Phase
2

Trade of Motor Mechanic

Module 1

Unit 1

Health, Safety, Fire Drill & Behaviour

Produced by

SOLAS

An tSeirbhís Oideachais Leanúnaigh agus Scileanna
Further Education and Training Authority

In cooperation with:

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Curriculum Revision 2.2 16-01-07

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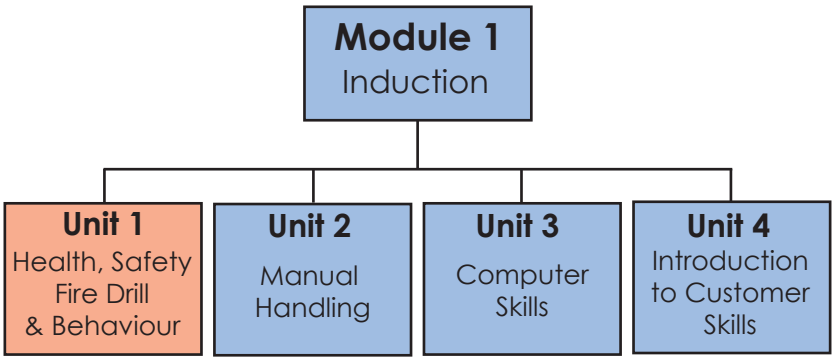
Introduction

There are four Units in Module 1. Unit 1 focuses on Health, Safety, Fire Drill and Behaviour Guidelines, Unit 2; Manual handling, Unit 3; Computer Skills and unit 4; Introduction to Customer Skills.



In this unit you will receive instruction on health and safety, behaviour guidelines and the fire drill applicable to your training centre.

Unit Objective

By the end of this unit each apprentice will be able to:

- Describe the health, safety, responsibilities of all personnel, fire drill procedures and course participant personal behaviour guidelines that apply to the Training Centre/premises
- Describe the structure of the Phase 2 Apprentice Motor Mechanics training course
- Demonstrate the location and use and limitations of the appropriate fire extinguisher for an identified fire incident
- Describe the procedures to be followed in accident or emergency events
- Demonstrate the operation and safety controls of the automotive workshop 'fixed' equipment
- Describe the vehicle parking arrangements of the Training Centre Workshop that comply with emergency fire evacuation procedures

1.0 Health, Safety and Behaviour Guidelines

Key Learning Points

- Health and Safety; Fire alarm sound, emergency exit route, designated safe area, the location and function of Safety statements, responsibilities of all personnel i.e. identification of hazards, their removal, reduction, drawn to the attention of others etc. and personal safety recommendations applicable to the automotive workshop/equipment, chemicals, fuels, oils etc., e.g. voltage outlets -110V/220V/380V, vehicle hoists, battery charger - eye wash – first aid station, compressed air, tyre fitting machine etc.
- Course participant guidelines; Training Centre rules on: time, attendance, expected learning outcomes, personal behaviour on premises e.g. the driving or movement of vehicles or training units inside workshop or training areas computer user policy, racism, sexual harassment, drugs, alcohol, smoking, environmental materials, recycling etc. and disciplinary procedures
- Fire drill, location and use of fire alarm, emergency exit procedure, location, selection and use of correct fire extinguisher for electrical, chemical and carbonaceous fires, location and use of fire blanket

1.1 Health, Safety and Behaviour Guidelines

Please refer to your instructor for information, which is available from the training centre induction pack. Please refer to the key learning points within this unit.

2.0 Phase 2 Apprentice Motor Mechanics Training Course

Key Learning Points

- Training course structure; duration, modular block form, theory and practical assessment outlines, repeat/resit policy

2.1 Training Course Structure

Note: The instructor will explain the theory and practical assessments and outline the repeat/resit policy within SOLAS.

Motor Mechanics — Off-the-Job Phases — Code 50

MODULAR PLAN PHASE 2

Training time 562.5 hours **Assessment time** 62.5 hours **Total** 625 hours

Module 1 Induction	Module 2 Body Electrics	Module 3 Engine Mechanical	Module 4 Ignition and Transducers
Units 1. Health, Safety, Fire Drill and Behaviour Guidelines 2. Manual Handling 3. Computer Skills 4. Introduction to Customer Skills	**Units** 1. Magnetism 2. Basic Electricity 3. The Battery 4. Alternator/Circuit 5. Starter Motor/Circuit 6. Body Wiring, Lighting Circuits	**Units** 1. Engine Components and Operating Principles 2. Lubrication System 3. Cooling System	**Units** 1. Basic Ignition Systems 2. Transducers
Duration 37 hours	**Duration** 111 hours	**Duration** 75 hours	**Duration** 62 hours

NOTE: Durations given on all are guideline only

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MODULAR PLAN PHASE 2

Training time 562.5 hours **Assessment time** 62.5 hours **Total** 625 hours

Module 5 Petrol Fuel Injection	Module 6 Transmission	Module 7 Suspension and Steering	Module 8 Brakes
Units 1. Fuel Supply System 2. Electronic Fuel Injection 3. Emissions	**Units** 1. Clutch System 2. Manual Transaxle System	**Units** 1. Wheels and Tyres 2. Suspension and Shock Absorbers 3. Steering Alignment and Geometry	**Units** 1. Braking System (Mechanicals) 2. Braking System (Hydraulics)
Duration 45 hours	**Duration** 31 hours	**Duration** 62 hours	**Duration** 35 hours

NOTE: Durations given on all are guideline only

Motor Mechanics — Off-the-Job Phases — Code 50

MODULAR PLAN PHASE 2

Training time 562.5 hours **Assessment time** 62.5 hours **Total** 625 hours

Module 9 Compression Ignition	Module 10 Workshop Technology
Units	**Units**
1. CI Principles and Diesel Fuel System	1. Bench Fitting 2. Screw Thread Cutting 3. Welding and Registration Plate Fitting
Duration 31 hours	**Duration** 74 hours

NOTE: Durations given on all are guideline only

3.0 Fire Extinguishers

Key Learning Points

- Identifying the appropriate fire extinguisher type, its recommended storage location in the workshop and demonstrating its method of operation on an identified fire incident

3.1 Using Fire Extinguishers

Note: The instructor will make you aware of the fire fighting equipment within the training centre.

