Vehicle Painting

Level III

Based on Nov. 2016, Version 2 Occupational standard

Module Title: - Apply Multi-Layer and Clear Over-Base Colour Matching Techniques

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LG #34	LO #1- Prepare for work

Instruction sheet

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

- Using work instructions, methods and material type
- Reading and interpreting Job specifications
- Observing WHS requirements, and personal protection needs
- selecting and inspecting Materials for quality
- Identifying and checking Hand, power tooling and safety equipment
- Determining Procedures to minimize waste material.
- Identifying Procedures for maximizing energy efficiency

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

- use work instructions, methods and material type
- Read and interpret Job specifications
- Observe WHS requirements, and personal protection needs
- select and inspect Materials for quality
- Identify and checking Hand, power tooling and safety equipment
- Determine Procedures to minimize waste material.
- Identify Procedures for maximizing energy efficiency.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 1- using work instructions, methods and material type

1.1. 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

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

1.2. Work methods

Work methods are the physical actions employed to perform a task. Evaluating and modifying work methods to prevent discomfort and injury is one of several components of an effective ergonomics program. Work methods are also called work practices

The working method will have to be:

- Clearly explained. It will need to be understood by the team working under water, often taking turns, which will have to take individual decisions.
- Rapid to implement. There is a limit to the time that can be spent under water.
- Straightforward to implement. Working under water is hard enough without the addition of further complications.

1.3. Material type

material types are the materials which are having the similar attributes are categorized together and assigned to a material type. It is a classification of allowed material into material types based on attributes.

Material type controls the following functions

1. Number range assignments i.e. External or Internally.
2. Field selections i.e. which fields are mandatory, optional, hide and display.
3. Quantity and values basis
4. External procurement or internal procurement
5. Which value classes are to be allowed

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2 Reading and interpreting Job specifications

2.1. 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:

Figure 1. components of job specification

- 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.

Table 1. Job specification example

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

Table 2. 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.

BASIS	JOB DESCRIPTION	JOB SPECIFICATION
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**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3 Observing WHS requirements, and personal protection needs

3.1. 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.

3.2. Personal protection needs

The purpose of personal protective equipment is to reduce employee exposure to hazards when engineering controls and administrative controls are not feasible or effective to reduce these risks to acceptable levels. PPE is needed when there are hazards present.

Cars are one of the most common forms of transportation in the world. So, it should come as no surprise that the modern automotive and motor vehicle manufacturing industry is one of the top employment industries in the world. The industry is a hazardous one, with lots of moving parts and plenty of opportunities for injury. The dangers present are why wearing PPE on the job is so important. One position that is known for its inherent risk is painting.

Painters work with a variety of toxic paints, sealers, and adhesive coatings. They need a range of PPE to guard against these hazards

To keep yourself safe during any residential or commercial painting project, you need the right personal protective equipment (PPE):

- **Gloves:** Always wear gloves to protect your hands. Leather or cloth gloves are sufficient for sanding. Solvent-resistant gloves are required for handling paint thinner and other solvents. Impermeable gloves are best for water- and oil-based paint.
- **Eye wear:** Use protective eye glasses, eye goggles or a face shield whenever handling paint or paint thinners. It is especially important when painting above your head or spray painting, as well as when sanding.
- **Paint masks:** Wear a dust mask or particulate respirator when sanding. If you are very sensitive to chemicals, you should also wear a respiratory mask when using a brush or roller. Note that if you are painting outside in an area with lots of birds, you may need to wear a mask to protect yourself from the harmful pathogens in bird droppings. When you are spray painting, you are best advised to use a paint respirator, as this offers more protection for your airways.
- **Coveralls and shoe covers:** A disposable or cotton coverall and disposable shoe covers serve to protect both your clothing and any exposed skin that could become irritated by contact with paint.
- **Fire extinguisher:** It is always important to keep a fire extinguisher on site in case there are any incidents with flammable materials such as paint thinner.

Painters, especially car painters, operate spray-painting machines to paint automobile surfaces. They may also apply sealers and adhesives. While the majority of painting on new vehicles is automated, some specialized work and detailing still need to be done by hand.

The chemicals in these industrial paints and liquids pose many hazards to the skin, eyes, and respiratory system. A car painter is responsible for a variety of tasks that may expose them to these hazards. A typical day on the job may include:

- Mixing paints to achieve a specified color, or stirring and thinning paints either by hand or with power mixing equipment;
- Removing dirt, grease, old paint, or rust from vehicle surfaces to prepare for painting;
- Spray painting surfaces with primers, color, and finishes; and
- Disposing of hazardous waste per guidelines.

Self-check 3	Written test

Name…… ID…… Date…….

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

Test I Short Answer Questions

1. List four examples of PPE. (8)

Note: Satisfactory rating ≥ 4 points Unsatisfactory < 4 points

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Test I

1._____

2._____

3. _____

4. _____

Information Sheet 4- selecting and inspecting Materials for quality

4.1. Material selection

Material selection is the act of choosing the material best suited to achieve the requirements of a given application. Many different factors go into determining the selection requirements, such as mechanical properties, chemical properties, physical properties, electrical properties and cost. These must be weighed during the material selection process.

The materials selection process for a component or joint between components involves these steps:

1. Identify product design requirements
2. Identify product element design requirements
3. Identify potential materials
4. Evaluate materials
5. Determine whether any of the materials meet the selection criteria
6. Select materials

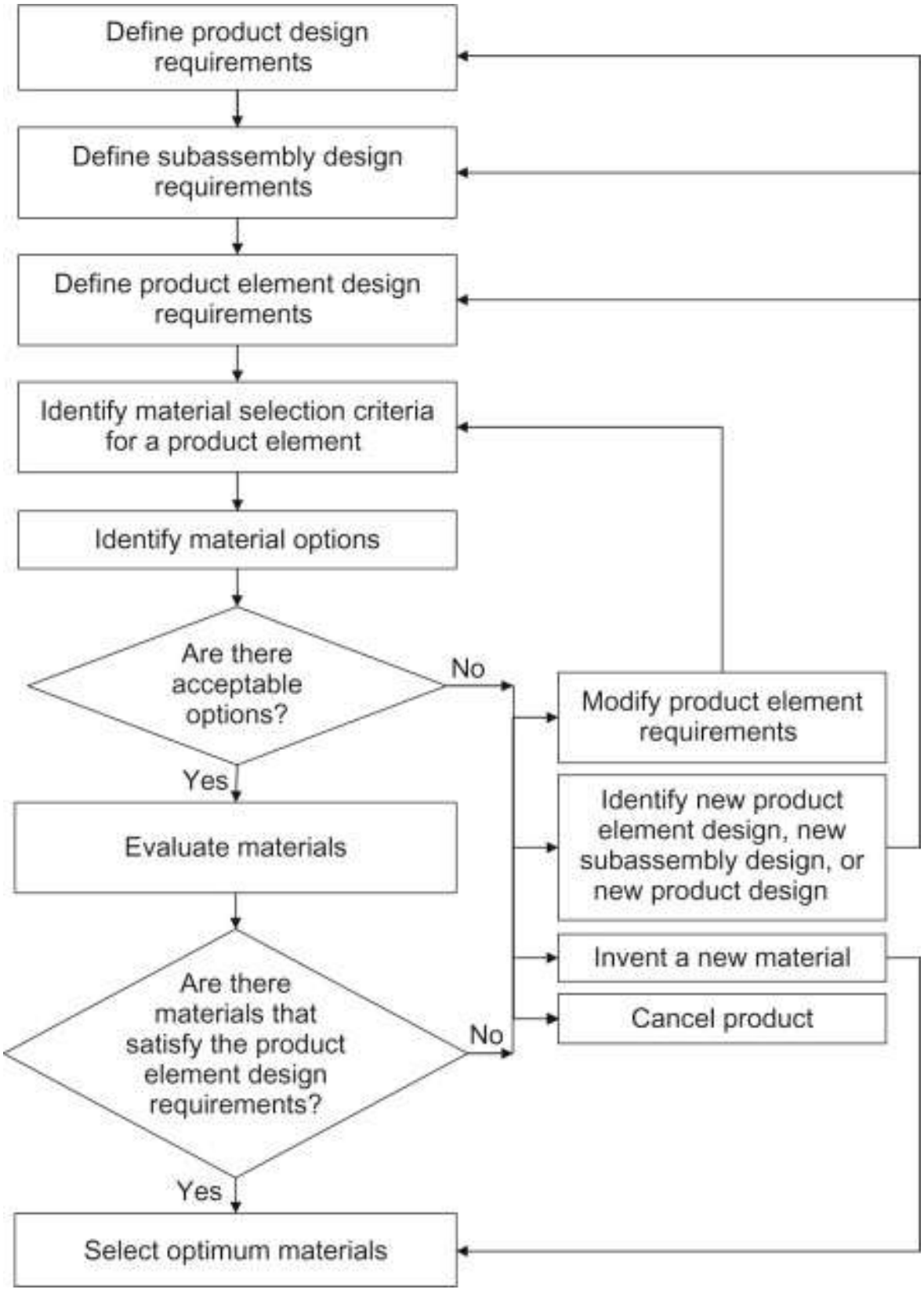


Figure 2. Material selection process chart

3.2. Material inspection

A raw material inspection is to select materials or item for an manufacturing or processing at factory at first stage. Inspection and tests on all aspects of materials as physical, chemical, AIM's inspector determine or verify materials the requirements of a specification, regulation, or contract are met.

Objectives of Inspection

The following are the main objectives of the Inspection of materials.

1. To maintain the quality of the product.
2. To receive only the right quantity of materials.
3. To make the supplier efficient and careful.
4. To make right utilization of the money invested.
5. To make the purchase and store staff more watchful and careful.

Advantages of Inspection or Materials

The following are the main advantages of inspection:

1. Ensure the right quality helps in maintaining a steady development and a high standard of living.
2. Enhanced goodwill because of high-quality production, that too, at a lower cost since the inspection assures quality production.
3. Procurement of statement items, again affecting favorably the cost curve because of lesser wear and tear and wastage, etc.
4. Increase in profitability.

Storage Of Materials

Materials are received in the store department for storage till they are issued to the using department. Materials are preserved for protecting them from all kinds of damages so as to maintain the original value of the materials. The maintenance of the original value and quality of the materials so as to help reduce the storage cost, production cost and help in improving the production quality. Storage of materials, therefore, is the most important function. Receiving is important but storage is still more important since it aims at:

1. Keeping the materials safe.
2. Protecting the materials from all kinds of damages etc.

3. Protecting the materials from losing its value and quality.
4. making the materials available when required in a perfect and serviceable condition.
5. Ensuring the smooth and efficient functioning of the production department.

Efficient storage requires the consideration of the following:

1. Checking of materials.
2. Classification of materials.
3. Codification of materials
4. Arranging the materials
5. Scientifically storing the materials in bins, racks, etc.
6. Maintaining and keeping a watch on different level points so as to take necessary steps at the right time.

