VEHICLE PAINTING

Level III

Based on Oct. 2016, Version 2 Occupational standards

Module Title: -Preparing and Applying Painting

LG Code: EIS VHP3 M09 LO (1-13) LG (39-51)

TTLM Code: EIS VHP3 M09 TTLM 1019v1

December 2020

Table of Contents

LO #1-Set up work 80
Instruction sheet 3
Information Sheet 1- Work requirements and OHS 4
Self-check 1 62
Information Sheet 2- Grinding Machines ..... **Error! Bookmark not defined.**
Self-Check – 2 ..... **Error! Bookmark not defined.**
Information Sheet 3- Grinding wheel ..... **Error! Bookmark not defined.**
Self-Check – 3 ..... **Error! Bookmark not defined.**
Operation Sheet 1-Techniques of leveling the balancing fixture .... **Error! Bookmark not defined.**
Operation Sheet 2– Procedures of mounting Grinding machine ... **Error! Bookmark not defined.**
LAP TEST ..... **Error! Bookmark not defined.**
Reference Materials ..... **Error! Bookmark not defined.**

LO #2- Perform Intermediate Grinding Operations 63
Instruction sheet ..... **Error! Bookmark not defined.**
Information Sheet 1- Grinding machine set up 65
Self-Check – 1 ..... **Error! Bookmark not defined.**
Information Sheet 2- Laying out and grinding allowance. **Error! Bookmark not defined.**
Self-Check – 2 ..... **Error! Bookmark not defined.**
Operation Sheet 1- Operating grinding machines 30
LAP TEST 31
Reference Materials ..... **Error! Bookmark not defined.**

LO #3- Assure quality components in conformance to specifications 73
Instruction sheet ..... **Error! Bookmark not defined.**
Information Sheet 1- Conformance checking techniques **Error! Bookmark not defined.**
Self-Check – 1 85

Information Sheet 2- Tolerances and surface finishes 89
Self-Check – 2..... **Error! Bookmark not defined.**
Operation sheet 1– Procedures for Checking of conformance..... **Error! Bookmark not defined.**
Operation sheet – 2..... **Error! Bookmark not defined.**
Lap Test ..... **Error! Bookmark not defined.**
Reference Materials 171

LG 39 | 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 and workplace communications
- Reading and interpreting Job specifications
- observing Workplace Health and Safety (WHS) requirements
- selecting and Inspecting quality refinishing materials
- Identifying and checking refinishing tools and equipment
- Identifying and checking safety equipment
- Determining procedures to minimize waste material.
- Identifying procedures for maximising energy efficiency
- Identifying and following workplace emergency 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:

- Use work instructions and workplace communications
- Read and interpreting Job specifications
- observe Workplace Health and Safety (WHS) requirements
- selecting and Inspecting quality refinishing materials
- Identifying and checking refinishing tools and equipment
- Identifying and checking safety equipment
- Determining procedures to minimize waste material.

- Identifying procedures for maximising energy efficiency
- Identifying and following workplace emergency procedures.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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 and workplace communications.

1.1 Work instruction

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.
- ✓ Contains the greatest amount of detail.
- ✓ 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.
- ✓ A description of the specific tasks and activities within an organization.
- ✓ 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.
- ✓ Contains much more detail than a procedure and is only created if very detailed instructions are needed.
- ✓ It is a document containing detailed instructions that specify exactly what steps to follow to carry out an activity.

1.1.1Verbal and visual instructions and fault reporting

Verbal instructions are medium-to-long goal-directed, task-oriented phrases of generally three or more words in length, verbally administered to an individual prior to motor skill performance in order to enhance athletic performance and, or motor skill learning.

1.1.1.1 Worksite specific instructions

A person conducting a business or undertaking (PCBU): A PCBU must provide workers and other persons with any information, training, instruction, or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out.

A PCBU must ensure that information, training and instruction provided to a worker is suitable and adequate having regard to:

- the nature of the work carried out by the worker
- the nature of the risks associated with the work at the time the information, training or instruction is provided the control measures implemented.

The person must also ensure, so far as is reasonably practicable, that the information, training and instruction is provided in a way that is readily understandable to whom it is provided.

Workers who are involved in spray painting or powder coating activities require relevant information, training, instruction or supervision to enable them to carry out their work safely. For example, this should include information on:

- the proper use, wearing, storage and maintenance of PPE
- working in hazardous environments such as confined spaces first aid and emergency procedures
- how to access SDSs for workers using, handling or storing hazardous chemicals
- the nature of, and reasons for, any health monitoring if required.

Training should be practical and where relevant include hands-on sessions (e.g. correctly setting up a spray zone or practising emergency procedures).

Job plan/instruction

Job Instruction is a step-by-step, relatively simple technique used to guid employees on the job. It is especially suitable for teaching manual skills or procedures; the trainer is usually an employee's supervisor but can be a co-worker.

The four steps of job instruction training are prepare, present, try out, and follow up. Preparation by the supervisor or instructor is for motivation of the employee or trainee. This involves empathy, assurance that nothing will be expected that can't be learned with reasonable effort, and encouragement of questions. Presentation on how a task is accomplished includes telling, showing, demonstrating, and explaining the sequence and steps so the trainee understands the job. Trying out provides learning by doing with reinforcement or correction by immediate and precise feedback. Following up gets the trainee flying solo through frequent examination of progress at first, gradually tapering off. An important aspect of job training is to convey a sincere desire not to judge but to help the trainee succeed.

Self-check 1	**Written test**

Name…… ID…… Date…….

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

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.
Origin	Originates from Job Analysis	Based on Job Description

BASIS	JOB DESCRIPTION	JOB SPECIFICATION
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 Workplace Health and Safety (WHS) Requirements

3.1 INTRODUCTION TO WHS

The WHS requires the provision of any information, training, instruction or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out as part of the conduct of the business or undertaking.

The WHS must ensure that information, training or instruction provided to a worker are suitable and adequate having regard to:

- the nature of the work carried out by the worker
- the nature of the risks associated with the work at the time of the information, training and instruction, and
- the control measures implemented.

The risk management process

A risk assessment is not mandatory for spray painting and powder coating under the WHS Regulation. However, in many circumstances it will be the best way to determine the measures that should be implemented to control risks. It will help to:

- identify which workers are at risk of exposure
- determine what sources and processes are causing that risk
- identify if and what kind of control measures should be implemented, and
- check the effectiveness of existing control measures.

Risk management is a systematic process to eliminate or minimise the potential for harm to people.

Identifying the hazards

The first step in the risk management process is to identify all hazards associated with spray painting and powder coating. This involves finding things and situations which could potentially cause harm to people.

Hazards generally arise from the following aspects of work and their interaction:

- physical work environment
- equipment, materials and substances used
- work tasks and how they are performed, and work design and management.

Hazards may be identified by looking at the workplace and how work is carried out. It is also useful to talk to workers, manufacturers, suppliers and health and safety specialists and review relevant information, records and incident reports.

Potential hazards may also be identified through:

- inspecting the materials and equipment that will be used during the spray painting or powder coating process, and
- reading product labels, SDS and manufacturers' instruction manuals.
- Identifying the hazards of spray painting and powder coating chemicals

The health effects that a worker may experience following exposure to hazardous chemicals can become apparent after a short period of time and include headaches, nausea or vomiting, dizziness, burns to the skin or eyes and irritation to the nose, throat and lungs. Serious long-term health effects caused by exposure to hazardous chemicals with symptoms that may not be immediately apparent can also occur. Long-term health effects include asthma, dermatitis, kidney or liver damage, cancer and damage to the reproductive system and central nervous system.

Many chemicals used in spray painting and powder coating also have physicochemical hazards. For example, many organic solvents are flammable and some chemicals used for cleaning or surface preparation may be corrosive. Information about the hazards of chemicals is available from labels and safety data sheets (SDS).

A SDS includes information on the health effects, physicochemical properties, safe handling and storage, emergency procedures, and disposal considerations. It also contains information about how hazardous chemicals can enter the body, for example by inhalation into the lungs, absorption through the skin and eyes and through swallowing, including accidently ingesting small amounts. If you don't have a SDS for a hazardous chemical supplied to your workplace, you must get one from the manufacturer, importer or supplier of the chemical. You should also consider getting a current SDS before you decide to purchase a new chemical as it is useful to identify hazards before you introduce them into your workplace.

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: Short Answer Questions

1. write the requirements of WHS.
2. Hazards generally arise from the following aspects of work and their interaction. What are they?
3. How to identify Potential hazards?
4. What are the information that includes in safety data sheets (SDS)?
5. What is the difference between risk assessment and risk management?

Information Sheet 4- Selecting and Inspecting quality refinishing Materials

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

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.

1.4.1 **Pearl finishes**

Pearl Finish is a soft pearlescent finish, which captures the rich lustre of natural pearl, leaving an effect that absorbs yet reflects light.

PRINCIPAL CHARACTERISTICS

- Suitable for interior use only.
- A natural finish with many variations,
- Pearl finish will cast a unique finish to your vehicle body.
- Colours and gloss

Stir contents thoroughly with a flat stirrer before and during use.

1.4.2 **water-based finishes**

Water-based automotive coatings

Description

Automotive coatings are one of the examples of coating systems based on a few layers. Each layer has its specific function that impacts the final performance of the automotive coating:

- CED (Cathodic Electrode position) – corrosion resistance
- Primer – UV resistance, anti-stone chipping
- Basecoat – color together with visual impression
- Clear coat – weather resistance, durability of the coating

Benefits

• Safe handling and storage – low flammability and toxicity

• Easy to use for both consumers and professionals

• Fast curing time – more efficient lines

• Good properties of the coating (appearance, gloss, chemical resistance, hardness, corrosion resistance)

• Low content of volatile organic compounds (VOC) and low odor • Good cost/performance balance

The main criteria for painting formulations that should be considered while designing a water-based architectural coating system, apart from the regulatory issues, are:

- Type of the binder and the curing conditions
- Two component coatings – ratio between base component and hardener
- Type of the pigment and fillers
- Type of the additives to be used in the formulation
- Pigment/binder ratio and pigment volume concentration in the formulation
- Compatibility of the components
- Performance of the coating

Components used in water-based automotive coatings

Preservatives, biocides and fungicides hinder the growth of microorganisms during the storage and after application of the paint.

A water-based automotive coating has to contain several ingredients that play key roles in paint manufacturing but also impact the performance of the finished coating. The concentration of each component varies depending on the paint. The typical ranges of the concentration of each component are demonstrated in the table:

Table 3 water based automotive coating content

Component	Content %
Water	35-50
Pigment	10-20
Fillers	10-30
Binder	10-40
Rheology modifier	0,2-1,5
Dispersant	0,5-1,0
Defoamer	0,2-0,6
Coalescing agent/cosolvent	1,0-5,0
pH stabilizer	0,1-0,3

1.4.3 **Paint thinners** A paint thinner is a solvent used to thin oil-based paints or clean up after their use. Commercially, solvents labeled "Paint Thinner" are usually mineral spirits having a flash point at about 40°C (104°F), the same as some popular brands of charcoal starter

Common solvents historically used as paint thinners include

Mineral spirits(US) /White spirit(UK)

- Acetone
- Turpentine
- Naphtha
- Toluene
- Methyl ethyl ketone(MEK)
- Di-methyl form amide(DMF)
- 2-Butoxyethanol, or any of the other glycol ethers

Less common solvents used as paint thinner include:-

- Ethyl benzene
- Xylene
- N-Butyl acetate
- Butanol

1.4.4 **Paint reducers and cleaning materials**

paint reducers are used for urethane-based paints. For example, if the paint is an enamel-based product, do not use a thinner, but rather a reducer. A urethane reducer allows you to adjust the consistency of the paint to make it easy to spray on the car surface. The reducer then evaporates, allowing the paint to set and harden.

Reducers in automotive paints are solvents used to thin paint. These additives make the paint flow better so the result is even, professional coats.

4.1.1 **Cleaning materials.**

Here are 12 of the best cleaning products for your car, according to both experts and product reviewers. These products will make your car shine from top to bottom, inside and out.

Every editorial product is independently selected, though we may be compensated or receive an affiliate commission if you buy something through our links.

Best Car Shampoo and Conditioner

Meguiare's Gold Class Car Wash does the trick, The Car Coach Lauren Fix says, and a gallon of the concentrate should last a year. A capful in a bucket of water will clean the car from roof to wheels.

Figure 2. car shampoo and conditioner

Do you run your car through a commercial car wash? If you do, here’s what it’s doing to your car’s finish.

Best Car Glass Cleaner

3M Glass Cleaner is a foaming spray that cleans off dirt, bugs and tree sap, says Greg Kopf, automotive expert for car supply websiteCARiD.com. This cleaner won’t leave streaks, and it’s also safe to use on vinyl and plastic inside your car. Here’s a clever streak-free glass hack.

Figure 3. 3M Glass cleaner

Best Car-Drying Towels

Half the battle when washing your car can be drying it fast enough to avoid water spots. With a name like The Absorber, this towel should do the trick. It's chamois, which absorbs water faster than a terry cloth or microfiber towel. It has more than 2,000 five-star reviews on Amazon!

Figure 4. car drying towels/absorber

Best Trim Cleaner

Armor All Trim and Plastic Restorer fights wear and tear onexterior plastic, which is prone to sun fading and wax stains, Kopf says. Armor All is easy to use, too. Apply, let the cleaner sit, then wipe it off.

Figure 5. Trim and Plastic Restorer

Another All-Around Great Car Cleaner

Turtle Wax also makes a car wash product that Fix likes. Mix one ounce with one gallon of water to wash away dirt and make your car shine. Reviewers praise this product for the mirror-like finish, with one saying their black car looked like patent leather.

Figure 6. **Turtle Wax**

Best Car Interior Cleaner

With more than 3,000 five-star reviews on Amazon, Car Guys Super Cleaner works onall interior surfaces—plastic, rubber, vinyl, leather and fabric. Reviewers love its stain-busting power that restores interiors to their original color and leaves a matte finish.

Figure 7. Car Guys Super Cleaner

Best Tire Cleaner

Armor All Wheel and Tire Cleaner gets Lowe's vote for wheels and tires. The foaming spray dissolves brake dust as well as dirt and makes tires glossy black. Just be sure to protect yourself from brake dust and wear rubber gloves while cleaning. Check out these tips for making your tires last longer.

Figure 8. Wheel and Tire Cleaner

Best Leather Cleaner

Lexol Leather Conditioner"is the best, period,"The Car CoachFix says. "It's made of natural products and truly does the job. It absorbs well and doesn't leave a film behind." The two-step cleaner and conditioner combo is also used to clean saddles!

Figure 9. **Lexol Leather Conditioner**

Best Car Cleaning Set

Lowe is a fan of the Trinova car wash kit for pro results at home. It includes shampoo, wax and tire shine spray; a trim restorer for rubber and plastic around the doors, windows and front grill; and an interior cleaner that's good for your dashboard and seats. It also comes with a quick detailer for taking care of dust and dirt in between washings.

Figure 10. **Trinova car wash kit**

Best Auto Carpet Protector

Fix likes Scotchgard protecting carpets and fabric. Car carpet has different materials underneath than the carpet in your house, which is why she says to avoid home carpet cleaners. And, she adds, don't skip vacuuming the carpet.

Figure 11. Scotchgard protector carpet

Best Car-Cleaning Splurge

Steam cleaners use distilled water instead of soap or chemicals. Lowe likes the Auto Right Steam Machine for its heat control, portability and varied brushes. It comes with 11 attachments in all!

This steam cleaner heats up to 290° to kill bacteria and promises to run for 45 minutes at a time, per battery charge. It's a splurge ($72), but you can also use it in your home to remove wallpaper and clean tile grout.

Figure 12. steam cleaner

1.5 Plastic primers

All About Automotive Primer

Primer:- It's an important part of most painting processes, and this is no exception in the world of automotive paint. Whether you're painting your own vehicle or just performing touch-ups, most will recommend sanding and then applying a primer before continuing with the final topcoat.

So - what IS primer?

In the automotive world, the term primer generally refers to a paint-like substance that's usually applied to freshly sanded metal before the topcoat. Much like paint, different types of automotive primer can be applied with a spray gun or a brush, and is allowed to dry thoroughly between coats. While it might seem like adding an unnecessary step, using primer when refinishing an auto body is important for a number of reasons. Some will have good filling capabilities, some will provide sealing against the elements, and others will work best when used in conjunction with a second type of primer before completion of the final paint job.

Why Use Primer?

How to Use Auto Primer?

If you're performing any type of bodywork, repairs, or paint updates, you'll need to use primer at some point. This is especially true if you're refinishing your car's paint job at home and will be sanding down to bare metal or removing rust. Most primer types come available as "two-part", which means a primer base and an activator need to be mixed before use. Simply follow the included instructions, and alter as necessary. Others, like urethane primer, can require up to 4-parts mix ratio, but easy-to-follow instructions are provided. Still others come complete in aerosol form for quick and easy application.

Once you've mixed your primer, before you proceed with priming any part of your vehicle, you'll want to make sure you've accomplished a few preparatory tasks first:

- Different Kinds of Automotive Primer

The kind of primer you end up using will vary with your project needs. You can ensure a lasting, high-quality auto paint job and extra rust protection with a good primer base. Different types of automotive primer will also withstand sanding differently, and depending on your project, you may want to consider this.

Epoxy Primer - Epoxy primer is considered a good standard base when it comes to ensuring the auto paint bonds to the metal and promotes a quality paint finish. It's formulated specifically to prevent corrosion, so epoxy primer won't sand as well as other types, like urethane primer.

Urethane Primer Surfacer - This type of two-part primer surfacer is often used in conjunction with any putty or fillers you're using to perform repairs and is applied over a secondary base primer as it doesn't provide the best corrosion resistance.

Polyester Primer - Polyester auto primer has what's known in the auto world as excellent "build" - it fills small scratches and dings much like a putty or filler would and has the highest filling capability of any sprayable primer. This makes it perfect for filling bodywork blemishes AND achieving a good paint bonding surface at the same time. However, it tends to be a bit more brittle and prone to cracking than urethane or epoxy once dry, so this makes a great primer for small repair and filling jobs but may not be the best choice for an entire car.

Urethane Sealer - This type of primer is best used merely as a strong adhesive layer for the paint to bond to. Urethane sealer doesn't really have any filler capabilities, but is perfect for when you're painting a vehicle that's already in decent condition or you need to seal off a good amount of filler or bodywork.

Acid Etch Primer - Another good, basic auto primer. Acid etch primer is much like urethane surfacer in that it's forte is not so much corrosion prevention as providing a strong bonding surface for paint. If extra rust prevention is the goal, use acid etch primer in conjunction with a sealer or rust preventative. This type of primer dries much more quickly than the others, so is used in a lot of body repairs in auto shops to speed up repair time. It also eliminates the need for any metal conditioner, so this is best when applied directly to bare metal and then covered with a secondary primer, like epoxy or urethane.

Enamel Primers/Sealers - Enamel primers are a extremely economical and, much like epoxy, provide a good base for auto paint to adhere to. They have a fair to good level of corrosion resistance.

Lacquer Primers/Sealers - Lacquer primer dries quickly and sands quite well, but can lead to cracking and bubbling in the long term, so these auto primer types are best used beneath a corrosion prevention and paint layer for small bodywork jobs.

Moisture Cure Urethane Primer - This auto primer is excellent for both paint adhesion and rust protection on difficult repair jobs where complete rust removal is

unobtainable, making it an excellent all-around primer choice for completing two jobs at once. It also cures quickly when exposed to the moisture in the atmosphere, so curing times are cut roughly in half.

Fig:- ---------Different Kinds of Automotive Primer

4.6 Pint -static cleaning.

Electrostatic Spray Painting Basics Explained

Electrostatic spray painting is a method that can reduce problems with uneven coverage and **overspray** that result from using a **regular spray painter**. It's an easy process if a little expensive to buy the tools. Although it does create a worthwhile result if you're willing to put forth the money, you should learn all you can about the technique before investing in your own sprayer or paying someone for an electrostatic paint job.

Equipment and Additional Materials

The equipment that normally comes with an electrostatic spray unit includes a spray gun, air and paint hoses, and a grounding cable. You will also need two types of adapters. A round sprayer tip is used for painting irregularly shaped objects and the flat tip adapter is for painting large flat objects.

In addition to the sprayer, you will need some other materials to actually do the job. Get tape for taping off areas not to be painted, as well as drop cloths to protect surfaces and a bucket for mixing paint.

Note: When using this equipment you should take safety precautions. Work in a ventilated area where the heaters have been turned off. Protect yourself by using eye

and ear protection along with clothing that covers most of your skin. These sprayers are under enormous pressure so never point the spray gun at yourself or anyone else.

Here are the basic steps you will need to follow when painting with an electrostatic sprayer.

Step 1 - Select and Add the Paint

Choose the right material to be sprayed. Your choice of paint will depend on the appearance you want and the item you're painting.

Step 2 - Test the Sprayer

Always make sure to test your sprayer first to avoid making any mistakes on your surface.

Step 3 - Apply Paint

Spray the object using even strokes and step back occasionally to check the coverage as you go.

Step 4 - Clean up the Sprayer

If everything looks good, it's time to clean the sprayer and put it away.

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 (4 point)

1. _____an auto primer is excellent for both paint adhesion and rust protection on difficult repair jobs.
   A. Lacquer Primers/Sealers B. Moisture Cure Urethane
   C. Epoxy D. All
2. It's an important part of most painting processes, and this is no exception in the world of automotive paint.
   A. Plastic primer B. Epoxy Primer C. Paint thinners D. Pearl Finish

Test I: Short Answer Questions

1. What is the difference between a thinner and a solvent?
2. What are the different types of automotive primer?
3. What are the components that can be used in water-based automotive coatings?

Operation Sheet -1. Operating with an electrostatic sprayer.

Sequence of operations for an electrostatic sprayer**.**

A. The following sequence is provided as a step-by-step example of a typical **electrostatic sprayer operation.**

1 - Select and Add the Paint. Choose the right material to be sprayed. Your choice of paint will depend on the appearance you want and the item you're painting.

2- Test the Sprayer**.** Always make sure to test your sprayer first to avoid making any mistakes on your surface.

3 - Apply Paint. Spray the object using even strokes and step back occasionally to check the coverage as you go.

4 - Clean up the Sprayer**.** If everything looks good, it's time to clean the sprayer and put it away.

