Safety for Reversing of Goods Vehicles

Recently, fatal accidents involving in reversing of vehicles always appear in news report. Hence, safety for reversing of goods vehicles at workplace could not be ignored. This article will introduce various types of auxiliary equipment that could be installed in the vehicles for enhancing vehicle safety when reversing. Besides, the "Reversing Video Device Sponsorship Scheme for Heavy Vehicles on Construction Sites", which is launched by the Occupational Safety and Health Council, the Labour Department and the Hong Kong Construction Association will be introduced briefly.

Advantages and Limitations of Different Reversing Devices

Reversing devices are the auxiliary equipment that are installed in the vehicles for the drivers to have clear rear view or to generate alerts in dangerous conditions when reversing. The devices are generally classified into electronic and non-electronic types. The following devices, that are available for installation in the vehicles, are introduced about their advantages and limitations.

Cross-View Mirror

Cross-view mirror is a convex rear view mirror to be mounted at an elevated point at the rear of the vehicle in such a way that the driver can catch the view of the vehicle blind spots at the rear. The image of the rear part of the vehicle is reflected to the driver through a normal rear view
mirror or side mirror installed.

Figure 1: An ultrasonic parking sensor

**Advantages**

- The driver's view of the rear area can be enhanced and be up to 2 meters by the cross-view mirror.
- It is relatively cheap and easy to install.
- There is no power requirement.

**Limitations**

- The views provided may be blocked if the vehicle is fully loaded.
- It is not suitable for goods vehicle that have no high mounting point at the vehicle rear most, for example, pick up and drop-side platform.
- Owing to image distortion and size, it is not suitable for most goods vehicles exceeding 3.5 tonnes.
- If the mirror is mounted at the center of the vehicle, it may fail to detect objects on the two sides of the vehicle.
- It is not effective in an environment where illumination level is low.
- Dirt, rain, mist, glare, and vibration of the rear view and cross view mirrors can result adverse effect to the performance.

**Reversing Video Device (RVD)**
RVD is a closed circuit television (CCTV) system with its camera being mounted at the vehicle rear to capture the rear view of a vehicle. The image is displayed on a monitor that is installed in front of the driver. The image being displayed is in opposite direction that is same as viewing from the rearview mirror. According to the guidance of Transport Department, recommended performance requirements of an effective RVD are as follows:

1. Longitudinal distance – 3.2m from rearmost of the vehicle
2. Transverse distance – overall width of vehicle plus 0.5m on each side of the vehicle
3. Height of object detected – 0.3m above ground

Recommended product requirements for RVD include:

1. The camera should be water and dust proofing.
2. When installed at 1m, the monitor diagonal size shall be no less than 130mm for either 4:3 or 16:9 monitor width to height display ratios.
3. Edges should be rounded to 2.5mm radius, and hard objects should be covered with 25mm thickness material of hardness no more than 60 Shore A.
4. The brightness of the monitor should be adjusted automatically to match the external illumination conditions as required under ISO 15008:2003 be specified.

(Please refer to "A Guide for the installation of Devices to Assist Reversing of Goods Vehicles" of Transport Department for other recommended requirements).
Advantages

- It gives the whole picture of the rear to the driver.
- There is no time delay in conveying the information to the driver.
- When RVD fails, the driver will know readily because the image would not be displayed.

Limitations

- The performance depends very much on the installation heights. Higher installation height will have a wider viewing coverage. In other words, a wider angle camera lens (camera lens with horizontal angle of vision about 175 effective angle) is required if the installation height is not high enough.
- Auxiliary illumination such as reversing lights is required in environment of low illumination.
- Dirt and rain drops on the camera may affect the quality of images captured.

Parking Sensor

Parking sensors make use of ultrasonic or electromagnetic technologies to detect the presence of objects in the vicinity of the sensor. They send audio (sometimes also with visual display) to alert the driver of the proximity of other objects.
Therefore, it is widely used for vehicle parking to prevent the vehicle from colliding with another object when reversing.

**Advantages**

- It is effective in sensing large and stationary objects such as walls and other vehicles.
- It is relatively cheap and easy to install.
- Ambient lighting is not required as it can still function in darkness.
- It gives an audio alarm actively when an obstacle is detected. The warning signal changes in proportion to the proximity of the obstacle.

![Figure 3a: Camera of the RVD](image)
Limitations

- It is not reliable in sensing moving objects such as walking pedestrians.
- The sensors installed at the bumpers for goods vehicles with high bumpers might not be able to detect objects of less than 0.3m in height such as small children.
- The effective horizontal range is short (usually less than 1.8m).
- Different products vary in their response time in sending the alarm signals.
- There may be false alarms due to proximity of objects on the sides, road ramps on the path, and sensors being covered with mud or rain.
- It is not reliable in sensing polishing slope or cone, coast, cliff as well as an object that can interfere any reflected signals.
- There is no indication to the driver if the sensors do not function.

A Tag-based Proximity Warning System

Recently, there is a Tag-based Proximity Warning System for mining industry that is available in the market of America. The system is relied on an ultrasonic or a magnetic field sensing technology. When there is a heavy duty vehicle approaching a worker who has worn this electronic tag, the receiver that has been installed in the
vehicle will be triggered. An audible alarm is sent to the driver and vibrating alarm is generated by the worker's tag.

**Advantages**

- It is able to sense longer distance and larger areas than that of parking sensor.
- Interactive communication can be achieved because both pedestrian and driver will be alerted simultaneously.

**Limitations**

- It can only sense the electronic tag worn by the worker.
- It takes time and is complicated for installation and adjustment.
- It is relatively expensive.
- It cannot automatically adjust the sensing distance with the vehicle's speed simultaneously.

**Advantages of Using Multiple Reversing Devices**

Having considered the advantages and limitations of various reversing devices as well as the operation needs, it is worth to consider the possibilities of using two or more types of the aforementioned reversing devices at the same operation. Benefits include:
Figure 4: The display screen of the RVD is mounted at the rear view mirror (The model was for reference only)

1. One reversing device can still function even though another is failed.
2. It is able to sense both near distant/low speed and far distant/high speed operation.
3. It allows the driver to confirm by naked eyes when the presence and position of an obstacle is detected.
4. Driver is more willing to accept the use of reversing system because of few false alarm and disturbance.
5. Make use of it to detect the boundary such as cliff or coast.
Limitations of Auxiliary Equipment

The aforementioned devices are all the auxiliary equipment for vehicle safety and assist the driver to be aware of the vehicle blind spots. However, we should not solely rely on them. Effective and efficiency safety management system should be established by commencing risk assessment to the driving operations and work out proactive and reasonable practicable safety measures for vehicle safety. These include: planning of transportation schedule, design of traveling routes, selection of vehicles, instructions for traveling and warning notices, communication among the driver and his proximity of workers as well as effective safety training, etc. Key issue for vehicle safety at
workplace is the safe driving attitude.

Reversing Video Device Sponsorship Scheme for Heavy Vehicles on Construction Sites

Recently, traveling accidents involving in reversing of vehicles have been occurred occasionally at construction sites. Therefore, the Occupational Safety and Health Council, the Labour Department and the Hong Kong Construction Association launch the "Reversing Video Device Sponsorship Scheme for Heavy Vehicles on Construction Sites". The scheme aims at sponsoring the SMEs and self-employed to install the reversing video devices in their vehicles in order to reduce the number of accidents involving reversing vehicles on construction sites. For details, please refer to the following link:
