily to remove lacquer type product
2. Paint removers designed to remove all types of finishes down to the bare metal

Caution - Never use a paint remover on plastics or fibber glass substrates

i. **Bare metal substrate**

Bare metal surface preparation is one of the most important steps in assuring long term corrosion resistance of body panels. The conventional system generally consists of the following three types.

1. Cleaning to remove the contaminants. Use a wax and grease remover to dissolve and float off oily greasy film as well as other contaminants
2. Cleaning with metal conditioner the purpose of metal conditioner is to deep clean the metal.
3. Applying conversion coating

The conversion coating forms a zinc phosphate coating that is chemically bonded to the metal. This layer makes on ideal surface for the primer and prevents rust from creeping under the paint.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the two chemical paint removers are popular? (2 point)
2. Discuss briefly the Bare metal substrate? (2 point)
3. What are the three common ways of stripping paint from metal surface?(2 point)

Note: **Satisfactory rating -4 and 6points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1.

I. _____

II. _____

2. _____

_____

3. .

A_____

B_____

c. _____

Information Sheet-6	Noting and reporting Unrecorded damage equipments

Prepare a Damage Report

Guidelines to create a useful report:

1. Follow a standard format.

When writing a damage report, it's important to use a business format for formality reasons. Some organizations may also have a standard format for you to follow, which may include a few elements not found in an average report format. The report should consist of all the necessary facts covering the incident, which include but are not limited to the following details:

- Date, time, and location of the incident
- The extent of the damage
- The full names and designations (role/position) of the people involved
- Names and testimonies of witnesses
- Series of events leading up to the incident
- Environmental conditions at the time of the incident
- Specific injuries sustained by the people present in the incident

There are many templates and examples found in this article and online that you could use as a guide. If you have any further questions or concerns with the format and content of the formal report, you could always consult a legal professional for proper assistance.

2. Write the report immediately.

File the report as soon as you can. If possible, you could write it on the same day of the incident. Any delays in the process can cause problems along the way.

For instance, failure to make the report could raise a few questions on the authenticity of the incident. Some people may even assume that you were hiding something vital to the case.

A delayed report may also lack evidences to prove that your claims are true, like if the scene of the incident has been wiped clean or if there aren't sufficient evidences to prove that such damages were caused by the exact incident stated in your report. Similar to a police report, a damage report must be written immediately after an incident for a quicker and easier response.

3. Describe the scope of the damage.

Explain everything that happened in a first-person narrative. This must be done thoroughly and accurately as well.

Describe each phase of the event in a logical sequence, specifically what occurred before, during, and immediately following the incident. You should be able to provide an in-depth analysis on what caused the incident from a personal standpoint. Be as descriptive with your general analysis as possible. Given that there are three sides to every story, your claims can contribute significantly to the investigation.

Make sure to share the specifics with authorities. If necessary, you can also collect photo and video evidences using your Smartphone or camera (if you have one on hand) to illustrate the type or extent of the damage. This will make it easier for the assessment team and the insurance company to analyze your report.

4. Make it clear and understandable.

Avoid using big, flowery words that only make it harder for people to grasp your message. It's best to use simple language to prevent confusion or misinterpretation. Vague words and sentences may sound great in writing, but when crafting something as professional as a damage report, they only act as a distraction from the document's main purpose. You may also check out sample activity reports.

Be sure to focus on your main objective when writing: to deliver sufficient and relevant information in regards to the incident. Try not to be biased with your claims, as this may only complicate the situation. Keep it brief yet detailed enough for readers to properly visualize what happened.

5. Review the document.

Finally, review the report for any grammar or spelling errors you may have committed. It would also be necessary to double-check the facts provided, as you may have missed or overlooked some details essential to the report.

If you hold any critical information but forgot to include it or chose to exclude as you filed the report, you may have problems using it to your defense. If possible, you can ask a lawyer, or somebody reliable with you at the moment, to assist you in filling the report.

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are Guidelines to create a useful report: ? (5 point)

Note: **Satisfactory rating -3 and 5points** **Unsatisfactory – below3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1..

a._____

b_____

c. _____

d_____

e. _____

Information Sheet-7	Carrying out Surface preparation activities

Surface preparation is the process of treating the surface of a substance in order to increase its adhesion to coatings. The single most important function that influences coating performance is the quality of surface preparation. This can be done mechanically or chemically.

Surface Preparation

Correct surface preparation will help prevent coating systems failures. The most common coating system failures caused by incorrect surface preparation are:

1. Loss of adhesion (delamination) between the coating system and the substrate.
2. Loss of adhesion (delamination) between the various coating layers of the coating system.
3. Cissing, cracking or frying of the coating system.
4. Gritty or cloudy finish in the final coat of the coating system.

Coating systems are not designed to hide or correct imperfections on the surface of a substrate, only correct surface preparation can rectify these (either on the bare timber substrate or between the coats of a coating system). All surface imperfections will telegraph through the coating system and be seen in the final finish unless corrected.

Cleanliness

Coating application should always be carried out in the cleanest environment possible. While the need for a dust free, clean and a properly functioning spray-booth is easily understood, the need for personal cleanliness is most often overlooked. Many coating systems have been spoiled by applicators for example not washing their hands after eating a greasy lunch, or by wearing contaminated, dust coated clothing during surface preparation and coatings system activities. Maintaining a high level of cleanliness results in a consistently higher quality in coating system finishes.

Surface Preparation - Prior to Coating

Use only correctly seasoned clear grade timbers from reputable suppliers. Beware of resin bleeds and wood knots as these can cause problems in the coating system. Allow MDF board to stabilise prior to machining. Prepare the surface using the following procedure:

1. Fill all defects with a wood filler (e.g. cracks, holes, etc.)
2. Sand the surface to a smooth even finish. While the sanding process may start with 100 or 120 grit papers to correct surface defects, always finish:

(a) On Timber with 180 grit

(b) On MDF with 240-320 grit

1. Remove all sanding dust using air guns and tack rags.
2. Ensure substrate is free from dust, grease, dirt and all other contaminates.
3. Ensure timber is stabilised to ambient conditions and has a moisture content of less than 15% immediately before commencing coating operations.

Sanding

1. Form panel edges and face profiles using sharp router blades at the correct spindle speeds to reduce wood fibre tear and machine chatter marks.
2. Radius off exterior and internal corners to reduce coating pull back due to surface tension of the coating relative to the substrate.
3. Take particular care on edges or profiles to ensure the total surface area has been sanded thoroughly. Most coating system failures occur on the edges of flat panels and are usually caused by insufficient surface preparation in these areas.
4. On MDF Board edges use the correct grade of abrasive paper to minimise fibre tear.
5. Inspect all edges after sanding to ensure the best possible sanded finish has been achieved.

General Sanding Tips

1. Sand with the grain of the timber using sanding blocks or mechanical sanders to maintain maximum flat area contact between the abrasive paper and the surface. Hand sanding without a sanding block will result in an uneven and poorly finished surface.
2. Use only new abrasive papers of the correct grit size. Change frequently to maintain the correct cutting performance. Worn abrasive paper will polish the surface, preventing the sealer or pigmented undercoat from penetrating, and consequently, adhering to the surface.
3. Use sanding equipment with dust extraction facilities to prevent powder build up under the abrasive paper. Excess powder will clog the abrasive paper and polish the surface, preventing the sealer or pigmented undercoat from penetrating, and consequently, adhering to the surface.
4. Remove all surface dust using air guns and tack rags. The use of air guns alone will not remove all of the surface dust. Residual dust will cause a cloudy finish or gritty appearance in the topcoats.

Surface Preparation - During Coating Applications

On the prepared surface apply (as per the instructions of the relevant product data sheets) either a clear sealer or pigmented undercoat as required. Inter-coat surface preparation while similar to surface preparation of bare timber, does have peculiarities to be aware of.

All coating systems rely on two methods to adhere the next coat of the coating system onto the previous one.

1. **Chemical Bond:** Where the previous coat is softened or dissolved a little by the solvents in the next coat allowing the resins of the two coats to bond together.
2. **Mechanical Key:** Where the sanding marks left in the surface form a profile in the previous coat for the subsequent coat to flow over and shrink onto, through the drying and curing of the coating.

Both functions require that the previous coat be thoroughly sanded prior to the application of the subsequent coat. Some coatings can be applied wet on wet in double pass application – but only if indicated on the relevant product data sheet and within the time limits imposed.

Inter-Coat Sanding Tips

1. Allow the previous coat to fully dry (dry times are specified on product data sheets) before sanding – uncured coatings will ball up on the abrasive paper and scour the coating.
2. Sand coating using sanding blocks or mechanical sanders to maintain maximum flat area contact between the abrasive paper and the surface – especially important at the junction where the panel flat faces meet the edges or profiles. Hand sand the contours of the edge and profiles, being careful not to remove the coating from the important edge and face junction.
3. Take particular care on edges and profiles to ensure the total surface area has been sanded s

In five steps or less, quickly update plastic surfaces to better reflect your personal style:

1. Clean project surface
    - For old plastic, use an ammonia-based cleaner on surface
    - For new plastic, use paint thinner to clean surface
2. Lightly sand surface if previously painted
3. Remove dust with a tack cloth
4. Let plastic surface dry
5. Apply spray paint according to the directions on the spray can label

Self-Check -7	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What is surface preparation? (5 point)
2. What are the five steps or less, quickly update plastic surfaces to better reflect your personal style: (point 5)

Note: **Satisfactory rating – 6 and 10points** **Unsatisfactory - below 6 and 10 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

_____

_____

2..

a._____

b._____

c._____

d._____

e_____

Information Sheet-8	Disposing waste material

Waste management is the precise name for the collection, transportation, disposal or recycling and monitoring of waste. This term is assigned to the material, waste material that is produced through human being activity. This material is managed to avoid its adverse effect over human health and environment. Most of the time, waste is managed to get resources from it. The waste to be managed includes all forms of matter i.e. gaseous, liquid, solid and radioactive matter.

The methods for the management of waste may differ for developed and developing nations. For urban and rural populations, industrial and residential areas it does differ as well. The management of waste in metropolitan and rural areas is general responsibility of the local government. While the waste that is produced by the industries is managed by the industry itself, in case it is non-hazardous.

Motor vehicle wastes include:

- Engine oil.
- Transmission fluid.
- Power steering fluid.
- Brake fluid.
- Antifreeze.
- Solvents.
- Degreasers.

Waste Management Resources

- Methods for dumping off waste:
- Landfill: this method involves burying off the waste and this is the most common practice for the disposal of waste around the Globe. ...
- Incineration:
- Methods for recycling:
- Biological reprocessing:

- Recovery of Energy:
- Reduction and Avoidance Methods:
- Waste handling and transportation.

Recycling

Recycling is the process for converting used materials in to new products for the prevention of producing waste. This leads to the lessened consumption of fresh material for the production of new material, reduction of use of energy, reduction of air pollution and water pollution. This process it the contributor for less requirement for disposing off waste and filling in landfills and requiring incinerations. Recycling has taken humanity out of the risk for the production of the green house gases at landfill sites. This process is the key factor, which is used in the modern techniques for waste management and is the third participant for 3R's i.e. Reduce, Reuse and Recycle of the waste hierarchy.

To properly dispose of Automotive Hazardous Waste and other Hazardous Wastes:

1. Prepare a properly labeled container, which is compatible and non-leaking for the collection of the waste by:

2. Place the Hazardous Waste into the labeled container.
3. Incompatible Wastes shall be kept segregated and managed appropriately in separate containers.
4. Make sure the lid is closed on the container when you are not adding waste.
5. Handle all waste in a manner that minimizes breakage, prevents fire, explosion, and the unauthorized release of any Hazardous Waste to the environment.
6. Immediately clean up and place in a labeled container, as specified above, any waste that is spilled.
7. When the container is either full or 90 days after the initial accumulation date, call the Environmental Health & Safety Department at Extension 4697 and make arrangements to have the waste picked up or transported to the Hazardous Materials Facility within 3 days.

Self-Check -8	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are Motor vehicle wastes? (5 point)
2. Discuss method to dispose of Automotive Hazardous Waste(5point)

Note: **Satisfactory rating - 6 and 10 points** **Unsatisfactory - 6below 10 and 5 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

2..

a_____

b_____

c_____

d_____

Operation Sheet 1	Techniques of Preparing Plastic Surfaces to be painted using approved methods, material and equipment

1.1 Techniques for Preparing Plastic Surfaces to be painted using approved methods, material and equipment

Step-1 . Before Auto Painting, Isolate the Plastic Parts You'll Be Working On

Step -2. Prepare the Surface of the Plastic Correctly Before Auto Painting

Step- 3. Use an Adhesive When Painting Plastic After Car Painting Courses

Step-4 Make Sure to Paint Car Parts in a Clean Workspace

LAP Test 1	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary painting material, tools and materials you are required to perform the following tasks within 2-3 hours.

Task 1: Prepare Plastic Surfaces to be painted using approved methods, material and equipment

Reference

1. Krylon® Fusion for Plastic®
2. Krylon® ColorMaster Plastic Primer
3. A.Robinson and W.A.Liversey,2004. ***THE REPAIR OF MOTOR BODIE***S,
4. Britain (Butterworth-Heinemann publication), Fourth Edition ISBN 0 7506 45172.
5. Porter, Lindsay. ***THE CAR BODY WORK REPAIR MANUAL.*** New edition
6. Robert Scharff and James E.Duffy, 1992. ***MOTOR BODY REPAIR*** .United States Of America, 3rd edition .ISBN 0827368585
7. Scharff.Robert. ***MOTOR AUTO BODY REPAIR.*** Third edition
8. Alan Robinson, 1997. ***THE REPAIR OF VEHICLE BODIES***. British 3rd edition, ISBN 0 7506 0955 9
9. L.C.Rhone, 1983***. TOTAL AUTO BODY REPAIR***. United States of America, second Edition. ISBN 0 02 682110 9
10. A.G.Deroche, 1996***. THE PRENCIPLES OF AUTO BODY REPAIRING AND REPAINTING***. United States of America, sixth Edition. ISBN 0-13- 440033 Alan Robinson, 1993. ***THE REPAIR OF VEHICLE BODIS.*** Great Britain, Second Edition. ISBN 0 7506 0159 0
11. John D. Anderson, JR., 1991. ***FUNDAMENTALS OF AERODAYNAMICS*** Singapore, Second Edition. ISBN 0 07 100767 9

Vehicle Painting and Body Repair

Level II

Learning Guide-#37

Unit of Competence: Prepare Vehicle Components for Paint Repairs

Module Title: Preparing Vehicle Components For Paint Repairs

LG Code: EIS VHP2 M011 LO3-LG-37

TTLM Code: EIS VHP2 M011 TTLM 0919v1

LO 3: Apply primers

Instruction Sheet	Learning Guide #37

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

- protecting and/or removing Components and storing safely
- Applying Primers/primer surfaces
- Carrying out application
- Completing work without damage

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

- protect and/or remove and store safely Components and ancillary fittings that can be affected by application processes
- Apply Primers/primer surfaces using approved methods, materials and equipment.
- Carry out Application activities according to industry regulations/guidelines, WHS legislation, and enterprise procedures/policies.
- Complete Work without causing damage to any component or system.

