Mobile Plant Reversing & Visibility Aids

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CONTENTS

1. Scope of this guidance

2. Reversing in safety

3. Driver and vehicle visibility

4. Reversing aids

5. Audible reverse alarm

6. Machine visibility

7. Indicative summary of the main UK legal requirements.

8. Further information and guidance

1. Scope of this guidance

Poor visibility from mobile plant has been a significant factor in many incidents, dangerous occurrences and near misses in the cement manufacturing industry. The procedures detailed in this guidance should be a minimum standard applied to all mobile plant operated by members of the British Cement Association and their contractors, regardless of whether the mobile plant is owned or hired.

This document concentrates on a relatively narrow set of health and safety criteria specific to visibility and reversing aids that should be considered as part of an overall risk assessment. Compliance with any guidance set out in this document does not absolve the user from his legal duties under the Health and Safety at Work etc Act 1974 to form his own site specific assessment of his workplaces and operations and to provide accordingly for such matters.

Any alternative ways of controlling risks should only be performed if they can be justified by the risk assessment and assurance that the measures are compliant with statutory duties. This guidance is not intended for use at construction sites or for vehicles that operate on the public highway.

Some 50 work place deaths are caused annually in the UK by reversing incidents.

2. Reversing in safety

The Health and Safety Executive issued a leaflet in 2002 that contains notes on good practice for reversing vehicles. They advise that when considering the risk of an accident caused by a reversing vehicle, the following questions should be answered

- What vehicle manoeuvres will be necessary?
- Can you avoid the need to reverse the vehicles?
- If vehicles must reverse, can you remove people from the area?
- Is there enough space for reversing?
- Do vehicles use the most suitable route when reversing?
- What training, instruction and supervision is going to be provided? And for whom?
- Have you considered all possible ways of dealing with the dangers of reversing vehicles?

Further advice is provided in the leaflet, which can be found at the following web address
www.hse.gov.uk/pubns/indg148.pdf

3. Driver and vehicle visibility

All vehicles should be fitted with mirrors and a rear view camera where necessary so that the driver can see all round the vehicle. As part of the overall risk assessment on visibility, a *"red stick test"* shall be carried out as described below.

Red Stick Test
The Driver is to sit in his normal seat facing forward. An assistant will walk around the machine with a 1m high stick 1m away from the machine (refer to Table 2 on pages 7 & 8).

The Driver must be able to see the top of the stick at all times using fitted mirrors and rear view camera by turning his head, but without looking over his shoulder.

Mirrors are available that offer "blind spot" coverage to any vehicle. These might be used to view beyond the vehicle cab, or down to the ground in the front wheel area, or increased panoramic rearward side mirrors. Options are also available that provide heating for winter months.

To achieve compliance with the red stick test; the following equipment should be considered as part of the overall risk assessment and usually fitted as a minimum.

- Closed Circuit Television (CCTV)
- Convex internal rear view mirror
- Convex segment wing mirrors on each side

Convex segment wing mirrors

Mirrors must be kept clean and drivers should be provided with the means to clean them. If it is necessary for the CCTV to be in use all the time, (e.g. so that overtaking vehicles approaching from the rear can be seen), the CCTV monitor should be fitted at the same height as the mirrors to avoid distracting the driver.

Convex segment wing mirrors. Spot the photographer, not visible in the ordinary mirror!

Convex internal rear view mirror

Convex internal rear view mirror

4. Reversing aids

Companies should carry out their own risk assessment to determine whether a reversing aid is appropriate and if so what type should be fitted. An example can be found in Table 1 on page 6.

Radar based systems are available that detect people and obstacles behind the reversing vehicle. These systems can be configured in a number of different ways.

Automatic – A radar based system that detects a person or other obstacle behind the machine and automatically applies the brakes. This system can also be configured to provide pre-warning of automatic braking and can turn on the CCTV when the vehicle is reversing.

Warning Only – A radar based system that also detects a person or obstacle behind the machine but just sounds an audible and or visual alarm in the cab.

Radar system fitted to rear of quarry vehicle

Following initial installation or relocation of a machine to another site or duty, the reversing aid must be set up by the Supplier so that the alarm or automatic braking detection zones are correct for the new application. If necessary, a speed limit should be established for reversing so that the vehicle is able to stop within the automatic braking detection zone.

(A new system is being trialed, whereby images captured by remote camera are transmitted to the screen in the drivers cab. Currently this is being used to assist the alignment of road vehicles when reversing under silos, although this could be developed for use in other applications.)

5. Audible reverse alarm

Improved reversing alarms are available that provide more *'localised'* sound behind reversing vehicles. These alarms make reversing vehicles easier to locate and reduce noise complaints from neighbours. Therefore, a smart alarm type Brigade Smart (87-112dB(A)) or similar (manufactured to the appropriate standard) should be fitted to all machines.

The smart alarm should be wired with the automatic radar system so that it can only be switched off when the automatic radar system is turned on and operating. It is important that the alarm does not become part of the background noise of the workplace or cause confusion when more than one vehicle is reversing.