Preparation and Safety

Objective

Locate workplace fire extinguishers and identify applications and operating procedures.

Personal Safety

Whenever you perform a task in the workshop you must use personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies. Among other items, this may include:

- Work clothing - such as coveralls and steel-capped footwear
- Eye protection - such as safety glasses and face masks
- Ear protection - such as earmuffs and earplugs
- Hand protection – such as rubber gloves and barrier cream
- Respiratory equipment – such as face masks

If you are not certain what are appropriate or required, ask your instructor.

Safety Check

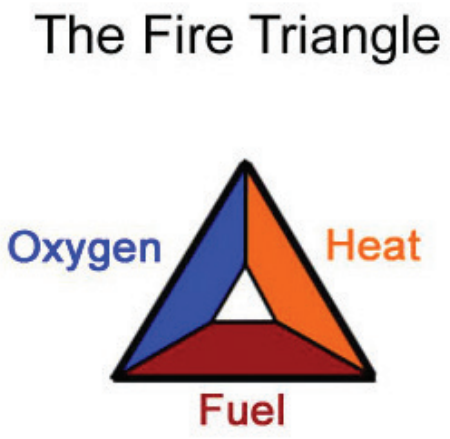
- Do not attempt to fight a fire unless you have a fire extinguisher large enough to extinguish the fire. Many small extinguishers empty in 8 to 10 seconds.
- Never try to extinguish a fire that is spreading rapidly.
- Do not try to put out a fire unless you know what type of fire is burning. Using the wrong fire extinguisher will make the fire worse.
- Test the fire extinguisher before you attempt to extinguish a fire.
- Do not inhale any fumes from a fire. Fire gives off toxic gases.
- Do not use water on grease fires, electrical fires or fires where electrical wiring is present.
- If you cannot fight the fire, leave the area and call the fire department.
- See your local fire department for a demonstration of the appropriate procedure in your jurisdiction.
- Make sure that you understand and observe all legislative and personal safety procedures when carrying out the following tasks. If you are unsure of what these are, ask your instructor.

Points to Note

- Each workshop will have a fire fighting procedure. There should be a workshop fire warden and fire officers. Understand clearly the fire fighting policy for your workshop.
- Fire extinguishers will be located in easily accessible places. Do not block access to fire extinguishers with workshop equipment and clutter.
- Fire extinguishers either smother or quench a fire. A fire extinguisher that smothers a fire does not remove heat. Keep a watch over the fire. Even though the fire may seem to be out, it may restart.
- Workshops will have various fire fighting tools: fire hoses, fire buckets, fire blankets and fire extinguishers. Each has a specific application and method of use. Familiarise yourself with each of these tools.
- Fire blankets are manufactured from fire retardant material and have multiple uses. They can be used to smother a fire in a cleaning station or wrap around clothing that has caught on fire. They may be used to shield people from fire when evacuating a building or be used as a stretcher to carry injured or unconscious people.
- Never use water on a fuel-based fire. The fuel will float on the water and spread further.
- The only exception to this is in the case of a fire fuelled by methanol. Methanol is heavier than water and burns with an invisible flame. Use a water extinguisher on a methanol fire.
- Fire buckets contain sand that can be thrown over a fire to smother it. Do not be too quick to empty all the sand in one throw. You may not completely cover the fire the first time.

Fighting a Fire

- Three elements must be present at the same time for a fire to occur: fuel, oxygen and heat. These three elements are demonstrated by the fire triangle. The secret of fire fighting involves the removal of one of these elements, usually the oxygen or the heat.



- Know how to operate the extinguisher. Read the instructions when you purchase the extinguisher. You will not have time to read them once a fire has started.
- Never turn your back on a fire or allow a fire to get between you and a means of escape. If you are fighting a fire outside, always have the wind at your back.
- If possible, get an assistant to guide you and inform you of the fire's progress.
- If a fire occurs in your work area, remember the PASS word: Pull, Aim, Squeeze, Sweep

    1. *PULL* out the pin that locks the handle at the top of the extinguisher to prevent accidental use.
    2. Carry the fire extinguisher in one hand, and use your other hand to *AIM* the nozzle at the base, or seat, of the fire. Some fire extinguishers need to be turned upside down to operate. Check which way to hold the extinguisher you've chosen.
    3. Stand about 2.8m (8 ft.) away from the fire and *SQUEEZE* the handle to discharge the fire extinguisher.
    4. Remember that if you release the handle on the extinguisher, it will stop discharging.

5. *SWEEP* the nozzle from side to side at the base of the fire. Watch the fire. Although it may appear to have gone out, it may re-ignite.

- If the fire is indoors, you should be standing between the fire and the nearest safe exit. If the fire is outdoors, you should be standing facing the fire with the wind on your back, so that the smoke and heat are being blown away from you. Again, make sure that you have a means of escape, should the fire get out of control.
- When you are quite sure that the fire is out, report it to your instructor. Also report what actions you took to put out the fire.
- Once the circumstances of the fire have been investigated, and your instructor or the fire brigade has given you the all clear, clean up the debris and submit the used fire extinguishers for inspection and re-filling.