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 50 min. The project is expected from each student to do it.

Task-1 perform electrostatic sprayer painting.

Information Sheet-5.dentifying and checking refinishing tools and Equipment.

5.1 INTRODUCTION

This leaflet is mainly aimed at owners, managers and supervisors of vehicle body shops and also provides useful information for employees. It outlines the risks in using is ocyanate paints (also known as 2K, two-pack or polyurethane paints) in motor vehicle repair and how you can minimise them by taking the right precautions. The leaflet will also be useful to other industries where spraying of isocyanate- containing paints and lacquers takes place. A checklist at the end of the leaflet will help you prioritise the actions you need to take. More detailed guidance is contained in the HSE publication Isocyanate paint spraying: Safely managing spray booths and rooms.1

This leaflet does not cover Small and Medium Area Repair Technique (SMART) spraying. You can find more information on that in the HSE leaflet SMART paint spraying in motor vehicle repair.

Equipment and Application Conditions

Spray Booths

De Beer recommends positive pressure down-draft spray booths for the application of water-based paint. For example the one in Lelystad was gas heated, slight overpressure, adjustable temperature (up to at least 60o Celsius), minimum air movement of 20.000m3 per hour, and a minimum air speed of 20cm/sec.

5.2 Spray Guns

De Beer recommends DeVilbiss and SATA gravity feed spray guns for spraying water-based paint as these are the most commonly used guns in Europe. They have been developed and tested with the use of water-based paint in mind. These guns are used for both painting and blending. One is to use a spray gun that is only used for water-based base coats and no other products. HVLP spray guns give a better result than the conventional spray gun (less air entrapment). It also saves material.

Blow-Drying Equipment

Blow-drying equipment is a must as the paint will not dry without good air movement. There are different types available. The dryers mounted on the drying frame are detachable units that can be used by hand.

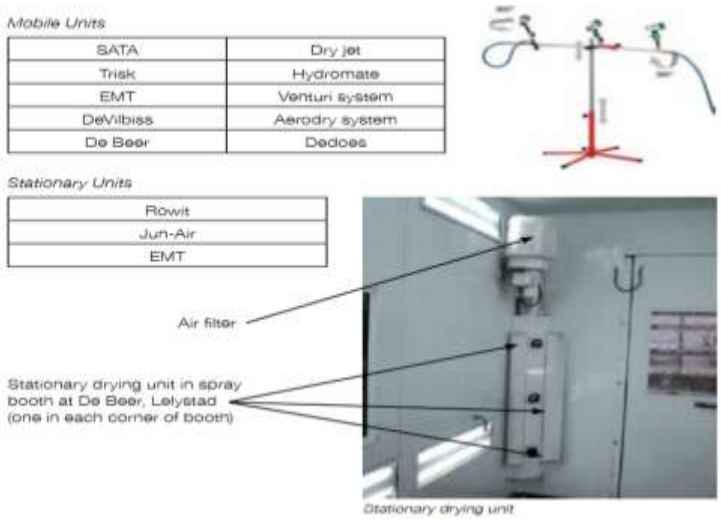


Fig:- -----Blow-Drying Equipment

Heating

Heating can be convection (most common) or infrared. There are robotised infrared systems available. With the robotic drying systems the drying time is reduced by 40 per cent. For example primers: 2.30 minutes; wet on wet undercoat: 2.00 minutes; water-based colour:1.30 minutes; and clear lacquer: 4.00 minutes.

Sanding

- Sanding can be done dry, or wet and dry.
- Finishing off dry (P360-P500) using a three orbit sanding machine. This will ensure there are no sanding marks left in the primer to come through in the top coat clear.
- Finishing off using wet and dry P800-P1000, for hand sanding using clean water.

Degreasing

When using silicone remover always use two clean cloths. Spray the product onto the job using an atomizer (this will save on volume of product used) then wipe with one cloth and finish with a dry cloth.

Non-Paint Products

- Masking paper, or plastic of high enough quality to ensure that the water-based paint will not penetrate.
- Water resistant crepe back masking tape (always use the right waterproof masking paper and tape).
- A tack rag, suitable for water-based products to clean the object and make it dust free.

- Plastic mixing cups (not tins, which are commonly used in Australia with solvent based paint).
- Plastic stirring sticks, not aluminum.
- Paint strainers – should be water resistant and have a minimal mesh size of 125 microns.

Paint Storage

The storage life of De Beer 900 series paint is 18 months to two years. As the paint must not be stored below 5o Celsius, a temperature controlled paint cabinet is required. The pot life is six months for mixed colours.

5.2.1 Various spray guns

The 3M ACCUSPRAY HGP HVLP Gravity Pressure Feed Spray Gun is designed to spray very high solids coatings such as gel-coat, polyester, epoxies, adhesives and boat bottom marine coatings, etc. effectively. The 3M HGP spray gun includes two 2.0mm and two 1.8 mm replacement atomizing heads and an airflow control valve. The 3M PPS H/O pressure cup with the liners and lids are sold separately.

Devilbiss Siphon Feed JGA Spray Gun

Devilbiss Gravity Feed GTI Spray Gun

Fig:-------Various spray guns

GTi, GTiW Gravity Feed

The GTi and GTi W spray guns have been developed to take refinishers into the next millennium. They provide superb performance with all refinish paints, base coats and lacquers plus assured compliancy with EPA legislation. Developed using the world's most advanced techniques in computational fluid dynamics the GTi has become recognized for setting the atomization, lay down and colour matching standards for compliant spray guns. The GTi W has been specially developed for the application of waterborne base coats and features a no 115 HVLP air cap and a 1.3mm fluid cap.

FIG:- GTi, GTiW Gravity Feed

Table:---- The GTi and GTi W spray guns spesification

Specification	
Air Supply Connection	Universal ¼ BSP and NPS
Maximum Static Inlet Pressure	P_1 = 9 bar (130 psi)
Maximum Service Temperature	40°C
Gun Weight (with cup)	721g
Air Inlet Thread	¼" Universal (M)
Weight	678 gm
Normal working air inlet Pressure at the Gun	2 Bar (29 psi)
Air Consumption with No. 105/115 HVLP Air Cap	453 L/min (16 cfm)
Air Consumption with the No. 110 Compliant/Trans-tech Air Cap	269 L/min (9.5 cfm)
Materials of Construction	
Gun Body	Anodised Aluminium
Nozzle	Stainless Steel
Needle	Stainless Steel
Cup	Acetal and Stainless Steel

In-Line Air Adjusting Value

Lightweight at the gun pressure adjustment

Fits neatly in-line at the gun air inlet

Ideal for setting up compliant and HVLP spray guns

Increase or decrease working pressure at-the-gun

Loose swivel nut for convenient positioning

Lightweight design (only 50 gms) does not affect balance

40mm diameter gauge in PSI and bar Calibrated up to 11 bar (160PSI)

Fig:- -----In-Line Air Adjusting Value

Fig:-

Spray Gun Cleaning Kit

Comprehensive range of brushes and tools

Includes cleaning instructions and spray gun oil

Can be hung on the mix room wall

Handy PVC wrap format keeps tools clean

Keep your gun in top class working order

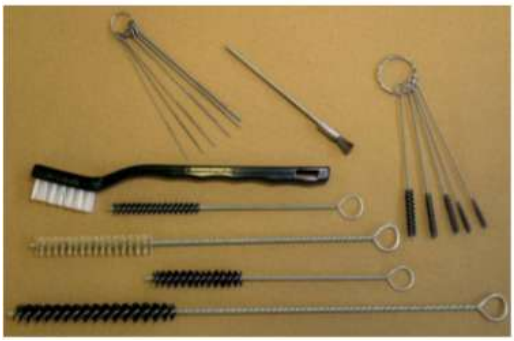


Fig:- Spray Gun Cleaning Kit

Cup Filters

- Convenient, easy to fit suction cup paint filters
- Effectively removes dirt, flakes and scum
- Keeps the spray gun passages clear
- Inexpensive and virtually indestructible
- Resistant to most solvents - easily cleaned

- Pushes onto the fluid tube of KR suction cup

Cup Filter

Cup Filter Gravity Feed

Fig:------- Cup Filters

Viscosity Cups

- The fast simple way to check out paint viscosity
- Tough, durable, easy to clean nylon
- Precision metal drain out insert
- Hanging hook for convenient storage

Fig:-----Viscosity Cups

Duster Blow Guns

- Palm size trigger operated with diffused air flow
- Compact light weight
- Low noise factor

Fig:---------- Duster Blow Guns

5.2.2 Air pressure regulators

THE BASICS OF PRESSURE REGULATORS

Pressure regulators are found in many common home and industrial applications. For example, pressure regulators are used in gas grills to regulate propane, in home heating furnaces to regulate natural gas, in medical and dental equipment to regulate oxygen and anesthesia gases, in pneumatic automation systems to regulate compressed air, in engines to regulate fuel and in fuel cells to regulate hydrogen. As this partial list demonstrates there are numerous applications for regulators yet, in each of them, the pressure regulator provides the same function. Pressure regulators reduce a supply (or inlet) pressure to a lower outlet pressure and work to maintain this outlet pressure despite fluctuations in the inlet pressure. The reduction of the inlet pressure to a lower outlet pressure is the key characteristic of pressure regulators.

When choosing a pressure regulator many factors must be considered. Important considerations include: operating pressure ranges for the inlet and outlet, flow requirements, the fluid (Is it a gas, a liquid, toxic, or flammable?), expected operating temperature range, material selection for the regulator components including seals, as well as size and weight constraints.

Fig:------- Air pressure regulators

MATERIALS

A wide range of materials are available to handle various fluids and operating environments. Common regulator component materials include brass, plastic, and aluminum. Various grades of stainless steel (such as 303, 304, and 316) are available too. Springs used inside the regulator are typically made of music wire (carbon steel) or stainless steel.

FLUID USED - (GAS, LIQUID, TOXIC, or FLAMMABLE)

The chemical properties of the fluid should be considered before determining the best materials for your application. Each fluid will have its own unique characteristics so care must be taken to select the appropriate body and seal materials that will come in contact with the fluid. The parts of the regulator in contact with the fluid are known as the “wetted” components.

OPERATING PRESSURES

The inlet and outlet pressures are important factors to consider before choosing the best regulator. Important questions to answer are: What is the range of fluctuation in the inlet pressure? What is the required outlet pressure? What is the allowable variation in outlet pressure?

FLOW REQUIREMENTS

What is the maximum flow rate that the application requires? How much does the flow rate vary? Porting requirements are also an important consideration.

SIZE & WEIGHT

In many high technology applications space is limited and weight is a factor. Some manufactures specialize in miniature components and should be consulted. Material selection, particularly the regulator body components, will impact weight. Also carefully consider the port (thread) sizes, adjustment styles, and mounting options as these will influence size and weight.

PRESSURE REGULATORS IN OPERATION

A pressure regulator is comprised of three functional elements:

1) A pressure reducing or restrictive element. Often this is a spring loaded poppet valve.
2) A sensing element Typically a diaphragm or piston.
3) A reference force element. Most commonly a spring.

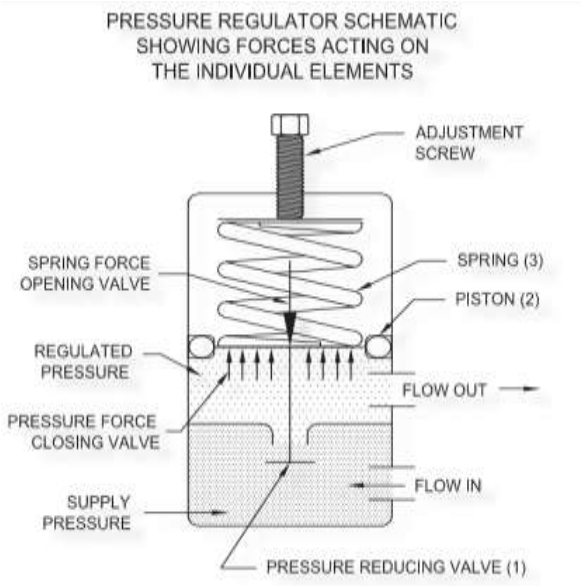


Fig:------ pressure regulator in operation

In operation, the reference force generated by the spring opens the valve. The opening of the valve applies pressure to the sensing element which in turn closes the valve until it is open just enough to maintain the set pressure. The simplified schematic "Pressure Regulator Schematic" illustrates this force balance arrangement.

In low pressure applications, or when high accuracy is required, the diaphragm style is preferred. Diaphragm regulators employ a thin disc shaped element which is used to sense pressure changes. They are usually made of an elastomer, however, thin convoluted metal is used in special applications. Diaphragms essentially eliminate the friction inherent with piston style designs. Additionally, for a particular regulator size, it is often possible to provide a greater sensing area with a diaphragm design than would be feasible with a piston style design.

SINGLE, TWO, & THREE STAGE REGULATORS

SINGLE-STAGE REGULATOR

Single-stage regulators are an excellent choice for relatively small reductions in pressure. For example, the air compressors used in most factories generate maximum pressures in the 100 to 150 psi range. This pressure is piped through the factory but is often reduced with a single-stage regulator to lower pressures (10 psi, 50 psi, 80 psi etc.) to operate automated machinery, test stands, machine tools, leak test equipment, linear actuators, and other devices. Single stage pressure regulators typically do not perform well with large swings in inlet pressure and/or flow rates.

Fig:- ----Single-stage regulators

TWO-STAGE (DUAL-STAGE) REGULATOR

A two-stage pressure regulator is ideal for applications with large variations in the flow rate, significant fluctuations in the inlet pressure, or decreasing inlet pressure such as occurs with gas supplied from a small storage tank or gas cylinder.

Fig:---- A two-stage pressure regulator

THREE-STAGE REGULATOR

A three-stage regulator provides a stable outlet pressure similar to a two-stage regulator but with the added ability to handle a significantly higher maximum inlet pressure. For example, the Beswick PRD3HP series three-stage regulator is rated to handle an inlet pressure as high as 3,000 psi and it will provide a stable outlet pressure (in the 0 to 30 psi range) despite changes to the supply pressure.

Fig:- -----A three-stage regulator

Type of Air Compressors

Compressed Air System

The compressed air system may be supplied from the mechanical workshop if there is sufficient capacity or, for remote body and paint shops or where capacity is too small, by a stand alone system just for the body shop. In either case it should be borne in mind that the air requirements for the body shop are somewhat different to those for a mechanical workshop. This is particularly true when considering the air supply for paint spraying. Air for paint must be completely clean, free from moisture contamination and at the correct pressure and temperature.

Piston Type

- Generally cheaper
- Noisier than rotary vane or screw types
- Less efficient than other types

Figure____: Piston Type Compressor

Rotary Vane

- Quieter than piston type

- More compact than piston type
- More efficient than piston type
- Less moving parts
- Can be left to run continuously
- More expensive than piston type, particularly below 10hp
- Direct drive form motor provides greater mechanical efficiency

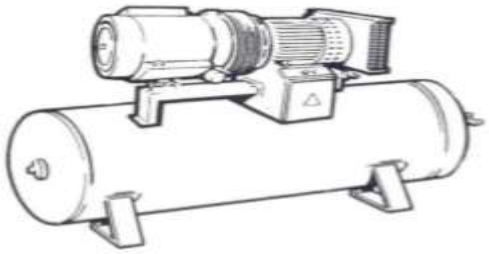


Figure ____: Rotary Vane Compressor

Screw Type

- Quieter than piston type
- More efficient than piston type
- More compact than piston type
- Usually supplied as complete system with after cooler, condenser and control system
- Direct drive from motor, provides greater mechanical efficiency
- All compressors should be serviced regularly
- All compressors should be drained daily

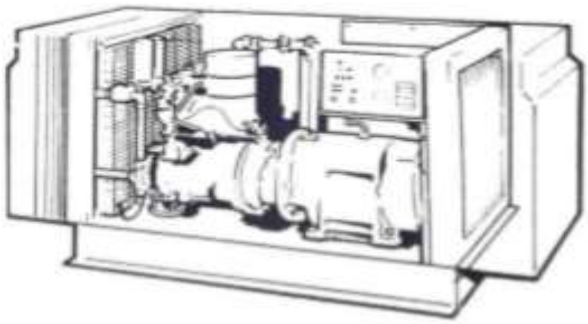


Figure____: Screw Type Compressor

5.2.3 Spray booths

Spray painting in spray booth

Spray booths are enclosed or partially enclosed structures designed to prevent or reduce exposure to hazardous chemicals or vapours. A spray booth should be used when spray painting with a hazardous chemical, except when: the shape, size or weight of an article cannot be easily moved or fit into a spray booth, for example painting a building, bridge or a large boat, or „ the painting involves minor work such as spotting or touch-ups, for example painting a scratch or stone chip on a car (painting a car panel with two-pack polyurethane paint would not be regarded as minor work).

Types of spray booths include:

- ✓ **Open-faced spray booths** generally have two walls, roof with air extraction, a filtered rear wall and an open front. „
- ✓ **Enclosed type batch booth** is a room or large cabinet where the operator enters and spraying is conducted. The airflow is either down draught, cross draught, end draught or any combination thereof. „
- ✓ **Tunnel or production spray booths** for mass produced items requiring a continuous painting application process. These booths are usually down draught or cross draught and have open ends. „
- ✓ **Full downdraft spray booths**, where air enters the booth from the ceiling through a filtering system, and moves downwards vertically. Heavy and large objects, like cars, which are not easy to handle are often painted in the down draft spray painting booths. „
- ✓ **Semi downdraft booths,** where fresh air enters the booth from outside the building, is ducted through the roof intake filters, and is drawn towards the rear exhaust wall of the booth where it is exhausted through filters.
- ✓ **Spray booth ventilation control systems should operate a pre-purge cycle to remove any residue contaminants** and also operate a minimum of a 5 minute post-purge period following spraying.

Whenever possible, the spray should be directed towards the exhaust air outlet of a booth. For example, when spraying a tall object in a down-draught booth no spraying should be performed above shoulder height. Extension poles or lift platforms should be used so that the operator can get above the object and spray towards the air exhaust outlet in the floor. The spray painter should never be positioned between the spray gun and the exhaust air outlet. See Figures 1 to 8 below for further guidance.

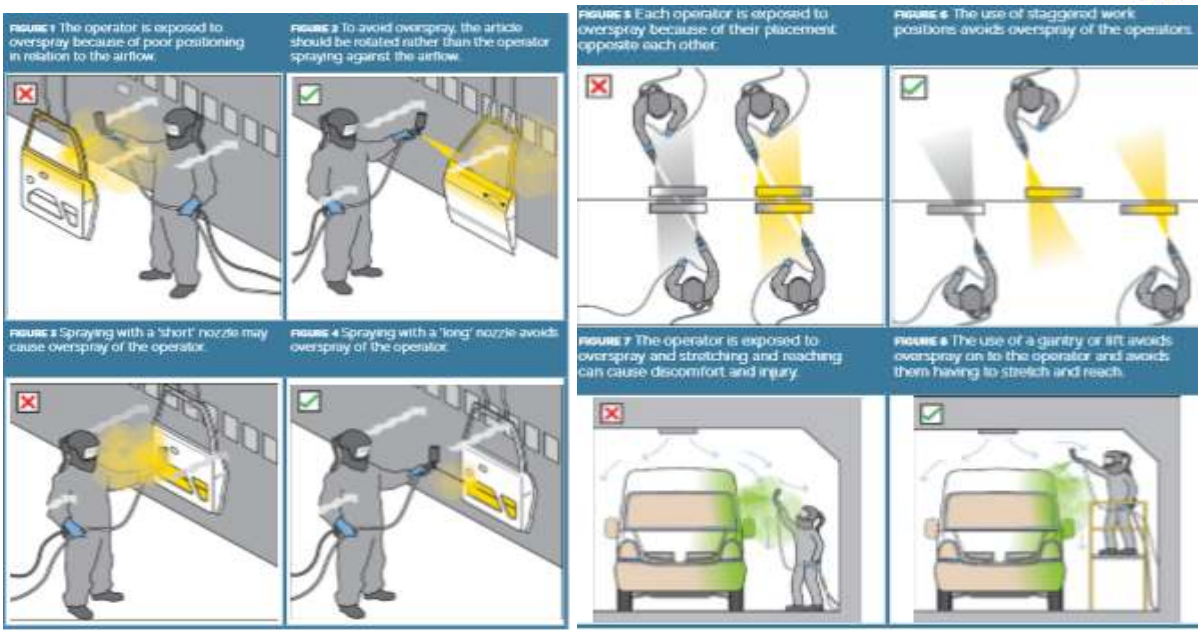


Fig:---- The spray painter should never be positioned between the spray gun and the exhaust air outlet.

Even with a ventilation system, there is still potential for flammable mists and vapours to accumulate inside the spray booth, which can increase the risk of fire and explosion.

Whenever possible, the spray should be directed towards the exhaust air outlet of a booth. For example, when spraying a tall object in a down-draught booth no spraying should be performed above shoulder height. Extension poles or lift platforms should be used so that the operator can get above the object and spray towards the air exhaust outlet in the floor. The spray painter should never be positioned between the spray gun and the exhaust air outlet. See Figures 1 to 8 below for further guidance.

Figure 1 The operator is exposed to overspray because of poor positioning in relation to the airflow.

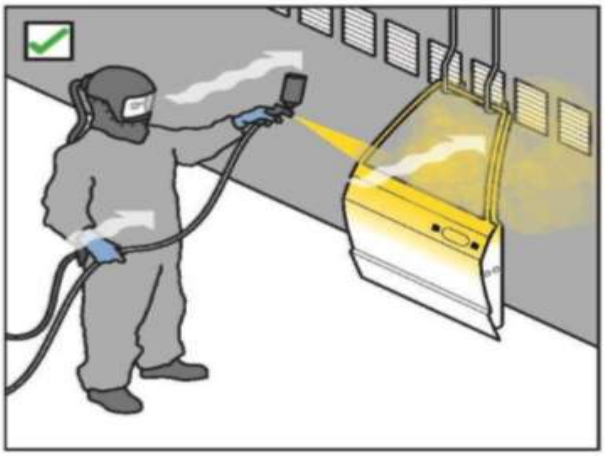


Figure 2 To avoid overspray, the article should be rotated rather than the operator spraying against the airflow.

