



Vehicle body repairing

Level III

Based on November 2016, Version 2 Ethiopian
Occupational Standard (EOS)

Module Title: - Monitoring Environmental and
Sustainability Work Practice

LG Code: EIS VBR3 M 06 LO (1-5) LG(22-26)

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December, 2020

6.1. Table of Contents

LG #22	: Apply and monitor environment regulations
<p>Instruction sheet</p> <ul style="list-style-type: none"> • Identifying <i>ethical environmental practice</i> in an automotive workplace • Identifying Environmental responsibilities and penalties for individual breaches of legislation and regulations • Applying Documents and procedures relevant to environmental safety and hazards • Minimizing waste materials including sludge, solids and other wastes by sorting and storing in bins • Sorting and reusing, disposing or recycling packaging goods • Identifying and sourcing <i>safety equipment and other material</i> <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none"> • Identify <i>ethical environmental practice</i> in an automotive workplace • Identify Environmental responsibilities and penalties for individual breaches of legislation and regulations • Apply Documents and procedures relevant to environmental safety and hazards • Minimize waste materials including sludge, solids and other wastes by sorting and storing in bins • Sort and reuse, dispose or recycle packaging goods • Identify and source <i>safety equipment and other material</i> 	

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Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

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Information Sheet 1- Identifying *ethical environmental practice* in an automotive workplace

1.1. Ethical work conduct

is thus a sort of work ethics that used as guideline to enable workers to identify the right way of conduct from the wrong way of conduct. Work ethics is intended to serve as a guide to everyday conduct of workers. Work ethics enables workers to possess proper work behavior.

1.1.1. Common Ethical Work Conduct for all Workers

It is true that there are different professional ethics depending on the type of profession. But still there are ethical rules that are commonly found in almost every profession.

The word profession is simply defined as avocation or occupation, which requires a special and advanced educational training. A person who attained a certain specialized skill is known as a professional. A man trained in machine or automotive technology, a man trained in medical science and the like.

Professional ethics reference to ethics that enables professionals to distinguish what is right from what is wrong using morality as standard of evaluation. Therefore, professional ethics can be conceived as parameter by which actions and behaviors of a professional can be determined as right or wrong. In absolute terms all professions do not have the same set of values and standards such as accountants, physicians,

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doctors, managers, lawyers, etc.

But there are also some common codes of ethics and rules of conducts that apply to all professions regardless of their specific specialization .These are:-

- i. **Punctuality:** Punctuality refers to the state of being strictly observant of an appointed or regular time across all professions a worker should be punctual not only when he/she meets deadlines and when he/she is always available during working hours.
- ii. **Honesty and integrity:** honest basically refers to the art of telling the truth. Employers and institutions expect their workers to be honest and hence professionals should be honest, and at the same time work in good behavior and integrity.
- iii. **Proper utilization of resources:** A worker in any profession is it a doctor, teacher physician, should handle the resources in a way that she/he can use the resources for longer time. That is any worker of a given profession should uses resources be it financial, material, etc. off efficiently, and in a just and proper manner. This is particularly should apply in public institutions who deliver services to the public, in other words, it means avoiding of wastage in any, be it material or financial resources.
- iv. **Loyalty and self –efficacy:** Any worker, in a given profession must stand for, and not against the employer or the institution. This true certainly in relationships with your employer or institution. Moreover, an ethical professionals must develop self-efficacy, that is an appraisal or evaluation that a professional about his /her professional and personal competence to succeed in a particular task. That is he has to develop his personal and professional belief in the ability to perform tasks successfully.
- v. **Working in cooperation with collogues:** A worker of a given profession should make sure that he/she has a good relationship with other workers. the main

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rationale behind these codes of professional ethics is to create a fertile and good atmosphere conducive for cooperation ethics is to create a fertile and good atmosphere conducive for cooperation and better productivity. He/she should serve hand in hand with other professional and better productivity. He/she should serve hand in hand with other professional workers in the interest of effective provision of service.

- vi. **Anti-corruption spirit:** It is known that corruption severely hampers development and it is an impediment for building democracy. One way of fighting corruption is by making professionals to comply with the laws, rules, and regulations of the state. But most importantly, it is plausible that every professional should enhance or develop the spirit or mentality that is anti/against corruption so that development, equality, democracy and justice can remarkably be fostered.
- vii. **Confidentiality:** A worker of give profession need to keep some information that should be kept secret. For instance, in case of physician or nurse he/she has to keep all the information regarding the patient contained in a patient’s chart. Therefore the physician or nurse should never voluntarily divulge information of a confidential nature unless the patient’s best interest requires this be done. Another example is that a teacher should keep all information of student’s achievements confidential.
- viii. **Commitment:** A professional should help his /her clients and the whole community to maintain and satisfy societal or public demands. Moreover, he/she holds paramount’s the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.
- ix. **Persistent tolerance and democratic culture:** Any worker or professional have to develop the ability and willingness to accommodate differences in ideas, outlooks or views is indispensable, but it should be carefully and peacefully managed and resolved.
- x. **Respecting the dignity of people:** A professional or worker should respect the dignity of all personal serving them in accordance with their basic needs,

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irrespective of their sex, personal status, religion or by supernal factors involved.

- xi. **Impartiality /Non-partiality:** A professional should be impartial, that is being non- participant to his /her clients or all persons that he/she contacts. Rather, he/she should treat all equally in his/her service delivery without any discrimination. for example a teacher should treat his/her students equally on the basis of their academic performance or achievement.
- xii. **Accountability and responsibility:** Any worker in a given profession has professional responsibilities or duties. In an organization where someone is engaged, he/she has to be obedient for the chains of command, which are presented to him/her. As part of a given organization, everyone is expected to be answerable for his/her actions.
- xiii. **Transparency:** It is also important for a professional to be transparent. That is, his/her work must be open to the public to whom he/she delivers public services. Confident professionals who work for the people effectively and efficiently are usually transparent.
- xiv. **Responsiveness:** Responsiveness refers to the extent that a professional satisfies the needs, preferences ,or values of his/her has connections and professional relationship with his clients or public, he/she has to able to reply or respond to the people's demand.
- xv. **Proper execution of professional duties:** It means that when you work you have to do so according to the agreed guidelines and in the best possible way.

1.1.2. The Significance of Work Ethics for an Organization

Code of ethics identifies those ethical principles and values that are regarded as the foundation of an organization. The significance of work ethics for an organization includes:

- It clearly defines acceptable and non-acceptable codes of conduct.
- It enables workers to develop proper relationship with other workers and create a good industrial environment. Ethical principles are instruments for the development of common values and outlooks.

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- It helps workers to use instruments of labor properly and to save other resources of the organization.
- It helps workers to use their time and knowledge effectively.
- It makes a worker to perform with high professional excellence. The existence of professional standards insists individuals in a profession to observe to the ethical values and principles. Therefore, the observance of these ethical values by professionals ensures the provision of well standardized service to members of the society. So we as workers shall honor and promote the fundamental rights, dignity and worth of all people in general and respect and treat ethically of our customers in particular.

1.2. Solving Problems And Critical Thinking

Anyone who can think critically and logically to evaluate situations is considered very desirable by the industry. Critical thinking is the art of being able to judge or evaluate something without bias or prejudice. When diagnosing an automotive problem, critical thinkers are able to locate the cause of the problem by responding to what is known, not what is supposed to. Good critical thinkers begin solving problems by carefully observing what is and what is not happening. Based on these observations, something is declared as a fact. For example, if the right head lamp of a vehicle does not light and the left headlamp does, a critical thinker will be quite sure that the source of the problem is related to the right head lamp and not the left one.

Therefore, all testing will be centered on the right head lamp. The critical thinker then studies the circuit and determines the test points. Prior to conducting any test, the critical thinker knows what to test and what the possible test results would the vehicle indicate. Critical thinkers solve problems in an orderly way and do not depend on chance. They come to conclusions based on a sound reasoning. They also understand that if a specific problem exists only during certain conditions, there are a limited number of causes. They further understand the relationship between how often the problem occurs and the probability of accurately predicting the problem.