Learning Instructions:

- Read the specific objectives of this Learning Guide.
- Follow the instructions described below 3 to 6.
- Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
- Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -119, 126, 130 and 13**7 respectively.
- If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1,” **in page -139.**
- Do the “LAP test” **in page – 140** (if you are ready).

Information Sheet-1	protecting and/or removing Components and storing safely

3.1.1 in-situ panel

Many times when a car is damaged in a collision or has a rusted area that is beyond repair, the damage is confined to one body panel. Attempting repairs or taking the car to a body shop can become expensive. With many companies offering replacement body panels to the public for almost any make or model of vehicle, replacing auto body panels in your driveway has become easy. With the use of a new body panel and a few tools, it can be done in less than an hour.

Step 1

Remove the old or damaged auto body panel. Reach the panel by looking under the vehicle and removing the plastic protective skirting using a Phillips screwdriver. Several Phillips screws hold the skirting in place. Remove the screws and pull the skirting back out of the way.

Step 2

Look behind the panel and locate the bolts that are holding it to the car. There are several metal tabs that come off of the panel and attach to the car, usually located along the bottom, top and sides. Reach behind the panel from the bottom and open the hood or truck. Remove the bolts completely, but save them and the nuts to use on the new panels.

Step 3

Pull the old panel off of the car. Notice where the tabs and bolt holes are located and compare their positions to the new panel to make sure the new panel is going to fit properly. Most replacement auto body panels don't come with hardware, so you must use the old bolts and

nuts. If one is lost, take one that you have to a hardware store to compare sizes and buy replacements.

Insert the bolts through the tabs and tighten the nuts onto the bolts with the ratchet and a socket, to replace the auto body panel on the car. Replace the plastic skirting underneath the vehicle and replace the Phillips screws.

3.1.2. Doors

Door removal is necessary for replacement and many repairs, such as door skin replacement or frame straightening. To remove a typical door, you must remove the two door hinge bolts or drive out the welded hinge pins on the outside of the door; other wiring requires complete door disassembly.

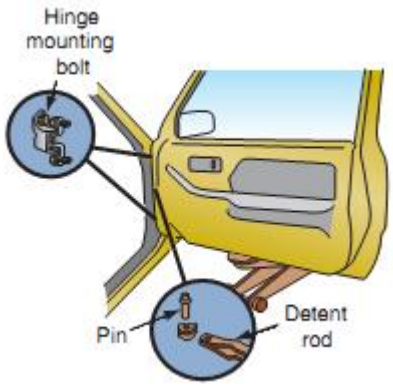


FIGURE 1 A floor jack covered with a shop towel or holding fixture is commonly used to support the weight of a door when loosening hinges. Have someone hold the door to keep it from falling when removing the last hinge bolt..

Open the door about halfway. Place a floor jack under the door. Place a fender cover, rag, notched block of wood (a short piece of 2 × 4 works well), or door hold in tool on the jack saddle to protect the painted edge of the door. A door holding tool is a rubber jack saddle inser that has a long groove to engage the bottom of the doo flange (Figure 15–30). With the saddle near the center of the door, raise the jack just enough to take most of the weight off the hinges.

Be careful not to raise the jack too much, because it is easy to damage the door with the power of a hydraulic jack.

A . A special door holding fixture has been placed on the floor jack. It has a rubber insert that will not damage paint. Masking tape has also been applied to door edges to protect against paint chips and damage.

Figure 2 Note how two technicians are working together to install a freshly painted door without damage.

B Raise or lower the jack so that the door hinges are at the right height. Slowly move the door into position while making sure it does not hit the fender. Hand-start and tighten the door hinge bolts. Then feed wiring harness into door.

You want the weight of the door balanced on the jack so the hinge bolts unscrew easily (Figure 3)

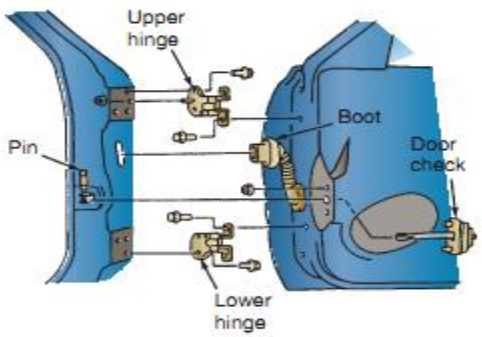


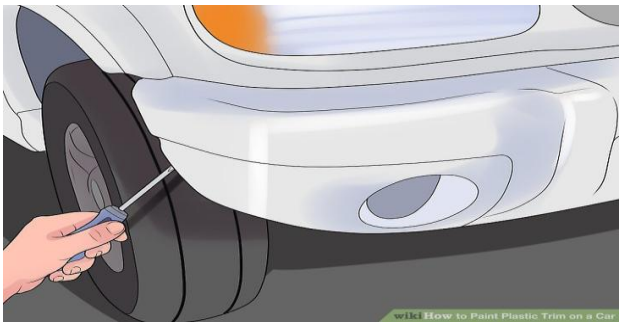
Figure 3 Note how hinges fasten to the door and vehicle body. Sometimes a wire harness can be unplugged on the outside of the door frame. (Courtesy of Mitchell 1)

Figure 4 When loosening door hinge bolts, make sure the door is held so it does not fall off the jack.

Before removing the last bolt, ask a coworker to help hold the door and keep it from falling off the jack (Fig 4). The two of you can then move the door to a workbench or out of the way. Normally, place the door skin or outer panel down on the work surface. If the door does not have to be repainted, make sure you place a clean shop blanket on the work surface to prevent scratches in the finish

3.1.3. Plastic components

I. Cleaning the Trim



1. Remove the plastic trim from your car if you can. Trim is easiest to get an even coat of paint on if it's taken off of your vehicle. Use a screwdriver and look for the screws holding your trim in place, and slowly remove them so the trim comes loose from your

vehicle. Make sure there are no electrical components attached to your trim when you take it off.[1]

- Set the screws in an area where you won't forget them. If you're removing all of your trim at once, keep the screws for each part separate from one another so you don't accidentally mix them.
- Don't try to paint plastic trim from your car's interior if it cannot be removed.

2. Mix soapy water together in your sink or in a bucket. Fill a sink with warm water and pour in 1 US tbsp (15 ml) of liquid dish soap. Thoroughly mix the soap into the water with your hands until it's sudsy. If you have large pieces of trim or trim pieces you couldn't remove, such as a bumper, then fill a bucket with soapy water instead of your sink.[2]

3. Clean the trim with the soapy water and a scouring pad. Wet a scouring pad in the soapy water and scrub your car's trim with a light amount of pressure. This will help remove any dirt or grease that's on your trim as well as create small abrasions that will

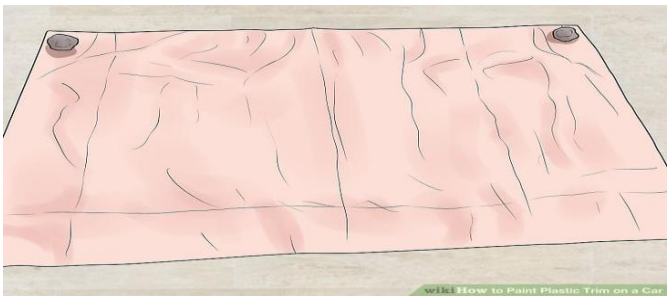
help the paint stick better. Be sure to rinse all of the soap off your trim after you scrub it.[3]

- You can also use a commercial degreaser to clean the trim on your vehicle.
- As long as you use a scouring pad, you shouldn't have to sand your trim.

4. Dry the trim with a lint-free towel before letting it air dry. Shake off any excess water from your trim and then use a lint-free microfiber to dry it. Make sure to dry all of the corners and areas where water could collect or else your paint won't set in that area. Once you get the trim towel-dry, let it air dry completely for about 1-2 hours so there's no water on it when you start to paint.[4]
   - It may take more or less time for your trim to dry depending on the weather conditions.

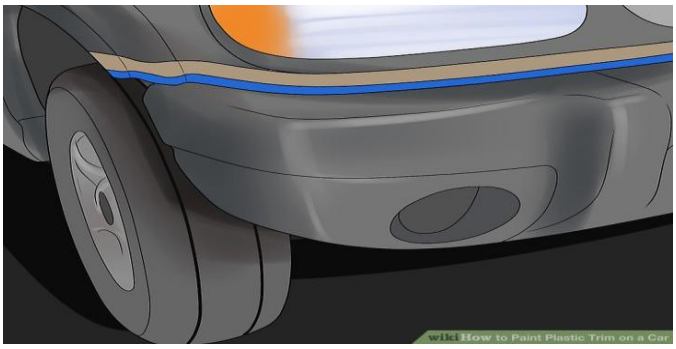
Tip: If your trim doesn't look scuffed after it's dry, use 200-grit sandpaper and apply light pressure so the paint can adhere.

II. Setting up Your Work Area



1. Spread a drop cloth on the ground outdoors. Find a hard flat surface outdoors to put your drop cloth down so you don't get paint on the ground. Put something heavy on each corner to hold the cloth securely in place. Space the pieces of your car's trim on the drop cloth so you're able to paint the sides of each piece.[5]
    - You can buy drop cloths at paint supply or hardware stores.

    Tip: If you don't have a drop cloth, you can break down a cardboard box and use that instead.



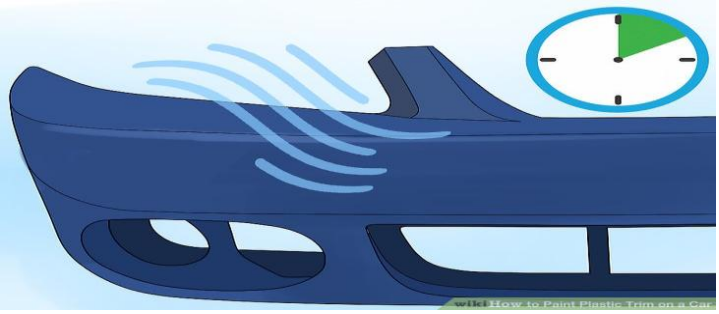
2. Tape off the area around your trim if you couldn't remove it from your car. If you weren't able to remove the trim from your vehicle, cover the areas near your trim with masking paper so you don't paint your car. Apply a layer of painter's tape around the edges of the trim to secure it in place and create a tight seal that paint can't get through.[6]
    - You can buy masking paper and painter's tape from home improvement stores or online.
    - Don't spray paint any trim inside your car that you can't take out.

3. Spray a coat of adhesion promoter on your trim. Shake the can of adhesion promoter to mix it together and hold it about 6 in (15 cm) from your trim. Apply a thin coat of the adhesion promoter, slowly working your way back and forth across the trim. Once you have one side finished, flip it over and spray the other side.[7]
    - You can buy adhesion promoter from a painting or hardware store.

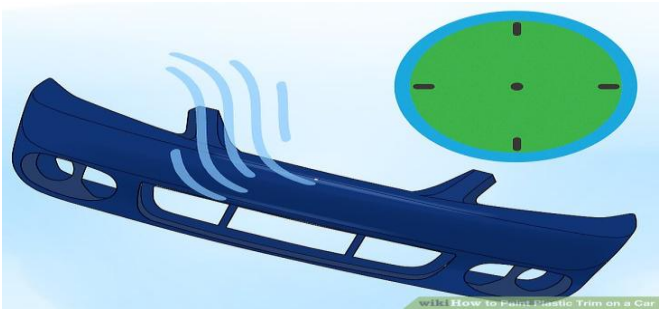
III. Applying the Paint

1. Apply a coat of spray paint made for plastic for the best adhesion. Hold the can of spray paint about 6 in (15 cm) from your trim, and press the button to apply the paint. Move back and forth across the surface of your trim so you apply a thin and even coat. When you finish spraying from one direction, apply the paint from the other side of the trim.[8]
    - You only need to paint the side of the trim that's visible when it's on your car. You can paint the back side of the trim if you want.

Tip: If you're painting a hard plastic, such as ABS or PVC, start spraying while the adhesion promoter is still wet. If you're spraying a flexible plastic, like TPO or PP, wait for the adhesion promoter to dry completely.[9]



2. Let the first coat dry for 10 minutes before applying a second coat. Leave your first coat of paint for 10 minutes so it has time to set. When you apply your second coat, spray your paint in the opposite direction of your first coat. For example, if you sprayed from left to right for your first coat, spray up and down for your second coat. Make sure the paint evenly coats the trim so you don't see the plastic underneath.[10]
    - If you can still see the plastic underneath your paint after your second pass, then apply a third coat once the trim is dry again.



3. Allow the trim to dry for 1 hour after all the coats are applied. Once you have all your coats applied, leave for an hour so it has time to completely set. Keep the trim in a well-ventilated area so the paint fumes don't build up. Test a discrete area of the trim with your finger to see if the paint still feels sticky. If it does, let it dry longer.[11]
    - It may take more or less time for the paint to dry depending on your climate.

4. Apply a clear coat enamel once the trim is dry if you want a glossy finish. Clear coat enamel hardens the surface of your trim to protect against future damage and also adds a glossy finish. Hold the can of clear coat 6 in (15 cm) from the trim and apply a thin coat across the entire surface of your trim. Once you have the clear coat applied, allow it to dry for 2-3 hours.
    - You can buy clear coat enamel from paint supply or hardware stores.
    - You don't need to apply a clear coat if you don't want to.

3.1.4. Glasswork

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.

Types of glass

There are two types of glass used in today's vehicles: laminated and tempered. Both are considered safety glass.

They may or may not be tinted (Figure below)

Figure 1 The doors and glass are important structural members in a modern vehicle. They must be serviced properly for the driver and passengers to be safe while driving.

