Phase 2

Trade of Motor Mechanic

Module 1

Unit 2

Manual Handling

Produced by

SOLAS

An tSeirbhís Oideachais Leanúnaigh agus Scileanna
Further Education and Training Authority

In cooperation with:

Subject Matter Experts

Martin McMahon

&

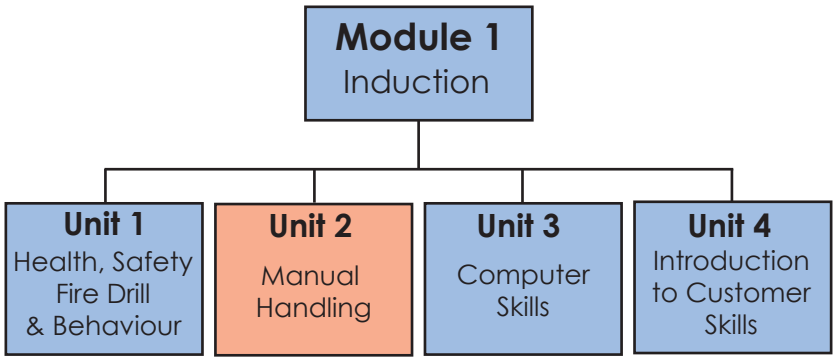
CDX Global

Curriculum Revision 2.2 16-01-07

Table of Contents

Introduction

Unit two covers the Manual handling. You will receive general information on Manual handling procedures. If at any time you are not clear on any aspect of the manual handling, section please refer to your instructor for more information.



Unit Objective

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

- List the main statutory requirements of both employers and employees in relation to manual handling and general safety in the workplace
- Explain the structure of the spine
- Explain the functions of muscles, tendons and ligaments
- Explain the types of injury that may occur from lifting and handling loads
- Explain the requirement for a pre-lift analysis of a load
- Explain how the body should be positioned before attempting a lift
- Explain and demonstrate good handling techniques for lifting workplace objects
- Explain and demonstrate good handling techniques for pushing and pulling a workplace object
- Demonstrate the correct procedures for team lifting a load
- Describe the various types of handling devices and in what situations they may be used
- Correctly demonstrate how to handle a typical workplace load using a handling aid

1.0 Manual Handling and Safety in the Workplace

Key Learning Points

Duty of employer towards employee to:

- Take measures where possible to avoid manual handling
- Carry out risk assessment where manual handling is unavoidable to reduce dangers involved
- Provide employee with precise information about the load

Duty of employee to:

- Take reasonable care for his safety and welfare and that of others in the workplace
- Use any equipment, protective clothing or other means provided by the employer for securing his safety and welfare in the workplace
- Report any problems or defects to his employer which might endanger health and safety

1.1 Employer and Employee Statutory Requirements

Duty of employer towards employee to:

- Take measures where possible to avoid manual handling
- Carry out risk assessment where manual handling is unavoidable to reduce dangers involved
- Provide employee with precise information about the load

Duty of employee to:

- Take reasonable care for his safety and welfare and that of others in the workplace
- Use any equipment, protective clothing or other means provided by the employer for securing his safety and welfare in the workplace
- Report any problems or defects to his employer which might endanger health and safety

Note: Current laws and regulations have to be referred to at all times.

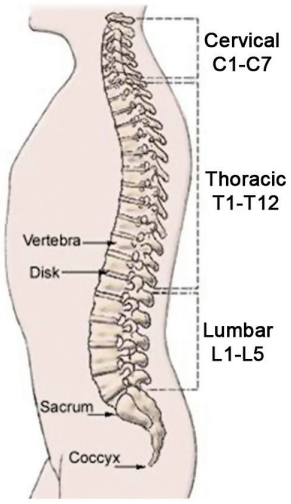
2.0 The Structure of the Spine

Key Learning Points

- Structure of the spine: spinal cord, spinal canal, vertebrae, intervertebral discs

2.1 Structure of the Spine

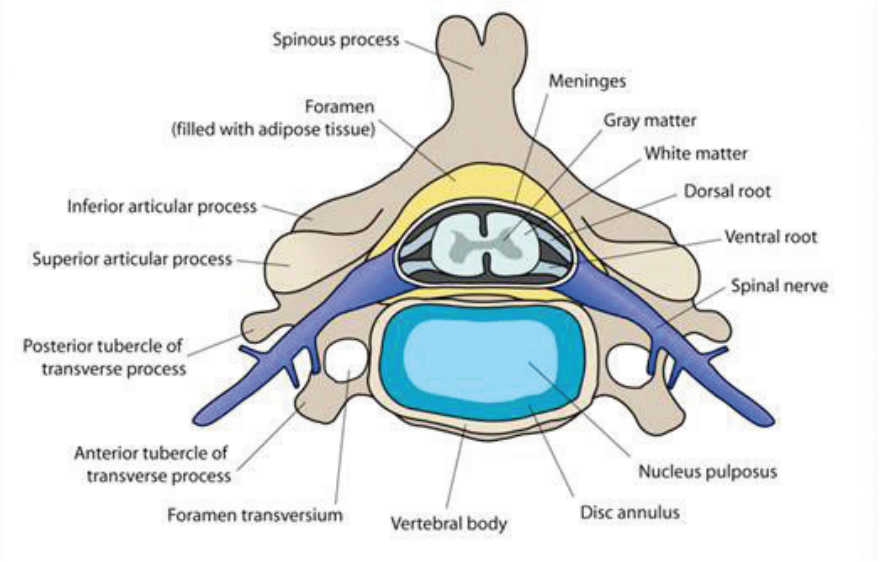
Our spine is the main support of our upper bodies. It lets us stand up straight, bend or twist. It also encases and protects the spinal cord. The spinal cord is a thin, tubular bundle of nerves that is an extension of the central nervous system from the brain and is enclosed in and protected by the bony vertebral column. The main function of the spinal cord is transmission of neural inputs between the periphery and the brain. The nerves branch out from our spine to the rest of our bodies.