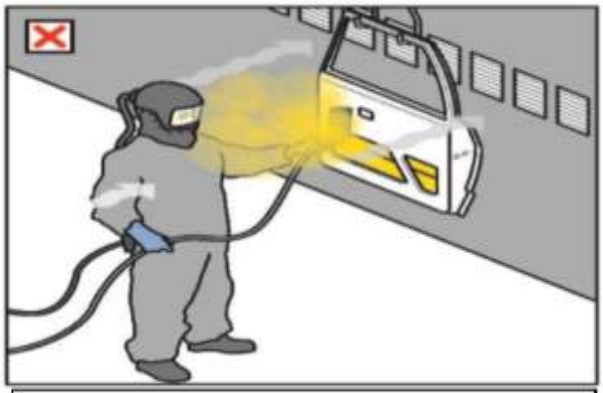


Figure 3 Spraying with a 'short' nozzle may cause overspray of the operator.

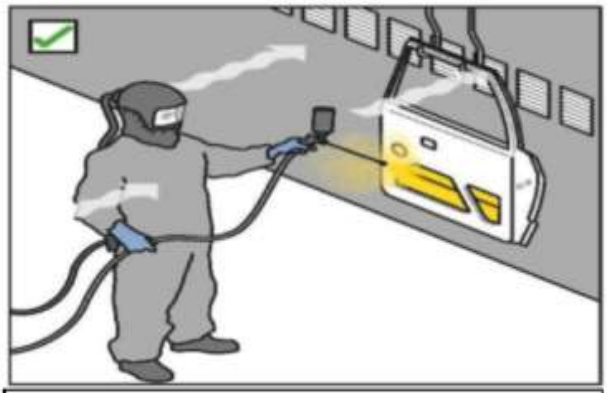


Figure 4 Spraying with a 'long' nozzle avoids overspray of the operator.

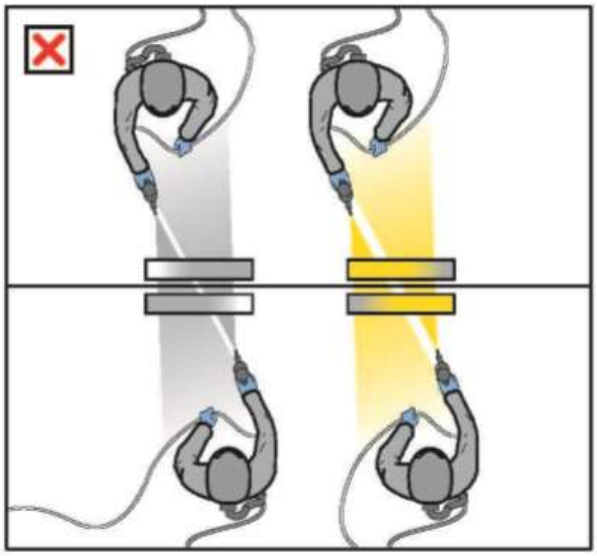


Figure 5 Each operator is exposed to overspray because of their placement opposite each other.

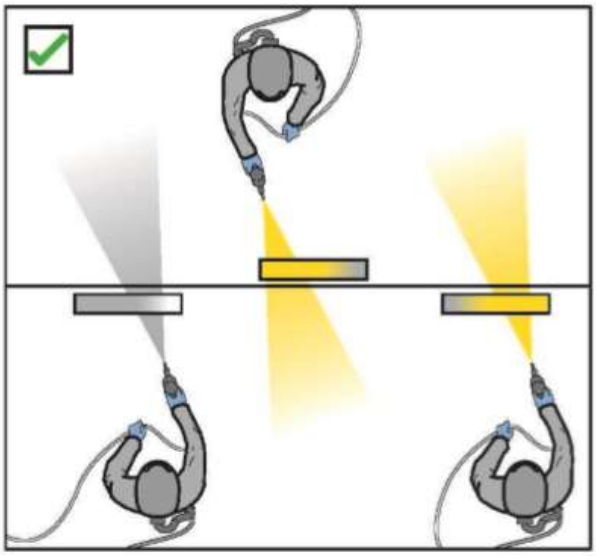


Figure 6 The use of staggered work positions avoids overspray of the operators.

Figure 7 The operator is exposed to overspray and stretching and reaching can cause discomfort and injury.

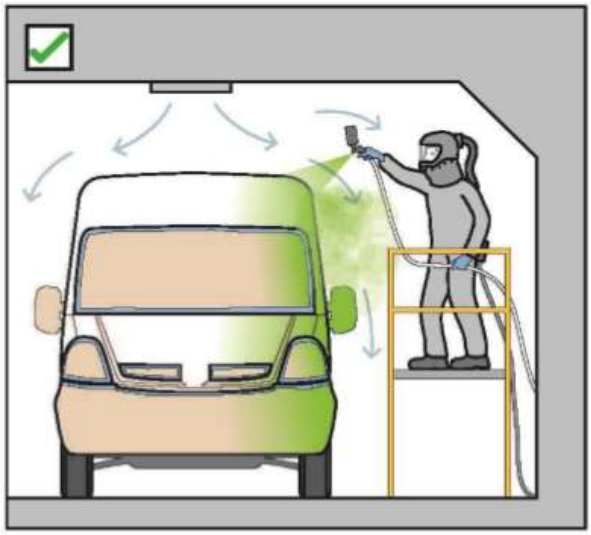


Figure 8 The use of a gantry or lift avoids overspray on to the operator and avoids them having to stretch and reach.

Fig:-------

Even with a ventilation system, there is still potential for flammable mists and vapours to accumulate inside the spray booth, which can increase the risk of fire and explosion.

Ventilation systems

Two common types of ventilation used in spray painting are:

- Local exhaust ventilation captures the overspray and solvent vapour as close to the source of release as possible by drawing the contaminants into a capture hood. They should be fitted with a particulate filtration system to filter overspray. Wherever possible, local exhaust ventilation should be used when a spray booth cannot be used. It may be necessary to use it in combination with other control measures.
- Dilution ventilation dilutes and displaces contaminated air with fresh air which is supplied to the work area by mechanical supply fans or natural air currents through doors, windows or other openings in the building. It can be used to supplement local exhaust ventilation.

When using dilution ventilation:

- The spray painting operator should stay between the air supply inlet and the source of vapours or aerosols generated
- Temporary barriers may be needed to channel the dilution ventilation through the spray zone and to restrict cross currents
- make sure the contaminated exhaust air does not re-enter the work area
- use auxiliary mixing fans to disperse the spray painting emissions towards the outlet and to enhance the rate of air dilution.

➢ **Baking ovens**

Why Switch to Oven-Baked Car Repainting?

The value of your car significantly depreciates over time. This is even more so if its paint has already lost its natural shine and gloss. And while respraying your car can be a do-it-yourself project, the quality of the workmanship may not be that great.

Fig:- ------Oven-Baked Car Repainting

Oven-Baked Automotive Painting

You don't have to paint your car yourself. **Nova Smash Repairs** says you can always take it to a car body shop for a fresh coat of paint. However, you need to choose between ordinary spray painting and oven-baked car painting. While one is definitely cheaper than the other, oven-baked car painting does have its perks.

Dust-Free Environment

The environment where low temperature oven-baked car painting is performed is generally dust-free. This results in a more stable application of a coat of paint. It's this dust-free environment that makes the car oven an **ideal place for automotive repainting**. If it were to be performed outside, dust would readily settle on the wet paint, giving the whole car a speckled look and a rather course finish, instead of the glossy and smooth finish you'd expect.

Environment-Friendly

Additionally, the room-sized oven is fully filtered to protect the environment from the **harmful chemicals found in automotive paints**. If the painting job were to be performed outside, the airborne chemicals can be carried elsewhere and can readily settle on other life forms in the immediate surroundings.

More Durable Finish

Perhaps the best advantage of oven-baked car painting over the ordinary type of automotive repaint is the strength and durability of the finished paint coat. With air temperature maintained at a constant setting, individual paint molecules are evenly distributed across the surface of the car. This creates a very even layer and colour of automotive paint. Additionally, since the paint molecules have been sprayed onto the car in exactly the same environmental conditions, they are better able to bond with each other. This creates a stronger and more durable paint finish.

ADVANTAGES OF USING OVEN BAKE TECHNOLOGY.

1. Oven bake technology

have extraction systems and filters, which remove atomized spray from the air. This creates a clean, dust- free environment with reduced overspray. The extraction system also creates a seal around the doors of the paint booth so that dust and other particles that might be found in a typical traditional workshop cannot enter the spraying area while work is in progress. If a job is sprayed in traditional workshop conditions, dust can contaminate the paint and ruin the integrity of your work.

2. Oven bake technology

create an ambient spraying temperature of approximately 64 to 70 degrees Fahrenheit. In a traditional workshop, the spraying temperature is dependent on the local climate or heating systems and this makes it more difficult to maintain optimum spraying temperatures. Professional paints are sprayed at paint booth temperatures so that a wet, even application of color can be achieved. If a job is painted in a traditional workshop in conditions that are too warm, dry patches in the paint occur. If the

temperature is too cold, paint will not cure quickly enough and this causes it to run or sag.

3. Modern paint materials

use hardeners and reducers that are designed to dry at low-bake temperatures of 160 to 175 degrees Fahrenheit. Most paints dry within 30 minutes if they are exposed to the baking temperatures inside a paint booth. When a vehicle is painted and left to dry in normal traditional workshop conditions, solvents remain inactive underneath the final coat of color and this slows down the drying process. If paint isn't fully dry when a job is unmasked or polished, tearing occurs and this results in the vehicle having to be prepared and painted a second time.

4. Health and Environmental Issues

The extraction system in Oven booths reduces the amount of volatile organic compounds that are released into the atmosphere. Once a coat of paint has been applied, operatives can usually return to the paint booth without respiratory equipment within three minutes. In a traditional workshop environment, it can often take hours for overspray to clear. This increases the risk of breathing in harmful polyisocyanate materials for other workers and increases the level of VOC emissions (Volatile organic compound). This presents a significant risk to the surrounding environment and violates current health and safety legislation.

Before

After

Identifying and checking safety equipment

If personal protective equipment (PPE) is to be used at the workplace, the person conducting the business or undertaking must ensure that the equipment is selected to minimise risk to health and safety including by ensuring that the equipment is:

suitable for the nature of the work and any hazard associated with the work „

a suitable size and fit and reasonably comfortable for the person wearing it
maintained, repaired or replaced so it continues to minimise the risk, and „
used or worn by the worker, so far as is reasonably practicable.

A person conducting a business or undertaking who directs the carrying out of work must provide the worker with information, training and instruction in the proper use and wearing of personal protective equipment; and the storage and maintenance of personal protective equipment.

A worker must, so far as reasonably able, wear the PPE in accordance with any information, training or reasonable instruction and must not intentionally misuse or damage the equipment.

In most cases PPE must be worn by workers when spray painting and powder coating to supplement higher levels of controls (such as ventilation systems or administrative controls). Where PPE is worn by workers, that PPE should not introduce other hazards to the worker, such as musculoskeletal injuries, thermal discomfort, or reduced visual and hearing capacity.

Table:-

PPE type	Hazards	Recommendation
Eyes, face and head protection	Exposure to hazardous chemicals	Workers should have their eyes, face and head protected whenever spray painting or powder coating. „ Guidance is provided in AS/NZS 1336: Recommended practices for occupational eye protection.
Hearing protection (e.g. ear muffs and ear plugs)	Hearing loss „	If workers are still exposed to noise levels in excess of the exposure standard after higher order control measures have been implemented, ear plugs, ear canal caps and ear muffs or combinations may be required. „ Guidance is provided in AS/NZS 1270: Acoustics - Hearing protectors and AS/NZS 1269.3: Occupational noise management – Hearing protector program.

Gloves and clothing	Exposure to hazardous chemicals	Gloves and clothing should protect exposed skin. „ Guidance is provided in AS/NZS 2161: (series) Occupational protective gloves and AS/NZS ISO 13994: Clothing for protection against chemicals - Determination of the resistance of protective clothing materials to penetration by liquids under pressure.
Foot protection (e.g. boots and shoes)	Trips, slips and exposure to hazardous chemicals	Foot protection should be non-slip and be heat and fire resistant. „ Guidance is provided in AS/NZS 2210: Occupational protective footwear (series).
Respiratory protective devices (e.g. dust masks, half face respirators and air supplied respirators)	Dusts, aerosols, vapours, gases and oxygen depleted atmospheres	Workers carrying out spray painting with two part epoxy or polyurethane paint, or some catalytic acrylic paints should be provided with either a full face piece supplied air respirator or half face piece supplied air respirator. „ Respirators should be fitted for each person individually. The tightness of all connections and the condition of the face piece, headbands and valves should be checked before each use. Air supplied respirators may be required in some situations, for example confined spaces. Select air supplied respirators that generate less noise so the worker can hear warning signals and will not become easily tangled or caught on other objects.
Respiratory protective devices (e.g. dust masks, half face respirators and air supplied	Dusts, aerosols, vapours, gases and oxygen	Respirators should closely fit the wearer to provide its designed protection, it is essential that an adequate face seal is achieved. They should be cleaned and disinfected with a

respirators)	depleted atmospheres	broadspectrum disinfectant in accordance with the manufacturer's instructions after each use. They should also be inspected for damage before and after each use. Filters should be changed in accordance with manufacturer's instructions and stored to prevent contaminations, damage and deterioration. Airline filters should be changed as required. „ For further information refer to AS/NZS 1715: Selection, use and maintenance of respiratory protective equipment and AS/NZS 1716: Respiratory protective devices

PPE for Workers

Sawing, cutting, drilling, sanding, grinding, hammering, chopping, abrasive blasting, punch press operations, etc.

Pouring, mixing, painting, cleaning, siphoning, dip tank operations, dental and health care services, etc.

Battery charging, installing fiberglass insulation, compressed air or gas operations, etc.

Welding, cutting, laser operations, etc.

Fig:-

FACE PROTECTION

Pouring, mixing, painting, cleaning, siphoning, dip tank operations, etc.

Welding, pouring molten metal, smithing, baking, cooking, drying, etc.

Cutting, sanding, grinding, hammering, chopping, pouring, mixing, painting, cleaning, siphoning, etc.

Fig:-

HEAD PROTECTION

Work stations or traffic routes located under catwalks or conveyor belts, construction, trenching, utility work, etc.

Construction, confined space operations, building maintenance, etc.

Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high tech equipment; arc or resistance welding; etc.

Fig:-

FEET

Construction, plumbing, smithing, building maintenance, trenching, utility work, grass cutting, etc.

Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high tech equipment; arc or resistance welding; etc.

Welding, foundry work, casting, smithing, etc.

Demolition, explosives manufacturing, grain milling, spray painting, abrasive blasting, work with highly flammable materials, etc.

Fig:-

HANDS

Grinding, sanding, sawing, hammering, material handling, etc.

Pouring, mixing, painting, cleaning, siphoning, dip tank operations, health care and dental services, etc.

Welding, pouring molten metal, smithing, baking, cooking, drying, etc.

Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high tech equipment; arc or resistance welding; etc.

Fig:-

BODY

Pouring, mixing, painting, cleaning, siphoning, dip tank operations, machining, sawing, battery charging, installing fiberglass insulation, compressed air or gas operations, etc.

Cutting, grinding, sanding, sawing, glazing, material handling, etc.

Welding, pouring molten metal, smithing, baking, cooking, drying, etc.

Pouring, mixing, painting, cleaning, siphoning, dip tank operations, etc.

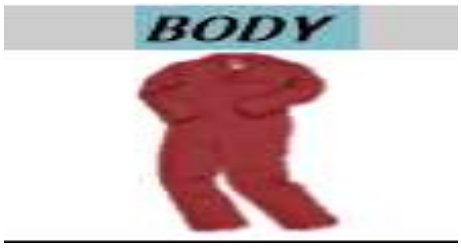


Fig:-

Hearing protection

Machining, grinding, sanding, work near conveyors, pneumatic equipment, generators, ventilation fans, motors, punch and brake presses, etc.

Samples shown are: ear muffs (left) and earplugs (right)

Fig:-

Self-check 1	Written test

1.8 Identifying and following workplace emergency procedures

EMERGENCY RESPONSE PROCEDURES

Emergency procedures and response actions will provide order during an otherwise confusing emergency, including, but not limited to, fire, power failure, gas leak, chemical spill, crime prevention and workplace violence. Prior to a project commencing, post the emergency contact numbers and directions to the nearest hospital. Post the certificates of those trained in first aid alongside the emergency numbers and hospital routes. The supervisor must train and familiarize his/her workers in the site emergency procedures. The supervisor should also review the locations of the project's evacuation routes, gathering points and emergency alarms. Once the workers are familiar with the routes of access/egress for the site, the supervisor will designate a "Gathering Point". During an evacuation alarm, this is the point where ALL employees and/or visitors will gather for a headcount by the supervisor and receive any information or instructions regarding the emergency. A competent worker will perform the shutdown process of specific equipment, hydro, gas, etc. in the event of an emergency.

The supervisor shall have all employees and/or visitors sign a training roster to acknowledge their understanding of the emergency procedures. It is both the supervisor's and employee's responsibility to review and be aware of the nearest emergency

evacuation routes prior to starting work. In the event of a serious accident or emergency, senior management will make any official statements to anyone requesting a formal statement.

Re-entry into an evacuated area is not permitted until the site supervisor, under the guidance of the appropriate authority (Fire Department, Police, MOE, etc.), has deemed the workplace suitable for re-entry.

EMERGENCY FALL ARREST RESCUE PLAN

The supervisor shall have all workers, sub-contractors and/or visitors sign a training roster to acknowledge the emergency rescue plan. If a Fall Arrest System arrests a worker's fall and you are first on the scene, the following crisis management steps apply:

Conscious Worker

1. Send someone to notify the supervisor/constructor immediately.
2. Communicate with the worker; calm the person.
3. If accessible and safe to do so, place a ladder or use an Elevating Work Platform under the person to allow him/her to climb down safely.
4. If qualified to do so, render first aid until help arrives.
5. If it is unsafe for you to easily rescue an arrested worker call 911.
6. Never risk your safety to rescue a worker, wait for the Fire Department.
7. Send someone to guide the Emergency Services to the scene.
8. Send someone to call our main office to activate our crisis response.
9. Stay with the injured person until the supervisor or Emergency Services arrives.
10. Turn the scene over to the supervisor once they have arrived.
11. Restrict access to the accident scene, (other than Emergency personnel / MOL).
12. Rope off the accident area for the accident investigation team.
13. Notify the Safety Representative or JH&SC and union (if any).

Unconscious Worker

1. Call …… immediately.
2. Send someone to notify the supervisor/constructor immediately.
3. If they become conscious, keep the worker calm and follow the procedures for a conscious worker.
4. If accessible and safe to do so, place an Elevating Work Platform under the person to support and remove from their Arrest System.
5. If qualified to do so, render first aid until help arrives.
6. If it is unsafe for you to properly rescue an arrested worker wait for the Emergency services to arrive.
7. Never risk your safety to rescue a worker - wait for the Fire Department.
8. Send someone to guide the Emergency Services to the scene.
9. Send someone to call our main office to activate our crisis response.
10. Stay with the injured person until the supervisor or Emergency Services arrives.
11. Turn the scene over to the supervisor once they have arrived.
12. Restrict access to the accident scene, (other than Emergency personnel / MOL).
13. Rope off the accident area for the accident investigation team.

14. Notify the Safety Representative or JH&SC and union (if any).

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 (4 point)

Unsafe work in terms of personal safety, work shop safety, and tools and equipment safety leads to

Accident B. Damage C. A & B

From the given choose which one is personal protective equipment.

Safety goggles B. Safety shoes C. Clothes D. gloves

E. ear protection F. all

Test II: Short Answer Questions

List duties of grinding machine operator (5 point)

Write down all the safety requirements for grinding machine. (3 point)

Write three examples of Hazards parts of machines? (3points)

Essential element of a working drawing is _____ ? (2point)

The first activities to make desired shape and size a product or project is to do _____ (2point)

What are the common causes of grinding accidents? (2point)

LG 40	LO #2- Clean vehicle body exterior and interior for painting

Instruction sheet

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

- Selecting and using tools and equipment according to workplace methods and customer requirements.
- Selecting materials according to vehicle finish type, workplace methods and paint
- Using and storing materials according to manufacturer/ component supplier recommendations.
- Cleaning Vehicle body exterior and interior according to workplace and industry methods and procedures.
- Completing cleaning without causing damage to component or system.
- Cleaning vehicle body exterior paint according to industry standards/ regulations/ guidelines, WHS 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:

- Select and use tools and equipment according to workplace methods and customer requirements.
- Select materials according to vehicle finish type, workplace methods and paint
- Use and store materials according to manufacturer/ component supplier recommendations.
- Clean Vehicle body exterior and interior according to workplace and industry methods and procedures.
- Complete cleaning without causing damage to component or system.
- Clean vehicle body exterior paint according to industry standards/ regulations/ guidelines, WHS requirements.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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”

Wet down the car exterior

Materials Needed

- Baking soda
- Bucket
- Garden hose

Step 1: Rinse your car. Begin by rinsing your car thoroughly with a hose. This breaks up dry dirt and debris. Use a soft sponge to scrub the exterior gently to prevent any dirt from scratching or damaging the paint.

Step 2: Create mixture. Mix one cup of baking soda to one gallon of hot water. This mixture helps remove grime from your car without being too harsh

Clean the exterior

Materials Needed

- Brush (stiff-bristles)
- Bucket
- Soap
- Sponge
- Water

Step 1: Create mixture. To clean the entire exterior, combine ¼ cup of soap with one gallon of hot water.

Make sure the soap has a base of vegetable oil. Do not use dishwashing soap as it can damage the finish of your car.

Use a sponge to wash the exterior and a stiff-bristled brush for the tires and wheels.

Rinse the exterior

- Spray bottle
- Vinegar
- Water

Step 1: Rinse. Rinse all ingredients off your car with cold water and a hose.

Step 2: Spray exterior. Mix vinegar and water with a ratio of 3:1 into a spray bottle. Spray the exterior of your car and wipe it with newspaper. Your car will dry without streaks and shine.

Clean the windows

Materials Needed

- Alcohol
- Spray bottle
- Vinegar
- Water

Step 1: Create mixture. Make a window cleaner of one cup of water, one-half cup of vinegar and one-fourth cup of alcohol. Mix and put in a spray bottle.

