Vehicle Body Repairing and Painting NTQF Level-II

Learning Guide -13

Unit of Competence: - Apply Paint Removal Methods

Module Title: - Applying Paint Removal Methods

LG Code: EIS VRP2 M05 LO01-LG-13

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LO 01: Prepare for work

Instruction Sheet	Learning Guide #-13

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

- Using Work instructions to determine job requirements
- Reading and interpreting Job specifications
- **observing Workplace Health and Safety (WHS)** requirements
- selecting and inspecting **Materials** for quality
- identifying and checking hand, power tools and safety equipments
- Determining procedure to minimize waste materials
- identifying procedures for maximizing energy efficiency while completing the job.

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to –**

- Use work instructions to determine job requirements
- Read and interpret Job specifications
- **observe Workplace Health and Safety (WHS)** requirements
- select and inspect **Materials** for quality
- identify and checking hand, power tools and safety equipments
- Determine procedure to minimize waste materials
- identify procedures for maximizing energy efficiency while completing the job.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1,2,3,4,5,6” in page 7,12,34,39,42,49,50 respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work.
6. If you earned a satisfactory evaluation from self check proceed to next learning activity. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Using Work instructions

1.2 Work instructions

Information about the work

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

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

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

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

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

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

Difference Between Work Instructions and Procedures

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

Procedures describe:

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

Work instructions describe:

- How the activity is performed.

Purpose of Work Instructions

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

Steps to Writing Work Instructions

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

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

Introduction to Body material type

The choice of materials for a vehicle is the first and most important factor for automotive design. There is a variety of materials that can be used in the automotive body and chassis, but the purpose of design is the main challenge here. The most important criteria that a material should meet are lightweight, economic effectiveness, safety, recyclability and life cycle considerations. Some of these criteria are the result of legislation and regulation and some are the requirements of the customers. However, some of these criteria may be conflicting and therefore the optimization comes into business here. In the beginning we start with explaining each criterion and then continue to introducing several materials and where they can be used.

Requirements of the materials in automotive design

1. Lightweight

As there is a high emphasis on greenhouse gas reductions, reduction of emission and improving fuel efficiency this criterion is most important one for an automotive company. Lightweight materials can improve fuel efficiency more than other factors. Experiments reveal that 10 percent of weight reduction can lead to 6 to 8 percent improvement in fuel usage. Weight reduction can be obtained by three ways:

- Replacing materials of high specific weight with lower density materials without reducing rigidity and durability. For example replacement of steel with aluminum, magnesium, composites and foams.
- Optimizing the design of load-carrying elements and exterior attachments so as to reduce their weight without any loss in rigidity or functionality.
- Optimizing the production process, such as reducing spot welding and replacing new joining techniques.

But the single main obstacle in application of lightweight materials is their high cost. Yet the weight reduction is still the most cost-effective means to reduce fuel consumption.

2. Economic effectiveness

One of the most important consumer driven factors in automotive industry is the cost, that determines whether any new material has an opportunity to be selected for a vehicle component. Cost includes three components: actual cost of raw materials, manufacturing value added, and the cost to design and test the product.

Aluminum and magnesium alloys are certainly more costly than the currently used steel and cast irons. Since cost may be higher, decisions to select light metals must be justified on the basis of improved functionality. Meanwhile the high cost is one of the major obstacles in use of the composite materials.

3. Safety

The ability to absorb impact energy and be survivable for the passengers is called “crashworthiness” of the structure in vehicle. At first two concepts in automotive industry should be considered: crashworthiness and penetration resistance. In the more accurate definition of crashworthiness, it is the potential of absorption of energy through controlled failure modes and mechanisms. However, penetration resistance is concerned with the total absorption without allowing projectile or fragment penetration.

4. Recycling

The most important concerns in industries such as automotive, are ‘protection of resources’, ‘reduction of CO2 emissions’, and ‘recycling’. There are some guidelines in European Union and Asian countries about this issue. While the United States has not issued any regulations concerning automotive end-of-life requirements.

For example, in the UK, around two million vehicles reach the end of their life each year and these vehicles are concidered as hazardous waste untill they have been fully treated. When a consumer decides not to use a vehicle anymore, there are following options available :

1. Sell the whole vehicle to another user.
2. Disassemble the vehicle.
3. Remanufacture the vehicle.
4. Recycle the vehicle for materials.
5. Dispose the vehicle to a landfill.

Body Materials

1. Steel

The main factors of selecting material specially for body is wide variety of characteristics such as thermal, chemical or mechanical resistance, ease of manufacture and durability. So if we want to choose a material with these characteristics, Steel is the first choice. There was many developments in irons and steels over the past couple decades that made the steel more light-weight, stronger, stiffer and improving other performance characteristics. Applications include not only vehicle bodies, but also engine, chassis, wheels and many other parts. Iron and steel form the critical elements of structure for the vast majority of vehicles, and are low-cost materials.. The prime reason for using steel in the body structure is its inherent capability to absorb impact energy in a crash situation.

2, Aluminum

There are a wide variety of aluminum usage in automotive power train, chassis and body structure. Use of aluminum can potentially reduce the weight of the vehicle body. Its low density and high specific energy absorption performance and good specific strength are its most important properties.

Aluminum is also resistance to corrosion. But according to its low modulus of elasticity, it cannot substitute steel parts and therefore those parts need to be re-engineered to achieve the same mechanical strength, but still aluminum offers weight reduction.

Aluminum usage in automotive industry has grown within past years. In automotive power train, aluminum castings have been used for almost 100% of pistons, about 75% of cylinder heads, 85% of intake manifolds and transmission. For chassis applications, aluminum castings are used for about 40% of wheels, and for brackets, brake components, suspension, steering components and unstriment panels. Aluminum is used for body structures, closures and exterior attachments The cost of aluminum and price stability is its biggest obstacle for its application.

3. Magnesium

Magnesium is another light metal that is becoming increasingly common in automotive engineering. It is 33% lighter than aluminum and 75% lighter than steel/cast iron components. Magnesium components have many mechanical/physical property disadvantage that require unique design for application to automotive products. Although its tensile yield strength is about the same, magnesium has lower ultimate tensile strength fatigue strength, and creep strength compared to Aluminum. The modulus and hardness of magnesium alloys is lower than aluminum and the thermal expansion coefficient is greater.

Magnesium alloys have distinct advantages over aluminum that include better manufacturability, longer die life and faster solidification. Also magnesium components have higher machinability.

Because of its too low mechanical strength, pure magnesium must be alloyed with other elements. The most common alloying elements for room temperature applications is Mg-Al-Zn group that contains aluminum, manganese, and zinc.

4. Advanced composite materials

Fibber reinforced composites offer a wide range of advantages to the automotive industry. It has the potential for saving weight offered by their low density. Component designs can be such that the fibres lie in the direction of the principal stresses, and amount of fibre used is sufficient to withstand the stress, thus optimizing materials usage.

5. Carbon-fibre epoxy composite

Most recently, the most of the racing car companies much more rely on composites form whether it would be plastic composites, Kevlar and most importantly carbon-fibre epoxy composition. It is because the composite structures is the high strength/low weight ratio. The most common materials used for racing cars are carbon (graphite), Kevlar and glass fibres. Epoxy composites have been the first choice in car industries and other race cars.

6. Glass-fibre composites

Glass fibre is being used mostly for the sports car which includes Formula 1 cars. It is lighter than steel and aluminum, easy to be shaped and rust-proof. And more important factor is that it is cheap to be produced in small quantity.

Self-Check -1	Written Test

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

1. List steps to write work instruction (4)

2. Define work instruction (2)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Reading and interpreting Job specifications

Job Specification

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

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

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

Managerial experience in handling and managing a team can also be a job specification criteria required for a particular position

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

Purpose of Job Specification

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

Job Specification Example

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

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

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

Advantages of Job Specification

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

1. Job specification highlights all the specific details required to perform the job at its best
2. It gives the HR managers a threshold and a framework on the basis on which they can identify the best prospects
3. Helps in screening of resumes and saves time when there are multiple applications by choosing those who are closest to the job specification
4. HR managers can used job specification as a benchmark to evaluate employees and give them required trainings
5. It also helps companies during performance appraisal and promotions

Disadvantages of Job Specification

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

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

Steps

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

Difference and Comparison of job specification and job description

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

Self-Check -2	Written Test

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

1. Explain job specification (4)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

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

WHS Requirements

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

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

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

AUTO BODY PAINTING SAFETY TIPS

Sanding, painting, or applying solvent or fillers is a daily duty of professional and practicing collision repair technicians. But no technician or hobbyist should ever put their health in danger for the perfect paint job.

we take auto body painting safety seriously and our shop-based training sessions are always accompanied by the proper safety apparatus and procedures.

Before you load your spray gun, remember the following:

1. Always Paint in a Ventilated Space

Paints and solvents contain harmful chemicals known as volatile organic compounds (VOC) that are immediately released into the air when a paint can is opened. Even after the job is complete, these vapors can stick around for up to 3 days.

Paint on a dry day, keep your garage door open, and equip windows with box fans that will aid in removing harmful fumes from the work area.

2. Use a Respirator

The auto body industry mandates the use of a respirator anytime you paint with a spray gun. An air-supplied respirator is the top choice of auto body shops.

In second place is a cartridge-based respirator that filters out chemicals before you breathe in. When filters are changed on a routine basis, cartridge respirators are a safe option.

Professionals working in shops are required by law to be test fitted for their respirator to ensure the correct fit and optimal protection.

3. Cover Exposed Skin

Not only can the chemicals that leech out from paint be harmful to our lungs, they can also be harmful to skin. Paints that contain isocyanates, most of which are found in two part polyurethane-based paints, are particularly toxic to the skin and lungs.

Wear a full-body paint suit with a hood and nitrile gloves as well as safety glasses to protect yourself from exposure to these harmful elements. Expert auto body painters refer to these items as their personal protective equipment, or PPE.