6. Machine visibility

The following are recommended as minimum standards to improve machine visibility

- The machine should be painted a bright colour.
- Red and white stripes should be painted or attached to the rear of the machine.
- An amber rotating roof beacon should be fitted to the top of each machine cab.
- A "keep your distance" sign should be fitted to the rear of each machine.
- Full road lighting with roof lights should be fitted.
- Two high intensity reversing lights should be fitted.

These should be cleaned on a regular basis and maintained in good order. All signage and marking should conform to the Health & Safety (Safety Signs & Signals) Regulations 1996.

7. Indicative summary of the main UK legal requirements (other legislation could apply depending on the site or duty specific risk)

Legislation	Key Requirement	Practical application
Health and Safety at Work etc Act 1974	Section 2 & 3. Duty to maintain safe systems of work for protection of employees and others	Safe systems of work need to be developed for mobile plant reversing
The Workplace (Health, Safety and Welfare) Regulations 1992 http://www.opsi.gov.uk/si/si1992/uksi_19923004_en_1.htm	Regulations 12 &17, require the organisation of traffic routes to ensure safety and maintenance in an adequate condition.	Separation of pedestrians and vehicles, maintenance of road surfaces.
Use of Work Equipment Regulations 1998 (PUWER 98) www.opsi.gov.uk/si/si1998/19982306.htm	Regulation 28(e) and (f) requires that *"where the driver's direct field of vision is inadequate to ensure safety, there are adequate devices for improving his vision so far as is reasonably practicable and, if provided for use at night or in dark places, it is equipped with lighting appropriate to the work to be carried out; and is otherwise sufficiently safe for such use"*.	Fitting CCTV and radar.
Management of Health & Safety at Work Regulations 1999 http://www.opsi.gov.uk/si/si1999/19993242.htm	Regulation 3. Every employer to make a suitable and sufficient assessment	Mobile plant reversing & visibility aids must be included as party of generic, site & duty specific risk assessments.
Health and Safety (Safety Signs & Signals) Regulations 1996 The Health and Safety (Safety Signs and Signals) Regulations 1996	Regulation 6 sets out requirements for the provision and maintenance of safety signs. Where it is appropriate to provide safety signs because there is a H&S risk in connection with the presence or movement of traffic (including pedestrians in relation to that traffic) and an appropriate sign exists in the Road Traffic Regulation Act, that sign shall be used, whether or not that Act applies to that place of work.Warning Sign Manual	Maintenance and provision of road signs.
The Supply of Machinery (Safety) Regulations 1992 http://www.opsi.gov.uk/si/si1992/Uksi_19923073_en_1.htm	Various including Clause 3.2.1 *"Where necessary appropriate devices must be provided to remedy hazards due to inadequate vision"* and Clause 3.6.1... instruction plates concerning use/ an acoustic warning device/lamps & rotating beacons.	Devices to improve vision, keep your distance signs, reversing alarms etc.

8. Further information & guidance

1. INDG 148 HSE good practice leaflet on reversing vehicles. www.hse.gov.uk/pubns/indg148.pdf
2. ***"Let drivers see and be safe"*** (part of Quarry Industry Hard Targets on HSE website www.hse.gov.uk/quarries/qff16.pdf
3. MISC 156 HSE information sheet on the hiring and leasing out of plant. www.hse.gov.uk/pubns/9204.pdf
4. HSC 13 HSE guide on health & safety regulation: www.hse.gov.uk/pubns/hsc13.pdf
5. INDG 244 HSE short guide for managers; www.hse.gov.uk/pubns/indg244.pdf
6. **Ogdens** (Radar and associated systems); www.pla-net.uk.net/ogden/index.htm
7. **Vision Techniques** (Ogden radar systems, CCTV, Ultrasonic Reversing Aids, Mirrors); http://vision-techniques.com/
8. **Benfells** (Reversing/Forward blind spot aids, Wireless Reversing Cameras including remote cameras that can be viewed in cab e.g. cameras facing downward under silos, other reversing aids, custom solutions); www.benfells.co.uk
9. **Spillards** Allround vision (Mirrors, radars, optronics, visibility assessments); www.allroundvision.com/

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TABLE 1: TEMPLATE FOR SELECTING REVERSING AIDS

To determine what sort of reversing aid should be fitted to a piece of mobile plant, a risk assessment should be carried out. The questions should be scored as follows:

Never - 0
Occasionally - 1
Often - 2
All the time - 3

If a machine is used for more than 1 duty, each duty should be scored and the higher one used to assess the aid required.

MACHINE TYPE .....

LOCATION .....

DUTY .....

Example

		Never	Occasionally	Often	All the time
1	Does the machine have to reverse into a congested area to carry out its normal duty? *Note that for excavators, where the driver always faces the direction of travel, the answer would be never.*	**0**	**1**	**2**	**3**
2	Are there likely to be pedestrians around the machine whilst it is operating?	**0**	**1**	**2**	**3**
3	Are there likely to be light commercials in the area that the machine operates?	**0**	**1**	**2**	**3**
TOTAL					

0 – 2 **Low risk**

3 – 4 **Medium risk**

5 – 9 **High risk**

SIGNED ..... **NAME** .....

