



## ROADING NEW ZEALAND

# GUIDELINE FOR CONTROLLING REVERSING VEHICLES

December 2009

**ISBN 978-0-9582827-1-0**

This publication is copyright of Roding New Zealand Inc (RNZ)  
and may not be copied, used or reproduced except in its entirety.

Roding New Zealand, 2 Collina Terrace, Box 12-412, Thorndon, Wellington, New Zealand.

Telephone (64-4) 471 1184; Fax (64-4) 471 1185.

E-mail; [Info@Rodingnz.org.nz](mailto:Info@Rodingnz.org.nz)

Web; [www.rodingtonz.org.nz](http://www.rodingtonz.org.nz)

## **Foreword**

Roading New Zealand is proud to present this *Guideline for Controlling Reversing Vehicles*.

Sadly, this project was initiated as a result of a fatal incident within the roading industry. Research has confirmed that reversing mobile equipment of all sorts across all industries features heavily in workplace deaths and personnel injuries, not to mention the significant costs of other damage.

This handbook therefore aims to provide best practice guidance and practical advice on how to reverse vehicles safely. The information is primarily directed towards the roading industry and the types of equipment that may be found on any construction worksite. However, the principles are the same for all types of equipment and thus can be applied to vehicle operations in all industry sectors. We commend this document's use for training purposes and to raise awareness of the dangers that abound wherever mobile equipment is used.

Roading New Zealand would like to acknowledge the many people who provided input into the production of this Guideline and also the assistance provided by the Department of Labour.

It is hoped that this document will increase the safety of all people involved in the use of mobile equipment.

## **Acknowledgment**

This guideline has been developed in consultation with members of Roothing New Zealand (Roothing NZ) and with InfraTrain, the roading industry training organisation.

The Health and Safety Committee of Roothing NZ gratefully acknowledges the assistance of all contributors.

## Contents

Foreword .....	3
Acknowledgment .....	3
1. Introduction.....	5
2. Purpose of Guideline.....	5
3. Scope of Guideline .....	5
4. Definitions.....	6
4.1 Hazardous Area .....	6
4.2 Driver/Operator .....	6
4.3 Spotter/Signaller.....	6
4.4 Blind Spot.....	6
4.5 Incident.....	6
4.6 Accident .....	6
5. Accident Prevention .....	9
5.1 Ensuring a safe system of work for roading operations .....	9
5.2 Measures to be taken.....	9
5.2.1 Operational measures (site planning) .....	9
5.2.2 Physical measures .....	11
5.2.3 Training.....	12
6. Safe Reversing Procedures .....	12
6.1 Workers on Foot.....	12
6.2 Drivers/Operators.....	13
6.3 Spotters/Signallers .....	14
6.4 Hand signals for Day-time operations .....	15
6.5 Light signals for Night-time operations.....	18

## **1. Introduction**

Nearly a quarter of all deaths involving heavy and specialist off-road vehicles used for work operations in the roading construction industry occur while the vehicle is reversing. The types of vehicles used include heavy trucks, light trucks, dump trucks, milling machines, bobcats, rollers, etc.

Research conducted in the roading construction industry has shown that, in terms of the injuries and the frequency of accidents, rollers were involved in the most serious accidents, closely followed by milling machines, bobcats, then heavy trucks.

Many more accidents do not result in injury to workers but cause costly damage to vehicles, equipment and premises. Industry research has shown that heavy trucks and light vehicles are involved in the most incidents, followed by rollers, milling machines and loaders.

Most of these accidents happen at low speeds and could be prevented by taking some simple safety precautions which are given in this Guideline.

## **2. Purpose of Guideline**

The purpose of this Guideline is to raise the awareness of the dangers caused by reversing vehicles used in the roading construction industry in order to protect the health and safety of employees and others.

By critically looking at how people can be put at risk and considering how reversing can be done safely, both employers and employees can then take reasonable practicable measures to reduce the risk of injury or damage.

This Guideline provides some practical advice on general safety precautions for using road vehicles and specialist off-road vehicles. It can be applied to any vehicle that may have to reverse in roading operations.

This Guideline is, therefore, a best practice document to be applied to the roading construction industry to reduce the occurrence of reversing accidents. This Guideline will assist in meeting the requirements of the Health and Safety in Employment (HSE) Act 1992, Health and Safety in Employment Amendment Act 2002 and the Health and Safety in Employment Regulations 1995.