4. Take Care of Spills Immediately

If you spill paint, stop what you're doing and clean it up. Aside from posing as a physical hazard should you or someone else step into the spill, the chemicals can easily attach to the bottom of your shoes and get tracked to other areas of your workspace.

Additionally, always be mindful to keep paint can lids tightly closed between uses.

5. Read Your Paint Product's MSDS

A paint's material safety data sheet (MSDS) lists all harmful toxins in the paint you're using. Paint manufacturers make this information available online and searchable by product, and auto body shops must keep an up-to-date MSDS on file for each product that's readily accessible to employees.

Aside from knowing which chemicals the paint releases and at what degree, an MSDS will also give insight into pertinent prep and application information such as dry time, appropriate paint environment temperature, and cleanup requirements.

protective clothing and equipment

A clean spray booth, free from dust and lint, is key to achieving the perfect paint finish.

Choosing the type of protective clothing best suited to the situation therefore depends on a number of factors, including the products handled, the type of paint or surface treatment product, the concentration of the chemicals used and the type of application (projection, spraying, etc.).

One of the big, time consuming jobs on any project vehicle (unless you are building one from scratch with raw sheet metal) is stripping off years of old paint, primer and anything else on the body panels. There are as many different ways to strip paint as there are types of paint to apply. Many times, especially with older projects, there may be multiple layers of primer, urethane, lacquer and enamels between the bare metal and the outside world. Knowing how to strip car paint is essential if you want to completely remove every old layer without damaging the metal beneath..

Paint Removal Products & Safety Equipment

Here on the picture, you can see various sanders, grinders and other mechanical methods to get the paint off the surface. you can see several sizes of the Eastwood Gel Chemical Paint and Powder Remover. As you can see the picture below the big blue tank of the Eastwood Abrasive Media Blaster for spraying various grits of media at the panel that will eat the paint off.

Of course, you always want to wear proper safety gear no matter what you are doing. Besides the normal dangers when you are grinding and sanding, working on old cars can expose you to lead paint and body solder as well as rust and tetanus. You should at least have a pair of safety goggles on and a filter over your nose and mouth to keep the dust out. A pair of sturdy leather gloves gives you something else to cut or burn before you get to your actual skin. When the particles really start flying, a clear fold- down full face shield is a good idea as well.

Hand Sanding with a Block

This is the cheapest and easiest method for stripping paint from a car but that is only if you don't value your time or you are just looking for an upper body workout. Mister Miyagi had great luck with tricking local teenagers into doing this by promising to teach them karate.

The advantages of the paper and sanding block method are that there is very little to buy before you get started, it is gentle to the metal and you can get into really tight, irregularly shaped areas. The main disadvantage is that it will take what seems like a year to sand off the old paint on the whole car. After 30 seconds of work, Matt barely was able to get through the top layer of black paint and down to the white.

Dual Action Sanding Disc

Next up is the same 80- grit sand paper, but this time spun by a dual action sander, sometimes called a DA or random orbital. This is the best sander for auto paint removal that we've found. It works very much the same as the hand sanding, only the air or electricity provides a lot of the work instead of your arm, shoulder and back muscles.

As you can see, in the same 30 seconds the DA s ander was able to take off all the black paint, and in the one spot Matt focused on, three other layers to expose the base metal. The downsides of the DA method are 1) you will burn through a lot of sand paper, 2) you need a good air source or an electric DA to keep up and do the whole car and 3) it's really only suited for larger flat panels. The advantages over doing it by hand are obvious, but it's not the best way to remove paint from a whole car.

4.5-in. Flap Discs

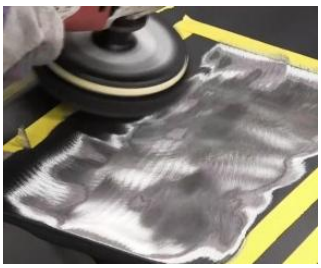
The next item often used to remove old paint is the flap disc that attaches to your common angle grinder. It's basically a flat disc with little pieces of sand paper glued to it in an overlapping pattern. All the edges of the paper give it a much more aggressive bite than just a flat disc like the one on the DA.

The problem is it's usually too aggressive. Sure, this tool will make short work of all the old paint, but if you aren't careful it will leave a ton of gouges in the metal. Use too much pressure and it will even grind grooves in it. All this means more work after stripping with filler or high build primer to undo the damage you just caused taking off the paint. The flap disc is especially dangerous around edges and body lines as they can grind right through the metal. They do work great though for grinding and smoothing welds and surface rust.

Hook & Loop Cleaning Disc

Next up is the Eastwood Cleaning Disc, which is like a super heavy- duty version of the green scrubby you use to clean pots and pans when washing the dishes. It's available in a similar form to the flap disc glued to a fiberglass backing for use with an angle grinder, but for big jobs, it's much easier to use the Eastwood hook and loop version. The hook and loop kit has a dedicated disc that screws onto your angle grinder and cleaning discs that stick to it with a heavy- duty version of Velcro. The discs are available in 80- grit and 320- grit and are easy to change.

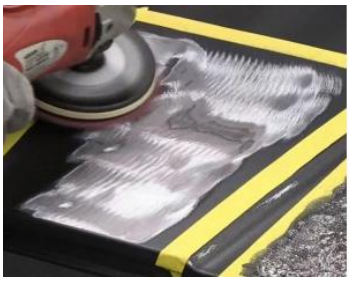
The woven material of these discs is great because it doesn't come apart when you are using it and fling pieces everywhere. The flexible nature of the disc and backing pad make them much less dangerous to edges and body line too, and they don't gouge if you push too hard. As you can see, they make short work of blasting through all this old paint too. But if you use the disc in one place for too long, it is possible to get the panel too hot and warp it, so keep moving.



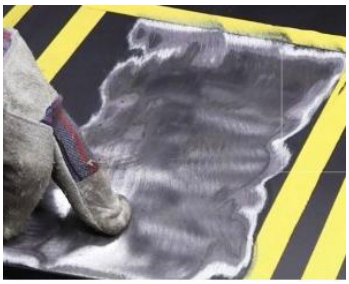
Hook & Loop Stripping Disc

Next up is the less aggressive 320- grit hook and loop disc. This one does the same job it just takes more time. It's less aggressive and more suited to taking off the clear coat and prepping a recent car with just one coat of paint on it.

As you can see, it leaves a smoother finish, but it takes longer to cut though the paint. Eastwood sells a kit with both discs and the hook and loop attachment for your angle grinder. It's great to start out with the more aggressive 80-grit disc, cut through the old layers of paint, and then smooth it all out with the 320-grit disc.



Here's a before and after on the same patch of hood we used the cleaning disc on originally, showing how you can use the stripping disc to finish the job and get down to smooth bare metal. Here is before.



And this is after.

3M Plastic Bristle Disc

Next is the plastic bristle disc from 3M. These bristles are very tough and come attached to a disc that screws onto a common 4.5- inch angle grinder. It works exactly the same as a wire wheel would, only the discs don't fall apart as easily as wire wheels do and they are gentler on the metal.

As you can see, it's a little more aggressive than the red stripping pad, but not as much as the hook and loop cleaning pad. And look at how smooth it leaves the metal after the paint is all gone! These bristle discs are very durable too and last a long time, so they are great for big jobs like a whole car. Be careful around edges, though, because the bristles can catch an edge and get broken off, and they will hurt if they hit bare skin, so wear long sleeves and a face shield.

Roloc Quick Change Surface Conditioning Discs

These little discs are very similar to the hook and look stripping discs, only they mount differently and they are more flexible for sanding irregular surfaces. On the back on these discs is a little threaded stud that screws into a flexible rubber mandrel you can attach to any drill.

The softer, flexible nature of the mandrel allows you to use these for areas that aren't flat. Also because these are so small, they are great for getting in tight areas like window frames and such. They are available in 2- and 3- inch sizes and are commonly referred to as "cookies."

That's it for the mechanical methods of stripping old paint, but there are other ways to take off paint that don't involve spinning discs.

Eastwood Paint & Powder Stripper

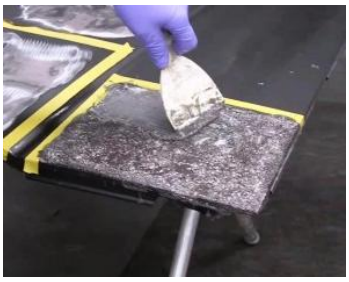
Guys often wonder about stripping paint off with chemicals. How well does it work? Is it safe for the panel? It is safe, and it works great, especially in areas that have tight curves or something that would prevent you from getting a cleaning disc or bristle disc in there.

You do need to wear rubber gloves though, because if you get this stuff on your bare skin it will burn.

Then it's just a matter of brushing it on . Use these acid brushes that are made of a plastic that won't melt in the chemicals.

Wait 30 minutes or so and start scraping it off (Matt cheated and applied the stripper before the cameras started rolling so it would be ready now).

As you can see, the first application took off almost all the layers of paint. You could use mechanical means to strip the rest down to the metal, or apply the stripper again, and you should have a totally clean bare metal surface. To make it even more effective, especially if dealing with modern clear coat, use the DA sander to scratch through the surface first, then apply the stripper.



Media Blasting

Finally, the last and best method for stripping car paint – and the most expensive to get set up to do – is media blasting. Media blasting sprays various small particles like ground glass, aluminum oxide, silicon carbide and walnut shells at the panel with high-pressure air. For softer surfaces like fiberglass and urethane, soda blasting does the same thing with a softer media similar to baking soda. You do have to be careful, though, because media blasting can still warp a panel if you stay in one spot for too long and it gets hot. You also need to tailor the media to what you are stripping. Use too coarse of a media on a soft metal like aluminum or pot metal and you will be left with a rough surface that will take a ton of work to correct.

