Vehicle Body Repairing and Painting

Level-II

Learning Guide- 26

Unit of Competence: Remove and Replace Vehicle Components and Body Repair

Module Title: Removing and Replacing Vehicle Components and Body Repair

LG Code: EIS VRP2 M09 LO1-LG-26

TTLM Code: EIS VRP2 TTLM 0919v1

LO1. Prepare for work

Instruction Sheet	Learning Guide # 26

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

- Using work instructions
- Reading and interpreting Job specifications
- Observing Workplace Health and Safety (WHS) requirements
- Selecting and inspecting quality Materials
- Identifying and checking operation of hand power tools and safety equipment's.
- Determining procedures to minimize waste material.
- Identifying procedures to maximizing 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
- Read and interpret Job specifications
- Observe Workplace Health and Safety (WHS) requirements
- Select and inspect quality Materials
- Identify and check operation of hand power tools and safety equipment's.
- Determine procedures to minimize waste material.
- Identify procedures to maximizing energy efficiency

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 and Sheet 4".
4. Accomplish the "Self-check 1,Self-check t 2, Self-check 3 and Self-check 4" **in page -6, 9, 12 and 14**respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3" **in page -15.**
6. Do the "LAP test" **in page – 16** (if you are ready).

Information Sheet-1	Using Work instructions

Work instructions

Information about the work

- Describe what workers need to be able to do on the job
  - Work functions, Key activities of each work function and Performance indicators
- Describe what task to be done or work roles in a certain occupation

A Work Instruction is a document that provides specific instructions to carry out an Activity. It is also a document describing specific activities and tasks within the organization. It contains the greatest amount of detail.

Work instruction is a step by step guide to perform a single instruction which contains more detail than a Procedure and is only created if detailed step-by-step instructions are needed.

Work instruction is a description of the specific tasks and activities within an organization. A work instruction in a business will generally outline all of the different jobs needed for the operation of the firm in great detail and is a key element to running a business smoothly.

In other words it is a document containing detailed instructions that specify exactly what steps to follow to carry out an activity.

It contains much more detail than a Procedure and is only created if very detailed instructions are needed. For example, describing precisely how a Request for Change record is created in the Change Management software support tool.

Difference Between Work Instructions and Procedures

Another way of looking at Work Instructions v Procedures is that:

Procedures describe:

- What is the activity is
- Who performs it
- When it is performed

Work instructions describe:

- How the activity is performed.

Purpose of Work Instructions

'A work instruction is a tool provided to help someone to do a job correctly. This simple statement implies that the purpose of the work instruction is quality and that the target user is the worker. Unfortunately, in many workplaces, today's work instructions have little connection with this fundamental focus. Factories have encumbered work instructions with content that has been added to satisfy auditors, lawyers, engineers, accountants and yes, even quality managers. We've piled on so much extraneous material that we've lost sight of the intended purpose of work instructions.'

Steps to Writing Work Instructions

Follow these steps to write your next set of Work Instructions.

1. Know exactly how to perform the task.
2. Plan how to write steps in the correct order.
3. Write the steps in logical order.
4. Start each instructions with a verb.
5. Write each step as a single action.
6. Include warnings as pre-steps.
7. Review and edit instructions carefully.
8. Write in the positive voice.
9. Avoid opinions, preferences, or choices

Self-Check -1	Written Test

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

1. List steps to write work instruction (4)

2. Define work instruction (2)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Reading and interpreting Job specifications

Job Specification

A job specification also known as employee specifications, which 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..

Components: Job specification emphasizes human qualities essential for a job. It involves the following elements:

- ***Educational Qualification*** defines the specific requirement regarding academic knowledge of a person. It includes his school education, graduate, post-graduation and other such qualifications of which he holds degree or mark sheet.
- **Skills & Knowledge:** This is an important parameter in job specification especially with knowledge and skill based profiles. The higher the position in a company, the more niche the skills become and more is the knowledge required to perform the job. Skills like leadership, communication management, time management, team management etc are mentioned.
- **Experience:** Job specification clearly highlights the experience required in a particular domain for completing a specific job. It includes work experience which can be from a specific industry, position, duration or in a particular domain. Managerial experience in handling and managing a team can also be a job specification criteria required for a particular position

- **Personality traits and characteristics**: The way in which a person behaves in a particular situation, handles complex problems, generic behavior etc are all covered in the characteristics of a job description. It also covers the emotional intelligence of a person i.e how strong or weak a person is emotionally

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 Specification Example

Here is a sample job specification, which is prepared for a marketing manager in a telecom company.

Education	Must be an engineer and MBA in marketing for a reputed MBA institute
Work experience	Must have prior work experience in marketing & sales (preferably telecom or FMCG)
Skills & Knowledge	a. Must be a good communicator and must be able to lead a team. b. Prior experience in handling ATL-BTL activities and managing promotional events. c. Must be able to handle social media like Facebook, Twitter and help build online brand d. Experience in managing PR and media e. Strong analytical skills and problem solving skills f. Must understand business, come up with innovative products and launch them
Personality Traits & Characteristics	1. Must be presentable and a good orator 2. Should be calm in complex situations and show leadership skills in managing multiple teams 3. Should be emotionally strong and should give timely deliverables

The above table is a sample of job specification. More specific details can also be put to give a better understanding about the job.

Advantages of Job Specification

There are several benefits of having a comprehensive job specification. Some advantages are listed below:

1. Job specification highlights all the specific details required to perform the job at its best
2. It gives the HR managers a threshold and a framework on the basis on which they can identify the best prospects

3. Helps in screening of resumes and saves time when there are multiple applications by choosing those who are closest to the job specification
4. HR managers can used job specification as a benchmark to evaluate employees and give them required trainings
5. It also helps companies during performance appraisal and promotions

Disadvantages of Job Specification

As we know, job specification arises from the job description; it also has some related problems. Let us have a look at those limitations:

- Change in technology impacts the requirement of the company, i.e. changing of skills, qualification, experience, knowledge needed to execute the roles and responsibilities properly.
- A job specification is a lengthy process and requires complete knowledge of the job position.

Steps

1. Write up a rough outline. It can be helpful to create a rough outline of your job description before setting down to write the final versions. ...
2. Decide on the job title. ...
3. Include the details of the job. ...
4. Create a summary of the job. ...
5. Include the duties and responsibilities of the job. ...
6. Add job factors to the description

Difference and Comparison of job specification and job description

BASIS	JOB DESCRIPTION	JOB SPECIFICATION
Meaning	Job description is the written document in which all the information regarding a particular job including role, responsibilities and duties is summarized in a systematic manner.	Job specification is the set of specific qualities, knowledge and experience, a person must possess to perform a particular job.
Origin	Originates from Job Analysis	Based on Job Description
Elements	Consist of job title, job location, role, responsibilities, duties, salary, incentives and allowances	Involves personal attributes, skills, knowledge, educational qualification and experience
Objective	Describes the job profile	Specifies the eligibility criteria
What is it?	What the company is offering to the candidate.	What the company is demanding from the candidate.
Application by Human Resource Manager	Used to give the sufficient and relevant information of the job	Used to match the right attributes with the job so described

Self-Check -2	Written Test

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

1. Explain job specification (4)

2. List four components of job specification (4 pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Workplace Health and Safety (WHS) requirements

WHS Requirements

Safety is a critical consideration for any automobile body work. if safety measures are ignored, body workers face an array of hazards which can be potentially dangerous, including electric shock, fumes and gases, fire and explosions and more.

WHS requirements are legislation/regulations/codes of practice and enterprise safety policies and procedures. This may include protective clothing and equipment, use of tooling and equipment, workplace environment and safety, handling of material, use of firefighting equipment, enterprise first aid, hazard control and hazardous materials and substances.

Workplace safety and health can be important for moral, legal, and financial reasons. In common-law jurisdictions, employers have a common law duty (reflecting an underlying moral obligation) to take reasonable care for the safety of their employees. Good WHS practices can also reduce employee injury and illness related costs, including medical care, sick leave and disability benefit costs.

protective clothing and equipment

Abrasive dust vapour from caustic solutions and solvents spray mist from undercoats and finishes-all present dangers to the air passages and lungs, especially for workers who are among them day in, day out. The cartridge filter or organic vapour type of respirator, which covers the nose and mouth, is equipped with a replacement cartridge that removes the organic vapours by chemical absorption painting without this equipment it is harmful to our respiratory organ.

The dust respirator or mask is worn to protect against dust from sanding and grinding. These operations in the body shop create dust can that can cause bronchial irritations and possibly long terms lung damage such as silicosis (well known in mining areas). Keep in mind that these respirators are good for removing solid particles from the air and have little if any ability to remove vapours. They should never be worn when spray painting use cartridge filter.

Eye protection is required where there is a possibility of an eye injury from flying particles, chips, and so forth clear protective safety goggles, glasses or face shields should be worn when using grinders, disc sanders, power drills, pneumatic chisels, removing shattered glass, or when working underneath the auto. When they are in the metal working or painting areas of the shop locations there is always the possibility of flying objects, dust particles or splashing liquids entering the eyes. Not only can this be painful it can also cause loss of sight. Remember eyes are irreplaceable. Get in the habit of wearing safety goggles, glasses, or face shields in the working areas.

A welding helmet or welding goggles with the proper shade lens must be worn when welding. These will protect the eyes and face from flying molten pieces of steel and from harmful light rays.

EAR PROTECTION

Panel beating the piercing noise of sanding, the radio blaring full-blast-it is impossible to hear anything else. It is enough to deafen a person and that is exactly what it will do if proper precautions are not taken. When in metal working areas, wear are plugs or ear muffs to protect the eardrums from damaging noise levels.

BODY AND HAND PROTECTION

Loose clothing unbuttoned shirt sleeves, loose Jewellery are very dangerous in body shop. Instead wear approved shop work clothes. Trousers should be long enough to cover the top of the shoes. This will prevent sparks from going down in to the shoes.

Especially when using welding equipment. The harmful effects of liquid undercoats and finishes on the hands can be prevented very effectively by wearing proper gloves. When using anybody or paint shop chemicals, be sure to wash the hands with soap and water before eating or smoking.

FOOT PROTECTION

Wear safety work shoes that have metal toe inserts and no slips. The inserts protect the toes from falling objects, the soles help to prevent falls. In addition, good work shoes provides support and comfort for someone who is standing for a long time. Never wear plastic (rubber) or sandal none of this shoes provided adequate protection in a body shop.

use of tool and equipment

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.

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

a. **BALL PEEN HAMMERS** - The ball peen hammer(Figure 4–44) is a useful, multipurpose 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.

A The flat head is for hammering on flat surfaces and the round head is for concave surfaces.

b. **SLEDGEHAMMER** - A light sledgehammer (Figure 4–45) 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 4–45 The heavier mini-sledge hammer will produce a much more powerful blow than a small hammer.

c. **MALLETS -** The *rubber mallet* gently bumps sheet metal without damaging 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 original 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 4–46).

A B

FIGURE 4-46 Note the two types of dead blow hammers. (**A**) This dead blow hammer has a metal face but the head is filled with lead shot. This keeps the hammer from rebounding after striking an object. (**B**) This is a plastic-faced dead blow hammer. It will not mar or damage surfaces as easily as a metal-faced hammer head.

2. **BODY HAMMERS -** *Body hammers* are the basic tools for working sheet metal back into shape. They come in many different designs. As shown in Figure 4–47, they have flat, square, rounded, or pointed heads. Each style is designed for a special purpose.

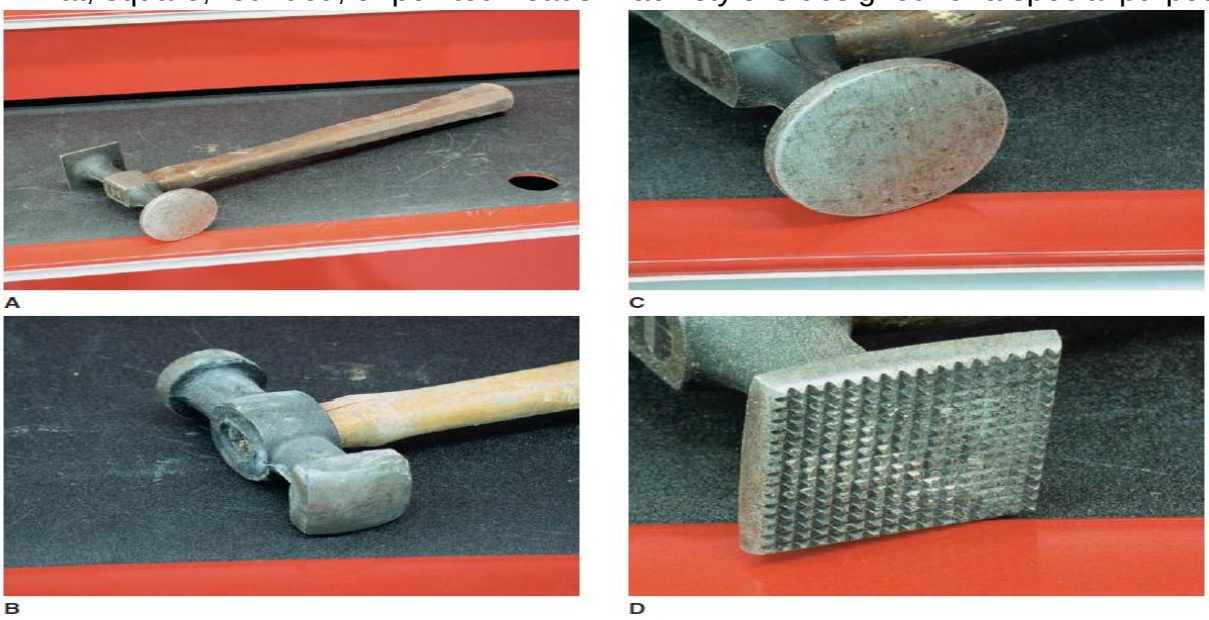


FIGURE 4–47 A body hammer and dollies are often needed to take minor dents out of sheet metal. Body hammers have specially shaped heads for working sheet metal. Dollies are specially shaped blocks of steel for straightening sheet metal. Body hammers are the primary striking tools used in collision repair. (**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.

a. **PICKING HAMMERS -** The **picking hammer** has a pointed tip on one end and usually a flat head on the other. It will take care of many small dents. The pointed end is used to raise low spots from the inside. A gentle tap in the center usually does it (Figure 4–48). The flat end is for hammer-and-dolly work to remove high spots and ripples. Picking hammers come in a variety of shapes and sizes. Some have long picks for reaching behind body panels. Some have sharp pencil points; others have blunted bullet points. Select the head best suited for the job. See Figure 4–49.

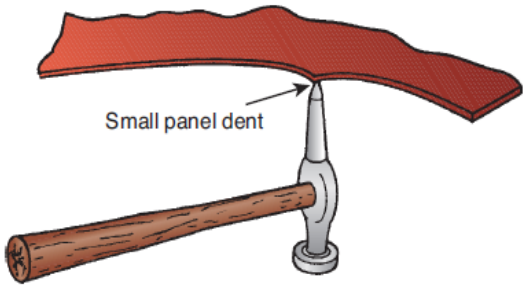


FIGURE 4–48 The pick hammer's pointed end can be used to raise a dent in sheet metal.

WARNING Be careful when using the pick hammer. If swung forcefully, the pointed end can pierce the lighter sheet metals used in late model cars. Use the pick only on small dents, and control impact force.