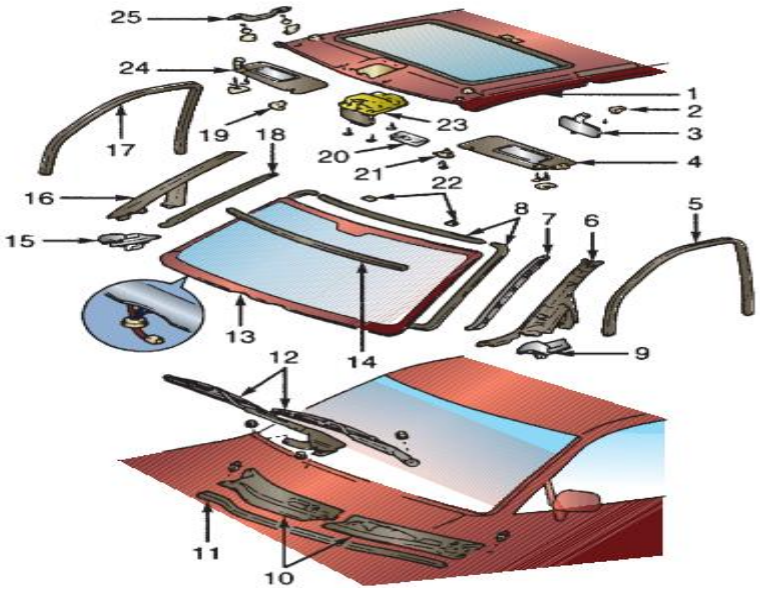
Laminated plate glass consists of two thin sheets of glass with a thin layer of clear plastic (vinyl) between them. It is used to make all windshields and some side glass. The plastic or vinyl material is usually clear to pro- vide an unimpeded view from all angles. When laminated glass is broken, the plastic material helps to hold the shattered glass in place and prevent it from causing injury (below)

Figure 2 Lamination kept this windshield glass intact upon impact. Tempered glass would have shattered into small pieces. Air bag deployment often shatters windshield glass.

The replacement of a windshield and a rear window follow almost identical procedures, varying slightly for different makes of vehicles. Replacement of windshield glass involves two different methods based on the materials used: rubber gasket installations or adhesive installations. The adhesive-type installation is further reined into two additional methods: the full cutout and the partial cutout method.

The partial cutout method takes advantage of the fact that if most of the adhesive is in good condition and of sufficient thickness, it can be utilized as a base for the application of new adhesive. When the original adhesive is defective or requires complete removal, the full cutout method must be used.

The gasket installation was more predominant in older vehicles but still finds use in present-day, high-end



1. Headliner
2. Mirror cover
3. Rear view mirror
4. Sun visor
5. Front door opening trim
6. Front pillar garnish
7. Side reveal outer molding
8. Dam
9. Instrument side panel
10. Cowl louver
11. Weatherstrip
12. Wiper arm
13. Windshield glass
14. Upper reveal outer moulding
15. Instrument side panel
16. Front pillar garnish
17. Front door opening trim
18. Side reveal outer molding
19. Holder
20. Lens
21. Holder
22. Stopper
23. Map light assembly
24. Sun visor
25. Assist grip

FIGURE 3 Study the typical parts relating to windshield service. (Courtesy of Mitchell 1)

3.1.5. Bonnets

Replacing a car bonnet is a rather straight forward process, as long as you have someone to help you complete the change over. This job can be done in 10-20 mins. Different car bonnets will be slightly different but they are all pretty straight-forward jobs.

Step 1

Begin by opening the car bonnet and propping it up using the prop rod. Get your helper to stand at one side of the bonnet and hold it up. You will need a ratchet with the correct sized head, probably 10mm. You may want to check your manufacturer's manual to find out the exact size and other information before starting the job.

Step 2

The car bonnet is attached at the hinges by either two or three bolts. Remove the bolts from one side and get your assistant to go over to that side of the vehicle and help hold up the bonnet.

Step 3

Go to the other side and remove the bolts from the hinges. Now you should remove the prop rod reminding your partner to take the weight. Both remove the old car bonnet from the vehicle and place to the side.

Fitting the new car bonnet

After you have done all the above you are now ready to place the new car bonnet. Take the new car bonnet and put it in place.

Step 1

Put up the prop rod to take some of the weight while your assistant holds it in place. Tighten the bolts on one side and then the other. Make sure that all the bolts are tightened correctly and remove the prop rod, closing the car bonnet.

Step 2

Check that the bonnet fits well. If it is slightly aligned out of position then loosen the bolts and move the bonnet until there is an even space on each side and tighten the bolts again. Check it fits ok and away you go!

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. _____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).?.(2point)
2. List out the Types of glass?(2point)
3. _____plate glass consists of two thin sheets of glass with a thin layer of clear plastic (vinyl) between them?(2point)

Note: **Satisfactory rating - 4 and 6 points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Question

1._____

2._____

3._____

Information Sheet-2	Applying Primers/primer surfaces

Auto paint primer, or just primer for short, is an area of auto painting that is full of misunderstanding.

It has been regarded as a term simply referring to one product that adequately prepares car bodies for the application of paint materials.

It has also been believed that thick auto paint primer will hide dents and scratches, even out body surfaces and allow paint to cover evenly.

Bizarrely, some people have even thought that auto paint primer should be used to eliminate rust problems!

The opposite is more the case as many primers, except epoxy primers, are indeed very permeable (having holes) therefore soaking up moisture.

This will only lead to an increase in the build-up of rust beneath the level of auto paint primer.

What are primers?

Primers are materials that are applied over bare metal once the metal has been properly prepared.

What category are they labeled under?

Their category comes under the different products that are separately designed to provide a variety of surface preparation functions.Together, they can be classed as undercoats: those materials applied to auto body surfaces in preparation for paint applications.These would also include:

- Epoxy Primer
- Primer (Primer-Surfacer)
- Paint Sealer

Epoxy Primer -

Epoxy primers are used to waterproof and therefore protect bare metal from oxidation problems. By mixing them with an appropriate hardener, according to what it says on the label, you would apply the catalyst-type epoxy primers using a paint spray gun. One to two coats would be all that's required.

Two Application Methods:

1. You would be wise to apply epoxy primer to bare metal (once the old paint and any rust have been removed) before you would apply any other product.

You would do this for two reasons:

- Since they are waterproof, they protect the sheet metal.
- Epoxy primers offer excellent adhesion to metal and serve as a perfect base for additional undercoat products and top coats (paint).

2. Another approach would be to apply body filler directly to the bare metal and then seal the repair area once coats of primer have been applied and sanded.

Advantages of using Epoxy Primer

Epoxy primer does not require sanding for most of the time after it's been applied and allowed to cure properly, unless runs or imperfections develop when you apply it. In this case, use a fine-grit sandpaper to smooth blemishes. Then touch-up spots with a new coat of material if required.

Each manufacturer offers its own epoxy primer and you are advised to only use those designed for the paint system you have chosen.

If you are living in a region with exceptionally harsh corrosion conditions (such as when during winter there is always plenty of salt put onto the roads) to maximize oxidation, rust and

corrosion protection, apply catalyzed epoxy primers to bare metal and then do the same over any subsequent primer undercoats.

If you do live in an area like this, it may be a good idea also to consult with your nearest auto paint supply store and confirm with these people your intended application procedure for additional epoxy primer coats, just to be on the safe side.

II. Primer or Primer-Surface

Before we begin, here in the UK 'primer-surfacer ' is simply referred to as 'primer' whereas in the US 'primer-surfacer ' is the common term used. For the sake of ease writing this section, whenever 'primer' is written we indeed refer to 'primer-surfacer'.

When is Primer used?

After an auto body has had its sheet metal repaired and received its required coats ofepoxy primer, minor blemishes might still remain, such as sanding scratches from earlier bodywork repair.

To cover them use primer products manufactured by the same company that produced the rest of the paint system you are using.

With primer having a high solid content, it covers these tiny surface imperfections and will allow you to sand the coated surfaces to smooth heaven!

Primer is NOT a substitute for filler.

Whatever you do, never confuse primer with body fillers. The materials used in body fillers offer a lot more strength and durability than primer will ever do.

Primer is only intended to be sprayed on surfaces to fill very slight sand scratches or other tiny surface blemishes.

Primer is the final undercoat product that is designed to be sanded and smoothed. Anything applied after them are simply used to seal based materials from absorbing paint solvents or to increase overall paint adhesion.

Therefore, you must make sure that your application of primer is uniform and all sanding be performed in a controlled and organized manner. How to avoid problems along the way.

Refrain from washing or driving your vehicle during periods of wet weather while your vehicle is displaying only a primer finish, this is because some types of primer can actually absorb water.

This water can unfortunately become trapped inside this permeable material and remain there after paint has been applied and cured.

At this point, the moisture would move in one of two directions or both:

- Down - it would find its way to bare metal and start the process of corrosion or if epoxy primer stands in the way,
- Up - travel toward the surface to cause problems with the newly applied paint finish.

Always read information sheets and application guides that come with the primer products you buy. Remember, you can always ask for extra guidance from your nearest auto paint supply store.

Purchase plenty of sandpaper of the proper grit for smoothing the primer down with after you've applied it.

The correct process when applying primer.

1. Apply 2-3 coats of primer, allowing sufficient time in between coats for it to cure properly,
2. Apply a guide coat of matte black spray paint to aid your sanding down progress,
3. Using 800-grit wet and dry sandpaper - flat down the finish until perfectly smooth.

III. Paint Sealer

The ultra simplistic definition of paint sealer is that it forms a sort of barrier between the undercoat and top coat (paint), it seals.They really can be the difference between an adequate paint job and an excellent one. In providing a little more detail, the purpose of sealers is:

- To protect undercoats from the materials and solvents in subsequently applied paint top coats.
- Add maximum adhesion capabilities for those top coats.
- Ensure a uniform color match.

When applying new paint over an existing painted surface, you would be wise to consider the use of a sealer, especially when you aren't sure what type or brand of paint is currently on the finish of the vehicle.

Advantages of using Paint Sealer.

Sealers do not require sanding for most of the time after they've been applied and allowed to cure properly, unless runs or imperfections develop when you apply them. In this case, use a fine-grit sandpaper to smooth blemishes. Then touch-up spots with a new coat of material if required.

It would also be to your advantage to use sealers for jobs on which new paint will be applied over factory finishes that were baked on at temperatures around 450 degrees F.

New paint will have a difficult time penetrating the surface of these hard and durable paint finishes in order to achieve maximum adhesion.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are primers(point 3)
2. What is Advantages of using Epoxy Primer?.(5point)
3. What is the purpose of sealers ?(2point)

Note: **Satisfactory rating – 6 and 10 points** **Unsatisfactory - below 6 and 10 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

1._____

_____

_____

2._____

_____

_____

3..

A_____

b._____

c_____

Information Sheet-3	Carrying out application

Figure

1. Achieving Proper Adhesion

   To achieve proper adhesion of a primer surface, its necessary to first prepare the repair area properly.

2. Sand

   To begin, sand all recessed areas and panel edges with a red scuff pad.

3. Clean Repair Area

   Then wash area with an appropriate PPG cleaner being sure to avoid spraying the cleaner directly on the body filler. Completely dry with a clean cloth.

4. Masking

   Next, mask off the adjoining areas as necessary to protect from any overspray.

5. Apply Self-Etching Primer

   Then, apply a self-etching primer to any exposed bare metal areas, following the product's proper application procedures.

6. Mix Primer Surfacer

   Next, mix the primer surfacer following the product's instructions. If you're not planning on applying a primer sealer after the surfacer, be sure to mix the recommended G-shade for the vehicle color being repaired.

7. Apply First Coat of Primer Surfacer

   The first coat of the surfacer should be applied medium wet and extend just beyond the repair edge.

8. Apply Additional Coats of Primer Surfacer

   Then apply 2-4 additional coats, staying within the repair area to minimize its size. This is called “reverse priming.” Allow each coat to flash to a uniform, dull appearance before applying the next.

9. Flash and Dry

   After the primer has flashed completely to a matte finish, allow to air dry at the ambient temperature or force dry according to the product’s instructions.

10. Final Sanding

    Once dry, you’re ready to sand the primer surfacer, following the recommended procedures.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. Write at list five procedure to Apply Primer Surfacer (point 5)

Note: **Satisfactory rating – 3 and 5 points** **Unsatisfactory – below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

1._____

2._____

3. ._____

4. _____

5. _____

Information Sheet-4	Completing work without damage

The best way to avoid auto repair rip-offs is to be prepared. Knowing how your vehicle works and how to identify common car problems is a good beginning. It's also important to know how to choose a good mechanic, the kinds of questions to ask, and your consumer rights. This kind of information may help you keep a lid on mechanical mistakes.

- Repair Information
- Heading Off Problems
- Trouble Shooting

Repair Information

How to Choose a Repair Shop

What should I look for when choosing a repair shop?

- Ask for recommendations from friends, family, and other people you trust. Look for a repair shop before you need one to avoid being rushed into a last-minute decision.
- Shop around by phone and online for the best deal, and compare warranty policies on repairs.
- Ask to see current licenses if state or local law requires repair shops to be licensed or registered. Make sure the shop will honor your vehicle's warranty.

Repair Charges: Unlocking the Mystery

Before you arrange to have any work performed, ask how the shop prices its work. Some shops charge a flat rate for labor on auto repairs. This published rate is based on an independent or manufacturer's estimate of the time required to complete repairs. Others charge on the basis of the actual time the technician worked on the repair.

If you need expensive or complicated repairs, or if you have questions about recommended work, consider getting a second opinion.

Find out if there will be a diagnostic charge if you decide to have the work performed elsewhere. Many repair shops charge for diagnostic time.

Shops that do only diagnostic work and do not sell parts or repairs may be able to give you an objective opinion about which repairs are necessary.

If you decide to get the work done, ask for a written estimate.

What should a written estimate include?

- It should identify the condition to be repaired, the parts needed, and the anticipated labor charge. Make sure you get a signed copy.
- It should state that the shop will contact you for approval before they do any work exceeding a specified amount of time or money. State law may require this.

What should I know about the parts to be repaired or replaced?

Parts are classified as:

- *New* — These parts generally are made to original manufacturer's specifications, either by the vehicle manufacturer or an independent company. Your state may require repair shops to tell you if non-original equipment will be used in the repair. Prices and quality of these parts vary.
- *Remanufactured, rebuilt and reconditioned* — These terms generally mean the same thing: parts have been restored to a sound working condition. Many manufacturers offer a warranty covering replacement parts, but not the labor to install them.
- *Salvage* — These are used parts taken from another vehicle without alteration. Salvage parts may be the only source for certain items, though their reliability is seldom guaranteed.

What do I need after the work is done?