Step 2: Spray and dry. Spray window solution onto windows and use newspaper to dry. Save this task for last to remove any other cleaners that might have accidentally gotten on the glass.

Step 3: Remove bugs. Use plain vinegar to remove bug splatter.

Part 5 of 7: Clean the interior

Step 1: Wipe. Wipe down the interior with a clean damp cloth. Use it on the dash, center console and other areas.

The following chart details which products work on the different areas in the cabin of the car:

Treat difficult stains

Treat stains on the car with special products that remove it without hurting the exterior. The ingredient used depends on the type of stain.

- **Tip**: Use a soft cloth that won't be abrasive to your car's paint. For tight areas, use a dust mop which works on the roof and other places.

Clean upholstery

Materials Needed

- Brush
- Cornstarch
- Dish soap
- Dryer sheets
- Vacuum
- Water
- Wet cloth

Step 1: Vacuum. Vacuum your upholstery to get rid of dirt.

Step 2: Sprinkle and wait. Sprinkle cornstarch on any stains and leave it to work for half an hour.

Step 3: Vacuum. Vacuum up the cornstarch.

Step 4: Create paste. Mix the cornstarch with a small amount of water if the stain is still there. Spread the paste on the stain and allow it to dry. It will then be easy to vacuum up.

Step 5: Spray mixture and blot. Another option is to mix equal parts water and vinegar and put it in a spray bottle. Spray it on a stain and allow it to soak for a few minutes. Blot it with a cloth. If that doesn't work, scrub gently.

Step 6: Treat grass stains. Treat grass stains with equal parts rubbing alcohol, vinegar and warm water. Rub on the stain and wash the area with water.

Step 7: Treat cigarette burns. Place a raw onion on a scorch mark from a cigarette. While it won't repair the damage, the acid from the onion will absorb into the fabric and make it less noticeable.

Step 8: Treat heavy-duty stains. Mix one cup of dish soap with one cup of club soda and one cup of white vinegar and spray on heavy-duty stains. Use a brush to work it into the stain.

- **Tip**: Place dryer sheets under floor mats, in storage pockets and under the seats to freshen the air.

Information Sheet 2- Using and storing materials according to manufacturer/ component supplier recommendations.

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 13 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.

Information Sheet 3- Cleaning Vehicle body exterior and interior for paint

Exterior cleaning

Wash your car regularly

To keep your car's bodywork in an impeccable condition it has to be washed regularly. As the paintwork is permanently exposed to pollution, bird droppings, tree sap and other harmful elements washing your car regularly prevents the build up of harmful substances that damage paintwork.

How to wash your car effectively

First of all, it is very important to use a special detergent for cars, like the Super Wax Shampoo or the Beauty Shine Shampoo. Dishwashing type products have too much degreasing power, which might damage the paintwork's protective layers.

Step 1

Fill a bucket with water and add Super Wax Shampoo or Beauty Shine Shampoo according to the recommended dosage.

Step 2

Open the doors, the trunk and the hood and clean the jambs of doors, trunk and so on. Close everything

step 3

Remove dust and dirt everywhere by spraying the car with plenty of clean water. To remove insects and bird droppings use a product such as Marly Anti-Insects to avoid scratching the paint.

Step 4

Use a clean sponge and begin washing the horizontal parts, such as roof, windshield and trunk. Rinse each part after washing it.

Step 5

After the horizontal parts, wash the vertical parts and keep the lower parts for last, as they are also the dirtiest. Finish with the car front, rear and underbody.

Step 6

Finally, wipe the rims with a suitable product such as Marly Wheel Cleaner. Spray the rims with the product and let it work for 10-15 minutes. Treat resistant dirt with a brush and clean the entire rim with a sponge. Rinse under a strong jet of water.

Step 7

Rinse thoroughly the entire car by holding the jet near the body so that water flows and does not produces drop, which will facilitate drying.

Step 8

Dry the car immediately with a chamois leather or a clean cotton cloth, starting from the top.

Step 9

After drying the exterior off, open the doors, the hood and the trunk and dry the jambs.

Step 10 As a finishing touch use the Marly Bumper & Tyre Dressing to make the bumpers, moldings and tire sidewalls to shine.

Interior cleaning

Step 1

Remove the carpets and vacuum clean the interior and the trunk. Shake the carpets to remove excessive dirt and vacuum clean them.

Step 2

Clean seats and carpets with Marly Textile Cleaner. If you have a leather interior clean it with Marly Cockpit Multi Cleaner and apply a leather care product to keep it soft and comfortable.

Step 3

Un-dust the dashboard, starting with the highest spots to avoid the dust would redeposit on cleaned spots.

Step 4

Use the Marly Multi Cockpit Cleaner to clean the dashboard. Spray on. Wipe clean with a soft cloth or absorbing paper.

Step 5

At last, clean the windows with a special cleaner like the Marly Glass Cleaner. Spray on and wipe clean with a soft cloth, absorbing paper or chamois leather.

LG 41	LO #3- Prepare plastic surfaces for refinishing

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Preparation of cleaning plastic surfaces. • Carrying out Preparation activities according to industry regulations/ guidelines, WHS legislation, and enterprise procedures/policies. • Completing preparation without causing damage. • Disposing Waste materials in accordance with statutory and enterprise 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 Preparation of cleaning plastic surfaces. • Carry out Preparation activities according to industry regulations/ guidelines, WHS legislation, and enterprise procedures/policies.. • Complete preparation without causing damage. • Dispose Waste materials in accordance with statutory and enterprise requirements.
Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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- preparation of cleaning plastic surfaces.

1.1 INTRODUCTION

The term plastics refer to a wide range of materials synthetically compounded from crude oil, coal, natural gas, and other natural substances. Unlike metals, plastics do not occur in nature and must be manufactured.Because plastic is much lighter in weight than sheet metal, it has become an important component of today's vehicles. Today,more and more plastic is being used in automobile manufacturing. Plastic parts include bumpers, fender extensions, fascias, fender aprons, grille openings, stone shields, instrument panels, trim panels, fuel lines, door panels, quarter panels,and engine parts.Fuel-saving and weight reduction programs by auto makers have made plastic parts more common. Many of the new reinforced plastics are almost as strong and rigid as steel. Some are even more stable dimensionally. Plastic parts are also extremely corrosionresistant.Tests are being made on plastic engine blocks and plastic frame parts. Plastic suppliers are projecting increased use of plastic in floor pans, windows, steering shafts, springs, wheels, bearings, and other mechanical components. This increasing use of plastic has resulted in new approaches to collision repair.Many plastic parts can be repaired more economically than they can be replaced, especially if the part does not have to be removed.Cuts, cracks, gouges, tears, and punctures are all repairable. When necessary,some plastics can also be re-formed back to their original shape after distortion.Because parts are not always available, this means less downtime for the vehicle and more profits for you and your shop. Symbols are sometimes stamped on the back of plastic parts to denote the type of plastic used during manufacturing.However,if you cannot find a symbol,as is often the case,the chart in Figure 13–1 provides logical methods for identifying the type of plastic to be repaired.

Types of plastics

Two general types of plastics are used in automotive construction:thermoplastics and thermosetting plastics.

Thermoplastics can be repeatedly softened and reshaped by heating, with no change in their chemical makeup. They soften or melt when heated and harden when cooled.Thermoplastics are weldable with a plastic welder or they can be adhesively repaired.

Thermosetting plastics, or thermosets, undergo a chemical change by the action of heating,a catalyst,or ultraviolet light.They are hardened into a permanent shape that cannot be altered by reapplying heat or catalysts. Thermosets are usually repaired with flexible parts repair materials.In general,chemical adhesive bonding is used to repair thermosetting plastics, and welding is used for thermoplastics Figure 13–2 explains more fully the effects of heat on the two types of plastics. Table 13–1 shows some of the more common plastics with their full chemical names, common names, and where on the vehicle they might be found.Their designations as thermosetting or thermoplastic are also noted. **Composite plastics**, or hybrids, are blends of different plastics and other ingredients designed to achieve specific performance characteristics. A good example of this change is the use of fiberreinforced composite plastic panels,commonly known as sheet molded compounds (SMC).The reason for using SMC is simple. It is light, corrosion proof, dent resistant and relatively easy to repair compared to more traditional materials.

Surface preparation is the key to success when airbrushing on metal and plastics.

Before painting on metal, the surface needs to be clean and rust-free. It should appear dull rather than shiny. The basic steps for surface prep are: cleaning, removing rust, sanding and or scuffing and priming.

Before you begin, read the labels on all products you're using, making sure they are suitable for the type of metal and compatible with each other. Also, take note of and follow the manufacturer's safety procedures.

Cleaning

Wash the metal thoroughly with a degreaser solution. Rinse, and let the metal dry. Use a tack cloth to remove any addition dust.

Rust Removal

Look for rusty areas on the surface and remove all rust down to the bare metal. For light rust and small areas, use steel wool and 80- to 120-grit sandpaper.

Scuffing, Sanding and Applying Primer

Sand the entire surface to smooth out uneven areas and dull the surface so the primer and paint can adhere. Start with 500-grit sandpaper and work to finer grade sandpapers, ending with 1000-grit. For large, flat surfaces, use a sanding block to get

even pressure. Wipe the surface with a tack cloth to remove the dust. Follow immediately with the first coat of primer.

Scuff pads and sand papers are available at your local automotive paint supply shop.

Clear Coating

Clear coat is that all-important barrier which protects your paint from the cruel world around it. When properly appliedt, clear coat will block harmful UV rays that can cause fading, protect against chips and scratches, and provide a glossier finish than any paint. When it comes to applying clear coat, the most important thing to remember is that it's more of a science than an art. It's an often meticulous job, which requires a delicate environment, but the results are well worth the effort put into it.

You can use either a spray gun or a premixed aerosol. **Do not not put clear coat into your airbrush!**

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

1. Clean project surface.
2. Lightly sand surface if previously painted.
3. Remove dust with a tack cloth.
4. Let plastic surface dry.
5. Apply Krylon® Fusion for Plastic® spray paint according to the directions on the spray can label.

Information Sheet 2- Disposing Waste materials in accordance with statutory and enterprise requirements

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 m**ethods 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. ----------

LG #42	LO #4- Apply refinishing materials to plastic surfaces

Instruction sheet

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

- Environmental application of refinishing materials.
- Preparing surfaces and applying refinishing materials using approved methods
- Drying refinishing materials using approved methods and equipment.
- Producing finish meet application specifications for colour, texture, depth and gloss and is contaminant-free blending into surrounding surfaces.
- Completing refinishing material without causing damage to any component or system.
- Carrying out application activities are according to industry regulations/ guidelines, WHS legislation, and enterprise procedures/policies.
- Disposing or/and storing waste materials in accordance with statutory and enterprise 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 environmental application of refinishing materials.
- Prepare surfaces and apply refinishing materials using approved methods
- Dry refinishing materials using approved methods and equipment.
- Produce finish meet application specifications for colour, texture, depth and gloss and is contaminant-free blending into surrounding surfaces.
- Complete refinishing material without causing damage to any component or system.
- Carry out application activities are according to industry regulations/ guidelines, WHS legislation, and enterprise procedures/policies.
- Dispose or/and store waste materials in accordance with statutory and

enterprise requirements.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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- Environmental application of refinishing materials.

1.1 Introduction

Part 1 of this document deals with mandatory requirements for vehicle refinishing for repair under the 2012 Regulations. This section of the document, Part 2, outlines what is considered “state-of-the-art” or “World Class” for the vehicle refinishing for repair sector, particularly in relation to VOC-material use and emissions. These techniques are not current requirements under the 2012 Regulations, but may be practices which you could consider implementing at your facility. In many cases these will save you money long-term and improve work quality as well as protecting employee health and the environment.

Choice of Repair Method

There are techniques which can be used in certain instances which can avoid the need for spraying in such cases. Using such alternatives will help free up the booth for other spray work:

- Dry guide coat. Guide coats are used to show up imperfections in fillers and primers prior to sanding. A dry product is available which can be used instead of aerosols or paint. This avoids VOC emissions and waiting time for the guide coat to dry.
- Scratch/chip repair systems. These systems can be used in certain instances for minor scratches or chips. They allow mixing of very small amounts of paint. These systems use much less paint and less masking is required. You may have to ensure quality of finish is sufficient for the job required.
- Paintless dent repair. Used for very small dents where paintwork is not damaged and is not located at the edge of a panel. A massaging tool massages out the dent from the inside out. A series of tools is used which allow the massaging tool to work in more awkward areas.

Choice of Coatings

Evaluate Products in Use

Carry out a written assessment of all refinishing products in use to identify those that contain the following substances:

- ✓ VOCs - list actual VOC content against the VOC limit for the category of product in question.
- ✓ substances which are hazardous to health or to the environment. The material safety datasheets of refinishing products in use should be reviewed to identify what risk phrases have been assigned, if any.

Determine and record at what level such substances are present. Undertake regular assessments of such refinishing products to identify potential for substitution with alternative materials that:

- result in reduced VOC emissions
- contain substances which are less hazardous to health or to the environment than those currently in use.

By tracking the usage of each product, you can prioritise high use products for substitution.

A. Current Alternatives

The final VOC content limits that were adopted in the Directive (see Part 1) are actually more generous in some of the categories than the levels originally identified by an EU study5. Hence there are products commercially available for some of the categories of coatings that go beyond the compliant coating VOC limits, i.e. they have even lower solvent content than that specified in the 2012 Regulations. Such products should be used where feasible, taking into account effects of using additional energy as applicable.

B. Future Alternatives

There are alternative coatings used in other areas but being developed for the refinishing sector which may be used in future including:

- UV-A curing technology. Will reduce energy costs associated with curing coatings.

- Use of supercritical carbon dioxide instead of VOCs as the solvent in paint systems. The use of supercritical carbon dioxide also provides superior atomisation during spraying.

Application Equipment

Excellent practice for the use of spray guns include:

- Use of gravity cups rather than siphon cups in HVLP guns which give reduced paint wastage and are easier to clean.

- Use of roller application of coatings for areas that will not be visible such as internal areas that will not be on display. This gives higher transfer efficiency than spraying.
- For large single colour paint jobs use of pumped remote paint feed. This minimises potential wastage through mixing, residual paint in containers, etc. Using a pumped remote paint feed also allows use of equipment that mixes the two components just before the spray gun. This minimises wastage due to mixing too much material or through delays in the spraying operation.

Spray Booths

Excellent practice for spray booths includes:

- Use of spray booths for carrying out all spraying activities.
- Ensuring spray booths are designed with optimal air flowates and minimum air turbulence. Design should aim to minimise overspray landing on lighting and walls.
- Ensuring booths are designed to minimise energy use through recirculating air-flow during curing phase, heat exchange between the exhaust/incoming air, programmable painting and curing times, automatic switching to idling mode when not spraying, and variable speed drive motors on the extraction system.
- Ensuring spray booth lighting is designed for the optimal level of lighting and kept at this through regular cleaning of light fixtures and walls and planned lamp replacement at fixed intervals.Ensuring the booth walls have been coated white will increase the effectiveness of the lighting.
- Establishing the optimal air flow-rate for the spray booth, in conjunction with the supplier if necessary, and operating the booth at this flow-rate when spraying.
- Regularly replacing spray booth filters for particulate removal according to the manufacturers instructions. Establishing the frequency at which filters should be replaced and implementing this. Newer models have filter pressure drop monitoring which indicates when replacement is needed.
- Keeping spray booths clear of any clutter to minimise air turbulence.

Compressed Air Supply System

Excellent practice for compressed air includes:

- Ensuring a design and layout of the compressed air delivery lines that minimises pressure drop.
- Use of an air supply system that removes moisture, oil, and dust.
- Ensuring the compressor is sized correctly to minimise energy costs.
- Use of pressure gauges on the system and ensuring they are working.
- Maintenance: draining the air compressor daily, or use of an automated drainage timer on the system.

Self-Check – 1	**Written test**

Information Sheet 2- Preparing surfaces and applying refinishing materials using approved methods

2.1 Surface Preparation

Appropriate surface preparation to ensure optimal coating and minimise reworks. Excellent practice includes:

- Washing off dirt using detergent and water followed by a water rinse before using any pre-cleaners.
- Use of pre-cleaners that can be diluted with water, where possible. Waterborne products based on alcohol and detergents below the compliant limit of 200 g/l are available.
- Use of spray bottles for pre-cleaners to spray a mist of pre-cleaner on the surface which is then wiped with a cloth. This uses less solvent than soaking or pouring liquid solvent on cloths. Alternatively, use cans with plunger/piston pumps for pre-cleaners.
- Use of a rental service for cloths instead of disposing of them. This service provides clean cloths, collects used cloths, and launders them for reuse while recovering the solvents.
- Use of dispensing units for fillers that give out the exact amount required to reduce wastage.
- Removing parts from vehicles before coating where feasible – this will reduce masking requirements.

Paint Mixing

Accurate estimation of, and mixing of, the amount of coating needed. Excellent practice includes:

- Measuring the area to be painted accurately.
- Use of paint manufacturers' charts and specifications to mix the right quantity. Use of a colorimeter or spectrophotometer could be considered.
- Use of an electronic precision scales. Ensure this is calibrated on a periodic basis, mounted on a stable, levelled properly and kept clean. Enclosing the

scales in a sealed plastic bag to prevent spillages from causing weighing inaccuracies.

- Use of an automated paint dispenser.
- Use of a computerized precision paint mixing system which allows paint use by individual sprayers to be logged, improves work scheduling, and assists with stock control.
- Use of software for calculating material requirements for each job based on the type of repair and the repair area. This makes it easier to mix small amounts and reduces wastage.
- Use of colour matching software.
- Use of software for job colour scheduling to minimise frequency of gun cleaning.
- Use of a system of preparing small metal test blanks along with every job to aid future colour matching.
- Establishing a process of comparing estimated and actual paint used to refine estimation techniques.

Refinishing Operation

Excellent practice for each time spraying is carried out includes:

- Choosing spray gun nozzle size to match refinishing product; choosing air hose recommended by the spray gun manufacturer.
- Ensuring air passages in the gun are not clogged.
- Ensuring air pressure matches that recommended by the spray gun manufacturer, and air is not too hot (causes solvent to evaporate before reaching the surface).
- Setting up the spray gun correctly (lowest air pressure chosen that will still provide the required atomisation; optimal fan width suitable for the specific job and fluid flowrate) with a test spray of the pattern before beginning work.
- Ensuring booth air flow and temperature are at the required levels.
- Operating the spray gun correctly (gun to workpiece distance, spray gun held perpendicular to the surface, constant speed, timing of start and end triggering, spray pattern, overlap previous stroke by 50%, visual feedback, edge painting techniques).

- Use of a laser guidance device on the spray gun to ensure optimal distance is maintained could be considered. This uses two laser beams that form a single dot when the spray gun is at the optimum distance. Too close, too far, or angled, the beams separate into two dots. Allows for high efficiency spraying and accurate 50% overlap.

Drying

Infrared drying lamps can be used for curing small painted areas, reducing energy costs by avoiding heating the entire booth and freeing up the spray booth at the same time.

Spray Gun Cleaning

Excellent practice for spray gun cleaning includes:

- Cleaning equipment immediately before paint hardens.
- Storing left over primer and basecoat for reuse.
- Pouring excess paint into a separate container before cleaning the spray gun. Such waste paint should be disposed of appropriately for recovery or disposal.
- Use of a spatula to scrape out paint residue from the gun cup before cleaning to reduce contamination of the gun-wash.
- Pre-cleaning the gun-cup before putting it into the gun cleaner to prolong gun-wash life.
- Use of gun wash with lower VOC content.
- Use of gun cleaning equipment which:

Self-Check – 1	**Written test**

Information Sheet 3- Producing finish meet application specifications for colour, texture, depth and gloss and is contaminant-free blending into surrounding surfaces.

3.1INTRODUCTION

Matt finishes

Vehicles with matt finishes are currently in fashion. A shimmering satin or dull matt surface gives a vehicle a special style and makes it stand out from the cars with gloss finishes. However, repairing matt finishes poses particular challenges for body shops. Repairs require precise preparation and considerable professional skill. Correcting potential errors also involves a significant amount of effort. What is common practice for high gloss clear coats is out of the question for matt paint finishes. Re-sanding or polishing are not an option. Refinishers can only make one attempt.

Fig:-

Ensuring there's no shine after the repair

Even small repairs are a challenge when it comes to matt paints.

With matt paints, it is not possible to polish out small scratches on one of side of the vehicle or fingernail traces from the handle recesses. That would result in shiny spots or streaks – visual defects on an otherwise evenly matt surface. MicroRepairs and blending in also are not suitable, as they would both mar the general appearance. To avoid this from happening, when refinishing matt paints, the entire body part is always painted. Depending on where the damage is it may even be best to repaint the entire side of a vehicle.

Fig:-

Care and precision – essential for an outstanding result.

Refinishing matt surfaces is more time-consuming and requires more material than refinishing gloss finishes. But with the right preparation, the necessary care when working, and the right products, it is possible to achieve impeccable results. What matters more than anything else is working accurately. Even the smallest deviation from the mixing ratio between clearcoat, hardener, thinner and matting agent can lead to a discrepancy in the degree of matting, and the required volumes for a total or partial re-spray should be weighed out accurately using the scales. The use of Standowin or Standowin iQ makes precise measuring easy. Being completely accurate is also important for the documentation and potential later adjustments.

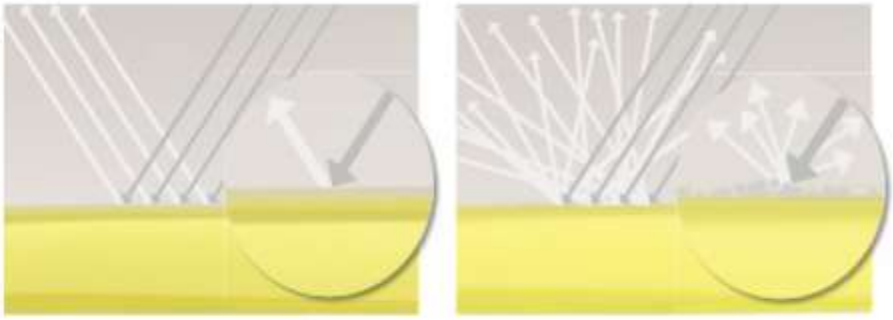
The effect of film build and drying on matt paints.