Fire Classifications

There are 5 classes of fire.

- "A" class fires involve wood, paper, cloth, rubber and trash.
- "B" class fires involve flammable liquids, such as oil, paint, petrol, grease, and tar.
- "C" class fires involve flammable gases, such as LPG, Natural Gas, Acetylene, etc.
- "D" class fire is fuelled by combustible metals - magnesium, potassium turnings and metal shavings. They are not as common as "A", "B", or "C" class fires.
- "E" class fires need electricity to feed the fire. This class includes wiring, damaged appliances, circuit breakers and fuse boxes. Once the electrical supply has been disconnected, the fire changes to the class of fuel it is burning.

Fire Extinguisher Types

There are four types of fire extinguisher. Each type can be used for one or more classes of fire.

- *Water extinguishers* contain water pressurized by an inert gas or compressed air. The water quenches the heat from the fire to below its vaporization point. They should only be used on class "A" fires.
- *Carbon dioxide* fire extinguishers are most effective when used against "B", "C" and "E" class fires. The gas is heavier than air and provides an inert blanket that smothers the fire. A carbon dioxide fire extinguisher will spray small ice particles with the gas. This is normal.
- *Dry Powder* fire extinguishers contain a fine powder, usually sodium bicarbonate, held under pressure by an inert gas. The extinguisher smothers the fire with a fine powder. These extinguishers are good to fight any fuel or liquid fire.
- *Foam fire extinguishers* contain a chemical that forms a soft foam that floats over the target area and smothers the fire. These are effective fighting liquid, gaseous, paper or wood fires.

Fire Extinguisher Suitability

You will often see more than one symbol on a fire extinguisher. This identifies the extinguisher as suitable for more than one class of fire.

4.0 Procedures in Accident or Emergency Events

Key Learning Points

- Procedures to be adopted in accident or emergency events e.g. contact Instructor, First Aid Officer, and Safety Officer/ Assistant Manager etc.

4.1 Evacuating in an Emergency

Note: Examples only, please follow your training centre procedures

Preparation and Safety

Objective

Carry out emergency evacuation procedures.

Personal Safety

Whenever you perform a task in the workshop you must use personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies. Among other items, this may include:

- Work clothing - such as coveralls and steel-capped footwear
- Eye protection - such as safety glasses and face masks
- Ear protection - such as earmuffs and earplugs
- Hand protection – such as rubber gloves and barrier cream
- Respiratory equipment – such as face masks

If you are not certain what are appropriate or required, ask your instructor.

Safety Check

- Make sure you understand and observe all legislative and personal safety procedures when carrying out the following tasks. If you are unsure of what these are, ask your instructor.

Points to Note

- Emergency evacuation procedures are designed for the specific requirements of your workshop and region. If there are no evacuation procedures in your workshop, consult your local police and fire departments for specific information.
- Evacuation procedures will also vary depending on the nature of the emergency.
- In the case of a building fire, the procedure will involve leaving a building and moving to an "assembly point" outside. The emergency procedure for a hurricane or cyclone warning, however, requires you to "take cover" inside a designated shelter.

Other evacuation procedures provide action for emergencies such as:

- Bomb Threats
- Civil Unrest
- Chemical Spills
- Bushfire/Wildfire

If you have any questions about evacuation procedures, contact your national health and safety authority.

If your instructor assigns you a task, like assisting in an evacuation, it is because he or she believes you are capable of fulfilling that role. Once you have completed that task, notify your instructor.

Step-by-Step Instruction

1. *Don't panic!* The first Rule when you have an emergency, or if you hear the alarm at your workshop is: "DON'T PANIC!" Follow the emergency procedures that apply in your workshop.

2. *Who's in charge?* Determine who's in charge. He or she should have a list of all personnel who are working in the area. Follow their directions and evacuate the area by the nearest emergency exit.

3. *Secure your workplace:* If you have time, turn off the electrical supply to all operating equipment. Turn off the taps and put lids on any containers of flammable liquids. Check small rooms, such as offices or rest rooms to make sure nobody is in them. If you are the last one out of an area, close all doors and windows on your way out.

4. *Assemble and count:* Once you have all met at the appropriate assembly point, count your co-workers and report anyone missing to your instructor. Report the emergency to the appropriate authorities. That may be garda, fire, ambulance or other regional emergency body. Be aware that emergency vehicles or personnel may be arriving on site and may need direction. If this is not your task, stay out of the way.

5.0 Operation and Safety Controls of the Workshop

Key Learning Points

- Automotive 'fixed' equipment e.g. vehicle hoists, test lane equipment, grind wheels.

5.1 Automotive 'Fixed' Equipment

Using a Two-Post Hoist - Preparation and Safety

Objective

Lift a vehicle using a two-post hoist.

Personal Safety

Whenever you perform a task in the workshop you must use personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies. Among other items, this may include:

- Work clothing - such as coveralls and steel-capped footwear
- Eye protection - such as safety glasses and face masks
- Ear protection - such as earmuffs and earplugs
- Hand protection – such as rubber gloves and barrier cream
- Respiratory equipment – such as face masks.

If you are not certain what are appropriate or required, ask your instructor.

Safety Check

- Make sure that you understand and observe all legislative and personal safety procedures when carrying out the following tasks. If you are unsure of what these are, ask your instructor.