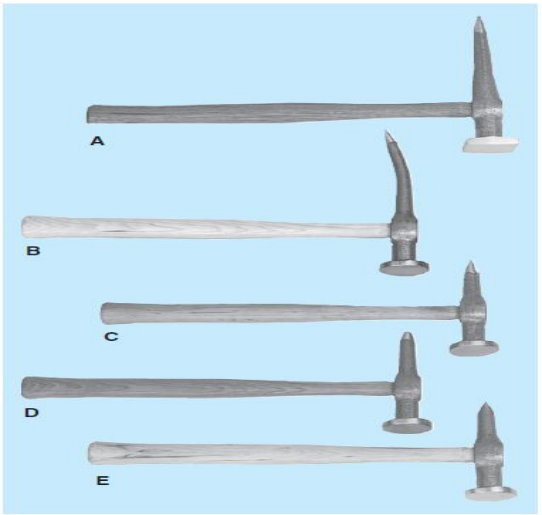


FIGURE 4–49 Note pick hammer names (*Courtesy of S&H Industries*): (**A**) long pencil point, (**B**) long curved pencil point, (**C**) short pencil point, (**D**) short bullet point, and (**E**) short chisel point.

b. **BUMPING HAMMERS -** Larger dents require the use of a **bumping hammer**. Bumping hammers can have round faces or square faces that are almost flat. The faces are large so that the force of the blows is spread over a large area. These hammers are used for initial straightening on dented panels or for working inner panels and reinforced sections that require more force but not a finish appearance. See Figure 4–50. Sharp concave surfaces, such as the reverse curves on quarter

panels, headlights, doors, and so on, require the use of a reverse curve light bumping hammer. The faces of these hammers are crowned—one in the opposite direction of the other. The tight curve of the faces allows concave contours to be bumped without the danger of stretching the metal. Remember that the contour of the hammer must be smaller than the contour of the panel to avoid stretching the metal.

FIGURE 4–50 This body bumping hammer has a very large, long head on it for working obstructed areas on damaged panels.

c. **FINISHING HAMMERS -** After the bumping hammer is used to remove the dent, final contour is achieved with the **finishing hammer** (Figure 4–51). The faces on a finishing hammer are smaller than those of the heavier bumping hammer. The surface of the face is crowned to concentrate the force on top of the ridge or high spot. A *shrinking hammer* is a finishing hammer with a serrated or cross-grooved face. This hammer is used to shrink spots that have been stretched by excessive hammering.

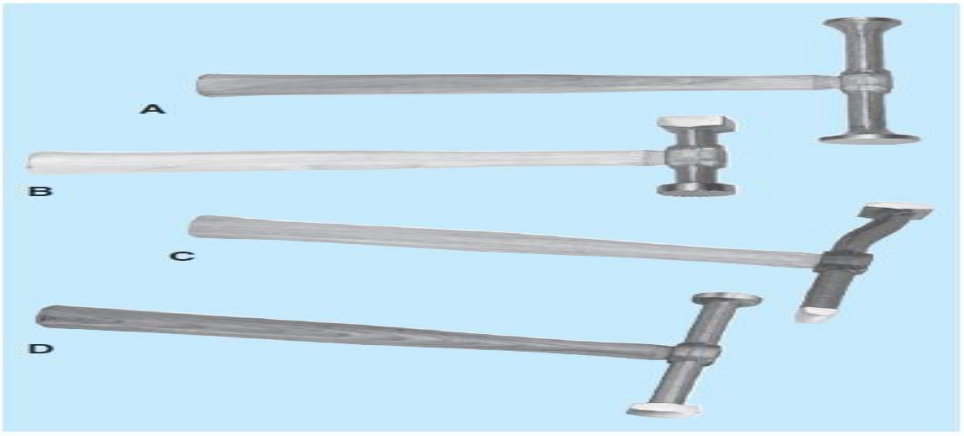


FIGURE 4–51 Here are several finishing hammers: (**A**) double round, (**B**) shrinking hammer, (**C**) offset bumping, and (**D**) dinging hammer. (*Courtesy of S&H Industries*)

3. **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 4–52). There are many different shapes of dollies (Figure 4–53). Each shape is intended for specific types of dents and body panel contours—high crowns, low crowns, flanges, and others. It is very important that the dolly fit the contour of the panel. If a flat dolly or one with a low crown is used on a high crown panel, additional dents will be the result. Look at Figure 4–54. A *general purpose* dolly has many contours. It can be used in most situations. A rail-type dolly is another commonly used dolly with many contours. Toe and heel dollies are used for bumping in tight places. The flat right angle edge is used for straightening flanges.

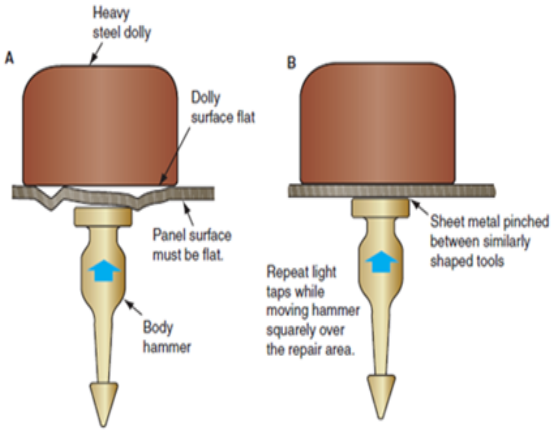


FIGURE 4-52 A body hammer is often used in conjunction with a dolly block. (**A**) Dolly block is being held on rear of the body panel while the body hammer is used to straighten and repair damage from the front. (**B**) Dolly acts as a small anvil to hold the bent panel secure from the rear. The body hammer can then strike the bent panel to straighten it.

FIGURE 4-53 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)*

FIGURE 4-54 An interchangeable driver set is handy because you can match the shape of the driver to the desired contour of the sheet metal panel being straightened. (**A**) Note the different driver heads that can be used to reshape and fix damaged sheet metal. (**B**) A small driver head can be placed into a dented body line to hammer it straight quickly. *(Courtesy of SPX/OTC Service Solutions)*

4. **<u>SPOONS</u> - Body spoons** are another class of body working tools used like a hammer or a dolly. They are available in a variety of shapes and sizes to match various panel shapes. The flat surfaces of a spoon distribute the striking force over a wide area (Figure 4–55). They are particularly useful on creases and ridges. A spoon dolly can be used as a dolly where the space behind a panel is limited. A dinging spoon is used with a hammer to work down ridges. Inside spoons can be used to pry up low places or can be struck with a hammer to drive up dents. Bumping files have serrated surfaces and are used to slap ridges or the underside of creases to bump the metal back to its original shape.

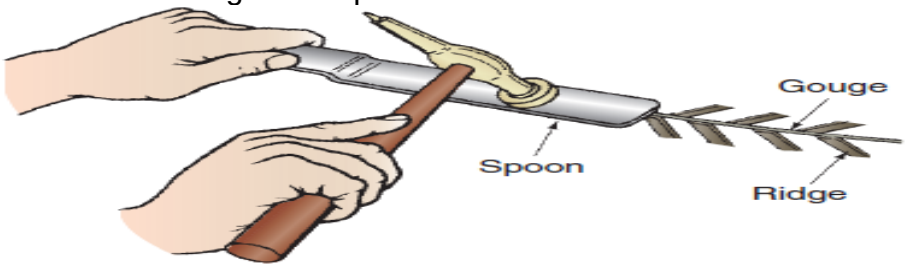


FIGURE 4–55 A minor ridge or bump in a sheet metal body panel can be lowered by placing the spoon over a high spot and hitting it with a hammer. The spoon increases the surface area so that hammering will not produce dents.

5. **<u>PICKS</u> - Picks** (Figure 4–56), like spoons, are used to reach into confined spaces. The pick is used only to pry up low spots. They vary in length and shape, and most

have a U-shaped end that serves as a handle. Picks are commonly used to raise low spots in doors, quarter panels, and other sealed body sections (Figure 4–57). Picks are often preferred to slide hammers and pull rods because they do not require drilling holes into the metal and subsequently welding them shut after the repair. Picks are sometimes used during *paint less dent removal* (removing small body dings or dents without painting the panel).

NOTE *Straightening tools and techniques are discussed further in other text chapters. Refer to the index for additional information.*

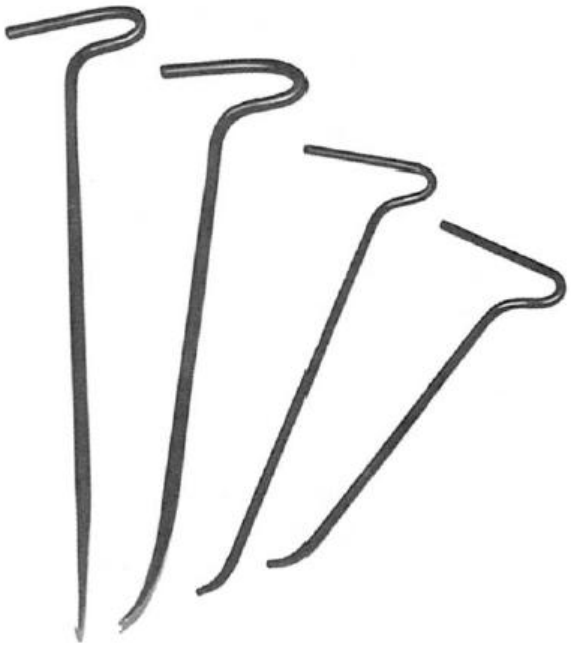


FIGURE 4-56 Body picks can be used for dent removal from the rear of a body panel. (*Courtesy of Snap-on Tools Company, www.snapon.com*)

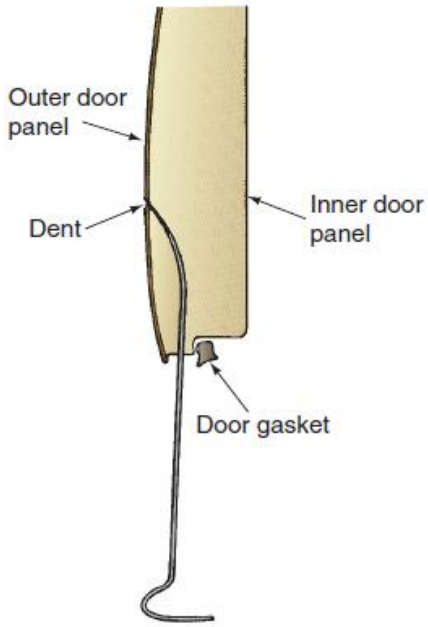
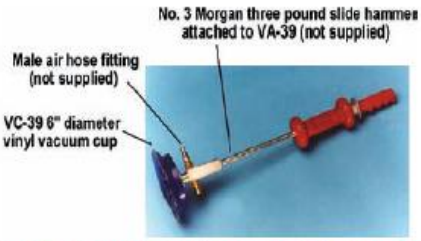


FIGURE 4-57 A pick can be inserted into obstructed areas, like inside a door, to help pry out small dents. This is the basis for paintless dent removal. If you carefully position and work the pick, you may not have to paint the panel.

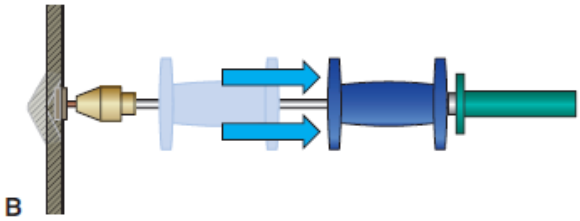
6. **<u>DENT PULLERS AND PULL RODS</u> -** Creases in sealed body panels that cannot be reached from the backside can be pulled out with a *dent puller* (Figure 4–58). Never drill or punch holes in the crease for the puller or pull rod. Now, common practice is to weld a bracket or pull pin onto the surface instead of drilling. Either will give the rod something to grab and pull on. A dent puller usually comes with a threaded tip and a hook tip. Either tip is inserted in the drilled hole or welded rod or bracket (Figure 4–59). Then the slide hammer is pulled back and struck against the handle. Tapping the slide hammer against the handle slowly pulls up the low spot (Figure 4–60). A small dent or crease can be pulled up with a single pull rod (Figure 4–61).

A Depending upon the attachment on the end of a slide hammer, it can be used to pull out drive axles or dents in the panels. A dent puller set has various attachments for hooking over a damaged panel to pull dents out. (*Courtesy of SPX/OTC Service Solutions*)



B A suction cup, when attached to an air line, will produce a powerful holding force for pulling large but shallow dents in sheet metal. Puller equipped with a suction cup head. It is attached to a compressed air source to form a powerful vacuum for popping out more stubborn dents. (*Courtesy of Morgan Manufacturing, Inc. www.morganmfg.com*)

FIGURE 4-58 Slide hammer set will produce a powerful pulling force on parts and panels.



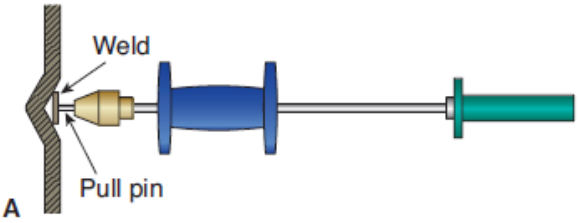
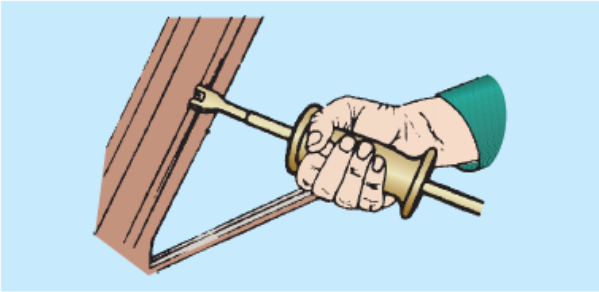
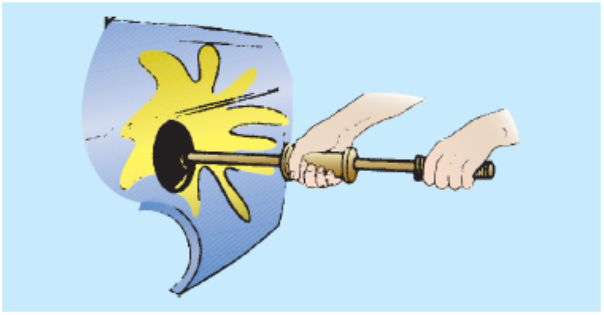


FIGURE 4-59 To pull a dent with a dent puller, (**A**) resistance weld a bracket, puller head, or pull pin to the surface of the repair area. (**B**) Slide the hammer back to pull out the dent. (*Courtesy of Snap-on Tools Company, www.snapon.com*)

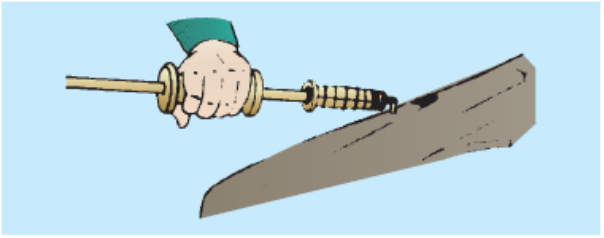


A A slide hammer with hook attachment will grasp and pull the edges of panels easily. The size and shape of the pull tip should roughly match the contour of the panel being repaired.

B A screw tip should only be used to pull panels if factory holes already exist in the panel or if the panel is going to be replaced, after frame straightening, for example. Never drill holes in panels for pulling with screws if the panel is being repaired. Drilled holes would have to be welded shut and the weld can burn off corrosion protection on the back side of the panel, which can cause rusting of the repaired panel.



C A suction cup attachment on a slide hammer will sometimes pop out very minor, shallow stress dents.



D A cutter attachment will slice difficult-to-access panels' flanges to aid in removal.

FIGURE 4-60 Study the varied uses of a slide hammer puller. By pulling back briskly on the heavy weighted handle, a powerful outward pulling blow is exerted. Be careful not to pinch your hand between the two handles! The heavy striker handle can severely injure your hand.