Self-Check -4	Written Test

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

1. The main objectives of the Inspection of materials is (2)
   A. To maintain the quality of the product.
   B. To receive only the right quantity of materials.
   C. To make the supplier efficient and careful.
   D. All
2. --------- is the act of choosing the material best suited to achieve the requirements of a given application. (2)

   A. material processing **B**. Material selection **C.** management **D.** material arrangement
3. Efficient storage requires the consideration of (2)
   A. Arranging the materials
   B. Checking of materials
   C. Codification of materials
   D. All

Note: Satisfactory rating ≥ 3 points Unsatisfactory < 3 points

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer

1. 2. 3.

Information Sheet 5- Identifying and checking Hand, power tooling and safety equipment

5.1. Hand tools

Hand tools a tool held in the hand and operated without electricity or other power.

A hand tool is any tool that is powered by hand rather than a motor. Categories of hand tools include wrenches, pliers, cutters, files, striking tools, struck or hammered tools, screwdrivers, vises, clamps, snips, saws, drills and knives. Portable power tools are not hand tools.

Visual inspection

The purpose of this inspection process is to thoroughly inspect all of the hand tools, regardless of the type, for any visible damages, dents, cracks, chips, or any known production anomalies to ensure that all of the hand tools on the queue are ready for the next set of inspection processes. Should there be any items that show poor craftsmanship and functionality, these will be labeled “DEFECTIVE” and should be reconfigured to pass the quality control and safety guidelines.

General Hand Tools Best Practices

- Keep tools clean. Dirty tools are harder to use safely and properly.
- Do not modify hand tools. Keep the manufacturer’s design intact.
- Secure all hand tools and store them away properly. Tools left out are much more likely to get lost, stolen, or damaged.
- Use tools how they are designed to be used. This will keep the tool in good condition longer and you safe when using it.

What are some basic tips when using hand tools?

- Ensure that employees are properly trained in the safe use of hand tools.
- Always provide training on how to choose the right tool for the job, how to correctly use each tool, and how to identify when tools need repair.
- Select the right tool for the job. Substitutes increase the chance of having an accident.

- Use tools designed to allow wrist to stay straight. Avoid using hand tools with your wrist bent.
- Use good quality tools.
- Keep tools in good condition at all times.
- Inspect tools for defects before use. Replace or repair defective tools.
- Keep cutting tools sharp and cover sharp edges with a suitable covering to protect the tool and to prevent injuries from unintended contact.
- Replace cracked, splintered, or broken handles on files, hammers, screwdrivers, or sledges.
- Ensure that the handles of tools like hammers and axes fit tightly into the head of the tool.
- Replace worn jaws on wrenches, pipe tools and pliers.
- Redress burred or mushroomed heads of striking tools.
- Pull on a wrench or pliers. Never push unless you hold the tool with your palm open.
- Point sharp tools (e.g., saws, chisels, knives) laying on benches away from aisles and handles should not extend over the edge of the bench top.
- Maintain tools carefully. Keep them clean and dry, and store them properly after each use.
- Carry tools in a sturdy tool box to and from the worksite.
- Wear safety glasses or goggles, or a faceshield (with safety glasses or goggles) and well-fitting gloves appropriate for the hazards to which you may be exposed when doing various tasks.
- Keep the work environment clean and tidy to avoid clutter which may cause accidents.
- Use a heavy belt or apron and hang tools pointed down at your sides, not behind your back.
- Keep the work space tidy. Store tools properly when not in use.

What should I avoid when using hand tools?

- Do not use tools for jobs they are not intended to do. For example, do not use a slot screw driver as a chisel, pry bar, wedge or punch, or wrenches as hammers.
- Do not apply excessive force or pressure on tools.

- Do not cut towards yourself when using cutting tools.
- Do not hold the stock in the palm of your hand when using a cutting tool or a screwdriver. Always lay it on a workbench or in a vice.
- Do not wear bulky gloves to operate hand tools.
- Do not throw tools. Hand them, handle first, directly to other workers.
- Do not carry tools in a way that interferes with using both hands on a ladder, while climbing on a structure, or when doing any hazardous work. If working on a ladder or scaffold, tools should be raised and lowered using a bucket and hand line.
- Do not carry a sharp tool in your pocket.
- Do not use tools during electrical work unless they are designed for electrical work (e.g., properly insulated).
- Do not leave tools lying around on elevated structures such as a platform or scaffold as they may be bumped and fall.

5.2. Power tools

A power tool is a tool that is actuated by an additional power source and mechanism other than the solely manual labor used with hand tools. The most common types of power tools use electric motors. Power tools are classified as either stationary or portable, where portable means hand-held.

When and how should you inspect powered hand tools?

1. Inspect tools for any damage prior to each use.
2. Check the handle and body casing of the tool for cracks or other damage.
3. If the tool has auxiliary or double handles, check to see that they installed securely.

Power tools must be fitted with guards and safety switches; they are extremely hazardous when used improperly. The types of power tools are determined by their power source: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated. To prevent hazards associated with the use of power tools, workers should observe the following general precautions:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.

- Disconnect tools when not using them, before servicing and cleaning them, and when changing accessories such as blades, bits, and cutters.
- Keep all people not involved with the work at a safe distance from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button while carrying a plugged-in tool.
- Maintain tools with care; keep them sharp and clean for best performance.
- Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance when operating power tools.
- Wear proper apparel for the task. Loose clothing, ties, or jewelry can become caught in moving parts.
- Remove all damaged portable electric tools from use and tag them: "Do Not Use."

5.3. safety equipment

Safety equipment, also known as personal protective equipment, is specifically designed to help protect workers against health or safety risks on the jobsite. By wearing the appropriate safety equipment, workers can decrease the number of preventable accidents that occur on jobsites every year.

To ensure maximum safety for you and your team you need to get the right personal protective equipment

1. Gloves

You should wear leather or cloth gloves for sanding and handling all the materials using your hands. They will protect your hands from handling any corrosive and harmful products. They should impermeable meaning that they cannot allow any water or liquid to pass through to your skin.

2. Eye-wear:

When painting your car, make sure you wear protective glasses for your eyes, eye goggles or create a shield that prevents you from looking at thinners and paint directly with your naked eye. This is important because no liquid can pour on your eyes when you are painting locations above your head.

3. Paint Masks

During sanding which is an important stage when painting your car, you may inhale the chippings from the previous paint which can be harmful to your health. Therefore, you should wear a respiratory mask that will prevent you from breathing any of these harmful materials. You should use a similar mask when you start the spray painting works.

4. Coveralls and shoe covers:

To prevent paint damaging your clothes and shoes, you should put on coveralls and shoe covers. They will also prevent the paint from touching your skin directly as it may cause irritation after contact.

5. Fire Extinguisher

As noted earlier, some components of paint mixers such as primers and thinners are highly flammable. For this reason, you should have a fire extinguisher as a safety precaution in case of a fire. The fire extinguisher will enable you to clear off the fire immediately before it spreads and causes any damage.

Self-Check – 5	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

Note: Satisfactory rating ≥ 4 points Unsatisfactory < 4 points

Score = _____

Rating: _____

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

Answer sheet

Test I

1._____

2._____

Test II

1._____

2._____

Information Sheet 6- Determining Procedures to minimize waste material

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 a process of reducing the amount and activity of waste materials to a level as low as reasonably achievable. Waste minimization is now applied at all stages of nuclear processing from power plant design through operation to decommissioning. It consists of reducing waste generation as well as recycling, reuse and treatment, with due consideration for both primary wastes from the original nuclear cycle and secondary wastes generated by reprocessing and clean-up operations.

Waste Minimization Suggestions

- Substitute less hazardous chemicals or ingredients for ones you are using now.
- Substitute alcohol thermometers for mercury thermometers. Contact EH&S for information on the no cost exchange program.
- Borrow a chemical from a colleague to conduct an investigative research trial. Contact EH&S to find out what other labs on campus might have the chemicals you need to borrow.
- Test your ideas on the smallest scale practical to minimize disposal costs.
- Keep your wastes segregated by compatibility and type; avoid cross contamination as much as possible.
- Avoid mixing hazardous and non-hazardous wastes; avoid contaminating glassware.
- Rotate chemical stock to keep chemicals from becoming outdated.
- Order smallest container of material necessary for use.
- Review experimental protocol to assure that chemical usage is minimized.
- Take care when weighing and transferring chemicals in order to minimize spills and additional wastes generated during spill clean up.

- Neutralize hazardous by-products as the final step of an experiment (Contact EH&S 459-4840 to write a benchtop neutralization procedure as required by regulations).
- Practice good housekeeping.
- Distill and reuse solvents.

Start your waste minimization thought process by following the proper campus hazardous waste procedures.

- Keep an up-to-date chemical inventory in the Chemical Inventory System (CIS).
- Review your inventory periodically to remove unwanted or unusable chemical stocks.
- Manage peroxide formers and dispose of them by their expiration date.
- Only purchase gas cylinders from manufactures who will accept the return of the partially used or empty cylinders.
- Ensure proper identification is on all chemical containers.
- Attach a properly completed hazardous waste tag to each chemical waste container.
- Submit the container for pickup through the WASTe Program.
- Contact the Hazardous Waste Manager (459-3086) if you have any specific questions or need help with your project.

Self-Check -6	Written Test

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

point

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1.

A_____

B_____

C_____

D_____

E_____

2.

1._____

2 _____

.

Information Sheet 6- Identifying Procedures for maximizing energy efficiency

6.1. Energy efficiency

Energy efficiency simply means using less energy to perform the same task that is, eliminating energy waste. Energy efficiency brings a variety of benefits: reducing greenhouse gas emissions, reducing demand for energy imports, and lowering our costs on a household and economy-wide level.

Here are a few simple ways you can save energy in the workplace and bring positive changes to your working environment.

- Develop an Energy Management Team.
- Conduct an Energy Audit.
- Strategically Schedule Machinery Use.
- Schedule Shut-Downs and Start-Ups.
- Optimize Air Compressors.
- Ways to conserve energy
- Adjust your day-to-day behaviors.
- Replace your light bulbs. ...
- Use smart power strips. ...
- Install a programmable or smart thermostat.
- Purchase energy efficient appliances.
- Reduce your water heating expenses.
- Install energy efficient windows.

The efficiency is the energy output, divided by the energy input, and expressed as a percentage. A perfect process would have an efficiency of 100%. W_{out} = the work or energy produced by a process. Units are Joules (J).

Energy conversion efficiency (η) is the ratio between the useful output of an energy conversion machine and the input, in energy terms. The input, as well as the useful output may be chemical, electric power, mechanical work, light (radiation), or heat.

To make your manufacturing facility more energy efficient and less expensive to run, here are ways to reduce industrial energy costs on your production floor.

Self-Check -6	Written Test

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

point

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1.

A_____

B_____

C_____

D_____

E_____

2.