The spine is made up of vertebrae. At the top are the cervical vertebrae. There are 7 of them and they are referred to as C1-C7, starting at the top. The seventh one joins to the first of the thoracic vertebrae. These are the 12 that run down the back and provide a place for our ribs to attach. They are referred to as T1-T12, again from the top down. The lower inward curve of our back is made up of the five lumbar vertebrae. They are called L1-L5. Below that comes a set of 5 fused vertebrae called the sacrum that lies between the hip bones. Lastly comes the coccyx or the tailbone, another set of fused vertebrae.

The vertebrae join together at what are called the facet joints. Between each of the vertebrae are the disks, which provide cushioning and act as shock absorbers.

Travelling down the centre of the spine is the spinal cord and at each of the vertebrae, nerves branch out through what are called the foramen to the rest of the body. Intervertebral discs lie between adjacent vertebrae in the spine. Each disc forms a cartilaginous joint to allow slight movement of the vertebrae and acts as a ligament to hold the vertebrae together.

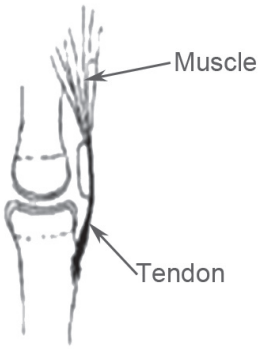


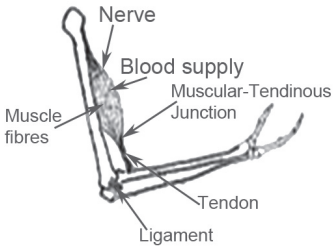
3.0 Functions of Muscles, Tendons and Ligaments

3.1 Muscles, Tendons and Ligaments

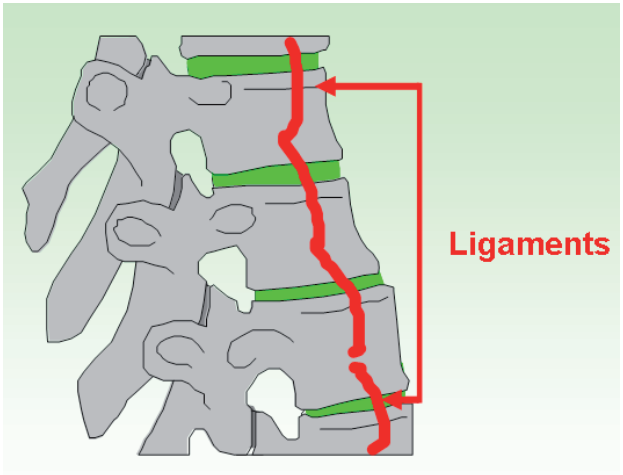
Muscles contract (shorten) to bring the ends closer together and relax (lengthen) to let the ends move apart.

Muscles are attached to bones by cord-like extensions called tendons. In the adolescent skeleton, tendons attach to a growthplate called an apopyses (a-pof-i-sez). The area where the tendon attaches may be weaker than the tendon itself. In adults, where the growthplate fuses the tendon is weaker than the bone.





Ligaments are strong bands of tissue that attach to the bones and form a joint. Ligaments provide stability to the joint by restricting movement and holding the bones in place.

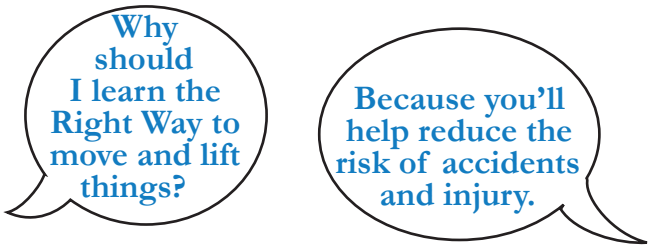


4.0 Injuries from Lifting and Handling Loads

Key Learning Points

- Injuries resulting from lifting heavy loads: Prolapsed/slipped disc, cuts and abrasions, crushed feet and hands, muscle and joint strain

4.1 Potential Injuries



Don't take chances with:

Strains and Sprains

Muscles and joints can be injured by over-exertion.

Wounds

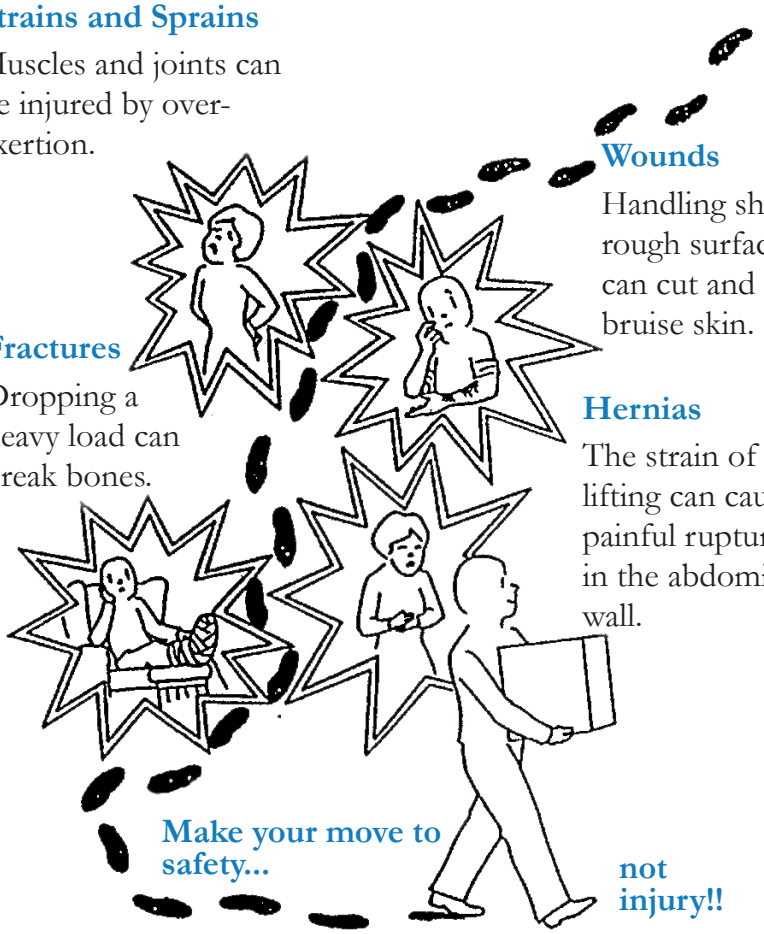
Handling sharp, rough surfaces can cut and bruise skin.