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Also,they understand that one problem may cause other problems and they know how to identify the connec-tion between the problems.

Solving problems is something we do every day. Often the problems are trivial, such as deciding what to watch on television. Other times they are critical and demand much thought. At these times, thinking critically will really pay off. Although it is impossible to guarantee that critical thinking will lead to the corect decision, it will lead to good decisions and solutions.

1.3. Identifying Skills to do job

Honestly evaluate yourself and your life to determine what skills you have. Even if you have never had a job, you still have skills and talents that can make you a desirable employee. Make a list of all of the things you have learned from your school, friends,and family and through television, volunteering, books, hobbies, and so on. You may be surprised by the number of skills you have. Identify these skills as being either technical or personal skills.

Technical skills include things you can do well and enjoy, such as:

- Using a computer
- Working with tools, machines, or equipment
- Playing video games
- Doing math problems
- Maintaining or fixing things
- Figuring out how things work
- Making things with your hands Working with ideas and information
- Solving puzzles or problems Studying or reading
- Doing experiments or researching a topic
- Expressing yourself through writing

Personal skills are also called soft skills and are things that are part of your personality. These are things you are good at or enjoy doing, such as:

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- Working with people
- Caring for or helping people
- Working as a member of a team and independently
- Leading or supervising others
- Following orders or instructions
- Persuading people
- Negotiating with others

By identifying these skills you will have created your personal skills inventory. From the inventory you match your skills and personal characteristics to the needs and desires of potential employers. The inventory will also come in handy when marketing yourself for a job, such as when preparing your resume and cover letter and during an interview.

1.4. Professional Ethics

The key to effective communications is respect. Like communication, respect is a two-way process. You should respect others and others should respect you.

However, respect cannot be commanded; it must be earned. As a technician, you can earn respect in many ways. All of these result from the amount of professionalism you display. Professionalism is best shown by having a positive attitude, displaying good behavior, and accepting responsibility. A good technician is a highly skilled and knowledgeable individual. A professional technician is a good technician who dresses and acts appropriately.

A professional demonstrates the following:

- Self-esteem, pride, and confidence
- Honesty, integrity, and personal ethics
- A positive attitude toward learning, growth, and personal health
- Initiative, energy, and persistence to get the job done
- Respect for others

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- A display of initiative and assertiveness
- The ability to set goals and priorities in work and personal life
- The ability to plan and manage time, money, and other resources to achieve goals
- The willingness to follow rules, regulations, and policies
- The willingness to fulfill the responsibilities of your job
- Assuming responsibility and accountability for your decisions and actions
- The ability to apply ethical reasoning

1.4.1. Purposes of Professional Ethics

- Advance the quality of service the quality of service for professionals could render
- Evaluate the performance of professionals in each profession
- Distinguish acceptable and non- acceptable characters or code of conduct
- Serve as a foundation of professional identity

Self-Check -1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Instruction I: - write true if the statement is correct or write false if the statement is incorrect and write the answer on the space provided or on the separate answer sheet (5 pts)

Instruction II:- Ddiscuses or write the answer for the following questions (10 pts)

Note: Satisfactory rating ≥ 7.5 points

Unsatisfactory < 7.5 points

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Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

Information Sheet 2 - Identifying Environmental responsibilities and penalties for individual breaches of legislation and regulations

2.1. Concept Of Environmental Protection

The natural environment can be defined as the circumstance or conditions that surround one organism or group of organisms. This means the environment is composed of land, water, air, human beings and other living creatures as well as human created surroundings. We need unpolluted air to breathe, uncontaminated water to drink, nutritious food to eat and hygienic condition to live. In short, we want to survive. Human survival depends on natural environment. We need plants for photosynthesis, building material and energy. We also need water and arable soil for survival. These and other ecosystem services can be obtained when the environment is protected. In order to protect and preserve the environment, we have to use our resources in a responsible way.

In addition to that, for the natural environment to sustain itself, the normal interaction of these communities must exist. In other words, for an ecosystem to sustain itself and to be fully functional, there must be representatives from the three metabolic groups (primary producer, consumer and decomposer). The complex interaction of these functional groups enable the natural environment to sustain itself and support and the lives of living things, including human.

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Ethiopia has an environment owed with plenty of natural resources. It is a home to a wealth of biological diversity. Its wild life includes animals such as Walia Ibex, Mountain Nyala and Menelik's bushback.

However, the country's biological diversity is under serious threat due to environmental degradation. Ethiopia is now left with less than 2.5 % of its forests. The major cause of deforestation is the expansion of agricultural activities and wild fire which destroyed every year a considerable forests and wild animal. Estimate of deforestation in Ethiopia is 80,000-200,000 hectares per year. The permanent loss in value of Ethiopia's soil resources caused by erosion in 1990 was for instance estimated to nearly 10million US dollar.

Therefore, the protection of our environment is now a question of survival. We need to conserve, protect and properly utilize our natural resources. This is a responsibility of every member of the society. We need to actively participate in the afforestation programe. We have to fight against illegal hunting, deforestation etc. We need to actively participate in the public policies which may affect the environment.

2.2 Manufacturers' Warnings And Government Regulations

Many government agencies have the responsibility to ensure safe work environments for all workers. Federal agencies include the **Occupational Safety and Health Administration (OSHA)**, Mine Safety and Health Administration (MSHA), and National Institute for Occupational Safety and Health (NIOSH). These agencies, as well as state and local governments, have instituted regulations that must be understood and followed. Everyone in a shop has the responsibility to adhere to these regulations.

OSHA: In 1970, OSHA was formed to "assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions by providing research, information, education, and training in the field of occupational safety and health." The established safety standards are consistent across the country. It is the employer's responsibility to provide a place of

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employment free from all recognized hazards. All automotive industry safety and health issues are controlled by OSHA.

Environmental safety includes those procedures that protect people and the Earth's resources (land, water, and air) from toxic chemicals. Persons working in body and/or paint shops are often exposed to dangerous levels of various gases, dusts, and vapors. Because of this exposure, control measures should be established for air contaminants and other hazardous substances. Do not breathe contaminated air! Proper ventilation is very important in areas where caustics, degreasers, under coats, sanding dust, and finishes are used. The vapors from thinners used in most paints have a narcotic effect, and long-term exposure can cause serious illness. Ventilation can be provided by means of an air-changing system, extraction floors, or central dust extraction systems.

In addition to personal safety, body/paint technicians These systems use large fans to pull contaminated air out of the paint booth or work area. For the spray booth, adequate air replacement is necessary not only to promote evaporation and drying of paint materials, but also to remove harmful mists and vapors. Always remember to turn on the air exchange system when working in the paint booth or paint mixing room.

Dustless Sanding Systems.

Use a dustless sanding system to minimize exposure to toxic airborne dust particles created by sanding automotive paints and primers. A dustless sanding system uses a blower or air pump to draw airborne dust into a storage container, much like a vacuum cleaner. This action pulls airborne sanding dust through holes in a special sanding pad and sandpaper or through a shroud that surrounds the sanding pad. Some dustless system manufacturers claim that their machines can trap over 99 percent of the toxic dust created by sanding operations. When running, connect a shop exhaust hose(s) to the tailpipe(s). This will Carbon monoxide (CO) is an invisible, odorless, but deadly gas! Car and truck engine exhaust produces harmful CO gas. CO poisoning from engine exhaust fumes can cause drowsiness and vomiting; it can even be fatal. Operate engines only in a

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well-ventilated area to avoid the danger of CO poisoning. Connect a shop vent hose to the tailpipe of any vehicle being operated in the shop. Look at Figure 9–31
 Space heaters used in some shops can also be a major source of CO. These heaters should be inspected periodically to ensure they are adequately vented and have not become blocked.