Points to Note

- Before lifting any vehicle, make sure the frame is structurally sound. If you see rust or signs of major repair, lifting the vehicle with a hoist may cause damage to the vehicle or may be dangerous to you.
- The lifting capacity of the hoist you are using must be rated for a vehicle weight greater than that of the vehicle you are intending to lift. Check the hoist rating and compare it with the weight given in the vehicle service manual.
- Make sure you know exactly how to operate the hoist. Take particular care that you know exactly where the "stop" control is so that you can use it quickly in an emergency. Refer to the operations manual for the correct procedure.
- Be sure the hoist is fully lowered before positioning the vehicle over it. Check the amount of clearance under the vehicle. Driving a low-slung vehicle over the lifting mechanism may result in damage to the underside of the vehicle.
- The lifting points on a vehicle are typically located under the jacking points. Check the vehicle service manual if you are not sure where the lift points are. The lifting arms must be positioned under the centre of the lift points, so that the weight of the vehicle is distributed evenly.
- Make sure that there will be adequate headroom above the vehicle after it has been raised. Taller vehicles, especially those fitted with roof racks, may need more headroom than you think.
- The hoist should be raised so you can comfortably work under it. Lock the lift in place before moving underneath or working on the vehicle.

Step-by-Step Instruction

1. *Read instructions:* Read the safety instructions that are provided with the hoist. They should be displayed near the lift operating controls. Check the hydraulic system for leaks. Make sure there are no oil spills around or under the hoist.

2. *Prepare the hoist:* The hoist should be completely down before you attempt to drive the vehicle onto it. You should also check the arms and pads for any signs of damage. Check under the vehicle to make sure there are no parts which will interfere with the hoist operation and that the vehicle is structurally sound and not badly corroded. Check the vehicle's service manual or your workshop service manual and locate the correct contact points for the lifting pads.

3. *Position the vehicle:* Carefully drive the vehicle onto the hoist and position it centrally. Leave the vehicle in neutral with the emergency brake off. You may need to move the car forward or backward to allow the arms to swing under the car. Position the lifting pads under the vehicle lifting points. Make sure the lifting pads are adjusted to the same height for both sides of the vehicle.

4. *Raise the hoist to the vehicle:* Move to the operating controls and raise the hoist just far enough to come into contact with the vehicle. Make sure that the lifting pads are positioned centrally under the contact points.

5. *Raise the vehicle slightly:* Make sure nobody is near the vehicle, and then raise it just far enough for the wheels to be off the floor. Check the position of the lifting pads to make sure they have not moved, and shake the vehicle gently to confirm that it is stable on the hoist.

6. *Raise the vehicle completely:* Once you are sure the vehicle is safely positioned on the hoist; lift it to the working height.

7. *Engage safety device:* With the vehicle at the correct height you should now lock the hoist in place and engage whatever safety device is used with it.

8. *Lower the vehicle:* Before the hoist is lowered, remove all tools and equipment from the hoist area, and wipe up any spilled fluids. Remove the safety device or unlock the lift before lowering it. Make sure nobody is near the vehicle on the hoist before lowering it. Once the vehicle is on the ground you can remove the lifting arms and drive it away from the hoist.

Using a Four-Post Hoist - Preparation and Safety

Objective

Lift a vehicle using a four-post hoist.

Personal Safety

Whenever you perform a task in the workshop you must use personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies. Among other items, this may include:

- Work clothing - such as coveralls and steel-capped footwear
- Eye protection - such as safety glasses and face masks
- Ear protection - such as earmuffs and earplugs
- Hand protection – such as rubber gloves and barrier cream
- Respiratory equipment – such as face masks.

If you are not certain what are appropriate or required, ask your instructor.

Safety Check

Make sure that you understand and observe all legislative and personal safety procedures when carrying out the following tasks. If you are unsure of what these are, ask your instructor.

Points to Note

- Four-post hoists allow the vehicle to be positioned and lifted easily. They are often used to lift a vehicle for wheel alignment services and brake repairs.
- Some four-post hoists are fitted with attachments that allow the vehicle to be raised in a "wheels free" position. Refer to the operations manual for the correct operational procedure.
- The lifting capacity of the hoist you are using must be rated for a vehicle weight greater than that of the vehicle you are intending to lift. Check the hoist rating and compare it with the weight given in the vehicle service manual.

- Make sure you know exactly how to operate the hoist, taking particular care to know exactly where the stop control is so that you can use it quickly in an emergency. Refer to the operations manual for the correct procedure for stopping the hoist.
- Make sure that there will be adequate headroom above the vehicle after it has been raised. Taller vehicles, especially those fitted with roof racks, may need more headroom than you think.
- The hoist should be raised so you can comfortably work under it. Lock the lift in place before moving underneath or working on the vehicle.

Step-by-Step Instruction

1. *Read instructions:* Read the safety instructions that are provided with the hoist. They should be displayed near the lift operating controls. Check the hydraulic system for any leaks, and the steel cables for any sign of damage. Make sure there are no oil spills around or under the hoist.
2. *Prepare the hoist:* The hoist should be completely down before you attempt to drive the car on to it. The platform may have built in wheel restraints, or attachments for wheel alignment equipment. A set of bars is mounted at the front of each ramp to prevent the vehicle from being driven off the front of the hoist. At the back there will be ramps that allow the vehicle to be driven up and on to the hoist. These will lift up when the hoist is raised and prevent the vehicle from rolling off.
3. *Position the vehicle:* Drive the vehicle slowly and carefully onto the hoist and position it centrally. If the vehicle has front wheel restraints, drive the vehicle forward until the wheels lock into the brackets. Get out of the vehicle and check that it's correctly positioned on the platform. If it is, apply the emergency brake and select first gear or park.
4. *Raise the vehicle*: Make sure the hoist area is clear. Move to the controls and lift the vehicle until it's reached the appropriate work height.

