Sheet Metalwork

Module 1: Sheet Metal Fundamentals

Unit 2: Manual Handling Phase 2
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Module 1 – Sheet Metal Fundamentals

Unit 2 – Manual Handling

Duration – 3 Hours

Learning Outcome:

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.
### Key Learning Points:

<table>
<thead>
<tr>
<th>Duty of employer towards employee to:</th>
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<td>a). Take measures where possible to avoid manual handling.</td>
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<td>b) Carry out risk assessment where manual handling is unavoidable to reduce dangers involved.</td>
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<td>c). Provide employee with precise information about the load.</td>
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<th>Duty of employee to:</th>
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<td>a) Take reasonable care for his safety and welfare and that of others in the workplace.</td>
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<td>b) Use any equipment, protective clothing or other means provided by the employer for securing his safety and welfare in the workplace.</td>
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<tr>
<td>c) Report any problems or defects to his employer which might endanger health and safety.</td>
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<p>| Structure of the spine: spinal cord, spinal canal, vertebrae, intervertebral discs. |  |
| Injuries resulting from lifting heavy loads (Prolapsed/slipped disc, cuts and abrasions, crushed feet and hands, muscle and joint strain). |  |
| Pre-lift analysis of a load (Checking object for sharp edges, difficult to grasp, unstable, teamwork required). |  |
| Workplace obstacles/hazards such as slippery/uneven surfaces, poor lighting conditions, steps. |  |
| Other factors that may hinder movement such as clothing or personal protective equipment. |  |
| Use of good posture before beginning to lift a load. |  |
| Raising a load correctly. |  |
| Putting the load down correctly. |  |</p>
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<td>Coordination of team learning outcome when team lifting.</td>
<td>Good handling techniques for pushing and/or pulling an object using a handling device.</td>
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<td>Safe working practices at all times when handling heavy objects.</td>
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Training Resources:

- Information sheets, instructional videos, samples of various materials/objects typical of the apprentices’ workplace
- Various handling devices used in the apprentices’ workplace

Exercise:

1. Apprentice to answer general questions on correct procedures for lifting heavy objects
2. Apprentice to state the main obligations of employer and employee in relation to safe handling in the workplace
3. Under supervision and using the correct handling techniques, the apprentice is required to lift a workplace object from:
   i. Ground to ground
   ii. Ground to bench
   iii. Ground to height
   iv. Bench to bench
4. 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

Key Learning Points Code:

- M = Maths
- D = Drawing
- RK = Related Knowledge
- Sc = Science
- P = Personal Skills
- Sk = Skill
- H = Hazards
Employee’s Duty

1. Take reasonable care for his safety and welfare and that of others in the workplace.
2. Use any equipment, protective clothing or other means provided by the employer for securing his safety and welfare in the workplace.
3. Report any problems or defects to his employer which might endanger health and safety.
Basic Manual Handling Course

Course Objective

After completing the course participants will be able to demonstrate the ability to apply safe manual handling techniques in the workplace.

Course Aims

At the end of the training period participants will be able to:

- Identify and avoid hazardous and unsafe manual handling situations.
- Assess the characteristics of a load prior to lifting on the basis of weight, size, stability and position.
- Assess their personal capacity to complete a manual handling task.
- Apply the basic techniques involved in completing:
  - A one person lift.
  - A two person lift.
Disc Troubles

It is well known that the vertebral column, or spine, has the shape of an elongated S. At chest level it has a slight backwards curve called a kyphosis, and in the lumbar region it is slightly curved forwards, the lumbar lordosis. This construction gives the spine elasticity, to absorb the shocks of running and jumping.

The loading on the vertebral column increases from above downwards, and is at its greatest in the lower five lumbar vertebrae. Each pair of vertebrae are separated by an intervertebral disc. Degeneration of the discs first affects the margin of the disc, which is normally tough and fibrous. A tissue change is brought about by loss of water, with the result that the fibrous ring becomes brittle and fragile and loses its strength. At first the degenerative changes merely make the disc flatter, with the risk of damage to the mechanics of the spine, or even of displacement of the vertebrae. Under these conditions quite small actions such as lifting a weight, a slight stumble or similar incidents, may precipitate severe backache and lumbago. When degeneration of the disc has progressed further, any sudden force upon it may squeeze the viscous internal fluid out through the ruptured outer ring, and so exert pressure either on the spinal chord itself or on the nerves running out from it. This is what happens in the case of a “Slipped Disc” or disc herniation. Pressure on nerves, narrowing of the spaces between vertebrae, pulling and squeezing at adjoining tissues and ligaments of the joints are the causes of the variety of aches, muscular cramps and paralyses including lumbago and sciatica which commonly accompany disc degeneration.

Back troubles are painful and reduce one’s mobility and vitality. They lead to long absences from work, and in modern times are among the main causes of early disability. They are comparatively common in the age group 20 - 40, with certain occupations (labourer, farmer, porter, nursing staff, etc.) being particularly vulnerable to disc troubles. Moreover, workers with physically active jobs suffer more from ailments of this nature, and their work is more affected than in the case with sedentary workers.
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 *and* the upper body weight in that posture.