FIGURE 4–61 Here the technician is using a slide hammer to pull out and straighten the bent edge of a front fender.

7. **SUCTION CUPS -** The *suction cup* (Figure 4–62) will pull out shallow dentsquickly if they are not locked in by a crease in the metal.Simply attach the suction cup to the center of the dent andpull. The dent might come right out with no damage to thepaint and no refinishing required. It is an easy tool to useand can make a simple repair. However, once a dent islocked in, some hammer-and-dolly work will be necessaryto smooth the metal. Even so, the suction cup method isusually worth a try.

FIGURE 4–62 This hand-held suction cup tool will grasp and pull on glass or smooth body panels.

8. **PUNCHES AND CHISELS -** A good set of punches and chisels (Figure 4–63) is absolutely necessary in everybody working tool chest.
Center punches are used to mark parts before they are removed and for marking a spot for drilling. The punch mark keeps the drill bit from wandering. A *drift* or *starter punch* has a tapered point with a flat end used to drive out rivets, pins, and bolts. A *pin punch* is similar to the drift except its shaft is not tapered, so it can be used to drive out smaller rivets or bolts.
An ***aligning punch*** is a long, tapered punch used to align body panels for welding and for starting bolts. For example, one might be used to align fender bolt holes and a bumper. A **chisel** is a steel bar with a hardened cutting edge for shearing steel. These chisels come in various sizes, and a set is necessary for both light- and heavy-duty work. The cold chisel is used to split frozen nuts, shear off rusted bolts, cut welds, and separate body and frame parts.

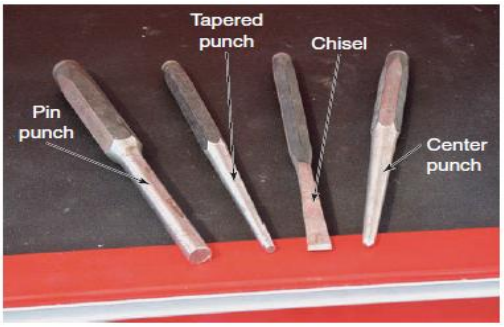


FIGURE 4–63 Study the names of punches and chisels.

DANGER Keep the end of a chisel or punch ground properly. If the end is mushroomed or enlarged from hammering, grind it down. A mushroomed end could cut your hand and metal fragments could fly into your face.

9. **SCRATCHES AWL -** A *scratch awl* is very similar in appearance to an ice pick, but the pointed steel shank is heavier. A scratch awl is used to pierce holes in light-gauge metal when a specific size hole is not required. It is also used to mark metal for cutting, drilling, or fastening. Keep the awl ground to a sharp point so it can be used effectively and safely in every job.

10. **METAL-CUTTING SHEARS -** Most body repair technicians have at least one pair of shears or tin snips. *Snips* are used to trim panels or metal pieces to size. Several types of metal cutters are useful.

a. **Tin Snips -***Tin snips* (Figure 4–64) are perhaps the most common metal cutting tool. They can be used to cut straight or curved shapes in sheet metal and aluminum.

A Sheet metal cutting pliers come in right- and left-hand configurations for cutting in different directions.

B Straight-jaw sheet metal cutting pliers are handy when you have plenty of room for cutting.

FIGURE 4–64 Study the types of snips often used in collision repair.

b. **Metal Cutters -** *Metal cutters*, also called aviation snips, are used to cut through metal panels. The narrow profile of the jaws allows the snips to slip between the cut metal. The jaws are serrated to cut through the tough metal.

c. Panel Cutters - *Panel cutters* are special snips used to cut through body sheet metal. These are used to make straight or curved cutouts in panels that require spot repair for rust or damage. They are designed to leave a clean, straight edge that can be welded easily (Figure 4–65).

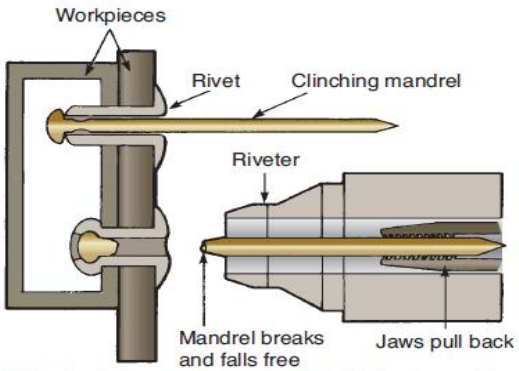
A A panel cutter, or two-way nibbler, will cut thicker panels easily. (*Courtesy of S&G Tool Aid Corporation*)

B The center jaw pinches between two stationary jaws to shear a thin strip of sheet metal away for cutting. (*Courtesy of Eastwood Company, www.eastwood.com*)

FIGURE 4-65 A panel nibbler will cut thick sheet metal easily even when making curved cuts.

10. RIVET GUN - *Pop rivets* are sometimes used to hold panels in place while repairs are made. They can be inserted into a blind hole through two pieces of metal and then drawn up with a riveting tool. This locks the pieces of metal together (Figure 4–66). There is no need to have access to the back of the rivets. They are used as temporary fasteners before the replacement sheet metal is welded. This prevents the extreme heat from distorting the metal or creating a safety hazard (such as around the gas tank). A good rivet gun does not cost much. The most commonly used rivets in bodywork are 1⁄8 inch and 3⁄16 inch. A few others of assorted sizes might be needed for special jobs (Figure 4–67). A heavy-duty riveter is used to rivet hard-to-reach places and heavier mechanical assemblies, such as a window glass regulator. It has long handles, a long nose, and sets 3⁄16- to 1⁄4-inch blind rivets.

A A hand riveter in kit form for blind rivets. (*Courtesy of Marson Corporation and Alcoa Fastening Systems*)



B When the rivet gun handle is squeezed, it will pull and expand the back side of the rivet head to secure parts together.

FIGURE 4-66 Note how rivets can hold two panels together. Factory-installed rivets are becoming common again.

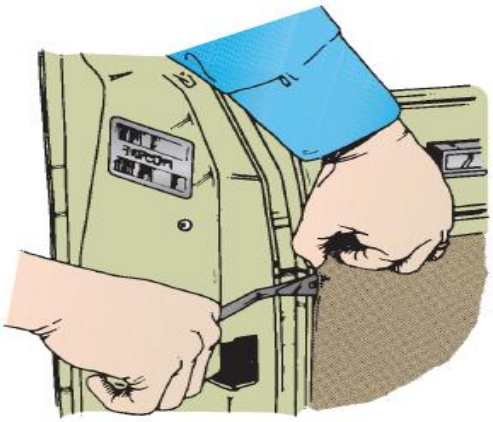
A These spring-loaded rivets and clamps can be installed and removed easily using special pliers. (*Courtesy of Eastwood Company, www.eastwood.com*)

B These spring-loaded rivets can be installed and removed easily. They are ideal for holding panels together while welding.

FIGURE 4–67 Panel holding tools will temporarily align parts before welding.

11. **TRIM AND UPHOLSTERY TOOLS -** Any repair work that requires removing interior trim and some-body moldings will be facilitated with an *upholstery tool* (Figure 4–68). This prong-shaped prying tool is used to slip under and pry up upholstery tacks, springs, clips, and other fasteners.

A



B

FIGURE 4–68 A body clip or upholstery tools will reach behind trim panels or parts for pulling out clips without breaking them. (*A Courtesy of Snap-on Tools Company, www.snapon.com*) (*B Courtesy of S&G Tool Aid Corporation*)

12. **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,* (Figure 4–69) are needed to reach inside the door and remove the clip. Some door handle tools pull the clip out; others push the clip off the shaft. Figure 4–70 shows an assortment of window and door tools.

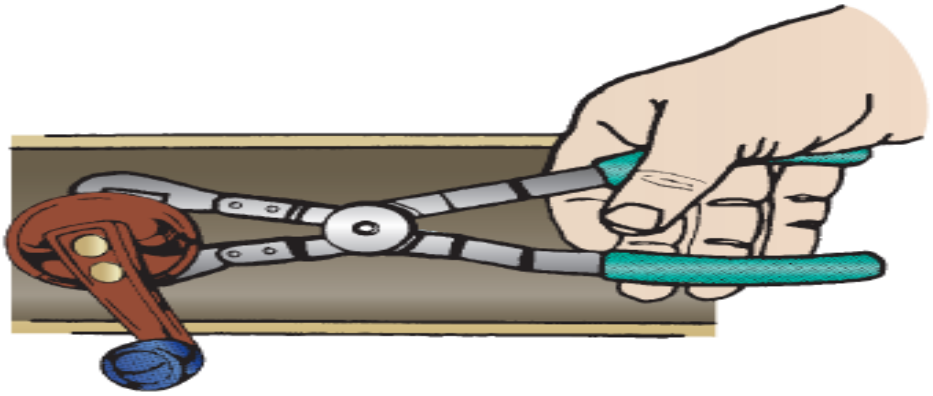
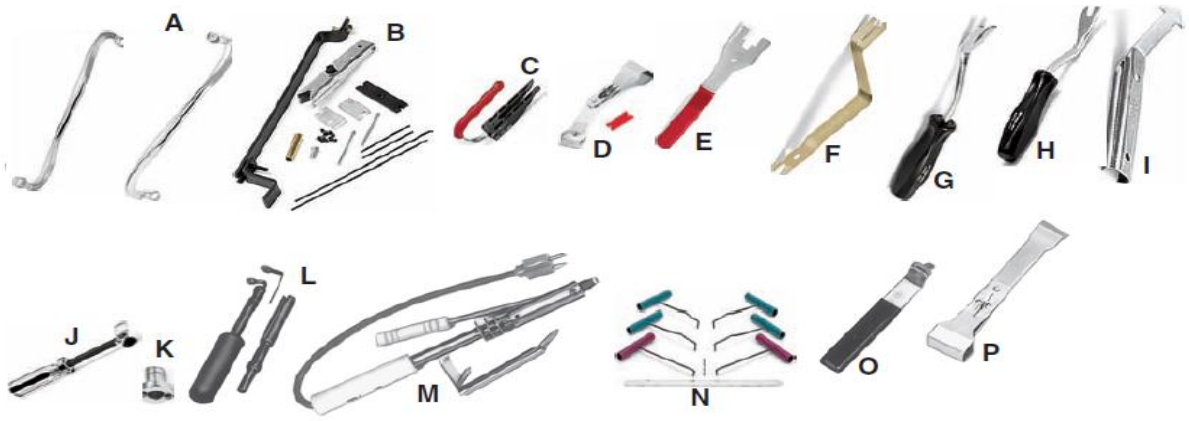


FIGURE 4–69 A door handle tool will reach behind the handle to remove spring clips. (*Courtesy of Lisle Corp.*)



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

FIGURE 4–70 Study the names of window and door tools. (*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 repaired metal. Others are used to apply and shape plastic body filler and putty.

1. **METAL FILES -** After working a damaged panel back to its approximate original contour, a *metal file* is used to mark (scratch) the metal to find high and low spots. Two special files are necessary for most bodywork.

a. Reveal File - The *reveal file* is a small file that is available in numerous shapes. Generally, it is curved to fit tightly crowned areas such as around windshields, wheel openings, and other panel edges. The reveal file is pulled, not pushed, when used. Pushing causes the file to chatter, resulting in nicks and an uneven surface.

b. Surform File - Body filler can be cut level and to rough contour with a **Surform file** (Figure 4–71). Commonly referred to as a "cheese grater," the surform file is used to shape body filler while it is semihard. Shaping the filler before it hardens reduces sanding and shortens the waiting period while the filler cures. A dirt nib file is used to remove minor paint imperfections, Figure 4–72.

FIGURE 4-71 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.

FIGURE 4-72 A dirt nib file is a small, finger-held tool used to carefully cut off dirt and dust particles in new paint.

c. Sanding Board - Once the body filler has hardened, the repair can be shaped and leveled with a *sanding board* (Figure 4–73). The long sanding board is a rigid wooden holder about 17 inches long and 23/4 inches wide. Also sometimes called a *flatboy,* the sanding board allows a repair area to be sanded quickly with long, level strokes, using 36- or 40-grit sandpaper. This eliminates waves and uneven areas. The extra-long length helps avoid creating a wavy surface. The sander also flexes to match the panel contour. Adhesive-backed sandpaper is applied from a roll.

A A long sanding board will quickly level and smooth large areas of body filler on flat body parts being repaired.

B A short sanding board is needed to level and smooth body filler on smaller repair areas.

FIGURE 4–73 Hand-sanding boards are the most important sanding tools of a body technician. It is almost impossible to make a large body repair area perfectly flat without them. (*Courtesy of Snap-on Tools Company, www.snapon.com*)

d. Sanding Blocks - *Sanding blocks* are used to support sandpaper when you are leveling and smoothing a repaired body panel. They come in various shapes and sizes. See Figure 4–74 and Figure 4–75. Stiff or hard sanding blocks are needed on larger flat surfaces (Figure 4–76). Softer sanding blocks are needed on curved surfaces or when block sanding paint problems. Curved or rounded sanding blocks will help when you are sanding a contour or rounded shape in a body panel. The shape of the sanding block must match the shape of the part or panel being repaired. See Figure 4–77. A contour sanding block has a shapeable or movable surface or a preformed irregular surface for sanding body lines. Look at Figures 4–78 and 4–79. By matching the profile of the contour sander to the body shape on the vehicle, you can quickly repair irregular profiles in body filler.

A Soft rubber sanding block with handle.

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

FIGURE 4–74 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.

FIGURE 4–75 The size of the sanding block must match the job. On the left is a tiny sanding block for repairing minor dirt damage in freshly applied paint. On the right is a large round sanding block that will accept Velcro-type sanding discs.

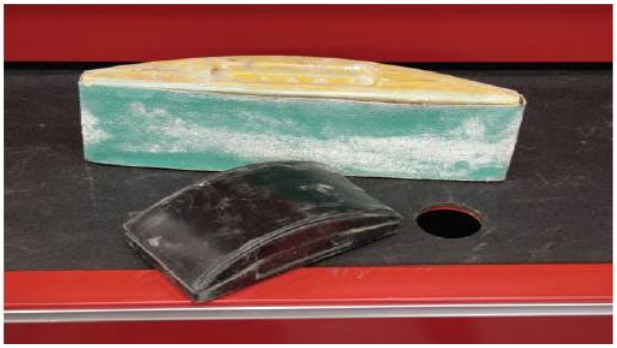
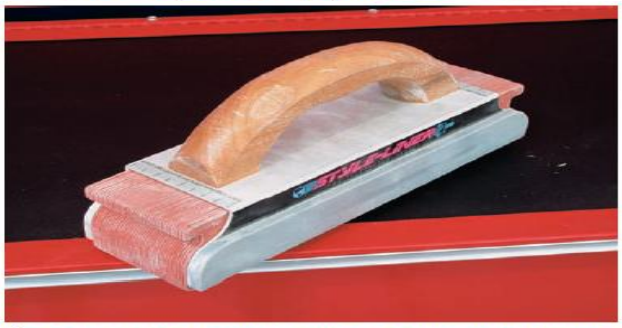


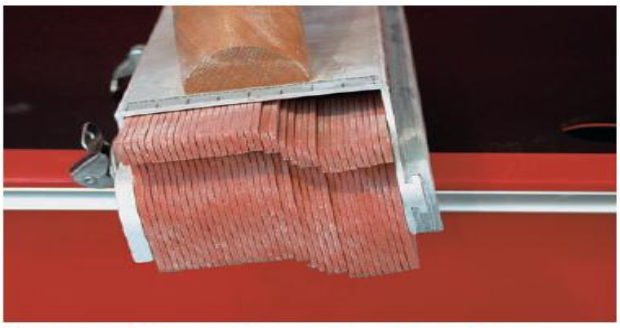
FIGURE 4–76 Hard rubber sanding blocks, like these, are used when the surface is still rough or high and must be leveled and shaped flat.

FIGURE 4–77 Again, the sanding blocks should match the shape or contour of the panel being repaired. On the left is a rounded sanding board for shaping long, curved body lines. On the right is a round rubber sanding block for shaping smaller curved surfaces.

FIGURE 4–79 This sanding block has interchangeable shapes. You can select a shape that matches body panel to repair complex body lines.



A The sanding block has movable parts that can be moved to match shape of body panel.



B The sanding block can be pressed against the undamaged surface on a body panel and then locked into that shape so the damaged area can be sanded to the right contour.

FIGURE 4–78 This is a shapeable sanding block.

2. **SPREADERS AND SQUEEGEES -** Spreaders and squeegees are two important tools used in auto body resurfacing. **Spreaders** are used to apply body filler and are made of rigid plastic and available in various sizes (Figure 4–80). Be sure to use one that is large enough to apply plastic filler over the complete repair area smoothly before the filler begins to set. A **squeegee** is a flexible rubber pad or block used to apply glazing putty and light coats of body filler. It is also used to skim water and sanding grit from the repair are when wet sanding.

FIGURE 4–80 Upper left, a plastic putty knife should be used to mix body filler and hardener. Lower right, spreades are used to apply body filler after mixing.

Tools and Equipment Safety

- ✓ Keep fingers and clothing away from rotating equipment.
- ✓ Sanding and buffing wheels must be securely attached.
- ✓ Protective guards must be in place.

- ✓ Use a box end wrench or socket whenever possible.
- ✓ Use only impact sockets with impact wrenches.
- ✓ Never use pliers to loosen or tighten.
- ✓ Never use screwdrivers as chisels.
- ✓ Never strike two hammers together
- ✓ Do not dump residue from steam cleaning in sewers.
- ✓ Wear protective gloves and a face shield.
- ✓ Use only approved cleaning solutions.
- ✓ Observe all environmental regulations.
- ✓ Keep tools in good condition.
- ✓ Use the proper tool for the job.
- ✓ Do not put tools in your pocket.
- ✓ Keep tools with cutting edges sharp.
- ✓ Keep tools clean and free from grease.
- ✓ Pull wrenches toward you, do not push.
- ✓ Do not use power equipment or tools on which you have not been trained.
- ✓ Keep power cords away from the path of vacuum cleaners, floor polishers and grinders.
- ✓ Do not carry plugged in equipment or tools with your finger on the switch.
- ✓ Do not carry equipment or tools by the cord.
- ✓ Disconnect the tool from the outlet by pulling on the plug, not the cord.
- ✓ Turn the tool off before plugging or unplugging it.
- ✓ Do not leave tools that are "On" unattended.
- ✓ Do not handle or operate electrical tools when your hands are wet or when you are standing on wet floors.
- ✓ Turn off electrical tools and disconnect the power source from the outlet before attempting repairs or service work. Tag the tool "Out of Service".
- ✓ Do not drive over, drag, step on or place objects on a cord
- ✓ Follow the tool manufacturer's directions.

when working on power tools

- The instruction for using any equipment should be studied carefully before the equipment is operated
- Hands and clothes should be kept away from the running machineries
- Disconnect the power source when you stop working on machines
- Clean, lubricate and cover the machine every time you finish working
- Never get under a vehicle which is standing on a jack. Support it with car stands and chock the wheels to keep the car from rolling
- Always use your legs and not and shoes while you are working in the shop

Workplace environment and safety

The preparation of work shop to supply equipment helps to -

- ✓ Keep environment well being
- ✓ Finish with specified our time pre-summing
- ✓ Identify the work and its implementing tools and equipment
- ✓ Decide the work procedure
- ✓ Keep tools, equipment and resource prevent ourselves from injury
- ✓ Done the work with quality

Hazards in the work shop

a) Faulty work habits
b) Misuse of equipment
c) Misuse of hand tools

a) **Faulty work habits**
   i) Smoking around fuel and solvents
   ii) Incorrect handling of paint, thinners, solvents, flammable liquids etc..
   iii) Blocking exits. A block exit could mean serious injury or even death during an emergency case such as fire.

b) **Misuse of equipments**
   i) Incorrect safety guarding of moving machinery
   ii) Misuse of flexible electric cords or worn cords. When used through holes the may cause fire
   iii) Improperly stored composed gas cylinders
   iv) Using hand held electric tools improperly grounded

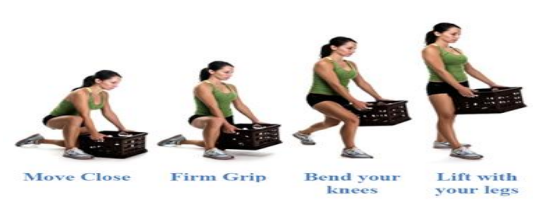
c) **Misuse of hand tools**
   i) Keeping hand tools dirty and in poor conditions
   ii) Improper storing of hand tools
   iii) Using defective hand tools
   iv) Keeping sharp tools in pockets

Handling of material

There are many potentially dangerous materials encountered in the auto body shop. These materials can cause bodily harm and property damaged if improperly handled. Always follow the manufacturer's suggestions when working with any materials

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

- ✓ Avoid lifting materials from the floor or while seated.
- ✓ Make use of available handling aids.
- ✓ Refrain from using sudden or jerky movements.
- ✓ Never lift a load over an obstacle.
- ✓ Perform lifts in areas with adequate footing, space and lighting.
- ✓ Modify objects and redesign jobs to make moving easier.
- ✓ Seek assistance from co-workers.
- ✓ Stay in good physical shape.
- ✓ Begin lifts close to the body.
- ✓ Use containers made of lighter materials.
- ✓ Reduce load sizes when possible.
- ✓ Do not twist or bend while lifting objects.
- ✓ Always bend your knees ,Maintain balance, Keep feet apart and in a comfortable position , Minimize bending at the waist, Bend your knees to a semi squat
- ✓ **.** Turn your feet in the direction that you want to move the load, Avoid unnecessary bending, twisting, and reaching, Change direction by turning your feet and not your back, To set down a load, squat down and keep your head up. Let your legs do the work



- ✓ Ensure repetitive, heavy and bulky lifts are not performed.
- ✓ Keep lifts between shoulder and knuckle height.

- ✓ Use conveyors, slides or chutes to eliminate pushing or pulling.
- ✓ Team lifts are appropriate if:
  - ➢ The load is too heavy for one person
  - ➢ The load is large, bulky, or oddly-shaped
  - ➢ You feel uncomfortable lifting the load by yourself (and do not have the proper equipment)

Use of fire -fighting equipment

Fire Extinguisher

A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations. It is not intended for use on an out-of-control fire, such as one which has reached the ceiling, endangers the user (i.e., no escape route, smoke, explosion hazard, etc.), or otherwise requires the expertise of a fire brigade. Typically, a fire extinguisher consists of a hand-held cylindrical pressure vessel containing an agent which can be discharged to extinguish a fire. Fire extinguishers manufactured with non-cylindrical pressure vessels also exist but are less common.

There are basically four different classes of fire extinguishers, each of which extinguishes specific types of fire. Newer fire extinguishers use a picture/labeling system to designate which types of fires they are to be used on.

Older fire extinguishers are labeled with colored geometrical shapes with letter designations. Both of these types of labels are shown below with the description of the different classes of extinguishers.

1. **Class A** Extinguishers will put out fires in ordinary combustibles, such as wood and paper. The numerical rating for this class of fire extinguisher refers to the amount of water the fire extinguisher holds and the amount of fire it will extinguish.
2. **Class B** Extinguishers should be used on fires involving flammable liquids, such as grease, gasoline, oil, etc. The numerical rating for this class of fire extinguisher states the approximate number of square feet of a flammable liquid fire that a non-expert person can expect to extinguish.
3. **Class C** Extinguishers are suitable for use on electrically energized fires. This class of fire extinguishers does not have a numerical rating. The presence of the letter “C” indicates that the extinguishing agent is non-conductive.
4. **Class D** Extinguishers are designed for use on flammable metals and are often specific for the type of metal in question. There is no picture designator for Class D extinguishers. These extinguishers generally have no rating nor are they given a multi-purpose rating for use on other types of fires.

Types of Fire Extinguishers

1. **Dry Chemical extinguishers** are usually rated for multiple purpose use. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant
2. **Hualon extinguishers** contain a gas that interrupts the chemical reaction that takes place when fuels burn. These types of extinguishers are often used to protect valuable electrical equipment since them leave no residue to clean up. Halon extinguishers have

a limited range, usually 4 to 6 feet. The initial application of Halon should be made at the base of the fire, even after the flames have been extinguished.

3. **Water** These extinguishers contain water and compressed gas and should only be used on Class A (ordinary combustibles) fires.
4. **Carbon Dioxide (CO2) extinguishers** are most effective on Class B and C (liquids and electrical) fires. Since the gas disperses quickly, these extinguishers are only effective from 3 to 8 feet. The carbon dioxide is stored as a compressed liquid in the extinguisher; as it expands, it cools the surrounding air. The cooling will often cause ice to form around the “horn” where the gas is expelled from the extinguisher. Since the fire could re-ignite, continue to apply the agent even after the fire appears to be out.

How to Use a Fire Extinguisher

Even though extinguishers come in a number of shapes and sizes, they all operate in a similar manner.

- ✓ Pull the pin at the top of the extinguisher that keeps the handle from being accidentally pressed.
- ✓ Aim the nozzle toward the base of the fire.
- ✓ Stand approximately 8 feet away from the fire and squeeze the handle to discharge the extinguisher. If you release the handle, the discharge will stop.
- ✓ Sweep the nozzle back and forth at the base of the fire. After the fire appears to be out, watch it carefully since it may re-ignite!

Enterprise first aid,

Give first aid whenever required using the first aid kit available in the shop
Depending on the type of accident, call for help (doctor or ambulance).
First aid" is a catch-all phrase that refers to two distinctly different medical needs. Emergency first aid is exactly that the first response to a life-threatening (or limb-threatening) medical emergency, either an illness or an injury. It's often called first responder training
The aims and objectives of first aid
The objectives of first aid, is just that, to provide the “first aid” to a person who has been injured. In may cases, such as a scraped knee, a small cut, or minor illness, that is all the aid that a person needs. In more severe cases, the first aid is meant to stabilize the person until better, trained and equipped providers arrive. An example is CPR, the first aider starts CPR and the rescue squad shows up and provides care beyond the training of the first aider such as medications, airway adjuncts and IV’s.

- Preserve life.
- Prevent illness or injury from becoming worse.
- Relieve pain, if possible.
- Promote recovery.

The office can seem like a safe place to work, but, there are risks you wouldn’t think of until they happen. An accident can occur at any time and if it did, who in the workplace is trained to help? It is a legal requirement as a company to ensure your employees receive immediate attention. Here are 10 reasons why you should consider First Aid Training for employees.

1. It can save lives
2. Reduce the number of workplace accidents
3. Positive work environment
4. Your company will be safer place to work
5. First aid kits are used properly
6. It can reduce recovery time
7. It can keep employees safe outside of the workplace
8. It's a great team-building exercise
9. It gives your employees confidence and clarity during an emergency
10. The cost of a First Aid at Work Training course is nothing compared to that of potentially saving alive.

hazard control and hazardous materials and substances

Hazardous materials include any materials that can cause seriously physical harm or pose a risk to the environment. These materials are identified and regulated by the united states Environmental Protection Agency (EPA)

There are four types of hazardous materials found in the body shop

- Flammable materials
- Corrosive materials
- Reactive materials
- Toxic materials

"Hazardous Substances" are classified based only on health effects which have the potential to harm human health. They may be solids, liquids or gases; they may be pure substances or mixtures. When used in the workplace, these substances often produce vapours, fume, dusts and mists. There are many industrial, laboratory and agricultural chemicals which are classified as hazardous. Hazardous substances may cause immediate or long-term health effects. Exposure could result in:

- Poisoning;
- Irritation;
- Chemical burns;
- Sensitization;
- Cancer;
- Birth defects; or
- Diseases of certain organs such as the skin, lungs, liver, kidneys and nervous system.

Common hazardous substances

Many industrial, agricultural and medical organizations use hazardous substances. The degree of hazard depends on the concentration of the chemical. Common hazardous substances in the workplace include:

- acids
- caustic substances
- disinfectants
- glues
- heavy metals, including mercury, lead, cadmium and aluminum
- paint
- pesticides
- petroleum products
- solvents.

Possible side effects of exposure to hazardous substances

Health effects depend on the type of hazardous substance and the level of exposure (concentration and duration). A hazardous substance can be inhaled, splashed onto the skin or eyes, or swallowed. Some of the possible health effects can include:

- poisoning
- nausea and vomiting
- headache
- skin rashes, such as dermatitis
- chemical burns
- birth defects
- disorders of the lung, kidney or liver
- nervous system disorders

Hazard control system

A hazard control program consists of all steps necessary to protect workers from exposure to a substance or system, the training and the procedures required to monitor worker exposure and their health to hazards such as chemicals, materials or substance, or other types of hazards such as noise and vibration. A written workplace hazard control program should outline which methods are being used to control the exposure and how these controls will be monitored for effectiveness.

Hazard prevention and control program requires:

1. political will and decision-making;
2. commitment from top management, with a clear and well circulated policy basis;
3. commitment from workers;
4. well defined goals and objectives;
5. adequate human and financial resources;
6. technical knowledge and experience;
7. adequate implementation and competent management of program;
8. establishment of multidisciplinary teams;
9. mechanisms for communication;
10. monitoring mechanisms (indicators);
11. continuous improvement of the programme.

Steps for hazard control

1. Be aware of the problem
2. Accept the problem
3. Know the cause
4. Learn of possible solutions
5. Accept a solution
6. Know the supplier (of solution)
7. Finance
8. Implement solutions
9. Evaluate

Self-Check -3	**Written Test**

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

1. List 10 tools used for vehicle body work (10 pts)

2. List Steps for hazard control (8 pts)

Note: **Satisfactory rating - 14 points** **Unsatisfactory - below 14 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet 4	**Select and inspect quality Materials**

Material selection is a step in the process of designing any physical object. In the context

of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material for a given application begins with properties and costs of candidate materials. For example, a thermal blanket must have poor thermal_conductivity in order to minimize heat transfer for a given temperature difference. It is essential that a designer should have a thorough knowledge of the properties of the materials and their behavior under working conditions. Some of the important characteristics of materials are : strength, durability, flexibility, weight, resistance to heat and corrosion, ability to cast, welded or hardened, machinability, electrical conductivity, etc.

What kind of materials are used to make cars?

Cars are made of a wide variety of materials, such as steel, aluminum, copper, glass, rubber, and special fibers. First, a raw material production company takes individual raw materials and turns them into materials that can be used to make car parts, and delivers them to parts production companies or to Toyota. These materials are then made into car parts and later installed in car bodies to complete the cars.

Material selection in the automobile industry is an artful balance between market, societal, and corporate demands, and is made during a complex and lengthy product development process. Actual selection of a particular material for a specific application is primarily driven by the trade-off between the material's cost (purchase price and processing costs) and its performance attributes (such as strength and durability, surface finish properties, and flexibility.) The vehicle manufacturers' materials engineer and component-release engineer play the pivotal role in screening, developing, validating, and promoting new materials, although initial consideration of possible material changes may be sparked by numerous players. These selection decisions are made within a material selection process that will continue to evolve. This evolution will largely reflect changes in the vehicle and component development processes to make them more responsive-in terms of accuracy, time, and cost-to market and regulatory demands. The balancing of market, societal, and corporate demands will continue to determine specific automotive material usage in the future.

Surface Finish Material surface finish and the ability to take coatings and paints is an important consideration. Typically, materials may be grouped into two categories, exposed and non-exposed. Exposed materials, such as body panels, are styling sensitive. Exterior body panels require a Class A finish. A Class A finish is a function of the surface finish and surface treatment. Surface finish refers to specific characteristics such as formability and surface smoothness. Surface treatment involves paint and coating treatments. Other considerations such as surface finish and light reflectivity require a material to accept specified primer, base coat, and top coat coatings. Every material has advantages and disadvantages.

Receiving and Inspection of the materials

The receiving department receives the materials supplied by the vendor. The quantity is verified and tallied with the purchase order. The receipt of the materials is recorded on the specially designed receiving slips or forms which also specify the name of the vendor and the purchase order number or into a computer. It also records any discrepancy, damaged condition of the consignment or inferiority of the materials. The purchase department is informed immediately about the receipt of the materials. Usually a copy of the receiving slip is sent to purchase department. In computerized system the Purchase department concerned staff member is supposed to keep a track of all the receipts through the computer. If the materials require any quality control or inspection, they are sent for such testing. The inspection department tries to verify that the incoming materials comply with the standard quality as specified in the purchase order. It may involve mechanical, electrical, chemical or such types of testing. The accept reject decision may be taken on the basis of either sample testing or testing the entire lot. The inspection may involve in house testing or testing done at the vendor's plant.

The inspection report along with the Test certificate and the recommended acceptance or rejection should be sent to the purchasing department. On the basis of the recommendations made by the inspection department, the purchase department arranges for the segregation of the rejected materials. They are sidetracked from the normal flow towards the stores or production departments. If they involve some further shipments at supplier's end, they are suspended immediately. The concerned departments such as stores department, production department, accounting department, scrap and waste disposal section etc. are immediately informed about the rejections. If the defectives are within the established tolerance limits, they may be accepted as their returning to the vendor may disrupt the production schedule. However, the vendor should be informed about this and if possible, the credit should be claimed from him.

Receiving function is usually of a routine nature and sometimes it is kept independent of purchase department but within Material department usually Stores. However, it is desirable to treat the receiving departments as a subordinate function of purchase department due to following reasons:

1. Before the settlement of the invoices, the purchase department has to verify that the consignment agrees with the purchase order in all respects. This can be verified only with the help of the receiving department.
2. When the shipment is received in damaged condition, the purchase department must have first hand prompt information about this, so that it can initiate immediate legal action against the vendor or the carrier. It can also take necessary action for tapping the substitute sources of the supply for the urgently needed materials.
3. In case of the short shipment from the suppliers, the rush orders can be managed so that the work stoppages caused by the lack of materials can be eliminated.

Payment of the invoice: When the goods are received in satisfactory condition, the invoice is checked before it is approved for the payment. Generally the invoice is checked to see that the goods were duly authorized to purchase, they were properly ordered, they are priced as per the agreed terms, the quantity and quality conform to the order, the calculations are arithmetically correct etc. It is a matter of controversy, whether the invoice should be checked by the purchase department or by the accounting department. The popular argument in favor of purchase department are:

1. It is the purchaser who can accurately verify that the consignment is billed properly.
2. As he is familiar with the routine details and terms and conditions of the order, he can correct and adjust any discrepancy in the execution of the order before an invoice is paid.
3. It allows the purchaser to watch the price of the materials closely increasing his consciousness for the future purchase.

This is now changed and the Stores within the Materials department can take care of receiving as one copy of Purchase order is already marked to them or they can get all the necessary information through the internal computer system

- Type of damage
- Type of vehicle construction (Body over frame/unitized)
- Type of sheet metal-HSLA, UHSS, etc.

Self-Check -4	**Written Test**

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

1. What is material selection? (2 pts)

2. What kind of materials are used to make cars? (4 pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet 5	Check and identify operation of hand power tools and safety equipment's.

Auto Body Repair
Dent Repair, Body Hammers & Dollies, Body Fillers, Body soldering, Seam Sealer, Sanding Blocks & Sandpaper, Body Panel removal and installation

DENT REPAIR

HAMMERS & DOLLIES

BODY FILLERS

BODY SOLDERING

SEAM SEALERS

SANDING BLOCKS & BOARDS

SANDPAPER

BUFFING & POLISHING

SOUND DEADENING

ROTISSERIE

FENDER ROLLER

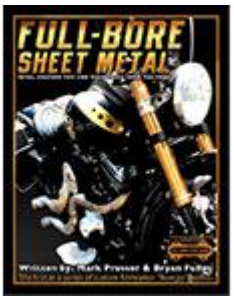
BODY PANEL INSTALLATION

BODY PANEL REMOVAL

DOOR REPAIR TOOLS

INTERIOR REPAIR

PLASTIC & GLASS REPAIR



BOOKS & DVDS

CAR CARE SUPPLIES

Hand and power tools

Manual tools have fewer moving parts, and their designs are simple in nature. To recap: power tools use a source of power (i.e. battery or electricity) to run, while hand tools rely on human power to operate..

Tools and Equipment Maintenance

First and foremost, the purpose of checking or a pre-use inspection is to ensure that the tools and equipments are safe to operate. A defective tools and equipments could easily endanger the life of its operator, as well as the lives of laborers working in close proximity to it

Testing of tools and equipments

Testing tool and equipment should be tested regularly to ensure it provides the level of protection required. Testing intervals will depend on several factors including:

- The frequency of use
- The environment in which it is being
- manufacturer's advice.

All 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.

components of maintenance program

A maintenance strategy includes procedures as well as corrective and preventive maintenance

- Inspections ensure that tools and equipments are operating correctly. Safety inspections ensure the tools/equipments are safe for both patients and operators.
- Corrective maintenance (cm) restores the function of a failed device and allows it to be put back in to service.

- Preventive maintenance (pm) aims to extend the life of the tools/equipment and reduce failure rates.

  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.

General requirements for tools/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 tools/equipment maintenance and where the records are kept.
- Set up a system for removal and tagging of damaged or defective tools and equipment

Self-Check - 5	Written Test

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

1. Write the difference between hand and power tools (4 pts)

2. What are the main factors that Testing of tools and equipments intervals will depend on (6 pts)

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet 6	Determine procedures to minimize waste material.

Determining waste minimizing procedure.

Waste minimization is a set of processes and practices intended to reduce the amount of waste produced. By reducing or eliminating the generation of harmful and persistent wastes, waste minimization supports efforts to promote a more sustainable society.

Waste minimization involves redesigning products and processes and/or changing societal patterns of consumption and production.

Waste minimization entails limiting the amount of waste that is generated thereby helping to eliminate the production of persistent and harmful wastes effectively supporting efforts that promote a society that is sustainable. Thus, waste minimization involves a change of societal patterns that relate to production and consumption as well as redesigning products to eliminate the generation of waste.

Waste Minimization is reduction in the quantity of hazardous wastes achieved through a conscientious application of innovative or alternative procedures. Simple adjustments to a process producing wastes (e.g. a teaching lab experiment, a vehicle cleaning operation, etc.) may be the only requirement to achieve some results.

Benefits of Waste Minimization

While it is obvious that waste minimization supports sound business and economic practices in addition to protecting the environment, other benefits include the following:

- **Improved product quality** New technological practices and innovation will not only reduce generation of waste but also contribute to improved input quality that translates to improved products.
- **Economic benefits** Efficiency in product use translates to reduced costs when purchasing materials thus significantly affecting financial performance.
- **Efficiency of production practices** – Waste minimization will attain more output of the product for every part of raw material.
- **Environmental responsibility** eliminating or minimizing generation of waste will make it easy for you to achieve environmental policies, standards and regulations.
- **Public image** Embracing waste minimization will boost the reputation of your company, as it is a reflection of proactive movement in the quest to protect the environment.

3 R's of Waste Minimization

Waste minimization revolves around three R's as follows:

Reduce

This calls for using resources that are just enough to cater to your needs for instance building a smaller house. This is an effective way of conserving resources as it also lowers the costs. This can be achieved through attaining accuracy when ordering to ensure that there is no waste or no material is sitting on the site for long periods that it is damaged.

Reuse

Here, you will do well to reuse existing materials and buildings effectively reducing the need for resources while lowering waste volumes and saving money. A huge percentage of resources are incorporated in the construction of homes owing to the mixed materials that are used yet the end destination for most of them are landfills. Thus, renovating a house is a much better option than bringing it down to put up another one because a negligible fraction of the old house may be reused/recycled.

Recycle

Using left over resources or those resources that have reached the end of their life minimizes the need for new materials as well as lowers the volume that ends up in landfills. Thus, it is advisable to use materials that are recyclable as this creates a market for the resources that are recycled while also raising the price that recyclers pay for resources that are recovered even as the recycling viability increases.

Waste Minimization Techniques

1. Optimization of resources

In order to reduce the quantity of waste that is produced by individuals or organizations calls for the optimization of raw materials used in production. For instance, a dressmaker will do well to arrange the pieces of pattern in a certain way along the length of the fabric to use a small portion of the fabric.

2. Scrap metal reuse

Incorporating scraps into the initial stages of manufacturing is a surefire way of ensuring that they do not end up in landfills as waste products. A majority of industries embrace this process effectively returning rolls that are damaged to the initial production line and in the manufacturing of off cuts, plastic items so that scrap is re-incorporated in the new commodities.

3. Quality control improvement and process monitoring

Measures can be put in place to control the number of rejects and ensure it is at a minimum. This may be achieved through increased frequency of inspection as well as increasing the number of inspection points. For instance, installation of continuous monitoring device that is automated will help in identifying production problems before they get to an advanced stage.

4. Exchange of Waste

Here, the waste products from one process are used as raw materials for other processes. Exchange of waste is another means of minimizing waste disposal volumes especially for waste that may not be eliminated.

5. Shipping to the point of use

Here, raw materials as well as other components are directly delivered at the point of assembly or manufacturing plant ostensibly to minimize handling and use of enclosures and protective wrappings.

6. Zero waste

This systems approach is designed to eliminate waste from the source as well as at every point of the supply chain to ensure that no waste is produced. This design philosophy places emphasis on waste prevention and not waste management at the end of production line.

7. Waste Minimization for Households

Households can practice waste minimization by employing various techniques. One of the ways to achieve this is through purchasing adequate sizes and amounts of food. Purchasing large containers of paint when taking small decorating jobs or purchasing large volumes of food than you need will result in wastage. In instances where cans or packs may be thrown the remains of the containers should be removed to allow for recycling of the container.

Home composting, thoughtful use of electricity as well as reducing the number of car journeys is also a great way of waste minimization. Generally, buying fewer products or products that last longer, mending worn or broken equipment or clothing can also minimize household waste. Additionally, households can also minimize wastage of water and cycle or walk to various destinations as opposed to using cars thereby saving on fuel. Overall, personal waste reduction will have an effect on the general waste volumes. Consumers may also shun products without eco-labeling.

8. Waste Minimization in Building Construction

An assessment of streams of waste shows that energy savings may be achieved at minimal cost or no cost within the construction sector. Consequently, the environmental impact of materials may be reduced significantly with reuse.

While at it, it is important to ensure you work with the concerned authorities that include local councils, regional waste authorities, landfill operator or waste recycling contractors. Some of the construction materials that may be recycled include steel, aluminum, gypsum plasterboard, timber, concrete, glass, carpet, plastics as well as bricks and tiles. It is important to put in place waste minimization strategies that have been agreed upon by both the parties. A team approach is highly effective in reducing waste.

10 ways to reduce waste in the workplace

We all know that reducing waste is an important part of conserving our planet's resources and protecting it for many years to come. Fortunately, many of us are conscious of our impact and make efforts to reduce waste at home by recycling, returning bottles, using ceramic dishes over paper plates, and so on. But what about reducing waste in the workplace?

Companies may not put time, money, or energy into workplace waste reduction if they believe it's too inconvenient to establish a program, or that it's trivial because it doesn't bring the company money. However, while reducing waste may not generate revenue in the traditional sense, it will ultimately save your business money.

Even if your company isn't ready to establish a dedicated team to help take green measures, there are simple ways to reduce waste that are easy to implement, help the environment, and save you money in the long run:

1. GO (NEARLY) PAPERLESS

While recycling is helpful, the biggest impact comes from using less paper in the first place. With programs like Google Docs that allows you to write, edit, and collaborate for free online, and Dropbox, a free service that makes it easy to sync and share files, it's easier than ever to eliminate the amount of paper you use in the workplace. Consider adding a "think before you print" message to the bottom of your emails as a friendly reminder to coworkers.

2. KEEP A PAPER RECYCLING BIN WITHIN ARM'S REACH

People recycle when it's convenient. At ISCG, every trashcan has a small recycle bin attached so that it's visible and doesn't take any extra effort. Make it easy for employees to recycle by meeting them where they already are (at their desks) with a bin.

3. PRINT SMARTER

Sometimes printing is necessary. Save up to 50 percent on paper costs by having employees set their defaults to print double-sided, and ask employees to use the "Print Selection" function, which encourages them to only print what they need and reduces wasted sheets of paper.

4. PROVIDE REAL DISHES AND SILVERWARE

Instead of spending money on wasteful paper plates, harmful Styrofoam cups, and flimsy plastic utensils, invest in real dishes and silverware for your office café. You'll save on the cost of purchasing and disposing these items over time, and real dishes are much nicer to use. Make everyone responsible for cleaning their own dishes, and if you can, spring for a dishwasher to make it even easier.

5. GET RID OF THE K-CUP MACHINE

Those millions of little plastic cups can't be recycled and go straight to the landfill. K-Cups may seem economical because you can make one cup of coffee at a time, but they are much more expensive than coffee beans. A pound of K-Cup coffee goes for roughly $50, while Starbucks is $12 per pound, and Dunkin is only $9 per pound. Invest in a machine that grinds the beans to make one cup at a time, and buy coffee beans in bulk to save money.

6. BUY IN BULK

Coffee beans aren't the only thing you should buy in bulk for the office. Purchase items like sugar and creamer, snacks, cleaning supplies, and Kleenex in bulk instead of individually packaged to lower the cost per unit and reduce the amount of packaging you throw away.

7. REUSE BINDERS AND FILE FOLDERS

Provide label stickers so employees can write over and reuse binders and file folders instead of throwing them away after one use.

8. CREATE A RECYCLING CENTER

Make a small recycling center by providing bins to put returnable bottles, non-returnable bottles, and paper. At ISCG, we have these three bins and a trash bin hidden in two large pull-out drawers in the kitchen. Money from the bottle deposits is money in your company's pocket.

9. PROVIDE FILTERED WATER

Install a filtered water tap or keep a large Brita pitcher in the fridge so employees can pour a glass of water instead of grabbing a disposable plastic water bottle. Your company will save money on bottled water, and landfills will be spared of more plastic.

10. GIVE EMPLOYEES A REUSABLE WATER BOTTLE

Surprise and delight employees with a reusable water bottle with your company's logo on it. There's a small cost associated, but ultimately you'll save on plastic water bottles, promote wellness, and get free advertising when they carry it outside the office.

Self-Check -6	Written Test

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

1. Explain waste minimization (4 pts)

2. List four Benefits of Waste Minimization (4 pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information 7	Identifying procedures to maximizing energy efficiency

Energy

- BAT for energy efficiency under the PPC Regulations will be satisfied provided the operator meets one of the following conditions:
  - the operator meets the basic energy efficiency requirements below and is a participant to a Climate Change Agreement (CCA) with the Government or has EU ETS (European Union Emissions Trading System) commitments: or
  - the operator meets the basic energy efficiency requirements below and the additional energy efficiency requirements

Basic energy efficiency requirements

- The requirements of this section are basic, low cost, energy standards that apply whether or not a CCA is in force or the operator has EUETS commitments for the installation.

