

Workplace Safety and Health Guidelines

Workplace Traffic Safety Management



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1. Introduction

Workplace traffic management is an integral part of operations for many industrial sectors; including but not limited to the construction, marine and logistics industries. If workplace traffic is not managed well, it can lead to damaged vehicles properties as well as fatalities and/or serious injuries in the workplace and public areas.

This set of guidelines highlights potential hazards when vehicles are used on the roads and within workplace premises. The guideline is recommended for companies who own transport¹ or goods vehicles such as prime movers, lorries, vans, tipper trucks, dumpers, concrete mixers, and so on. This publication also recommends good industry practices through the establishment of a traffic management plan.

¹ For forklift operations, refer to *WSH Guidelines: Safe Operations of Forklift Trucks*.

2. Workplace Traffic Management Plan

A Workplace Traffic Management Plan helps to effectively manage traffic and operation of vehicles at the workplace to minimise risks and hazards. The plan should be prepared by qualified WSH personnel and endorsed by senior management.

To create an effective Workplace Traffic Management Plan, management should first identify desired safety and health objectives. Suitable programmes and resources should then be established to achieve the objectives.

To establish the safety and health objectives for a workplace traffic management plan, the management should:

- Conduct an initial status analysis of current workplace traffic management;
- Carry out risk assessments on all workplace traffic and transport activities, and types of vehicles used;
- Establish the measurement standards for performance monitoring; and
- Evaluate the effectiveness of the plan.

There are eight elements that should be included in an effective Traffic Management Plan. They are (non-exhaustive):

1. Workplace Safety and Health (WSH) policy;
2. duties and responsibilities;
3. traffic rules and regulations;
4. risk management;
5. safe work procedures;
6. training;
7. emergency response plan; and
8. incident investigation.

2.1 Workplace Safety and Health Policy

Management's commitment to WSH is the most important factor in ensuring the success of any Workplace Traffic Management Plan. If your business's key activities include extensive use of transport or goods vehicle/s, a written WSH policy that clearly states the management's commitment and approach in workplace traffic management should be established and endorsed. This written policy should also be communicated to all levels of staff, contractors and vendors.

2.2 Duties and Responsibilities

The duties and responsibilities of personnel managing and implementing the Workplace Traffic Management Plan should be clearly defined for all levels of staff. Legal obligations, such as the WSH Act and its subsidiary regulations, must be taken into account when assigning duties and responsibilities. More specific duties and responsibilities can be established by the individual company to meet its requirements.

The following are some examples of the responsibilities of management and employees:

2.2.1 Responsibilities of Management

Management includes person-in-charge such as managers, engineers, safety and health personnel, supervisors, foremen, and so on.

Their responsibilities include (non-exhaustive):

- Develop and implement the workplace traffic management plan;
- Ensure that the workplace traffic management plan is implemented effectively and communicated to all levels of workers;
- Ensure that workplace traffic safety rules, training programmes and safe work procedures (SWPs) are followed by workers;
- Provide all workers with the necessary information, instruction, training and supervision to ensure their safety and health at the workplace;
- Provide and ensure proper use of personal protective equipment (PPE);
- Ensure that there are safe means of access to and egress from any part of the workplace;
- Ensure that all equipment (including vehicles) used are properly maintained in accordance with the manual;
- Ensure that all workers under their charge have attended the relevant safety training course and possess the relevant certification for the work that is to be carried out;
- Provide all necessary emergency facilities required at a workplace such as first aid kits;
- Ensure that workers are familiar with the contingency or emergency plan; and
- Keep records of reported accidents, incidents and diseases and take necessary action to prevent a recurrence.

2.2.2 Responsibilities of Workers

Workers include logistics workers, operators, drivers, and so on.

Their responsibilities include:

- Follow workplace traffic instructions and safety warnings or signages at the workplace;
- Attend workplace traffic safety and health training or briefing sessions;
- Only operate plant or equipment if they hold valid licences, possess the relevant safety certification and have been given the authorisation to do so;
- Observe emergency procedures, instructions and arrangements as established and instructed;

- Operate equipment with care and do not use equipment (including vehicles) beyond their capacity or designated purpose;
- Use all safety devices and PPE as provided;
- Never misuse, interfere with or modify any of the devices or equipment;
- Report any damage, malfunction or suspected defect of plant, equipment, safety device or PPE to their respective supervisor;
- Report accidents, incidents, diseases and any workplace hazards to the supervisor or person-in-charge; and
- Suggest ways to improve traffic safety at the workplace if they identify any lapses during the course of work.

The other group of employees who are crucial in effective implementation of the traffic management plan are the signallers or banksmen.

Trained signallers or banksmen may be appointed to assist in directing transport vehicles at the workplace during difficult manoeuvres such as unavoidable blind spots and tight bends. Where the driver has difficulty seeing a single signaller or banksman, two or more signallers or banksmen, or other alternatives should be appointed.

Signallers or banksmen must be properly trained to direct traffic and are aware of the risks they are exposed to. The following are some responsibilities (not exhaustive) of signallers or banksmen:

- Observe SWPs or safe traffic measures;
- Remain highly visible to the driver at all times;
- Use a clear or standard signalling system understood by the driver;
- Stand at a safe position while guiding the transport vehicle; and
- Wear highly visible reflective vests at all times.

2.3 Workplace Traffic Rules and Regulations

A set of written workplace traffic rules and regulations should be established for compliance by all levels of staff, vendors, contractors and visitors. The rules and regulations serve as a constant reminder of their obligations and responsibilities.

Legal requirements such as the WSH Act and its subsidiary regulations should be incorporated into these rules and regulations. More specific rules and regulations can be developed by the individual company to suit its requirements. The following points (not exhaustive) should be included:

- Only allow authorised transport vehicles or personnel to enter workplaces;
- Observe all traffic safety measures at workplaces;
- Observe the notices, and safety or traffic signage displayed at workplaces;
- Ensure that the designated pedestrian walkways are used;
- Observe the safe speed limit signs displayed at workplaces;

- Turn on the flashing warning light on the transport vehicles whenever they are in operation;
- Do not load a vehicle beyond its safe working load;
- Avoid reversing vehicles within the compound; and
- Reverse vehicles only under the direction of a banksman or signaller.

2.4 Risk Management

Good risk management comprises components such as communication, record keeping, implementation and review. Together with risk assessment, they form the risk management process shown in Figure 1. Risk assessment, when carried out properly, can allow a better understanding of the risks at the workplace and their control measures. It is a key component of risk management.

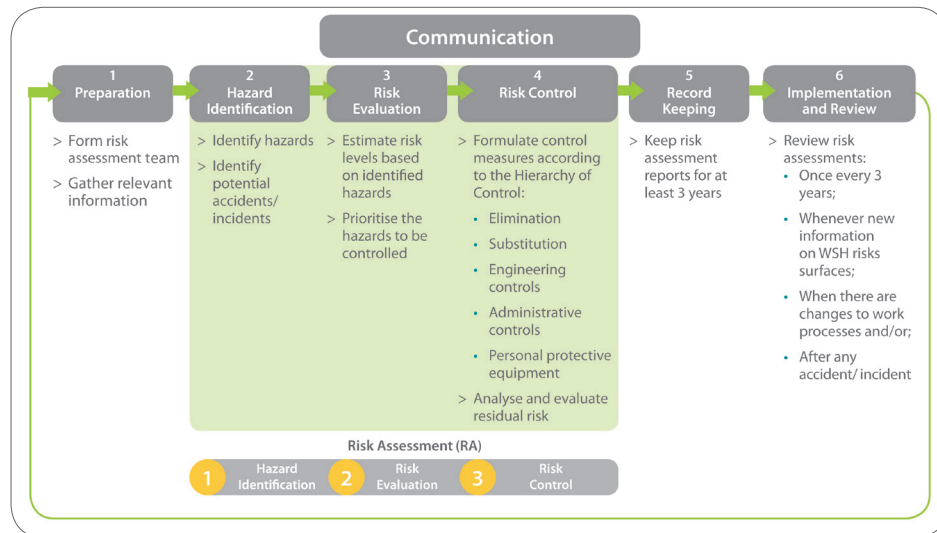


Figure 1: The risk management process.