Fractures

Dropping a heavy load can break bones.

Hernias

The strain of lifting can cause painful ruptures in the abdominal wall.



5.0 Pre-Lift Analysis of a Load

Key Learning Points

- Pre-lift analysis of a load (Checking object for sharp edges, difficult to grasp, unstable, teamwork required)
- Other factors that may hinder movement such as clothing or personal protective equipment
- Safe working practices at all times when handling heavy objects

5.1 Pre-Lift Analysis of a Load

Moving Things The Wrong Way May Injure Your Back!

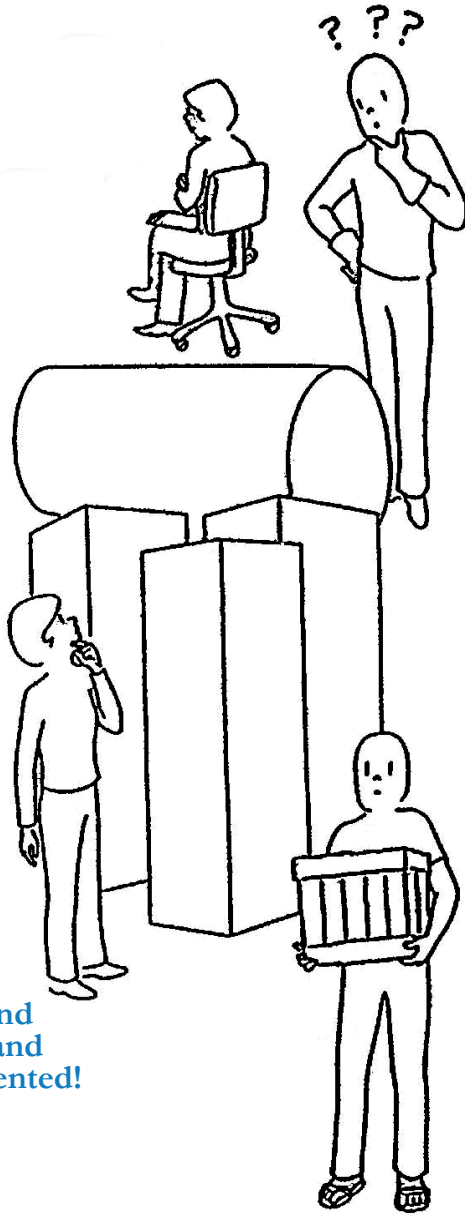
People May Also Be At Risk If They Are Not:

Properly trained to work safely

Provided with safe systems of work and adequate supervision

Physically suited or in proper shape to carry out a given task

Wearing the proper clothing, footwear and other protective equipment for the type of work they do



Fortunately, back injuries and other sprains, strains, cuts and bruises can usually be prevented!

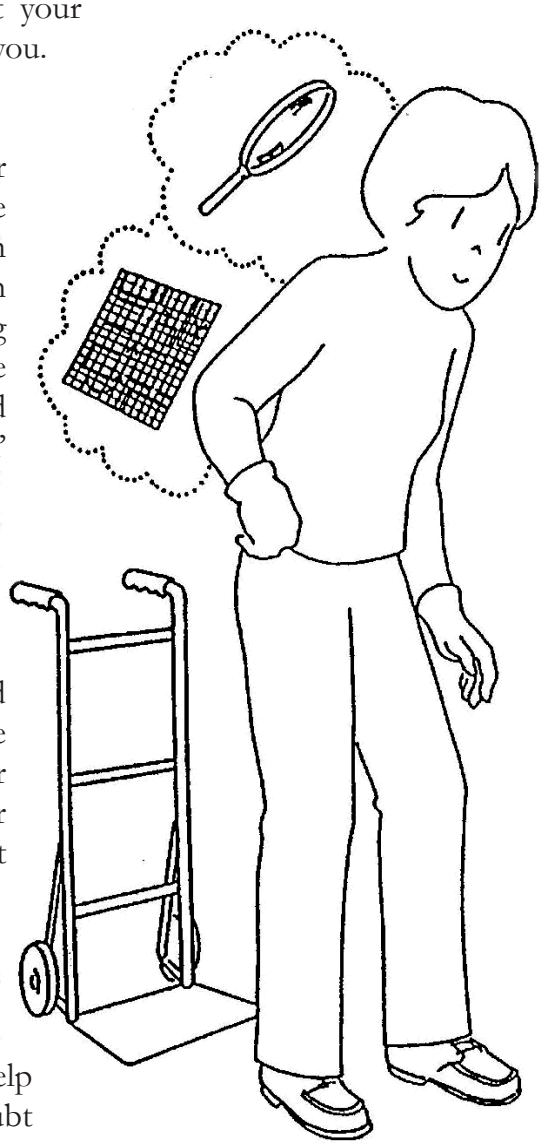
5.2 Prevent Pain, Injuries and Damage

Examine the object

Determine its weight and look for sharp edges. All loads which are heavy or awkward should be marked. Check to see if the load is stable and equally distributed. This is a responsibility that your supervisor shares with you.

Plan the job

Check with your supervisor on a safe system of work. Plan a route that's free from tripping and slipping hazards. Know where the object will be unloaded and plan 'rest stops' along the way.



Get a good grip

Decide in advance how to hold the object. Protect your hands and feet by grasping the load firmly. If you wear gloves to prevent cuts or burns, make sure they fit properly.

Get help

Use the mechanical aids provided and get help if you have any doubt about moving an object by yourself.

Wear the right equipment! This may include:

- anti-slip safety shoes
- a hard hat
- safety goggles
- a respirator
- protective gloves
- durable clothing, loose enough for free movement but tight enough to avoid snags

Rest or rotate tasks

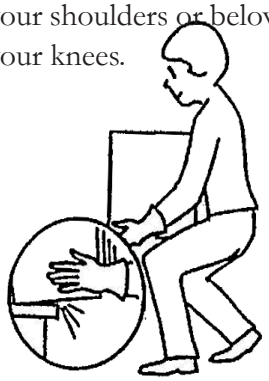
Avoid becoming over-tired! Frequent lifting, lowering and moving is demanding work and can result in cumulative stress.