5. *Lock safety device:* Most 4 -post hoists will have an automatic locking mechanism. If the hoist has a manual safety mechanism you should lock it in place to engage whatever safety device is used.

6. *Lower the vehicle*: Before the hoist is lowered, remove all tools and equipment from the hoist area, and wipe up any spilled fluids. Remove the safety device or unlock the lift before lowering it. Make sure that nobody is near the vehicle or the hoist. Once the hoist is fully lowered you can drive the vehicle off the hoist.

Using an Engine Hoist - Preparation and Safety

Objective

Use an engine hoist and choose the correct attachments to lift an engine.

Personal Safety

Whenever you perform a task in the workshop you must use personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies. Among other items, this may include:

- Work clothing - such as coveralls and steel-capped footwear
- Eye protection - such as safety glasses and face masks
- Ear protection - such as earmuffs and earplugs
- Hand protection – such as rubber gloves and barrier cream
- Respiratory equipment – such as face masks.

If you are not certain what are appropriate or required, ask your instructor.

Safety Check

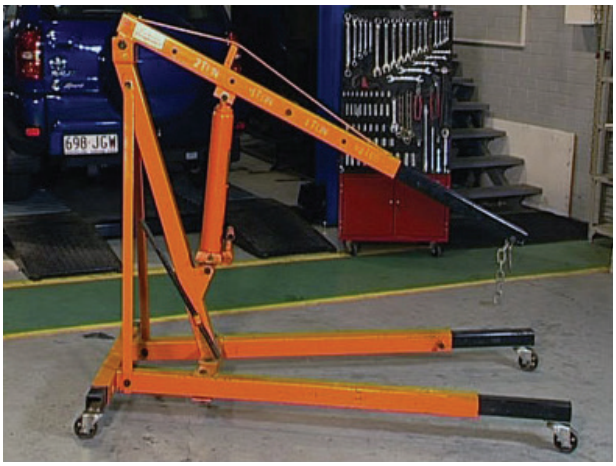
- The weight rating of the crane or hoist must be greater than the weight of the object to be lifted.
- Never leave an unsupported engine hanging on a shop crane. Secure the engine on an engine stand, or on the ground, before starting to work on it.
- If using engine stands, make sure they are designed to support the weight of the object you are lifting.
- Always extend the legs of the engine hoist in relation to the lifting arm to ensure adequate stability.

- Make sure that you understand and observe all legislative and personal safety procedures when carrying out the following tasks. If you are unsure of what these are, ask your instructor.

Points to Note

- Mobile floor cranes are capable of lifting very heavy objects, which make them suitable for lifting engines.

- The lifting arm is moved by a hydraulic cylinder and is adjustable for length. If the arm is lengthened, the lifting capacity of the arm is reduced. The weight limit is usually marked on the arm so that the arm or the hydraulic mechanism is not damaged by attempting to lift too heavy a load.



- Make sure the lifting attachment at the end of the lifting arm is strong enough to lift the engine and is not damaged or cracked.

- When attaching the lifting chain or sling to an engine, make sure it is firmly attached and that the hoist is configured to lift that weight. Make sure that the fasteners attaching the lifting chain, or sling, have a tensile strength that is in excess of the weight of the engine.
- Leave enough length in the sling so that when the engine is hanging, the angle at the top of the sling is close to 45 degrees and not exceeding 90 degrees.
- If removing an engine from an engine bay, once it is lifted free and away from the vehicle, lower the engine so that it is close to the ground. If the engine is lifted high in the air, the hoist will be unstable.
- When moving a suspended engine, move the hoist slowly. Do not change direction quickly because the engine will swing and may cause the whole apparatus to tumble.

Step-by-Step Instruction

1. *Position the hoist:* Make sure the weight rating of the lifting crane is greater than the weight of the object you're lifting. In this case, you'll be lifting and moving an engine. Lower the lifting arm and position the lifting end and chain over the centre of the engine.
2. *Inspect the lifting attachments:* Inspect the chain, steel cable or sling and bolts to make sure they are in sound condition. They must be strong enough to support the weight of the engine. The sling should be long enough so when you lift the engine the angle at the top of the sling is about forty-five degrees.
3. *Locate the lifting points:* Look carefully around the engine to determine if it has lifting "eyes" or other anchor points.
4. *Attach the hoist sling:* If the engine has lifting eyes, attach the sling with "D" shackles or chain hooks. If you need to screw in bolts and spacer washers to lift the engine, make sure you use the correct bolt and spacer size for the chain or cable. Screw the bolts until the sling is held tight against the engine.

5. *Attach the hoist hook*: Attach the hook of the hoist under the centre of the sling and raise the hoist just enough to lift the engine an inch or two. Double-check the sling and attachment points for safety. The centre of gravity of the engine should be directly under the hook of the hoist, and there should be no twists or kinks in the chain or sling.

6. *Raise the engine:* Raise the hoist high enough so that the engine is clear of the ground and any obstacles. Slowly and gently move the hoist and engine to its new position.

7. *Lower the engine:* Lower the engine until it touches the ground. Making sure it is positioned correctly. You may need to place spacers under the engine to stabilise it. Once you are sure the engine is stable lower the hoist, remove the sling and any securing fasteners, and then return the equipment to its storage area.

Using a Floor Jack - Preparation and Safety

Objective

Lift and secure a vehicle with a floor jack and jack stands.