Get a completed repair order describing the work done. It should list each repair, parts supplied, the cost of each part, labor charges, and the vehicle's odometer reading when you brought the vehicle in as well as when the repair order was completed. Ask for all replaced parts. State law may require this

Heading Off Problems

The more you know about your vehicle, the more likely you'll be able to head off repair problems. You can detect many common vehicle problems by using your senses: eyeballing the area around your vehicle, listening for strange noises, sensing a difference in the way your vehicle handles, or even noticing unusual odors.

Looks Like Trouble

Small stains or an occasional drop of fluid under your vehicle may not mean much. But wet spots deserve attention; check puddles immediately.

You can identify fluids by their color and consistency:

- Yellowish green, pastel blue or florescent orange colors indicate an overheated engine or an antifreeze leak caused by a bad hose, water pump or leaking radiator.
- A dark brown or black oily fluid means the engine is leaking oil. A bad seal or gasket could cause the leak.
- A red oily spot indicates a transmission or power-steering fluid leak.
- A puddle of clear water usually is no problem. It may be normal condensation from your vehicle's air conditioner.

Smells Like Trouble

Some problems are under your nose. You can detect them by their odor:

- A thick acrid odor usually means burning oil. Look for sign of a leak.
- The smell of gasoline vapors after a failed start may mean you have flooded the engine. Wait a few minutes before trying again. If the odor persists, chances are there's a leak in the fuel system — a potentially dangerous problem that needs immediate attention.
- Burning resin or an acrid chemical odor may signal overheated brakes or clutch. Check the parking brake. Stop. Allow the brakes to cool after repeated hard braking on mountain roads. Light smoke coming from a wheel indicates a stuck brake. The vehicle should be towed for repair.

Sounds Like Trouble

Squeaks, squeals, rattles, rumbles, and other sounds provide valuable clues about problems and maintenance needs. Here are some common noises and what they mean:

Squeal — A shrill, sharp noise, usually related to engine speed:

- Loose or worn power steering, fan or air conditioning belt.

Click — A slight sharp noise, related to either engine speed or vehicle speed:

- Loose wheel cover.
- Loose or bent fan blade.
- Stuck valve lifter or low engine oil.

Screech — A high-pitched, piercing metallic sound; usually occurs while the vehicle is in motion:

- Caused by brake wear indicators to let you know it's time for maintenance.

Rumble — a low-pitched rhythmic sound.

- Defective exhaust pipe, converter or muffler.
- Worn universal joint or other drive-line component.

Trouble Shooting

Car trouble doesn't always mean major repairs. Here are some common causes of trouble and techniques to help you and your technician find and fix problems:

- *Alternator* — Loose wiring can make your alternator appear defective. Your technician should check for loose connections and perform an output test before replacing the alternator.
- *Battery* — Corroded or loose battery terminals can make the battery appear dead or defective. Your technician should clean the terminals and test battery function before replacing the battery.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next

1. How to identify fluids by their color(5point)

Note: **Satisfactory rating -3 and 5points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

2..._____

_____

3..._____

_____

4._____

_____

Operation Sheet 1	Techniques of Applying Primers/primer surfaces using approved methods, materials and equipment.

Step -1 to achieve proper adhesion of a primer surface, its necessary to first prepare the repair area properly.

Step – 2 To begin, sand all recessed areas and panel edges with a red scuff pad.

Step – 3 Then wash area with an appropriate PPG cleaner being sure to avoid spraying the cleaner directly on the body filler. Completely dry with a clean cloth.

Step – 4 mask off the adjoining areas as necessary to protect from any overspray.

Step – 3 Apply Self-Etching Primer

Step – 5 Next, mix the primer surfacer following the product's instructions.

Step – 6 Apply First Coat of Primer Surfacer

LAP Test 1	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary painting material, tools and materials you are required to perform the following tasks within 3-4 hours.

Task 1: Apply Primers/primer surfaces using approved methods, materials and equipment

Reference books

1. A.Robinson and W.A.Liversey,2004. ***THE REPAIR OF MOTOR BODIE***S,
2. Britain (Butterworth-Heinemann publication), Fourth Edition ISBN 0 7506 45172.
3. Porter, Lindsay. ***THE CAR BODY WORK REPAIR MANUAL.*** New edition
4. Robert Scharff and James E.Duffy, 1992. ***MOTOR BODY REPAIR*** .United States Of America, 3rd edition .ISBN 0827368585
5. Scharff.Robert. ***MOTOR AUTO BODY REPAIR.*** Third edition
6. Alan Robinson, 1997. ***THE REPAIR OF VEHICLE BODIES***. British 3rd edition, ISBN 0 7506 0955 9
7. L.C.Rhone, 1983***. TOTAL AUTO BODY REPAIR***. United States of America, second Edition. ISBN 0 02 682110 9
8. A.G.Deroche, 1996***. THE PRENCIPLES OF AUTO BODY REPAIRING AND REPAINTING***. United States of America, sixth Edition. ISBN 0-13- 440033 Alan Robinson, 1993. ***THE REPAIR OF VEHICLE BODIS.*** Great Britain, Second Edition. ISBN 0 7506 0159 0
9. John D. Anderson, JR., 1991. ***FUNDAMENTALS OF AERODAYNAMICS*** Singapore, Second Edition. ISBN 0 07 100767 9

Vehicle Painting and Body Repair

Level II

Learning Guide-#38

Unit of Competence: Prepare Vehicle Components for Paint Repairs

Module Title: Preparing Vehicle Components For Paint Repairs

LG Code: EIS VHP2 M011 LO4-LG38

TTLM Code: EIS VHP2 M011 TTLM 0919v1

LO 4: Prepare primed surface for refinishing material

Instruction Sheet	Learning Guide #38

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

- Preparing surfaces to be refinished
- Carrying out preparation
- Completing work without causing damage
- Disposing waste materials

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

- Prepare Surfaces to be refinished using approved methods, materials and equipment.
- Carry out Preparation activities according to industry regulations/guidelines, WHS legislation, and enterprise procedures/policies.
- Complete Work without causing damage to any component or system.
- dispose Waste materials of in accordance with statutory and enterprise requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1 and Sheet 2”.
4. Accomplish the “Self-check 1 and Self-check 2” **in page -1148 and 1153** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1” **in page -1154.**
6. Do the “LAP test” **in page – 155** (if you are ready).

Information Sheet-1	Preparing surfaces to be refinished

Purpose of Refinishing

Automobile finishes perform four very important functions:

1. Protection – protection of the occurrence of rust.
2. Appearance improvement- refinishing improve the body appearance by giving it a three dimensional color effect.
3. Increased value-A vehicle with the most beautiful paint finish will have a higher market valve.
4. Color designation- is used for easily distinguishing automobiles of special purposes. E.g. Police and fire department vehicles.

When preparing to paint a vehicle, you must first decide what type of repair is called for: spot repair, panel repair, or overall repainting of the whole vehicle. You must order or mix all re finish materials needed to complete the repair. You must also check what type of paint is already on the vehicle and check whether the vehicle has been repainted before.

If spot or panel repair is planned, it is important to pur-chase or mix the topcoat color to accurately match the original paint color. When planning an overall re finish, the customer may want to match an old finish or choose a completely new color

Types of refinishing repair

There are three general types of refinishing repairs

Spot refinishing repair

- Spot repair involves painting an area smaller than a panel.
- The paint must be blended out to match the existing finish.
- Spot repair generally involves the following
    a. Minor body repair
    b. Metal conditioning
    c. Application of under coat system
    d. Application of top coat blend into the old finish surrounding the repair

2. **Panel refinishing repair**

Panel repair involves painting a complete body part separated by a definite boundary such as a door or fender.

3**. Overall Repainting of the entire vehicle**

- Here the whole vehicle is painted. Reasons are:-
- Size and/or number of spots to be repainted
- Dull, cracked, or worn finish
- color change desired by owner

Refinishing materials

A vehicle body is protected by a complete finishing system. All parts of the system work together to protect the vehicle from ultraviolet radiation, weathering, pollutants, and corrosion.

Refinishing materials is a general term referring to the products used to repaint a vehicle. Refinishing material chemistry has changed drastically in the past few years. New paints last longer but require more skill and safety measures for proper application.

The substrate is the metal, fiberglass, or plastic material used in the vehicle's construction. It will affect the selection of refinishing materials.

A basic finish consists of several coats of two or more different materials.

The most basic finish consist of

4. under coat or primer coat
5. Topcoat(color coat or basecoat/clear
6. Topcoat (color coat or basecoat/clear coat).

Automotive refreshing materials

Function of Automobile paint materials

Function nomenclature	Primary Objective	Use and Feature
Primer	Adhesion and anticorrosion	Apply directly to panel surface
Primer surface	Adhesion anticorrosion and smoothness	Intermediate b/n primer and surface. Applied to metal surface or over primer
Putty	Filler	To smooth out rough spots
Sealer	Prevent absorption of topcoat	Intermediate b/n surface and topcoat
Top coat	Upgrades external appearance	Gives color, gloss, and body to help upgrade merchandizing valve

Use of three major types of putties and body fillers.

	Body filler	Polyester putty	Lacquer putty
Primary use	Used to smooth out large depression and fill in scratches	Used to fill holes in body filler and sand paper scratches in the metal	Used to cover pinholes and small scratches after application of primer surface, and to fill in small scratches in the old paint film
Maximum film thickness per application	Below ¼"	Below 1/8"	Below 1/6"

In summary, the selection of one or more undercoats will be determined by the following characteristics of a job

- Type of surface bare metal or previously finished
- Condition of that surface repaired area or sanded aged finish

Under coat refinishing system

Purpose of undercoats:

Most surfaces must be undercoated before refinishing for several reasons

- To fill scratches to provide a good base for application
- To promote adhesion of the top coat.
- To assure corrosion resistance.
- To prevent top coat absorption and add the gloss level.

Under coats contain pigment, binder and solvent.

- There are four general or basic types of liquid undercoat products
- Primer
- Primer Surface
- Primer Sealer
- Sealer

The decision to apply a primer, a primer sealer or primer surfacer by itself or combined with putty and/or a sealer depends on three factors.

- The conditions of the substrate -smooth or rough, bare or painted.
- The type of finish (old or new) on the substrate
- The type of finish to be used for the top coat

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. **What are the** basic types of liquid undercoat products**? (2point)**
2. List at least three major types of putties and body fillers? **2point)**
3. _____general term referring to the products used to repaint a vehicle..

   2point)

Note: **Satisfactory rating – 4 and 6 points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. .
   - **a**_____
   - **b.**_____
   - **c**_____
   - **d.** _____
   - **b.**_____
2.
   1. _____
   2. .**_____**
   3. _____
3. _____

Information Sheet-2	Carrying out preparation

Safety Precautions

Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).

Surface Preparation

- Inspect, remove, store, and replace exterior trim and molding.
- Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.
- Inspect and identify substrate, type of finish and surface condition; develop a plan for refinishing using a total product system.
- Remove paint finish.
- Dry or wet sand areas to be refinished.
- Featheredge broken areas to be refinished.
- Apply suitable metal treatment or primer.
- Mask trim and protect other areas that will not be refinished.
- Mix primer, primer-surfacer or primer-sealer.
- Apply primer onto surface of repaired area.
- Apply two-component finishing filler to minor surface imperfections.
- Dry or wet sand area to which primer-surfacer has been applied.
- Dry sand area to which two-component finishing filler has been applied.
- Remove dust from area to be refinished, including cracks or moldings of adjacent areas.
- Clean area to be refinished using a final cleaning solution.
- Remove, with a tack rag, any dust or lint particles from the area to be refinished.
- Apply suitable sealer to the area being refinished when sealing is needed or desirable.
- Scuff sand to remove nibs or imperfections from a sealer.

Spray Gun and Related Equipment Operation

- Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).
- Check and adjust spray gun operation for HVLP (high volume, low pressure) or LVLP (low volume, low pressure) guns.

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

Paint Mixing, Matching, and Applying

- Determine type and color of paint already on vehicle by manufacturer's vehicle information label.
- Shake, stir, reduce, catalyze/activate, and strain paint according to manufacturer's procedures.
- Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next

1. List at least five Surface Preparation procedure ? (5point)

Note: **Satisfactory rating – 3 and 5 points** **Unsatisfactory – below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1..

a_____

b. _____

c. _____

d. _____

e_____

Operation Sheet 1	Techniques of disposing Waste materials of in accordance with statutory and enterprise requirements

Step 1- Sort your garbage into a few different bins. This can be done quickly by setting up a multi-storage bin in your kitchen so items can be sorted as they are disposed.

Step 2- Bring any garbage that can be reused, such as toys or clothing, to a secondhand store to be resold.

Step 2- Take recyclables such as glass, plastics and paper to a local recycling center. If your neighborhood has a recycling pick-up, leave it out in the front of your house in plastic bins. Don't use plastic garbage bags as this only contributes to the waste.

Step 2- Turn food and garden waste into compost. You can do this with a simple compost pile, or speed things up with a compost bin filled with worms that will digest the trash and do the work for you. Once it's completely composted, you can use it in your garden as a rich fertilizer.

Step 2- Collect any remaining garbage into a trash bag and place it into a garbage bin. Remember to seal the top so that animals won't be able to get into it. Leave the bin in sight for garbage collectors on your pick up day.

LAP Test 1	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary tools and materials you are required to perform the following tasks within 2 hours.

Task 1: dispose Waste materials of in accordance with statutory and enterprise requirements

Reference books

1. A.Robinson and W.A.Liversey,2004. ***THE REPAIR OF MOTOR BODIE***S,
2. Britain (Butterworth-Heinemann publication), Fourth Edition ISBN 0 7506 45172.
3. Porter, Lindsay. ***THE CAR BODY WORK REPAIR MANUAL.*** New edition
4. Robert Scharff and James E.Duffy, 1992. ***MOTOR BODY REPAIR*** .United States Of America, 3rd edition .ISBN 0827368585
5. Scharff.Robert. ***MOTOR AUTO BODY REPAIR.*** Third edition
6. Alan Robinson, 1997. ***THE REPAIR OF VEHICLE BODIES***. British 3rd edition, ISBN 0 7506 0955 9
7. L.C.Rhone, 1983***. TOTAL AUTO BODY REPAIR***. United States of America, second Edition. ISBN 0 02 682110 9
8. A.G.Deroche, 1996***. THE PRENCIPLES OF AUTO BODY REPAIRING AND REPAINTING***. United States of America, sixth Edition. ISBN 0-13- 440033 Alan Robinson, 1993. ***THE REPAIR OF VEHICLE BODIS.*** Great Britain, Second Edition. ISBN 0 7506 0159 0
9. John D. Anderson, JR., 1991. ***FUNDAMENTALS OF AERODAYNAMICS*** Singapore, Second Edition. ISBN 0 07 100767 9

Vehicle Painting and Body Repair

Level II

Learning Guide-#39

Unit of Competence: Prepare Vehicle Components for Paint Repairs

Module Title: Preparing Vehicle Components For Paint Repairs

LG Code: EIS VHP2 M011 LO5-LG-39

TTLM Code: EIS VHP2 M011 TTLM 0919v1

LO 5: Cleanup work area and maintain equipment

Instruction Sheet	Learning Guide #39

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

- Collecting and storing Material
- Removing waste and scrap
- Cleaning and inspecting equipment and work area
- Tagging unserviceable equipment Identifying faults
- Completing operator maintenance
- Maintaining tools and equipment

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

- Collect Material that can be reused and stored.
- Remove Waste and scrap following workplace procedure.
- Clean and inspect Equipment and work area for serviceable condition in accordance with workplace procedures.
- Tag and identify faults Unserviceable equipment is in accordance with workplace procedures.
- complete Operator maintenance in accordance with manufacturer/component supplier specifications and worksite procedures.
- Maintain Tooling in accordance with workplace procedures.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5 and Sheet 6”.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3 Self-check 4 Self-check 5 and Self-check 6” **in page -164, 169, 174,178,186 and 214** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1 ” **in page -216.**
6. Do the “LAP test” **in page – 217** (if you are ready).