1._____

2 _____

Operation Sheet 1– Preparing raw materials for primary processing

Objectives to preparing quality raw materials for primary processing of spice and herbs

Procedures

1. Identify product design requirements
2. Identify product element design requirements
3. Identify potential materials
4. Evaluate materials
5. Determine whether any of the materials meet the selection criteria
6. Select materials

LAP TEST	Performance Test

Name…… ID……Date……

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **6** hour. The project is expected from each student to do it.

Task 1: Perform raw materials preparation for primary processing

LG #31	LO #2- Mix multi-layer/clear over base paint colours

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Performing mixing activities using the appropriate method and/or system. • Mixing multi-layer/clear over base paint color This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Perform mixing activities using the appropriate method and/or system. • Mix multi-layer/clear over base paint color
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 6. Do the “LAP test”

Information Sheet 1- Performing mixing activities using the appropriate method and/or system.

Color Mixing Activities

Color mixture is a colloquial term denoting mixture of direct and indirect color stimuli: lights or colorants (dyes and pigments) by physical combination, different stimuli appearing in rapid succession in the field of view, or stimuli so small that they cannot be individually resolved by the visual system

Base Coat & Clear Coat for Auto Paint Mixing

A paint job on a car involves more than spraying paint on the car's surface. There are several extremely important steps that must be completed before the car is ready to be painted. One of these steps is mixing a base coat and clear coat for auto paint. If the paint isn't mixed correctly, the unsightly results will show up once the car has dried. The only thing to do then is to strip the paint off and start again, which is costly and time-consuming.

Step 1 Read the directions carefully to make sure the paint isn't a specialty paint, which may call for a specific mixture ratio.

Step 2 Place a clean measuring cup (purchased at an automotive paint store) on a flat surface. Pour the paint into the cup. Use a separate clean cup to measure the reducer. Most automotive paints require a 4-to-1 ratio, which means four ounces of paint for every one ounce of reducer.

Step 3 Follow the same mixing ratio for clear coat paint. Mix the paint and reducer together and stir very well with a stir stick.

Pour the paint into the cup of the paint gun and close it tightly.

Auto Paint and Reducer Mixing

Step 1 Place the measuring cup on a flat surface. Add the desired amount of automotive paint to the measuring cup. Make sure the paint reaches a line on the measuring cup so that it is easier to measure.

Step 2 Add reducer to a separate measuring cup; the ratio is 4:1 of paint to reducer. Once the amount of reducer is measured, add it to the paint.

Stir the mixture of paint and reducer with a stir stick. Once the mixture is stirred well, pour it into a clean paint can, and close the lid to keep the paint fresh.

Automotive Paint With Reducer & Hardener Mixing

Modern automotive paints are activated with hardeners to promote faster drying times. Reducer is added to help the material flow through the spray gun easily. The mixing process is a vitally important aspect of automotive refinishing work. Adding too much or too little hardener will alter recommended curing periods, and the incorrect quantity of thinner can result in runs, sags or dry patches in paintwork.

Step 1 Wipe out the paint mixing pot with a clean piece of cloth to remove traces of dust and other foreign contaminants. Place the paint mixing pot on a flat, even surface. Stand the paint measuring stick against the inside wall so it rests in a vertical position.

Step 2 Stir the automotive paint thoroughly with a disposable stirring stick before mixing begins. Make sure the separate pigments mix together. Check the paint against the vehicle to make sure the color is accurate.

Step 3 Refer to the technical data sheet supplied with the automotive paint to establish the correct mixing ratio. Remember that the mixing ratio is written sequentially. So figures of 2:1:1, for example, will relate to two parts of automotive paint, 1 part of hardener and 1 part of reducer. Check the markings on the paint measuring stick to ensure the correct ratio markings are available.

Step 4 Determine how much unmixed material is needed for painting. Refer to the left-hand side of the paint stirring stick to view the different volume measurements. Note that each numbered vertical marking represents one-tenth of a liter of automotive paint. Add paint up to marking number 1 on the left-hand side of the stick if 100ml of unmixed paint is required. Add up to the number 2 if 200ml of unmixed paint is needed. Add up to any other number that represents the correct volume of material necessary to complete the job.

Step 5 Take a tin of compatible hardener and look at the markings on the center of the paint measuring stick, which represent the second part of the mixing ratio. Fill the paint mixing pot to the same number on the center of the stick as you used when adding unmixed paint. Add to the number 1 if the paint was added to number 1 on the left-hand side; 2 if the paint was added to 2 on the left-hand side; or any other relevant number that matched your original paint quantity.

Repeat the process on the right-hand side of the stick with compatible reducer, making sure the pot is filled to the same number on the paint measuring stick so it matches the number used for the unmixed paint and hardener. Allow the material to settle for a few seconds before stirring the three components together and adding the mixed product to a spray gun.

2K Primer Mixing

Two-pack primers are commonly used in the automotive repair industry and they are applied to vehicles for several different reasons. Because of their high solid content, two-pack primers are capable of producing a higher build which helps to achieve a flatter painting surface after it has been rubbed down. Etching properties also mean that two-pack primers will stick more readily to repairs and bare metal. A good two-pack primer will also repel moisture and alleviate the risk of corrosion for long periods of time.

Step 1 Always wear latex gloves before handling solvent-based paint or primer products. Check the dates on the label of the primer against the technical data sheet provided to ensure the product has not exceeded the recommended shelf life.

Step 2 Remove the metal seal on the tin of two-pack primer and take off the lid. Take a metal mixing stick and stir the primer continuously for several minutes. If two-pack primers have been in storage for long periods of time, the high-solid content will sink to the bottom of the tin and the product binders will float to the top. Do not stop stirring until the entire contents of the tin have merged. Once the primer is usable, remove the stirring stick and wipe clean with a general-purpose cloth.

Step 3 Take a mixing pot and check inside to ensure there are no waste products from previous jobs. Contamination can lead to poor adhesion and slow drying times. Wipe the inside of the pot clean with a piece of general-purpose cloth soaked with cellulose thinners if any old materials are present. Take the mixing stick and place it upright against the inside wall of the pot with the ratio markings facing outward.

Step 4 Refer to the technical data sheet to establish the mixing ratio. Most two-pack primers are mixed at a ratio of 3:1 or 4:1 with a compatible hardener. It is the presence of two separate packs (in this case, the primer and the hardener) that give two-pack

materials their name. Establish how much mixed material you will need before continuing.

Step 5 Check the left-hand markings on the mixing stick and choose a relevant number that reflects the amount of material you will need. Most mixing sticks are separated in measurements of one-tenth of a liter; if you need a half-liter quantity of primer, select the number 5 on the stirring stick. Pour in the primer carefully until it reaches the level you require. Stop pouring, replace the lid and store the primer away safely for future use.

Step 6 Take the hardener and check the markings that run through the middle of the mixing stick. If you have poured enough primer into the mixing pot to reach number 5 on the left-hand markings, you will need to pour in enough hardener until it reaches the number 5 on the middle of the stick. Once sufficient hardener has been added, put the cap on the tin of hardener and store safely.

Step 7 To establish flow through your paint spray gun, a small amount of thinners can be added. The right-hand side of the mixing stick will have markings at 5-percent intervals. Experienced painters will usually add thinners to a level of approximately 10 percent but this can vary a little according to gun setups and spraying actions.

Stir the primer, hardener and thinner continually until all three products have merged. Wipe the mixing stick clean and pour the contents of the mixing pot into the paint gun, using a filter to remove any lumps or pieces of grit. Wash the mixing pot clean with cellulose thinners to finish.

Clear coat Car Paint Mixing

The final step in protecting your car's paint job is applying a clear coat. The clear coat protects your paint job and provides the desired level of gloss to your car. Your clear coat is made up of two different parts, the clear paint and the hardener. Mixing your clear coat needs to be done in the correct proportions; incorrect proportions will cause your clear coat to thicken before you are done using it

Mix Clear coat Car Paint

Step 1 Decide between an overall clear coat or a spot clear coat. Overall clear coats are used for painting an entire car. Spot clear coats are used for touch-up work.

Step 2 Pour a ratio of 4 to 1. You will be using 4 oz. of clear coat for every 1 oz. of acrylic hardener. Once you pour in the acrylic hardener, the chemical reaction will begin to activate the paint. Plan on making 20 percent more clear coat car paint than you will need.

Step 3 Pour in the same amount of acrylic reducer as you did acrylic hardener. The acrylic reducer will keep your paint thin enough to go through your paint gun.

Step 4 Stir the mixture. You need to use this mixture within a few hours. If left out for several hours, the mixture will harden.

Place your filter cone on top of the paint gun's opening. Pour the mixture into your paint gun and you are ready to begin to clear coat your car.

Information Sheet 2- Mixing multi-layer/clear over base paint color

Many auto body and repair shops can re-paint your vehicle, but will charge heavily for the service. If you want a smart new look for your car, but don't want to leave a hole in your wallet, painting it yourself could be a good option. This will require some knowledge of the various automotive paint types and mixing methods. But, having grasped the basics, that slick new coat of paint won't be too far away.

1. Purchase a mixing pail or cup. It is well worth your while purchasing a container made specifically for mixing automotive paint. Not only will these better endure the repeated use of harsh chemicals, but also come with side-markings which will be invaluable when it comes time to measure your paint.

Figure 3. mixing pail or cup

2, Choose single-stage paint if you're looking for a quick and cheap option. Selecting the paint you will work with is more than simply choosing a pleasant colour. Different kinds of paint do different jobs. Single-stage paints are those which can be used independently, without an extra base or finishing layer. A good comparison is to nail polish. You can apply as many or as few layers as you wish, with nothing else being required.

- Single-stage paints are recommended for basic colours such as red, blue, or yellow. They dry to a glossy finish and are easy to prepare, so are perfect for the novice painter. Note, however, that these are rarely used to coat an entire car.

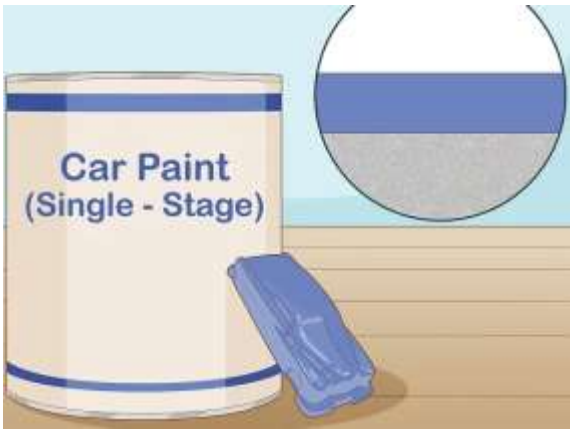


Figure 4. single stage car paint

3. Choose a two-stage paint method if you want a longer-lasting result. Two-stage or base coat/clear coat paints will involve at least two coats (one base, one clear). The base coat provides the colour, while the clear coat provides extra protection against scratches and the elements.

- A two-stage method tends to yield a more metallic finish. If this, along with greater protection, appeals to you, then opt for a compound coat.