Never use automotive-type paints on household items such as toys or furniture. Automotive paints pose a dangerous health hazard to children who might ingest some of the toxic paint. Asbestos was used in the manufacture of older brake and clutch assemblies. Asbestos dust contains cancer-causing agents. Never blow this dust into the shop. Use a vacuum system while wearing a filter mask to safely clean off asbestos dust.



FIGURE 9–31 Whenever a vehicle is in a stall with the engine running, connect a shop exhaust hose(s) to the tail pipe

2.3. Warnings And Regulations

Right-to-Know Laws specify essential information and stipulations for safely working with hazardous materials. Since then, the majority of states have enacted their own Right-to-Know Laws. The federal courts have decided that these regulations should apply to all companies, including the auto collision repair and refinishing

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professions.

The general intent of such laws is that employers provide their employees with a safe workplace. Specifically, there are three areas of employer responsibility:

1. Obtain proper hazardous materials training. All employees must be trained about their rights under the legislation. They must learn the nature of the hazardous chemicals, the labeling of chemicals, and the information about each chemical. This information should be posted on MSDS. MSDS summarize all information sheets should be made readily available to employees. Employees must be familiarized with the general uses, characteristics, protective equipment and accident or spill procedures associated with major groups of chemicals. This training must be given to employees annually and provided to new employees information about potentially hazardous chemicals.
2. All hazardous materials must be properly labeled, indicating what health, fire, or reactivity hazard they pose. Information about what protective equipment is needed when handling each chemical must be given. This safety data must be read and understood by the user before application.
3. Shops must keep hazardous material records. Shops must maintain documentation on the hazardous chemicals in the workplace. They also must provide proof of training programs, records of accidents and/or spill incidents, satisfaction of employee requests for specific chemical information via the MSDS, and a general Right-to-Know compliance procedure manual used within the shop

Self-Check -2	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Instruction : Discusses or write the answer for the following questions (10 pts)

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Explain job specification (2pts)

List four components of job specification (4 pts)

Explain the difference between job specification and job description (4 pts)

Note: Satisfactory rating ≥ 5 points

Unsatisfactory < 5 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

Information Sheet 3- Applying Documents and procedures relevant to environmental safety and hazards

3.1. Hazard control and hazardous material and substance

A typical shop contains many potential health hazards for those working in it. These hazards can cause injury, sickness, health impairments, discomfort, and even death.

These hazards can be classified as:

1. Chemical hazards—caused by high concentrations of vapors, gases, or dust
1. Hazardous wastes—those substances that are the result of a service
- Physical hazards—include excessive noise, vibration, pressures, and temperatures

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2. Ergonomic hazards—conditions that impede normal body position and motion

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 difficulty in cleaning up contaminants after removal. Where abrasive blasting is done, suitable respiratory

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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.

3.2. 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.

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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.

3.2.1. 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.

3.2.2. 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

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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.






3.2.3. 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

Table 1 potential Health & Safety Hazards

HAZARD		TO PROTECT YOURSELF
EXPLOSIVE		Make sure volatile chemicals are stored and handled correctly. Proper grounding must be used for all containers.
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HIGH SOUND LEVELS Sound levels exceed 85 dB		HEARING PROTECTION is required when working in designated areas.
EXPOSURE		Understand the chemical(s) you are working in the vicinity of. Consult the MSDS and wear the appropriate PPE.
FOOT INJURY		Approved protective footwear is needed when there is the risk of foot injury due to slipping, uneven terrain, abrasion, crushing potential, temperature extremes, corrosive substances, puncture hazards, electrical shock and any other recognizable hazard
COMPRESSED GASES		Do not <ul style="list-style-type: none"> • drop • keep near heat
FIRE Due to flammable liquids, gases or combustible dusts		Complete a hot work permit work requires it.

Self-Check -3	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in

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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)

Answer Sheet

Name: _____ Date: _____

Note: Satisfactory rating >10= points Unsatisfactory <10 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

Information Sheet 4- Minimizing waste materials including sludge, solids and other wastes by sorting and storing in bins

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4.1. 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.

4.1.1. 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

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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.

4.1.2. 3 R's of Waste Minimization

Waste minimization revolves around three R's as follows:

i. 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.

ii. 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.

iii. 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.

4.2. Waste Minimization Techniques

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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

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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.

9 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

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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:

4.3. 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.

4.3.1. 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,

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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 -4	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Instruction :- Discuss or write the answer for the following questions (8 pts)

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

Note: Satisfactory rating ≥ 4 points

Unsatisfactory < 4 points

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

Answer Sheet

Score = _____
Rating: _____

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Name: _____

Date: _____

Short Answer Questions

Information Sheet 5- Sorting and reusing, disposing or recycling packaging goods

5.1. Recycling

Recycling is a resource recovery practice that refers to the collection and reuse of waste materials such as empty beverage containers. The materials from which the items are made can be reprocessed into new products. Material for recycling may be collected separately from general waste using dedicated bins and collection vehicles, a procedure called kerbside collection. In some communities, the owner of the waste is required to separate the materials into different bin (e.g. for paper, plastics, metals) prior to its collection. In other communities, all recyclable materials are placed in a single bin for collection, and the sorting is handled later at a central facility. The latter method is known as "single-stream recycling.

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

5.2. Handling Shop Wastes

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Some of the common hazardous wastes, along with what you should do with them follows Oil Recycle oil. Set up equipment, such as a drip table or screen table with a used-oil collection bucket, to collect oil that drips off parts. Place drip pans underneath vehicles that are leaking fluids onto the storage area. Do not mix other wastes with used oil, except as allowed by your recycler. Used oil generated by a shop (and/or oil received from household do-it-yourself generators) may be burned on site in a commercial space heater. Also, used oil may be burned for energy recovery. Contact state and local authorities to determine requirements and to obtain necessary permits.

Oil Filters Drain for at least 24 hours, crush (Figure)and recycle used oil filters.



Figure 6–24 A hydraulic single oil filter crusher

Metal Residue from Machining Collect metal filings when machining metal parts. Keep separate and recycle if possible. Prevent metal filings from falling into a storm sewer drain

Solvents Replace hazardous chemicals with less toxic alternatives that have equal performance. For example, substitute water-based cleaning solvents for petroleum-based solvent degreasers. To reduce the amount of solvent used when cleaning parts, use a two-stage process: dirty solvent followed by fresh solvent. Hire a hazardous waste management service to clean and recycle solvents. (Some spent solvents must be disposed of as hazardous waste, unless recycled properly.) Store solvents in closed containers to prevent evaporation. Evaporation of solvents contributes to ozone depletion and smog formation. In addition, the residue from evaporation must be treated as a

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hazardous waste. Properly label spent solvents and store on drip pans or in diked areas and

only with compatible materials.

Containers Cap, label, cover, and properly store aboveground outdoor liquid containers and small tanks within a diked area and on a paved impermeable surface to prevent spills from running into surface or ground water.

Other Solids Store materials such as scrap metal, old machine parts, and worn tires under a roof or tarpaulin to protect them from the elements and to prevent potential contaminated runoff. Consider recycling tires by retreading them

Liquid Recycling Collect and recycle coolants from radiators. Store transmission fluids, brake fluids, and solvents containing chlorinated hydrocarbons separately, and recycle or dispose of them properly

Shop Towels/Rags Keep waste towels in a closed container marked “contaminated shop towels only.” To reduce costs and liabilities associated with disposal of used towels, which can be classified as hazardous wastes, investigate using a laundry service that is able to treat the Waste water generated from cleaning the towels.

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

1. Prepare a properly labeled container, which is compatible and non-leaking for the collection of the waste by:
2. Place the Hazardous Waste into the labeled container.
3. Incompatible Wastes shall be kept segregated and managed appropriately in separate containers.
4. Make sure the lid is closed on the container when you are not adding waste.