## **3. Scope of Guideline**

While this Guideline is primarily aimed at the roading construction industry, it also has an application to a wider range of vehicle operations in other industries.

## **4. Definitions**

### **4.1 Hazardous Area**

A hazardous area is the area in which an accident is most likely to occur. Its size depends on how large the driver's/operator's 'blind spot' is, and the distance needed to stop the vehicle/machine safely and gradually.

### **4.2 Driver/Operator**

The person who operates the machine that is being reversed, i.e. the driver.

### **4.3 Spotter/Signaller**

These people have the designated role to assist the driver/operator of the vehicle/machine to reverse safely, using agreed signals and commands where required in reversing situations.

### **4.4 Blind Spot**

The area around every vehicle/machine that is partly or completely concealed from sight to the operator/driver, even with the help of mirrors. The area where visibility is partly or wholly reduced for the operator.

### **4.5 Incident**

An event which causes damage to plant, but does not cause injury to people.

### **4.6 Accident**

An event which causes injury to people, and may be non-serious, serious or fatal.

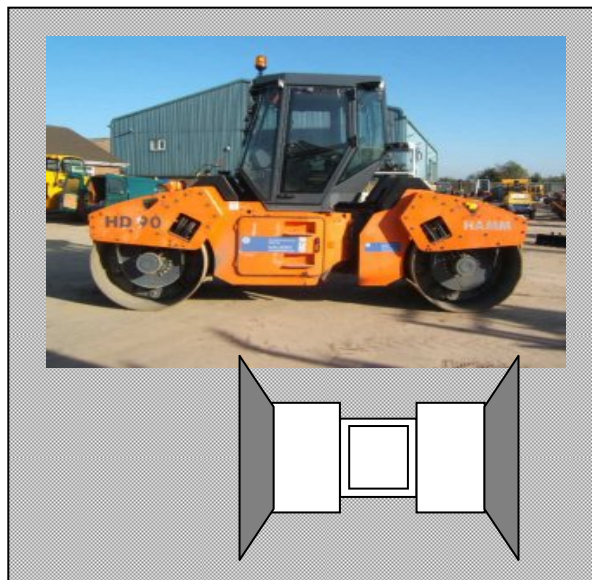
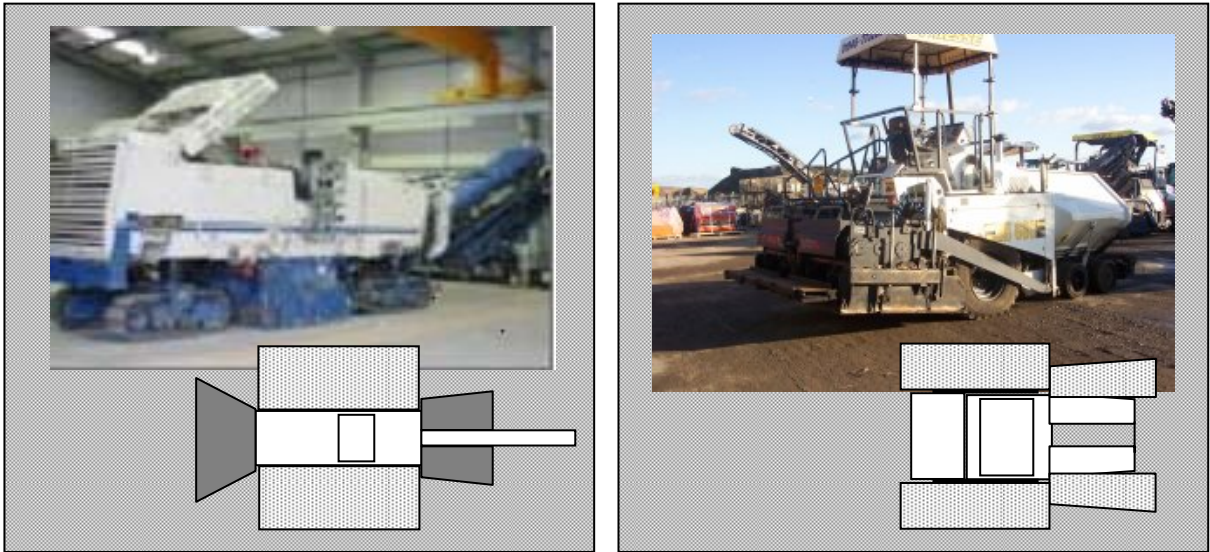


Figure 1: Dark areas indicate blind spots for the operator and the shaded areas indicate the operator's blind spots on plant that have double-sided steering.