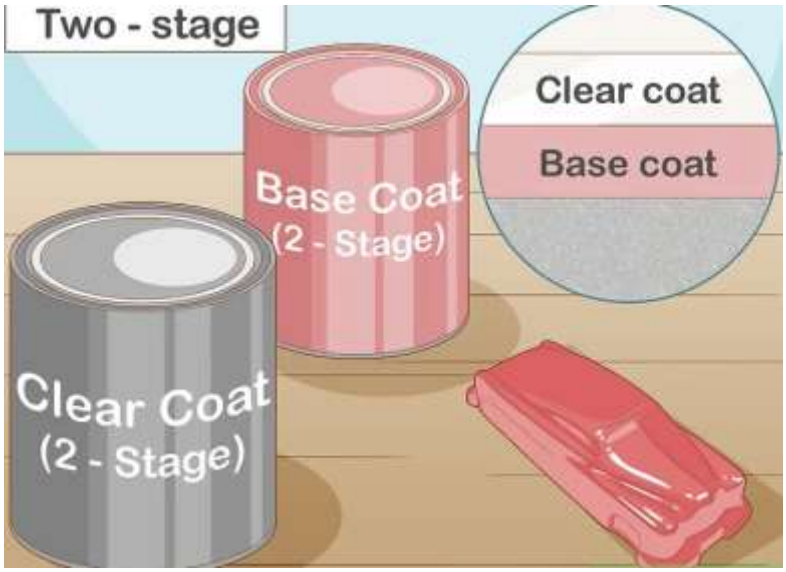


Figure 5. two stage paint

4. Be consistent when mixing your paint. Whatever you choose, try not to vary your paint types or brands, as this can create an uneven result. If you don't know which paint

or method is best suited to your vehicle, consult your owner's manual or local car dealer to find out.

Figure 6. paint method comparison

Find your paint's technical information. When mixing paint, you need to know what additional materials are required, as well as any safety precautions to take into consideration. However, this information is not difficult to find. Simply inspect the side of the can.[6]

- If the technical data specifies the use of paint thinner and/or paint hardener, these will need to be purchased as well.
- In the unlikely event that this information is not printed on the can, go to the manufacturer's website or contact the retail outlet where the paint was bought.

Mixing Single-Stage Paints

1. Gather your paint and other required materials. Single-stage paint will usually require the mixture of three basic substances.

- The paint itself will determine the colour of your mixture.
- 'Reducer' or 'thinner' serves to dilute the paint, avoiding solid clumps or "orange peels" in your coat.
- 'Hardener' will help your paint dry for a convenient finish.[

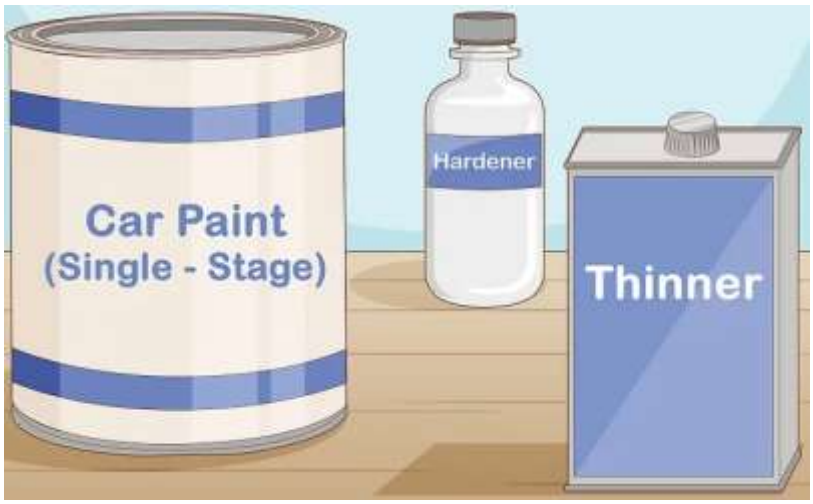


Figure 7. single stage paint required material

Pour your materials into a mixing container. The paint's technical information will inform you of what ratio of materials are needed, written as a series of 3 numbers. For example, a standard mixing ratio for single-stage paints is an 8/1/1 mixture. That is to say, for every 8 parts paint add one part thinner and one part hardener.[9]

- If you are using a paint mixing cup there will be fractions which correspond to this ratio. So, you might fill the cup with paint to the '8' level, use thinner to reach '9,' and top it up to '10' with hardener.

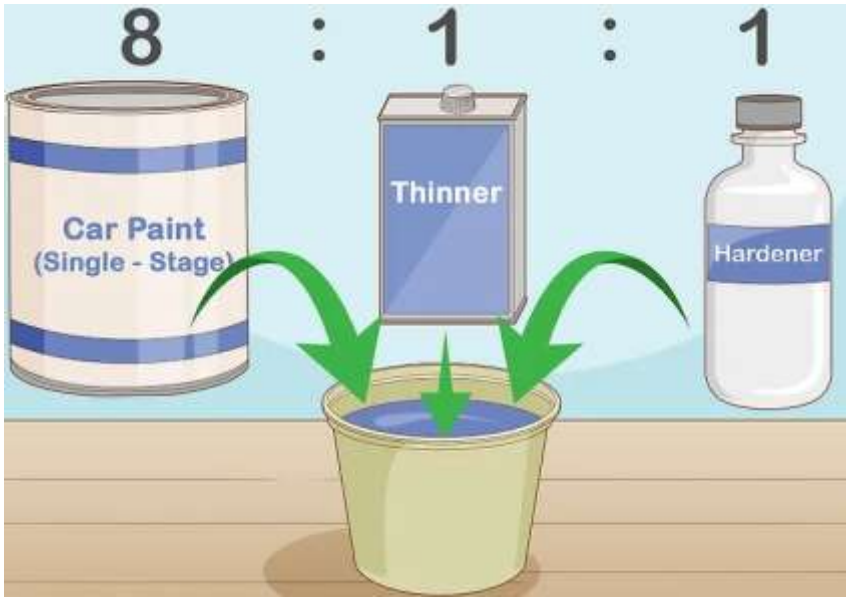


Figure 8. pouring paint materials

3. Stir the paint well. Paint sticks can be acquired from any trade store, otherwise a sturdy piece of wood or old tool will suffice to stir the mixture. Do so thoroughly to create the appropriate consistency.

- Whatever you use to mix the paint with will be ruined, so choose something that will not be missed.

Figure 9. paint stirring

4. Test the paint with a spray gun. Add a small amount of the paint to the gun, and have a disposable surface set aside to test the suitability of your newly mixed paint.

- If the paint is not flowing well from the spray gun, add more thinner to increase the flow.
- If having sprayed the surface you see that the paint is running, or is having trouble drying, this is an indication that more hardener is required.

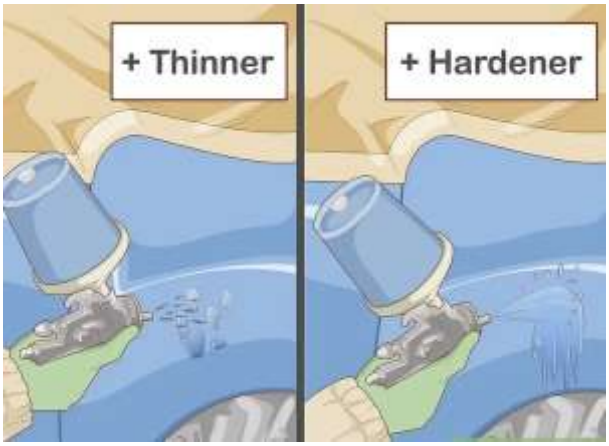


Figure 10. paint testing

Mixing Two-Stage Paints

1. Gather the different paints and their additional materials. Both the base coat paint and clear coat paint will require pairing with an additional substance.

- Base coat paint will be paired with reducer or thinner to ensure the best viscosity.
- Clear coat paint must be combined with hardener before being applied to your car's surface

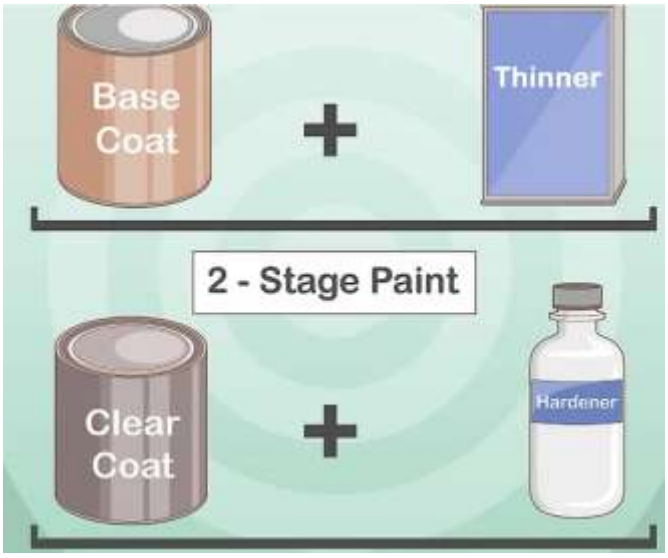


Figure 11. Two stage paint materials

2. Combine your materials in a mixing container. Refer to the technical information you sourced earlier to determine the ratios for each coat.

- The ratio of base coat paint to reducer will always be 1/1. Your container, preferably a mixing pail, should therefore be half paint and half thinner.
- Your clear coat will be slightly more complicated. Depending on the brand, the ratio of clear coat paint to hardener will usually be either 4/1 or 2/1.

Figure 12. combining paint materials

3. Mix your compounds thoroughly. Using a paint stick or similar tool, stir the contents until they appear smooth. Don't worry about getting the consistency exactly right first time, you will have a chance to test the texture before painting your car, and to stir further if necessary.

Figure 13. mixing/stirring compounds

4. Spray a test coat on a safe surface. Place a small sample of both coats into your spray gun and apply on something dispensable - a wooden board or old piece of equipment would be best. Your base coat should be checked for viscosity as this will

contribute most to the colour of the vehicle. The clear coat, while colourless, generates that much coveted gloss or shine. Both ought to flow smoothly from the gun.

Figure 14. a test coat spraying

LG #32	**LO #3- Determine paint fault cause and rectification requirements for clear over base (two component system) paint materials**

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics: • Determining cause of paint fault from available information • Undertaking visual inspection of vehicles damage • Assessing damage to paintwork from visual comparison with undamaged paintwork • Determining Paint faults cause and rectification requirements This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to**: • Determine cause of paint fault from available information • Undertake visual inspection of vehicles damage • Assess damage to paintwork from visual comparison with undamaged paintwork • Determining Paint faults cause and rectification requirements
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 6. Do the “LAP test”

Information Sheet 1- Determining cause of paint fault from available information

1.1 Causes of Paint fault

Paint faults can have many causes. May be your customer had an accident, or may be the car was exposed to aggressive atmospheric conditions. It is also possible, that mistakes were made during the coating process – maybe the coat thickness was not right or drying times were too short.