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5. Handle all waste in a manner that minimizes breakage, prevents fire, explosion, and the unauthorized release of any Hazardous Waste to the environment.
6. Immediately clean up and place in a labeled container, as specified above, any waste that is spilled.
7. When the container is either full or 90 days after the initial accumulation date, call the Environmental Health & Safety Department at Extension 4697 and make arrangements to have the waste picked up or transported to the Hazardous Materials Facility within 3 days.

waste oil furnaces, oil filter crushers, refrigerant recycling machines, engine coolant recycling machines, and highly absorbent cloths.

Always keep hazardous waste separate from other wastes. Make sure they are properly labeled and sealed in the recommended containers. The storage area should be covered and may need to be fenced and locked if vandalism could be a problem.

Information Sheet 6- Identifying and sourcing *safety equipment and other material*

6.2. Handling of material

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

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

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

Material Handling is the field concerned with solving the pragmatic problems involving the movement, storage, control and protection of materials, goods and products

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throughout the processes of cleaning, preparation, manufacturing, distribution, consumption and disposal of all related materials, goods and their packaging.

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

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

- Hand and forearm protection, such as gloves, for loads with sharp or rough edges.
- Eye protection.
- Steel-toed safety shoes or boots.
- Metal, fiber, or plastic metatarsal guards to protect the ninstep area from impact or compression.

6.3. Handling of solvent and other flammable liquid

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

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- Solvents
- Additives



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



Figure (A) Plain primer is handy for rapidly priming small repair areas when the area is very smooth and ready for paint. (B) Etching primer is applied to bare metal. It contains acid that will eat into and bond to sheet metal. (C) High-build primer-surfacer is a very thick primer and is ideal for spraying over body filler repair areas. It will build up quickly

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and is like a spray-on body filler. (D) Corrosion resistor or epoxy primer can be used in place of self-etch or acid-type primer. It will bond to bare metal while resisting corrosion or rust. Epoxy primer-surfacer is similar and is a commonly used product. (E) Water-based primer is designed to replace OEM water-based products. All other paint products must be designed to be used with water-based primer.



Figure ; When doing paint or refinish work, always use a complete matching system manufactured by one company. You are then sure that all ingredients are compatible and designed to be used together without problems.

6.4. Fire-fighting equipment

- Fuels used in modern ICE are highly volatile and require proper handling and storage.
- Diesel fuel is not as refined and contains active micro-organisms that can cause infections.
- Cleaning solvents and shop rags must be stored and handled properly to prevent fires.

6.4.1. Classes of Fires

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

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- Flammable liquids such as gasoline, oil, grease, and paint.
- iii. Class “C” fires
- Electrical equipment such as electric motors, wiring, and fuse boxes.
- iv. Class “D” fires
- Combustible metals such as aluminum, magnesium, and potassium.
- v. Fire extinguishers can be
- vi. Class A, B, C, or D. Many are ABC or multipurpose extinguishers







6.4.2. Steps in Using a Fire Extinguisher

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

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TABLE 9-1 GUIDE TO EXTINGUISHER SELECTION			
	Class of Fire	Typical Fuel Involved	Type of Extinguisher
Class  Fires (green)	For Ordinary Combustibles Put out a class A fire by lowering its temperature or by coating the burning combustibles.	Wood Paper Cloth Rubber Plastics Rubbish Upholstery	Water* ¹ Foam* Multipurpose dry chemical ⁴
Class  Fires (red)	For Flammable Liquids Put out a class B fire by smothering it. Use an extinguisher that gives a blanketing, flame-interrupting effect; cover the whole flaming liquid surface.	Gasoline Oil Grease Paint Lighter fluid	Foam* Carbon dioxide ⁵ Halogenated agent ⁶ Standard dry chemical ² Purple K dry chemical ³ Multipurpose dry chemical ⁴
Class  Fires (blue)	For Electrical Equipment Put out a class C fire by shutting off power as quickly as possible and by always using a nonconducting extinguishing agent to prevent electric shock.	Motors Appliances Wiring Fuse boxes Switchboards	Carbon dioxide ⁵ Halogenated agent ⁶ Standard dry chemical ² Purple K dry chemical ³ Multipurpose dry chemical ⁴
Class  Fires (yellow)	For Combustible Metals Put out a class D fire of metal chips, turnings, or shavings by smothering or coating with a specially designed extinguishing agent.	Aluminum Magnesium Potassium Sodium Titanium Zirconium	Dry powder extinguishers and agents only

6.4.3. Enterprise first aid

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

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

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

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

6.5. First aid signs

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

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

6.5.1. FIRST AID ROOMS

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

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

6.5.2. Providing first aid safely

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

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

Procedures could include:

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- Proper hand hygiene practices
- how to handle and dispose of sharps
- how to clean surfaces and reusable equipment
- how to manage spills and handle and clean soiled laundry
- how to handle and dispose of waste

when to use personal protective equipment, for example, using resuscitation masks for cardiopulmonary resuscitation

6.6. safety equipment and other material

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

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

Storage

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

Spray painting equipment

The **spray gun** (Figure) breaks the liquid primer or paint into a fine mist and forces it onto the surfaces of the vehicle. It is the key component in a refinishing system. It is a

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precision engineered and manufactured tool. Each type and size available is specifically designed to perform a certain number of tasks. Even though all spray guns have many parts and components in common, each gun type or size is suited for only a certain, defined range of jobs. As in most other areas of refinishing work, having the right tool for the job goes a long way toward getting a professional job done right in minimum time.

PARTS OF A SPRAY GUN

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

- Air cap or nozzle
- Fluid tip or nozzle
- Fluid needle valve
- Trigger
- Fluid control (or spreader) knob
- Air valve
- Pattern (or fan adjustment) control knob
- Gun body (or handle)

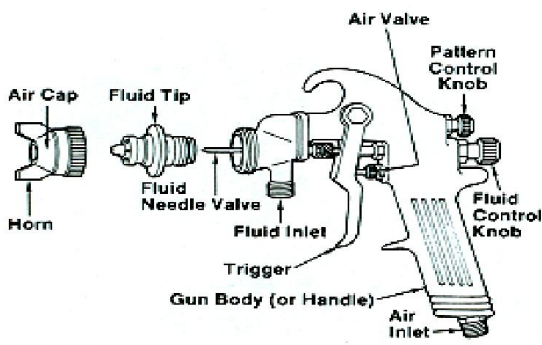


Fig Parts of a spray gun guns

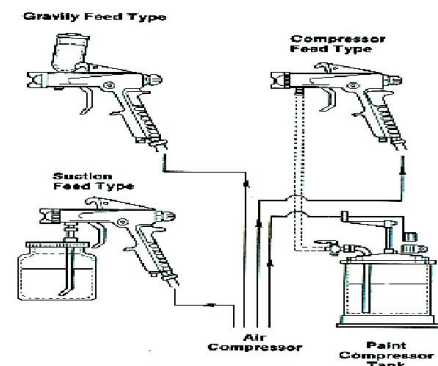
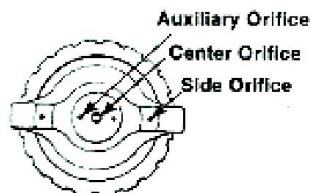


Fig. Study paint feed methods of air spray



Fig; Memorize nomenclature of air orifices.

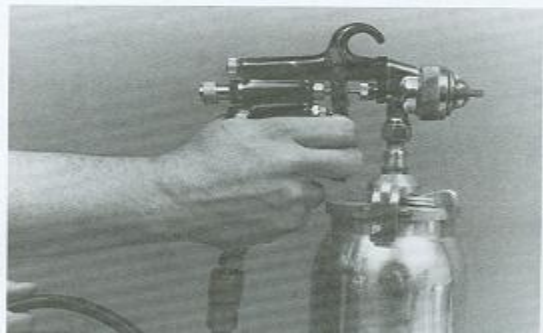


Fig. Suction feed type spray gun



Fig. Pressure feed type spray gun



Fig. Gravity feed type spray gun

SPRAY GUNS

Spray guns are used to apply sealer, primer, paint, and other liquid finishing materials to a vehicle. Spray guns must atomize the liquid, often paint, so that it flows onto the body surface smoothly and evenly. A spray gun atomizes a liquid by breaking it into a fine mist of droplets. This requires sufficient pressure and volume at the gun, which can be powered by air or electric energy, although air is more common.