*Figure 1. Stooping to lift*
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

*Figure 2. Bending the knees*
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 coordination of team lifts.
The Right Way

Figure 3. The right way to move things
Moving Things the Wrong Way

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!

Figure 4. Moving things the wrong way
Prevent Pain, Injuries and Damage

**PREVENT PAIN, INJURIES AND DAMAGE**

Follow these basic tips to prevent accidents:

**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.

---

*Figure 5. Prevent pain, injuries and damage*
**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.

Figure 6. Prevent pain, injuries and damage continued
Lifting

To avoid injury do warm-up exercises before lifting.
Carrying

**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.

**KEEP YOUR ARMS TUCKED IN**
to prevent injury or fatigue to your neck or shoulder muscles.

**DON’T CHANGE YOUR GRIP**
on the load unless its weight is supported.

**AVOID TWISTING YOUR BODY,**
stooping, bending or leaning back. If you must change direction, move your feet instead.

**DON’T BLOCK YOUR VISION**
by carrying too large a load. Use a mechanical aid, or get help if you need it.

**FACE THE SPOT**
the load will rest on by turning your feet and whole body in that direction.

Figure 8. Carrying
Uploading

**UNLOADING**

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

1. **Bend Your Knees**
   - To lower the load. Keep your back straight and the weight close to your body.

2. **Be Careful With Fingers**
   - And toes. Allow enough room for them when the load is set down.

3. **Slide The Load**
   - Into tight spaces - it's much easier and safer than trying to lift it.

4. **Place The Load**
   - On a bench or table 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.

*Figure 9. Uploading*
Special Lifts

**Figure 10. 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.
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 lift, keeping the same grip.
- SEEK advice if 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 shift when you 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.

*Figure 11. Awkward objects and overhead lifts*
Pushing and Pulling Safety

For either movement, remember:

- STAY CLOSE to the object.
- GET A GOOD GRIP on it.
- KEEP YOUR BACK STRAIGHT, stomach in, knees bent.
- LEAN IN THE DIRECTION you’re pushing or pulling.
- WATCH OUT for obstructions.

KEEP THE STRAIN OFF YOUR BACK.
Let your body’s weight and leg muscles do the work for you.

Figure 12. Pushing and pulling safety
Special Objects Require Special Handling

Figure 13. Special objects require special handling

BARRELS, DRUMS AND KEGS
Roll a heavy barrel if you move it 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.
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.

To do your part, you should:

**TAKE ALL TRAINING SERIOUSLY**
and make use of what you know at all times.

**PROVIDE INFORMATION AND TRAINING**
regarding safe work systems along with details (weight, centre of gravity, etc.) on various loads.

**REPORT ANY HAZARDS**
or potential hazards to your supervisor at once. Make your safety and the safety of others a top priority!

**Figure 14. Team effort**
So --

BE SURE TO HANDLE OBJECTS SAFELY

✓ KNOW YOURSELF and your limits.
✓ KNOW HOW to move materials.
✓ USE MECHANICAL AIDS and other safety equipment provided by your employer.
✓ KNOW WHEN to get help.

You can get the job done safely and easily!

Figure 15. Handle objects safely
Lifting and Lowering Whist Standing

Figure 16. Lifting and lowering whist standing
Pregnant Employees Regulation 1994

Risks due to manual work must be assessed for pregnant employees and employees who have recently given birth.

Health and safety leave must be given if the maternity employee cannot be protected from the risks identified.

Certification of risk by employer for social welfare purposes.
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

*Figure 17. Manual handling legal obligations*
Eight Principles of Lifting

1. Access – the area
   Access – the load.
2. Bend Knees.
4. Keep back straight (not necessarily erect)
5. Firm palm grip
6. Arms close to trunk
7. Weight close to centre of gravity
8. Point/pivot feet in direction of movement.
9. Left with legs
Self Assessment

Questions on Background Notes – Module 1.Unit 2

1. Name three metals commonly used by sheetmetal workers.
2. Name three different areas of sheetmetal work.

3. How is stainless steel classified?
4. Name two types of finish on stainless steel.

5. Why use copper – give two reasons.
6. List four characteristics of lead.
Answers to Questions 1-6. Module 1.Unit 2

1.

Mild Steel
Galvanised Steel
Stainless Steel
Copper
Brass
Aluminium

2.

Heating and Ventilation
Catering
Aircraft
Transport
Sign Manufacture
3.

Stainless Steel:

Stainless Steel is classed by type number. E.g. Type 304.
There are a large number of grades available.
There is a handbook available to find the type of stainless steel
suited to each particular job.

4.

Types of finish:  
Dull finish
Mirror finish

5.

a. High resistance to corrosion
b. Appearance
c. Working properties i.e. soft and malleable
6.

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| • The heaviest metal a sheetmetal worker would use.  
| • It is very soft and easy to bend.  
| • Chemically the most inactive of metals. Exposure to air or burial in the ground would not effect it.  
| • Lead is resistant to most acids.  
| • Lead is gauged by the number of pounds per square foot.  
| • Lead can be soldered easily using rosin, the melting point of lead is 621°F. |
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