The usual cause is contamination of the surface, e.g. by grease, oil, wax polish or silicones. Cussing may also occur when water-thinned paints are applied over glossy or semi-gloss oil based coatings. Some common causes of Paint Failure

Fish Eyes or Craters

Identification: Appears as a small crater-like opening in the finish after it has been applied. Appear either during or shortly after you lay down a coat of paint or primer (though primer is often much more forgiving).

Figure 15 fish eye type paint fault

Causes:

- Oil, wax, grease or silicone contamination. Many waxes and polishes contain silicone – the most common cause of fish eye or craters.
- Contaminated air lines.
- Effects of old finish and previous repair (May contain excessive amounts of silicone).
- Polishes, aerosol sprays that contain silicone (Interior cleaners).

Prevention:

- Thoroughly degrease surface with a wax and silicone remover.
- Regular maintenance of air supply/equipment.
- Add fish eye eliminator.

Chipping

Identification: Small chips of finish losing adhesion to the substrate.

Figure 16 chopping type paint fault

Causes:

- Improper cleaning or preparation.
- Improper metal treatment.
- Materials not properly mixed.
- Failure to use proper sealer.

Prevention:

- Degrease and prepare substrate carefully.
- Use correct metal conditioner. (e.g. Selft Etching Primer).
- Ensure all materials are measured and mixed uniformly.
- Use compatible products/follow manufacturers instructions.

Blushing (Milkiness)

Identification: A milky white, grey cloud appears on the surface of the paint film immediately or shortly after application.

Figure 17. blushing (milkiness)

Causes:

When spraying during humid conditions, air from the spray gun and solvent evaporation lowers the substrate temperature below the dew point, causing moisture in the air to condense in or on the paint film. The condition is aggravated when too fast drying or unbalanced thinner/reducer is used.

Prevention:

- Thoroughly degrease surface with a wax and silicone remover.
- Regular maintenance of air supply/equipment.
-

Chalking – Fading, Oxidation, Weathering

Identification: A chalk white appearance on the surface of the paint film.

Figure 18. chalking - fading type paint fault

Cause:

Pigment is no longer protected by resin, resulting in a powder-like surface and lack of gloss due to:

- Natural weathering of paint film.
- Improper application of paint material.
- Excessive generic thinner/reducer and/or hardener in the paint material.

Prevention:

- Weekly washing and occasional polishing or waxing will remove oxidation from the finish.
- Thoroughly stir, shake or agitate all paint materials.

- When spraying single stage metallic finishes, apply mist/fog coats panel by panel while finish is still wet.
- Use recommended thinner/reducer/hardener and measure accurately.

Clear coat Yellowing

Identification: Clear coat has a yellow hue to it (pretty obvious).

Figure 19. Clear coat Yellowing type paint fault

Causes: New paint:

- Dirty mixing equipment.
- Too much accelerator (i.e. kicker) used.

Old paint:

- Clearcoat is too thin.
- Contaminated hardener.
- No cross link.
-

Edge Mapping – Edge Ringing, Feather-edge Lifting

Identification: Raised or lifted edges in the wet or dry paint film that outline sand-throughs or feather-edges. You'll recognize it as a wrinkled area outlining a repaired area.

Figure 20. Edge Mapping – Edge Ringing, Feather-edge Lifting type paint fault

Cause:

Solvent from the new topcoat penetrates a solvent sensitive substrate causing a lifting or wrinkling that outlines the feather-edge.

Prevention:

Check questionable finishes by rubbing a small inconspicuous area with a shop towel saturated with lacquer thinner. Finishes susceptible to lifting will soften, wrinkle or shrivel as lacquer thinner is applied. If any of these reactions occur, the following recommendations should be considered:

- Use acrylic urethane primer surfacer, waterborne primer surfacer or an acrylic lacquer primer surfacer thinned with non-penetrating thinner over sensitive substrates.
- Use 400 or finer grit sandpaper when featheredging.
- Avoid sanding through insoluble topcoat colour or clear, exposing solvent sensitive or soluble finishes.

Lifting – Wrinkling, Raising, Alligatoring, Shrivelling, Swelling.

Identification: The existing paint film shrivels, wrinkles or swells during new finish application or drying. Wrinkling, often called lifting, is when an existing paint layer shrivels during the application of a new finish or as the new finish dries. This is caused by the solvents in the new finish attacking the old finish. You'll most likely see this malady when re-coating enamels or urethane's that are not fully cured, or if and when you exceed the maximum flash (dry) or re-coat time during application. It'll also sometimes happen when you re-coat a basecoat/clear coat finish where the old clear coat had an insufficient film build.

Figure 21. Lifting – Wrinkling, Raising, Alligatoring, Shrivelling, Swelling. type paint fault

Causes:

Solvents in a newly applied product attack the previous finish causing wrinkling, raising, or puckering of the paint film due to:

- Re-coating enamels or urethanes that are not fully cured.
- Re-coating a basecoat/clear coat finish, where existing clear coat has insufficient film build.
- Exceeding maximum flash or re-coat times during applications.

Prevention:

Check questionable finishes by rubbing a small inconspicuous area with a shop towel saturated with lacquer thinner. Finishes susceptible to lifting will soften, wrinkle or shrivel as lacquer thinner is applied. If any of these reactions occur, the following recommendations should be considered:

- DO not exceed a products maximum recoat time before recoating or after application.
- Allow enamels or urethanes to thoroughly cure before recoating or attempting a repair.
- Avoid applying undercoats or topcoats excessively wet.
- Use waterborne undercoats to repair extremely sensitive finishes..

Loss of Gloss or Dieback

Identification: A noticeable loss of surface gloss

Figure 22. Loss of Gloss or Dieback type paint fault

Cause:

- Incorrect mixing or contaminated hardener where no cross-link occurs.
- Porous primer.
- Poor flow primer.
- Attack of primer by solvent from the topcoats.
- Interrupted baking/uneven temperatures.
- Certain metallic basecoats.
- Topcoat applied too thin.

Prevention:

- Use finer grade of sanding paper.
- Increase film thickness/improve flow of topcoat.
- Ensure adequate temperatures in cooler weather.
- Do not interrupt baking cycle.
- Allow adequate flash times, follow manufacturers application instructions.
- Seal solvent-sensitive primers (e.g. lacquer).

Orange Peel

Identification: Uneven surface formation, texture like skin of an orange. One of the more common paint problems we run into, and its name is self-explanatory. It looks like an orange peel. This predicament is often caused by under-thinning/reducing the paint, spraying at too low a pressure, or a combination of both. Other causes may well be too fast a thinner or reducer, piling on too many or too heavy coats, or improper spray gun

adjustment. Depending on severity orange peel can be repaired by compounding and polishing, or wet sanding with 1200 grit or finer paper and then buffing, or sanding and re-spraying the surface.

Figure 23. Orange Peel type paint fault

Causes:

- Improper spraying pressure/technique or application temperatures.
- Improper flash or recoat times between coats.
- Extreme shop temperatures (When air temperature is too high, droplets lose more solvent and dry out before they can flow out and level).
- Use of improper reducer/thinner (Fast evaporating solvents cause the atomized droplets to dry before they reach the surface).
- Materials not mixed correctly.

Prevention:

- Use proper gun adjustments, techniques and recommended pressures.
- Schedule paint jobs to avoid extreme temperature/humidity conditions.
- Allow proper dry times for undercoats/topcoats per manufacturers recommendations.
- Use recommended thinners per manufacturers instructions.
- Follow paint mixing instructions carefully per manufacturers recommendations.

Peeling / Blistering / Adhesion Problems

Identification: Loss of adhesion between paint and substrate (topcoat to primer and/or old finish, or primer to metal).

Figure 24. Peeling / Blistering type pant fault

Causes:

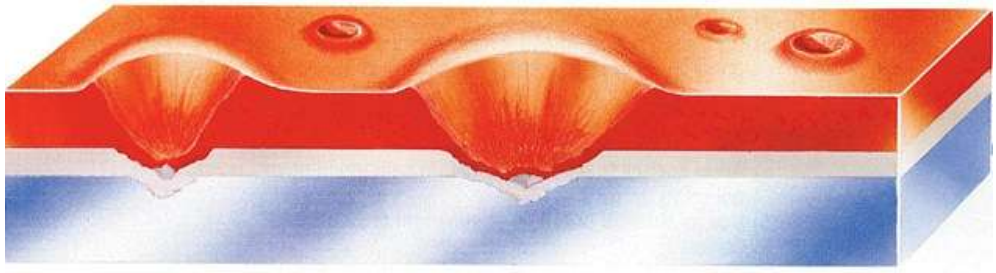
- Improper cleaning or preparation of substrate.
- Failure to remove sanding dust or other surface contaminants.
- Improper metal treatment.
- Use of incompatible materials or not properly mixed.
- Condensation on substrate due to temperature changes.
- Flash off/drying times too short.
- Formation of condensation on substrate between coats due to temperature fluctuations.
- Applying excessive film thickness or primers or basecoat.

Prevention:

- Thoroughly degrease, clean and prepare surface carefully.
- Use correct metal primer (e.g. self-etching or epoxy primer).
- Stir all pigmented undercoats and topcoats thoroughly.
- Keep to specified dry times.
- Follow manufacturers application instructions.

Pinholing

Identification: Tiny holes in the finish, putty or body filler usually the result of trapped solvents, air or moisture.



Cause:

- Improper surface cleaning or preparation – moisture left on primer-surfacers will pass through the wet topcoat causing pinholing.
- Contaminated air lines (Moisture or oil in airlines will enter paint).
- Incorrect gun adjustment or spray technique (Gun too close to substrate).
- Improper dry method (Fanning a newly applied finish can drive air into the surface causing the surface to skin, which result in pinholes when solvents retained come to the surface).
- Improperly primed body filler.
- Improperly mixed polyester, fibreglass bodies.

Prevention:

- Thoroughly clean all surfaces and ensure surface is dry.
- Drain and clean air pressure regulator to remove trapped moisture and dirt. Air compressor tank should also be drained regularly.
- Use proper gun adjustments, technique and pressure.
- Allow sufficient flash and dry times. Do not dry by fanning.
- Body filler should be sufficiently filled with primer-surfacer.
- Body filler must be thoroughly mixed.

Runs / Sags

Identification: Appears as a thick, raised uneven line on the surface.

- Typically, on vertical surfaces.
- May be in topcoat colour or clearcoat.

Figure 25. Runs / Sags type paint

Causes:

- Incorrect spraying viscosity, spray technique, flash off times between coats or film thickness.
- Defective spray gun setup/incorrect pressure.
- Temperature – shop/garage too cold.
- Incorrect thinner/reducer/hardener used.

Prevention:

- Do not ‘pile’ on finishes. Allow sufficient dry times between coats.
- Use proper gun adjustments, techniques and gun pressure.
- Warm material/substrate to room temperature.
- Use correct hardeners, thinners.