FIGURE 5–3 Spray guns are used to apply a paper-thin film of primer and paint to the vehicle body.

Spray Gun Parts

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To use, service, and troubleshoot a spray gun properly, you must understand the operation of its major parts. The gun body holds the parts that meter air and liquid.

The body holds the spray pattern adjustment valve, fluid control valve, air cap, fluid tip, trigger, and related parts. The spray gun cup attaches to the gun body to hold the

material to be sprayed. The cup often fits against a rubber seal to prevent leakage. Another seal is mounted or formed in the lid to prevent leakage around the top of the cup.

The spray gun's fluid control valve can be turned to adjust the amount of paint or other material emitted. It consists of a thumbscrew or knob, needle valve, and spring. Turning the knob affects how far the trigger pulls the needle valve open. The fluid needle valve is seated in the fluid tip to prevent flow or can be pulled back to allow flow. Refer

again to **Figure 5-4**.



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The spray gun's air control valve, or spreader valve, controls how much air flows out of the air cap side jets. It has an air needle that can be slid back and forth to open or close the air valve.

The spray gun trigger can be pulled to open both the fluid and air valves. It uses lever action to pull back on the needle valves.

The spray gun air cap works with the air valve to control the spray pattern of the paint. It screws over the front of the gun head. The spray pattern is the shape of the atomized spray when it hits the body. Little air flow out of the side jets on the cap produces a very round, concentrated spray pattern. By adjusting air flow up, the cap jets narrow and better atomize the paint flowing out of the gun. The spray gun is probably the most used air-powered tool in the body/paint shop. It is used to do most of the refinishing work. Spray guns are also one of the most efficient of all pneumatic tools. See Figure 5–5. A conventional atomizing air spray gun is a precision tool using compressed air to atomize sprayable material. Replacing the conventional system in many body shops is the high volume, low-pressure (HVLP) gun. Air and paint enter both types of guns through separate passages and are mixed and ejected at the air nozzle to provide a controlled spray pattern

. Pulling back slightly on the trigger opens the air valve to

allow use of the gun as a blowgun. In this position the trigger does not actuate the fluid needle and no fluid flows. As the trigger is further retracted, it unseats

the needle in the fluid nozzle and the gun begins to spray. The amount of paint leaving the gun is controlled by the paint, the size of the fluid tip, and the fluid needle adjustment. In industrial finishing where pressure tanks or pumps are used, the fluid needle adjustment should normally be fully opened. In suction cup operation, the needle valve controls the flow of paint

The proper painting environment must address six

variables:

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1. Cleanliness—to keep dirt out of paint
2. Temperature/humidity—to provide proper paint curing or drying conditions
3. Light—to properly illuminate the vehicle and paint as it is applied
4. Compressed air—to send clean air at the right pressure to the gun
5. Controlled ventilation—to ensure the health of workers
6. Fire safety—to protect the shop and employees

To adjust the flow rate from a spray gun, use the following procedure:

1. Fill the gun with properly mixed and reduced material to be sprayed. Make sure the correct pressure is being fed into the gun from the air line. Check pressure at the gun-mounted pressure gauge.
2. Remove the air cap from the spray gun. Obtain a clean graduated container for measuring liquid volume.
3. While wearing protective gear, aim the spray gun into the container. Pull the trigger for 10 seconds. Measure the amount of material that flows into the container in that time. Multiply the volume of liquid by 6. This is the fluid flow rate in ounces per minute.

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4. For standard refinishing, flow out of the spray gun should be about 14 to 16 ounces (413 to 472 mm) per minute.

5. If the flow rate is less than this, open the fluid control valve more and repeat. If flow rate is faster than this, turn the fluid valve in a little and try again. When the flow rate is correct, reinstall the air cap

Information Sheet 1 3- Conducting spray painting in an approved spray booth

1.1. SPRAY BOOTHS

A spray booth is designed to provide a clean, safe, well-lit, and well-ventilated enclosure for painting vehicles. A spray booth isolates the painting operation from dirt and dust-producing activities and confines and exhausts the volatile fumes created by spraying automotive finishes; [see Figure](#)

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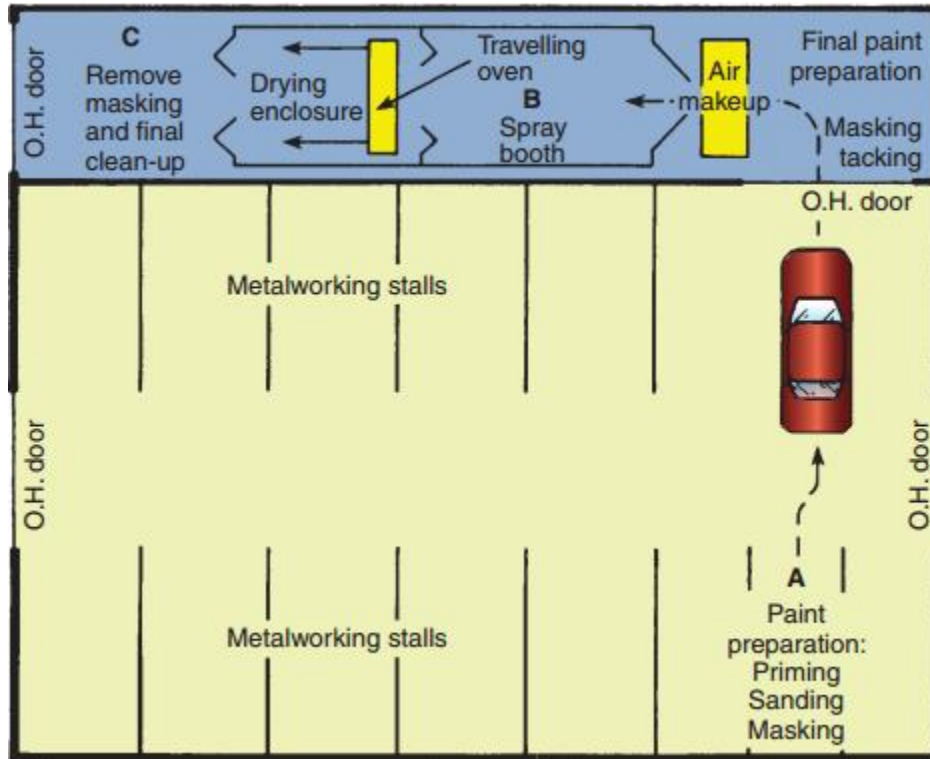
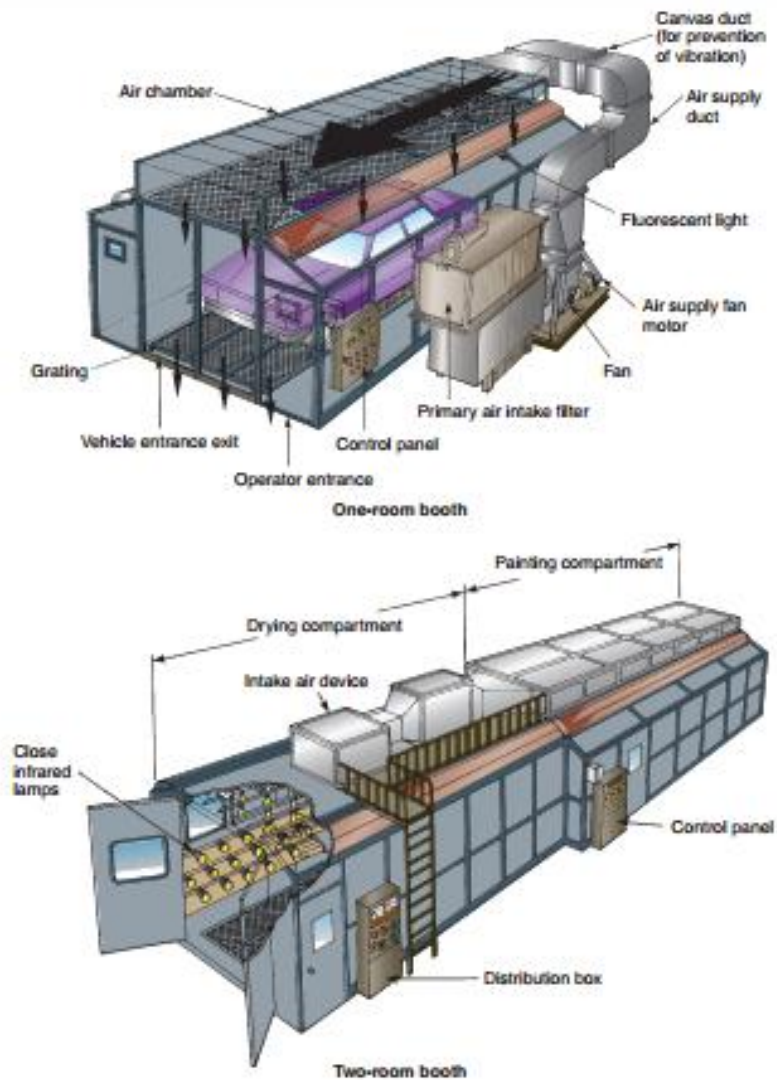