Information Sheet-1	Collecting and storing Material

5.1.1. Paint primers and cleaning materials

Automotive primer acts as a bonding agent to help the paint adhere more strongly to the body of the vehicle. paint primer helps prevent rust and moisture damage to your vehicle by adding a couple of extra protective layers

Materials and Tools:

- Paper, tarp or other covering
- Masking tape
- Grease or wax remover
- Fine sandpaper and thick grit sandpaper
- Primer
- Goggles and dust mask
- Putty
- Car washing and cleaning materials

Step 1: Remove Dirt

The very first step is washing the car to get rid of any dirt or grit. If you do not wash your car then any dust, grit or dirt can interfere with the primer and paint adhering to the car. Besides washing your car you also need to use a grease or wax remover in order to get rid of that dirt that does not wash off using soap or water.

Step 2: Sand the Car

Now that the car is clean it is necessary to sand down any rough areas. For very tough spots use the tough grit sandpaper as smaller areas can be done using finer sandpaper. If you find any holes or dips that need to be fixed, fill them with putty and then sand the area down. You want all imperfections taken care of in order to have a level and smooth area to paint.

Step 3: Let your Car Dry

Make sure the car is completely dry before you start painting. This can take a few hours after washing the car, but it really will depend on the weather. You can prevent any dust from settling on the car by grounding a wire from the car frame to a grounded object near the car.

Step 4: Cover areas not to be Painted

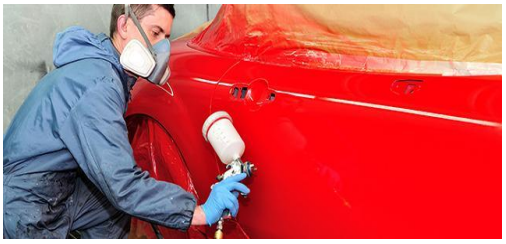
It is important to cover all areas that you do not want paint on. You can use paper or cloth and cover all the mirrors, windows, chrome and other areas. Makes sure you tape down all edges with masking tape. This is very similar to taping over molding when painting a wall. If you go over the edge you can just peal the paper away and you will not have any problems.

Step 5: Priming

The first step to completely painting a car is priming the car. Make sure you use a paint primer exterior as this will be tougher then interior primers. You also can apply a primer clear coat if desired. You want to apply the primer evenly to any area that is to be painted. Primer is needed to make sure the paint adheres to the car. Paint will stick much better to a car with primer than to a car that has not been primed. If you are applying primer indoors then it is necessary to make sure there is good ventilation. You also need to cover up any exposed skin, wear eye protection and wear a dust mask so you do not inhale any primer.

Step 6: Sand Car again

It may be necessary to sand down your car again after the primer is dried. Many times applying the primer can cause mounds or dips in areas and you want to smooth these out as much as possible. Only use fine grain sandpaper for the primer as you do not want to sand off the primer.



Primers have several unique characteristics:

- Adhesion – they provide a strong bond between the sheet metal or old paint and the new paint
- Rust resistance – they resist the formation of rust where they adhere to the sheet metal
- 'Build' – they're able to fill sanding and grinding marks in old paint, sheet metal and fillers
- Sanding ease – they can be sanded smooth and levelled quickly and easily
- 'Hold out' – they prevent the paint from soaking in, which results in a dull finish
- Drying speed – a good high-build primer should be ready to sand in as little as 30 minutes

The two main types of primers are: Primer lacquer (also known as 1K or 1-pack, or just Primer) and Etch primer.

Primer Lacquer

This type of primer is normally available as 'high-build' primer. High-build primer has three main functions:

- To provide a relatively thick coating which will fill any small imperfections (eg. minor scratches and sanding marks) in the finish underneath.
- To provide an element of stone chip resistance; if a stone penetrates the top-coat, the high-build primer has an element of elasticity to absorb the impact, preventing the chip from penetrating through to the bare substrate underneath.
- To provide a coating which can be sanded to give a smooth, sound base on to which colour coat can be sprayed.

Etch primer

The purpose of etch primers is to replicate the cataphoretic dip priming process used by vehicle manufacturers to protect panels against corrosion. Etch primers contain an acid which etches bare metal, ensuring that there is a very strong bond between the primer and the panel surface. Etch primers are normally used on bare metal, but most types are equally effective on other materials such as plastic and Generally, etch primers do not require sanding, and 1K primer (high-build or otherwise) is usually spayed over the top before preparing the panel to receive the colour coat. Etch primers are the only primers suitable for use directly on galvanized panel's fiberglass (check the manufacturer's recommendations as to suitability for non-metallic surfaces).

Start spraying on the top, which is the hardest area to reach, and remember these hints:

- Throw the air hose over one shoulder and hold it away from the car with your other hand
- Wrap a piece of rag around the gun/cup connection point to keep paint from dribbling out when painting with the gun in a nozzle down position
- If the primer is going on correctly, it will appear smooth and wet for just a short time; if it looks grainy, the primer is too thick or you're holding the gun too far away from the surface
- If the primer runs, it's too thin or you're holding the gun too close to the surface
- If the primer alternates wet dry wet or wet runny wet, your passes are inconsistent

After the primer has dried for 20 or 30 minutes, the tape can be removed. Although it's possible to go right ahead and sand the car (dry) and follow with the paint, it's a good idea to allow the primer to cure for several days, or even a couple of weeks if possible.

The primer will shrink as it dries, so allow time for it to cure completely before painting

After the primer has cured and shrunk, use wax/silicone remover again, completely washing the car, even in the tiniest cracks. This is vital – any foreign substance will invariably ruin an otherwise perfect paint job. For instance, just the marks left by your fingers will leave dark splotches under the final colour. When washing the car with the solvent, always use clean, lint free rags.

Don’t use workshop rags, as they’re often cleaned with low-grade solvents that contain contaminants which will prevent good paint adhesion. If wax/silicone remover isn’t available, in a pinch you can use thinner, applied with a very wet rag and immediately wiped off with a dry rag. Don’t wait even a minute if you use thinner, as it’ll quickly soften the primer’s surface

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the two main types of primers?(point 2)
2. What are the purpose of etch primers?(point 2)
3. What are a unique characteristics of Primers :(point 2)

Note: **Satisfactory rating - 4 and 6 points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

   _____

2. _____

   _____

3. ..

   A_____

   B_____

   C_____

   D_____

   E_____

   F_____

Information Sheet-2	Removing waste and scrap

As a health and safety practitioner, implementing systems to manage and control waste in the workplace will fall within your remit. What approach should you take?

Waste and the law

Firstly, it is vital to know what waste is. Under the Environmental Protection Act 1990, the definition of waste is “any scrap material, effluent or unwanted surplus substance”, and “any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled”.

There are four categories of potential waste. It can be a substance or object that is:

- Worn but functioning
- Useable otherwise than by means of specialised waste recovery
- Useable only by specialized waste recovery establishments
- Unwanted, and which requires collection.

In England and Wales, the Environment Agency controls certain types of waste, known as “controlled wastes”. These include household, industrial and commercial waste, so it is likely that your organisation will produce controlled wastes.

How should waste be dealt with?

Under the Environmental Protection Act 1990, organisations have a duty to ensure that their waste is safely disposed of, in a way that adheres to the law.

The waste hierarchy was set out in the Waste Framework Directive, a 2008 European Union Directive. This ranks methods of managing and controlling it. In order of preference, these are:

- Prevention
- Preparation for reuse
- Recycling

- Other recovery
- Disposal.

Prevention involves using less material, keeping a product for a longer duration, reusing materials, and using materials that are less hazardous to the environment. Preparing for reuse involves checking, cleaning and repairing objects so that they avoid becoming waste.

The other three methods are concerned with what happens to waste once it has been created. Recycling it will turn it into a new product, whereas “other recovery” may involve, for example, incineration (with energy recovery). Disposal is the least preferred option, because the waste will end up as landfill, or be incinerated without any energy being recovered.

Identifying the waste your organization produces

Of course, merely knowing how best to prevent or otherwise handle waste does not constitute a strategy. Before formulating a strategy, it is necessary to quantify and classify your organisation’s waste streams.

Every type of waste produced by your organization will have its own particular impact on the economy, and its own suitable method of disposal. Every separate stream offers its own potential for reducing, reusing or recycling, which affects the demands placed on any waste management contractor your organization uses.

Identifying and classifying waste allows the health and safety practitioner to look at how best to separate streams and minimize costs, and develop individual strategies for each stream, by applying the waste hierarchy.

Waste streams may be categorised as follows:

- General refuse
- Paper
- Production scrap
- Construction waste
- Special wastes.

General refuse includes waste such as litter bin contents. There may be items placed in bins that could be recovered, so it is important to check whether any recovery or recycling programmes are in place to reduce the amount of waste that goes into general refuse. For example, used polystyrene cups may be recovered by vending machine operators, and printer cartridges may be collected by charities

Developing a waste management strategy

Firstly, having identified the different waste streams within your organisation, you should account for the waste that is produced. Carry out an audit to determine how much is generated, and what costs are involved.

Secondly, compare your organisation's performance with industry standards. Determine whether best practice is being followed.

Thirdly, walk around your organisation to gauge opportunities to minimise waste. Ask questions and listen to what staff members tell you, then use this information to build a case to present to senior management.

Fourthly, present your case and make it clear to the senior management team that reducing waste will cut costs. Of course, you will need resources to implement waste reduction measures, so demonstrate the need for sufficient funding to them. When you receive the necessary resources, form a working group to generate ideas.

Fifthly, take action. Begin with the areas in which immediate savings could be made with the minimum of cost and effort. Ensure that waste management is enshrined in your organization's policies and procedures, too.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the four categories of potential waste?(point 5)

Note: **Satisfactory rating - 3 and 5points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1..

a. _____

b. _____

c. _____

d. _____

e. _____

Information Sheet-3	Cleaning and inspecting equipment and work area

Effective house keeping can eliminate some workplace hazards and help get a job done easily and properly.

A good housekeeping program plans and manages the orderly storage and movement of materials from point of entry to exit. It includes a material flow plan to ensure minimal handling.

Worker training is an essential part of any good housekeeping program. They should be reporting any unusual conditions or hazards as well as obeying posted warning signs.

The final addition to any housekeeping program is inspection. It is the only way to check for deficiencies in the program so that changes can be made.

Floors and other areas

Clean up spills such as oil on floors immediately. Floors should be free of debris and accumulations of dust. Areas that cannot be cleaned continuously, such as entranceways, should have anti-slip flooring.

Replace any worn, ripped or damaged flooring that poses a tripping hazard. Repair all trap doors and railings. Any equipment or tools not in use should be removed from the work area.

Guard floor openings. Trap doors, cages or railings around hay chutes will prevent anyone from accidentally falling into them.

Cut down and remove weeds and brush from around buildings. They can hide tripping hazards.

Maintain light fixtures

All buildings and yards should be adequately lighted. Dirty light fixtures reduce essential light levels. Light fixtures in storage areas containing combustible materials should be protected against breaking (i.e. explosion proof fixtures).

Maintain lighting evenly, since shadows mixed with light spots inside animal handling facilities will increase the animal's fear and tension.

Aisles and stairways

Aisles and stairways should be clearly marked and kept clear of objects that can cause trips and falls.

Aisles should be wide enough to accommodate people and vehicles comfortably and safely. Warning signs and mirrors can improve sight lines at blind corners. Properly arranged aisles encourage people to use them so that they do not take "shortcuts" or "bottleneck" storage. Stairways and aisles also require adequate lighting.

Spill control

The best way to control spills is to stop them before they happen. Regularly cleaning and maintaining machines and equipment is one way to do this. Another is to use drip pans and guards where possible spills might occur. When spills do occur, it is important to follow cleanup procedures as indicated on the Material Safety Data Sheet.

Spills must be cleaned up immediately. Absorbent material is useful for wiping up greasy, oily or other liquid spills. Used absorbents must be disposed of properly and safely.

Tools and equipment

Keeping tools neat and orderly can be very important to everyone's safety, whether in the tool room, on the rack, in the yard, or on the bench.

Returning tools promptly after use reduces the chance of them being misplaced or lost. Workers should regularly inspect, clean and repair all tools and take any damaged or worn tools out of service.

Maintenance

A good maintenance program provides for the inspection, maintenance, upkeep and repair of tools, equipment, machines and processes.

Maintenance involves keeping buildings, equipment and machinery in safe efficient working order and in good repair. This includes maintaining sanitary facilities and regularly painting and cleaning walls, maintaining windows, damaged doors, defective plumbing and broken floor surfaces.

Waste disposal

The regular collection, grading and sorting of scrap contributes to good housekeeping practices. Allowing materials to build up on the floor wastes time and energy since additional time is required for cleaning it up.

Placing scrap containers near where the waste is produce encourages orderly waste disposal and makes collection easier. All waste receptacles should be clearly labeled (e.g., recyclable glass, plastic, metal, toxic and flammable etc.) All waste containers should be emptied regularly.