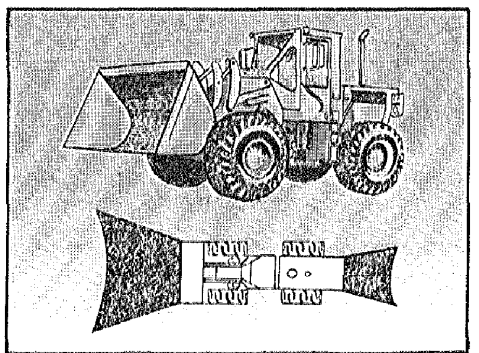
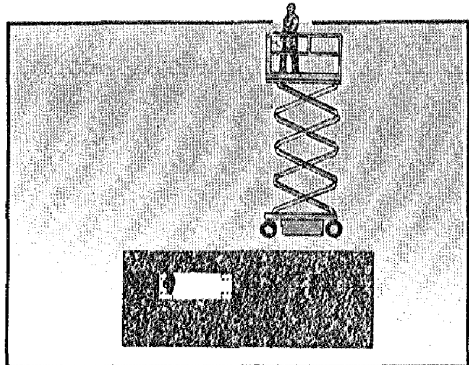
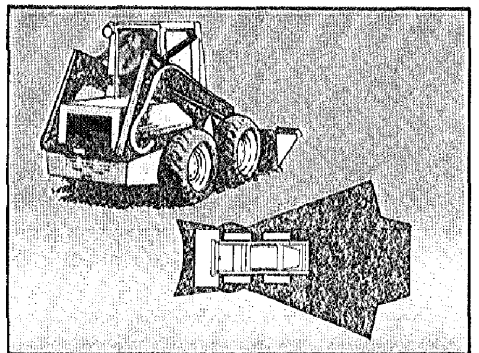
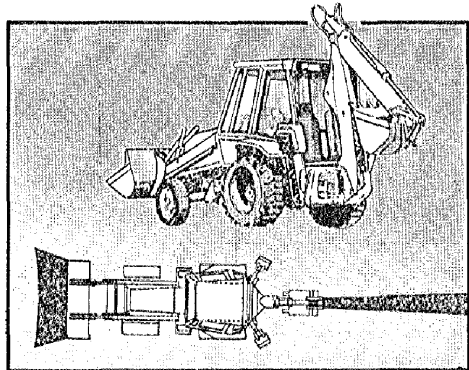
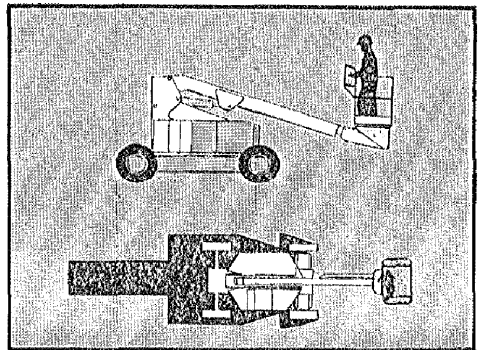
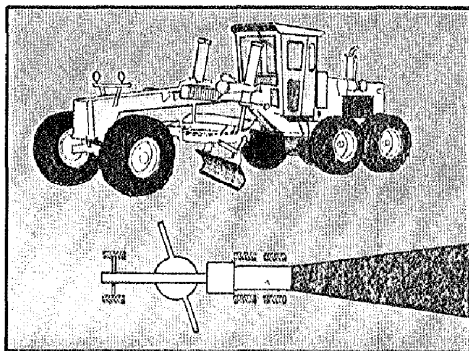
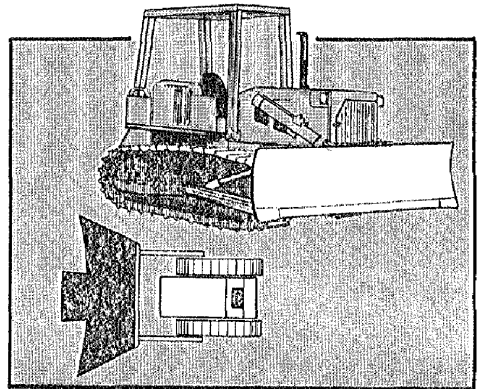
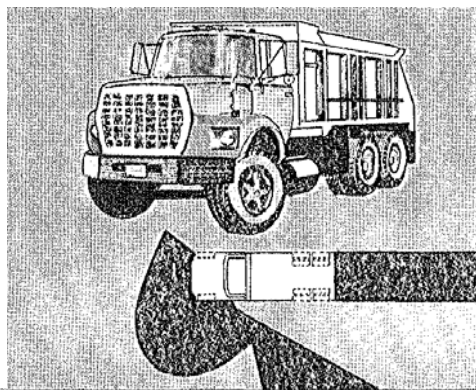