Solvent Popping

Identification: Blisters on the paint surface. Or boiling as it’s sometimes known, can be recognized by groups of small bubbles or crater-like openings in the paint surface.

Causes:

- Poor surface cleaning and preparation.
- Incorrect thinner/reducer, especially the material is sprayed too dry or at excessive pressure.

- Spraying too much, too fast – excessive film build. Too heavy on undercoats may trap solvents causing popping or topcoat/clearcoat as solvent escapes.
- Incorrect gun setup.
- Booth with insufficient air flow.

Prevention:

- Degrease and prepare surface carefully.
- Apply at recommended film thickness.
- Allow proper dry times for undercoats and topcoats. Allow each coat of primer-surfacer to dry naturally. Do not fan.
- Check oven temperatures and follow manufacturers recommendations.
- Do not 'pile' on coatings. Follow manufacturers recommended film thickness and flash times.

Cracking

Also known as wrinkling, splitting, or checking, cracking can include cracks of random size and often resembles the wrinkles on a reptile's skin.

Figure 26. Cracking type paint fault

COMMON CAUSES

- Insufficient surface preparation: Step one in avoiding cracks or many other imperfections is properly preparing the substrate for paint. Cracking or other imperfections in the surface itself should be removed before the new material is applied.

- Lifting of substrate: When the wrong reducer is used in a top coat, or when certain materials are top coated before achieving full cure, the undercoat may lift in a way that appears like cracking.
- Improper choice in reducer or hardener: Be sure to follow the paint manufacturer's suggestions on the type of reducers and hardeners to use with each paint. Improper or low quality materials may have an adverse effect on the finished dry paint film.
- Incorrect mixing ratio: If too much activator/hardener is used, or if the correct ratio is not properly mixed, defects may appear in the finished dried paint film.
- Environmental conditions: Excessive heat or humidity during application and curing can cause surface imperfections such as cracking.
- Too much, too quickly: Spraying too much material in full wet coats can lead to cracking.

Orange Peel

This is one of the most common conditions we hear mentioned when people talk about painting their own vehicle. As the name suggests, orange peel is a condition in which the dried paint has an appearance or finish similar to an orange peel.

Figure 27. Orange Peel type paint fault

COMMON CAUSES

- Excessive film thickness: Again, applying too much material in full wet coats can cause issues. This includes preventing the paint from flowing to an even film before drying.
- Improper use of reducer: The wrong reducer for the conditions can cause solvents to evaporate too fast, allowing the paint film to dry before the material has properly flowed out to the desired appearance. Make sure to use the right reducer for the temperature and conditions in which you are working.
- Gun troubles: Make sure to use the correct spray gun, fluid tip, and air cap for your application. Also, insufficient air pressure at the tip of the gun can prevent paint material from properly atomizing, keeping it from flowing out to a desired appearance.
- Poor technique: Any number of factors, including the position of the gun tip, the speed of the pass, the degree of overlap between passes, and the distance of the gun from the panel, can lead to orange peel.

Runs and Sags

Whether on the side of a vehicle or while repainting a kitchen or bathroom, we've all probably dealt with paint sags or runs at some point. When struggling with runs, sags, or curtains on an automobile, there are some likely culprits.

Figure 28. Runs and Sags type paint fault

COMMON CAUSES

- Improper reducer/too much reducer: Again, your choice in reducer and hardener plays a key role in your final finish. Be sure to choose the appropriate reducer for the type of material being sprayed, and the shop conditions in which they will be sprayed. Reducer that evaporates too slow and excessive use of reducer are two primary causes of runs and sags.
- Excessive film thickness: Too much material in full wet coats leads to excess paint that runs.
- Insufficient flash time: Not allowing enough time for solvent to flash off of the first coat before applying next coat can also cause runs.
- Inadequate air pressure: Paint sags can result from insufficient air pressure at the tip of your paint gun. It's also important to use the correct fluid tip and air cap, and the proper paint gun for specific materials.
- Poor technique: Runs and sags can be caused by improper gun tip position, the speed of the pass, the degree of overlap between passes, and the distance of the gun from the panel.

Flaking and Peeling

Figure 29. Flaking and peeling type paint fault

It's generally a bad sign when pieces of dried paint peel or flake off of your vehicle. If you're experiencing this condition, delamination has occurred. The dried paint film is no longer adhering to the substrate, causing it to pull away in strips or flakes. Here's how to avoid or fix that problem.

COMMON CAUSES

- Improper surface preparation: If the substrate is not properly abraded, or features surface irregularities and/or rust spots that are not addressed prior to the application of paint, delamination may occur (sometimes immediately, other times after a lengthy period). Remember, your vehicle's finish is only as good as what lies beneath it.
- Insufficient film thickness: Consistent and adequate film thickness is important. Paint that has been applied too thinly has an eventual tendency to pull away from the substrate.
- Failure to follow application instructions: Adhesion may become an issue if specific application instructions are not followed. For example, certain undercoats that have fully cured must be sanded before taking a topcoat to avoid delimitation.

Absence of Gloss

A matte finish is nice if it's what you really want. But if you're expecting a nice gloss finish and you get a more satin or matte look—well, that's bad. If your automotive paint isn't giving you the gloss finish you want, there are a few possible causes. Keep in mind, though, that all paints will lose some degree of gloss over time due to everyday weathering.

COMMON CAUSES

- Insufficient film thickness: If the final coat of single-stage paint or a clearcoat is applied too thinly, finished paint film will not exhibit full gloss potential. This also may occur when material is applied too dry, causing orange peel.
- Insufficient flash time between coats: If solvent does not have adequate time to flash between coats, the result may be a loss of gloss in finished paint film.
- Excessive film thickness: A repeat suspect in multiple paint problems, excessive film thickness can prevent the finished paint film from achieving full gloss. Make sure to not apply too many full wet coats of paint.
- Wrong reducer: The wrong grade or temperature reducer for the conditions can cause solvents to evaporate too fast. This will allow the paint film to dry too quickly, leaving a satin or matte finish. This can also occur if too much solvent is used.
- Insufficient time between different materials: Gloss may be compromised if a topcoat or clearcoat is applied too soon, or in some cases, before the previously applied material has achieved a full cure.

- Poor cross ventilation: It is important to maintain air movement even after application. Failure to do so can impede the overall gloss development.

Figure 30. absence of gloss type

Poor Hiding

Uneven filler or substrate color can cause poor hiding. (image courtesy of corvetteforums.com)

Is your dried paint allowing the substrate to show through?

While paints are designed for opacity, poor hiding can allow variances in the vehicle surface or previously applied coating material to be visible through the finished paint. Here are some typical causes:

COMMON CAUSES

- Too much reducer: Reducers are totally transparent, so using too much reducer takes away from the normal hiding level of the paint.
- Wrong primer color: Certain color primers are more difficult to cover, depending on the color of the paint. For instance, a white paint will cover a light-colored primer faster than a black or dark gray.
- Uneven color on substrate: Body fillers and other variations in substrate color can cause an uneven appearance.
- Insufficient coats: Depending on the paint color used, a manufacturer's suggestion may not be enough to achieve proper hiding and additional coats should be applied.

- Improper paint prep: Paint must be sufficiently agitated prior to use so that pigments can be mixed throughout the material. This is especially true with older materials, because pigments may easily settle to the bottom of a container if left untouched for long periods.

Information Sheet 2- Undertaking visual inspection of vehicles damage

2.1. Visual inspection

Visual Inspection, or Visual Testing (VT), is the oldest and most basic method of inspection. It is the process of looking over a piece of equipment using the naked eye to look for flaws. It requires no equipment except the naked eye of a trained inspector. A well-trained inspector can detect most signs of damage.

A visual inspection is an inspection of an asset made using only the naked eye. This kind of inspection does not necessarily require any special equipment, but it does require special training so that the inspector knows what to look for as they visually review the asset.

Here are 5 simple steps to effectively perform visual inspections:

1. Clearly define defect criteria. ...
2. Standardize inspection performance. ...
3. Analyze visual defects. ...
4. Communicate improvement measures. ...
5. Use mobile-ready checklists.

Advantages of visual inspection

- It is the lowest cost non-destructive test;
- Allows to detect and eliminate possible discontinuities before starting or completing the welding;
- It allows the identification of major discontinuities and generally indicates possible points where discontinuities may arise, which must be inspected by other non-destructive tests;
- A well-achieved visual inspection provides a reduction in the amount of repairs to the weld, leading to greater production of the other non-destructive tests and therefore decreasing the cost of production.

Limitations and disadvantages of visual inspection

- It depends a lot on the inspector's experience, as well as on his knowledge in welding, besides the need to be inside the project and its requirements;
- It is limited to the detection of surface defects.

Information Sheet 3- Assessing damage to paintwork from visual comparison with undamaged paintwork

3.1. Assessing damage to paintwork

How to assess the quality of your car paint job

Step 1: inspect your vehicle in a well-lit area

This may seem like a simple step, but it's important to remember. You'd be amazed how small imperfections in your car's paint can be obscured in the dim light of a panel beater's workshop.

Check your vehicle either:

- Outside under direct sunlight
- In your garage under quality lighting
- Under fluorescent light globes

Inspecting your car's paint work in a well-lit area can mean the difference between noticing blemishes and missing them.

Step 2: ensure that paints match

Less-reputable panel beaters can cut corners by using 'similar' paint or paint that isn't an exact match.

This leaves you with a car that essentially has two colours, which diminishes the overall aesthetic appeal of the vehicle. And it can mean less money in your pocket should you attempt to sell.

Additionally, mismatched paints can be the most obvious sign of poor workmanship or low quality paints. If your paints don't match, then there may also be other problems with your car re-spraying.

Step 3: check for imperfections in the paint

Your car paint job should have a consistent sheen. You should be unable to tell the difference between the freshly painted section and the original coat of paint.

Common blemishes to look for include:

- Streaking or machine swirl marks

- Bubbling or uneven textures
- Places where paint is thicker/thinner

Run a hand over the paint. It should be smooth and clean. Rough patches can mean dirt or grit trapped underneath the paint.

Step 4: look for paint spatter inside and out

Your car's bumpers, glass, tires and the like should be free of paint spatter and drips.

Paint where it shouldn't be is usually a sign of ineffective taping during a car paint job. It can leave you with unsightly marks and run-offs on your bumpers and other non-painted components.

Check your interiors for paint or paint residue too. Especially around openings such as windows and doors.

Paint leaking into the interior of your vehicle can damage your carpets, seats, and finish.

Step 5: care and maintenance

After work on your car's paint is complete and you're satisfied with the workmanship, ask your panel beater or re-sprayer about care and maintenance.

You'll want to wax your paint as soon as it is safe to do so. This will help your paint to remain vibrant. It will also prevent some deterioration from the elements.

If in the weeks or months after your car re-spraying you start to notice peeling or flaking of paint, contact your panel beater immediately. This shouldn't occur and if it does it may require a warranty claim.