Personal Safety

Whenever you perform a task in the workshop you must use personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies. Among other items, this may include:

- Work clothing - such as coveralls and steel-capped footwear
- Eye protection - such as safety glasses and face masks
- Ear protection - such as earmuffs and earplugs
- Hand protection – such as rubber gloves and barrier cream
- Respiratory equipment – such as face masks

If you are not certain what are appropriate or required, ask your instructor.

Safety Check

- Make sure the jack and stands you are using are suitable for the job.
- Never lift a vehicle that is heavier than the jack's rated capacity.
- Always use matched pairs of jack stands.

- Never support a vehicle on anything other than jack stands.
- Do not use wood or steel blocks to support the vehicle. They may slide or split under the weight of the vehicle.
- Do not use bricks to support the vehicle. They will shatter under the weight of the vehicle.
- Make sure that you understand and observe all legislative and personal safety procedures when carrying out the following tasks. If you are unsure of what these are, ask your instructor.

Points to Note

- There are three types of workshop jacks: hydraulic, pneumatic and mechanical.

- Hydraulic and pneumatic jacks are the most common. They can be mounted on slides or on a wheeled trolley.
- The size of jack you use will be determined by the weight of the vehicle you want to lift. Most workshops will have a jack that has a lifting capacity of about 2 ½ tonnes. If the vehicle is heavier than that, or if the vehicle is loaded, you will need to use a jack with a larger lifting capacity.
- Always check the vehicle service manual or owner's manual to determine the best position to support a vehicle. Some vehicles require special attachments to be fitted before they can be lifted.
- Do not jack or support a vehicle under any independent suspension components. They are not strong enough to support the weight of the vehicle.

- Make sure the vehicle is positioned on a firm level surface.
- Make sure the jack stands are in good condition before you use them to support the vehicle. If they are cracked or bent, they will not support the vehicle safely.

Step-by-Step Instruction

1. *Position the vehicle:* Position the vehicle on a flat, solid surface. Put the vehicle into first gear or park and set the emergency brake. Then place blocks in front of and behind the wheels that aren't going to be raised off the ground.
2. *Inspect the floor jack:* Before you try to use the jack, check for leaks in the hydraulic system. Check the pad, or saddle, and the wheels of the jack. They should rotate freely and show no signs of damage. Check the manufacturers' label on the jack. The specifications will tell you the maximum load weight it will bear, so it must suit the vehicle you want to raise.
3. *Check the vehicle handbook:* Refer to the owner's manual to find out where you can safely place the jack. This is usually a major point on the chassis, a cross member or axle unit.
4. *Select the jack safety stands:* Before operating the jack, select two safety stands of the same type, suitable for the weight of the vehicle. Check the stands for any cracks, and if necessary lubricate the threaded adjusting post with a few drops of engine oil. Place one stand on each side of the vehicle at the same point. Adjust them so that they are both the same height, and high enough to slip under the vehicle once you've raised it.
5. *Position the jack:* Roll the jack under the vehicle, and make sure the pad, or saddle, is positioned correctly under the frame or cross member. Turn the valve on the top of the jack handle clockwise, and begin pumping the handle up and down until the jack pad touches and begins to lift the vehicle.
6. *Check position of jack:* Once the wheels lift off the floor, stop and check the placement of the jack pad under the vehicle to make sure there's no danger of slipping. Double check the position of the wheel blocks to make sure they haven't moved. If the vehicle is stable, continue lifting it until it's at the height where you can safely work under it.

7. *Position the safety stands:* Slide the two jack safety stands underneath the vehicle. Make sure they're positioned at a point that can support the weight. Both stands should be adjusted to the same height and placed as far apart as practical.

8. *Lower the vehicle onto the stands:* Turn the valve on the jack handle counter-clockwise and gently lower the vehicle onto the stands. When the vehicle has settled onto the stands, lower the jack completely and remove it from under the vehicle. Repeat this process to lift the other end of the vehicle. Be aware that the vehicle is now supported on jack stands and will not be as stable as it would if the wheels were on the ground. When you've finished working under the vehicle, make sure you've removed all tools and equipment before you attempt to lower it.

9. *Raise the vehicle off the stands:* Use the jack to raise the vehicle off the safety stands. Slide out the safety stands from under the vehicle.

10. *Lower the vehicle:* Turn the valve on the jack handle counter-clockwise very gently to lower the vehicle to the ground. Do not allow the vehicle to drop quickly or you may cause serious damage. Return the floor jack, the safety stands and the wheel wedges to their storage area before you continue working on the vehicle.

Axle Stands

Axle stands are types of weight supporting equipment, they are used with vehicle jacks and are designed to take the weight of the vehicle when they are positioned correctly under the vehicle.

There are a range of types, each of these are designed for a particular application and should NEVER be used for a job for which they not recommended. They normally come in matched pairs and should be used in those pair whenever possible.

Stands are load rated, and should only be used for loads less than the rating indicated on the stand.

Using a Bench Grinder - Preparation and Safety

Objective

Set up, adjust and use a bench grinder.

Personal Safety

Whenever you perform a task in the workshop you must use personal protective clothing and equipment that is appropriate for the task and which conforms to your local safety regulations and policies. Among other items, this may include:

- Work clothing - such as coveralls and steel-capped footwear
- Eye protection - such as safety glasses and face masks
- Ear protection - such as earmuffs and earplugs
- Hand protection – such as rubber gloves and barrier cream
- Respiratory equipment – such as face masks

If you are not certain what are appropriate or required, ask your instructor.

Safety Check

- Stand to the side of the grinder when starting the electric motor.
- Always wear full-face protection, ear protection, leather gloves and a leather apron.
- Use the safety shield fitted to the grinder. If it has been damaged, replace it.
- Do not grind on the side of the wheel because it may cause the wheel to shatter.
- Make sure you understand and observe all legislative and personal safety procedures when carrying out the following tasks. If you are not sure of what these are, ask your instructor.

