

Improving pedestrian safety in container ports and terminals

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Ports and terminals can be a difficult environment to work within as they operate 24 hours a day, in all conditions, with multiple employers and contractors carrying out different activities. To ensure a container port or terminal is efficient different types of workplace vehicles have to be operated. It is the duty of an employer to protect the health and safety of workers and to implement safe systems of work. Unfortunately operating workplace transport in close proximity to pedestrian workers increases risk and accidents occur every year which are either very serious or fatal.

The UK Health and Safety Executive list many areas where workplace transport hazards can occur within ports and terminals. Pedestrian workers are at higher risk of being struck or crushed when vehicles or plant are loading and unloading, moving on the dockside, on access bridges or ramps, reversing and

when they are in container storage areas and lorry parks.

The Department of Transport Port Employment and Accident Rates Survey 2009/10 found that 421 accidents were directly port related or on a port. [ICHCA International Ltd – Port & Terminal Accident Statistics]

Below we will discuss some of the advantages and potential disadvantages of different safety methods and technologies available to help reduce the risk of workplace transport accidents.

Traffic management

Effective traffic management aims to reduce workplace transport hazards and provide a safe site. Where achievable, pedestrians should be segregated from vehicle movements especially around container handling areas and access routes. Good traffic management with pedestrian and

vehicle segregation offers passive control which manages risk without further action.

Where complete segregation cannot be achieved traffic control measures such as speed limits, road signs, marked surfaces, lighting, visibility, walkways and managed vehicle activities must be implemented to reduce risk. Training, monitoring and site inductions are essential to ensure everyone is fully aware of site hazards, risk areas and safe routes.

The advantage of implementing effective traffic management is that it can be achieved through careful design and layout which requires limited technical equipment and can have low installation and maintenance costs.

The main disadvantage is that it relies on personnel taking responsibility for their own safety and if site rules are ignored then little protection will be offered.

Mirrors

Mirrors are a basic vision aid which should be fitted to vehicles to allow the driver to see around the vehicle. There are different types of mirrors available to help reduce blind spots including wide angle convex, convex segmented and panoramic mirrors.

The advantages of mirrors are that they provide a low cost vision aid to areas of a vehicle which are hard to see from the driving position. Mirrors are prone to vibrations and convex mirrors are distorted which is a disadvantage as this can result in an unusable vision aid especially in wet and dirty conditions.

Vehicle camera systems - CCTV

Camera systems allow drivers to see blind spots and obtain views via a cab-mounted monitor. Cameras can be mounted to allow a machine operator to view multiple images at once. It is common on vehicles to see both convex mirrors and reversing cameras fitted.

The advantage of a well maintained and correctly fitted camera system is that

ZoneSafe Proximity Warning System installed on a reach stacker operating in the Port of Iquique, Chile



Photo courtesy of El Alherio

they are quick and easy to implement and provide excellent all round visibility.

Their disadvantages are the operator must first see the problem and react accordingly. If the system is not maintained, combined with poor environmental and lighting conditions their effectiveness is greatly reduced.

Radar systems

A radar system is used to detect people and obstacles behind a reversing machine. These systems transmit high frequency radio waves which are reflected from surrounding objects. The time taken for the signal to be received will give an indication of distance from the object, and signal size received determines the objects size. Typical systems sense objects within a radius of 0.15 to 30 metres or beyond. Radar Systems can be

configured to automatically apply brakes or just sound an audible alarm when a person or object is detected.

The advantage of radar systems is that they are compact and easy to install and the system can reliably detect small vehicles, people and other equipment as well as link to CCTV systems.

Their main disadvantage is that the object or person needs to be in the direct line of sight of the radar beam to be detected and poorly defined detection zones can trigger unnecessary alarms.

LED lights

LED lights are bright lights attached to the roof of a vehicle which project a large spot on to the floor in the direction of travel, warning pedestrians of the approaching vehicle. They are quick and

easy to install and offer a very simple, cost effective solution to warn of an approaching vehicle.

The advantage of an LED light is that they work very well in narrow aisles where lighting is controlled such as in warehouses, pedestrians will see the approaching spot and react accordingly.

The disadvantages of LED lights are that they can be harder to see in bright light conditions and in open environments where pedestrians may not notice the spot on the floor.

Infrared detection

Infrared sensors operate by transmitting energy from a light emitting diode (LED) or a laser diode. When this signal is interrupted (broken) an alarm is triggered. Sensors can be mounted on both side and overhead configurations and are relatively low cost.

The advantages of infrared detectors are that they operate very well in clear controlled environments.

Unfortunately infrared detectors can be sensitive to weather conditions and are prone to nuisance alarms from non pedestrian objects.

RFID proximity warning

Radio frequency identification (RFID) tags or transponders provide a unique identification number using wireless radio technology that transmits data to a receiver unit. These transponders are worn by pedestrians and are read by the antennas fitted locally to the vehicle. There are different types of RFID technologies used for proximity warning systems including passive, which do not require a power source and active, which do require a power source. Some systems only receive a pulsed signal from the transponder and other systems activate or energise the transponder before receiving a signal back. When a transponder is detected the system will trigger an alert and in some cases can slow or stop the vehicle.

The advantage of RFID is that it provides an early warning to an operator that a pedestrian is close by, transponders do not need to be in the line of sight with the antenna, transponder IDs can be logged and integration with other RFID systems can be achieved. The main disadvantage of RFID is that a pedestrian must always wear a transponder, however these can be easily integrated into existing PPE.

Ultrasonic sensors

These sensors are used for a wide variety of non-contact, proximity or distance measuring applications. These devices transmit ultrasonic sound towards a target which is reflected. The time taken to reflect is an accurate measurement of distance.



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Any object in the detection area of the beam triggers an alarm.

The system is very affordable, accurate at short distances and provides all-weather operation.

The system's main disadvantage is that the sensors cannot distinguish between different objects and can trigger false alarms.

In summary

The vision and safety aids discussed provide interactive controls, even when triggering a warning, require operators to look, detect and take action. They all have their own advantages and disadvantages, some more effective in one environment compared to another. Many of the technologies can complement each other and work together to offer effective systems to help improve pedestrian safety and significantly reduce risk.

Site safety is an employers' responsibility, they must determine the potential hazards and what systems would be most effective on site, always employ passive safety first where possible.

Ports around the world are leading the way by implementing both passive safety solutions and interactive safety aids, which use the latest technology to help reduce the risk of collisions between pedestrian workers and industrial vehicles.

About the authors



Barry Roberts has been working within electronics and RFID for the past 15 years. Barry has extensive knowledge of RFID principles which includes designing systems and tags and is now expanding customer system knowledge to improve safety between vehicles and pedestrians.



Melanie Gray has almost 20 years of wide range experience in marketing. Melanie has charity, financial services, retail ecommerce and technical marketing expertise as well as a BA in public relations.

About the organisation

Avonwood has been established since the 1980s. They design and manufacture successful identification and tagging technologies across many industries and applications. ZoneSafe is a cost effective safety aid which can reduce the risk of accidents between industrial vehicles and workers. In addition, the proximity warning system can be used to protect valuable assets and prevent encroachment near to hazards and restricted areas. The ZoneSafe system has been developed by Avonwood, using their extensive experience and knowledge of active tagging technology. They have been installed successfully on large reach stackers and small forklift trucks in ports around the world.

Enquiries

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