4.1. Rectification

Rectification is a remedy whereby a technician return the paint fault its original condition. Rectification refers to changes made in a paint work..

Paint rectification/correction refers to the process of removing the imperfections in a vehicle's finish and restoring it to a better than new finish. The only true way to remove scratches in your vehicle's paint is with the process of paint correction, one of our specialties at The Car Polishing Company.

The Paint rectification/correction process involves removing imperfections in the clear coat (or finish) and 'restoring it' to better than original condition. Professional paint rectification/correction involves a few important steps:

1. Cleaning and completely removing debris
2. Wet sanding or leveling
3. Waxing and Polishing
4. Sealing the Paint

1. Hand wash

The paint correction process starts with thorough hand washing of the vehicle. It is extremely important to wash away dust and dirt before going further with machine polishing. Our six-step exterior hand wash will make your vehicle look extravagant. We will hand wash the outside of your vehicle with our power house degreaser which will remove the sodium chloride and road gravel off your car, truck or SUV. Once this is complete we will use our triple foam conditioners, our two-step soap, and finally blow-dry and full wipe down.

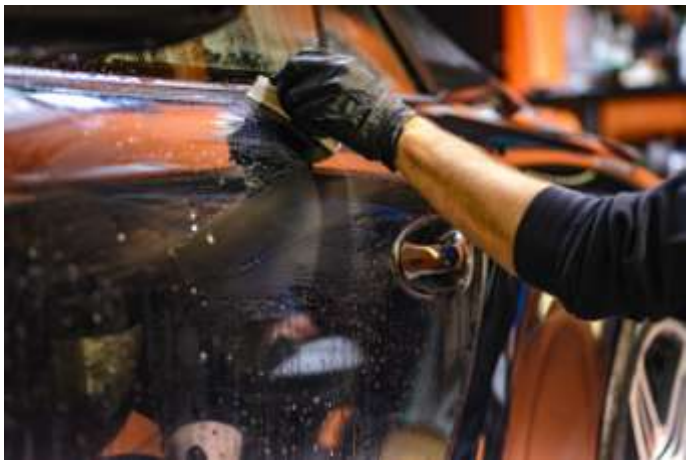


Figure 31. hand washing

2. Paint decontamination

Decontaminating a car's paint finish is an often-overlooked detailing step yet very necessary to achieving a flawless finish.

At Nova Auto Detailing we either use an iron remover surface decontamination system which is completely safe and effective on automotive paint. Iron remover is sprayed on the surface and then rubbed into it. All the contamination will turn purple after being in contact with the iron remover. Then the iron remover must be completely washed away from the painted surface.

Figure 32. paint decontamination

3. Paint decontamination (clay bar)

The clay bar process removes all stubborn contaminants. This step is very important because stubborn contaminants can be ground into the paint and cause more scratches while machine polishing.

The next level of paint decontamination (and most cost effective) after washing is achieved through the use of ‘detailing clay’ through a process known as ‘claying’.

Detailing clay is designed to remove above surface bonded contaminants on paint, glass, fiberglass, and metal. Claying is excellent at removing above surface bonded contaminants, and is an essential step in the detailing process.

Figure 33. paint decontamination (clay bar)

4. Wet sanding and re-leveling (if required)

The wet sanding process is used when buffing and polishing isn’t enough to remove deep scratches or orange peel from a vehicle’s surface.

Wet sanding is an amazing process that, when done properly, can result in a surface that’s as smooth as glass. Whether you’re talking about paint, primer, bare metal or anything in between, your car’s body can be smoothed by wet sanding.

Figure 34. Wet sanding and relabeling

5. Buffing and machine polishing

The machine polishing step is the actual polishing of the vehicle in the paint correction process. Our specialists determine a combination of machine, pad, and polish compounds to be used to achieve the best possible results in paint correction. Usually two to four cut and polish stages are applied. Deep and large scratches are removed in the first stage of polish and then the smaller surface abrasions caused by this harsh polish are removed by the finer polish that comes after it. Every case is unique and it differs from vehicle to vehicle.

Figure 35. Buffing and machine polishing

6. Erasing

Degreasing is a very important step that prepares painted surfaces for the final step in the paint correction process. A chemical by Car pro called Eraser was specifically designed for the complete removal of polishing oils for inspection and prior to the application of Quartz or any other coating, wax, or sealant

Figure 36. Erasing

7. Sealant

After all the paint correction steps above have been completed, it is time to seal the vehicle's paint to protect it from further scratching.

It is important to use a high quality and durable sealant. We, at Nova Auto Detailing, recommend using Car Pro Nano coating as the sealant in paint correction process.

LG #37	LO #4 Rectify and touch up paint faults of clear over base (two component system) paint materials

Instruction sheet

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

- Determining Materials required to restore paintwork to "as new" condition
- Material data sheets
- Rectifying Damaged paintwork to blend with existing paintwork on vehicle..
- Rectifying paint faults

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

- Determining Materials required to restore paintwork to "as new" condition
- Material data sheets
- Rectifying Damaged paintwork to blend with existing paintwork on vehicle..
- Rectifying paint faults

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 1- Determining Materials required to restore paintwork to "as new" condition

Materials used to restore paint work

- Protective gloves
- Safety glasses
- A dust mask
- The right product for your type of damage

Material data sheets

A material safety data sheet is a technical document which provides detailed and comprehensive information on a controlled product related to:

- health effects of exposure to the product
- hazard evaluation related to the product's handling, storage or use
- measure to protect workers at risk of exposure
- emergency procedures.

. The Purpose of the Data Sheet

The data sheet is the second element of the WHMIS information delivery system and is intended to supplement the alert information provided on labels. The third element of the system is the education of employees in hazard information on controlled products, including instruction in the content and significance of information on the MSDS.

There are nine (9) categories of information that must be present on an MSDS. These categories are specified in the Controlled Products Regulations and include:

1. Product Information: product identifier (name), manufacturer and suppliers names, addresses, and emergency phone numbers
2. Hazardous Ingredients
3. Physical Data
4. Fire or Explosion Hazard Data
5. Reactivity Data: information on the chemical instability of a product and the substances it may react with
6. Toxicological Properties: health effects

7. Preventive Measures
8. First Aid Measures
9. Preparation Information: who is responsible for preparation and date of preparation of MSDS

The Controlled Products Regulations prescribes what information must be present in more detail.

Information Sheet 2- Rectifying Damaged paintwork to blend with existing paintwork on vehicle.

2.1. Paint rectification

Paint rectification/correction refers to the process of removing the imperfections in a vehicle's finish and restoring it to a better than new finish. These imperfections include but are not limited to, swirl marks, automated car wash marring, fine scratches, water spots, etched bird droppings hologramming caused by poor washing techniques.

The only true way to remove scratches in your vehicle's paint is with the process of paint correction, one of our specialties at The Car Polishing Company. Paint correction involves the use of machine polishers and a range of different polishes and graded pads. A fully corrected vehicle when viewed in direct sunlight will show only true reflections and no swirl marks, scratches or blemishes will be visible to the naked eye.

2.2. Car Paint Correction Process

Paint correction is a process of restoring and enhancing the original paintwork of a vehicle by an expert car detailing facility using specialized tools and an abrasive material of the professional's choice. Swirls, scratches, grime, and oxidation are methodically removed. Specialized polishing machines and agents slowly remove microscopic layers of clearcoat. A buffing or polishing machine is a hand-held motorized spinning head with a fiber rotating pad connected to it. This car detailing tool circularly spreads a compounding agent on the painted surface. Then it slowly rubs down the surface and removes the scratches like a fine grit sandpaper. The result? A slick and glassy surface! Then the detailing professional would add a wax or paint sealant to create shine, lock in the glow, and protect the newly buffed down or finished car surface.

2.3. Damaged paint work and rectification

Fish Eyes or Craters

Repair Process:

- In severe cases, affected areas should be sanded down and refinished.
- Apply mist coat.
- Use fish eye remover (in severe cases).

Chipping

Repair Process:

Remove finish from an area slightly larger than the affected area, sand smooth, prepare metal and refinish.

Blushing (Milkiness)

Repair Process:

Should blushing occur during application: a) apply heat to the affected area. OR b) add retarder and apply additional coats.

Chalking – Fading, Oxidation, Weathering

Repair Process:

- Compound to remove oxidation and polish to restore gloss.
- Or sand to remove 'weathered' paint film refinish.

Clear coat Yellowing

Repair Process: Affected areas must be sanded smooth, sealed and refinished.

Edge Mapping – Edge Ringing, Feather-edge Lifting

Repair Process:

- Sand sooth or remove the affected area. (Final sand with 400 or finer grit sandpaper).
- Isolate affected area with two component primer surfacer and refinish.
- Or, apply waterborne primer surfacer, sand smooth and re-finish.
- Or, apply acrylic lacquer primer surfacer thinned with non-penetrating thinner, sand smooth and refinish.

Lifting – Wrinkling, Raising, Alligatoring, Shrivelling, Swelling.

Repair Process: Remove areas lifted and refinish.

Loss of Gloss or Dieback

Repair Process:

- Buff and polish.
- If extreme, sand and refinish.

Orange Peel

Repair Process:

- Sand and buff using a mild polishing compound for enamel, rubbing compound for lacquer.
- In extreme conditions, sand to smooth surface and respray topcoat.

Peeling / Blistering / Adhesion Problems

Repair Process:

Remove finish from an area slightly larger than the affected area and refinish.

Pinholing

Repair Process: Affected areas must be sanded smooth and refinished.

Runs / Sags

Repair Process:

- In clear coat: sand and buff.
- In basecoat: (Colour coat or topcoat/clear coat) Clean affected area and let dry until surface can be rescinded and repainted.
- If you do “sew some curtains,” in some cases you can wipe the area with a solvent-wetted rag and then clean and re-spray the area (seldom a first choice), or you can keep on going and wait till the paint fully cures and then sand and buff or sand and re-spray.

Solvent Popping

Repair Process:

After drying, repaint with sanding (within 24 hours). If extreme, sand affected areas, refinish pinholes with a polyester filler, prime and refinish.

Orange Peel

HOW TO FIX IT

If orange peel is minimal, sand out the texture in the dried paint film with a fine grit sandpaper, then compound and polish to restore gloss. If orange peel is significant, sand out imperfections and reapply paint using properly reduced material, air pressure, and technique. Making adjustments to the gun settings may also help.

Runs and Sags

HOW TO FIX IT

If the paint is wet: Remove with solvent, clean the area, and reapply coating.

If the paint is dry: Sand out any runs and reapply coating.

Flaking and Peeling

HOW TO FIX IT

If the area in question is relatively small, remove flaking and peeling paint, and then reapply paint material as you would during a spot repair. For larger problem areas, sand the entire paint surface and reapply paint material. Take care to follow application instructions and build the material to a sufficient film thickness.

Absence of Gloss

HOW TO FIX IT

Once paint film is cured, compound and polish to restore gloss or scuff sand and reapply paint.