BAT	
1	The operator should produce a report annually on the energy consumption of the installation
2	The operator should monitor energy flows and target areas for reduction which should be updated annually. ("Sankey" diagrams and energy balances would be useful as aids.)
3	In order to optimize combustion, the operator should, where practicable, monitor waste gases. The scope of this monitoring will depend on the size of the combustion plant and, where relevant, should be determined by consulting the appropriate Statutory Process Guidance Note.
4	The operator should ensure that all plant is operated and maintained to optimize the use and minimize the loss of energy
5	The operator should ensure that all appropriate containment methods, (e.g. seals and self-closing doors) are employed and maintained to minimize energy loss.
6	For new oxidation plant, where thermal oxidation is used, heat recovery should be maximized. Where heat recovery is not practicable, catalytic oxidation should be used wherever technically possible.

Additional energy efficiency requirements

- Within IPPC it is valid to consider both the emission of direct (heat and emissions from on-site generation) and indirect (emissions from a remote power station) pollution when considering options for energy efficiency.

BAT	
Energy efficiency techniques	
7	The following techniques should be considered:
	Heat recovery from different parts of the processes
	Minimisation of water use and closed circulating water systems
	Good insulation
	Plant layout to reduce pumping distances
	Phase optimisation of electronic control motors and fans
	Optimised efficiency measures for combustion plant
	Preventative maintenance programme targeting energy drops
Energy supply techniques	
8	The following techniques should be considered:
	Use of Combined Heat and Power (CHP)
	Generation of energy from waste
	Use of less polluting fuels

Self-Check -6	Written Test

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

1. List four Basic energy efficiency requirements (4 pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Vehicle Body Repairing and Painting

Level II

Learning Guide #27

Unit of Competence: Remove and Replace Vehicle Components and Body Repair

Module Title: Removing and Replacing Vehicle Components and Body Repair

LG Code: EIS VRP2 M09 LO2-LG-27

TTLM Code: EIS VRP2 M01 TTLM 0919v1

LO2. Prepare vehicle surfaces for painting

Instruction Sheet	Learning Guide #27

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

- Accessing and interpreting Information of manufacturer**/component** supplier specifications
- protecting painted Surfaces adjacent
- Cleaning painted surface.
- Protecting and/or removing components and ancillary fittings and store securely .
- Preparing Surfaces to be painted.
- Noting and reporting Unrecorded damage.
- carrying out Surface preparation
- 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**:

- Access and interpret Information of manufacturer**/component** supplier specifications
- Know how to protect and clean painted Surfaces adjacent.
- Know how to Protect and/or remove components and ancillary fittings and store securely .
- Prepare Surfaces to be painted.
- Note and reporting Unrecorded damage.
- carry out Surface preparation
- Dispose Waste materials

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 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14**respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3” **in page -15.**
6. Do the “LAP test” **in page – 16** (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 points** **Unsatisfactory – below 4 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 points** **Unsatisfactory – below 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. _____
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.

I. 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.

II. 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

III. **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.

IV. **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.

V. **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.

VI. **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 -

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.

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.

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.

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.

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.

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 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 Parts You'll Be Working On

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

Step- 3. Use an Adhesive When Painting Parts 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 part 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 BODIES,***

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
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Vehicle Body Repairing and Painting

Level II

Learning Guide-#28

Unit of Competence: Remove and Replace Vehicle Components and Body Repair

Module Title: Removing and Replacing Vehicle Components and Body Repair

LG Code: EIS VRP2 M01LO3-LG-28

TTLM Code: EIS VRP2 M01 TTLM 0919v1

LO3. Apply primers

Instruction Sheet	Learning Guide #28

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

- Protect and/or remove and store securely.
- Applying primer surfaces
- Carry out application activities
- Complete work without causing damage to any component or system

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 for work
- Prepare vehicle surfaces for painting
- Apply primers
- Prepare primed surface for refinishing
- Clean up work area and maintain equipment

Learning Instructions:

7. Read the specific objectives of this Learning Guide.
8. Follow the instructions described below 3 to 6.
9. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
10. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14**respectively.
11. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3”**in page -15.**
12. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet 1	Protecting and/or removing components and ancillary fittings and storing securely.

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.

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. Use the Answer sheet provided in the next page:

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.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

h. _____

i. _____

j. _____

k. _____

l. _____

m. _____

n. _____

2..

a_____

b_____

c_____

d_____

Information Sheet 2	Applying primer surfaces

Applying 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.

a primer is generally the first prime coat in any finishing system. Primers are designed to prepare the bare substrate (steel, aluminum, SMC, fiber glass, or plastic) to accept and hold the color topcoat. Primers should be selected to match the sub-strate. Epoxy and etching primers provide maximum adhesion on metal panels and produce a corrosion-resistant foundation to prevent rusting.

There are several types of primers or prime coat materials available. Make sure you use the right kind for the body substrate or panel being painted.

Applying primers to bare metal

Apply etching primer or two-part epoxy primer to all bare metal surfaces. On smaller areas sanded to bare steel, you can use a spray can of etching primer. On larger areas of bare metal, mix and apply the primer with your spray gun. Generally, use one full wet coat over all exposed

steel areas on the panel. Blend or fan the primer thinner around the perimeter of the repair area. Apply this material following label directions, usually as full wet or medium wet coats. One or two coats are generally recommended, with proper flash time between coats. Etching primer-surfacers are also available that can be applied to bare metal. They should be used if the metal has surface rust or surface pits. The thicker etching primer- surfacer will bond to the metal while also filling small pits in the surface. Plain primer is often not thick enough to fill rust pits in metal.

Primecoat selection

The decision to apply a primer, a primer-sealer, an adhesion promoter, or a primer-surfacer depends on three factors. These are:

1. condition of the substrate—smooth or rough, bare or painted
2. type of finish on the substrate—if painted
3. Type of finish to be used for the topcoat

Generally, use prime coats as follows:

- Use a self-etch primer or epoxy primer on bare metal.
- Use a sealer over repair areas to prevent repair material ingredients from bleeding or showing through the new paint.
- Use a primer to improve adhesion and to help cover repaired surfaces with dissimilar materials on them.
- Use a primer-sealer for covering dissimilar materials and for preventing bleed through in the new paint.
- Use a primer-surfacer or primer-filler to help smooth and level surfaces with a large area of minor surface imperfections or to help featheredge repair areas.
- Use an adhesion promoter on hard, baked-on OEM finishes helping prevent peeling or a poor bond between the new paint and the existing finish.

Table 25–2 summarizes the use of common prime coat materials for refinishing.

TABLE 25–2 FUNCTIONS OF PRIMECOATS

Primecoat Function	Self-Etch Primer	Primer	Primer-Surfacer	Primer-Sealer	Sealer
Apply to bare metal	Yes	No	No	No	No
Resists rust and corrosion	Yes	Yes	Yes	Yes	No
Makes topcoat adhere better	Yes	Yes	Yes	Yes	Yes
Fills scratches and nicks	No	No	Yes	No	No
Provides uniform hold out of the topcoat	No	No	No	Yes	Yes
Prevents show through of sand scratches	No	No	No	Yes	Yes

Applying prime coats

Reduce the prime coat chosen according to the manufacturer's instructions. Be careful to select the proper solvent for the weather conditions and thoroughly mix the material.

Generally, only one or two coats of primer or primer sealer are required. Primer-surfacer and primer-filler also require one or two coats for proper buildup. Apply the first coat of primecoat. Allow this coat to flash dry, following the recommended flash time on the label.

Flash time is the time needed for a fresh coat of sprayed material to partially dry or cure. Flash time is needed to prevent the material from sagging, running, cracking, or experiencing other problems when another coat is applied.

After the recommended flash time has passed, apply the next coat or coats as medium wet coats for additional film buildup, with sufficient flash time between each application. When making a spot repair, extend the prime-coat (primer material) several inches or millimeters around the first coat.

Allow the prime-coat to dry thoroughly. Do not apply extra heavy coats to speed up the operation. Primer applied too thickly will require more time to dry and can lead to cracking, crazing, pinholes, and poor holdout (Figure 25–13).

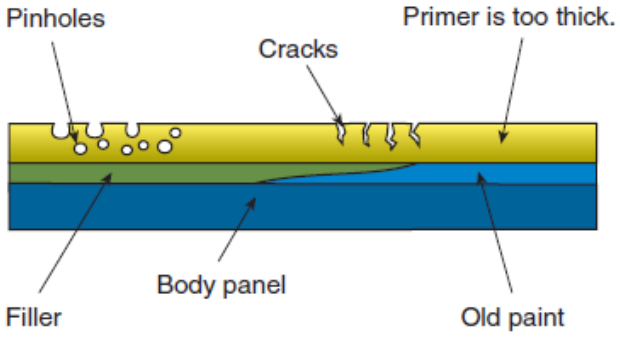


FIGURE 25–13 If primer is put on too thickly in one coat, pinholes and cracks can result. Allow primer to flash for a few minutes before applying the next coat.

It is also difficult to tell when a thick coat of primer surfacer is really dry. The surface will appear dry while there is still a lot of solvent trapped below the surface. The lower layer of primer-surfacer is still trying to dry and shrink. Follow the manufacturer's guidelines to avoid problems!

If primer-surfacer is sanded before all of its solvent has evaporated, the material in the scratches will continue to shrink down in the scratches. They will show up in the final finishing color topcoats as sanding scratches.

At the other extreme, thin dry coats of primer-surfacer can cause loss of adhesion, not only to the substrate but also to the topcoat color. Always spray wet coats of primer surfacer.

After the material is fully dry, block sand the area until it is smooth.

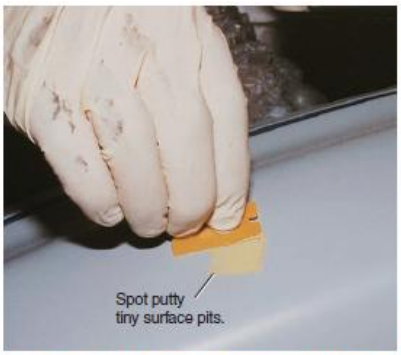
As discussed in Chapter 12, some technicians like to apply a guide coat. Using a guide coat, you can easily find high and low spots by sanding the area. If the second guide coat does not sand off, you have found a low spot. If it sands off too quickly, you have found a high spot. Ideally, the guide coat should sand off at the same time. This shows that the surface is flat and ready for sealer, a color coat, and other operations.

APPLYING SPOT PUTTY

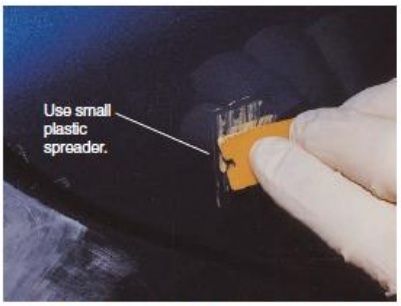
Once the primer is dry, any remaining small pinholes and scratches must be filled with *spot putty,* or glazing putty. Closely inspect all panels to be painted for remaining surface problems: paint chips, pits, sanding marks, or other imperfections. It can be very difficult to see some of the flaws, so make sure the surface are well lit. Use a handheld shop light for your inspection if needed.

Place a small amount of properly mixed putty onto a clean rubber squeegee or tiny putty spreader. Wipe a thin coat over the primer imperfections. Use single strokes and a fast scraping motion (Figure 25–14A).

Putty dries very quickly. Use a minimum number of strokes when applying putty. Repeated passes of the spreader might pull the putty away from the primer (Figure 25–14B). Go to the next surface imperfection and repeat putty application (Figure 25–14C).



A It is difficult to see small dimples or depressions in dull primer, so look closely. Use a small flexible plastic mini-spreader or rubber squeegee to apply spot putty.



B Wipe putty in two directions only. Do not keep rubbing spot putty because it will tend to dry and may not bond properly, resulting in imperfections.

C Some spot putties can be used on painted surfaces. Use your finger to scuff the paint chip before putty application. After thorough curing, you can featheredge putty into existing paint with less sanding.

FIGURE 25–14 Spot putty should be applied only to small surface imperfections. Never use it like plastic body filler.

NOTE; A common mistake is to build up spot putty as if it were body filler. Spot putty is too expensive to be used in place of body filler. Normally, only use two-part putty. Older one-part, lacquer putty is seldom used because it dries so slowly that shrinkage problems can result (Figure 25–16).

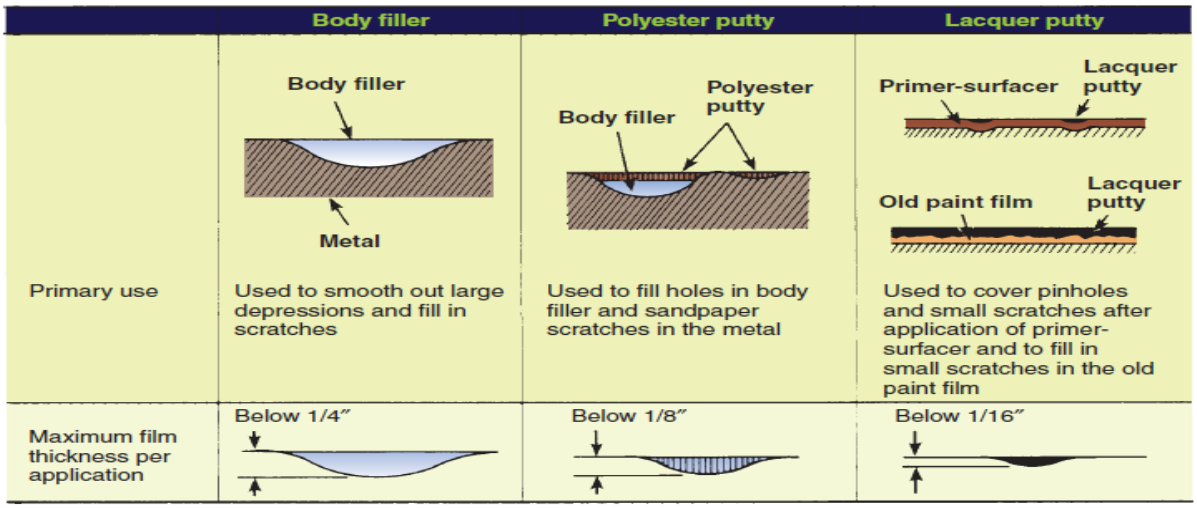


FIGURE 25–16 Compare use of filler and putty. Materials must not be applied beyond recommended thickness or problems will result.

After curing, block sand the putty flush with the surrounding surface. Although wet sanding works well, it is not recommended by some putty manufacturers because moisture can soak into the putty. Refer to label instructions for details. Dry sand the putty if needed. See Figure 25–15. Spot putty is normally applied over the primer or primer-surfacer (Figure 25–17).

When featheredging and sanding spot putty use a very fine grit dry sand paper or wet sand with very fine wet sandpaper. Many paint technicians use #220- to #600-grit sandpaper to featheredge spot putty.

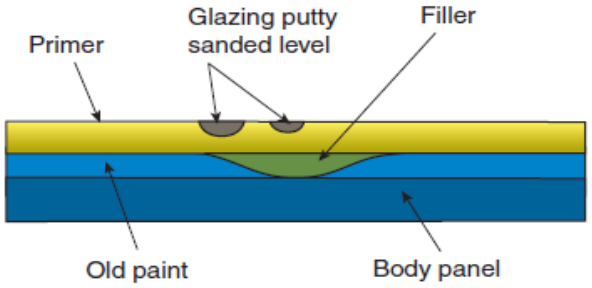


FIGURE 25–15 Glazing putty is like a very thick primer, only it will fill minor surface imperfections such as pinholes. If a large area has tiny pinholes, you might want to spray the panel with primer-surfacer instead of using spot putty.