FIGURE 24–54 This typical body shop layout shows a straight-line work flow finishing operation

Modern one- and two-room spray booths are scientifically designed to create the proper air movement, provide necessary lighting, and safely enclose the painting operation



. FIGURE 24–55 Compare one- and two-room spray booths

In addition, their construction and performance must conform to federal, state, and even

local safety codes, not to mention those of insurance underwriters. In most areas, automatically operated fire

extinguishers are required because of the highly explosive

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nature of the refinishing materials. Cleaning preparation should be done outside the booth area. Steam clean the underbody of a vehicle thoroughly and air dust the entire vehicle before moving it into the spray booth. After the vehicle is in the booth, close the booth doors tightly and wipe the entire vehicle again with a tack cloth before proceeding with the painting operation. All spray booth doors must be kept tightly closed during painting. If it becomes necessary to open a door, be sure the air supply is turned off. In fact, many spray booths are equipped with door switches that shut off the air supply when the doors are opened. The air compressor should be outside the booth with the air delivery pipes slanting back toward the compressor. An air makeup or air replacement system is important because of the large volume of air exhausted from a spray booth. During the winter, the spray area can become cold and uncomfortable. Finish problems can arise from spraying cold materials on cold vehicles in cold air. An air makeup system will provide even temperatures and clean filtered air as well as ensure proper booth performance. Sometimes paint shops employ an independent air replacement system specifically designed for the spray booth. This provides clean, dry, filtered air from the outside to the booth, heating the air in colder weather. Replacement air can be delivered to the general shop area or directly into the booth for a completely closed system.

There are four air makeup systems in use today:

1. Regular flow booth
2. Reverse flow booth
3. Crossdraft booth
4. Downdraft booth

Both the regular and reverse flow types of booths were once considered standards in spray booth construction. However, since the late 1970s they have been replaced to

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a great degree by the downdraft airflow booth. shown in Figure 24–56, in the regular system the airflow is from back to front.

In the reverse flow process, the airflow is from front to back.

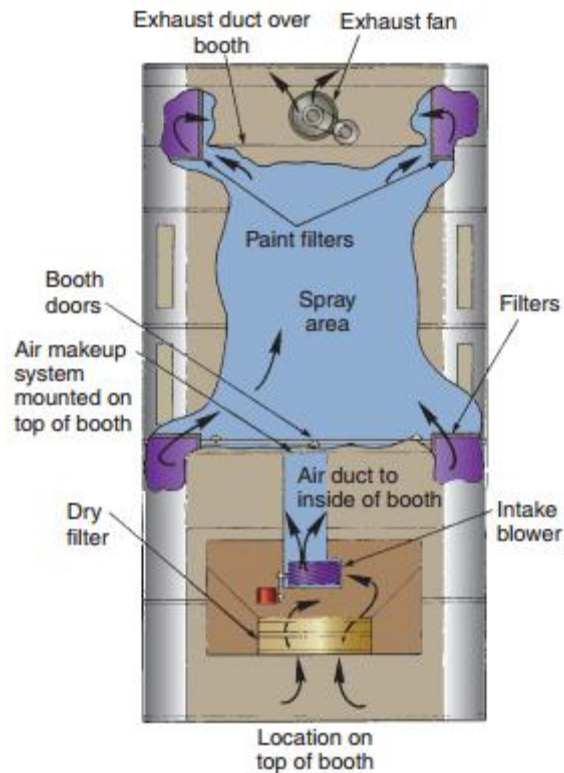


FIGURE 24–56 This is a typical makeup air system for a spray

Booth The reverse flow type of booth generally has a solid back (Figure 24–57), whereas

a regular flow booth usually is of the drive-through style. It is interesting to note that a good number of vehicles that were sprayed in a reverse flow booth were backed in.

The downdraft spray booth forces air from the ceiling down through exhaust vents in the floor. It is the most popular air movement system used today. The downward flow of air from the ceiling to the floor pit creates an envelope of air passing by the surface of the vehicle.

Information Sheet 2 3 Mixing paint in a well-ventilated room

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FOLLOW MIXING INSTRUCTIONS

Material mixing instructions, printed on the container label or product bulletins, state how much of each ingredient (solvent, hardener, flex agent, and so on) must be added to the paint product. A percentage of each ingredient might be called for. A simple example is given in Figure 26–9. A percentage reduction means that each ingredient must be added in certain proportions or parts. For instance, if paint requires a 50 percent reduction, this means that one part reducer (solvent) must be mixed with two parts of paint. Mixing by parts means that for a specific volume of paint or other material, a specific amount of another material must be added. For example, if label directions call for a 25 percent reduction, you would add 1 quart of reducer to 1 gallon of paint. Because there are 4 quarts in a gallon, 1 quart is 25 percent of a gallon. You would mix one part (25 percent) reducer for each four parts (100 percent) of paint.

Proportional mixing numbers compare how much of each ingredient must be mixed regardless of quantity. The first number is the parts of paint needed. The second number is usually the hardener. A third number might be used to denote the amount of reducer required. The sequence of ingredients can vary. Some instructions list four ingredients to mix, so read the paint manufacturer's instructions carefully.

For example, if the mixing instruction is 2:1:1, the first digit (2 in 2:1:1) would normally mean two parts of paint. The next digit (the first 1 in 2:1:1) would mean to add one part hardener. The last digit (the second 1 in 2:1:1) would tell

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you to add one part reducer when mixing the paint material.

A mixing chart converts a percentage into how many parts of each material must be mixed. One mixing chart is shown in Figure 26–10. Study the percentages and parts of each material that must be mixed.

As explained in several other chapters, many shops now use an electronic or computerized scale when mixing paint materials (Figure 26–11). The scale will prompt you to add each ingredient and also show you how much of each ingredient to add

Information Sheet 7 3- Cleaning spray guns and equipment in environmentally safe manner

7.1. Spray Gun Cleaning Tank

A spray gun cleaning tank, also called a gun washer/recycler, is a pressurized container for flushing the gun and other tools with cleaning solution. It is used by most modern body shops because it saves time and keeps sprayguns in good, clean condition.

As shown in Figure 24–42, a spray gun washer directs a cleaning solution into the cup and over and through the spray gun body to remove paint or other materials.