Before starting to refinish matt paints, the effect of different film build on the appearance of the dried paint film should be considered. Application methods must therefore be adapted to the circumstances.

- Two “normal” spray passes may look different after drying, in some circumstances, compared to two “full” ones.
- Correct flash off is very important: in order to avoid “patchiness” the intermediate and final flash-off times given in the Technical Data Sheet should be strictly adhered to.
- Even the manner and type of drying method plays a role in the repair of matt clearcoats. Air and forced spray booth drying have a different effect on the gloss level. Finishes dried in the spray booth are generally slightly glossier than those that are dried at ambient temperatures.
- Infra-red drying should be avoided completely.

Background knowledge/information

How are the perception of colour and the general impression of a matt surface created? The colour impressions of an object are the result of nerve impulses in the viewer's brain. The human eye receives colour stimuli via the retina, relays them to the brain and in so doing, triggers a certain colour perception. That part of the light spectrum, which is not absorbed but reflected by the surface of an object, supplies the data that our conscious mind attributes to a specific colour. Reflection is also the reason why our eye perceives a surface as glossy or matt. Certain clearcoat additives increase the diffusion of light to such an extent that the surface appears matted.



Light reflection on a glossy clearcoat (simplified illustration, as effect pigments also have a scattering effect, although only in the basecoat paint).

Light reflection on a matted clearcoat (matting agents contain ball-shaped particles that have a strong scattering effect). Viewed at an angle of 60o, the reflection is at its most even. That is why the gloss level of car paints is measured and recorded at this angle.

What influences matt colours?

The appearance and gloss level are influenced by:

- the coating thickness of each spray pass or the overall film build
- the way in which the paint is sprayed – for example with full or limited saturation, at a large or small spray gun distance, in straightforward lengths or in criss-cross pattern
- the intermediate or final flash-off time and the colour.
- the temperature and type of drying (air or spray booth)
- the spray booth or paint temperature during application
- hardener and thinner

The degree of gloss increases with the use of short hardeners and thinners, with greater spray viscosity, thicker coats and forced drying.

The degree of gloss decreases with the use of longer hardeners and thinners, with a lower spray viscosity, reduced coating thickness and air drying. As humidity also has an effect on the end result, we recommend avoiding ambient air drying when refinishing matt paints.

These arguments show that the gloss level of a repair can only be determined by creating a spray sample!

Fig:-

What you should pay attention to when refinishing matt paints.

As there are many factors that influence gloss levels, it is not possible to give a pre-defined gloss level. There are measurable differences even for OEM finishes. In practice that means that it is not possible to achieve uniform results in a bodyshop where conditions change on a daily basis. A larger object should therefore not be refinished over several days and with different product build ups. To achieve a uniform appearance refinishers should paint in one go.

For technical reasons dust inclusions cannot be polished out of matt paints. Instead, they would require a complete re-paint including basecoat. Depending on the object, colour and desired gloss level we recommend finishing the paintwork with a gloss Standocryl VOC Clear.

All refinish paints will still contain traces of solvent once dry. With matt paints this means that the final degree of gloss is not quite attained immediately after drying.

Measurements show that gloss levels can fall by up to five per cent within the first 14 days after the paintwork is completed.

Treat all fresh matt paints with the greatest care. Currently, damage to surfaces can only be reactivated by a total re-spray. Contamination, for example with grease, adhesives or sealants, must be removed immediately with solvent-free cleaner. Do not use any solvents!

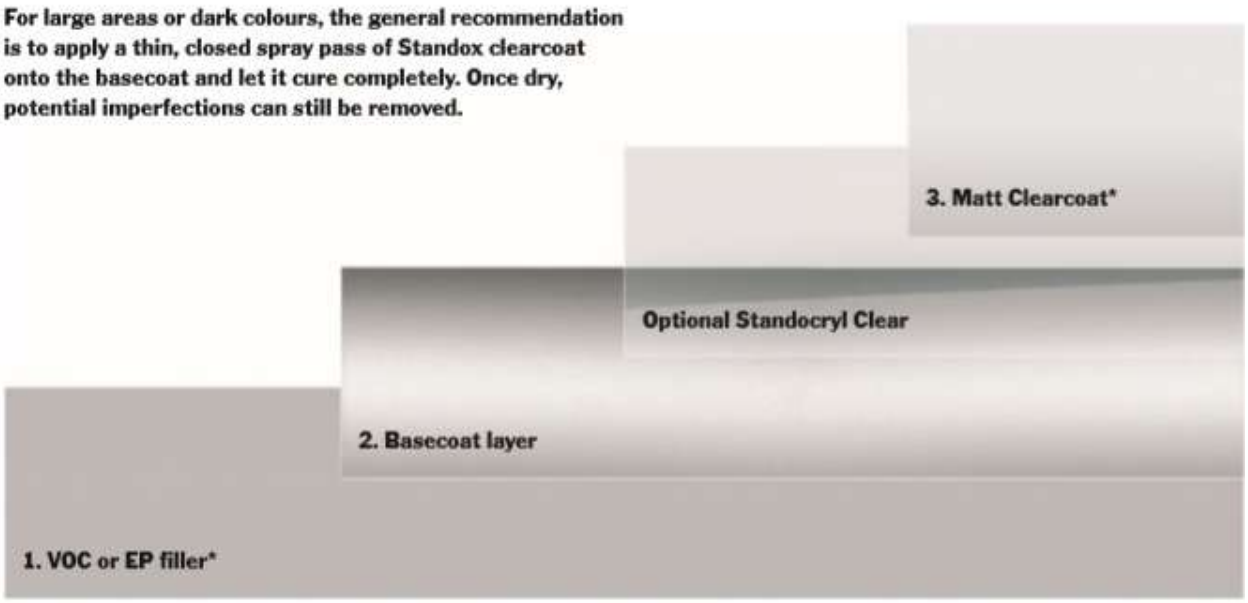


Fig:-

Preparation of sample panels.

1. **First determine the gloss level, then the colour**.

The gloss level has a significant effect on the appearance of the colour. Therefore first paint a spray sample with different ratios of Special Matt to VOC HS Clearcoat K9520. Begin with a mixture of 80:20, 75:25 and 70:30 (under certain circumstances smaller increments may be useful). You will find the precise formulas in Standowin iQ. Then refine your selection of the colour (potentially produce variants). Pay attention to clear marking of the spray samples. Note: The spray samples must be prepared using the same spray and drying techniques as the refinish work.

Fig:-

Which mixing ratio produces what gloss level (E = units of gloss)?

- 70:30 > 25 E at a 60o angle
- 75:25 OEM recommendation, for example MB 23 E at a 60o angle Tolerance +/- 7 units
- 80:20 < 15 E at a 60o angle or < 20 E at an 85o angle

The formula for the right mixing ratio can be found in Standowin iQ in the section title "ANCILLARY PRODUCT MIX" under products "SPEC MATT".

Standox Special Matt must be stirred thoroughly immediately prior to use. The clearcoat/Special Matt mixture must also be stirred carefully before adding the hardener. Just like other matting additives, Standox Special Matt can, in principle, be used with all Standox clearcoats. As the clearcoats all have different properties and mixing ratios, we recommend using the Standocryl VOC HS Clearcoat K9520 from the Standox refinish range. Only the VOC HS Clearcoat K9520 has the best basic properties for this particular type of application and is approved by the major car manufacturers for refinish work.

Refinish process

With a matt clearcoat, it is not possible to blend in sections. It is only possible to refinish complete body parts. These should be carried out by two refinishers who should avoid overlapping. All spray and drying processes should follow the same procedure used for the selected spray sample. Even small changes can distort the result. The more matt a matt clearcoat is, the more accurate the preparation, basecoat application and clearcoat use has to be.

2. **Prepare and clean as usual.**

Prepare for the entire matt clear coat application, as blending in of the matt clear coat with Smart Blend Plus is not possible.

3. **Basecoat application and flash off**.

   Apply the basecoat just as you would a two-coat paint (also see page 9). Allow for sufficient flash off time afterwards.

4. **Apply matt clear coat.**

   Apply the first spray pass and let is flash off for five to ten minutes at 20°C. Then apply a second spray pass. Let the vehicle part flash-off a final time before force drying it for 10 to 15 minutes.

   - Tip for the 80:20 mix: The risk of patchiness can be reduced with a larger nozzle such as SATA HVLP 1.5mm with 2.0 bar inlet pressure.
   - Tip to reduce bonding: Increase the spray distance from the object and make the bands correspondingly narrower. For large horizontal surfaces such as the bonnet, apply the first and second spray pass at a displaced 90°C angle if at all possible. The first and second spray pass should produce a classic criss-cross pattern.

5. **Drying in the spray booth**

   Allow the painted vehicle part to dry for 45 to 50 minutes at 60°C to 65°C object temperature.

Care tips for matt paints

Fig:-

There are many, at times conflicting, recommendations concerning matt paint care. These listed here are the Standox findings; we cannot address questions relating to third-party products.

It is, in principle, possible to wash the car in a car wash. However, care programmes such as “gloss protection” should not be selected. Paint-protecting car washes are recommended as brush washes can, in the longer term, have a polishing, and therefore gloss-heightening, effect. The best and most protective cleaning method is to wash the vehicle by hand with neutral soap, plenty of water and a soft sponge.

Just as for traditional gloss finishes, bird droppings, dead insects and tree sap should be removed immediately. If that is not possible, soak the area concerned with water in order to remove the dirt without mechanical help if at all possible. Micro-fibre cloths are suitable for this. Tar stains can be removed by car owners with a silicone remover in conjunction with the standard commercial cleaning agents. Avoid rubbing the same place vigorously with strong pressure.

Car manufacturers don`t recommend application of stickers, films or magnetic signs to OEM matt paints, and Standox recommends the same for refinish paints.

Information Sheet 5- Carrying out application activities are according to industry regulations/ guidelines, WHS legislation, and enterprise procedures/policies.

5.1 INTRODUCTION

Danish Waste management regulation is characterized by a combination of traditional regulation through laws and executive orders, and a wide range of other instruments such as taxes, fees, subsidy schemes, and agreements. Waste management is regulated in the environmental protection law (consolidation Act no 879, 26th June 2010) and the related executive orders (bekendtgørelser), and hereunder especially the executive order on waste (executive order no 1309, 20th December 2012). Since 1st January 1997, Denmark has banned the landfilling of waste suitable for incineration. As a consequence, flexible PVC is being landfilled as it is harmful in the incineration process and no current methods are available for recycling in Denmark. As the only exception from the general rule in the EU, Denmark has no packaging producer responsibility scheme for plastic packaging (except the deposit system for beer and soft drink containers, which is detailed in the next subsection). According to the environmental protection law, the responsibility for collecting and assigning all waste is allocated to the municipalities. The legal requirement is that the municipality shall establish arrangements that secure an environmentally sound waste handling. This entail that the municipalities by default has the responsibility for waste management. However, the responsibility for source sorted waste from businesses, suitable for recycling or recovery rests with the businesses, but under the authority and supervision of the municipalities.

Table 2. Key roles in collection and recycling of plastic packaging waste in Denmark

Key actor	Role
Importers and producers of plastic packaging	Put plastic packaging on the Danish market.
Municipalities	Responsible for collection of household waste. Responsible for establishment and operation of recycling centres that must be able to receive sorted waste from businesses.
Consumers of plastic packaging	Buy plastic packaging on the Danish market.
Waste transporters (Affaldstransportører) & Collection companies for sorted recyclable waste (Indsamlingsvirksomheder for kildesorteret genanvendeligt erhvervsaffald)	Transport the plastic packaging waste from businesses to recyclers, register volumes and report to the EPA (waste-database).
Recyclers	Recycling of plastic packaging waste into new products.
The Danish EPA	Collects data on the recycling of plastics and reports data to Eurostat according to the Packaging directive.

Besides the executive order on waste, a number of executive orders regulate specific waste fractions for which municipalities do not have responsibility. This includes for plastics the executive order on deposit and collection of beverage containers for beer and certain soft drinks, where the collection is done by Dansk Retursystem A/S in a producer responsibility scheme paid by producers and importers (Dansk Retursystem, 2013). The system implies that these products only can be marketed in recyclable or refillable packaging, and importers and producers pay for the collection and recycling. Beverage packaging is a special focus area in Denmark, as it represents a considerable volume. In 1978, a weight-based fee on new beverage packaging, creating a motivation increase of reuse and minimization of volume was introduced. In 1988 there was placed a levy on disposable tableware and in 1994 levies was placed on plastic shopping bags, both stimulating reuse. Weight-based fees were introduced on sales packaging and multipacks with volumes less than 20 litres, and in 2000 the fees were adjusted according to results from Life Cycle Assessment to reflect both weight and environmental impact. In Denmark, plastic bulky waste is collected at recycling centres.

Collection and recycling of plastic waste

Around 70 percent of the plastic waste collected from households origins from packaging, and it is mainly constituted by LDPE (Low-Density Polyethylene), HDPE (High-Density Polyethylene), PP (Polypropylene), PET (Polyethylene terephthalate) and

PS (Polystyrene) and EPS (Expanded Polystyrene (DEPA, 2011). Household waste is collected by the respective 98 Danish municipalities, and this takes places in accordance with specific waste regulations according to the single municipality, and accordingly the collection schemes differ from municipality to municipality. Municipal collection schemes for plastic ranges from permanent individual and joint full service collection of waste at household and collection points, to the approximately 500 manned waste collection centres where citizens and smaller businesses bring relevant waste fractions, hereunder plastics, for recycling. Collection frequency varies from weekly to bi-weekly. In approximately 25 percent of the municipalities household waste is only collected as residual waste, 40 percent sorts one fraction (mainly paper), and the remaining municipalities have collection of two to five fractions, and approximately 22 percent collects household plastic waste fractions separately. All municipalities have waste collection centres with collection of rigid plastic waste. The waste collection centres collect all types of waste except residual waste and a typical layout is depicted in Figure 1. Currently, there is no comprehensive information on how collected plastics are being treated after collection, but the main route is to export the collected plastic waste to sorting facilities in Sweden, Germany and the Netherlands.

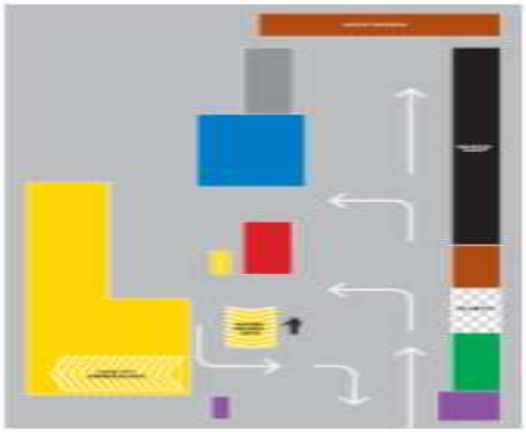


Figure 1. Typical layout of a waste collection center. In the plastic collection area, bottles, bulky plastic waste such as garden furniture, rigid and flexible PVC, and plastic foils are received.

Plastic waste is presently becoming a focus point nationally and in the municipal collection schemes, leading to a general trend of increased source sorting and collection of plastic waste.

Based on a review of the municipal waste directives it is assessed that in 2013, 22 out of the 98 municipalities have established kerbside collection of rigid plastic waste, and in the majority of these, the collection is limited to detached houses. The rigid plastic waste collection schemes in 2013 cover some variations including:

- Collection frequency varies between one and two weeks.
- In few municipalities plastic waste is also collected from apartment buildings (among these Copenhagen, Frederiksberg, and Gladsaxe).
- The plastic waste collected is mainly plastic packaging, but some municipalities collect also other types of rigid consumer plastic waste.
- Some municipalities have voluntary purchase of sorting bins (reducing the more expensive residual fraction).

Figure 2.Kerbside collection. Source-sorting system in Herlev municipality, Denmark

Flexible plastic waste is collected with the residual waste, but can also be delivered at some municipal collection stations. Flexible PVC is, as the only plastic waste fraction, sent to landfill. The frequency of municipalities with separate collection is likely to increase as several municipalities currently are running pilot tests with household source sorting and collection. One example of these developing arrangements can be found in Aalborg, where the fractions received are:

- Drinking bottles.
- Containers used for shampoo and conditioner.
- Containers used for washing and cleansing agents.

- Plastic bins, tubs, pots, jars, small buckets, and flowerpots.
- Plastic trays used for meat and vegetables.
- Various plastic foils and plastic bags, although not bread bags or plastic that has been in direct contact with food.
- Toys and other plastic articles from households.

The resource plan for waste management (2013–2018), sets up a framework for the municipalities within which the municipalities are in the process of developing appropriated source sorting of household waste, and the frequency of multi-compartment waste bins is increasing.

Plastic bulky waste

Plastic bulky waste is covered by the waste executive order, and is collected at the manned waste collection centres. Bulky waste originating from households is under the responsibility of the municipalities, i.e. all municipalities collect this fraction at the recycling sites. Bulky waste originating from businesses is the responsibility of the companies. The sorted plastic bulky waste is collected and compressed into bales, and send to sorting facilities, mainly in northern Germany and Sweden, though a few facilities does exist in Denmark.

Self-Check – 1	**Written test**

Information Sheet 6- Disposing or/and storing waste materials in accordance with statutory and enterprise requirements

6.1 INTRODUCTION

Work intelligently around hazardous materials! Be informed; read the warnings on the product labels and in manufacturers' literature. If more information is desired, get copies of the material safety data sheets (MSDS) for specific products from the shop's office or from the material suppliers.

Material safety data sheets (MSDS) contain information on hazardous ingredients and protective measures that the technician should use. MSDS, available from all product manufacturers, detail chemical composition and precautionary information for all products that can present a health or safety hazard. An example of an MSDS is shown in Figure 9–48. Hazardous waste, as determined by the Environmental Protection Agency (EPA), is a solid or liquid that can harm people and the environment. If the waste is on the EPA list of known harmful materials or has one or more of the following characteristics, it is considered hazardous.

1. Ignitability means the material or waste fails the ignitability test if it is a liquid with a flash point below 140°F or a solid that can spontaneously ignite.

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

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

4. **Toxicity** means a material leaches one or more heavy metals in concentrations greater than 100 times primary drinking water standard concentrations. These heavy metals include lead, cadmium, chromium, and arsenic. Complete EPA lists of hazardous wastes can be found in the Code of Federal Regulations. Materials and wastes of most concern to the body/paint technician are organic solvents that contain

heavy metals, especially lead. During disposal, all hazardous waste must be handled according to the appropriate regulations

FIGURE ---------Note the basic steps for using a fire extinguisher.

FIGURE----------Someone in the shop must inspect the dates on all fire extinguishers. They must be recharged at periodic intervals.

FIGURE-------Soiled or dirty rags and towels must be placed in a metal can with a lid. If spontaneous combustion occurs, the metal lid will smother the fire.

Self-Check – 1	Written test

LG #43	LO #5- Mix 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 according to paint manufacturer recommended specifications
- carrying out mixing activity according to environmental requirements; industry, statutory and regulatory authorities' guidelines
- Mixing clear over-base paints without causing damage to other components or systems.

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 according to paint manufacturer recommended specifications
- carry out mixing activity according to environmental requirements; industry, statutory and regulatory authorities' guidelines
- Determine Mixing clear over-base paints without causing damage to other components or systems.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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 according to paint manufacturer recommended specifications

PRODUCT DESCRIPTION

The Ultra 7000® Basecoat is a versatile product line that delivers premium urethane performance to customers expecting the highest in productivity, cycle time and color match. Ultra 7000® basecoat is supported by OEM Certifications and a Limited Lifetime Guaranty, This basecoat is utilized in the Collision Repair, Custom Restoration, Fleet Refinish, Manufacturing, Recreational Vehicle, and Automotive Interior market segments.

SURFACE PREPARATION*

1. When sealing, final sand repair area with P400-P800 grit sandpaper. If directly top coating over primer, final sand with P600-P800 sandpaper. Sanding can be done either wet or dry.
2. Solvent clean with appropriate Sherwin-Williams® surface cleaner and wipe dry with a clean cloth.
3. Treat sand-throughs to bare metal with a Sherwin-Williams® self-etching primer, SpectraPrime® or SpectraSeal®

Preparation for Blending Panels (Prior to Basecoat Application):

1. Solvent clean with appropriate Sherwin-Williams® surface cleaner and wipe dry with a clean lint free cloth.
2. Blend panel should be sanded with P800-P1000 grit sand paper on a random orbital sander or with USP90 scuffing gel and water using a gray nylon-scuffing pad. Rinse surface thoroughly and wipe dry with a clean dry cloth.
3. Repeat step one - then thoroughly tack the surface to be painted with a clean tack cloth. *See the appropriate Ultra 7000® Best Demonstrated Practices for instructions on how to properly prepare panels.

SUITABLE SUBSTRATES

- Sherwin-Williams® Automotive Finishes Premium Undercoats
- Sherwin-Williams® Automotive Finishes Adhesion Promoters
- OEM Enamels
- Aged Refinishes

MIXING

1 Ultra 7000® Color	+	1 RHF65, RHF75, RHF85, RHF95	OR	16 ULTRA 7000® Color	+	16 BCS65, BCS75, BCS85, BCS95	+	1 UH904 Hardener

UNDERHOOD COLORS = This application requires that all underhood basecoat colors be mixed @ 16:16:1 w/ RHF solvents and UH904 -- or -- mix @ 16:16:2 (8:8:1) w/ BCS Stabilizers and UH904. You do not need to apply clearcoat to Ultra 7000® underhood basecoat colors.

Note: For GM SPECIFICATIONS, mix 16:16:1 w/ RHF solvents and UH904 hardener – or – mix 16:16:2 (8:8:1) w/ BCS Stabilizers and UH904.

BASECOAT STABILIZER / TEMPERATURE RANGE

	Fast	Standard	Medium/Slow	Hi-Temp
Size of Repair	**RHF65 or BCS65**	**RHF75 or BCS75**	**RHF85 or BCS85**	**RHF95 or BCS95**
Small spot repairs	60-90°F	75-90°F	85-100°F	Above 110°F
1- or 2-panel repair	60-80°F	70-85°F	80-100°F	Above 100°F
Multi-panel repair	60-70°F	65-75°F	75-95°F	Above 95°F
Complete refinishing	Below 60°F	60-70°F	70-90°F	Above 90°F

NOTES

- Do not use fisheye eliminators in basecoat color, as it will adversely affect the adhesion of the clearcoat.
- If dirt must be removed, areas 4" or smaller may be wet sanded with P600 or finer. Sanded areas MUST be recoated with basecoat color before clear coating.
- Pot Life: 8 hours*
  *Note: If using BCS Stabilizers without adding hardener, the pot life is indefinite.