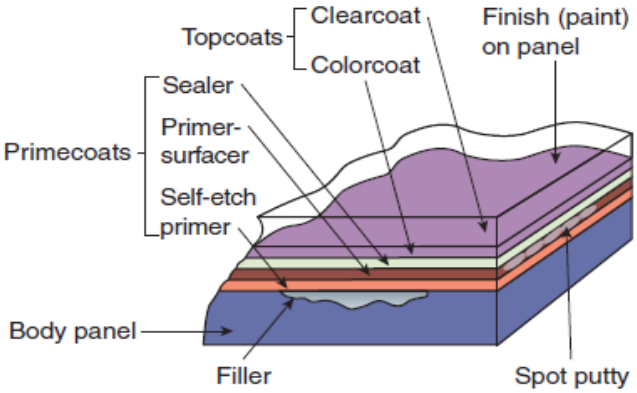


FIGURE 25–17 Note how different layers of repair materials are often applied during panel repair.

If the successive layers of paint are not properly tapered, a depression called a **bull's-eye** will show up under the freshly painted finish (Figure 25–18). This condition can usually be corrected by extending each paint and primer ring farther from the bare metal. Do this until the depression can no longer be felt when a hand is run over the featheredged area.

Occasionally, when featheredging areas with several layers of paint, primer and putty might be necessary to fill the bull's-eye to the level of the existing film buildup.

If a large surface area has small pits, spray primer surfacer over that area. Primer-surfacer will coat and fill in tiny imperfections. You can block sand the area to make it level and smooth.

Allow the putty to air dry or cure until it is hard. If it is sanded too soon, the putty will continue to shrink, leaving part of the scratch unfilled (Figure 25–19).

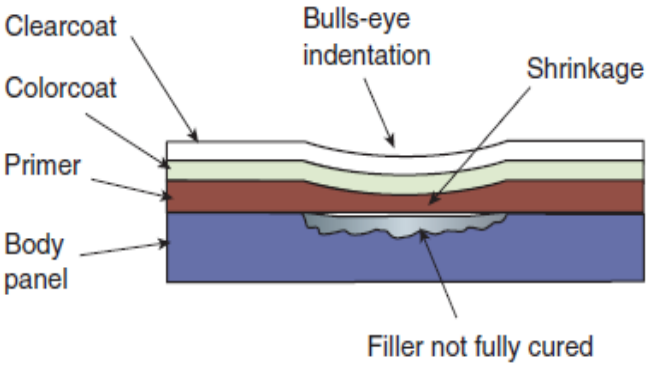


FIGURE 25-18 A bull's-eye is a depression formed over a repair area. It is caused by shrinkage of repair materials that were sanded too soon or from improper featheredging when sanding. You have to spray on primer-surfacer and block sand larger areas to correct a bull's-eye problem.

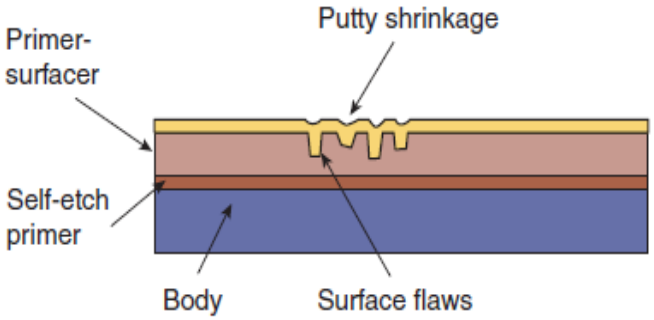
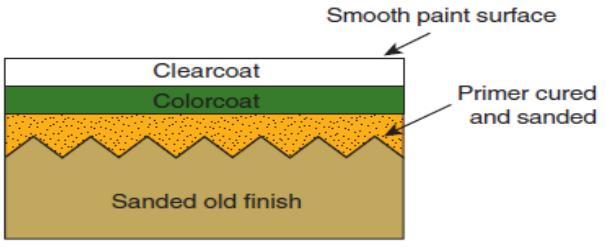


FIGURE 25-19 Even when using two-part putty, allow glazing putty enough time for proper curing or drying before sanding. If you sand the putty too soon, it can shrink more over thicker areas and cause indentations in the paint surface.

Once it hardens, the putty should be dry-sanded with #220-grit paper. After sanding the puttied area, clean the surface and then re-prime if needed. If the putty has been wet sanded, make sure to dry the surface thoroughly before applying sealer.

Figure 25–20 shows that the shrinkage and swelling of primecoat is an important point to consider in the elimination of sand scratches. If the primecoat is not allowed to dry down to its final position before sanding or applying finish coats, scratches are likely to result. Figure 25–21 shows a quarter that has been straightened and properly prepared for final sanding according to recommended procedures.



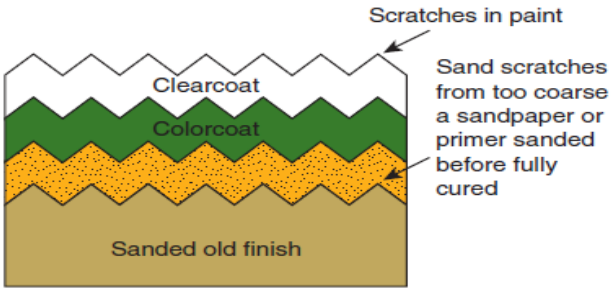


FIGURE 25-20 The best way to prevent sand scratches from showing is to use the correct grit sandpaper and proper sanding technique. When hand sanding, always sand in a straight line, never in a circular motion. (*Courtesy of DuPont Automotive Finishes*)

FIGURE 25–21 This quarter panel has been straightened, body filled, primed, and spot puttied. It is now ready for final fine sanding to prep it for topcoats of paint.

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.

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 – 8 points** **Unsatisfactory - below 8 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..

A_____

b._____

c_____

Information Sheet 3	Carrying out application activities

Priming

When the auto has been thoroughly sanded and masked, and the insides of the door openings have been sanded and masked, the auto is ready for priming. In this particular case the auto is going to be completely primed with a primer-surfacer. The auto is blown off, to make sure there is no water remaining in small cracks or openings. The auto is then tacked off and four coats of the primer are applied. Air pressure on the spray gun should be checked and adjusted accurately. Figure 1 shows the primer-surfacer being applied. Figure 2 shows the auto after it has been completely primed. Since the undercoat is a lacquer-based finish, it dries quickly, but in order for the primer to dry thoroughly it was allowed to harden overnight.

Fig. 1 Spraying the primer-surfacer.

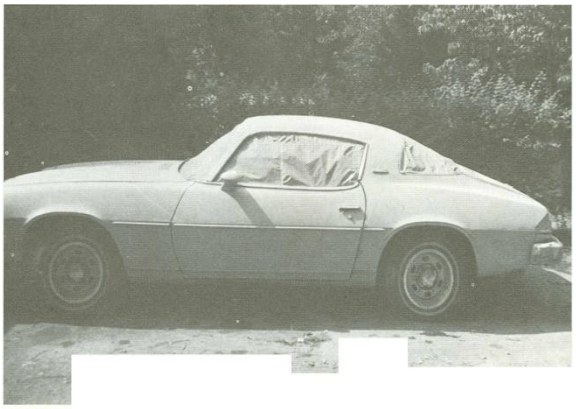


Fig. 2 The completed prime job

Procedures to carry out primer surfacer

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

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 Body Repairing and Painting Level-II

Learning Guide-29

Unit of Competence: Remove and Replace Vehicle Components and Body Repair

Module Title: Removing and Replacing Vehicle Components and Body Repair

LG Code: EIS VRP2 M01LO4-LG-01

TTLMCode: EIS VRP2 M01 TTLM 0919v1

LO4. Prepare primed surface for refinishing

Instruction Sheet	Learning Guide # 29

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.

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
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Vehicle Body Repairing and Painting Level-II

Learning Guide-#30

Unit of Competence: Remove and Replace Vehicle Components and Body Repair

Module Title: Removing and Replacing Vehicle Components and Body Repair

LG Code: EIS VRP2 M09 LO5-LG-30

TTLM Code: EIS VRP2 TTLM 0919v1

LO5. Clean up work area and maintain equipment

Instruction Sheet	Learning Guide #- 30

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

- Collecting and storing material that can be reused
- Removing waste and scrap following workplace procedures
- Cleaning and inspecting equipment and work area for serviceable conditions in accordance with workplace procedures.
- Tagging unserviceable equipment and identifying faults in accordance with workplace requirements
- Completing operator maintenance in accordance with manufacturer's specifications and site procedures
- Maintaining tooling in accordance with workplace procedures

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 and store material that can be reused
- Remove waste and scrap
- Clean and inspect equipment and work area for serviceable conditions
- Tag unserviceable equipment and identifying faults
- Complete operator maintenance
- Maintain tools and equipments

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 6.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” **in page -.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet 1	Collecting and storing reused material

Housekeeping Signs

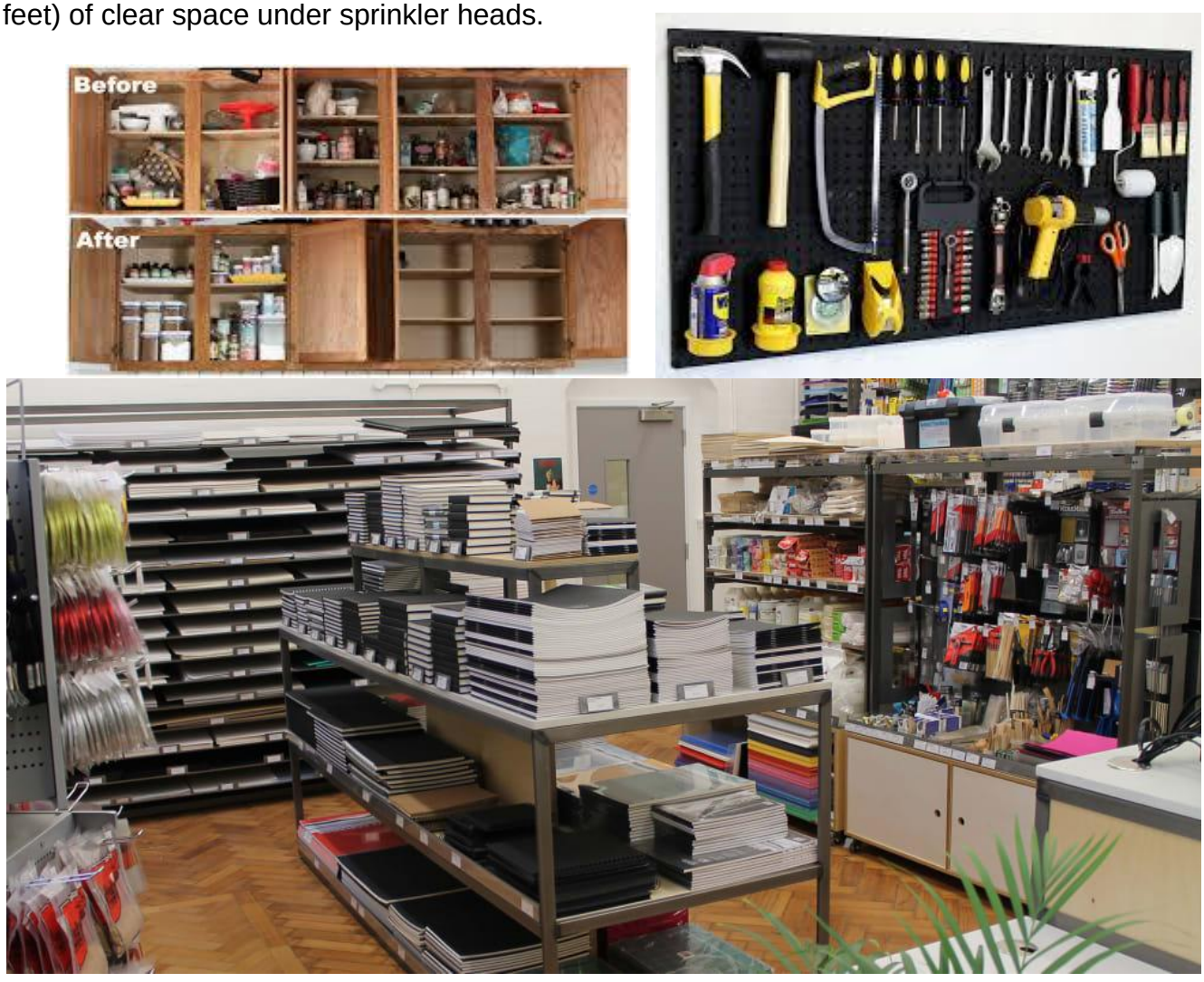
The workplace or office is a place where productivity is expected and having a pleasant work area certainly adds to a positive environment. Employees can do their part in addition to regular cleaning staff housekeeping and caretaker maintenance to keep it clean, safe, and healthy for all.

Collecting and storing material that can be reused

The proper care and storage of materials, tools and equipments are not only the concern of the management but of the workers who use the equipment.

A major responsibility of the technician is to ensure that materials, tools and equipment are maintained in a good condition and are readily available when required for the various work activities. Faulty tools and equipments are a common reason for delays on technical activities.

Good organization of stored materials is essential for overcoming material storage problems whether on a temporary or permanent basis. There will also be fewer strain injuries if the amount of handling is reduced, especially if less manual materials handling is required. The location of the stockpiles should not interfere with work but they should still be readily available when required. Stored materials should allow at least one meter (or about three feet) of clear space under sprinkler heads.



figures. proper storage of tools, materials and equipments

Importance of proper storage of tools and equipments

- ❖ It is important factor for safety and health as well as good business.
- ❖ Improves appearance of general-shop and construction areas.
- ❖ Reduce overall tool cost through maintenance.
- ❖ This also ensures that tools are in good repair at hand.
- ❖ Teaches workers principles of tool accountability.

Pointers to follow in storing tools and equipments

- ➢ Have a designated place for each kind of tools.
- ➢ Label the storage cabinet or place correctly.
- ➢ Store them near the point of use.
- ➢ Wash and dry properly before storing.
- ➢ store sharp edge materials properly when not in use with sharp edge down.
- ➢ Put frequently used items in conveniently accessible conditions.
- ➢ Gather and secure electrical chord to prevent entanglement or snagging.
- ➢ Cutting boards should be stored vertically to avoid moisture collection
- ➢ Metal equipments can be stacked on one another after drying.
- ➢ Make sure the areas where you are storing the equipment are clean, dry and not overcrowded.

Self-Check -1	Written Test

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

1. Define workplace (2)

2. List four importance of proper storage of tools and equipments (8 pts)

Note: **Satisfactory rating - 5 points & above** **Unsatisfactory - below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 2	Removing waste and scrap following workplace procedures

Waste Disposal Practices

There are eight major groups of waste management methods, each of them divided into numerous categories. Those groups include source reduction and reuse, animal feeding, recycling, composting, fermentation, landfills, incineration and land application. You can start using many techniques right at home, like reduction and reuse, which works to reduce the amount of disposable material used.

Methods of Waste Disposal

1. Landfill:- which is the most popularly used method of waste disposal used today. This process of waste disposal focuses attention on burying the waste in the land

2. Incineration/Combustion:- which is a type disposal method in which municipal solid wastes are burned at high temperatures so as to convert them into residue and gaseous products. .

3. Recovery and Recycling:- It is the process of taking useful discarded items for a specific next use. These discarded items are then processed to extract or recover materials and resources or convert them to energy in the form of useable heat, electricity or fuel.