Storage

Stored materials should allow at least one meter (or about 3 feet) of clear space under sprinkler heads. Stacking cartons and drums on a firm foundation and cross tying them, where necessary reduces the chance of their movement. Stored materials should not obstruct aisles, stairs, exits, fire equipment, emergency eyewash fountains, emergency showers, or first aid stations.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. _____ involves keeping buildings, equipment and machinery in safe efficient working order and in good repair (point 2)

2. _____ an essential part of any good housekeeping program? (Point 2)

Note: **Satisfactory rating - 3 and 4 points** **Unsatisfactory - below 3 and 4 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2._____

Information Sheet-4	Tagging unserviceable equipment Identifying faults

Identification of fitted equipment can sometimes be difficult because assembled equipment can have their identification numbers obscured by cover plates. Consequently, all fitted equipment not fitted to an installation equipment number must be under the control of either a serviceable equipment tag or an unserviceable equipment tag, one of which should be physically attached to the unit. In each case, the tag serves to identify the item of equipment to which it is attached. The Equipment Tracing Module allows you to enter a tag number to identify the equipment to which it is attached.

Unserviceable Tag

The unserviceable tag is created by the maintenance personnel who defit the fitted equipment. It has three copies:

- The original copy is attached to the removal work order and is routed directly to the planning officer or work area centre to record removal of the fitted equipment.
- The second copy is directed to the rebuild workshop as notification of a pending rebuild or overhaul requirement. It contains the necessary information to provide the work centre with advanced warning of the pending overhaul or rebuild.
- The last copy is securely attached to the fitted equipment, possibly in a plastic bag for protection, and serves as transmittal instructions to either the rebuild workshop or the warehouse for subsequent shipment to an offsite supplier.

Serviceable Tag

The serviceable equipment tag is created at two locations only:

- Rebuild workshop when a reconditioned unit is reassembled.
- Stores receiving when a reconditioned unit is returned from a supplier.

The tag has four copies:

- Assembly - related to a rebuild work order.
- Stock receipt - related to a stores credit requisition.
- Stock requisition - related to a stores requisition or purchase order.
- Fitment - related to fitment work order.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. List out a tag four copies
2. What are a two locations serviceable equipment tag is created

Note: **Satisfactory rating - 3 and 4 points** **Unsatisfactory - below 3 and 4 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1…

1._____

2._____

3._____

4._____

2.

a._____

b._____

Information Sheet-5	Completing operator maintenance

Mechanics are professionals trained to perform repairs and regular maintenance on motorized vehicles. Part of their job involves understanding how internal combustion and diesel motors work, as well as their components, and how to dismantle and reassemble them in order to fix any problems. Being a Mechanic involves a great deal of hands-on work, they take a direct approach towards problem solving and are not afraid to get their hands dirty in the process.

With the advancement of transportation and automotive technology, Mechanics have had to keep up by learning about the newest trends and technologies involved in vehicle designing. Some Mechanics specialize in specific types of vehicles, including cars, buses, or trucks. Others, however, may choose to specialize in specific brands and manufacturers of vehicles, as they might have more intricate engines and systems.

Mechanics are commonly employed by garages and auto-workshops. They may also work in car dealers, vehicle rental agencies, or in transportation companies providing regular maintenance checks and repairs, or be self-employed, working in their own garages.

Primary Responsibilities

Here's a non-exhaustive list of common tasks Mechanics are required to complete.

- Performing regular maintenance and status checks:
- Checking the levels of important fluids (e.g. motor oil, coolant, and brake fluid) and refilling them as necessary;
- inspecting and replacing filters when required;
- cleaning and lubricating engine pieces; and
- Checking the battery and the electric systems of the vehicle.

- Inspecting, diagnosing, and repairing malfunctioning parts of the vehicle:
- Conducting a thorough and complete diagnosis of the status of the vehicle using specialized hardware and software;

- Performing general and specific repairs and replacing malfunctioning parts:

- keeping track of all the pieces and parts changed, repaired, and replaced;
- maintaining a record of all pieces that were requested and bought; and
- providing clients with a bill explaining all purchases and repairs done.

- Following safety measures and protocols when performing repairs:
- Using the necessary safety tools and gadgets (e.g. safety goggles, gloves, and suits) to avoid accidents; and
- adhering to safety regulations when using heavy or dangerous machines and tools (e.g. hydraulic lifts, power tools, and welders).

- Maintaining a stock of frequently used pieces and tools.

- Performing all the administrative tasks necessary:
- Keeping track of all transactions, purchases, and services provided;
- paying taxes and submitting financial records to the correspondent government agency; and
- managing payroll operations, including sales and services commissions for employees when necessary

How To Avoid Mistakes At Work?

It is okay to wander off with your mind when too much is happening at work. However, during that wander do not leave the door open for tricks to slide into your work and make you vulnerable to making mistakes. To prevent that, follow these 8 ways to avoid mistakes and you will never have to worry again!

1. Give Full Attention To What You're Doing

Make them your priority and avoid any kind of activity that would pull you away from your work. It is also important not to multitask as it kills your productivity. Start your work from the smallest tasks and finish on those that are most difficult. *Or the other way*, begin your day with the task that requires lots of energy and leave those unimportant ones for later.

2. Avoid Distractions

Distractions make you prone to mistakes. They take away your attention and make you jump between tasks and projects. Also, they lower your productivity. Thus, they create confusion and your attention is split. Turn off your Face book and Twitter, put your phone away and stop procrastinating. It is better to spend time intensively on one task and avoid making mistakes, instead of checking the latest news and being pulled away from work.

3. Take Breaks

If you work too much, you harm your brain and with your brain not functioning in the right way, you make more mistakes. Harvard Business Review writes that: *"Overwork may hasten the aging-related decline in memory and thinking skills, according to a long-term study of British civil servants."* And here is what you can do to keep your brain sharp and to avoid making mistakes at work:

1. Ease your stress response. Take a break from work and relax. Think about something nice or go for a walk in the park. It is a great way to stop thinking about work and withdraw from stressful situations.
2. Connect with family and friends. Talking to friends or family is helpful to your brain. It makes you relaxed and keeps up your positive attitude.
3. Do something different. While on the break, you can focus your attention on something else, e.g.: reading a book. And after work, find a hobby, start doing something new to refresh the brain

4. Ask Questions

Do not be afraid to ask your supervisors for advice or opinion. Make sure you understand what your tasks are. It is better to ask before you begin your project than to listen to your boss's complaints after the project is done with multiple mistakes. The best way to avoid any mistakes in your work is to ask. This dissipates all doubts.

5. Create a Checklist

To-do list or a checklist is the easiest way to prevent mistakes from happening. Once you have everything written down, you can follow the list and act according to the steps. It is important to include every detail in order not to skip anything that could cause a problem.

6. Be Clear About Your Role

Do you know your role at the company? It is crucial to know what your tasks and duties include not to mess up. *If you're not sure about what your role at work is, it may be easy to make any kind of mistake.* Once you know what exactly you have to do, things will work much easier. Talk to your boss or supervisors to determine the scope of your duties. By that, you can be certain there will be no room for mistakes at work.

7. Review

Review, review, and once more, review your work. Check it twice for any mistakes. Take a break from it, few hours, or even a day or two. Come back to it with a fresh mind. It is a great method for finding any mistakes, even those tiniest ones.

8. Learn From Your Mistakes

Source: https://examgradebooster.com

It is okay to make mistakes, only if you learn from them. Leaving them as they are will not help you at work. Analyze what you did wrong, give it a thought and remember about it next time, in order not to do the same thing. By making mistakes you can learn what are your weaknesses and how to work on them.

We are all only humans and, after all, we all make mistakes. With our 8 steps, you will improve your ability to recognize what is the cause of your mistakes. Or you will even be able to avoid them at all. Don’t let mistakes make tricks on you and have a happy Halloween without them!

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. How To Avoid Mistakes At Work?(point 5)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Learning Guide

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

a._____

b._____

c._____

d._____

e._____

f._____

g._____

Information Sheet-6	Maintaining tools and equipment

Tools, equipment and vehicles must be properly maintained so that workers are not endangered. Construction regulations require inspections of vehicles, tools, machines and equipment before use.

Preventive maintenance is the systematic care and protection of tools, equipment, machines and vehicles in order to keep them in a safe, usable condition, limit downtime and extend productivity. We must always be aware that maintenance tasks themselves are potentially hazardous and can result in injury. The successful maintenance program is:

- well organized and scheduled,
- controls hazards,
- defines operational procedures, and
- trains key personnel.

Most manufacturers can provide maintenance schedules for their equipment. Large companies with a fleet of vehicles/equipment typically have a comprehensive maintenance program due to the capital investment and/or leasing agreements. Smaller companies may lease equipment and maintenance services may be included in the leasing agreement.

Requirements

General requirements for equipment maintenance include:

- Obtaining a copy of the maintenance schedule recommended by the manufacturer.
- Ensuring that maintenance is performed as required.
- Ensuring that the person(s) performing the maintenance are competent (e.g. licensed mechanic).
- Retaining records of maintenance/service conducted.
- Specifying who is responsible for overseeing equipment maintenance and where the r
- cords are kept.
- Set up a system for removal and tagging of damaged or defective tools and equipment

5.6.1 Hand tooling

Basic hand tools include a set of combination wrenches, a ratchet wrench and set of sockets, an adjustable wrench, a couple of regular and Phillips screwdrivers, several pairs of pliers and a few assorted special purpose tools such as an oil filter wrench, a funnel, a small floor jack, a pair of safety stands, a catch pan or bucket for oil and coolant changes, and a tire pressure gauge. You may certainly add more but these are the minimum requirements.

Hand wrenches

For simple maintenance jobs, you'll need a set of open end/box end wrenches (also called "combination" wrenches). Most late model cars and light trucks have metric fasteners. A set of wrenches ranging in size from 10mm through 19mm should handle all of the nuts and bolts you're likely to encounter.

Socket wrench set

A 3/8-inch or 1/2-inch drive socket set and ratchet wrench is also nice addition for your tool collection. A ratchet wrench is much faster at removing most fasteners. Buy a wrench set that has six point rather than 12-point sockets. Six point sockets are less apt to round off a rusted fastener than a 12-point socket.

SPECIALTY WRENCHES

To loosen large flare nuts or to hold one end of a bolt while you tighten a nut, a set of flare nut wrenches and/or an adjustable wrench (often called a Crescent wrench, or a "monkey" wrench) can be helpful. Get one with a wide jaw opening that can handle nuts up to an inch in diameter.

SCREWDRIVERS

For a variety of jobs you will need at least two different sizes of regular (flat tipped) and Phillips (cross-tip) screwdrivers. The cheapest way to buy screwdrivers is usually in a set. A set will often include an assortment of long and short handles which gives you more versatility. Plastic or wooden handles are fine but make sure the handle offers a good grip.

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PLIERS

A pair of regular pliers and a pair of long needle-nose pliers are a must for any tool box. A pair of interlocking pliers (often called water pump pliers or ChannelLock pliers) are very useful to own.

If you think you'll be going beyond basic maintenance and light repair, a pair of snap ring pliers will be necessary. The needle-like tips on these pliers are needed to remove snap rings from parts such as master brake cylinders, U-joints and starter drives.

OIL CHANGE TOOLS

For changing oil, one item you can't do without is an oil filter wrench. Make sure the wrench is the correct size to fit the oil filter on your car(s). You may have to buy several different filter wrenches if you own several cars that have different sized oil filters.

Oil filter wrenches come in various styles. The ones that work best are usually those that have a metal band that wraps all the way around the filter. If access to the filter is limited, you may

FEELER GAUGE OR SPARK PLUG GAUGE

Most spark plugs come "pre-gapped" from the factory, but the gap may not be correct for every application the spark plugs fit. Refer to the emissions decal under the hood on your vehicle for the recommended spark plug gap. Then use a feeler gauge or spark plug gauge to check and adjust the electrode gap on the spark plugs when replacing spark plugs.

TIRE PRESSURE GAUGE

Tire pressure should be checked at least once a month when the tires are cold. Refer to the tire inflation decal in the glove box, door jam or your owner's manual. Do NOT use the maximum inflation pressure on the side of the tire. Most passenger cars typically require 32 to 34 PSI.

OTHER HANDY AUTOMOTIVE TOOLS

AUTOMOTIVE DIAGNOSTIC TOOLS

If your Check Engine light is on, you will need a code reader or scan tool to diagnose the problem. The tool plugs into a diagnostic connector that is usually located under the dash near the steering column. The tool displays any fault codes that are causing the Check Engine light to come on. The tool won't fix your problem, but it will give you an idea of what might be wrong. Further diagnosis is usually necessary to figure out which part needs to be replaced.

Problem	Probable Cause	Recommended Action
Air Drills		
Tool will not run or runs slowly; air flows slightly from exhaust; spindle turns freely.	Motor or throttle plugged with dirt	1. Check for dirt in air inlet. 2. Pour liberal amount of air tool oil in air inlet. 3. Operate trigger in short bursts. 4. Disconnect air supply, then turn empty and closed drill chuck by hand. Reconnect air supply. 5. If still not functional, tool should be checked by an authorized service center.
Tool will not run; air flows freely from exhaust; spindle turns freely.	Rotor vanes stuck with dirt or varnish	1. Pour liberal amount of air tool oil in air inlet. 2. Operate trigger in short bursts. 3. Disconnect air supply, then turn empty and closed drill chuck by hand. Reconnect air supply. 4. If still not functional, tool should be checked by an authorized service center.
Tool locked up; spindle will not turn.	Broken motor vane Gears broken or jammed by foreign object	Tool should be checked by an authorized service center.
Tool will not shut off.	Throttle valve O-ring blown off seat	See parts list for part number and replace O-ring or send tool to an authorized service center.
Air Hammers		
Tool will not run.	Cycling valve or throttle valve clogged with dirt or sludge Piston stuck in cylinder bore by rust or dirt	1. Pour liberal amount of air tool oil in air inlet (check for dirt). 2. Operate trigger in short bursts (chisel in place against solid surface). 3. If not free, first disconnect air supply, then tap nose or barrel lightly with plastic mallet, reconnect air supply, and repeat above steps. 4. If still not free, disconnect air supply, insert a 6-inch piece of ⅜-inch diameter rod in nozzle and lightly tap to loosen piston in rearward direction. Reconnect air supply, and repeat Steps 1 and 2.
Chisel stuck in nozzle.	End of shank peened over	Tool should be sent to an authorized service center.
Air Ratchets		
Motor runs; spindle doesn't turn or turns erratically.	Worn teeth on ratchet or pawl Weak or broken pawl pressure spring Weak drag springs fail to hold spindle while pawl advances for "another bite."	Replacement parts should be installed by an authorized service center.
Motor will not run; ratchet head indexes crisply by hand.	Dirt or sludge in motor parts	1. Pour liberal amount of air tool oil into air inlet. 2. Operate throttle in short bursts. 3. With socket engaged on bolt, alternately tighten and loosen bolt by hand. 4. If motor remains jammed, tool should be checked by an authorized service center.