DATE .....

TABLE 2: RED STICK TEST

Machine Model …… **Plant ID Number** ……

Are the following items fitted and positioned / working effectively?

CCTV ……..

Cab mirror(s) ……..

LHS Wing mirror(s) ……..

RHS Wing mirror(s) ……..

LHS articulation trap point mirror ……..

RHS articulation trap point mirror ……..

Audible reverse warning device ……..

White reverse warning lights ……..

Where fitted are the following reversing aids positioned / working effectively?

Radar ……..

Warning alarms ……..

(Audible, visual, and pre-braking where fitted)

Comments

……

……

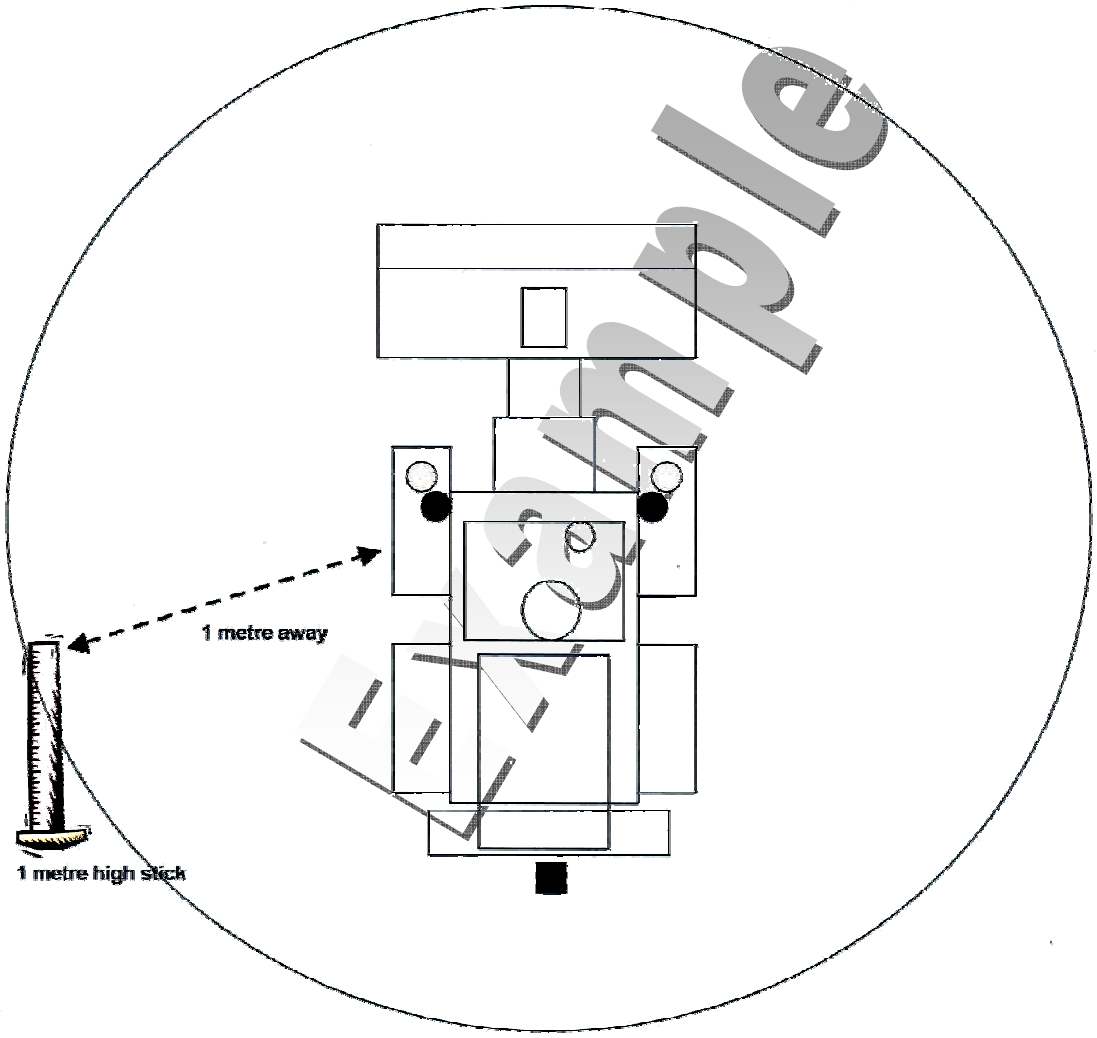
Assessed by …… **Signed** …… **Date** ..../……/…..

Example

TABLE 2: continued

Machine Identification Number ……

Mark on the plan - scope of operator's vision and highlight any blind spots



NOTE – Where this assessment identifies that 360° visibility has not been achieved additional reversing aids must be fitted to the loading shovel in order to achieve it. If the machine cannot be operated safely it must not be used until the additional reversing aids have been fitted.

Scope of vision beyond 1m should also be checked to ensure it is sufficient for safe operation.

Signed …… **Date** ……

TABLE 2: continued

The red stick test.

The red stick test. The view from the drivers mirror.