Talk to your supervisor

Do not hesitate to discuss any problems or moves you aren't sure about.

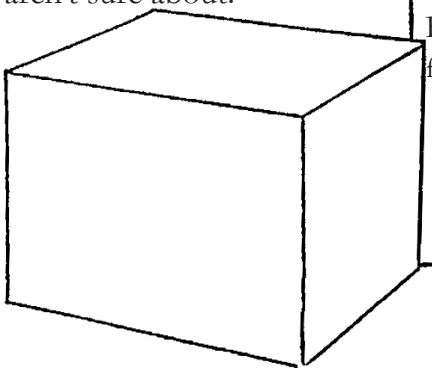
Lift with your legs

Assume a comfortable stance. Lift smoothly, keeping the load close to the body. Avoid twisting your body as you lift - move your feet instead. Minimise lifts above your shoulders or below your knees.



Keep hands in the "clear"

Be careful not to crush fingers when unloading



6.0 Body Position before Attempting a Lift

Key Learning Points

- Use of good posture before beginning to lift a load

6.1 Before Attempting a Lift

Use of good posture before beginning to lift a load

8 key points to remember:

1. Assess the task, the area & the load
2. Broad stable base - feet flat on floor
3. Bend the knees
4. Back straight
5. Firm grip
6. Arms in line with trunk
7. Weight close to centre of gravity
8. Turn feet in direction of movement

7.0 Good Handling Techniques for Lifting

Key Learning Points

- Workplace obstacles/hazards such as slippery/uneven surfaces, poor lighting conditions, steps

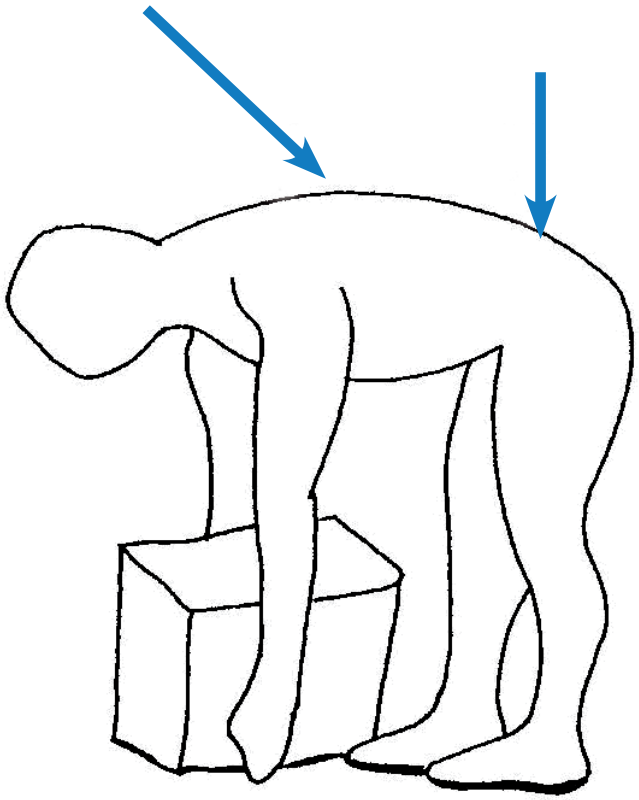
7.1 Stooping to Lift

Stooping to Lift is Dangerous!

Because:

The arched spine may cause a 'slipped disc'

It can overload the lower back muscles

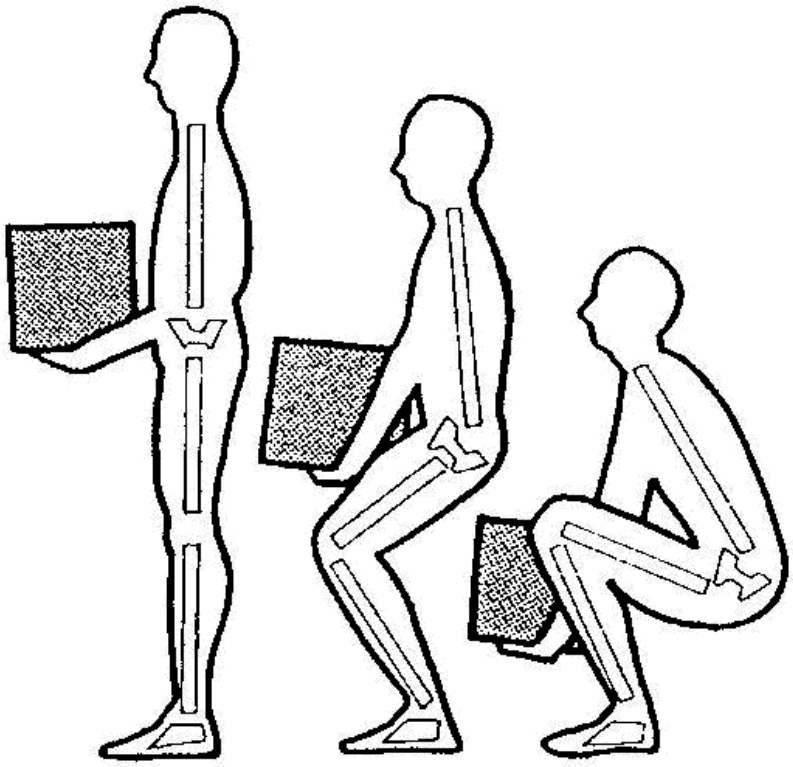


We are lifting the load <u>AND</u> the upper body weight in that posture!

7.2 Bending the Knees

Bending the Knees to Lift Ensures:

- That the leg muscles do the lifting not the smaller back muscles
- That a good lifting posture can be adopted
- That the load can be reached without arching the spine



7.3 Handling Loads

Avoid

- Very heavy loads.
- Arching of the spine.
- Excessive or repeated twisting.
- Over-stretching or over-reaching.

Ensure

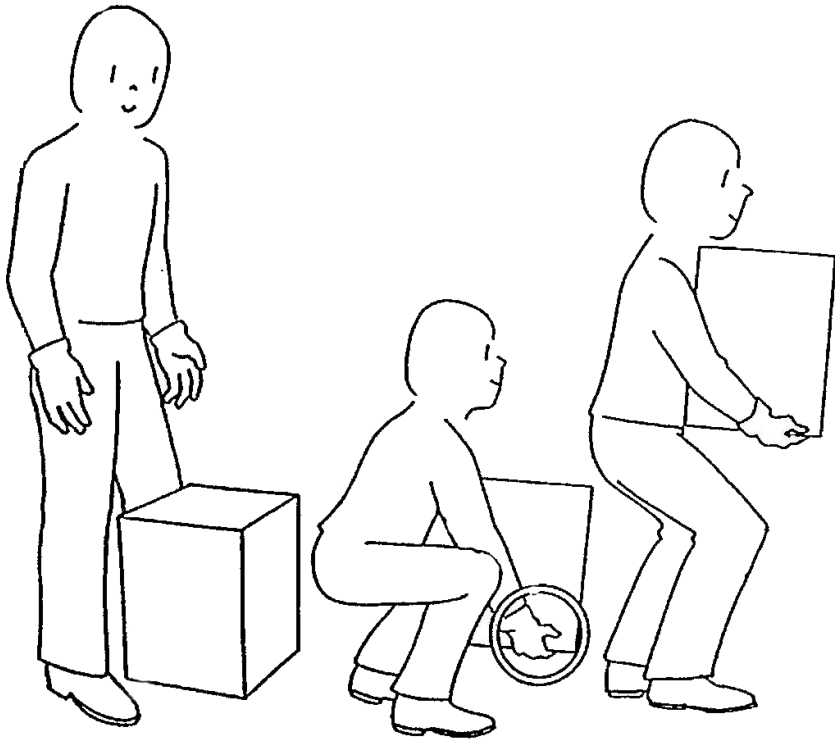
- A good secure grip
- Awareness of the weight and stability of the load.
- Correct stance and lift posture.
- Smooth quick lift.
- Correct protective clothing and equipment.
- Proper co-ordination of team lifts.
- That there are no obstacles such as;
    - Slippery/uneven surfaces
    - Poor lighting
- Due care is taken when using steps.

7.4 Lifting

One Person Lift - Squat Lift

1. *Think* before doing anything.
2. *Stand* as close to the load as possible. Spread you feet to create a stable base (slide the load close if it's on a shelf).
3. *Bend* your knees and keep your back in a natural line. Don't bend your knees fully as this will leave little power to lift.
4. *Grasp* the load firmly.
5. *Raise* you head.
6. *Lift* with your legs. Use your leverage , momentum, balance and timing for a smooth action. Move your feet.
7. *Hold* the load close to the centre of your body.

To avoid injury do warm-up exercises before lifting.



7.5 Carrying

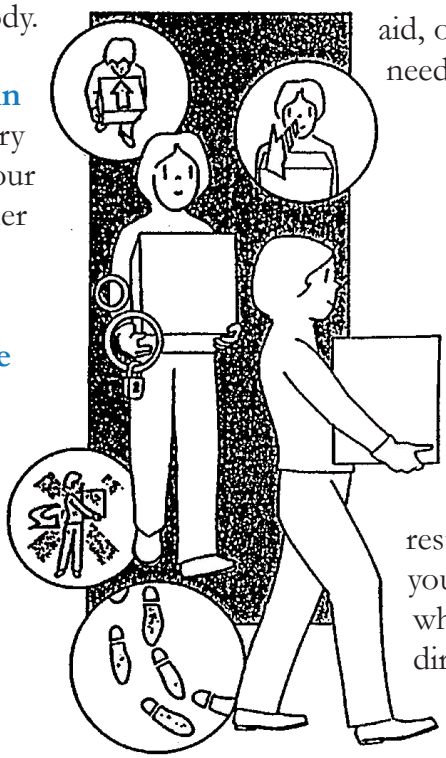
You can help prevent injuries when carrying objects too!

Here's how:

Keep the load close to take full advantage of the mechanical leverage of your body.

Don't block your vision by carrying too large a load. Use a mechanical aid, or get help if you need it.

Keep your arms tucked in to prevent injury or fatigue to your neck or shoulder muscles.



Don't change your grip in the load unless its weight is supported.

Face the spot the load will rest in by turning your feet and whole body in the direction.

Avoid twisting your body, stooping, bending or leaning back. If you must change direction, move your feet instead.

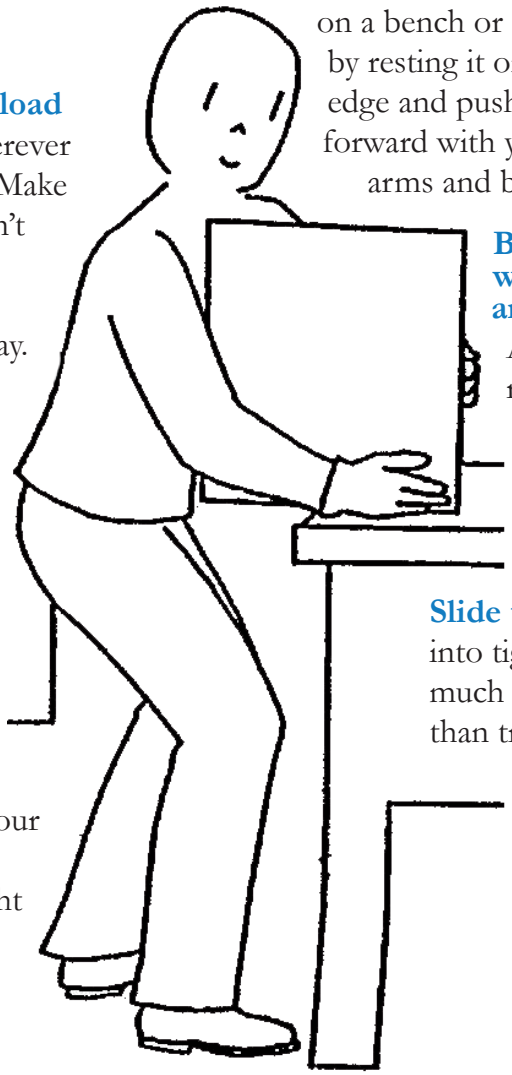
7.6 Unloading

Be as careful setting down the load as you are when lifting. Repeat the same procedure in reverse.