Problem	Probable Cause	Recommended Action
Air Wrenches		
Tool runs slowly or not at all; air flows only slightly from exhaust.	Airflow blocked by accumulation of dirt Motor parts jammed with dirt particles Power regulator might have simply vibrated to closed position	1. Check air inlet strainer for blockage. 2. Pour liberal amount of air tool oil into air inlet. 3. Operate tool in short bursts, quickly reversing rotation back and forth. 4. Repeat as needed. 5. If this fails to improve performance, tool should be serviced at an authorized service center.
Tool will not run; exhaust air flows freely.	One or more motor vanes stuck due to sludge or varnish buildup Motor jammed due to rust	1. Pour a liberal amount of air tool oil into air inlet. 2. Operate tool in short bursts of forward and reverse rotation. 3. Tap motor housing lightly with plastic mallet. 4. Disconnect air supply, then attempt to free motor by rotating drive shank manually. (Some clutches will not engage sufficiently for this operation.) 5. If tool remains jammed, it should be serviced by an authorized service center.
Sockets will not stay on.	Worn socket retainer ring or soft backup ring	1. Wear safety glasses. 2. Disconnect air supply. 3. Using external retaining ring pliers, expand old retaining ring and remove; *or* if retaining ring pliers are not available, clamp tool "lightly" in soft jaw vise. 4. Holding square drive with appropriate open-end wrench, pry old retainer ring out of groove with small screwdriver. 5. Always pry off ring away from body; it can be propelled outward at high velocity. 6. Replace backup O-ring and retainer ring with correct new parts. (See parts list that accompanied tool.) 7. Place retaining ring on table; press tool shank into ring in a rocking motion. Snap into groove by hand.
Tool shows premature shank wear.	Use of chrome sockets or excessively worn sockets	Discontinue use of chrome sockets. Remember that chrome sockets have a hard surface and relatively soft core. Drive hole will become rounded, but still be very hard. Besides the danger of splitting, they will wear out wrench shanks prematurely.
Tool gradually loses power but still runs at full free speed.	Clutch parts worn, perhaps due to lack of lubricant Engaging cam of clutch worn or sticking due to lack of lubricant	*Oil lubed* 1. Check for presence of clutch oil (where oil is specified for clutch) and, removing oil fill plug, tilt to drain all oil from clutch case. Refill with 30-weight SAE oil or that recommended by manufacturer, but only the amount specified. 2. Check for excess clutch oil. Clutch cases need only be 50 percent full. Overfilling can cause drag on high-speed clutch parts. A typical ½-inch, oil-lubed wrench only requires ½ ounce of clutch oil.

5.6.2. Power tooling

Air-powered tools

The automotive industry was one of the first industries to see the advantages of air-powered tools. Today they are known as “the tools of the professional technician.” Although electric drills, wrenches, grinders, polishers,drill presses, and heat guns are found in body and refinish-ing shops, the use of pneumatic (air) tools is a great deal more common. Pneumatic tools have four major advantages over electrically powered equipment:

1. Flexibility. Air tools run cooler and have the advantage of variable speed and torque; damage from over-load or stalling is eliminated. They can fit in tight spaces.
2. Light weight. Air tools are lighter in weight and lend themselves to a higher rate of production with less fatigue.
3. Safety. Air tools reduce the danger of fire in some environments where the sparking of electric power tools can be a problem. Air tools also do not use eletricity, so the danger of electrocution is reduced.
4. Low-cost operation and maintenance. Due to fewer parts, air tools require fewer repairs and less preventive maintenance. The original cost of air-powered tools is usually less than the equivalent electric type

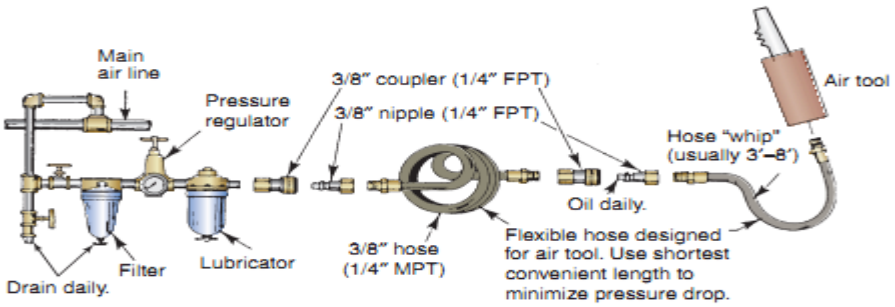


Figure the parts of a typical body shop compressed air supply system for power air tools.

Figure ; An air impact wrench can produce tremendous torque to quickly loosen or tighten bolts and nuts.

FIGURE; Here the technician is using a 1–2 -inch impact gun to install a wheel on the vehicle. A torque wrench should be used to adjust lug nut tightness after running the nuts down lightly with an impact gun.

Electric-powered tools

As mentioned earlier in this chapter, shop tools such as sanders, polishers, impact tools, and drills can also be powered by electric motors. The most important electric- only tools are drill presses, bench grinders, vacuum cleaners, heat guns, and plastic welders.

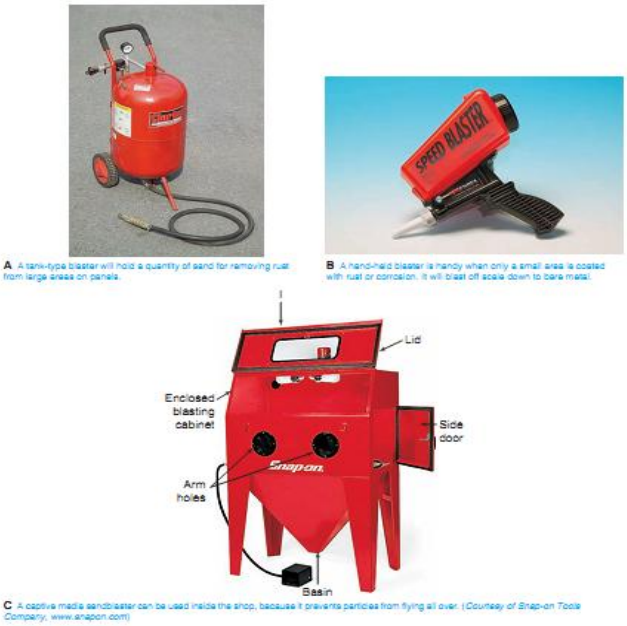


FIGURE ; Compare the types of sand or media blasting equipment.

5.6.3. Cleaning equipment

Spring is around the corner, which means it's time to start planning on how to get your car back in a presentable, shiny condition for the warmer weather. As you can imagine, there's a wide selection of products available to you to get your car ready for spring, but here are a select few that will get the job done. For this guide, we've picked products we have hands-on experience with and that we'd use on our personal cars.

1. Meguiar's Ultimate Liquid Wax (G18216)

A fantastic, one-step formula liquid wax from Meguiar's, this product offers effortless application and is extremely easy to use. With Thin Film technology, you can apply this wax and wipe it off easily, even in full sun. More importantly, it won't stain non-painted trim pieces white. Once you're done applying the wax, Hydrophobic Polymer technology will increase surface tension to protect the paint.

2. Best Wheel and Tire Cleaner on Amazon – Premium Wheel Cleaner by Car Guys

No car is ready to take on the road in spring unless its wheels and tires are also spotless. CarGuys' Premium Wheel Cleaner is the best-selling product in the Automotive Wheel Care category, removing brake dust and road grime with ease. It's an extremely powerful formula that is acid free and pH balanced, making it safe on all wheel finishes including alloy, aluminum, anodized, chrome, painted, polished, clear coated, and even plasti-dipped.

3. Meguiar's X2000 Water Magnet Microfiber Drying Towel

No collection of car cleaning supplies is complete without a high quality microfiber towel. Meguiar's Water Magnet Drying Towel is our pick for the best, measuring 22 inches by 30 inches, allowing you to dry up a large surface area with a single wipe. You've already did all the hard work of washing your car, so why making drying it a chore? More importantly, effective drying is important to making sure water spots don't end up on your car.

4. Invisible Glass Premium Glass Cleaner

Having clean windows not only makes your car look better, but allows you to safely see all around you while driving. If you're looking for a premium glass cleaner that's easy to use, take a look at Stoner's Invisible Glass. It's designed to dissolve and remove the thin layer of film that builds up on the interior of windshields, while leaving all other glass nice and spotless. Using a no-drip fine mist spray, it's easy to apply and will leave a streak-free finish.

5. Chemical Guys Mr. Pink Super Suds Car Wash Soap and Shampoo

There are dozens of car wash shampoos out there in the market, so it's far from easy to pick one best product. But if we had to choose, our nod goes to Chemical Guys' Mr. Pink Super Suds. Available in a variety of sizes, this car wash shampoo is ideal for weekly maintenance and is pH neutral for a gentle wash. It's an extra-slick formula to prevent scratches while washing and best of all, it rinses clean with no residue being left behind.

6. BLACK+DECKER Cordless Dustbuster (CHV1410L)

So far we've looked at a variety of tools to keep the exterior of your car spotless, but you'll also want to pay attention to your interior. There is a wide variety of car vacuums you can get, but a great and affordable option is the BLACK+DECKER Cordless Dustbuster. Featuring a lithium-ion battery that offers long battery life and outstanding performance, the company says this vacuum can hold a charge for up to 18 months. It's lightweight and offers 15.2 AW of suction power, while cyclonic action helps keep the filter clean.

7. Mothers Wheel Brush

Depending on the design of your wheels, they may not be very easy to clean. It's one of the more arduous tasks when it comes to washing your car, which is why we recommend a wheel brush. This product from Mothers is not only affordable, but one of the best for the job. It features a non-slip comfort grip and a protective rubberized bumper so you don't have to worry about accidentally damaging your wheels while cleaning.

8. 303 Aerospace Protectant Spray

. Designed to brighten surfaces and keep them looking newer, longer, 303's product features a formula that provides UV protection for any rubber, finished leather, plastic, vinyl, eisenglass, PVC, gel coat, and fiberglass surfaces. It shouldn't be used on unfinished leathers such as suede, fabrics, or floorings.

This product not only protects against fading, discoloration, and cracking caused from UV rays, it also keeps dust and stains away. It's a rinse-free formula that isn't greasy, so it leaves behind a nice dry matte finish. It's a waster-based solution that is non-toxic and has no odor, while 100% free of grease-producing silicone oils and petroleum distillates.

It's a basic, easy-to-use product that can protect all inch of your interior.

9. TriNova Tire Shine Spray

Once your car is nice and clean along with its wheels, it's time to make your tires shine brilliantly. TriNova's Tire Shine Spray does just that, giving your tires the dark and shiny look you need to complete the appearance of your vehicle. Not only will this product make your tires shine, it'll also protect them from outside elements that can potentially damage the rubber on your tires. What's also great with this product is that you can control the amount of shine it leaves your tires with. The spray will let you choose from low, medium, or high shine.

10. Relentless Drive Car Wash Mitt

Did you think we forgot the most basic tool for washing a car? Almost seen as a necessity these days, avoid using a sponge or even a towel when it comes to washing your car by spending a few bucks on a high quality microfiber wash mitt. Available in two sizes as a single unit or a 2-pack is Relentless Drive's Car Wash Mitt, which delivers a lint-free, scratch-free finish.

5.6.4 Adhesive equipment

This method involves the complete removal of the old adhesive sealer. To remove the glass, all of the old adhesive must first be cut. Several devices are available to do this: a steel wire; a hot knife; a pneumatic knife; an electric knife; or a cold, fine sharp knife. Each device has advantages and disadvantages. The pneumatic knife with a thin steel blade is preferred by many technicians. A 3-foot (914 mm) length of single strand steel piano wire (smallest diameter available) is the safest to use to prevent glass breakage. The hot or cold knife can crack the glass in the areas where the reveal molding clips are very close to the glass.

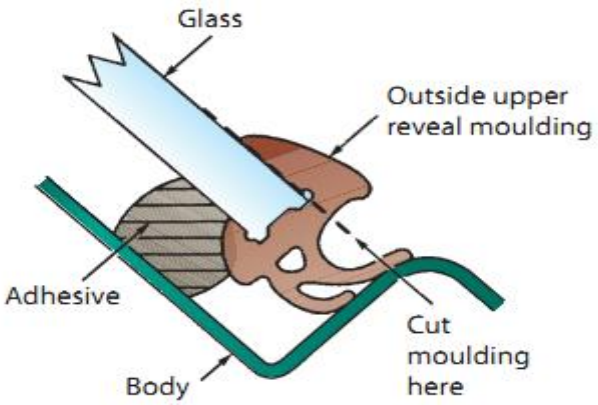
Pneumatic windshield cutters use shop air pressure and a vibrating action to help cut the adhesive around the glass. There are a variety of blade designs available for use on different windshields. Many have blades with depth stops to prevent pinch weld damage. With some designs, you may have to use two or more blades to remove the windshield.

Electric adhesive cutters plug into 120-volt outlets or use rechargeable battery power to produce a vibrating action that cuts the adhesive around the glass. Their operation is similar to that of pneumatic windshield cutters. Some power cutter blades are used on the outside of the vehicle.