APPLICATION

- Apply 2-3 medium coats or until hiding is achieved.
- Allow each coat to flash to a dull uniform appearance.
- 7-9 psi HVLP/ 45 psi Conventional

Note: A low-pressure mist (drop) coat must be used to even out metallic/mica colors and for blending.

DRYING SCHEDULE: Air Dry Times @ 75°F and 50% R.H.:

	Fast RHF65 or BCS65	Standard RHF75 or BCS75	Medium/Slow RHF85 or BCS85	Hi-Temp RHF95 or BCS95
Dust Free	2-5 minutes	5 minutes	7 minutes	10 minutes
Tape Time	10-20 minutes	10-20 minutes	10-20 minutes	10-20 minutes
Recoat	10-20 minutes	10-20 minutes	10-20 minutes	10-20 minutes

RECOAT

- Clearcoat ULTRA 7000® basecoat color with a Sherwin-Williams® Premium Clearcoat. See the appropriate clearcoat data sheets for specific instructions.
- Recoat basecoat colors before 7 days or remove basecoat color.

PERSONAL PROTECTION

- Read label, directions, and MSDS before use
- Refer to MSDS for specific information
- Wear a NIOSH approved organic vapor respirator when using this product
- Wear a NIOSH approved dust particulate mask when sanding, mixing or applying this product
- Keep product, paint and overspray off of the skin, wear goggles, coveralls, and chemical protective gloves when using this product

REGULATORY DATA

	As Packaged		As Applied	
	G/L	Lbs/Gal	G/L	Lbs/Gal
VOC Total	736	6.14	790	6.59
VOC Less Exempt	736	6.14	790	6.59
	Lbs/Gal Solids	Lbs/Gal Solids	Lbs/Gal Solids	Lbs/Gal Solids
HAPs	18.39	1.50	41.02	3.51
	Wt. %	Vol. %	Wt. %	Vol. %
Volatiles	76.8	84.8	86.6	91.3
Water	0	0	0	0
Exempt Compounds	0	0	0	0
	G/L	Lbs/Gal	G/L	Lbs/Gal
Density	958	8.00	912	7.62

- Two Stage Painting Ratio's:

1. Base Coat Clear Coat Paint's as you may know are todays newest paint products. The water borne paint is also a base/clear paint. Base coat mixing is always a 50/50 mixture.

Very easy. 1 cup of base (your paint color) + 1 cup reducer = ready to paint.

Your paint never goes bad. If you have left over, just cap it in a glass jar or your paint can and seal it up. When you are ready for your next job, just mix again and you're ready to paint. It makes it a LOT easier if you know your paint viscosity and can apply the drip test every time you're getting ready to paint. Then it won't matter if you put your leftovers from your gun back into the can of your unmixed base coat. I show you the short-cuts of the trade within the VIP members club of this site. No worries.

- Clear Coat mixing for base/clear paints:

When mixing clear coat again, pretty simple. Usually depending on the brand you get you have a 4/1 or a 2/1 mixing ratio. So if you have been following along so far I really

shouldn't have to explain this one for you

I'll do it anyway… a 4/1 mixing ratio goes like this. 4 parts of your clear coat to one part of your hardener. For a Gallon of clear in your bucket, you'll add one quart of hardener… and the last time I checked there were still 4 quarts in a gallon.

Hope this post cleared a lot of confusion out of the air for you! If you are looking to get into automotive auto body and paint for a special project, or a money making venture, we would love to help you get started and off the ground quickly.

Making things simple for you is our business. If you want to learn more about the Learn Auto Body And Paint **VIP Membership** community and how it can help you …feel free to check it out. You have nothing to lose and all to gain. With thousands of raving VIP members from all backgrounds, ages and regions worldwide learning how to restore and customize their ride, there must be something we're doing right.

Self-Check – 1	**Written test**

LG #44	LO #6- Apply clear over-base refinishing materials by spray-gun

Instruction sheet

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

- Applying refinishing materials by using processes and recommended methods
- Drying Refinishing materials using approved methods and equipment.
- Using techniques that ensure finishing produced meets specifications.
- Completing surface refinishing within approved time frames.
- Carrying out application activities according to industry regulations and guidelines, WHS legislation, and workplace policies and 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:

- Apply refinishing materials by using processes and recommended methods
- Determine Dry Refinishing materials using approved methods and equipment.
- Use techniques that ensure finishing produced meets specifications.
- Complete surface refinishing within approved time frames.
- Carry out application activities according to industry regulations and guidelines, WHS legislation, and workplace policies and procedures

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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- Applying refinishing materials by using processes and recommended methods.

1.1 Apply a Clear Base Coat to a Car

Much of a vehicle's appeal has nothing to do with its performance and is purely superficial. Although a car's speed and agility on the road is important, it means very little in terms of the total package if it is not also attractive in its shape and hue. If you decide to change its color or repair damage to the exterior after an accident, achieving maximum attractiveness through repainting can be quite costly in a body shop. Consequently, you may wish to consider doing the job yourself.

Fig;----- Clear Base Coat to a Car

Although acrylic paints are the easiest to apply, they show signs of wear from UV rays and elements quite quickly. So, if you're going to invest the money in automotive paint and your time in applying it, it may be a better choice in the long run to go with a base coat, or clear coat paint job.

Part 1 of 3: Preparing your materials

Materials Needed

- Air compressor
- Automotive clear coat (optional)
- Automotive paint
- Buffer
- Buffing compound
- Catalyzed glazing putty (if needed)
- Clean cloth
- Denatured alcohol, or other painting prep solvent (optional)
- Electric/orbital sander (optional)
- Face mask
- Masking tape
- Moisture separator filter

- Paper (thick brown industrial paper)
- Paint gun
- Plastic or paper sheets, large
- Primer paint (if needed)
- Sandpaper (ranging from 360- to 3000-grit, depending on damage to original paint)
- Water

Step 1: Choose your vehicle's future color. Purchase the paint and other necessary materials for the job (listed above).

Step 2: Prepare your workspace. Ideally, it should be both well-ventilated and free of dust or debris. This is because the fumes given off by the preparatory and paint products are harmful if inhaled, and you don't want bits of grime making their way onto your wet paint. This means you should avoid outdoor spaces or garages without windows or doors you can open.

- While it is virtually impossible to achieve a completely dust-free environment in a do-it-yourself situation, just do your best to minimize the risk of debris marring your wet paint. A clean garage with a partially opened door or window is usually sufficient.
- **Tip**: Before beginning the job, assess the condition of your existing paint job to determine the necessary materials and scope of your project. If you are merely changing the color of your paint, which is in good condition, you will not need to strip any existing paint or coarse sandpaper to expose the bare metal. If, however, there is damage to the paint, you will need the coarse sandpaper, primer paint, and also catalyzed glazing putty to fill in deep scratches or dents.
- **Note**: If you need to make such repairs on damaged areas (for example, if just your fender is damaged, only sand that fender down to the metal, fill in any damaged areas, and apply primer to that portion; the rest of the vehicle only needs a light wet sand before applying the base coat).

Part 2 of 3: Preparing your car

Fig:- ---Preparing car for painting

Step 1: Prepare your car. Remove any components you don't want painted or cover them with broad sheets of paper or plastic and masking tape.

Fig:- Remove any components you don't want painted or cover them with broad sheets of paper or plastic and masking tape

Step 2: Sand the target surface. In damaged regions, prepare your exterior surface and strip the existing paint by sanding with a rough grit (like 360-grit) paper. Although this can be done by hand by rubbing in a back-and-forth motion until the bare metal is exposed, the job is far easier when the paper is used with an electric orbital sander.

Step 3: Fill in any dents. Fill any dents or deep scratches with catalyzed glazing putty. Once it hardens, usually within a day, sand it smooth with the rough grit paper.

Part 3 of 3: Painting your car

Warning: Wear a protective face mask when working to prevent the inhalation of dust and harmful fumes.

Fig:---- Painting a car

Step 1: Use primer. If you repaired paint damage, you must apply a spray primer paint to create a surface to which the base coat can adhere. Spray the primer evenly in broad back-and-forth strokes and allow to thoroughly dry (up to 24 hours) before moving on in the process.

Step 2: Wet sand the target area. Submerge fine grit (around 3000-grit) sandpaper in a bucket of water for one to three minutes, then lightly sand the surface of your existing paint or primer by hand or using an orbital sander. The surface must always be wet, so add water or swap out the paper in your water bucket as needed.

If you opt to sand by hand, wrap the paper around a rubber block to apply even pressure.

Step 3: Dry your vehicle. Ensure there is no moisture on the vehicle's exterior by cleaning it with denatured alcohol, or another painting prep solvent, and a clean cloth.

Fig:- ----vehicle drying

Step 4: Paint the target area. Connect the moisture separator filter to the paint gun and the air compressor to the filter, then fill with the automotive base coat paint of your choice. Spray your vehicle in smooth strokes, overlapping those strokes by about 50 percent, while holding the sprayer between 6" and 10" from the exterior.

Step 5: Allow paint to dry. After allowing the base coat to air dry according to your particular paint product's instructions (at least a day), wet sand the surface again.

Step 6: Clean and apply clear coat. Clean the surface with denatured alcohol and a clean cloth another time, then apply the clear coat in the same manner you did the base coat.

Fig:- -----Clean and apply clear coat

Step 7: Buff your vehicle. After the clear coat dries according to its instructions (approximately 24 hours), remove all of the tape and plastic or paper. Then, buff the surface with a buffer and buffing compound in a circular manner to reveal your paint job's maximum shine.

Tip: Apply two to three coats of base for the best coverage, waiting 5 to 10 minutes between coats to prevent flash-off, a chemical reaction that results in a hazy appearance.

Tip: If you make a mistake or an area is otherwise damaged during the process, you can always start over in that region with sanding.

While it is possible to apply a base coat and/or clear coat of automotive paint on your own, it is a time-consuming process using materials that are relatively expensive, depending on the choice of paint. Bearing in mind that your time also has value and that there is a potential of a novice painting attempt turning out badly, it may be in your best interests to enlist a professional's help.

Self-Check – 1	**Written test**

Information Sheet 2- Drying Refinishing materials using approved methods and equipment.

2.1Introduction

Drying techniques, along with other detailing processes, are essential for maintaining the appearance, extending the longevity and improving the functionality of your vehicle. However, it is important to know that there are several methods of drying a vehicle. This is to protect your vehicle's surface from premature damage.

Drying Techniques that Every Vehicle Owner Should Know

Here's a common misconception about drying a vehicle: any method works as long as it removes water from the surface. As detailing experts, we know that this isn't true. When it comes to efficient drying techniques, you should consider the color and type of finish your vehicle has (matte or high gloss, glass coating, car paint film, etc); the weather in your area, and the size of your vehicle.

Before using any of the drying techniques listed below, make sure that your vehicle is totally free of dust and dirt to prevent the occurrence of paint swirls or scratches.

Fig:-

Techniques Listed

To facilitate this technique, use a car wash drying agent.

Master Blaster / Leaf Blower

These equipment blast away all excess water from a vehicle's surface. Some car enthusiasts prefer using them over other drying techniques. Since a master blaster/leaf blower "blows" excess water away, there's no need to rub, thus reducing the chances of car paint swirls or scratches.

Make sure that you do your "blowing" in an enclosed, dustless area to keep outdoor dust and dirt away from your vehicle's surface. Using a master blaster for drying your vehicle during winter time is a good idea too. It can blow away every single drop of liquid – even water from small crevices of your car or truck.

Water Blade

This is one of the drying techniques that has gained popularity among car owners. It's cheap and simple to use. A word of caution though – you need to have a surface that has 0% dust or dirt because if these contaminants get under the blade, there's a huge chance that your vehicle's finish will be scratched.

Self-Check – 1	**Written test**

LG #45	LO #7- Apply clear over-base refinishing materials by spray-gun.

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Identifying paint faults. according to industry and workplace procedures • Determining causes of paint fault. • Removing paint surface faults using compounds, polishes and glazes • Determining procedures of rectification. • Selecting rectification procedures to suit fault and type of finishing material. 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: • Identify paint faults. according to industry and workplace procedures • Determine causes of paint fault. • Remove paint surface faults using compounds, polishes and glazes • Determine procedures of rectification.

- Select rectification procedures to suit fault and type of finishing material

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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- Identifying paint faults.

Introduction

"Paint & Body Defects" is one of the 3 most consistent indicators when inspecting for 'prior repairs' that could ultimately indicate structural repairs, existing damage or alterations.

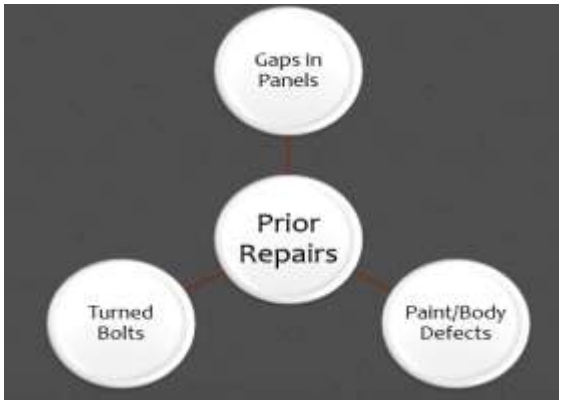


Fig:- 3 most consistent indicators when inspecting for 'prior repairs'

Paint Condition List

- Acid Rain
- Industrial Fallout Water Spotting
- Scratches Environmental Contamination
- Polishing marks
- Stone chip
- Corrosion
- Orange Peel / Texture
- Dirt Inclusions
- Adhesion Problems with Plastics
- Adhesion Problems with Clearcoat
- Clouding / Mottling
- Contamination / Fish-eyes
- Peeling Problems
- Sanding Marks – Topcoats
- Sanding marks - Substrates
- Loss of Gloss / Matting

- Hiding Power (Coverage,Opacity)
- Color Off Shade
- Clearcoat Yellowing
- Moisture Blisters
- Adhesion Problems with Polyester
- Edge Mapping Wrinkling / Lifting
- Shrinkage / Edge mapping
- Striping / Banding-Pinholes
- Pinholes - Substrates Topcoats
- Solvent Pop
- Runs
- Peroxide Stainin

Self-Check – 1	**Written test**

Information Sheet 2- Determining causes of paint fault.

Paint fault	Possible Causes
Acid Rain	- Rain containing airborne contaminants from manufacturing processes, chemical industries, and power stations. - Contaminants may become acidic or alkaline when combined with water (sulfur dioxide - acidic, cement dust - alkaline)
Industrial Fallout	- Iron and steel particles from heavy industry, foundries, railroads
Water Spotting	- Droplets of water on paint which is not sufficiently cured due to: - Excessive film thickness, drying time too short - Failure of cross linking due to moisture contamination - Unsuitable thinner
Scratches	- Frequent use of brush or soft cloth automated car wash facilities - Wiping a dry surface instead of rinsing with water
Environmental Contamination	- Bird droppings, acid rain, other environmental influences
Polishing Marks	- Top coat not through-dried - Sandpaper too coarse - Unsuitable polish - Polishing through layers on edges
Stonechip	- High use of gravel roads - Frequent highway use - Following vehicles too close - Improper film build
Corrosion	- Paint removed by chipping or scratching exposing bare

	metal - Inadequate pre-treatment of metal - Rust not removed before application of coatings - Metal surface contaminated before application of coatings
Orange Peel / Texture	- Incorrect spray pressure, gun setup, viscosity, technique, or application temperature - Wrong combination of solvents or non-system solvents - Substrate not sanded thoroughly
Dirt Inclusions	- Various types of contamination typically introduced during the application or drying process
Adhesion Problems with Plastics	- Insufficient cleaning, drying (tempering) 0 Incorrect primer has been used
Adhesion Problems – Clearcoat	- Excessive coat thickness of basecoat - Intermediate and final flash-off times of the basecoat too short - Wrong mixing ratio for clearcoat and hardener
Clouding / Mottling	- Incorrect spray viscosity, technique, flash off times, spray temperature - Defective spray gun setup, incorrect spray pressure - Unsuitable thinners
Contamination (Fish-eyes / Silicone)	- Oil, wax, grease or silicone contamination - Contaminated air supply - Use of polishes or aerosol sprays containing silicone (e.g. interior cleaners or dressings) - Insufficient cleaning
Peeling Problems	- Substrate not sufficiently prepared (rust, grease, moisture, poor sanding or cleaning) - Use of incompatible material or an incompatible substrate - Flash off and drying times too short

	- Condensation of substrate due to temperature changes
Sanding Marks – Topcoats	- Sanding paper too coarse - Soft, solvent reversible substrates e.g. acrylic lacquer (T.P.A.) - Insufficient film build
Sanding Marks - Substrate Preparation	- Insufficiently sanded polyester stopper - Insufficient isolation of the polyester before topcoat application
Loss of Gloss / Matting	- Film thickness/ air humidity - Solvent-sensitive substrate - Incorrect mixing or contaminated hardener, or unsuitable thinner - Insufficient airflow in oven or interrupted baking
Hiding Power (Coverage, Opacity)	- Substrate not uniform (effect finishes) - Color coat film build too low
Color Off-shade	- Weathered surface - Incorrect spraying technique
Clearcoat Yellowing	- Wrong or contaminated hardener - Insufficient clearcoat film thickness
Moisture Blisters	- Residue of sanding water in corners, edges, crevices, or below decorative strips - Contaminated air supply - Insufficient isolation of polyesters - Ambient humidity too high
Adhesion Problems – Polyester	- Substrate not carefully prepared - Polyester material unsuitable for galvanized substrate
Edge Mapping Due to Solvent Penetration	- Insufficient isolation where topcoat was sanded through to substrate - Isolated with unsuitable filler - Filler incorrectly applied - Insufficient drying of substrate

Wrinkling, Rippling, Lifting	- Finish not fully cured (synthetic resin finishes) - Unsuitable substrate (aerosol paints, acrylic lacquer or nitrocellulose) - Excessive film build
Shrinkage / Edge Mapping	- Substrate not fully cured - Subsequent coats applied too soon to preparatory materials - Excessive film thickness - Sanding paper too coarse
Striping / Banding	- Spray technique or PSI, material viscosity, or spray gun setup - Flash off time too short - Unsuitable thinner for application conditions
Pinholes	- Fiberglass bodies - Insufficient mixing of polyesters
Pinholes - Substrate Preparation	- Substrate insufficiently dried - Polyester material not sufficiently isolated - Pores not deeply sanded
Solvent Pop	- Solvent or air trapped in film escapes during drying leaving pop marks - Caused by incorrect spray viscosity, spray pressure, flash off time, or improper drying - Incorrect choice of hardeners and thinners
Runs	- Incorrect spray viscosity, flash off time, technique, or film thickness - Defective spray gun, incorrect gun setup, or spray pressure - Temperature of paint, substrate or room too low - Incorrect choice of hardener and/or thinner
Peroxide Staining from Hardener in	- Incorrect addition of hardener - Insufficient mixing

Polyester Body Filler	

Self-Check – 1	Written test

Information Sheet 3- Removing paint surface faults using compounds, polishes and glazes

paint surface faults	Prevention	Remedy
Acid Rain	- Avoid heavily contaminated atmospheres - Wash surface immediately after exposure to remove and neutralize the contaminants	- Neutralize the surface with mild detergent and water, thoroughly rinse - Sand, and polish - Sand, and repaint
Industrial Fallout	- Thoroughly wash vehicle immediately after exposure - Protect vehicle from exposure to such environments, cover if possible	- Clean surface with a suitable solution to dissolve the particles, neutralize, then polish - Remove particles, sand, and repaint
Water Spotting	- Follow technical recommendations - Ensure lids are tightly replaced after using hardeners	- Remove marks by polishing - Sand, isolate and repaint
Scratches	- Maintain and protect the finish with quality, non-silicone polish or wax - Rinse vehicle, never dry wipe the surface	- Polish - For severe scratches, sand and repaint
Environmental	- Immediately clean and neutralize the contamination with mild detergent	- Neutralize, sand, and polish

Contamination	and water before etching starts	- Neutralize, sand, and repaint
Polishing Marks	- Thoroughly dry top coat, if necessary re-bake - Use suitable polish and equipment 0 Use correct sandpaper - Use polish, free of ammonia	- Thoroughly dry topcoat and re-polish - Thoroughly dry topcoat, sand and repaint
Stonechip	- Careful driving habits - Proper film builds 0 Anti-chipping paint systems	- Sand and repaint with proper systems
Corrosion	- Remove all rust before applying coatings - Properly pre-treat metal substrates - Use correct coating materials	- Thoroughly remove all rust - Sand and repaint with proper systems
Orange Peel / Texture	- Follow recommendations on technical data sheets - Prepare and sand substrate correctly - Use recommended gun set up - Always use system thinners	- Sand and polish - Sand and repaint
Dirt Inclusions	- Proper vehicle/technician cleaning procedures, booth/spray equipment maintenance, material preparation, masking, etc.	- Sand, and polish - Sand, and repaint
Adhesion Problems with Plastics	- Clean and degrease properly - Temper parts before priming - Ensure proper solvents evaporation - Use suitable adhesion primer	- Remove damaged finish and repaint - Steam clean, sand, clean and repaint

Self-Check – 1	**Written test**

LG #46	LO #8- Rectify and touch up paint faults of clear over-base refinishing materials

Instruction sheet

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

- Determining Materials to restore paintwork to as new condition
- Rectified damaged a paintwork to blend with existing paintwork quality on Vehicle.
- Carrying out operation of rectification.

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 Materials to restore paintwork to as new condition
- Rectify damaged a paintwork to blend with existing paintwork quality on Vehicle.
- Carry out operation of rectification

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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 to restore paintwork to as new Condition

STANDARD OPERATING PROCEDURE

Spray Painting Plant DO NOT use this equipment unless you have been trained and inducted in its safe use and operation, and have been given permission to use this equipment.