Paint-covered equipment (guns, cups, stirrers, and strainers) is placed in the larger tub of the gun washer/recycler. The lid is closed, then the pump recirculates the solvent into the upper portion of the tub. In less than 60 seconds, the equipment is clean and ready for use.

The automatic gun washer/recycler saves the technician time: Compared with traditional manual cleaning methods, it saves 10 minutes on each color change. The

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cleaning system also offers increased safety, because solvent fumes are contained in the tank. The spray gun cleaning tank is designed so that sludge from the cleaning action settles to the bottom for easy drainage and disposal with other shop wastes.

Check the

owner's manual for complete operational details and the proper solvents to use.

To use a gun cleaning tank, remove any parts that might be damaged by the cleaning solvent. These parts would include the pressure gauge-regulator on HVLP guns and any plastic vent hoses. Place the cup into the tank. Then place the gun into the cleaning mechanism so that the trigger is engaged and the inlet tub is in place over the cleaning nozzle. Close the lid and turn the cleaning machine on. This will force solution through all passages in the gun. When cleaned, remove the gun and wipe it off with a clean rag. After removing the gun from the spray gun washer, you may need to use soft bristle brushes to final clean around

the air cap, trigger, and other hidden pockets on the outside of the gun. Use a clean, lint-free rag to wipe the cup and body. With a solvent-soaked rag, wipe the inside and outside

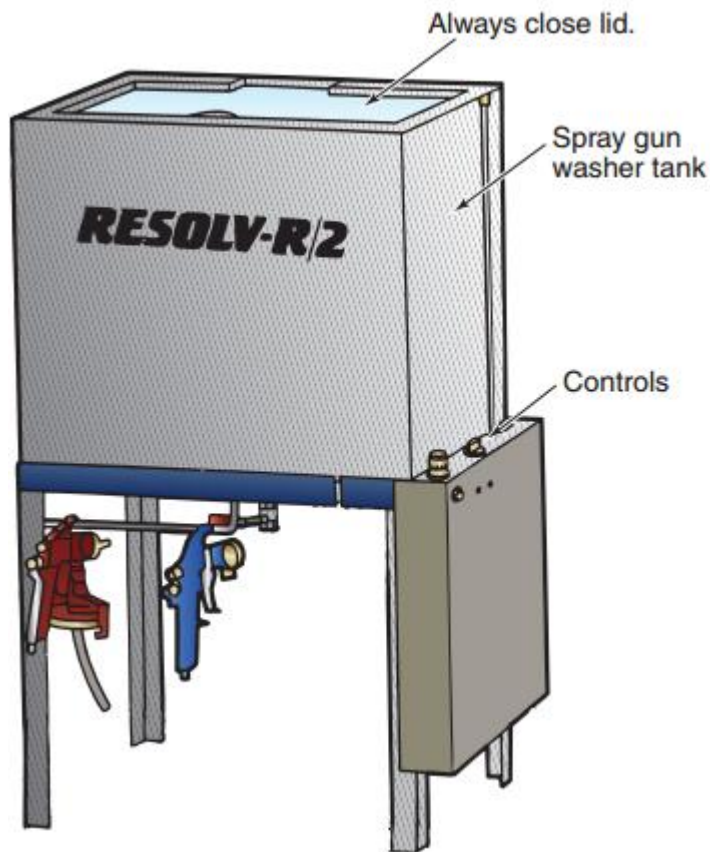
of the cup, the gun body, the air cap, and all external parts. Remove all traces of paint film.

794 Chapter 24

Always close lid. Spray gun, washer tank, Controls, Solvent spray, over guns, Spray inside cup, Solvent forced, through, internal passages

FIGURE 24-41 Always empty unused paint material into an approved storage container with a lid.

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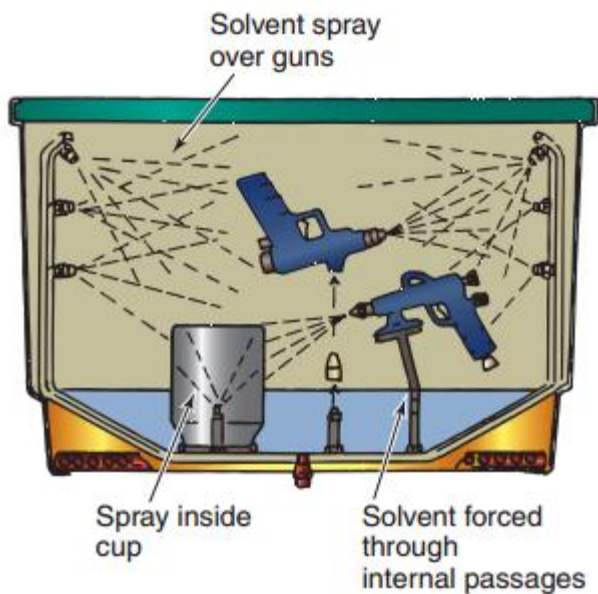


A A spray gun cleaning tank or washer saves time in high-production shops

Fill the cup with solvent and spray it through the gun into the container. Always keep the lid closed to prevent solvent evaporation and air pollution. Used paint can be processed in a recycling machine to remove pigments and separate resins and solvents.

FIGURE 24-42A spray gun washer or cleaning tank can be found in most professional body shops.

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B Note how cleaning solvent is forced through and over a gun and into the cup for rapid removal of finish materials.

A spray gun cleaning tank or washer saves time in highproduction shops.

B Note how cleaning solvent is forced through and over a gun and into the cup for rapid removal of finish materials. (Courtesy of PBR Industries)

7.2. MANUAL SPRAY GUN CLEANING

Even if you use a spray gun cleaning tank, you should periodically disassemble the gun for thorough service. To manually clean a suction-fed gun, first loosen the cup from the gun. With a gravity-fed gun, remove the lid. Pour out any remaining, unused material into an approved container for proper disposal. Pour some spray gun cleaning solvent into the gun. Slosh it around to partially remove the paint film in the cup. Spray the solvent through the gun to remove most of the paint. Following manufacturer's instructions, remove any parts that require further cleaning (air cap, nozzle, needles, vent tube, and so on). While wearing plastic or rubber gloves, wipe them clean with a solvent-soaked rag. When blowing off a spray gun, use very low pressure (5 psi or 34

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kPa). If needed, clean small, hard-to-reach areas on the gun with a thin, soft bristle brush. Wipe off residue with a clean rag soaked with solvent. Then, pour 1 inch of clean solvent in the cup again. Spray the solvent through the gun to clean out the fluid passages. See Figure 24–43. To avoid gun damage, never use wires or nails to clean the precision-drilled openings. Clean the fluid tip with a gun brush and solvent. With a clean rag soaked in thinner, wipe the outside of the gun to remove all traces of paint. Packings, springs, needles, and nozzles must be replaced periodically due to normal wear and tear. This should be done only in accordance with the manufacturer's instructions.



Information Sheet 8 Monitoring, preventing and reducing hazardous airborne particles

8.1. AIR-SUPPLIED RESPIRATORS

An air-supplied respirator circulates fresh air over the painter's face. It is the most common type of respirator used by painters and refinish technicians. By forcing fresh air over the painter's nose and mouth, harmful paint contaminants cannot pass around or through the respirator. There are two common types of air-supplied respirators: the hood type and the face shield type. Either type must be worn when spraying catalyzed paint materials. A full hood fresh air respirator covers a painter's head and face. A fresh air hose connects to the hood. One is

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shown in Figure 24–71.

A face shield fresh air respirator uses a clear plastic shield with a small air nozzle to direct breathing air over the painter's face.



FIGURE 24–71 This technician is wearing a full hood air-supplied respirator. It is the safest type to use when spraying toxic

materials, such as today's catalyzed paint materials. Note the fresh air hose attached to the technician's belt.

with the hood type, an extra fresh air supply hose is attached to a small hose going to the air nozzle. See Figure 24–72A. In Figure 24–72B, note how the fresh-air respirator connects to shop air line pressure.