Eastwood offers big, pressurized media blast tanks that are great for doing entire cars, or blasting a frame and chassis if you are doing a frame- off restoration.

If you don’t want to spend the money and make the commitment to a big set up like this, Eastwood also offers a Small Blast Kit that is very affordable and great for doing just the problem areas of the body panels.

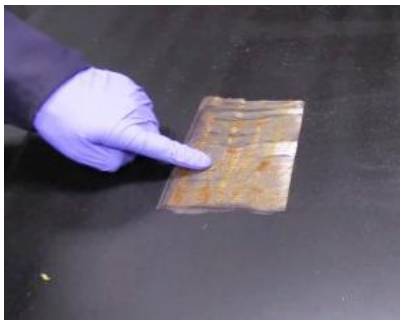
The best places to use the s mall b last kit, or any media blasting really, are problem areas like these intricately shaped edges of the hood. There is no way you are getting a cleaning disc or wheel in there, which means you could be there for hours with a piece of sandpaper stripping the paint by hand. The media blaster will make short work of this.

Eastwood Fast Etch

Once you are down to bare metal, you need to make sure you protect it so it doesn’t rust immediately. Eastwood Fast Etch not only helps eat away minor surface rust and

prep the bare metal for paint, it also leaves a protective phosphoric coating. The coating will protect it for a good long time, and can easily be wiped off with PRE™ painting prep with just a rag before painting.

If you do have surface rust on bare metal, you can spray the Fast Etch, let it work for a few minutes, then just wipe it off. Here is before.



And this is after. Obviously it could have used a few more minutes.

Video part 1 Video 2 Video part 3

To use Fast Etch as a protective coating, just spray it on and leave it on. It will eat into the metal, then react to create that phosphoric protective coating.

So those are the most popular methods of removing paint and getting down to bare metal. Of course, if you don't want to do it all yourself, you can always send the whole body out to be media blasted by a professional. There are also places with tanks of stripper so large a whole car can be submerged to eat away the paint and rust, but there is no way you are going to do something like that at home. However, it will often

cost much more to send the vehicle out to a shop for paint stripping. With so many options for different part sizes and restoration budgets, we're confident you can find the best way to remove paint from your car that makes sense for the particular project.

Workplace environment and safety

Workplace safety is very important for each and every employee in the industry because all the workers desire to work in a safe and protected atmosphere. Health and safety is the key factor for all the industries in order to promote the wellness of both employees and employers. It is a duty and moral responsibility of the company to look after the employee's protection.

Each and every person who leaves his home for his work in the morning should come back to his home in evening in good health. Have you ever imagined that your loved one will never be returning home? Or you get a call that he/she is in the hospital due to some incident occurred? These thoughts only get us goose bumps. This is the only reason that why it is important to create a safe working environment.

These days, workplace health and safety procedures are important for the well-being of both employees and employers because human loss is immeasurable and intolerable. As, such loss or injuries can employ major loss to the families.

All the industries do have safety risks but the management should devote their time to think and strategize the things that what safety precautions are required in their company to make sure that their workers are safe enough for all the time. Also, the management should confirm with all the workers related to their daily work and comfort. So, that the management can take the same step according to the desired aspects of workers. This helps them in improving the productivity and quality of the products and lot more.

1. **Aware about the surroundings:** There are many employees who doesn't bother about their surrounding hazards. But, it is important to observe your co-employees working circumstances. Once you get to know about the particular hazards that occur at your workplace, then it will help you in reducing the risk and allow you to take the precautionary steps.
2. **Reduce workplace stress**: Most of the employees are not fit and healthy because of their busy schedule, which includes long working hours, work-pressure and conflicts occur with co-workers or with the boss of the organization. And, all these can lead to some illness or depression to the employees. Also, this not only affects their professional life but also creates the nuisance in their personal lives too. So, instead of waiting to get unfit, it is better that you start take care of your health, by taking regular breaks, sit in an appropriate posture with appropriate diet. It will be better for you to schedule your work accordingly and manage the things to reduce your workplace stress.
3. **Use tools appropriately:** Take appropriate precautions while using machinery or any other tool, instead of taking any shortcuts. Taking shortcuts is one of the biggest reason behind workplace loss. It's a biggest safety risk to use scaffolding as a ladder or one tool instead of another for a particular job. So, it is always recommended to use the correct tools and reduce the opportunity of workplace injury.
4. **Keep crisis exits which are easily accessible:** In case there is an emergency, you will need quick access to the exits. It is also advised to keep clear usage of equipment shutoffs which might stop you from performing at emergency.
5. **Update Your Supervisor about the unsafe conditions:** It is important that you keep updating your supervisor about the hazards or risks occur at workplace. They should be legally obligated to ensure that their employees are working a safe environment or not.

And, in case, if the employees are not working in safe conditions, then it is the responsibility of the supervisor to listen and understand their condition and create safe working environment for employees.

6. **Use mechanical assistance:** Whenever, you want to carry or lift up some heavy equipment's then you should use a conveyor belt, crank or forklift. There are lot of risks involved, if you try to lift something which is heavier, it can affect your weighing capability and can lead to some muscle displacement. So, make sure that use the appropriate tools for not harming yourself.
7. **Stay Alert:** There are many employees who usually compromise or ignore the alerts of advance warning and due to this, a number of workplace injuries or fatalities occur.
8. **Reduce Workplace Environment Stress:** Stress to any employee or to any co-worker, can lead into depression and into concentration problems. And the main reason includes, extended working hours, excess of work, insecurity of job and issues which occur at co-workers or professionals. So, instead of taking stress on your shoulders, you should discuss it with your supervisor and ask him/her to look after your problems which you are facing in the organization.
9. **Wear the right safety equipment's:** It is essential that you wear the right protection equipment tools during your work. And, the equipment's can be in any form like, earplugs, earmuffs, hard hats, gloves, full-face masks, safety gloves and any other equipment which is required to wear while working. These tools will prevent the workers from the incidents that occur at workplace.
10. **Sit in a proper posture:** If have a sitting job, then it is essential than keep your posture correct, while working on a desk. You need to keep your shoulders in line and straight back to avoid any spine problem. Try to ignore stooping and twisting regularly and if possible, then try to use the comfort designed furniture and the safety equipment's, so that the desired things will be in your reach.

Safety is one of the biggest issue and it is completely the responsibility of the mangers and the business owners to make sure that their employees are working in safe environment or not. The management should make sure that they keep on motivating and boosting the employees to make them active in the working process.

There should be an appropriate discussions done about the work and the culture of the office on regular intervals, so that the management remain aware that how they simplify the things for the employee's comfort. Also, to motivate the workers, management should provide rewards as an appreciation towards their work. Thus, these only steps will make your workplace very secure and safe for the employees to work.

Workplace safety should never be taken lightly with any business. Doesn't matter if you're 1,000 employees strong or 10. Any businesses regardless of size must account for safety regulations, steps and more detailed options for their staff from the get-go. Preventative measures against accidents and/or workplace-related deaths are key for fostering a healthy, safe work environment.

There are some companies out there who may not be fully versed in workplace safety regulations or might not be equipped in every area of the office to handle any unforeseen circumstances.

For instance, let's say you're a towing and shipping company and most of your workforce is tied up in manual labor sectors where lifting, packing and stacking heavy shipments will occur more frequently. Or at the opposite spectrum, you're an accounting firm where there's hardly any lifting or physically demanding going on.

Both examples still must heed similar safety rules, have a system in place to readily inform each and every employee on preventative tips and regulations, and strive to accomplish what your business wants most: everyday safety. From OSHA compliance to inspections, there's a whole laundry list of tips on workplace safety that businesses can take with them. Some are simple, while others are a bit more complex in nature, but at the end of the day, they all can contribute to a safer haven for your staff.

1. Proper Uniforms: This is a critical base for businesses such as construction, home improvement, the aforementioned packing and shipping corporations on down to firefighters and other areas that require overly-protective headgear and uniforms. Construction workers must be wearing hard hats at all times in specified zones of the job site. Firefighters must have the latest fire-retardant outfits to go along with sturdy helmets. Chemists must always be wearing safety goggles every second they are inside the laboratory.

Putting up signs to reinforce the matter and educating the supervisors to stay on top of uniform regulations should be active from the moment the first employee clocks in to the last.

2. Designate Proper Emergency Exits: There's a reason we did three or four fire drill exercises as a kid each year in school. As annoying and (forgive the pun) alarming as they could be, it helped everyone in the building familiarize themselves with the exits. This same exercise should apply for every business. Not that every employee go in a single-file order and move at the sound of an alarm, just that they are aware and have some document that outlines emergency procedures.

This document should map out every exit doorway, ensure you have emergency exit signs posted in their assigned posts, detail up-to-date smoke detectors, signify water spouts to quench possible fires and assure you and your staff that each building code is covered front-to-back.

3. Open Discussions: Setting aside time at the end of the day once a month to discuss safety rules and general working environment is a great way for managers and supervisors to assess the overall quality of current measures taken. Getting feedback from employees is helpful because it opens the manager's eyes to potential hazards that went unnoticed, how well certain areas are doing and little touch-ups here and there that go a long way towards keeping employees safe and happy in the office.

While this may not be a safety regulation, per say, it's an outside factor that many businesses would do well to follow.

4. Promote Health Codes: You know those signs you see when entering a restaurant bathroom next to the sink that inform you that all employees must wash their hands before exiting? Having little indicators like those in the wash room, in the kitchen and general areas of heavy foot traffic is important on many fronts. The most important being health code standards, educating cleanliness, and encouraging employees to take every step necessary to make the room healthy for the next individual.

5. Proofing The Building: This falls in the category of getting the building inspected from time to time on down to subtle improvements around the building, stairways and exterior pathways. Little safety measures like adding ribbed, rubber padding along the ends of stairway steps, deicing the walkways leading up to the office, mats to stamp out slippery footing and other helpful precautions can give your employees as much peace of mind to know their well-being is being accounted for as much as possible.