PRE-OPERATIONAL SAFETY CHECKS

1. Ensure that risk assessment has been read. UQ risk assessment task ID # 1900.
2. Ensure that Compressed Shop Air UQ risk assessment task ID # 2128 has been read.
3. Ensure that Adhesives, Solvents & Coatings UQ risk assessment task ID # 35894 has been read.
4. Ensure no slip/trip hazards are present in workspaces and walkways.
5. Locate and ensure you are familiar with the operation of the ON/OFF starter and lockable E-Stop.
6. Ensure that the air inlet filters are clean and free from obstructions.
7. Ensure all source of ignition and miscellaneous items are removed from the booth before spraying.
8. Locate and check air isolation valve.
9. Check hoses and fittings are in good condition and are properly connected.
10. Check air pressure regulator and pressure gauge operates.

11. Ensure fume extraction filters aren't blocked or damaged and unit is on before beginning to spray.
12. Faulty equipment must not be used. Immediately report suspect plant.

OPERATIONAL SAFETY CHECKS

a. Ensure that the roller door is open as to ensure that adequate air flow is obtained for the fume extraction to operate effectively.

b. Adjust pressure regulator to suit work requirements.

c. Place the work piece in a position where the spray gun operator always has the spray between themselves and the extraction fan.

HOUSEKEEPING

1. Switch off the equipment, engage E-stop.
2. Dispose of waste paint\solvent in accordance with UQ Environmental Management Syetem Chemical Waste Management Procedure.
3. Turn off fume extraction.
4. Ensure solvents, paints etc. are stored in an approved storage facility.
5. Ensure all spray painting equipment is cleaned and stored away in the correct location.
6. Leave the equipment and work area in a safe, clean and tidy state after job is completed.
7. Lock up Spray Booth to avoid unauthorised access.

POTENTIAL HAZARDS

- Compressed Air
- Hazardous substances
- Eye injuries
- Explosions
- Spontaneous combustion
- Noise exposure

FORBIDDEN

- Spray painting without a compliant respirator

- Directing air stream at yourself or other people
- Operating near Ignition sources of any type
- Electrical equipment in spray booth
- Spray painting in windy conditions
- Mobile phones switched on in spray booth

Self-Check – 1	Written test

LG #47	LO #9- Mix clear over-base multi-layer pearl refinishing materials.

Instruction sheet

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

- Mixing materials using the appropriate method
- Carrying out mixing activities according to environmental requirements; industry, statutory and regulatory authority guidelines; WHS legislation; and workplace safe operating policies and procedures
- Mixing clear over-base multi-layer pearl paint colours..

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 Mixing materials using the appropriate method
- Carry out mixing activities according to environmental requirements; industry, statutory and regulatory authority guidelines; WHS legislation; and workplace safe operating policies and procedures
- Determine Mix clear over-base multi-layer pearl paint colours.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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- Mixing materials using the appropriate method

1.1 Introduction

Refinishing techniques used by vehicle makers have evolved over the years. From the days of hand painting the first Ford Model A, to spraying acrylic lacquer, to using basecoat/clearcoat finishes, vehicle maker refinishing has come full circle. With more vehicles being built everyday, vehicle makers are looking at ways to improve not only the final appearance of vehicles, but also ways to lessen the environmental impact of vehicle refinishing.

Nano-Particle

Clearcoat Nano-particle clearcoat uses nano technology. What is this? Nanotechnology is a scientific research field that uses very small microscopic particles (nano-particles) to build larger, complex structures. In the case of automotive clearcoats, the nano-particles are made of ceramic. When the nanoparticle clearcoat is applied, the ceramic nano-particles create a very hard, tightly cross-linked structure when the clearcoat cures, making it very durable.

Powder Clearcoat

Powder clearcoat is being used by BMW for the 5, 6, and 7 series vehicle models. Once the vehicle has the basecoat colour applied, the vehicle has a static charge applied to it. The powder-based clearcoat is then pumped into the spraybooth.

Self-Healing Clearcoat

Self-healing clearcoats are another new technology that is showing up on some vehicle maker products. Self-healing clearcoat has the capability to not only resist scratches, but also the ability to repair minor scratches on the surface. Depending on the depth of the scratch, the elastic resin based product can reflow when exposed to warm enough temperatures and repair minor scratches.

Figure 1 - Mercedes-Benz uses nano-particle clearcoat.

Figure 2 - This BMW M6 has powder clearcoat from the factory.

Repairing New Clearcoats

When it comes to performing refinishing repairs on vehicles with these new types of clearcoats, there are typically no special materials or recommendations required. These clearcoats can be sanded and scuffed with conventional methods currently used in the refinish process. Some paint makers are offering clearcoats for refinishing repairs that have similar characteristics to some new clearcoats being used by the vehicle makers, to aid with returning the vehicle finish as close to original as possible.

Clearcoats summary

As vehicle makers continue to produce new vehicles, the demand to create high gloss, durable finishes while limiting adverse affects on the environment will continue to drive changes in finishes and clearcoats. As technicians, the need to stay informed on these changes is critical as well.

Waterborne Basecoat

Now let's focus on the increasing use of waterborne basecoat, not only by the vehicle maker, but also in the collision repair facility.

Vehicle refinishing has evolved over the years. Today, vehicle makers are using refinishing products that not only improve finish longevity, but also have less of an environmental impact.

Waterborne Basecoat

Technology The use of waterborne basecoat has grown in an attempt to decrease the amount of volatile organic compounds (VOCs) being released into the atmosphere during the refinishing process. The EPA defines a VOC as any organic compound that evaporates readily into the atmosphere. Traditional basecoats are a solvent-based product. Solvent acts as both a reducer and a carrier so the basecoat can be applied to a vehicle body via spray gun. The VOCs in refinishing products are released into the environment when the solvents in the product evaporate during the curing process. EPA studies have shown that these VOCs contribute to depletion of the ozone layer, photochemical smog production, and adverse health effects.

Several vehicle makers have begun using waterborne basecoats during manufacturing. Instead of using petroleum-based resins and solvents in the basecoat, water-soluble solutions and resins are used. Specific waterbased reducers are used to act as a carrier for the waterborne basecoats. Waterborne basecoats still contain some solvents, although the solid content is higher than a solvent-based product. This results in less VOCs emitted during the spray application process.

Figure 7 - Waterborne basecoat waste material must be properly disposed.

Figure 8 - Air multipliers improve flash time of waterborne basecoats.

Fig:-

Spray gun cleaning equipment must also be specific for waterborne products. Waterborne cleaning material is not conventional thinner, but more of an alcohol-based product. The waste material must be collected and disposed of properly, similar to solvent-borne products.

Air filtration, such as incoming spray booth air and compressed air used for spraying must be extremely clean, as waterborne basecoats are more susceptible to contamination. One paint maker recommends intake air filters capable of filtering particles down to 10 microns in size, while compressed air for spraying initially should

be filtered to 5 microns, and then a second filter down to 0.01 microns, along with trapping oil and water vapor.

The other major equipment upgrade will be some way to increase air movement over the painted surfaces. Waterborne basecoat takes longer to flash when compared to solvent-borne basecoat. While it will flash from conventional spray booth airflow, the extra time needed may decrease efficiency. Items such as hand-held air multipliers (see Figure 8), spray booth-mounted ceiling fans, or spray booth-mounted air multipliers are all available from different product makers to help collision repair facilities gear up for transitioning to using waterborne basecoats.

Self-Check – 1	**Written test**

LG #48	LO #10- Apply clear over-base multi-layer pearl refinishing materials by spray-gun

Instruction sheet

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

- Identifying and observing requirements for environment for applying refinishing materials.
- Applying refinishing materials using recommended methods and intervals.
- Drying refinishing materials using approved methods and equipment.
- Removing paint surface faults by using compounds, polishes and glazes.
- Completing finish that meets specifications.
- Completing surface refinishing within approved time frames.

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:

- Identify and observe requirements for environment for applying refinishing materials.
- Apply refinishing materials using recommended methods and intervals.
- Dry refinishing materials using approved methods and equipment.
- Remove paint surface faults by using compounds, polishes and glazes.
- Complete finish that meets specifications.
- Complete surface refinishing within approved time frames.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
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5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 1-	Applying refinishing materials using recommended methods

Benefits of Automotive Clear Coats

- **Better appearance**. A clear coat finish gives a car a glossy appearance and deepens the pigment of a vehicle's base coat. It's a smart way to make your paintwork look new and shiny. It even looks better when applied on a newly washed car.
- **Protection.** Your vehicle's bodywork is prone to damage by dirt, stones, and other debris flung at your vehicle when you are on the road. Most car clear coats resist peeling and add an extra layer of protection against UV rays and corrosion on the paintwork.
- **Hide minor scratches.** It's almost impossible to avoid minor scratches on your paintwork. You shouldn't have to worry about that as most clear coats are known to buff out minor scratches and dents on a vehicle. They also hide minor spots caused by acid rain, bird droppings, and hard water spots.
- **Increase its value**. If you are thinking of selling your car, it's a good idea to spice it up with a clear coat so you can get more from its look. Most people buy with their eyes, and it's a cheap way to give an old car a new look.

Types of Automotive Clear Coats

Topcoat Clear Coat

Topcoat clear coats are typically applied as a final coat over a colored base paint on your vehicle. These coats are easy to polish, have great depth, and provide a glossy appearance. Topcoats also dry quickly.

Glamour Clear Coat

Glamour clear coats take longer to dry and, therefore, allow you to do more leveling on the vehicle's body. You can heat up the coat to speed up the drying process. Glamour coats are also more resistant to moisture.

Turbo Clear Coat

Turbo clear coats are ideal for collision repairs. They help cover up dents, chips, and scratches and require more polishing to get a glossy finish. They dry fast, and buffing can be done to the coat shortly after.

Higher Solid Clear Coat

Higher solid coats provide a thicker film over the paintwork. For that reason, they take longer to dry as the solvent takes time to fully evaporate. Higher solid coats are also the most expensive.

Stage Repairs

Repairing 3-Stage colors

Toyota recently createda new seriesof 3 stagecolors for its complete Toyota recently created a new series of 3-stage colors for its complete model range. This addition is seen as an enhancement to vehicle selection through color effects.

Repairing these 3 layer effect colors can successfully achieved by following various procedures and processes and the use of Toyota Co-Brand products. Always allow sufficient time for 3-stage repairs and never “rush” the job through the spray booth.

FIG:-- Repairing these 3 layer effect colors -

1. The first step is as always the identification of the color shade. 3-stage colors appear on the Wintoy system with 2 formulations (an underground color and usually a pearl color). These 3 stage colors are also indicated as “3-stage color” on the formulation and this signals the need to produce 2 mixes for the color match, plus over coating with clear coat.

Fig:- The 3-stage colors and it’s layering

2. When estimating the repair of 3-stage colors, remember to recover the cost for two equal quantities of basecoat color, mixing time of the colors and to adjust your pricing to accommodate this additional cost to the insurance company or the customer for retail sales.Layer 1 Underground color x 1.5 Coats Primer, filler or sanded paintwork.
3. After mixing, it is essential to create a series of color let-down panels in order to establish an accurate color match, by applying both the underground color and the pearl layers, to identify the number of coats required to reach the effect. In general, the underground color can be applied in a one-visit layer, with the pearl layer applied in either a one visit or in multiple layers. All color cards will need to be over coated with clear coat to accurately view the color shade.

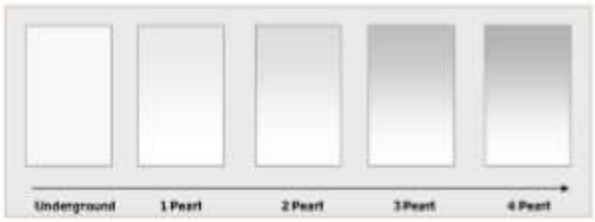


FIG:-

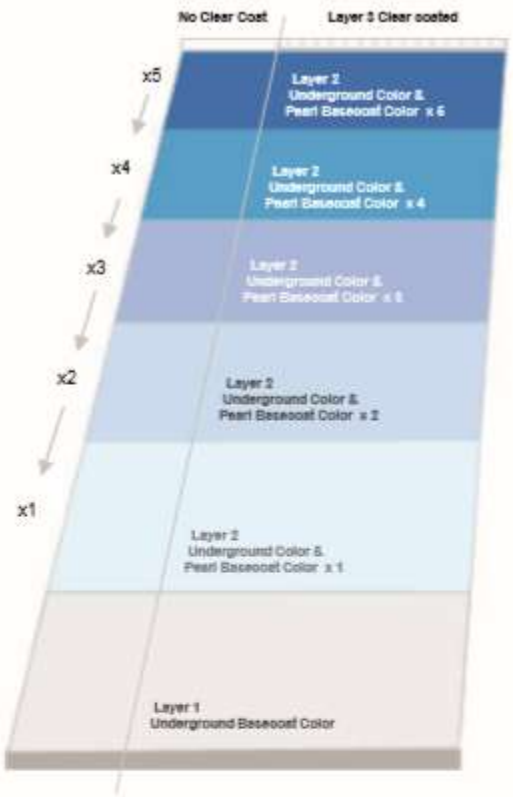
4. Always view the color match to the vehicle in natural daylight. The let down cards will help establish the size of the repair zone, the number of coats required and will help prepare you for a successful application ensuring a right “first time process”.

Create a Let-Down Panel

The first step in repairing Toyota / Lexus 3-stage colors is to create a let-down panel which will help identify the number of mid-coats required to match the original finish.

This can be created on individual spray cards or on a color card / plate.

1. Apply the ground color basecoat to the entire panel.
2. Mask the panel in 5 sections leaving only the first section exposed.
3. Apply a medium coat of pearl basecoat over the exposed underground color.
4. Remove the masking from the next section & coat the exposed section & the original section with its second Pearl coat.
5. Repeat step 4 to the end of the panel coating each exposed section in the reverse direction as shown.
6. Leave the underground color exposed in section 6.
   This process will exhibit the change in color with multiple layers & help identify the number of layers required to "mimic" the OEM coating.



7. After drying the panel apply clear coat to ¾ of the panel leaving a small section without clear to establish any color shift. This will aid your application during the painting process.
8. After drying completely, the panel can be compared to the vehicle in natural daylight or with the aid of a 3M PPS lamp. Select the best match & prepare to replicate the number of layers and application control on the actual repair.

Repair Process (partial panel repair)

Partial repairs should be prepared in the usual manner up to and as far as primer / filler sanding.

Whenever possible avoid sanding through the primer as extra efforts will be needed to cover break-through areas with the underground color. If ibl i il l dT t U i lP i lf possible use a similar coloured Toyota Universal Primer on the repair zones.

1. Small panel repairs where the color can be contained within in one panel can be easily processed. Prepare the damage in the usual manner with regard to primer / filler etc and sand the repairs

P2000regard to primer / filler etc and sand the repairs with P400 then P500. The adjacent parts can then be matted with P2000 on a damp soft-back pad to provide adhesion for the blend area and the clear coat. Re-clean and mask ready for color.

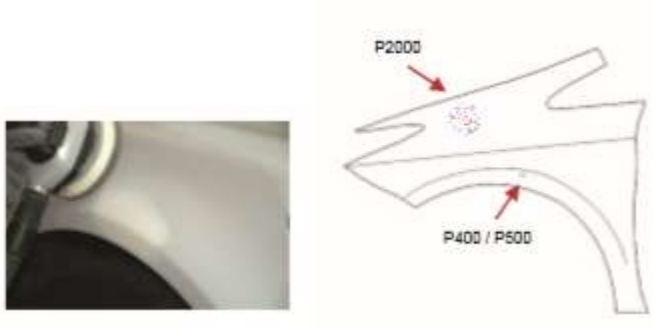


FIG:-

2. Mix the underground color with Toyota Basecoat Special Additive PZ469-A0004-05 according to the TDS and apply to the primed area extending slightly to give a soft-edge blend zone. Dry according to the TDS. After drying the underground color will be hard and can be tack-wiped prior to over coating with the pearl color layer and clear coat.

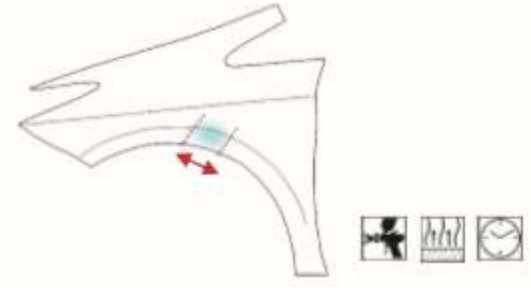


FIG:-

3. Mix the Pearl color according to the TDS and apply from the furthest outward point (starting with the blend first) then, work inwards in the direction of the repair. Spray to cover as required according to the let-down cards cards. Allow to flash off before drying according to the TDS. Avoid using a tack-wipe as the pearl basecoat may be easily damaged.

4. Mix Toyota Clear Coat according to the TDS and apply to the entire panel. Dry according to the TDS.Toyota Co-Brand Technical , After drying the clear coat dust particles or application defects can be removed by fine sanding and polishing.

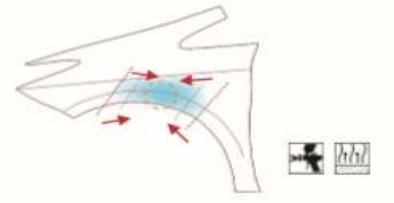


FIG:-

Repair Process (new replacement parts)

New be primed and color coated & clearcoated New replacement parts should be primed and color coated & clear coated on the inner edges before fitting to the vehicle. Whenever possible parts and bumpers should be painted on the vehicle to ensure an accurate color match. Allow extra space to blend the underground color and the pearl color. Thisrepairexamplewillconsistof a twostepdrying process This repair example will consist of a two step drying process to eliminate the potential risk of soft basecoat film build caused by thick multiple layers (to achieve the color match).

FIG:-

1. Primed areas can be sanded with P400 / P500. Blend zones can be sanded with P2000 with a damp a soft-backed pad. Re-clean the parts before and after masking.

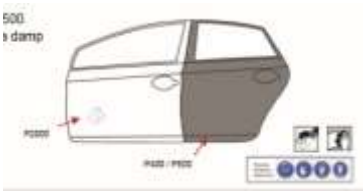


FIG:-

2. Mix the underground color according to the TDS and apply to the primed area extending slightly into the adjacent parts to give a soft-edge blend zone. Dry until matt with blowers.

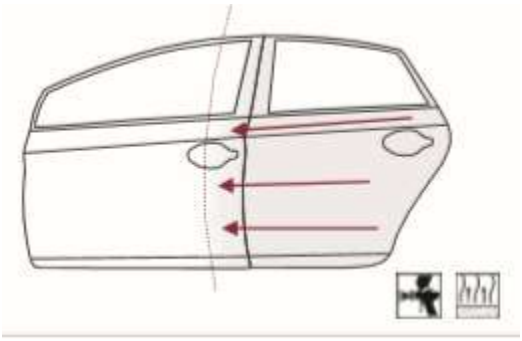


FIG:-

3. Mix a Toyota 2K Clear and apply a thin closed coat over all parts and dry according to the TDS. This will provide a good foundation for the Pearl application and clear coat layer.

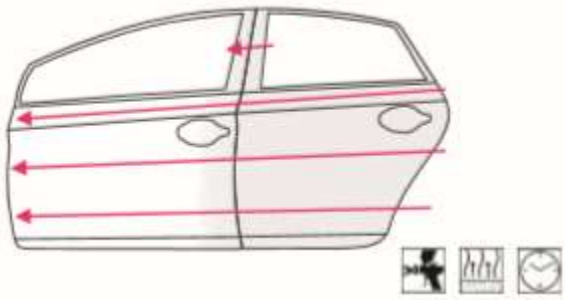


FIG:-

4. Sand the dried and cooled clear coat with P2000 with a damp soft-backed pad. Take care to only matt the surface and do not sand through the clear coat layer the clear coat layer. Clean with Toyota Panel Degreaser then reclean with Toyota Hydro Cleaner on a DuPont Sontara® lint free wipe.

FIG:-

The following information will help in understating and executing a right first time repair.

For let-down panels remember:

- Use the information gathered in creating a let-down panel to establish the best process & number of layers needed to mimic the OEM color & finish.
- A separate let-down panel must be made for each OEM color.
- Store the let-down panels for future use and record the vehicle details.

When applying the Pearl color:

- Maintain the uniformity of the Pearl particles in the spray gun, by gently agitating if left unstirred for long periods.
- Use the same application distance & inlet air pressure (set-up) for creating the panel as you will use for the actual repair.
- Apply medium layers of Pearl basecoat. Avoid over wetting or dry dusty spray.
- Due to possible application fluctuations, never use a let-down panel created by someone else. Always create your own let-down panel.

When performing the actual repair:

- Clean the area well as dirt inclusions are a major enemy of a 3-stage repair.
- Plan the application routine and identify your maximum boundary points.
- Never rush a 3-stage repair. Always allow sufficient time & avoid pressure to the job in a short time.
- Remember to allow enough space to complete the task in hand.

Self-Check – 1	**Written test**

LG #49	LO #11- Mix water based paint colours

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Mixing materials using appropriate method. • Carrying out mixing activities according to environmental requirements; industry, statutory and regulatory authorities' guidelines; WHS legislation and workplace safe operating policies and procedures • Mixing water-based paint colours without causing damage system Components. 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 Mix materials using appropriate method. • Carry out mixing activities according to environmental requirements; industry, statutory and regulatory authorities' guidelines; WHS legislation and workplace safe operating policies and procedures • Determine Mixing water-based paint colours without causing damage system Components.
Learning Instructions:

Read the specific objectives of this Learning Guide.

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Information Sheet 1- Mixing materials using appropriate method.

Introduction

Water-based Paint Different Can Be Good

Water-based automotive paints mix, spray, and dry differently from solvent-based products. Read on to learn more about key performance differences and how you can get excellent results using water-based coatings.

Water-based and solvent-based paint

Technologies are similar in their core composition. Both contain pigment for color, a binder to form the paint film, and a carrier that transports the pigment and binder through the spray gun onto the surface being painted.

Both paint types typically use similar pigments. Using only the best pigments helps each achieve OE color matching objectives, and helps optimize light refractivity. The binders in both water-based and solvent-based paints are variations of acrylic technology, to give the durability needed for an automotive exterior coating. The key difference is the carrier: solvent or water. When it's water, painters must adjust their mixing, spraying, and drying techniques.