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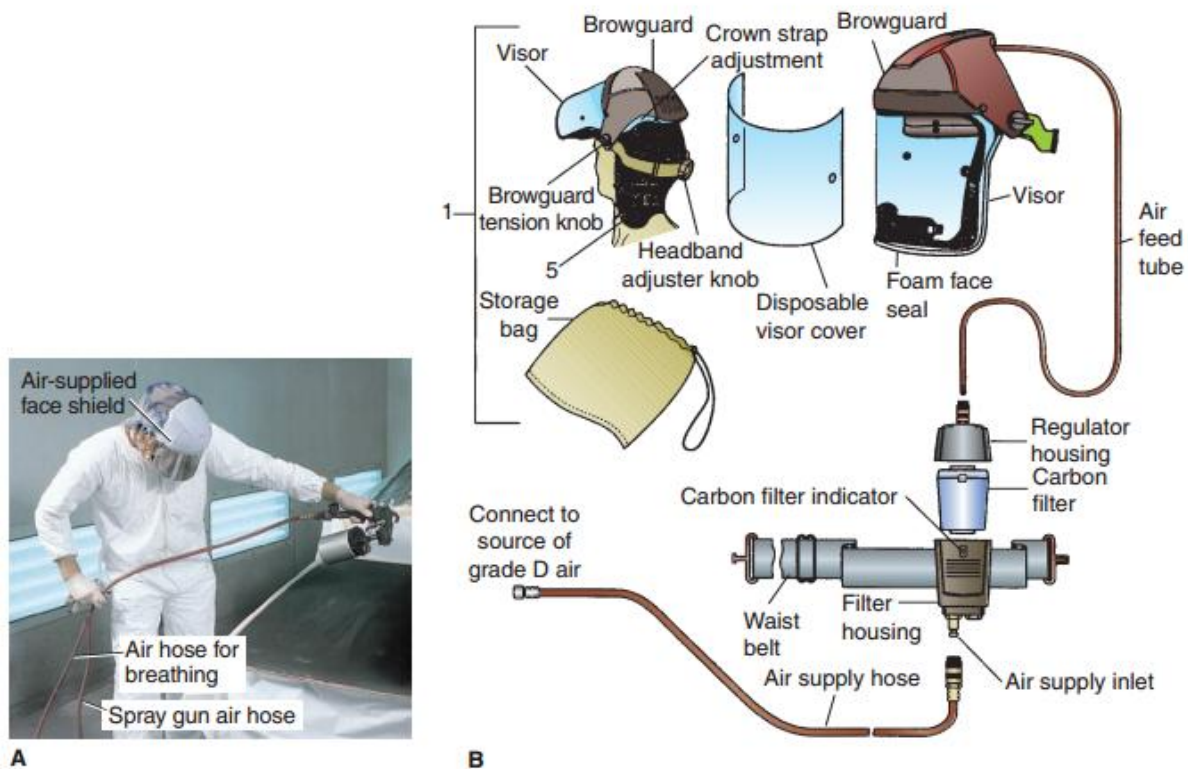


FIGURE 24–72An air-supplied respirator is cool on your face in hot weather and is the only safe way to spray today’s paint products.

(A) This technician is using an air-supplied face shield, or visor. (B) Study the parts of an air-supplied paint visor. It is lightweight and has

disposable visor covers. You can replace a scratched or overspray-coated clear plastic visor cover with a new one so you can see well when

painting

A carbon filter is needed before the respirator to make the air breathable. Clean air can then flow through the respirator feed tube. A simplified booth layout for a fresh air-supplied respirator is shown in Figure 24–73,

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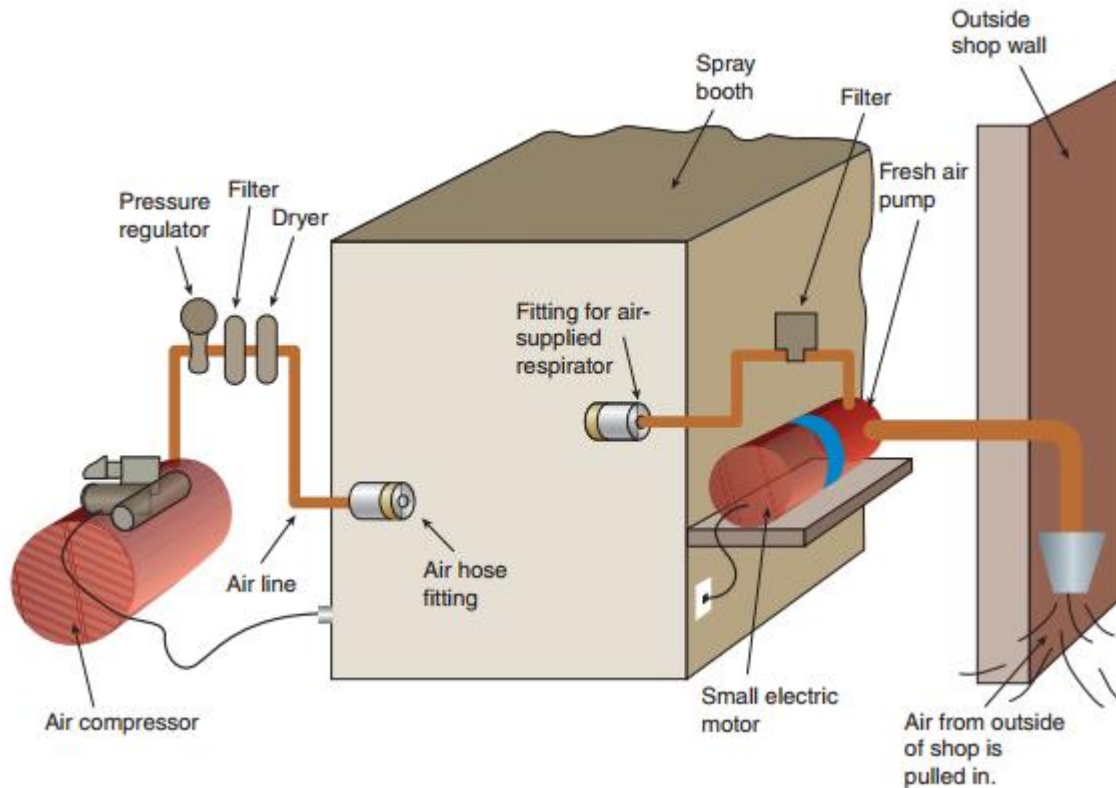


FIGURE 24–73 Note the components of simplified main air compressor and breathing air compressor systems for a paint booth. Breathing

air should be drawn from outside of the shop so dust and fumes are not pulled into the air-supplied respirator

Note that separate air lines are provided for the spray gun and respirator. The air intake for the respirator is normally located on the outside of the shop. This keeps fumes and dust from being pulled into the system. Also note that a small dedicated air compressor can be used to pump air to the respirator. It is very important that you periodically replace the fresh-air respirator filter. It can normally be replaced by unscrewing a cover over the element . If shop air pressure is going to be used for an airsupplied respirator, additional in-line filters and a desiccant drying unit are needed. They will clean the shop air enough for breathing. See Figure 24–75

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FIGURE 24–75 This is a desiccant air dryer system to purify and produce breathable air for an air-supplied respirator

There are two good reasons for wearing a respirator. First, some sort of respiratory protection is dictated by OSHA/NIOSH regulations. Second, even if the first reason were not true, common sense would indicate that inhaling overspray is not healthy. Overspray can contain particles of toxic paint pigments, harmful dust, and vapor fumes that can be harmful to your health. Depending on design, a respirator can remove some or all of the dangerous elements from the air around a spray finishing operator.

Reference Materials

Book:

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Auto Body Repair Mannual And Spesfic Information

WEB ADDRESSES

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