In the end, these tips can help businesses from all over achieve a healthy balance between workplace security and overall productivity. Whether that means taking a few more minutes to encourage safety practices in an HR training class or spending a few more dollars on office-proofing (your insurance company might thank you with that one), it signifies you're looking out for the protective interests of you and your staff.

Materials handling

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

- ✓ Avoid lifting materials from the floor or while seated.
- ✓ Make use of available handling aids.
- ✓ Refrain from using sudden or jerky movements.
- ✓ Never lift a load over an obstacle.
- ✓ Perform lifts in areas with adequate footing, space and lighting.
- ✓ Modify objects and redesign jobs to make moving easier.
- ✓ Seek assistance from co-workers.
- ✓ Stay in good physical shape.
- ✓ Begin lifts close to the body.
- ✓ Use containers made of lighter materials.
- ✓ Reduce load sizes when possible.
- ✓ Do not twist or bend while lifting objects.
- ✓ Ensure repetitive, heavy and bulky lifts are not performed.
- ✓ Keep lifts between shoulder and knuckle height.
- ✓ Use conveyors, slides or chutes to eliminate pushing or pulling.

Use of fire -fighting equipment

Fire Extinguisher

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

extinguishers manufactured with non-cylindrical pressure vessels also exist but are less common.

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

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

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

Types of Fire Extinguishers

1. **Dry Chemical extinguishers** are usually rated for multiple purpose use. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant
2. **Hualon extinguishers** contain a gas that interrupts the chemical reaction that takes place when fuels burn. These types of extinguishers are often used to protect valuable electrical equipment since them leave no residue to clean up. Halon extinguishers have a limited range, usually 4 to 6 feet. The initial application of Halon should be made at the base of the fire, even after the flames have been extinguished.
3. **Water** These extinguishers contain water and compressed gas and should only be used on Class A (ordinary combustibles) fires.
4. **Carbon Dioxide (CO2) extinguishers** are most effective on Class B and C (liquids and electrical) fires. Since the gas disperses quickly, these extinguishers are only effective from 3 to 8 feet. The carbon dioxide is stored as a compressed liquid in the extinguisher; as it expands, it cools the surrounding air. The cooling will often cause ice to form around the “horn” where the gas is expelled from the extinguisher. Since the fire could re-ignite, continue to apply the agent even after the fire appears to be out.

How to Use a Fire Extinguisher

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

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

Enterprise first aid,

Give first aid whenever required using the first aid kit available in the shop
Depending on the type of accident, call for help (doctor or ambulance).
First aid" is a catch-all phrase that refers to two distinctly different medical needs. Emergency first aid is exactly that the first response to a life-threatening (or limb-threatening) medical emergency, either an illness or an injury. It's often called first responder training

The aims and objectives of first aid

The objectives of first aid, is just that, to provide the “first aid” to a person who has been injured. In may cases, such as a scraped knee, a small cut, or minor illness, that is all the aid that a person needs. In more severe cases, the first aid is meant to stabilize the person until better, trained and equipped providers arrive. An example is CPR, the first aider starts CPR and the rescue squad shows up and provides care beyond the training of the first aider such as medications, airway adjuncts and IV’s.

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

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

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

Hazard control and hazardous material and substance

Hazard control procedures vary from organization to organization and also from job to job. But even then some of the procedures can be adopted generally in every job to protect the health of workers. A worker is exposed to a number of hazards at work. For

example, a worker working in extreme hot temperatures is more likely to get dehydrated, while a worker working high above the ground is at risk of falls. Hazards are often controlled via what's called the hierarchy of hazard control. This consists of a list of measures in decreasing order of effectiveness:

1. Elimination: This involves elimination of the hazard. It is the most effective measure, but may not always be possible. For example, working at heights may be a required part of some jobs.
2. Engineering Controls: This involves modifying the plant or equipment so that the associated hazards are reduced. For example, a plant might add a ventilation system.
3. Administrative Control: This involves changing the way in which a particular type of work is carried out. This is achieved by changing the timing of the work and/or changing policies and procedures.
4. Personal Protective Equipment (PPE): This is considered a last resort for employee protection for when other controls fail. It includes things like helmets, eye protection and safety footwear and while it is helpful, it is the least effective control in the safety hazard control hierarchy.

The following methods may help manage hazards presented by painting and surface preparation:

- Surface preparation must be preceded by an assessment of the paint lead content, removal method, and the persons who may be exposed to hazards arising (both during the work and afterwards).
- Abrasive blasting must not be used for the removal of lead based paint, due to the high lead exposure risk to operators, and difficultly in cleaning up contaminants after removal. Where abrasive blasting is done, suitable respiratory and hearing protection must be worn. Water blasting is preferable to dry abrasive blasting, as this does not generate a fine dust.
- Paint application by spray gun must be preceded by an assessment of the flammability and inhalation hazards associated with the substances used, based on Material Safety Data Sheets. Spray applications should only be done in a specially constructed spray booth.
- When working in confined locations, ensure fume build-up is prevented by enhancing local ventilation, and that appropriate filter respirators are used.
- When using flammable paints or solvents ensure that steps are taken to prevent the accumulation of a flammable atmosphere, or that all ignition sources are controlled.
- Barrier creams, overalls and gloves protect the skin from adverse effects which may arise from using paints, solvents or other cleaning materials. They should be used where required.
- When using isocyanates, supplied-air breathing apparatus must be worn, in conjunction with full body suit for skin protection. All spraying operations must be within a spray booth with extract ventilation and suitable electrical protection.

Hazardous material and substances

However, paints (both water-based and oil-based) and stains that contain certain metallic pigments or fortifiers are regulated as a hazardous waste when disposed. Aerosol cans containing paint and other materials are also regulated as a hazardous waste when disposed.

Exposure to chemicals commonly used in workplaces can lead to a variety of short and long term health effects such as poisoning, skin rashes and disorders of the lung, kidney and liver. A quarter of all Victorian employees regularly use hazardous substances such as chemicals, flammable liquids paints and gases in their work.

how to identify hazardous substances in the work place

To identify if a substance is hazardous, check the product's container label and/or the safety data sheet (SDS) which is available from the supplier. If a product is not classified as a hazardous chemical under the Work Health and Safety Act 2011, a SDS is not required and therefore may not be available.

Common hazardous substances

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

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

Possible side effects of exposure to hazardous substances

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

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

Labels and Safety Data Sheets for hazardous substances

Manufacturers and importers of hazardous substances in Victoria are required by law to provide warning labels and Safety Data Sheets with their products. Employers must ensure that the Safety Data Sheets for each hazardous substance used in the workplace is available to employees, and that a central register of hazardous substances is established. The Safety Data Sheet lists important information on handling the product safely, including:

- potential health effects
- precautions for use
- safe storage suggestions
- emergency first aid instructions
- contact numbers for further information.

Reducing exposure to hazardous substances

Suggestions on reducing exposure to hazardous substances in the workplace include:

- Where possible, perform the task without using hazardous substances
- Where possible, substitute hazardous substances with less hazardous alternatives (for example, use a detergent in place of a chlorinated solvent for cleaning)
- Isolate hazardous substances in separate storage areas
- Purge or ventilate storage areas separately from the rest of the workplace
- Thoroughly train employees in handling and safety procedures
- Provide personal protection equipment such as respirators, gloves and goggles
- Regularly monitor the workplace with appropriate equipment to track the degree of hazardous substance in the air or environment
- Regularly consult with employees to maintain and improve existing safety and handling practices.

Self-Check -3	Written Test

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

1. List four auto body painting safety tips (4 pts)
2. mention at least six reasons why you should consider first aid training for employees. (6 pts)
3. List four possible side effects of exposure to hazardous substances (4 pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-4	Selecting and inspecting Materials

Material selection is one of the foremost functions of effective engineering design as it determines the reliability of the design in terms of industrial and economical aspects. A great design may fail to be a profitable product if unable to find the most appropriate material combinations. So it is vital to know what the best materials for a particular design are. How we are going to get an idea about the best materials for a design? In this aspect engineers use several facts of materials to come to the most reasonable decision. They are mainly concentrated on the properties of the materials which are identified as the potential materials for that specific design.

1. Mechanical properties

When a certain design is going to be actually produced it must be subjected to a number of manufacturing practices depending on the material and the design process. At the completion of production it must be totally fit for the service phase, too. In order to predict the reliability of both of these requirements, the materials must be able to withstand a certain load. Therefore the material must possess a certain strength and stiffness. Selected materials are examined for strength and stiffness values, and then potential materials are further inspected for other desired properties.

Material selection is one of the prime concerns in mechanical engineering design as mechanical engineers possess great deals with various loads and temperature variations. Material selections in engineering designs such as civil engineering structures also are very crucial.

2. Wear of materials

Wear is a problem when the materials are contacting each other in a product. So it must be ensured that the selected materials have sufficient wear resistance. One of the best examples for this is designing gears to cope with wear. There are many production techniques available to improve the wear resistance and make the material is more suitable for the application. This is also very important factor to consider when selecting a material for a particular design. In the engineering design process this has to be considered with great care.

3. Corrosion

The importance of material selection in engineering is clearly visible in corrosive environments. Also it is an important engineering design criterion for designs open to the environment for a longer period of time. Some materials are very likely to be corroded in the service depending on the service environment. Metals like iron are heavily prone to corrosion if it not prepared to resist corrosion. Therefore it must be assured that the material is capable of being employed for the particular design before selecting it. Painting or any other surface coating method, cathodic protection, etc. are possible ways to minimize the effect and increase the service life.

4. Ability to manufacture

Although the material is well capable of using for the design, it may be difficult to manufacture. This is particularly applicable in mechanical engineering design. If this

selection criteria is neglected the manufacture process might be very costly making it unprofitable as a commercial product. So before selecting the materials this fact also must be considered. These facts are widely varied with the type of manufacturing method. For an example, when producing a gear its dimensions must be very accurate. Otherwise the application may not provide the expected performance. To make the dimensions more accurate it has to be machined in the production. So the selected material must able to be machined with a minimum cost. Otherwise there is no point of selecting that material for that particular gear.