Place the load on a bench or fable by resting it on the edge and pushing it forward with your arms and body.

Be sure the load is secure wherever you place it. Make certain it won't fall, tip over, roll or block someone's way.

Be careful with fingers and toes. Allow enough room for them when the load is set down.



Slide the load into tight spaces - it's much easier and safer than trying to lift it.

Bend your knees to lower the load. Keep your back straight and the weight close to your body.

7.7 Special Lifts

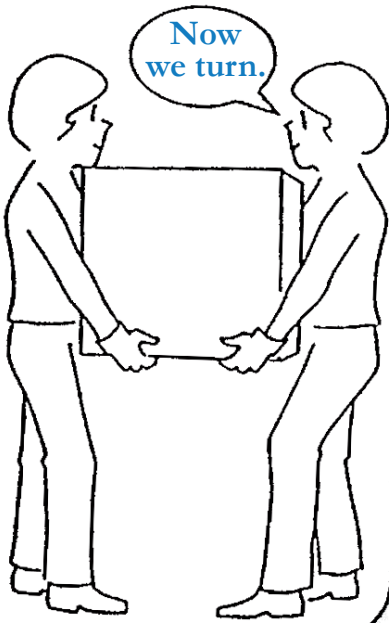
One arm loads

These are not a good idea, but if they cannot be avoided:

- *Brace* your body with the opposite arm, if possible.
- *Reach* for the load - bend your knees and waist and keep your back straight.
- *Grasp* the load firmly. Use a handle if possible.
- *Lift* with your legs, using the free arm for balance.
- *Keep* your shoulders level - switch hands regularly.
- *Divide* the load if possible.

Team lifts

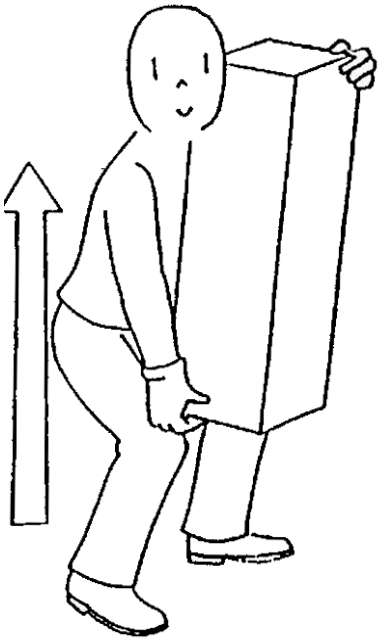
- *Work* with someone of similar build and height if possible.
- *Choose* one person to call the signals.
- *Lift* from the hips at the same time, then raise the load to the desired level.
- *Move* smoothly and in unison.



7.8 Awkward Objects and Overhead Lifts

Awkward Objects

- *Stand* over one corner of the load, with your feet comfortably apart.
- *Grasp* the bottom inside and top outside corners.
- *Bend* your knees and loft, keeping the same grip.
- *Seek* advice of you have any doubts.



Overhead Lifts

Lifting to a High Place:

- *Lighten* the load if possible
- *Stand* on something sturdy, with one foot in front of the other, unless using a stepladder.
- *Use* a mechanical aid or get help if the load is awkward or heavy.

Lowering from a High Place:

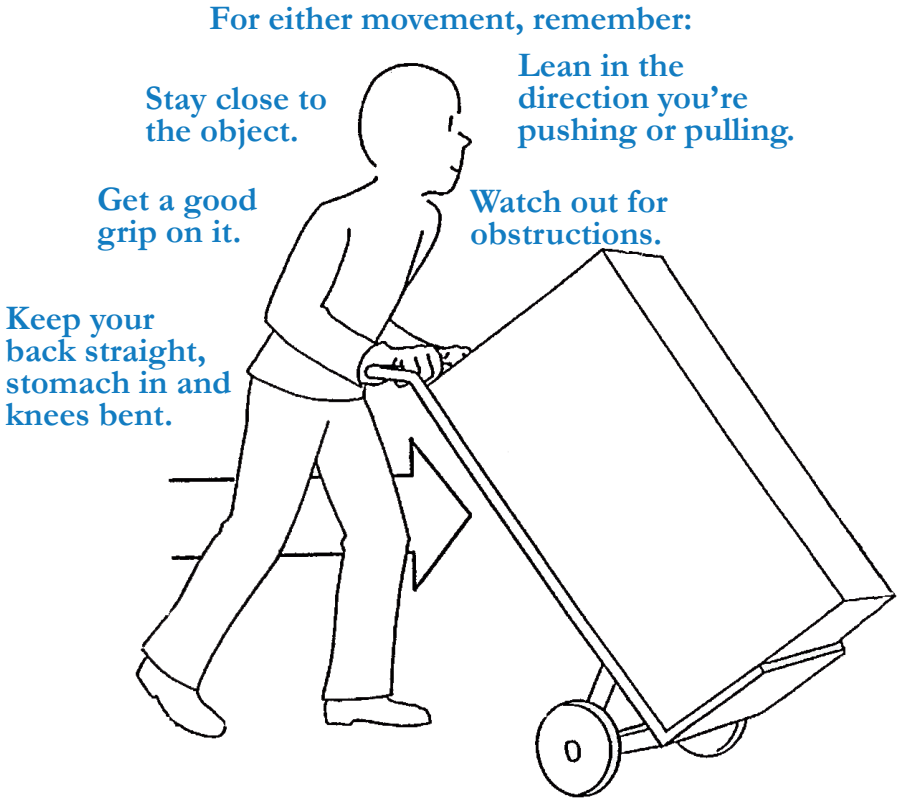
- *Test* the load's weight by pushing up on it. Check to see if the load will lift it.
- *Stand* as close to the load as possible.
- *Grasp* the object firmly, sliding it down your body
- *Use* a mechanical aid or get help if necessary.