4. Recycling is the process of converting waste products into new products to prevent energy usage and consumption of fresh raw materials. Recycling is the third component of Reduce, Reuse and Recycle waste hierarchy. The idea behind recycling is to reduce energy usage, reduce volume of landfills, reduce air and water pollution, reduce greenhouse gas emissions and preserve natural resources for future use.

5. Plasma gasification:- It is another form of waste management. Plasma is a primarily an electrically charged or a highly ionized gas. Lighting is one type of plasma which produces temperatures that exceed 12,600 °F . With this method of waste disposal, a vessel uses characteristic plasma torches operating at +10,000 °F which is creating a gasification zone till 3,000 °F for the conversion of solid or liquid wastes into a gas.

Self-Check -2	Written Test

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

1. List five waste disposal methods (10 pts)

Note: **Satisfactory rating - 5 points & above** **Unsatisfactory - below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 3	Cleaning and inspecting equipment and work area

Cleaning up is not just a measure of respect for the workspace, it also removes hazards. Cleaning is so important because when we clean an area, we are also doing some inspection or checking of machinery, equipment, and work conditions. An operator cleaning a machine can find many mal-functions. When a machine is covered with oil, soot, and dust, it is difficult to identify any problems that may be developing. While cleaning the machine, however, one can easily spot oil leakage, a crack developing on the cover, or loose nuts and bolts. Once these problems are recognized, they are easily fixed. It is said that most machines breakdowns begin with vibration (due to lose nuts and bolts), with introduction of foreign particles such as dust (due to the crack on the cover, for instance), or with inadequate oiling and greasing. For this reason cleaning is useful to make discoveries while cleaning machines.

Kinds of Cleaning Solvents

Solutions are homogeneous mixture of two or more components. They can be gaseous, liquid or solid. When we speak of a solution, we usually think of a solid dissolved in water. While water is the most common solvent, other liquids are frequently employed as solvents for certain substances for example wax maybe dissolved in gasoline. The dissolved material in a solution is termed as solute (e.g. wax) while the dissolving medium is called solvent (e.g. gasoline). However, the term can be interchanged depending on which substance is of greater amount.

Solvent is a component of a solution that dissolves solute and is usually present in large proportion or amount. It can be classified as polar or non polar. Polar solvents are solvents which dissolve/are soluble in water; while non polar solvents are solvents which do not dissolve/are insoluble in water.

Solvents usually used for cleaning in automotive shops are: water, gasoline, kerosene, thinner and detergent soap.

The table below shows the kinds of cleaning solvents based on their solubility in water.

Cleaning Solvents	Solubility in Water	Polar	Nonpolar
a. water	soluble	x	
b. gasoline	insoluble		x
c. kerosene	insoluble		x
d. thinner	insoluble		x
e. detergent soap	soluble	x	

Properties of Cleaning Solvents

A useful generalization much quoted is that “Like dissolves like”. More specifically, high solubility occurs when the molecules of the solute are similar in structure and electrical properties to the molecules of the solvent.

When there is a similarity of electrical properties; e.g. high dipole element between solute and solvent, the solute-solvent attractions are particularly strong. When there is dissimilarity, solute-solvent attractions are weak. For this reason, a polar substance such as H2O usually is a good solvent for a polar substance such as detergent soap but a poor solvent for a non polar substance such as gasoline.

Uses of Cleaning Solvents

Cleaning Solvents	Uses
1. Gasoline	- It is used to wash oil/greasy tools/equipment.
2. Diesoline	- It is used to wash oil engine, transmission and other parts of the vehicle.
3. Kerosene	- It is used to remove dust, grease oil, paint, etc.
4. Thinner	-It is used to remove spilled paint on the floor, walls and tools.
5. Soap and water	- It is used to wash/clean upholstered furniture such as seats, tables, cabinets, etc.

Occupational Health and Safety Practices in Handling Cleaning Solvents

A great percentage of eye injury and cuts results from a disregard for the simplest of rules in handling cleaning solvents. You should never use compressed air to clean your clothes, hands or body. The pressure could cause the cleaning solvents and dirt particles to penetrate your skin, resulting in infection and /or blood poisoning. Do not use compressed air to clean an object immediately after it has been removed from a hot cleaning tank. First, rinse the cleaning solvents away with water. Do not use carbon tetrachloride as a cleaning solution. The fumes, when inhaled can cause serious internal injury and possibly result in death. When steam-cleaning, place the object to be cleaned on a pallet and wear a face shield and rubber gloves for protection against loose debris.

If a job or cleaning task requires the use of gloves, use the appropriate gloves. Do not for instance use welding gloves when removing an object from a hot tank, or rubber gloves when welding. If you have cut, nicked, or burned yourself, or something has got into your eyes, report immediately to the first-aid person. Keep all inflammable cleaning solvents in closed tin containers and whenever possible, store them in a separate area.

Clean up procedures

- ✓ Clean up every time whenever you leave an area, including sweeping the floor.
- ✓ Clean and return all tools to where you got them.
- ✓ Use compressed air sparingly; never aim it at another person or use it to clean hair or clothes.
- ✓ Shut off and unplug machines when cleaning, repairing, or oiling.
- ✓ Never use a rag near moving machinery.
- ✓ Use a brush, hook, or a special tool to remove chips, shavings, scraps etc. from the work area. Never use the hands.
- ✓ Keep fingers clear of the point of operation of machines by using special tools or devices, such as, push sticks, hooks, pliers, etc.
- ✓ Keep the floor around machines clean, dry, and free from trip hazards. Do not allow chips to accumulate.
- ✓ Mop up spills immediately and put a chair or cone over them if they are wet enough to cause someone to slip.

Inspection of work tools/equipment

The purpose of inspection is to identify whether work tool/equipments and working area can be operated, adjusted and maintained safely. Not all work area, tools/equipments needs formal inspection to ensure safety and in many cases a quick visual check before use will be sufficient. However inspection is necessary for any work area, tools/ equipments where significant risks to health and safety may arise from incorrect installation, reinstallation, deterioration or any other circumstances. The need for inspection and inspection frequencies should be determined through risk assessment.

Importance of inspection

As an essential part of a health and safety program, workplaces should be inspected. Inspections are important as they allow you to:

- listen to the concerns of workers and supervisors
- gain further understanding of jobs and tasks
- identify existing and potential hazards
- determine underlying causes of hazards
- monitor hazard controls (personal protective equipment, engineering controls, policies, procedures)
- recommend corrective action

Inspection Procedures

When conducting inspections, follow these basic procedures:

- Draw attention to the presence of any immediate danger--other items can await the final report.
- Shut down and "lock out" any hazardous items that cannot be brought to a safe operating standard until repaired.
- Do not operate equipment. Ask the operator for a demonstration. If the operator of any piece of equipment does not know what dangers may be present, this is cause for concern. Never ignore any item because you do not have knowledge to make an accurate judgment of safety.
- Look up, down, around and inside. Be methodical and thorough. Do not spoil the inspection with a "once-over-lightly" approach.
- Clearly describe each hazard and its exact location in your rough notes. Allow "on-the-spot" recording of all findings before they are forgotten. Record what you have or have not examined in case the inspection is interrupted.
- Ask questions, but do not unnecessarily disrupt work activities. This may interfere with efficient assessment of the job function and may also create a potentially hazardous situation.
- Consider the static (stop position) and dynamic (in motion) conditions of the item you are inspecting. If a machine is shut down, consider postponing the inspection until it is functioning again.
- Discuss as a group, "Can any problem, hazard or accident generate from this situation when looking at the equipment, the process or the environment?" Determine what corrections or controls are appropriate.
- Do not try to detect all hazards simply by relying on your senses or by looking at them during the inspection. You may have to monitor equipment to measure the levels of exposure to chemicals, noise, radiation or biological agents.
- Take a photograph if you are unable to clearly describe or sketch a particular situation

Self-Check -3	Written Test

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

1. The following are importance of inspection except (2)
   A. listen to the concerns of workers and supervisors
   B. determine underlying causes of hazards
   C. recommend corrective action
   D. increase cause of hazards

Instruction II : match column "A" with "B" (10points)

"A"	"B"
-----1. kerosene	A. used to wash oil/greasy tools/equipments
-----2. Gasoline	B. used to wash oil engine, transmission and other parts of the vehicle
-----3. Diesoline	C. used to remove dust, grease oil, paint, etc
-----4. Thinner	D. used to wash/clean upholstered furniture such as seats, tables, cabinets, etc
-----5. Soap and water	E. used to remove spilled paint on the floor, walls and tools.

Note: **Satisfactory rating - 6 points & above** **Unsatisfactory - below 6 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 4	Tagging unserviceable equipment and identifying faults in accordance with workplace requirements

TAGS

The use of tags is considered an administrative control and as such only provides limited protection to people and plant; therefore in all cases a physical isolation must be used in conjunction with a tag to prevent the accidental activation of an isolation point.

Attaching the Tag

The person attaching the tag must completely fill the tag with the following information:

- Name & company of person placing tag
- The classification/department the person works for
- The date that the tag was placed
- The equipment / plant the tag was placed on
- Contact number
- Work order / job number if applicable
- Signature

It is important to clearly identify the exact piece of equipment that the tag and lock was placed on to allow identification of those personnel working on the plant.

Depends on what you need it for. You can include a stub to give to your customers, or feature numbering so you can easily track each defective part. Choose materials with a bit more durability if you'll be working outside, replace old tags, or fasten your tags to something new.

- We specialize in Repair Tags and we stock several different options for whatever suits your space. Check out our repair tag material guide to compare.
- All tags feature smudge-proof surface. Write your information with a pen, pencil, or marker.
- Bright colored repair and inspection tags with bold, legible prints display and highlight vital information.
- Order tags with our handy Tag-in-a-Box® for convenient storage and dispensing of tags. Just pull and tear!
- Looking for the right fit? Get a custom design. Our customer service staff is happy to help you find what you need.

Self-Check -4	Written Test

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

1. Mention six information must completely fill the tag during a person attaching the tag (6 pts)

Note: **Satisfactory rating - 3 points & above** **Unsatisfactory - below 3 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 5	Completing operator maintenance in accordance with manufacturer's specifications and site procedures

Tools and Equipment Maintenance

All 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.

components of maintenance program

A maintenance strategy includes procedures as well as corrective and preventive maintenance

- Inspections ensure that tools and equipments are operating correctly. Safety inspections ensure the tools/equipments are safe for both patients and operators.
- Corrective maintenance (cm) restores the function of a failed device and allows it to be put back in to service.
- Preventive maintenance (pm) aims to extend the life of the tools/equipment and reduce failure rates.

  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.

Self-Check -5	Written Test

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

1. List four successful maintenance program (4 pts)

2. Write 3 components of maintenance program (6 pts)

Note: **Satisfactory rating - 5 points & above** **Unsatisfactory - below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 6	Maintaining tooling in accordance with workplace procedures.

Tools need to have enough space to be operated safely and not endanger the operator or other people in the space. People need to concentrate when trying new tools, especially ones that can injure. Make sure there is enough real estate to use a tool safely. Work areas need to be well lit and clean. Ventilation and/or air filtering is required for many tools.

The equipment itself needs to be as safe as possible. Tools should be well maintained and not have safety features removed or defeated. This is especially important when using second-hand tools that might not have a perfectly safe heritage. When acquiring new tools consider spending the extra money on models with advanced safety features, such as a Saw Stop table saw.

Make well-stocked first-aid kits visible and easily accessible throughout your space. Post clear and visible warning signs on all equipment and where necessary.

Provide personal safety equipment such as goggles, earplugs, gloves, etc. to those who don't have their own.

Accidents may happen. They probably will, and let's hope they are all minor. Nonetheless, do make sure that there is a legal entity that owns the space so that the effects of a serious injury don't extend the horror with legal ramifications

Self-Check -6	Written Test

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

1. Which of the following are false during maintaining tooling

   A. tools not endanger the operator or other people in the space.
   B. The tools itself not needs to be as safe as possible
   C. Tools should be well maintained and not have safety features removed or defeated
   D. Tools need to have enough space to be operated safely

Note: **Satisfactory rating - 1 points & above** **Unsatisfactory - below 1 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation sheet 1

OPERATION TITLE:-Storing/arranging tools and shop equipments

PURPOSE:- For safety and health as well as good business. and for Reducing overall tool cost through maintenance.

CONDITIONS OR SITUATIONS FOR THE OPERATIONS:-

- ✓ Safe working area
- ✓ Properly operated tools and equipments
- ✓ Appropriate working cloths fit with the body.

EQUIPMENT TOOLS AND MATERIALS :

- ✓ Hand tools -screw driver, wrenches, hammers etc
- ✓ Equipments - floor jack, hydraulic crane etc
- ✓ special tools - torque wrench etc
- ✓ Reused materials

PROCEDURE:-

- ➢ Design place for each kind of tools.
- ➢ Label the storage cabinet or place correctly.
- ➢ Store them near the point of use.
- ➢ Wash and dry properly before storing.
- ➢ Store sharp edge materials properly when not in use with sharp edge down.
- ➢ Put frequently used items in conveniently accessible conditions.
- ➢ Gather and secure electrical chord to prevent entanglement or snagging.
- ➢ Cutting boards should be stored vertically to avoid moisture collection
- ➢ Metal equipments can be stacked on one another after drying.
- ➢ Make sure the areas where you are storing the equipment are clean, dry and not overcrowded.

PRECAUTIONS:-

- ➢ Wear working cloths which properly fit with your body
- ➢ Make working area hazard free
- ➢ Read and interpret manual which guide you how to use tools and equipments

QUALITY CRITERIA:

Assured performing of the activities correctly accordance with the given procedure mentioned above.

Operation sheet 2

OPERATION TITLE:- Cleaning work shop area

PURPOSE:- For safety and health as well as good business.

CONDITIONS OR SITUATIONS FOR THE OPERATIONS:-

- ✓properly sorted working area
- ✓Properly operated tools and equipments
- ✓Appropriate working cloths fit with the body.

EQUIPMENT TOOLS AND MATERIALS :

- ✓ Hand tools -brush / ascopa etc
- ✓ Equipments - air compressor etc
- ✓ water, solvent, etc

PROCEDURE:-

1. Clean up every time whenever you leave an area, including sweeping the floor.
2. Clean and return all tools to where you got them.
3. Use compressed air sparingly; never aim it at another person or use it to clean hair or clothes.
4. Shut off and unplug machines when cleaning, repairing, or oiling.
5. Never use a rag near moving machinery.
6. Use a brush, hook, or a special tool to remove chips, shavings, etc. from the work area. Never use the hands.
7. Keep fingers clear of the point of operation of machines by using special tools or devices, such as, push sticks, hooks, pliers, etc.
8. Keep the floor around machines clean, dry, and free from trip hazards. Do not allow chips to accumulate.
9. clean up and dry spills immediately and put a chair or cone over them if they are wet enough to cause someone to slip.

PRECAUTIONS:-

- ➢ Wear working cloths which properly fit with your body
- ➢ Make working area hazard free
- ➢ Read and interpret manual which guide you how to use tools and equipments

QUALITY CRITERIA:

Assured performing of the activities correctly accordance with the given procedure mentioned above.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 8 hour.

Task 1. Collect and store material that can be reused
Task 2. Remove waste and scrap following workplace procedures
Task 3. Clean and inspect equipment and work area for serviceable conditions in accordance with workplace procedures.
Task 4. Tag unserviceable equipment and identifying faults in accordance with workplace requirements
Task 5. complete operator maintenance in accordance with manufacturer's specifications and site procedures
Task 6. maintain tooling in accordance with workplace procedures.
Task 7. Perform the 5S in the assigned workshop:

List of reference materials

https://www.omicsonline.org/conferences-list/waste-disposal-practices