5. Cost

materials for a certain design for most products because they are facing a severe competition in the market. So you may see that most of the metal or other valuable materials are replaced by plastics in most of the designs which they are applicable such as mechanical engineering designs. The cost factor can be neglected when performance is given the top priority. When estimating costs, *all* the associated cost factors must be considered to get a more reasonable value. It may involve the transportation, processing, etc. costs.

A **chemical substance** is a form of matter having constant chemical composition and characteristic properties. Some references add that chemical substance cannot be separated into its constituent elements by physical separation methods, i.e., without breaking chemical bonds. Chemical substances can be simple substances, chemical compounds, or alloys. Chemical elements may or may not be included in the definition, depending on expert viewpoint.

Chemical substances are often called 'pure' to set them apart from mixtures. A common example of a chemical substance is pure water; it has the same properties and the same ratio of hydrogen to oxygen whether it is isolated from a river or made in a laboratory. Other chemical substances commonly encountered in pure form are diamond (carbon), gold, table salt (sodium chloride) and refined sugar (sucrose). However, in practice, no substance is entirely pure, and chemical purity is specified according to the intended use of the chemical.

Chemical substances exist as solids, liquids, gases, or plasma, and may change between these phases of matter with changes in temperature or pressure. Chemical substances may be combined or converted to others by means of chemical reactions.

Forms of energy, such as light and heat, are not matter, and are thus not "substances" in this regard.

Chemicals make your cleaning products work. It is important that you always check the labels to use them in a safe way.

Laundry detergents, all-purpose cleaners, washing-up liquids they all contain substances called surfactants or surface active materials. They reduce the surface tension between water and grease (liquid oil or solid fat) so that the two can mix, water can get a hold of the grease and wash it away. That is why we wash dirty clothes with detergent – the detergent can remove dirt in a solid or liquid form.

If you look at the ingredients of a cleaning product, you will see many other chemicals, too. For example, biological detergents contain enzymes. These help to break up and remove grease, but also food and other deposits. Different chemicals are also used to provide scents or colour to a product or to help preserve it.

Tips for safer use

- Check the labels of the products you use and follow the instructions to make sure you handle and store them in a safe way. Hazard pictograms show what kind of damage the product can cause to your health or the environment. Labels also have information on what to do if there is an accident.
- Prefer environmentally-friendly detergents with an official ecolabel – for example, the EU ecolabel or the Nordic ecolabel.
- Always use cleaning products according to the instructions. Some products can cause allergic reactions and irritate the skin and eyes. For example, drain unblockers and toilet cleaners may contain corrosive substances which can cause severe skin burns and damage eyes. Dishwasher detergents, decalcification agents and oven cleaners may also seriously harm your health if not handled properly.
- Remember to store your cleaning products away from the reach of children or pets/domestic animals/. Be also careful to not mix different cleaning products together or to change their container to store content.

Paint stripper, or **paint remover**, is a chemical product designed to remove paint, finishes, and coatings while also cleaning the underlying surface. The product's material safety data sheet provides more safety information than its product labels. Paint can also be removed using mechanical methods (scraping or sanding) or heat (hot air, radiant heat, or steam). Lead-based paint is banned in the United States. Removing old lead-based paint can disperse lead and cause lead poisoning, leading several US workplace and environmental regulations address removal of old paint that could contain lead.

Types of chemical paint remover

Chemical paint removers work only on certain types of finishes, and when multiple types of finishes may have been used on any particular surface, trial-and-error testing is typical to determine the best stripper for each application. Two basic categories of chemical paint removers are caustic and solvent.

Caustics

Caustic paint removers, typically sodium hydroxide (also known as lye or caustic soda), work by breaking down the chemical bonds of the paint, usually by hydrolysis of the chain bonds of the polymers forming the paint. Caustic removers must be neutralized or the new finish will fail prematurely. In addition, several side effects and health risks must be taken into account in using caustic paint removers. Such caustic aqueous solutions are typically used by antique dealers who aim to restore old furniture by stripping off worn varnishes, for example.

Solvents

Solvent paint strippers penetrate the layers of paint and break the bond between the paint and the object by swelling the paint.

The principal active ingredient in common solvent paint strippers is dichloromethane, also called methylene chloride. Methylene has serious health risks including death and is likely a carcinogen. Solvent strippers may also have formulations with orange oil (or other trepan solvents), n-methylpyrrolidone, esters such as dibasic esters (often dimethyl esters of shorter dicarboxylic acids, sometimes aminated, for example, adipic acid or glutamic acid), aromatic hydrocarbons, dimethylformamide, and other solvents

are known as well. The formula differs according to the type of paint and the character of the underlying surface. Nitromethane is another commonly used solvent. Dimethyl sulfoxide is a less toxic alternative solvent used in some formulations.

Paint strippers come in a liquid, or a gel ("thixotropic") form that clings even to vertical surfaces.

The principle of paint strippers is penetration of the paint film by the molecules of the active ingredient, causing it to swell; this volume increase causes internal strains, which, together with the weakening of the layer's adhesion to the underlying surface, leads to separation of the layer of the paint from the substrate.

Other components

Various co-solvents are added to the primary active ingredient. These assist with penetration into the paint and its removal and differ according to the target paint. Ethanol is suitable for shellac, methyl ethyl ketone is used for cellulose nitrate, and phenol and cresols are employed in some industrial formulas.[*citation needed*] Benzyl alcohol is used as well.

Types of refinishing materials

Car body is protected and beautified by a complete finishing system. Refinishing materials is a general term for the products used to repaint the vehicle. New paints last longer but require skill and safety measures. The substrate is the steel, aluminum, plastic and composite materials used in vehicle construction. Paint beautifies the body and protects the metal from rust

Automotive Refinishing Services Offered

The technicians at our collision repair shop use computerized matching system to determine your vehicle's OEM color code. Following this, we chemically clean the paint surface, identify areas with scratches or chipped paint and apply back tape to paint your vehicle with utmost precision. After the paint job, we will put on a clear coat matching with the color, making the repair work almost unnoticeable.

Our automotive refinishing services include:

- Steel, metal, aluminum, fiberglass and plastic repair
- Expert color matching
- Minor paint scrape
- Full automotive restorations
- Bumper scratches
- Custom auto paint

Why is Refinishing Important?

Refinishing is an important part of the post-collision auto repair process. The vehicle is brought back to its original beauty and the refinishing process. It is important that the color is perfectly matched to the original paint.. The technicians pride themselves in delivering original factory paint formulas that promise exactly the right color. Color matching is not something you can bring to just any auto body shop.

Self-Check -4	Written Test

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

1. Explain material selection (4)
2. what is chemical substance? (2 pts)
3. What is paint striper? (2 pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-5	Identifying and checking tools and equipments

Tools and equipment used for automobile paint removals

1. Abrasive media blaster for spraying various grits of media at the panel that will eat the paint off.
2. Pair of safety goggles
3. Leather gloves
4. Sanding block
5. Dual action sanding disc
6. Flap disc
7. Cleaning disc
8. Hook and loop stripping disc
9. 3m plastic bristle disc
10. Roloc quick change surface conditioning discs
11. eastwood paint & powder stripper
12. acid brushes
13. Media blasting
14. Eastwood fast etch

Tools and Equipment Maintenance

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

Testing of tools and equipments

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

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

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

components of maintenance program

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

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

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

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

General requirements for tools/equipment maintenance include:

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

Self-Check -5	Written Test

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

1. List ten tools and equipment used for automobile paint removals. (10 pts)

2. List three components of maintenance program and define each (6 pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-6	Determining waste minimizing procedure.

Determining waste minimizing procedure.

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

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

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

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

Benefits of Waste Minimization

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

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

3 R's of Waste Minimization

Waste minimization revolves around three R's as follows:

Reduce

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

Reuse

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

Recycle

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

Waste Minimization Techniques

1. Optimization of resources

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

2. Scrap metal reuse

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

3. Quality control improvement and process monitoring

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

4. Exchange of Waste

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

5. Shipping to the point of use

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

6. Zero waste

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

7. Waste Minimization for Households

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

packs may be thrown the remains of the containers should be removed to allow for recycling of the container.

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

8. Waste Minimization in Building Construction

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

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

10 ways to reduce waste in the workplace

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

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

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

1. Go (nearly) paperless

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

2. Keep a paper recycling bin within arm's reach

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

3. Print smarter

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

4. Provide real dishes and silverware

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

5. Get rid of the k-cup machine

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

6. Buy in bulk

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

7. Reuse binders and file folders

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

8. Create a recycling center

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

9. Provide filtered water

Install a filtered water tap or keep a large brita pitcher in the fridge so employees can pour a glass of water instead of grabbing a disposable plastic water bottle. Your

company will save money on bottled water, and landfills will be spared of more plastic.