8.0 Pushing and Pulling

Key Learning Points

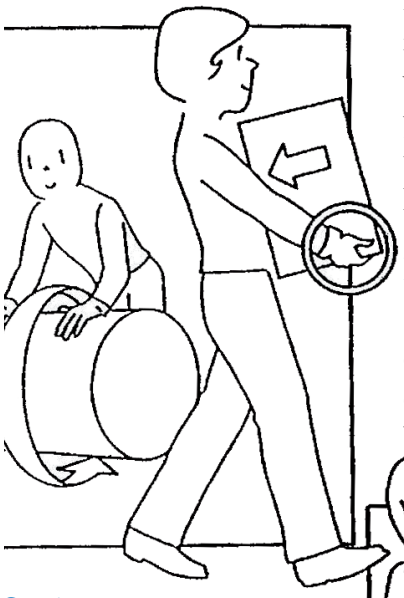
- Good handling techniques for pushing and/or pulling an object using a handling device

8.1 Pushing and Pulling Safety



- **Keep the strain of your back.**
- **Let your body's weight and leg muscles do the work for you.**

8.2 Special Objects Require Special Handling



Barrels, Drums and Kegs

Roll a heavy barrel if you move by yourself. Rocking will help get it started. If you must move it on end, use a mechanical aid or get help.

Boxes and Cartons

Grasp opposite bottom corners and keep the object close to the middle of your body.

Sacks

Carry the sack on your shoulder, braced by your hand on your hip. Or hold it at opposite ends, resting the load against your hip and stomach. Use extra care with slippery plastic sacks.

9.0 Procedures for Team Lifting a Load

Key Learning Points

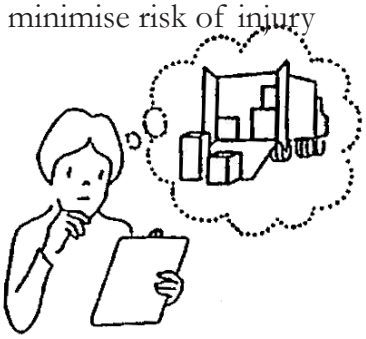
- Coordination of team activity when team lifting
- Raising a load correctly
- Putting the load down correctly

9.1 Team Effort

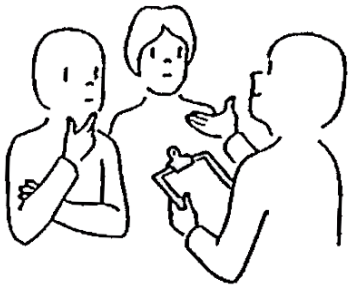
It takes a team effort to organise safe systems for handling loads....

Your employer is working hard to:

Assess loads and determine whether mechanical or other aids will be required to minimise risk of injury

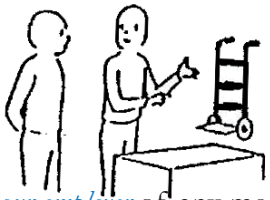


Provide information and training regarding safe work systems along with details (weight, centre of gravity, etc.) on various loads.

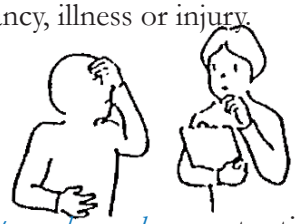


To do your part, you should:

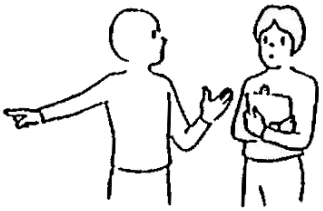
Take all training seriously and make use of what you know at all times.



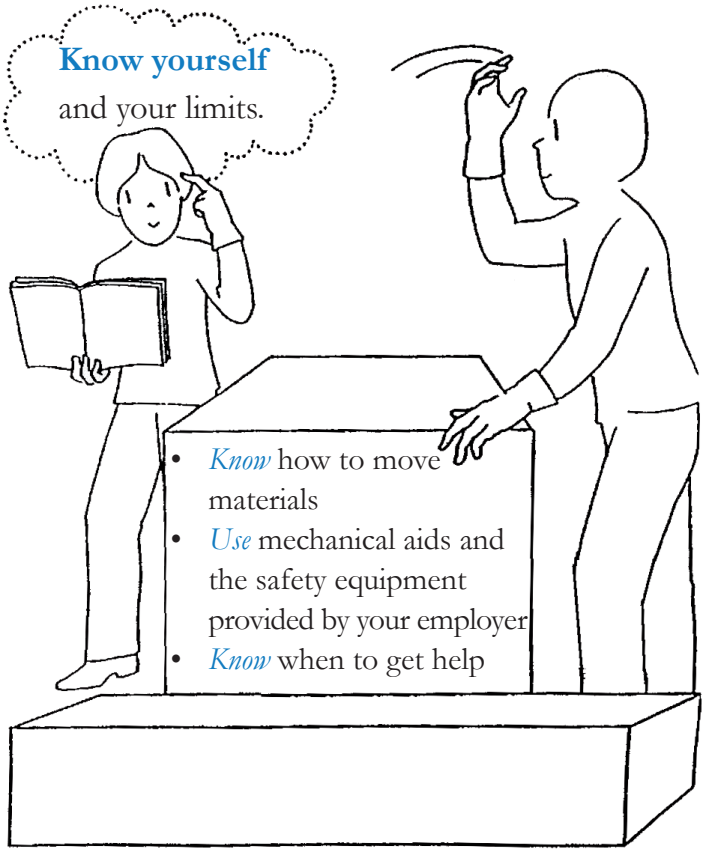
Notify your employer of any medical conditions that could affect your ability to handle loads- for example pregnancy, illness or injury.



Report any hazards or potential hazards to your supervisor at once. Make your safety and the safety of others a top priority!