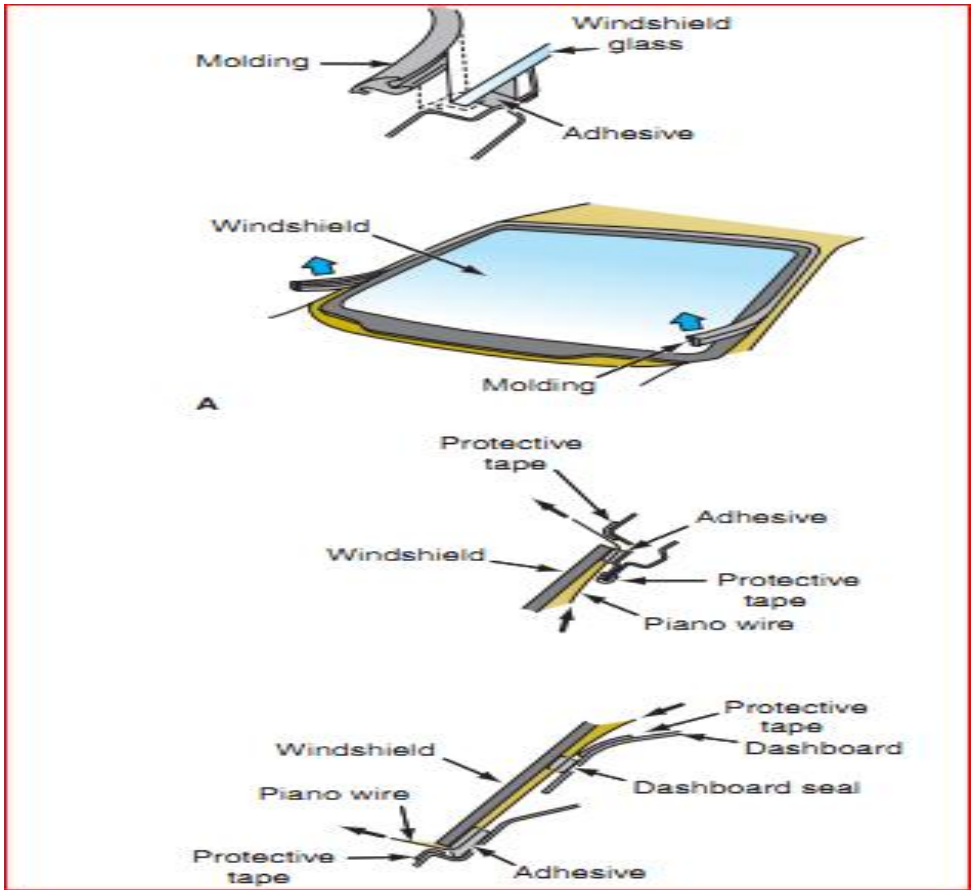
Others are designed to be used from inside the passenger compartment. Be sure to select the

correct blade for the application

Note that some late model windshields are secured using both a rubber gasket and adhesive. To remove this type of windshield, you will usually have to cut the old rubber gasket, as shown in Figure below



Rubber reveal molding can also be pulled out from between the body and glass using pliers. You can then gain access to the adhesive so you can cut through it (Fig below)



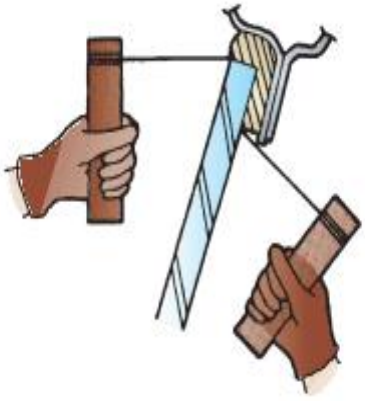


FIGURE You can cut through windshield adhesive with Piano wire. Be extremely careful not to cut your hand!

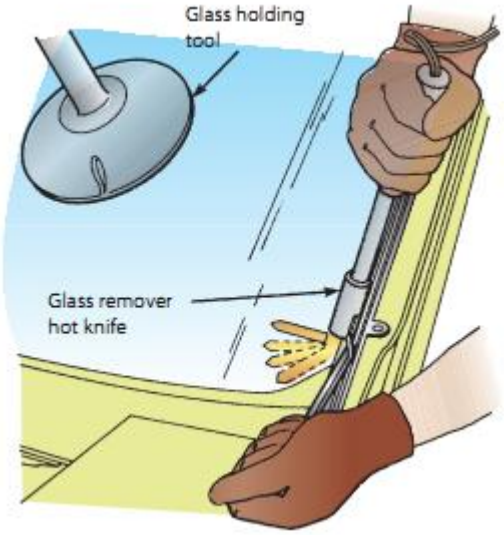


FIGURE Windshield adhesive can also be cut with a hot knife.

5.6.5. Spray painting equipment

The **spray gun** (Figure) breaks the liquid primer or paint into a fine mist and forces it onto the surfaces of the vehicle. It is the key component in a refinishing system. It is a precision engineered and manufactured tool. Each type and size available is specifically designed to perform a certain number of tasks. Even though all spray guns have many parts and components in common, each gun type or size is suited for only a certain, defined range of jobs. As in most other areas of refinishing work, having the right tool for the job goes a long way toward getting a professional job done right in minimum time.

PARTS OF A SPRAY GUN

The principal parts or components of a typical air spray gun, which are listed below, are illustrated in Figure 18-4. Most guns are equipped with a removable spray head unit containing the air cap, fluid tip, and fluid needle.

Air cap or nozzle
Fluid tip or nozzle
Fluid needle valve
Trigger
Fluid control (or spreader) knob
Air valve

Pattern (or fan adjustment) control knob Gun body (or handle)

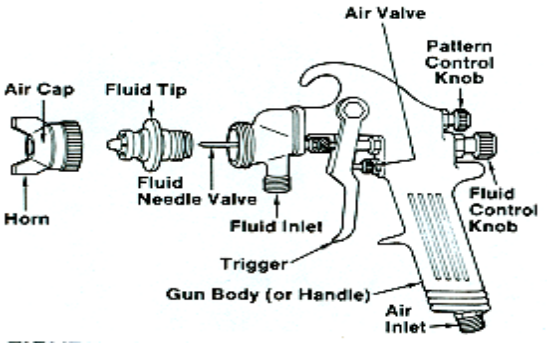


Fig Parts of a spray gun

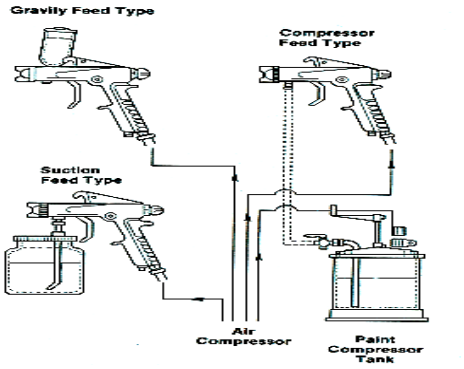
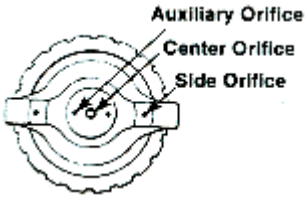


Fig. Study paint feed methods of air spray guns



Fig; Memorize nomenclature of air orifices.

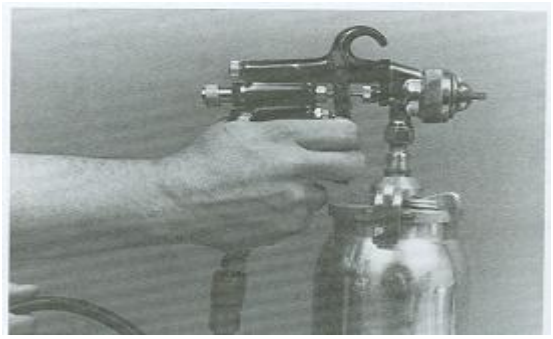


Fig. Suction feed type spray gun

Fig. Pressure feed type spray gun

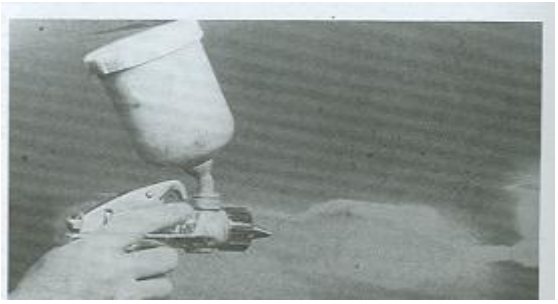


Fig. Gravity feed type spray gun

5.6.6. Rubbing down equipment

Body Filler sanding - preparation for primer application

Step 1 - Clean the area

In preparation for filler application, clean the repair area and remove all loose paint particles or rust. Sand down to bare, clean metal using Cubitron™ II 150+ on a DA sanding machine - to achieve the surface that you want to apply body filler onto.

Step 2 - Apply Dry Guide Coat and key the featheredge

Apply 3M Dry Guide Coat to highlight any 150+ scratches, then key the feather edge around the bare metal with Cubitron™ II 220+ to prevent that any solvents from the filler can penetrate the edges and lead to subsequent swelling.

Step 3 - Apply Body Filler

Apply 3M Body Filler by the method of your choice - either using the innovative 3M Dynamic Mixing System or standard Filler application processes.

- 

Step 4 - Apply Dry Guide Coat onto cured filler

Once the filler is cured, apply 3M Dry Guide Coat to show the filler structure and allow a controlled fast sanding. Dry Guide Coat also helps to reduce clogging and extends the live of the abrasive.

Step 5 - Filler sanding

Use 3M Cubitron™ II 150+ by machine or with the right Handblock and dust extraction for a fast shaping of the filler area.

Step 6 - Re-apply Dry Guide Coat to highlight fine scratches

Re-apply 3M Dry Guide Coat to highlight any deeper scratches and surface imperfections to be removed with finer abrasives.

Step 7 - Reduce any scratches

In order to prepare the surface for the primer application, reduce any scratches of 150+ by using grade 220+. To achieve optimal flattened results, use abrasive with a hand block.

Step 8 - Final sanding before Primer

Following the manual sanding, use a DA machine (Festool Automotive Systems LEX 150 / 5 or Festool Automotive Systems ETS / EC 150 / 15) and Cubitron™ II 220+, followed by P400 / P500 to featheredge and improve the adhesion of the primer.

Step 9 - Blending area

Interim protect any surrounding edges with a strip of masking tape, before you prepare the blending area.

9 a : Using 3M™ Flexible Abrasive Sheets P1000 - P1200 to prepare the edges and styling lines of the area that the base coat needs to be blended in.

9 b : To prepare the whole blending area, use 3M P1000 abrasive (e.g. 260L+, Flexible Disc or Trizact™) with an interface pad on a DA machine.

9 c : Using Scotch-Brite™ Disc Grey on a DA with dust extraction, clean the surface in preparation for a clean base coat application, wipe the surface clean with a 3M Panel Wipe and suitable degreaser, then mask the primer area as required.

Apply and cure the primer of your choice, following your paint manufacturers recommendations.

5.6.7. Paint rollers

How to Paint a Car With a Foam Roller. The most inexpensive way to paint a car with results that rival a bargain brand paint-job is with a foam roller. This method uses rust-resistant paint and mineral spirits, and although it may not be the most labor saving process, it certainly saves you quite a bit of money.

se this guide to help you re-paint parts of your car, or your entire car. This guide covers arguably the hardest method — rolling on the paint with a roller. You can also use cans of spray paint ("rattle canning" the car), but the best results will come from an air-powered sprayer — but also at the highest cost.

Always work in a well ventilated area and remember to use proper safety gear when prepping the car for paint and when painting, especially respiratory safety gear. This is bound to be a long and involved project, so work slowly and carefully to have the best possible paint job possible. Also take a couple of pictures of the car before starting the job, so you can remember how terrible everything looked like prior to your new paint job :)

5.6.8 Hand touch-up equipment

Touching up small areas on your vehicles paintwork can make a huge difference to your vehicles overall appearance.

Step 1 – Preparing

Once you've got your 50mL touch up paint from Super cheap Auto, start thoroughly cleaning the surface with Wax & Grease remover with a lint free cloth.

If the affected area has surface rust, apply a rust convertor to neutralise the corrosion before painting.

Step 2 – Test

Shake touch up paint for a full minute before painting, pull out the brush and wipe off the excess paint off as thin layers are required for the best finish.

Find a piece of cardboard or paper to practice applying paint thinly, also make sure the paint matches your car colour.

Step 3 – Paint

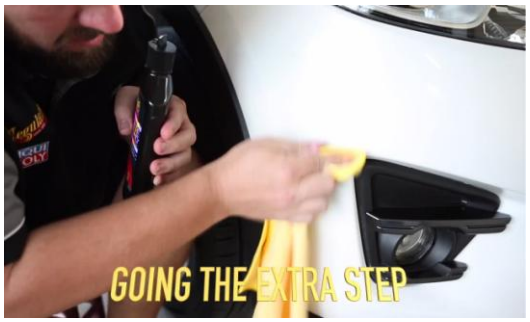
Lightly use the brush with little paint into the touch up area, get into all the edges by dabbing and stroking in one direction, make sure to rest you hand on the panel while doing the touch up to ensure best accuracy

NOTE: If you have excess paint, wipe away with a clean cloth and start again.

Lay down 3 medium coats with 15 minutes dry time between coats, after 24 hours the paint will be fully dry ready for polish.

NOTE: For superior high gloss results, go the extra step and use a cut a polish for desired effect.


USE UP TO THREE COATS
FOR A SEAMLESS REPAIR


GOING THE EXTRA STEP

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List out at least 4 Cleaning equipment? (3 point)
2. What are the requirements for equipment maintenance? (3 point)

Note: **Satisfactory rating - 4 and 6points** **Unsatisfactory - below 4 and 6 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

1..

1_____

2._____

3._____

4._____

2..

a_____

b. _____

c_____

Operation Sheet 1	**Techniques of** Tagging and identifying faults Unserviceable equipment is in accordance with workplace procedures

Step -1 identify the asset type and category.

Step -2 Assign a unique identification number.

Step -3 Determine the type of asset label required.

Step -4 Enter the asset and all associated information in your asset tracking system.

Step -5 Affix asset tag to the item.

Step -5 Implement data verification processes.

LAP Test 1	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary matterial, tools and materials you are required to perform the following tasks within 8-12 hours.

Task 1: Tag and identify faults Unserviceable equipment is in accordance with workplace procedures

Reference books

1. A.Robinson and W.A.Liversey,2004. ***THE REPAIR OF MOTOR BODIE***S,
2. Britain (Butterworth-Heinemann publication), Fourth Edition ISBN 0 7506 45172.
3. Porter, Lindsay. ***THE CAR BODY WORK REPAIR MANUAL.*** New edition
4. Robert Scharff and James E.Duffy, 1992. ***MOTOR BODY REPAIR*** .United States Of America, 3rd edition .ISBN 0827368585
5. Scharff.Robert. ***MOTOR AUTO BODY REPAIR.*** Third edition
6. Alan Robinson, 1997. ***THE REPAIR OF VEHICLE BODIES***. British 3rd edition, ISBN 0 7506 0955 9
7. L.C.Rhone, 1983***. TOTAL AUTO BODY REPAIR***. United States of America, second Edition. ISBN 0 02 682110 9
8. A.G.Deroche, 1996***. THE PRENCIPLES OF AUTO BODY REPAIRING AND REPAINTING***. United States of America, sixth Edition. ISBN 0-13- 440033 Alan Robinson, 1993. ***THE REPAIR OF VEHICLE BODIS.*** Great Britain, Second Edition. ISBN 0 7506 0159 0
9. John D. Anderson, JR., 1991. ***FUNDAMENTALS OF AERODAYNAMICS*** Singapore, Second Edition. ISBN 0 07 100767 9
10. *https://addonsinc.help › ellipse › infopak › zdocs › Help › en_AU › servic*