Figure 2: Dark areas indicate blind spots for the operator, and the shaded areas indicate the operator's blind spots on plant that have double-sided steering.

## 5. Accident Prevention

### 5.1 Ensuring a safe system of work for roading operations

No set formula has been provided in the roading industry that will create a safe system of work when reversing vehicles. The only way is to identify all the risks and decide how to tackle each of them. When considering the risk of an accident caused by a reversing vehicle, try to answer the following seven questions:

1. What vehicle manoeuvres will be necessary?
2. Can you avoid the need to reverse vehicles?
3. If vehicles must reverse, can you remove people from the area?
4. Is there enough space for reversing?
5. Do vehicles use the most suitable route when reversing?
6. What training, instruction and supervision will be provided? And for whom?
7. Have you considered all possible ways of dealing with the dangers of reversing vehicles? (Several options are given in this Guideline.)

### 5.2 Measures to be taken

To ensure a safe system of work and to prevent injury or damage and death caused by reversing vehicles/machines, the three basic approaches are:

- Operational measures (site planning)
- Physical measures (signallers or electronic devices)
- Training

Usually, no single measure will be enough so choose the measures that are appropriate to tackling the risks in your workplace.

#### 5.2.1 Operational measures (site planning)

Recommended measures are:

- **Remove the need for reversing**

This is your first priority. Remove the need for reversing by establishing one-way systems, setting up 'drive through' loading and unloading positions, or allowing greater space for storing materials. Consider all ways to avoid reversing.

- **Create distinct work zones**

Designate areas where a Spotter would not be required. For example, designate an area as a haul route or heavy machinery-operating zone where no foot traffic or light vehicles are allowed.

- **If reversing is unavoidable, exclude people from the area in which vehicles are permitted to reverse**

This is your first priority in this situation.

- Specify and clearly mark areas where reversing is permitted.

- Ensure that your system of work prevents people from unnecessarily entering these danger areas.
- Design and construct the areas so that drivers and pedestrians who may need to enter can see the demarcation lines.
- Consider creating 'vehicle only areas' in which barriers or warning signs are used to prevent workers and visiting drivers from entering.
- Minimise the distance vehicles need to reverse

- **Where possible minimise the distance a driver/operator is required to reverse.**

By decreasing the available space behind the vehicle, the event that someone or something will move behind a reversing vehicle/machine will be reduced or eliminated.

- **Ensure all employees are adequately trained**

Identify all the people who are involved with the reversing of vehicles, and take into account their capabilities when allocating tasks and deciding what training they should be given.

Drivers should be trained and competent to operate their vehicles safely and should be trained to recognise the hazardous areas around their vehicle/machine.

- **Use a properly trained Spotter or Signaller**

Use a Spotter to ensure safe reversing. The Spotter should be a designated person whose tasks are to keep the reversing area free of pedestrians and to ensure safe vehicle manoeuvres. Only properly trained people who have demonstrated a good understanding of the blind spots and the sweep path of a reversing vehicle should be designated.

- **Decide how the driver is to make and keep contact with the Spotter**

Ensure that both the Spotter and the driver understand the signals to be used. A recommended system of signalling is given in Section 6 of this Guideline.

- **Ensure all visiting drivers are briefed**

Familiarise drivers who are not your employees with the layout of the workplace, and ensure that they will follow your rules for reversing. For example, you could require visiting drivers to report and receive instructions before entering the workplace.

- **Ensure all vehicle manoeuvres are properly supervised**

Supervise and monitor transport operations to ensure that safe systems of work are always followed.

All employees and visiting drivers should be aware of your safe system of work, and its operation and supervision.

### 5.2.2 Physical measures

The following physical measures could reduce the risk of accidents:

- **Increase the area the driver can see**

Site layouts can be designed (and modified if necessary) to increase the visibility for drivers and pedestrians. Most vehicles already use external, side-mounted and rear-view mirrors that give maximum benefit. These must to be kept clean.

However, a large blind spot may still remain. In this situation consider, if appropriate, the use of refractive lenses in the rear window or a closed circuit television system in the cab. Mirrored surfaces erected in the reversing area may also help.

If, despite such measures, drivers cannot see behind the vehicle, they should leave their cab and check the area before reversing.

- **Fit a reversing alarm**

Many vehicles are already fitted with reversing alarms. These must to be kept in working order. Reversing alarms sound when the vehicle is reversing and help to warn people of the danger. Therefore, the alarm must not become just another part of the background noise of the workplace, or cause confusion when more than one vehicle is reversing.

Reversing alarms are not 'fail safe', so consider other warning methods, as listed below, and use or install them when they are more appropriate to the type of reversing operation.

- **Use other safety devices**

Devices that ensure safer reversing may include:

- Barriers to stop vehicles over-running steep edges
- Trip devices fitted to the rear of the vehicle to stop it when something is hit
- Reversing sensing devices that scan the area into which the vehicle is reversing
- Reversing lights
- Hazard lights that are at eye level for people on the ground
- Reversing cameras
- Walkie/talkie type systems used between the driver and Spotters

None of the measures mentioned above are sufficient on their own, but when systematically combined as a set of precautions they can lead to reducing the risk of a person(s) getting hurt. It is important for all parties involved to understand the work being performed. Different operations may have variations in the signals shown in this Guideline if they are more appropriate for the work being completed, i.e. when asphalt paving and chipsealing.

### 5.2.3 Training

Training is an important part in ensuring safety in workplaces where vehicles and machinery are used, and used often in reverse.

Training is essential to ensure safety around reversing vehicles and machinery by instructing drivers, operators, Spotters, and workers on foot about the associated hazards. All construction personnel must be made familiar with the hazards, especially of blind spots, Spotter locations, and must be instructed in the use of standard hand signals and safe reversing procedures. This will reduce the risk of injury to workers, and damage to vehicles and buildings.

## 6. Safe Reversing Procedures

The procedures that should be followed in any roading operation to ensure that vehicles/ machines are reversed safely, are listed below.

### 6.1 Workers on Foot

*Specific instructions for training these people should include:*

- Know how to work safely around trucks and operating machinery
- Understand the effect of blind spots (Figures 3 and 4)
- Avoid entering or standing in blind spots
- Make eye contact with the driver/operator before approaching equipment
- Signal intentions to the driver/operator
- Avoid standing and talking near vehicle/machine paths and other activities where heavy equipment is moving back and forth
- **Never** cross or step behind a reversing vehicle/machine or when its reversing lights/alarm is on
- Designate an area for the operation of mobile phones (because people tend to be distracted when using them)

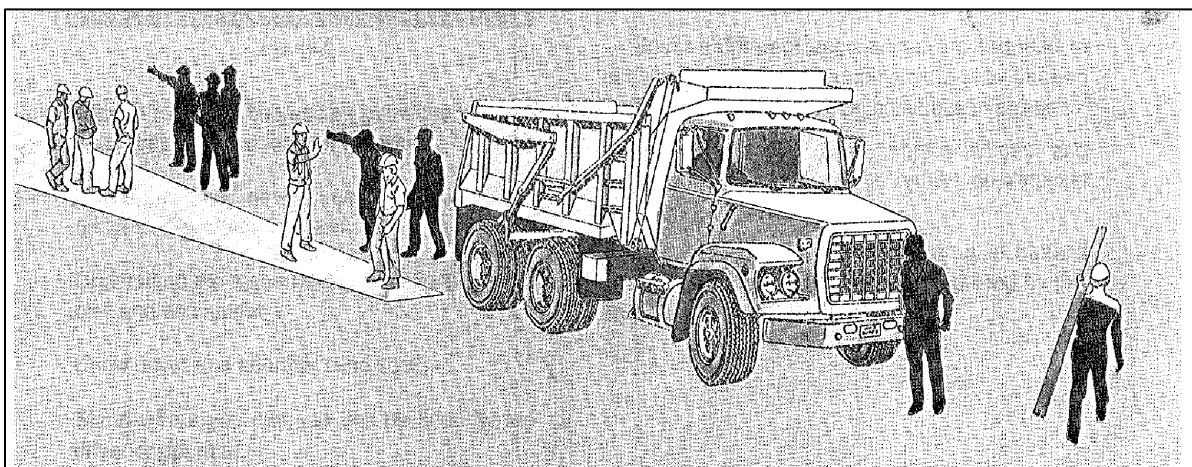


Figure 3: This diagram shows those workers (white) who are visible to the driver/operator and those (black) who are in the driver's blind spots (dark areas).

## 6.2 Drivers/Operators

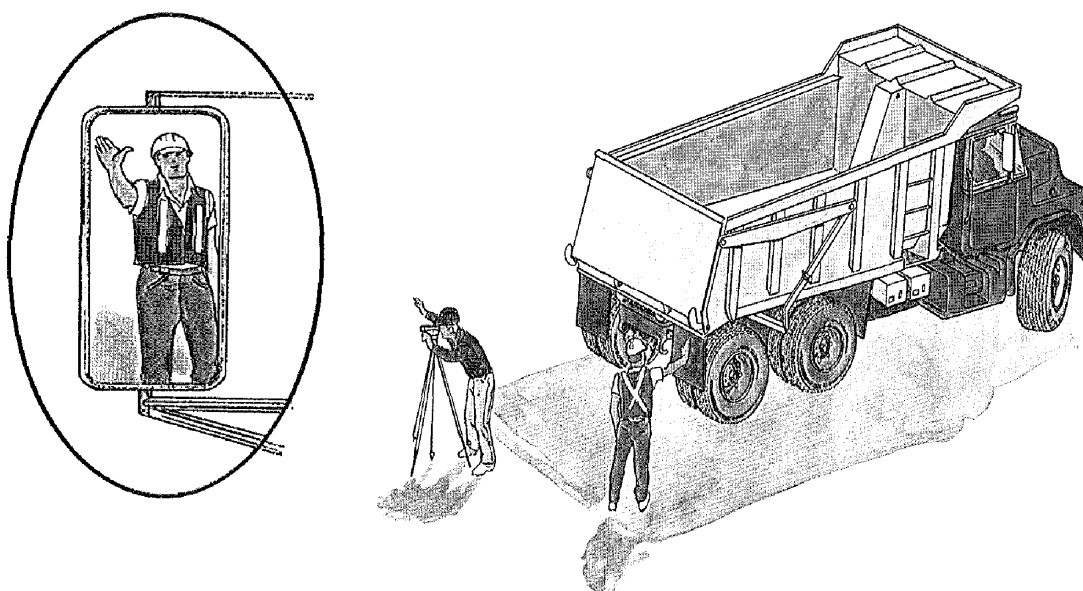
The driver's responsibility is to ensure they do **not** reverse into or over any person or object.

*Before reversing, drivers should:*

- Familiarise themselves with the area and, if unsure, walk the route and talk with the Spotter before attempting to reverse
- Ensure that all mirrors are intact, functional, clean, and properly adjusted for the best view
- Ensure all reversing devices (if fitted) are functional, i.e. lights and alarms
- Turn off or silence cellphones, vehicle radios, and other radios including iPods, except two-way radios
- Visually locate workers on foot to ensure that they are clear of the vehicle's path

*When reversing (with a Spotter), drivers should:*

- Always obey the Spotter or Signaller
- If in doubt about the signals or if more than one person is signalling, stop the vehicle and determine which signals or Spotter are to be followed
- **Stop** reversing immediately when a Spotter, worker on foot, or anyone else disappears from view
- Resume reversing only when visual contact is restored with Spotter or workers on foot
- Use agreed-upon hand signals to communicate with the Spotter
- **Stop** the truck if the Spotter needs to change their position



*Figure 4: These diagrams show the visibility that the driver/operator should have of the Spotter.*

*When reversing (without a Spotter), drivers should:*

- Get out and quickly check around the vehicle/machine, reverse only if the way is clear
- **Stop** reversing immediately when a worker on foot or anyone else disappears from view
- Resume reversing only when visual contact is restored with workers on foot
- Check both side mirrors repeatedly when reversing

### **6.3 Spotters/Signallers**

*Responsibilities of a Spotter:*

- Stay alert to recognise and deal with dangerous situations.
- Wear a reflective high visibility vest at all times.
- Use agreed-upon hand signals to communicate with the driver/operator (see signals in Figures 5, 6 and 7).
- Remain visible at all times to the driver/operator, i.e. stand where you can see and be seen.
- Detect and understand the effect of blind spots (see Figure 5). Drivers will rely on the Spotter to be aware of any obstructions in the blind spots to the left of the vehicle.
- Maintain a clear view of the hazard area (blind spot) behind the vehicle.
- Stay clear of the path of the reversing vehicles.
- Avoid walking backwards.
- Ensure no one is behind the vehicle/machine before signalling the driver/operator to start reversing.
- Immediately signal the driver/operator to stop if any person or object enters the area behind the truck.
- Signal the driver to stop when the Spotter must change positions while the vehicle is reversing.
- Stand in a safe position where they can guide the reversing vehicle without being in its way.