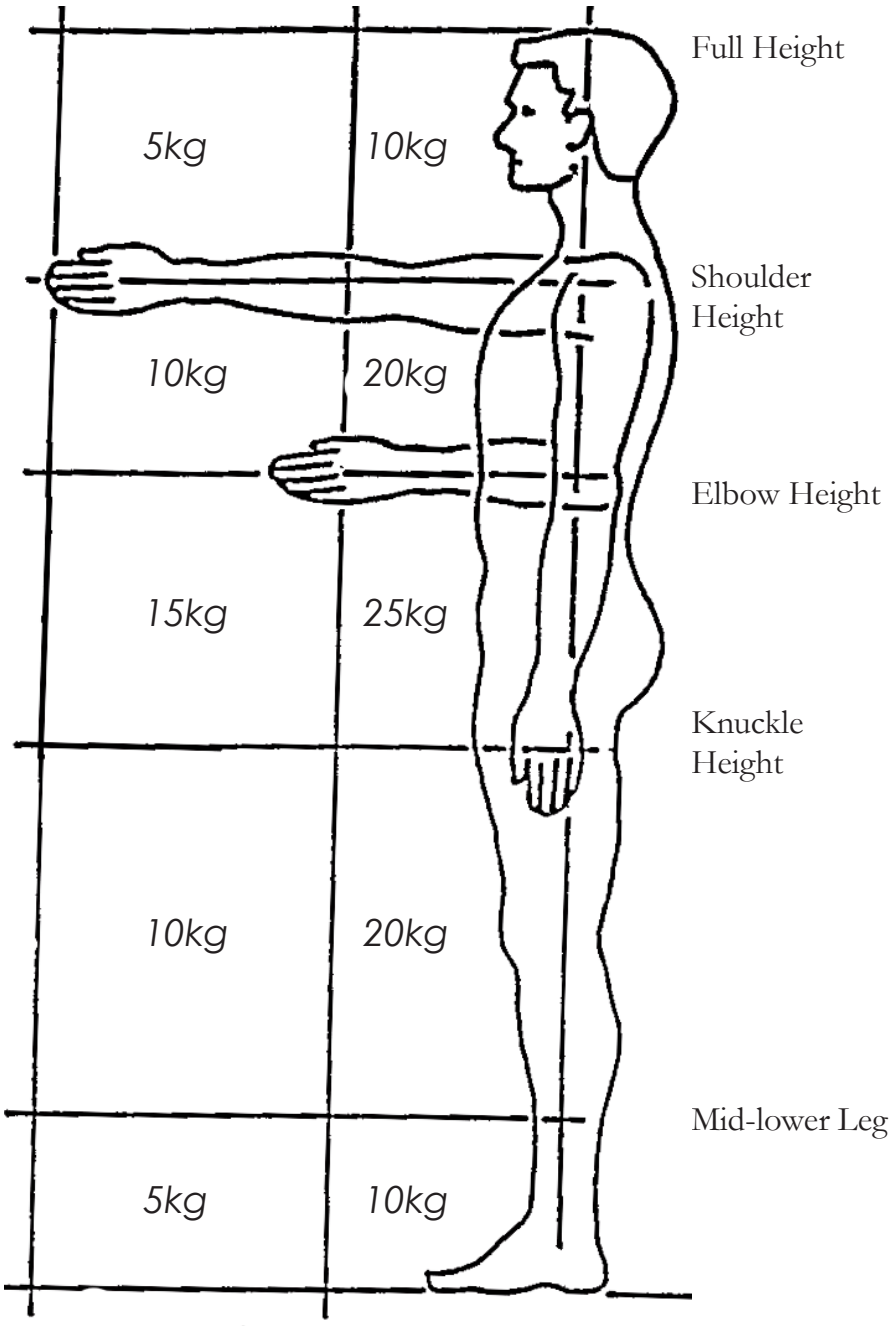


.... so be sure to handle objects safely.



You can get the job done safely and easily!

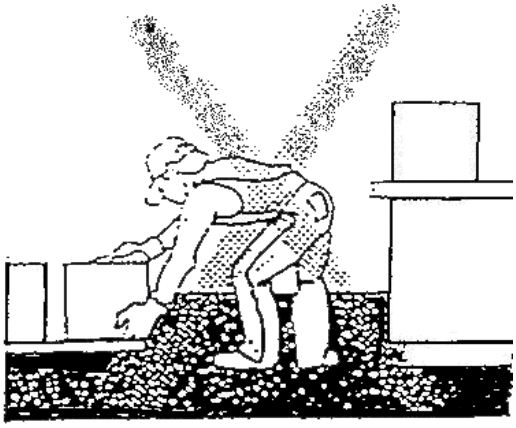
9.2 Lifting and Lowering Whilst Standing



9.3 Manual Handling-Legal Obligations

If a manual handling task involves a risk of back injury the *Employer* must:

Eliminate it or

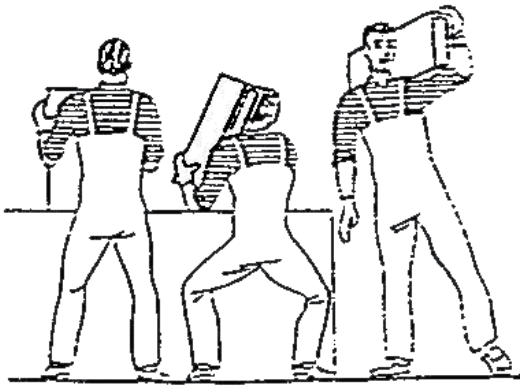


Mechanise it or

Assess it and

Train employees and

Ensure they can cope



10.0 Types of Handling Devices

10.1 Handling Devices

There are many handling devices used in a garage environment. They include a floor jack, two-post hoist, four-post hoist and an engine hoist.

These devices are covered in Module 1 Unit 1 section 5.0. Refer to your instructor for a more detailed list.

11.0 Using a Handling Aid

11.1 Using a Handling Aid

Please refer to Module 1 Unit 1 section 5.0

Note: It is important that proper instruction is given prior to using any type of handling aid.

Suggested Exercises

- Apprentice to answer general questions on correct procedures for lifting heavy objects
- Apprentice to state the main obligations of employer and employee in relation to safe handling in the workplace
- Under supervision and using the correct handling techniques, the apprentice is required to lift a workplace object from:
    - Ground to ground
    - Ground to bench
    - Ground to height
    - Bench to bench
- Under supervision and using the correct handling techniques, the apprentice is required to operate a handling device to move a typical workplace object from one location to another

Training Resources

- Overhead projector, transparencies, information sheets, instructional videos
- Samples of various materials/objects typical of the apprentice's workplace
- Various handling devices used in the apprentice's workplace

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.
- http://www.hse.gov.uk/pubns/indg398.pdf

Notes

SOLAS
An tSeirbhís Oideachais Leanúnaigh agus Scileanna
Further Education and Training Authority

27-33 Upper Baggot Street
Dublin 4