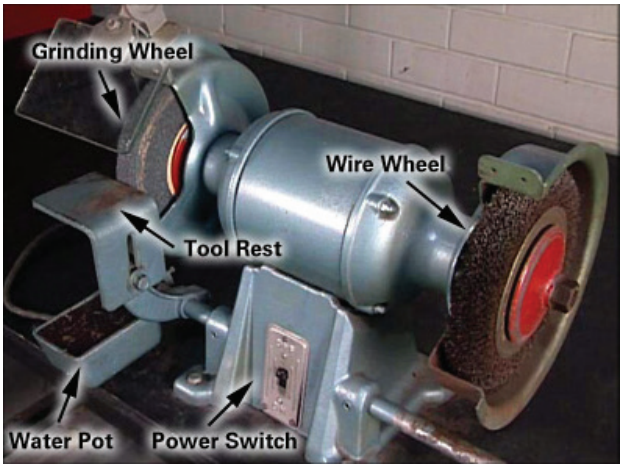
Points to Note

- The bench grinder turns an abrasive wheel or wire brush wheel at high speed. These wheels are used to remove metal from a work piece, sharpen tools and clean parts.
- The type of wheel you use will depend on the type and the hardness of the material.
- Whether you are grinding or polishing, use the correct wheel for the material you are grinding or buffing.

- Ask your instructor to demonstrate the differences between grinding wheels for soft and hard materials and wire brush wheels.
- As the abrasive wheel wears down, the gap between the wheel and the tool rest will increase.
- Make sure the tool rest is as close as possible to the grinding wheel, but not touching it. It needs about a 1.5 mm gap.
- The face of the abrasive wheel must be kept square. This is done with a dressing tool, which removes some of the abrasive compound.
- If the abrasive wheel is not square, ask your instructor to demonstrate the use of the dressing tool.
- When grinding metal, it must not overheat. This will affect its hardness. If the metal becomes too hot and is allowed to cool slowly, it may become soft. If it is cooled quickly (quenched), it may become brittle.
- As you shape the metal, dip it into the water pot attached to the bottom of the grinder. This will prevent the metal from getting too hot.
- Some bench grinders are not supplied with a water pot. If this is the case, you will need to have a water pot located near the grinder so that you can cool the piece you are grinding.

Component Identification

Some parts of this illustration are labelled. It is important to learn the names of these equipment components.



Step-by-Step Instruction

1. *Set up the bench grinder:* Before you start using the bench grinder, it's vital that you set it up correctly. When operating, the abrasive wheel turns at high speed and produces dangerous and hot flying particles and sparks. Make sure the grinder is both switched off and disconnected from the power supply before you attempt to adjust it.

2. *Use the correct safety equipment:* Certain safety attachments MUST be in place before operating the grinder. They are the wheel guard, the see-through safety shield, the tool rest, a water pot and a full-face protector.

3. *Use the correct wheel:* The grinder may have abrasive grinding wheels for removing metal, a wire wheel to clean parts, or both. Make sure the wheel you're using is appropriate for the job.

4. *Adjust the tool rest:* With the correct wheel fitted to the grinder, adjust the tool rest. Position it so there's at least 1.5 mm gap between the wheel and the tool rest and that it is the same height as the centre of the wheel. To adjust the tool rest, locate the adjusting bolt and loosen it with a box wrench. Set the tool rest at the right height and distance from the wheel and then tighten the adjusting bolt. If you are unsure of how to do this, ask your instructor.

5. *Safely use the grinder:* Connect the grinder to the power supply. Adjust your face protector, stand to the side of the wheel and switch the grinder on. Once the grinder is up to speed, move to the front of the wheel, hold the part firmly onto the tool rest, and move it slowly and gently forward until it comes into contact with the wheel. The grinding wheel removes the metal it contacts. Occasionally dip the part into the water to keep it cool.

6. *Shut down:* When you have finished, turn off the power and unplug the grinder.

6.0 Vehicle Parking Arrangements

Key Learning Points

- Workshop vehicle parking arrangements that facilitate emergency evacuation of persons and vehicles

6.1 Parking Arrangements

The car parking arrangement must be in accordance with the training centre rules and regulations.

Self Assessment

Q1: The yellow painted lines on a workshop floor indicate: (Tick ONE box only)

- ❑ 1. Where you can walk
- ❑ 2. Where you should not walk
- ❑ 3. A clear zone away from tools and equipment
- ❑ 4. An emergency evacuation path

Q2: What personal protection should you use when working with corrosive chemicals? (Tick ONE box only)

- ❑ 1. Eye and ear protection
- ❑ 2. Eye and respiration protection
- ❑ 3. Eye, hand and respiration protection
- ❑ 4. Hand protection

Q3: According to the "Fire Triangle", which element do you need to remove to extinguish a fire? (Tick ONE box only)

- ❑ 1. Oxygen and heat
- ❑ 2. Heat and fuel
- ❑ 3. Fuel and oxygen
- ❑ 4. Fuel, heat, or oxygen

Q4: Once a hand tool has been identified as irreparably faulty, you should: (Tick ONE box only)

- ❑ 1. Dispose of it
- ❑ 2. Purchase a replacement, then dispose of the faulty tool
- ❑ 3. Keep on using it
- ❑ 4. Borrow one from someone else

Q5: Engines with catalytic converters can safely be run indoors once the engine has warmed up: (Tick ONE box only)