Mixing

For water-based paint, the painter adds water instead of solvent at the mixing step in the process. There are versions of water-based paint that are pre-mixed with water. Consider, however, that if a pre-mixed product gets below 32 deg. F., ice crystals form in the paint, rendering it unusable, even after the ice melts. If your shop is in a part of the country that has very cold winters, and the paint room is not heated 24 hours a day, an overnight cold snap can cause a costly loss of your paint inventory.

Fig:----The VOC grams per liter on the waterborne product label can be entered into your electronic scale, which will calculate the exact amount of VOCs generated by the quantity of paint that you mix.

Spraying

As the water evaporates after spraying waterbased paint, latex molecules are attracted to each other, creating a strong chemical bond (polymer chains) as the particles join together. Once the water has fully evaporated, water-based paints are thermoset. The surface is permanent, and the only potential repair is to sand it and re-spray.

Avoiding the need for re-work is easy. Paint manufacturer worksheets spell out step-by-step procedures, such as how to select the spray nozzle opening, set spray pressure and the number of coats, and the way to check the dry layer thickness. Follow the paint manufacturer instructions for these and other painting steps, and you are on the way to a great water-based finish.

Volkswagen-approved paint manufacturers have developed water-based paints that offer outstanding color match to OEM finishes. Study the manufacturer's instructions to help you develop a plan before you begin spraying. For example, for some colors there may be special instructions about selecting a substrate color that is similar to that of the basecoat. There may be tips about how best to apply a pearl or other translucent finish. Following the manufacturer instructions are critical to achieving the desired result.

Use only primer that is approved for water-based paint systems. Each primer has a different "tooth," or ability to grip the surface. Once you have selected and applied the

appropriate primer, observe the recommended flashoff time. If you apply the basecoat before the primer has dried, it may lead to a reduction of gloss and degradation of color.

Water-based Paint

Flash-off between the basecoat and clear coat typically involves raising booth temperature to approximately 176 deg. F. until the paint has skinned over. However, the vehicle body temperature must be reduced back down to 104 deg. F. before the clear coat can be applied. If the body is too hot, the clear coat will dry before it has time to completely flow-out, resulting in the always undesirable ”orange peel.”

Different color substrate? Consider using a tinting primer or sealer. Worried that a color may not cover well? Don’t. Technological advancements have come a long way since the introduction of waterbased paints, and today’s products offer excellent coverage. Don’t make the mistake of spraying heavily to compensate for an assumption of low coverage. Also, don’t spray too wet in an attempt to get two-coat coverage in less time. The moisture in an excessively heavy coat may not evaporate fully before you spray the next coat, and can lead to blistering and adhesion problems.

Instead, thin the paint per the paint manufacturer’s mixing instructions. Spray a thin first coat for adhesion, flash-off, then apply up to two finish coats, depending on the product. If after drying you have a problem, sand and re-paint.

Solvent cures differently than water-based paints

The solvent in oil-based paints contains a variety of chemical agents that cure at different rates. This allows the solvent to vaporize evenly, and helps give the cured paint a uniform film thickness and smooth surface finish.

It also means that solvent-based paints tend to dry with a minimal amount of adjustment of conditions in the booth. You could add heat to the booth on really cold days, but with solvent-based paints, most of your decision-making is done after choosing the correct reducer and spray gun settings.

Fig:- ---Solvent cures

Differences in formulation of paints alters their chemical properties and performance, and makes compatibility between paint products a big question mark. To optimize the results of your job, use products from within the same brand, including primer, filler, distilled water, hardener, tints, topcoats, and clears.

Water is simple

Water-based paint contains only 10% solvent, versus up to 75% in solvent-based coatings. Of course, you still can compensate for different booth temperatures by adding slower or faster thinner/ reducer, just as you did with solvent-based paints.

But water is simple. Unlike solvent, it has no builtin chemical agents to help manage its vaporization rate. So, you have to manage evaporation as part of the painting process.

Water that has not completely evaporated before you spray the next color or clear coat can become trapped under the acrylic latex as the paint or clear coat dries. This causes swelling or blistering of the coatings above the trapped moisture, or worse, loss of adhesion between layers in the paint film.

Fig:------ HVLP spray gun

The higher solids content of water-based paint requires a different atomization rate than solvent based paint in order to flow out and form a smooth finish. The letters “WSB” on this HVLP spray gun tip stand for “water solvent borne.” It alerts you that this air cap, fluid tip and needle provide the correct atomization to give water-based paint the desired flow characteristics.

To prevent topcoat/clear coat swelling or blistering, allow time for water to evaporate after each step. If you must wet sand to remove a problem, allow approximately two hours at 68 deg. F. for water to evaporate. Your paint technical data sheet will tell you how much time to allow for flash-off between basecoat, additional coats, and clear. If in doubt, you can use a non-contact infrared thermometer to check whether the basecoat is dry enough to spray the next coat.

First, take a temperature reading of an area not in the freshly-repaired panel, for use as a baseline measurement. Next, measure and record the temperature of the just-painted panel. As water evaporates from the film, the panel will cool measurably. Check the temperature of the new paint every five minutes, until it has warmed back up enough to match the temperature of the panel that you did not paint. When a freshly-painted panel is as warm as nearby unrepaired areas, you can feel comfortable that enough water has evaporated to make it safe to spray the next coat.

Refer to the manufacturer’s paint data sheet, and always follow the manufacturer’s film thickness instructions. Just add air Given the same booth temperature, humidity, and air movement, water-based paint may take longer than solvent-based product to flash off, or to dry enough to spray a topcoat over your base. If it is also a high-humidity day, you

may need not only to select a fast reducer when mixing the paint, but also to increase airflow in the booth during the drying stage. In a market area that often gets afternoon rain showers during the summer, experienced painters schedule water-based spraying for the morning whenever possible.

To rev up water-based paint evaporation, add more airflow. You can reduce a high humidity level by increasing booth temperature, but only up to your tolerance for heat while you work. Higher temperature will help, but not as much as increased air flow.

We do not want just more of the same downdraft flow. You need turbulent air, and that requires air flowing in multiple directions. The air around the vehicle in a downdraft booth gets saturated with moisture from evaporation. You can reduce that saturation by introducing additional airflow from a different direction than the laminar, or downdraft flow.

Portable and stationary air blowers, and infrared or regular heaters all are acceptable drying equipment.

Fig:- Store and mix water-based paints only in plastic or inner-coated tin containers to avoid corrosion contamination problems.

Is It Dry Yet?

Water-based paint formulations typically contain more solids – 20% versus 15% pigment, metallic, or pearlescent particles in solvent-based coatings. The higher solids content of water-based paint offers very good hiding power. Once you master the application process, you should enjoy a significant reduction in both the amount of paint required and in labor time per job.

With the proper air flow, some water-based paint dries faster than solvent-based. The big benefit can be faster flash times, which leads to shorter cycle time and higher booth throughput. Painters must pay more attention however, to details that affect how the pigment flakes settle in the paint film. Chief among these are how wet you spray, and how you manage the amount of time it takes for the paint to dry.

Paint gets some of its color from metallic flakes or pearls in the cured film. Gravity makes the flakes tend to turn from a horizontal to a vertical orientation as they sink in the paint film. Before the paint is completely dry, the flake has flattened, or “floped” into a horizontal position.

Controlling the flop

With both flake and pearl particles, you control the color appearance by managing the rate of evaporation so that the color flakes are at the preferred angle and desired depth in the film by the time the paint has dried. In the case of pearl finishes, proper mixing and drying results in the pigment pearls all settling at the desired depth in the film. This gives the repaired panel a consistent color depth or saturation, so it has the same tone from edge to edge.

The paint manufacturer knows the correct amount of drying time to lock the flakes in at the desired depth and angle. Refer to the water-based paint application instructions from Volkswagen (or the paint data sheets) for details for the paint you plan to use.

Not too hot, not too cold

You cannot guarantee that your booth will always be in the ideal “Goldilocks” range of temperature, humidity, and air flow to support the perfect paint curing result. You can however, control your painting technique to compensate for the impact of weather variations on finish quality.

Follow paint manufacturer instructions about selection of primers and sealers, and how to adjust spraying times between coats to compensate for the different evaporation rates of various water-based paints. The benefits are many. You can achieve the desired final appearance with water-based in less time than with solvent-based paints. You can enjoy a high level of color match. Thanks to the bonding of molecules in latex paints, you will produce a durable long-term finish. And that’s better than a bowl of porridge any day.

Fig:- ----Water-based Paint

Self-Check – 1	Written test

LG #50	LO #12- Apply water-based refinishing materials by spray-gun.

Instruction sheet

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

- Identifying and observing requirements for environmental applying refinishing materials.
- Applying refinishing materials using recommended methods and intervals
- Drying refinishing materials using approved methods and equipment
- Removing paint surface faults using compounds, polishes and glazes.
- Producing finish that meets the specification.
- Completing surface refinishing within approved time frames

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:

- Identify and observe requirements for environmental applying refinishing materials.
- Apply refinishing materials using recommended methods and intervals
- Dry refinishing materials using approved methods and equipment
- Remove paint surface faults using compounds, polishes and glazes.
- Produce finish that meets the specification.
- Complete surface refinishing within approved time frames

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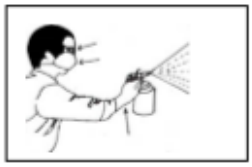
Information Sheet 1- Applying refinishing materials using recommended methods and intervals

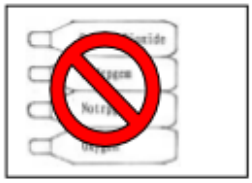
Introduction

A High pressure spray gun is ideal for refinishing a classic car or a wide variety of home improvement projects. This high pressure paint sprayer features air, fluid and fan controls to offer a wide variety of patterns. It is supplied with a 1000 cc suction feed aluminum cup.

Important Safety Instructions

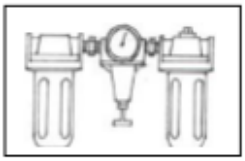


1. For toxic vapors produced by spraying certain materials can create intoxication and serious damage to health. Always wear safety glasses, gloves and respirator to prevent the toxic vapor hazard, solvent and pointing paint coming into contact with your eyes or skin.



2. Never use oxygen, combustible or any other bottle gas as a power source or would cause explosion and serious personal injury.
3. Fluid and solvent can be highly flammable or combustible. Please Use the tool only in well-ventilated area, and avoid any ignition sources, such as smoking, open flames and decrial hazard.

4. Disconnect paint gun from air supply hose before doing tool maintenance and during non-operation, for emergency stop and prevention of unintended operation, a ball valve near the gun to air supply is recommend.
5. Use clean, dry and regulate compressed air rated at 3.0~4.0bar, never exceed maximum permissive operating pressure 8.3 bar(120psi).



6. Never use homogenate hydrocarbon solvent, which can chemically react with aluminum and zinc parts and chemically compatible with aluminum and zinc parts.
7. Never point gun at yourself or others at any time.
8. Before operating the paint gun, ensure all the screws & caps are securely tightened to prevent leaking.
9. Before painting, make inspection for free movement of trigger and nozzle to insure tool can operate well.
10. Never modify this paint gun for any applications. Only use parts, nozzles and accessories recommended by the manufacturer.

Instructions for Operation Preparation

1. After unpacking the paint gun, inspect carefully for any damage that may have occurred during transit. Make sure to tighten fittings, bolts, etc., before putting unit into service.

2. Thoroughly mix and thin paint in accordance with the paint manufacturer's instructions. Most materials will spray readily if thinned properly.
3. Strain material through filter, cheese cloth or a paint strainer.
4. Fill the canister about ¾ full and start the air compressor. WARNING Do not exceed Maximum Pressure of Spray Gun or any other parts in the compressor system.
5. After connecting the gun to the air supply, please make sure that the fluid cap, container and air hose have been connected tightly to the spray gun.
6. Set up a piece of cardboard or other scrap material to use as a target and adjust for best spray pattern. WARNING Never aim or spray at yourself or anybody else as it could cause serious injury.
7. Test the consistency of the material by making a few strokes on a cardboard target. If material still appears too thick, add a small amount of thinner. THIN WITH CARE! Do not exceed paint manufacturer's thinning recommendations.

Adjustment

The desired pattern, volume of fluid output and fine atomization can easily be obtained by regulating the Pattern Adjusting Knob, Fluid (PAINT) Adjusting Knob and Air Adjusting Knob. Adjusting pattern: Turning the Pattern Adjusting Knob to the right until tight will make spray pattern round and turning it to the left will make spray pattern ellipse. Adjusting volume of fluid output: Turning the Fluid (PAINT) Adjusting Knob clockwise will reduce the volume of fluid output and turning it counter-clockwise will increase fluid output. Adjusting air volume: Turning the Air Adjusting valve clockwise will reduce the air volume and turning it counter-clockwise will increase the air volume.

Operation

1. Begin spraying. Always keep the gun at right angles to the work.
2. Keep the nozzle about 6 to 12 inches from the work surface. Grip the gun keeping it perpendicular with spraying area then move it parallel for several times. Stopping gun movement in mid-stroke will cause a buildup of paint and result in runs. Do not fan the gun from side to side while painting. This will cause a buildup of paint in the center of the stroke and an insufficient coating at each end.
3. Trigger the gun properly. Start the gun moving at the beginning of the stroke BEFORE SQUEEZING THE TRIGGER and release the trigger BEFORE

STOPPING GUN MOVEMENT at the end of the stroke. This procedure will blend each stroke with the next without showing overlap or unevenness.

4. The amount of paint being applied can be varied by the speed of the stroke, distance from the surface and adjustment of the fluid control knob.
5. Overlap strokes just enough to obtain an even coat. NOTE: Two thin coats of paint will yield better results and have less chance of runs than one heavy layer.
6. Use a piece of cardboard as a shield to catch overspray at the edges of the work to protect other surfaces.

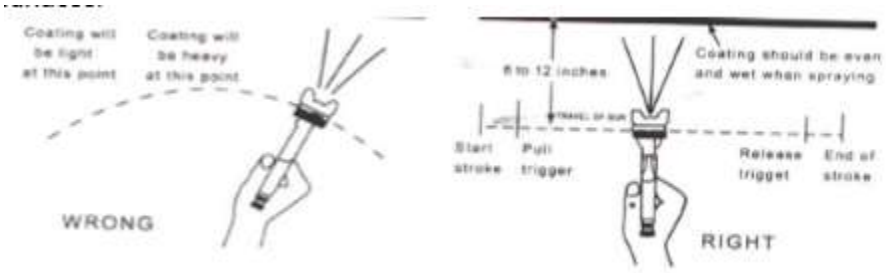


Fig:-

Maintenance

Incomplete cleaning could cause function failures and a degradation of the fan form.

1. Remove any remaining paint by pouring it into another container.
2. Disassemble the spray gun making sure to remove the needle before disassembling the nozzle to avoid damage to the housing of the nozzle closure.
3. Clean all the paint passages and the nozzle. Clean the other components using a brush soaked in solvent.
4. Reassemble the spray gun and spray a small quantity of solvent to eliminate all the residues in the paint passages.

Storing

When not using spray gun, turn the fluid adjustment knob counter-clockwise to open which will reduce spring tension on needle fluid tip. z Spray gun MUST BE well cleaned and lightly lubricated.

Table:---Troubleshooting

Symptom	Problems	Solution
Fluttering or spitting 	1. Material level too low. 2. Container tipped too far. 3. Loose fluid inlet connection. 4. Loose or damaged fluid tip/seat. 5. Dry or loose fluid needle packing nut. 6. Air vent clogged	1. Add material into container. 2. Hold more upright. 3. Tighten. 4. Adjust or replace. 5. Lubricate and or tighten. 6. Clear vent hole.
Pattern is arched. 	1. Worn or loose Fluid nozzle. 2. Material buildup on Air cap.	1. Tighten or replace Fluid nozzle. 2. Remove obstructions from holes, but don't use metal objects to clean it.
Pattern is not evenly spread. 	1. Material buildup on Air cap. 2. Fluid nozzle dirty or worn.	1. Clean or replace Air cap. 2. Clean or replace Fluid nozzle.
The center of pattern is too narrow. 	1. Material too thin. 2. Atomization air pressure too high.	1. Regulate material viscosity. 2. Reduce air pressure.
Pattern width of fan shape is too narrow 	1. Material too thick. 2. Atomization air pressure too low.	1. Regulate material viscosity. 2. Increase air pressure.
Air leaking from air cap without pulling trigger	1. Sticking air valve stem 2. Contaminate on air valve or seat 3. Worn or damaged air valve or seat 4. Broken air valve spring 5. Bent valve stem	1. Lubricate 2. Clean 3. Replace 4. Replace 5. Replace
Fluid leaking from packing nut	1. Packing nut loose 2. Packing worn or dry	1. Tighten, but do not restrict needle 2. Replace or lubricate (use non-silicone oil)
Excessive overspray	1. Too high atomization pressure 2. Too far from work surface 3. Improper stroking (arcing, gun motion too fast)	1. Reduce pressure 2. Adjust to proper distance 3. Move at moderate pace, parallel to surface.
Will not spray	1. No pressure at gun 2. Fluid control not open enough 3. Fluid too heavy	1. Check air lines 2. Open fluid control 3. Thin fluid or change to pressure feed system.

LG #51	LO #13- Clean-up 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 materials according to workplace sustainability Practices.
- Removing and disposing waste materials according to statutory and workplace procedures
- Cleaning spray equipment according to manufacturer and component supplier and workplace policies and procedure
- Cleaning and inspecting work area according to workplace procedures.
- Identifying and tagging faulty equipment according to workplace procedures
- Completing operator maintenance according to supplier specifications and workplace procedures

Maintaining tools according to 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 materials according to workplace sustainability Practices.
- Remove and dispose waste materials according to statutory and workplace procedures
- Determine Clean spray equipment according to manufacturer and component supplier and workplace policies and procedure
- Clean and inspect work area according to workplace procedures.
- Identify and tagg faulty equipment according to workplace procedures
- Determine Complete operator maintenance according to supplier specifications and workplace procedures

- Determine and maintain tools according to workplace procedures.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below.

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- Maintaining tools according to workplace procedures.

Introduction

Cleaning and Maintaining your Painting Equipment

In carrying out a practical and efficient painting job, it is common to use painting equipment. These devices, thanks to their design, facilitate the application of paint on countless types of surfaces saving time and effort to users.

Painting equipment must be carefully maintained and cleaned, due to the nature of its function. In complying with proper maintenance, it is essential that this type of machine is used correctly.

In this publication, we will be detailing the points and criteria you should consider to keep your painting equipment in good condition, and thus extend its useful life.

An Adequate Use of the Painting Machine

These are some of the primary recommendations for the proper use of painting equipment:

- Before using the material, you must read the user manual thoroughly.
- Familiarize yourself with all controls and the operation of the equipment.
- Persons trained in its use may only use the appliance.
- The machine should only be used in dry environments.
- In case the equipment presents some failure or malfunction, you must not use it.
- Painting equipment should only be used to perform the function for which it was designed.
- You must not allow children to play with the machine or make improper use of it.
- Use only accessories marked by the manufacturer.

Cleaning of Painting Equipment

- In maintaining the machine, you must make sure it is kept clean.
- Before carrying out any cleaning activity of the appliance, you must disconnect it from the electrical network, for your safety and that of the equipment.
- After completing the painting work, turn off the appliance motor.

- Squeeze the trigger so that the liquid left in the suction tube returns to the cup or container.
- Unscrew or disconnect the cup from the appliance, and empty it of any remaining paint.
- Use a brush to pre-clean both the paint container and the feeding tube.
- Place water or solvent in the cup and screw or attach it to the appliance. Only use solutions with a flash point higher than 21°C.
- Connect the motor and spray the solvent or water onto a cloth or container.
- Repeat this process until the solvent or water comes out completely clean.
- Turn off the equipment again.
- Empty the container and make sure that the union of the glass is free of residues and without any damage.
- Clean the exterior of the gun and container using a cloth impregnated with a solvent or water.
- Remove the cap and nozzle from the gun, and clean them using a brush with water or solvent.
- Finally, allow all components to dry completely before storing.

Maintenance of Painting Equipment

- Changing the air filter if it is dirty is essential for the maintenance of the machine.
- You must remove the air filter removing the corresponding cover, replace the filter and replace the lid. Check that both the cap and the screen are in the right place.
- Never use the appliance without the air filter. It could cause dirt to be absorbed by the engine, impairing the operation of the painting equipment.
- By following these things, you can carry out the correct cleaning and maintenance of your painting equipment.

Maintenance of equipment in the workplace

Regular maintenance of equipment is an important and necessary activity. The term 'maintenance' covers many activities, including inspection, testing, measurement,

replacement and adjustment, and is carried out in all sectors and workplaces. It has a vital role to play in reducing the risk associated with some workplace hazards and providing safer and healthier working conditions. Insufficient/inadequate maintenance can cause serious (and potentially deadly) accidents or health problems. PUWER (the Provision and Use of Work Equipment Regulations 1998) states that 'all work equipment be maintained in an efficient state, in efficient order and in good repair.' Machinery that has a maintenance log needs to be kept up to date and maintenance operations need to be carried out safely.

Fig;- ----Regular maintenance of equipment

There are two types of maintenance: routine maintenance is planned and focuses on preventing future problems, while corrective maintenance is reactive and happens when equipment goes wrong and needs to be fixed.

Maintenance can be a high-risk activity. According to Healthy Working Lives, it is estimated that 25-30% of all manufacturing industry deaths in Britain result from maintenance activity. This activity is also associated with exposure to hazards that cause health problems such as respiratory diseases, musculoskeletal disorders and skin diseases. There can also be difficulties in accessing equipment that requires maintenance and this may require work at height or confined space entry.

Maintenance is also heavily subcontracted by organisations that consider maintenance to be a specialised activity which does not belong to their core business or which requires expertise not present in the company. In some environments, this may

increase risk as the outsourced workers may be unfamiliar with the working environment.

A risk assessment should be carried out before any maintenance work begins and work should be planned. It is best practice to keep a maintenance log which is regularly updated. Workers should be involved in the risk assessment process as those carrying out a maintenance task are often in the best position to identify hazards and the most efficient ways of dealing with them. The work area should be made safe (e.g. preventing unauthorised access) and the people performing the maintenance work should be equipped with the proper tools and equipment to do the work safely (including personal protective equipment – PPE). The work should be monitored and safe working procedures need to be followed at all times. The process needs to end with checks to ensure that the job has been completed satisfactorily.

Reference Materials

WEB ADDRESSES

AKNOWLEDGEMENT

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

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