10. Give employees a reusable water bottle

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

Self-Check -6	Written Test

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

1. Explain waste minimization (4 pts)
2. List four Benefits of Waste Minimization (4 pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

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

Task 1. Use work instructions to determine job requirements, including job sheets, quality and quantity of materials.
Task 2. Observe Workplace Health and Safety (WHS) requirements, including personal protection needs
Task 3. Read and interpret Job specifications
Task 4. Select and inspect materials for repairing and replacement
Task 5. Select correct hand, power tools and safety equipment for safe use.
Task 6. Determine products to minimize waste materials and task time.
Task 7. Identify and discuss job Procedures

List of Reference Materials

1. https://www.autotraining.edu/blog/5-auto-body-painting-safety-tips/
2. http://www.dupont.co.za/products-and-services/personal-protective-equipment/chemical-protective-garments-accessories/uses-and-applications/paint-protective-equipment.html
3. https://garage.eastwood.com/tech-articles/how-to-strip-automotive-paint-the-tools-and-procedures/
4. http://www.dupont.co.za/products-and-services/personal-protective-equipment/chemical-protective-garments-accessories/uses-and-applications/paint-protective-equipment.html
5. https://simplifiedsafety.com/blog/how-to-create-a-safe-working-environment/
6. https://medium.com/@BastionSafe/top-10-reasons-why-workplace-safety-is-important-8797c978e1f9
7. https://www.safeopedia.com/definition/151/hazard-control
8. https://www.otago.ac.nz/health-safety/hazards/otago065416.html
9. https://www.brighthubengineering.com/machine-design/55560-basic-facts-to-consider-when-selecting-a-material-for-a-particular-design/
10. https://en.wikipedia.org/wiki/Chemical_substance#Definition
11. https://en.wikipedia.org/wiki/Paint_stripper
12. https://www.worksafe.qld.gov.au/injury-prevention-safety/electricity/tools-and-equipment
13. https://www.monroecti.org/site/handlers/filedownload.ashx?moduleinstanceid=1497&dataid=2350&FileName=Chapter%2007.ppt
14. http://www.lyallbros.com/Automotive-refinishing
15. https://www.ase.com/MediaLibrary/Images/PDF%20folder/Collision-Web-Studyguide-2019.pdf
16. https://www.conserve-energy-future.com/what-is-the-process-of-minimizing-waste.php
17. https://www.iscginc.com/blog/2016/4/18/10-ways-to-reduce-waste-in-the-workplace
18. https://www.beeindia.gov.in/sites/default/files/4Ch13.pdf

Vehicle Body Repairing and Painting NTQF Level-II

Learning Guide -14

Unit of Competence: - Apply Paint Removal Methods

Module Title: - Applying Paint Removal Methods

LG Code: EIS VRP2 M05 LO01-LG-14

TTLM Code: EIS VRP2 TTLM 0919v1

LO 02: Remove paint

Instruction Sheet	Learning Guide #-14

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

- Using Tools and equipment
- Using Protective clothing and equipment
- Requirements for extraction of fumes and cleanliness.
- Carrying out Removal activities

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to –**

- Using Tools and equipment
- Using Protective clothing and equipment
- Requirements for extraction of fumes and cleanliness.
- Carrying out Removal activities

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1,2,3,4”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1, 2, 3, 4” in page 55, 57, 62, 68-. respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work.
6. If you earned a satisfactory evaluation from self check proceed to operation sheet 1,2,3, in page 69,70,71” respectively and lap in page 72. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Using Tools and equipment

Use of tooling and equipment

When working any activity with tools and equipments, you should be use a proper tools and equipments they designed for the purpose in order to improve safety.

Tools and Equipment Safety

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

when working on power tools

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

Self-Check 1	Written test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. List at least 15 Tools and Equipment Safety (10 points)

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

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2	Using Protective clothing and equipment

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

Paint Stripper Type	Gloves* Less durable/Less expensive More durable/More expensive	Eye Protection	Respirator*
Benzyl Alcohol	Laminate of EVOH/PE (i.e. Silvershield®/4H by North) or Nitrile  	Indirectly vented or unvented chemical goggles and face shield 	For typical application by brush, normally no respirator is needed. If spray applied or if occupational exposure guidelines are exceeded, use full face NIOSH certified respirator with organic vapor cartridges or half mask with eye protection and dust/mist prefilter.
Caustics	Laminate of EVOH and PE (i.e. or Neoprene, or Nitrile Silvershield®/4H by North)  	Indirectly vented or unvented chemical goggles and face shield  	If spray-applied, use full face NIOSH-certified respirator with dust filters or half mask with eye protection.
-N-Methyl-2Pyrrolidone (NMP)	Laminate of EVOH and PE (i.e. or Butyl Rubber Silvershield®/4H by North)  	Indirectly vented chemical goggles 	NIOSH-certified respirator with organic vapor (OV) cartridges. If spray-applied, use OV cartridge with dust/mist prefilter. 
Methylene Chloride-based	Laminate of EVOH and PE (i.e. or Polyvinyl Alcohol (PVA) Silvershield®/4H by North) 	Indirectly vented chemical goggles unless full-face respirator worn. 	Supplied-air (airline) respi 

Self-Check 2	Written test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. define personal protective equipments and give at least four examples. (10 points)

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

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3	Requirements for extraction of fumes and cleanliness.

Fume Extraction for Auto Body Shops

When considering how to improve the air quality in your shop, it's important to consider both source capture fume extraction *and* ambient air cleaning. Source capture fume extraction helps to eliminate hazardous fume and particulate at the source of emission, before it is able to escape into the general working environment. Ambient air cleaners are used for general room air cleaning; they are designed to capture particulate at various micron sizes that escape into the working environment.

Source Capture Fume Extraction

There are several configurations of source capture fume extraction available, and based on what job is being performed, an appropriate model should be chosen. For instance, do you need the fume extraction unit to be mobile, or would a stationary model (ex. wall-mounted) be more practical? Does the unit need to fit into a compact space (ex. under an elevated car) or is there room for a larger unit?

Spray Paint Fume Extraction

The basic principles for controlling the occupational environment consist of substitution of less hazardous materials; isolation of the hazard; and the use of local and general exhaust ventilation to remove contaminants from the workroom. Experience has shown that occupational hazards can be controlled by the use of one or more of these principles.

Ventilation is one of the most important engineering controls available to the industrial hygienist for improving or maintaining the quality of the air in the occupational work environment. Broadly defined, ventilation is a method of controlling the environment with air flow.

When choosing a ventilation system, make sure to gather sufficient information about air volume and performance. Strong suction at the inlet of the booth is important as it will provide an effective source capture and containment of overspray particulates. This results in protecting the operator's breathing zone as well as preventing unwanted spray particulate and odors from entering the general work area.

Effective removal of paint and other fumes

Powerful fume extraction kit, enabling negative pressures to be achieved.

The intake capture hood can be fitted with a spark arrestor to enable this kit to be used alongside burning or cutting operations where sparks may be produced.

Fume Removal

A fume hood or fume removal system is a device used to capture hazardous chemical vapors, gases, dusts, mists and metal fumes in a work process. These systems help eliminate or lower human exposure to hazardous fumes. A fundamental safety and industrial hygiene principle is to control exposure to hazards with engineering and administrative controls before implementing personal protective equipment. Fume hoods represent an engineering control used to help reduce exposure to hazardous substances. A fume removal system consists of at least two of the following components: collection hood, ducting, air cleaning device and blower.

Regulations

There are government regulations and industry standards that either directly or indirectly require the use of fume removal equipment. This section will identify and highlight many of those regulations.

Components of a Fume Removal System

A fume removal system will consist of two or more of the following components: A blower, ducting, air cleaning device and collection hood.

The **blower** is a major component of every system and must be selected carefully. Blowers need to be sized properly in order to effectively remove the contaminant from the work area. Blowers are sized and rated by the amount of air, measured in cubic feet per minute, that can move at a given amount of resistance. The resistance is known as static pressure and is measured in inches of water. It is the amount of resistance the fan must overcome in order to move air through the ventilation system. The amount of static pressure in a system is influenced by the type of collection device, length of ducting, number and amount of turns in the ducting and type of air purification device (if used).

Consult a ventilation specialist to determine the correct blower size for each particular application.

Blower flywheels are available in a variety of materials (steel, aluminum, plastic) for different applications. Non-sparking flywheels should be chosen when working with flammable materials. Explosion-proof blowers are available for locations that could be potentially explosive. The motors on these blowers help reduce the possibility of explosion in certain types of environments.

Ducting is the material through which the air and contaminants are moved. Common materials are galvanized steel, stainless steel, PVC and other rigid or flexible plastic materials. Angles for fitting corners and reducers for connecting different size ducts are all available accessories.

Air purification devices will either be **mechanical filters** or chemical adsorption media. Mechanical filters are used to remove particulate contaminants. The type of filter selected will be determined by the application and particle size of the contaminant. HEPA filters are the most efficient type available and can filter particles of 0.3 microns in size. Mechanical filters will gradually become plugged with the particulate material and air flow will decrease. Pressure gauges and air flow indicators can help determine when filters need to be changed.

The use of air purification devices prior to exhausting air outside your facility may be required by your local Environmental Protection Agency (EPA). Determine this prior to designing a system. Cleaning the air and then exhausting it back into the work environment is normally not a recommended practice. However, it can be done if the contaminant concentrations generated are below the PEL and the chemical has good warning properties.

Activated carbon is one type of chemical sorbent that can be used for many organic vapors. Other absorption materials are available, depending on the chemical and application. Absorption filters need to be changed when they become full. Chemical concentration, humidity, air flow and the chemical's physical properties all play a role in the life of a chemical absorption filter. Warning properties of the contaminant can indicate when to change the filter. A safer way to monitor the exhaust air is to test for chemical breakthrough on a routine basis.

The type of collection device used in a fume removal system will depend on the application, the physical properties of the contaminant and the work environment. Three primary types of collection devices are: **Cabinet hoods** with vertical or horizontal sashes, **canopy hoods** and **local collection hoods** which attach directly to a length of ducting.

Cabinet hoods are often used in lab applications because they are effective for a variety of chemical contaminants. The three-sided enclosure is usually made of a chemically resistant material. A horizontal or vertical sash will control air flow through the front opening and can be positioned to offer the best chemical containment. Air is pulled through the front opening and away from the worker. Proper blower size and sash height help reduce the chance of turbulence within the hood, which could allow the contaminant to escape. Air currents from the mechanical ventilation system and traffic moving by the hood can all affect the ability of the cabinet to contain and remove the contaminant being generated.

Canopy hoods are wall-mounted or hung from the ceiling over the work process and may or may not have side panels. This type of hood works best in applications where the contaminant rises and the worker is not directly under the hood. Cross drafts decrease the effectiveness of these hoods, although side panels can minimize these effects.