- ❑ 1. True
- ❑ 2. False

Q6: If an object is embedded in the eye, you should: (Tick ONE box only)

- ❑ 1. Not attempt to remove it
- ❑ 2. Remove it with surgical tweezers
- ❑ 3. Flush the eye with hot water
- ❑ 4. Do nothing. It will come out by itself

Q7: When treating a burn, you should: (Tick ONE box only)

- ❑ 1. Not apply any ointments or lotions
- ❑ 2. Cover the burn with a tight dressing
- ❑ 3. Puncture blisters
- ❑ 4. Give alcohol

Q8: In the case of a building fire the procedure will involve leaving a building and: (Tick ONE box only)

- ❑ 1. Staying outside until the all clear is given
- ❑ 2. Assembling at assembly point
- ❑ 3. Going home
- ❑ 4. Closing and locking all doors

Q9: The features of a "danger" sign are: (Tick ONE box only)

- ❑ 1. Red background; white text
- ❑ 2. Yellow background; white text
- ❑ 3. Orange background; white text
- ❑ 4. Green background; white text

Q10: The features of a "caution" sign are: (Tick ONE box only)

- ❑ 1. Yellow background; black text
- ❑ 2. Red background; black text
- ❑ 3. Orange background; black text
- ❑ 4. Green background; black text

Q11: Material Safety Data Sheets provide information about: (Tick ONE box only)

- ❑ 1. Ground storage of old chemicals
- ❑ 2. The purchase requirements of chemicals
- ❑ 3. The purchase cost of chemicals
- ❑ 4. Handling, use and storage of chemicals

Q12: The MSDS should always be: (Tick ONE box only)

- ❑ 1. Available from the supplier
- ❑ 2. Clearly visible and located near where the product is stored
- ❑ 3. Available from the manufacturer
- ❑ 4. Kept in the manager's office

Q13: Exhaust gases in workshops are a serious health hazard. The best way to get rid of these gases is: (Tick ONE box only)

- ❑ 1. With an exhaust extraction system
- ❑ 2. Not to run vehicles in the workshop
- ❑ 3. Face the exhaust towards the workshop doors
- ❑ 4. Attach a pipe that vents the gasses away from your work area

Q14: When cleaning tools, you should use two types of rag. They are: (Tick ONE box only)

- ❑ 1. Dry and oily
- ❑ 2. Wet and dry
- ❑ 3. Oily and greasy
- ❑ 4. Coarse and smooth

Q15: When cleaning electrical equipment, you should remove any oil or dirt with a: (Tick ONE box only)

- ❑ 1. Oily rag
- ❑ 2. Wet rag
- ❑ 3. Dry rag
- ❑ 4. Greasy rag

Q16: The first rule in the case of an emergency is: (Tick ONE box only)

- ❑ 1. Wait for confirmation
- ❑ 2. Ignore the warning; it is a "drill"
- ❑ 3. Run outside
- ❑ 4. Don't panic

Q17: In an emergency evacuation, when meeting at an appropriate assembly point, you should: (Tick ONE box only)

- ❑ 1. Get comfortable
- ❑ 2. Count your co-workers
- ❑ 3. Go back and get your possessions
- ❑ 4. Talk amongst yourselves

Suggested Exercises

1. Under supervision, demonstrate to approved personnel, e.g. Safety Officer, the use of fire extinguisher
2. Demonstrate the most appropriate parking arrangement for the maximum number of vehicles in the workshop area
3. Demonstrate the use of the workshop 'fixed' equipment and its safety features e.g. emergency stop buttons etc.

Training Resources

- Information in book/electronic form on the Health, Safety and Fire Drill recommendations for the automotive workshop/ training area, the associated SOLAS guidelines on course participant behaviour, discipline and reporting procedures
- Fire extinguishers and personnel qualified to carry out practical demonstrations
- Workshop area with approved vehicles/parking/movement/ fire evacuation capability

Suggested Further Reading

- Advanced Automotive Diagnosis. Tom Denton. ISBN 0340741236
- Automobile Electrical and Electronic Systems (3rd Edition). Tom Denton. ISBN 0750662190
- Automotive Mechanics (10th Edition). William H. Crouse and Donald L. Anglin. ISBN 0028009436
- Bosch Automotive Electrics Automotive Electronics: Systems and Components (4th Edition). Robert Bosch. ISBN 0837610508
- Bosch Automotive Handbook (6th Edition). Robert Bosch. ISBN 1860584748
- Bosch Automotive Technology Technical Instruction booklet series (numerous titles)
- Hillier's Fundamentals of Motor Vehicle Technology: Book One (5th Edition). V.A.W. Hillier and Peter Coombes. ISBN 0748780823
- Hillier's Fundamentals of Motor Vehicle Technology: Book Two (5th Edition). V.A.W. Hillier and Peter Coombes. ISBN 0748780998
- Modern Automotive Technology. James E. Duffy. ISBN 1566376106
- Motor Vehicle Craft Studies - Principles. F.K. Sully. ISBN 040800133X
- National Car Test (NCT) Manual (Department of Transport, Vehicle Testers Manual - DoT VTM). Department of Transport
- Transmission, Chassis and Related Systems (Vehicle Maintenance and Repair Series: Level 3) (3rd Edition) John Whipp and Roy Brooks. ISBN 186152806X
- Vehicle and Engine Technology (2nd Edition). Heinz Heisler. ISBN 0340691867
- http://www.cdxglobal.com/
- http://auto.howstuffworks.com/
- http://www.autoshop101.com/
- http://www.cdxetextbook.com/
- Automotive Encyclopedia and Text Book Resource (CD version of e-textbook), Available from your instructor.

Notes

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