Poor Hiding

HOW TO FIX IT

Simply continue to apply properly agitated and reduced material until desired hiding level is achieved.

For more valuable paint help, including troubleshooting advice for other paint conditions, check out the Kirker Automotive Finishes website.

Information Sheet 3- Rectifying and touching up paint faults

3.1. Touching up minor paintwork damage

Paint is an important part of the car's rust proofing and should therefore be checked regularly. The most common types of paintwork damage are stone chips, scratches, and marks on the edges of wings, doors and bumpers. When repairing paint damage, the car must be clean, dry and have a temperature of over 15 °C.

Touching up minor paintwork damage

To avoid the onset of rust, damaged paintwork should be rectified immediately.

Note When repairing the paintwork, it must be clean and dry and at a temperature of at least 15°C.

Materials that may be needed

- Primer

  a special adhesive primer in a spray can is available for e.g. plastic-coated bumpers.
- Base coat and clear coat - available in spray cans or as touch-up pens/sticks
- Masking tape.
- fine sand paper.

If the damage has not reached down to the metal, the touch-up paint can be applied directly after the surface has been cleaned.

Note:- When paint is repaired the surface must be clean and dry. The temperature of the surface should be at least 15 °C (60 °F).

Apply a piece of masking tape over the damaged surface. Then remove the tape to remove any loose paint.

If the damage is down to the metal, use of a primer is appropriate. In the event of damage to a plastic surface, an adhesive primer should be used to give better results - spray into the lid of the spray can and brush on thinly.

Before painting, gentle polishing using a very fine polishing agent may be carried out locally if required (e.g. if there are any uneven edges). The surface is cleaned thoroughly and left to dry.

Stir the primer well and apply using a fine brush, a matchstick or similar. Finish off with a basecoat and clear coat once the primer has dried.

For scratches, proceed as described above, but mask around the damaged area to protect the undamaged paintwork.

Touch-up pens and spray paints are available from Volvo retailers.

Note

If the stone chip has not penetrated down to the meal and an undamaged layer of paint remains in place, fill in with base coat and clear coat as soon as the surface has been cleaned.

Repairing paint on a wall by touching-up sounds simple but it is easy to make mistakes that can highlight your invisible mend.

Do's

- Always use the same original container of paint to touch-up if possible. It is the ONLY WAY to a perfect repair.
- If you use all of the original paint, keep a piece of card or paper with the details and a dab of the colour for matching in case it is needed in future.
- Thin the touch-up paint with 20% water and apply with a nook and cranny roller or similar. Feather the edges of the damaged area or use filler if deeper than two coats of paint.
- Always check an inconspicuous area first to see if there are any colour/gloss differences.
- Always mix and box different batches of paint together before use.

Don'ts

- Do not change the batch of paint or container of paint in the middle of a wall.
- Do not touch-up with a different batch of paint.
- Do not touch-up paint without thinning or in large blobs. You are trying to merge in an invisible mend.
- Sheen paints tend not to be suitable for touch up. They usually show a sheen difference in which case the full wall should be painted.

Pro Tips To Touch-Up Car Paint

Touching up your vehicle's paint isn't open-heart surgery, but it never hurts to have some insider information. Here are a few pro tips:

- If you’re looking at a touch-up job that is larger than a scratch or small scuff, it’s better to take your car to a pro. Don’t get your feelings hurt. Trying to paint a large spot on your car at home won’t be easy. Even if you’re able to apply the paint smoothly, the colors will be off between the newly painted area and the rest of the vehicle.
- If the scratch or other paint damage has allowed rust to build up on the bare metal, make sure that it’s just topical and that it hasn’t “chewed” through the metal. We’re talking about touch up paint here, not complicated body repair.
- Start small, working as deliberately and as smoothly as possible. Apply both primer and paint in small amounts and add only as needed.

An Effective Guide on How to Touchup on Paint Defects

Any vehicle is bound to acquire a few chips on its paint from debris from the road kicking up while driving on the sides, minor accidents like your keys scratching the surface of the paint and of course adverse weather conditions especially if it is parked outside and without a cover.

Even a new vehicle you buy sometimes has a few paint defects that are unavoidable due to the weather conditions, the paint type and the application procedures followed. Usually, these scratches are so small that you wish you could take care of them yourself. This is where Com-Paint’s scratch touch up solutions can make your day by saving you a ton of money, the long tedious paperwork as well as time.

This blog post addresses the issue of how to touch upon paint defects by yourself. The process is simple and fairly easy to follow as long as you keep in mind some basic things. Here are the steps in a very non-technical manner which just about anyone can understand:

1. Wash the area of the car where the paint is scratched or chipped. Ensure that the repair area is free of any dirt or grime by using a good cleaning agent. Use a clean, soft cloth to rub the scratched area in a circular motion to make sure that it is clean and dry after washing.
2. Check for rust by looking for any signs of discoloration on the metal. If the area has any dark brown coloured substance, it is most probably the rust. Use a 220 grit sandpaper gently to remove this discoloration and wipe with a dry cloth to remove this rust which will allow the primer to hold on to the metal underneath.

Doing this will maintain the area and minimize any chances of this rust to develop under the paint in the future.

3. Apply the filler paste to the scratch area with the applicator provided in the kit. Let it dry for 30 minutes, after which wet the EP 400 emery pad and lightly scrape the area to make it smooth. Then wipe the area again to make it completely dry.
4. Apply the touchup paint, which is shade-matched to your car, on the area after thoroughly shaking the can to mix the colour consistently. Make sure you apply the paint 2 to 3 times in uniform coats to bring it up to the thickness of paint on the rest of the car. Make sure you allow some time between applications for the paint to dry.
5. Spray the finishing solvent over a wide area in and around the freshly painted section. Leave it for 24 hours. Apply the paint polish paste to the repair area and polish with a soft cloth till you get a uniform shine.

LG #33	**LO #5- Cleanup work area and maintain equipment**

Instruction sheet

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

- Collecting and storing reused material.
- Removing waste and scrap
- Cleaning and making ready tools and equipment and work area
- Tagging unserviceable equipment and identifying faults
- Completing operator maintenance inacordance to worksite procedure
- Maintaining tooling in accordance with workplace procedures

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

- Collect and store reused material.
- Remove waste and scrap
- Clean and make ready tools and equipment and work area
- Tag unserviceable equipment and identifying faults
- Complete operator maintenance inacordance to worksite procedure
- Maintain tooling in accordance with workplace procedures

Learning Instructions:

7. Read the specific objectives of this Learning Guide.
8. Follow the instructions described below.
9. Read the information written in the information Sheets
10. Accomplish the Self-checks
11. Perform Operation Sheets
12. Do the “LAP test”

Information Sheet 1- Collecting and storing reused material

1.1. 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.

Figure 37 properly stored tools

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

Name…… ID…… Date…….

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

Test I: choose the best answer

1. Importance of proper storage of tools and equipments
   A. Teaches workers principles of tool accountability
   B. Improves appearance of general-shop and construction areas
   C. Reduce overall tool cost through maintenance
   D. All
2. Pointers to follow in storing tools and equipments
   A. Label the storage cabinet or place correctly
   B. Wash and dry properly before storing
   C. Store them near the point of use.
   D. All

Note: Satisfactory rating ≥ 3 points Unsatisfactory < 3 points

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

Score = _____

Rating: _____

Answer sheet

Test I

1.---------- 2. ----------

.

Information Sheet 2 - Removing waste and scrap

2.1. 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

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

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

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.

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.

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

Name…… ID…… Date…….

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

Test I: Write short and precise answer

1. List methods of Waste Disposal

Note: Satisfactory rating ≥ 3 points Unsatisfactory < 3 points

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

Score = _____

Rating: _____

Answer sheet

Test I

1.---------- 2. ----------

.

Information Sheet 3- Cleaning and making ready tools and equipment and work area

3.1. Cleaning

Cleaning up is not just a measure of respect for the workspace, it also removes hazards. Plan to easily and regularly remove trash and debris. Enforce a strict cleanup policy throughout the workspace. Keep work areas tidy as well by minimizing the number of wires running around. Extension cords quickly become tripping hazards, and power strips also cause trouble on the ground or as they tumble erratically on a desktop. We suggest you provide access to grounded outlets all along the perimeter of the room and/or dropped from the ceiling for each workbench.

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.

Table 3. kinds of cleaning solvents based on their solubility in water.

Cleaning Solvents	Solubility in Water	Polar	Non polar
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.

Table 4. 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.

Self-Check – 3	Written test

Name…… ID…… Date…….

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

Instruction I : match column "A" with "B" (2points each)

"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.

5 and above correct answered points passed mark.

Information Sheet 4- Tagging unserviceable equipment and identifying faults

4.1. 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

Name…… ID…… Date…….

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

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

Note: Satisfactory rating ≥ 3 points Unsatisfactory < 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 operating maintenance in accordance to worksite procedure

5.1. 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..

1. Corrective maintenance (cm) restores the function of a failed device and allows it to be put back in to service.
2. 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.

Inspections ensure that tools and equipments are operating correctly. Safety inspections ensure the tools/equipments are safe for both patients and operators

The successful maintenance program is:

- Well organized and scheduled,
- Controls hazards,
- Defines operational procedures, and
- Trains key personnel.

Self-Check – 5	Written test

Name…… ID…… Date…….

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

1. ---------- restores the function of a failed device and allows it to be put back in to service. (3pts)

A. Preventive maintenance C. Corrective maintenance

B. Inspections D. None

2. The successful maintenance program is (3 pts)

A. Well organized and scheduled

B. Controls hazards

C. Defines operational procedures

Note: Satisfactory rating ≥ 3 points Unsatisfactory < 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 6- Maintaining tooling in accordance with workplace procedures.

6.1. Maintaining tooling

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

Name…… ID…… Date…….

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

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 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– Cleanup work area and maintain equipment

Procedures to ensure the job gets done safely and without delay

step 1. Clean up every time whenever you leave an area, including sweeping the floor.
step 2. Clean and return all tools to where you got them.
step 3. Use compressed air sparingly; never aim it at another person or use it to clean hair or clothes.
step 4. Shut off and unplug machines when cleaning, repairing, or oiling. (Never use a rag near moving machinery.)
step 5. Use a brush, hook, or a special tool to remove chips, shavings, etc. from the work area. Never use the hands.
step 6. Keep fingers clear of the point of operation of machines by using special tools or devices, such as, push sticks, hooks, pliers, etc.
step 7. Keep the floor around machines clean, dry, and free from trip hazards.
step 8. clean up and dry spills immediately and put a chair or cone over them if they are wet enough to cause someone to slip.

LAP TEST	Performance Test

Name…… ID……Date……

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **2** hour. The project is expected from each student to do it.

Task 1: Perform Cleanup work area and maintain equipment

Reference Materials

Book:

Pinson GS, Melville DJ, Cox DRS (1991) Decortication of tropical oilseeds and edible nuts (NRI Bulletin No. 42).

WEB ADDRESSES

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The trainers who developed this learning guide

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