*Figure 5a: The correct placement of a Spotter at the rear of the vehicle.  
A clear view of the Spotter is seen in the driver's mirror.*



*Figure 5b: The incorrect placement of a Spotter at the rear of the vehicle.  
As the mirror is out of sight of the Spotter, the driver does not have a clear view of them.*

#### **6.4 Hand signals for Day-time operations**

Figures 6a-e show the recognised signals that Spotters can use to help drivers/operators to reverse their vehicles safely during day-time operations. The signals must be slow and obvious.

The Spotter stands behind the vehicle and is in line of sight of the driver/operator's rear-view mirror. All workers must wear high visibility vests.

Figure 6: Signals that the Spotter uses to instruct the driver/operator what to do when reversing during day-time operations.



**a. Start Reversing**

*These two signals instruct the driver that he can start reversing. With the palm of your hand facing towards you, use a simple back and forth motion towards your body.*



**b. Stop Reversing**

*The signal to instruct the driver to stop is to extend the arm with your open palm facing forward.*



**c. Move Forward**

*These two signals instruct the driver to move forward. With the palm of your hand facing away from you, use a simple back and forth arm movement away from your body.*

Figure 6 continued:



#### d. Clearance

*This signal instructs the driver how much room is behind when the vehicle is getting close to any kind of object. Hold your hands apart and bring them together as the driver gets closer to the object. When close enough use the stop signal.*



Turn Left



Turn Right

#### e. Direction

*These two signals instruct the driver which direction to turn. Hold your arm out straight and point in the direction (left or right) that you wish the driver to go.*

#### Notes:

- **Stop** reversing immediately when a Spotter, worker on foot, or anyone else disappears from view.
- The signals for turn left and right should be interpreted by the driver who is reversing, to turn the wheel in the direction the Spotter is indicating, i.e. left if Spotter points with his left arm, or right if his right arm.
- Both the driver/operator and the Spotter need to understand the signals being used.
- These signals are a guide and may not be suitable for all reversing applications. Therefore others may be developed and agreed upon by drivers and Spotters, as long as everyone is aware of their meaning.

## 6.5 Light signals for Night-time operations

Figures 7a-f show the recognised signals using lights that Spotters can use to help drivers/ operators to reverse their vehicles safely during night-time operations.

If the light is not good enough during the day for hand signals to be seen, or if you are working during the night, then use a torch or traffic wands to instruct the driver/ operator. The procedures are the same as for day-time operations, and the signals must be slow and obvious.

The Spotter stands behind the vehicle and is in line of sight of the driver/operator's rear-view mirror. All workers must wear high visibility night-glo vests.

*Figure 7: Signals that the Spotter uses to instruct the driver/operator what to do when reversing during night-time operations.*



**a. Move Forward**

*Hold torch in the centre of your body and move it **up and down**.*



**b. Start Reversing**

*Circle torch in front of your body in a **clockwise** direction.*

Figure 7 continued:



**c. Turn Right**

*Hold the torch in your right hand and move it from the centre of your body down to your right side with a fully extended arm, and back.*



**d. Turn Left**

*Hold the torch in your left hand and move it from the centre of your body to your left side with a fully extended arm, and back.*



**e. Continue**

*Hold the torch in the centre of the body with NO movement.*



**f. Prepare to Change Direction**

*Hold the torch in the centre of the body and move from left to right.*

**Stop**

*Hold torch in the centre of your body and turn it off.*

**Notes:**

- To **STOP** all movement turn off the torch.
- The signals for turn left and right should be interpreted by the driver who is reversing to turn the wheel in the direction the Spotter is indicating, i.e. left if Spotter points with his left arm, or right if his right arm.
- These signals are a guide and may not be suitable for all reversing applications. Therefore others may be developed and agreed upon by drivers and Spotters, as long as everyone is aware of their meaning.