Local collection hoods attach directly to a length of ducting. Hood shape varies depending on the application and the air flow needed to capture the contaminant. These devices are designed for applications where the contaminant is generated at a localized point. Proper positioning of these hoods is critical to their effectiveness.

from Flamefast Extraction Solutions

A correctly designed and installed **Fume Extraction System** will not only greatly increase the safety, performance and efficiency of a fume containment or capture system, but will also reduce noise levels and minimise running costs.

Working to the requirements and recommendations of **DW144, DW:154, BS:7258** and **Building Bulletin 88,** our engineers have the experience and knowledge to fabricate and install **Circular or Rectangular Section Extract Ductwork** in a number of chemical-resistant materials, including PVC, fire retardant polypropylene, stainless steel and fire-rated GRP laminate to achieve the required fume extraction operations.

Flamefast Extraction Solutions supply a full range of ancillary items including expansion joints, support brackets (threaded rod or Gripple), anti-blowback valves, attenuators, dilution manifolds and weathering cravats.

The Dangers of no fume extraction

1. Chronic Health Dangers
2. Risk of Fire & Explosion
3. Breaking the law - COSHH
4. Fines for non-compliance
5. Employee health compensation claims

The Benefits of good fume Extraction

1. Safer Working Environment
2. Comply with the law & statutory regulations
3. Improved working life on machinery
4. Lowered risk of fire or explosions
5. Maximum productivity
6. Warranty on certain equipment

Self-Check 3	Written test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. Define fume extraction. (2 points)

2. List the dangers of no fume extraction (4 pts)

3. List The Benefits of good fume Extraction (4 pts)

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

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-4	Carrying out Removal activities

Methods of paint removal

here is no one **best way to remove paint** from your car. Learning the three broad types of paint removal methods available can help you to make an informed decision as to wish is best for your situation.

The best way to remove paint from car exteriors depends on the circumstance. Compare mechanical, chemical, and manual car paint removal methods.

- **Mechanical paint removal.** Most garages get rid of paint using an automated paint remover. This can involve either high power chemical spray, or a sander which simply scuffs the paint off. Either of these choices may not be suitable for someone with a classic car, as they can seriously damage the car, and not even be very good at removing the paint before a second layer is applied. In order to get the best for your classic car, the automatic paint remover is probably not the best way to go.

- **Chemical paint removal.** Chemical paint removers can be used to strip the paint off of your machine, and in fact they can be very useful if you want to take off the paint without damaging the car. You may have to remove the part of the car that you want to strip before applying the paint, or it can become very complicated, as you will have to protect the car before you proceed. In order to get the best from a chemical strip, read the instructions carefully, and then apply the stripper in a small area before you begin to use it on the rest of the car.

- **Manual paint removal.** Using manual methods involves the most work, particularly for the person doing the removing. The most common, and slightly easier, method is to use sandpaper. You can also use a paint scraper to take off the layers of paint manually. This is very hard work, as much as stripping the paint from a house, but it is probably the best way if you have a classic car that might be damaged by harsher methods such as chemical strippers.

Car Paint Removal Essentials

The kind of paint removers you need depends upon whether you want to have a full car paint strip, or if you are just looking for some touch-up paint removal in order to restore your car to its former glory. Whichever method you choose, you need to have a plan about how you will proceed.

- **Prepare the car.** Whether you are just removing a bit, or taking off the entire surface of the car, you need to prepare the car to ensure that the bits which you don't want to strip are protected. Cover the surface of any glass, including all windows and the side mirrors. You should also protect the chrome of your wheels, and bumpers, door stoppers and other items around the car that could

be affected by the stripper. Use painter's tape to cover over these areas, as it can easily be removed once it is no longer needed.

- **Sand the car.** Begin the process of removing the paint from your car by sanding it lightly. This is particularly useful where the surface of the car has been damaged and paint has been added on top of scratches or dents. Removing all of this damaged paint using a paint sander, or with sand paper, can also help you to iron out any lumps and bumps before you apply another layer of paint.

- **Remove the paint.** You are now ready to remove the paint. Most paint stripper comes in spray cans, although you may want to be cautious and use a pot of stripper with a paintbrush. In order to get the best results, rub the stripper in even strokes from top to bottom, so the stripper flows downwards and away from the car. Leave the stripper for around 30 minutes.

- **Remove the stripper.** Once a half hour or so has elapsed, remove the stripper. First, use a paint scraper to take off all of the paint that remains in the area, and then wipe your rag or sponge over the area. The last pieces of paint and the stripper should slide to the ground.

Paint removal procedures

How to Remove Car Paint

A fresh coat of paint on your vehicle is only as good as the paint layer beneath it. Whether you need to prevent more rust damage, cover an unsightly blemish, or completely re-paint your car, the first step in any car paint maintenance is to remove the old paint. It might sound like a complicated process, but much like painting your own vehicle, the process of removing old paint and rust is quite simple with the right tools and work space.

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1. Initial Steps Tools and Workspace

As with any vehicle paint project, make sure you're working in a well-ventilated area that is clean and free of debris or dust. A covered space is ideal, but if the weather looks good for the next few days, a spot outside away from trees also works well. Assemble your tools and safety implements beforehand you should always have at least a dust mask, gloves, and a respirator will provide even more safety when it comes to stripping paint chemically.

If you're reapplying the same paint color over a blemished patch, determine the type of paint, and then have your paint color matched at an auto paint shop. Also remember you'll need a topcoat for finishing and sealing. If you're going to be painting the entire vehicle, determine how much paint and topcoat you're going to need and assemble those.

Always thoroughly wash your car and allow it to dry completely before beginning any paint removal.

2. Removing Paint From Your Car - Sanding

Sanding away the old paint is a perfect paint-removal method for vehicles that don't have multiple paint layers. This method also works well for removing rust or small blemishes as it doesn't require a massive amount of equipment or paint to complete the job. Always remember when removing rust spots that after sanding away the rust, you'll need to treat the area to prevent it from spreading.

Sanding Process

- Make sure you have a dust mask and gloves before beginning, and are working in a well-ventilated area.
- Using 220-grit sandpaper, sand the area you wish to repaint until all the paint has been removed.
- Wipe the surface clean, and finish sanding with 400-grit until the area is completely smooth.
- Wipe the surface clean again to ensure no residue is left behind, and wash and allow your vehicle to dry before continuing with any painting or sealing.

Tip: Sanding by hand will work well, but having a dual-action sander will be more time-efficient. There are multiple types of sanders available that will also get the job done, but dual-action sanders tend to be the best. To prevent dents or gouging the surface, keep the DA sander flat against the surface at all times. Don't use heavy-duty grinders, as these are powerful enough to actually strip away the sheet metal and damage the vehicle further.

Stripping Car Paint

Using a chemical stripper to remove vehicle paint might seem a little more time consuming initially, but works well when you need to repaint a larger surface area and will save you time in the end. The amount of chemical stripper you'll need will vary on the surface area of the vehicle needing repainting, so make sure you've bought enough.As with the sanding method, start with a clean and completely dry vehicle. Remove any fixtures or rubber trim surrounding the area needing to be repainted so that

the chemical stripper doesn't damage them. Tape or cover any windows as needed, and assemble your materials — you'll need chemical stripper (available online or at auto shops), a foam brush or a rag, and a putty knife. When stripping car paint, always wear a ventilator and heavy-duty gloves, and make sure you're wearing thick clothing — long sleeves and pants with heavy boots are a good idea.

Chemical Stripping Process: Video

Pour or brush the chemical stripper on the surface area needing to be repainted, and let it sit for the amount of time recommended by the package instructions. Once the amount of time has elapsed, test a small area with a putty knife. If the paint still does not come off easily, let it sit a bit longer or brush with more stripper.

Once ready, scrape the entire area clean of paint with the putty knife. If needed, apply a second coat and scrape again.

Once the paint has been removed, rinse the area with water and let it dry.

Using a coarse-grit sandpaper, remove any residual paint, and then switch to fine-grit sandpaper until the surface is completely smooth.

Wipe or rinse the area clean and let dry completely before moving forward with any painting.

Tip: When using a chemical agent to remove paint from a vehicle, NEVER do so in an enclosed space, even while wearing a respirator. Make sure you are outdoors or in a space with lots of airflow.

Sand-Blasting Paint From Your Car

Sand-blasting is also a great method for removing car paint, but one that requires a few more tools and a larger workspace. This method tends to work well for vehicles that require repainting of a very large area or even the entire body. You will need a compressor and a compatible blasting nozzle. The type of nozzle will vary on the horsepower of the compressor, so make sure to research which size you'll need.

When choosing sand-blasting media, there are several different types and sizes available. The most common media types will be plastic or sand, and a good size range is anything from size 40 to size 12.

Once you're ready to begin, assemble your compressor and other blasting supplies. You'll need to wear a heavy shirt with long sleeves, a sand-blasting hood, a respirator, and heavy gloves, and always make sure you're working in an open or well-ventilated area. If you chose a plastic blasting media, cover ALL of the exposed glass, chrome, and trim on your vehicle to avoid damage. If you chose a sand blasting medium, remove all glass, trim, and chrome. If you'd like, you can cover any sensitive areas with a thick material, but test it first to ensure you won't blast right through it and damage your car.

Blasting Process

Add your blasting medium to the compressor, and adjust the pressure according to the type and size of blasting medium. Working in smooth, steady motions, blast the vehicle to remove paint, and continue until paint has been removed.

Tip: When blasting, make sure not to linger too long over a specific area to avoid damaging the metal. Blasting in a certain area too long with a harsh medium can warp the metal.

Once you've removed all of the paint from the entire vehicle or a specific area, you can now proceed with any further improvements. Visit our resources section for more info on auto painting, and shop our paint removal supplies online.

Self-Check 4	Written test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. List the three broad types of paint removal methods. (9 points)

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

You can ask your trainer for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Operation sheet 1

OPERATION TITLE:- Remove Paint From Your Car - Sanding
PURPOSE:- for repairing old paint

CONDITIONS OR SITUATIONS FOR THE OPERATIONS:-

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

EQUIPMENT TOOLS AND MATERIALS :

- ✓ sand paper, floor jack, hydraulic crane,

PROCEDURE:-

- Prepare tools, equipments and workplace
- Make sure you have a dust mask and gloves before beginning, and are working in a well-ventilated area.
- Using 220-grit sandpaper, sand the area you wish to repaint until all the paint has been removed.
- Wipe the surface clean, and finish sanding with 400-grit until the area is completely smooth.
- Wipe the surface clean again to ensure no residue is left behind, and wash and allow your vehicle to dry before continuing with any painting or sealing

PRECAUTIONS:-

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

QUALITY CRITERIA:

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

Operation sheet 2

OPERATION TITLE:- Stripping Car Paint

PURPOSE:- for repairing old paint

CONDITIONS OR SITUATIONS FOR THE OPERATIONS:-

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

EQUIPMENT TOOLS AND MATERIALS :

- ✓ sand paper, paint striper, putty knife or scraper floor jack, hydraulic crane,

PROCEDURE:-

1. Prepare tools, equipments and workplace
2. Pour or brush the chemical stripper on the surface area needing to be repainted, and let it sit for the amount of time recommended by the package instructions.
3. Once the amount of time has elapsed, test a small area with a putty knife. If the paint still does not come off easily, let it sit a bit longer or brush with more stripper.
4. Once ready, scrape the entire area clean of paint with the putty knife. If needed, apply a second coat and scrape again.
5. Once the paint has been removed, rinse the area with water and let it dry.
6. Using a coarse-grit sandpaper, remove any residual paint, and then switch to fine-grit sandpaper until the surface is completely smooth.
7. Wipe or rinse the area clean and let dry completely before moving forward with any painting.

PRECAUTIONS:-

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

QUALITY CRITERIA:

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

Operation sheet 3

OPERATION TITLE:- Sand-Blasting Paint From Your Car

PURPOSE:- for repairing old paint

CONDITIONS OR SITUATIONS FOR THE OPERATIONS:-

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

EQUIPMENT TOOLS AND MATERIALS :

✓sand paper, blasting medium, putty knife or scraper floor jack, hydraulic crane,

PROCEDURE:-

1. Prepare tools, equipments and workplace
2. Add your blasting medium to the compressor,
3. adjust the pressure according to the type and size of blasting medium.
4. Working in smooth, steady motions, blast the vehicle to remove paint,
5. continue until paint has been removed

PRECAUTIONS:-

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

QUALITY CRITERIA:

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

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

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

Task 1. Use work instructions to determine job requirements, including job sheets, quality and quantity of materials.
Task 2. Observe Workplace Health and Safety (WHS) requirements, including personal protection needs
Task 3. Read and interpret Job specifications
Task 4. Select and inspect materials for repairing and replacement
Task 5. Select correct hand, power tools and safety equipment for safe use.
Task 6. Determine products to minimize waste materials and task time.
Task 7. Identify and discuss job Procedures

List of Reference Materials

1. https://www.autobodytoolmart.com/how-to-remove-paint-t.aspx
2. https://www.sentryair.com/blog/welding-fume-extraction/fume-extraction-for-auto-body-shops/
3. https://www.sentryair.com/spray-paint-fumes.htm
4. https://www.grainger.com/content/qt-health-fume-extraction-145
5. https://www.carsdirect.com/classic-cars/understanding-the-best-way-to-remove-paint-on-cars

Vehicle Body Repairing and Painting NTQF Level-II

Learning Guide -15

Unit of Competence: - Apply Paint Removal Methods

Module Title: - Applying Paint Removal Methods

LG Code: EIS VRP2 M05 LO01-LG-15

TTLM Code: EIS VRP2 TTLM 0919v1

LO 01: Cleanup work area and maintain equipment

Instruction Sheet	Learning Guide #-15

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

- Collecting and storing Material
- Removing and disposing Waste material
- Cleaning Equipment
- Cleaning and inspecting Work area
- Tagging and identifying faults of Unserviceable equipment
- Maintaining Tooling

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to –**

- Collect and store Material that can be reused
- Removing and disposing Waste material
- Clean Equipment
- Clean and inspect Work area
- Tag and identify faults of Unserviceable equipment
- Maintain Tooling

Learning Instructions

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 20.
3. Read the information written in the “Information Sheets 1,2,3,4,5,6”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1,2,3,4,5,6” in page 78,80,85,87,89,91-. respectively
5. Ask from your teacher the key to correction
6. If you earned a satisfactory evaluation from self check proceed to operation sheet 1,2 in page 92,93 and lap in page 94. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity .
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Using Tools and equipment

Housekeeping Signs

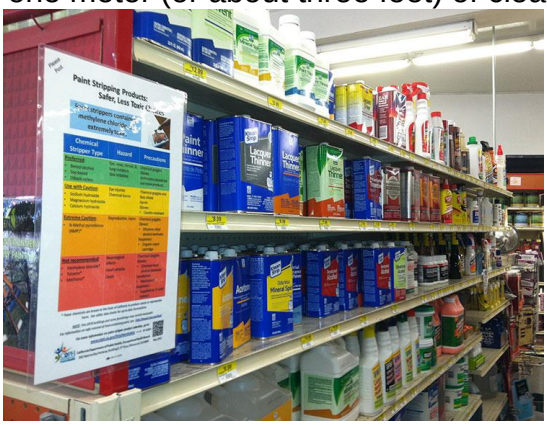
The workplace or office is a place where productivity is expected and having a pleasant work area certainly adds to a positive environment. Employees can do their part in addition to regular cleaning staff housekeeping and caretaker maintenance to keep it clean, safe, and healthy for all.

Collecting and storing material that can be reused

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

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

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



figures. proper storage of tools, materials and equipments

Importance of proper storage of tools and equipments

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

Pointers to follow in storing tools and equipments

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

Self-Check -1	Written Test

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

1. Define workplace (2)

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

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 2	Removing waste and scrap following workplace procedures

Waste Disposal Practices

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

Methods of Waste Disposal

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

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

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

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

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

Self-Check -2	Written Test

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

1. List five waste disposal methods (10 pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 3	Cleaning and inspecting equipment and work area

Cleaning up is not just a measure of respect for the workspace, it also removes hazards.

Cleaning is so important because when we clean an area, we are also doing some inspection or checking of machinery, equipment, and work conditions. An operator cleaning a machine can find many mal-functions. When a machine is covered with oil, soot, and dust, it is difficult to identify any problems that may be developing. While cleaning the machine, however, one can easily spot oil leakage, a crack developing on the cover, or loose nuts and bolts. Once these problems are recognized, they are easily fixed. It is said that most machines breakdowns begin with vibration (due to lose nuts and bolts), with introduction of foreign particles such as dust (due to the crack on the cover, for instance), or with inadequate oiling and greasing. For this reason cleaning is useful to make discoveries while cleaning machines.

Kinds of Cleaning Solvents

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

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

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

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

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

Properties of Cleaning Solvents

A useful generalization much quoted is that “Like dissolves like”. More specifically, high solubility occurs when the molecules of the solute are similar in structure and electrical properties to the molecules of the solvent. When there is a similarity of electrical properties; e.g. high dipole element between solute and solvent, the solute-solvent

attractions are particularly strong. When there is dissimilarity, solute-solvent attractions are weak. For this reason, a polar substance such as H2O usually is a good solvent for a polar substance such as detergent soap but a poor solvent for a non polar substance such as gasoline.

Uses of Cleaning Solvents

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

Occupational Health and Safety Practices in Handling Cleaning Solvents

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

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

Clean up procedures

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

- ✓ Mop up spills immediately and put a chair or cone over them if they are wet enough to cause someone to slip.

Inspection of work tools/equipment

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

Importance of inspection

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

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

Inspection Procedures

When conducting inspections, follow these basic procedures:

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

- Do not try to detect all hazards simply by relying on your senses or by looking at them during the inspection. You may have to monitor equipment to measure the levels of exposure to chemicals, noise, radiation or biological agents.
- Take a photograph if you are unable to clearly describe or sketch a particular situation

Self-Check -3	Written Test

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

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

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

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

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

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

TAGS

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

Attaching the Tag

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

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

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

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

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

Self-Check -4	Written Test

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

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

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

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

Tools and Equipment Maintenance

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

components of maintenance program

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

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

  Preventive maintenance is the systematic care and protection of tools, equipment, machines and vehicles in order to keep them in a safe, usable condition, limit downtime and extend productivity. We must always be aware that maintenance tasks themselves are potentially hazardous and can result in injury. The successful maintenance program is:
  - well organized and scheduled,
  - controls hazards,
  - defines operational procedures, and
  - trains key personnel.

Self-Check -5	Written Test

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

1. List four successful maintenance program (4 pts)

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

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet 6	Maintaining tooling in accordance with workplace procedures.

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

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

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

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

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

Self-Check -6	Written Test

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

1. Which of the following are false during maintaining tooling

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

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation sheet 1

OPERATION TITLE:-Storing/arranging tools and shop equipments

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

CONDITIONS OR SITUATIONS FOR THE OPERATIONS:-

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

EQUIPMENT TOOLS AND MATERIALS :

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

PROCEDURE:-

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

PRECAUTIONS:-

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

QUALITY CRITERIA:

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

Operation sheet 2

OPERATION TITLE:- Cleaning work shop area

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

CONDITIONS OR SITUATIONS FOR THE OPERATIONS:-

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

EQUIPMENT TOOLS AND MATERIALS :

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

PROCEDURE:-

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

PRECAUTIONS:-

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

QUALITY CRITERIA:

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

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

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

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

List of reference materials

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