Under the WSH (Risk Management) Regulations, every workplace, must conduct risk assessments for all routine and non-routine works. Risk assessment is the process of:

- Identifying and analysing safety and health hazards associated with work;
- Assessing the risks involved; and
- Prioritising measures to control the hazards and reduce the risks.

Before conducting risk assessment, adequate preparation must be done. A risk assessment team should be formed, preferably comprising personnel from various levels in the work activity. In this case, drivers should also be part of the risk assessment team to provide insight on the challenges they face during the course of their work. Relevant information should be collated to facilitate better understanding of the work process.

2.4.1 Risk Assessment

After completing the preparation work, workplace risks can then be assessed in three simple steps:

STEP 1: Hazard Identification

Hazard identification involves identifying hazards associated with the activity of each process and potential accidents or ill-health that could result from these hazards. It also identifies the person(s) who may be at risk as a result of being exposed to these hazards.

STEP 2: Risk Evaluation

Risk evaluation is the process of estimating the risk levels of hazards and the organisation's level of acceptability of these risks. The risk evaluation can be used as a base for prioritising actions to control the hazards to minimise safety and health risks.

Risk evaluation is made up of two parts:

- estimating the *severity* of the hazard; and
- estimating the *likelihood* of the incident or ill-health occurring with the existing risk controls.

STEP 3: Risk Control

Based on the risk evaluation done in STEP 2, risk controls should be selected to reduce or confine the identified risk to an acceptable level.

These risk controls must be effective yet practicable. To control hazards and reduce risks, control measures below should be observed in the following order:

- elimination;
- substitution;
- engineering controls;
- administrative controls; and
- PPE.

Residual risks are the remaining risks following the implementation of risk controls. The risk assessment team should ensure that the residual risks are acceptable and manageable.

Risk assessment, when carried out appropriately, will enable a better understanding of risks at the workplace and their control measures. It is a key component of risk management. Besides risk assessment, good risk management also comprises other components such as communication, record keeping, implementation and review. Together, they form the Hierarchy of Control shown in Figure 2.

Hierarchy of Control

The selection of control measures for hazards and reduction of risks can be accomplished by following the Hierarchy of Control (See Figure 2):

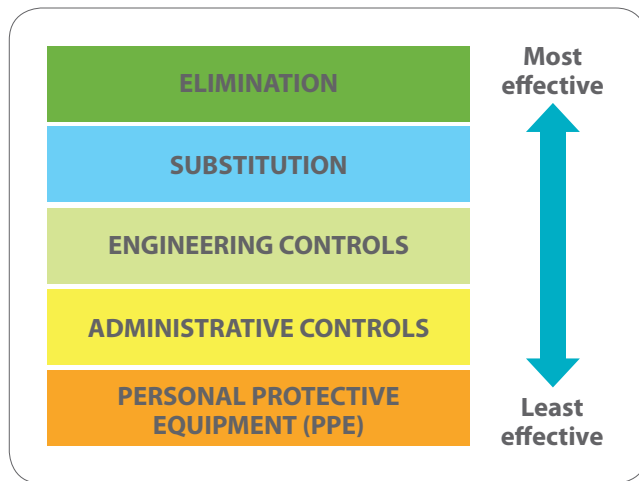


Figure 2: The Hierarchy of Control.

When considering each measure in the Hierarchy of Control, the following elements must be considered:

- the likelihood of a hazard or risk occurring (i.e., the probability of a person being exposed to harm);
- the degree of harm if the hazard or risk occurred (i.e., the potential seriousness of injury or harm);
- a person's degree of understanding the hazard or risk, and any possible ways of eliminating or reducing the hazard or risk; and
- the availability and suitability of ways to eliminate or reduce the hazard or risk.

Control measures are not usually mutually exclusive. It may be necessary to use more than one measure to reduce risks to the lowest possible level. For example, engineering controls can be implemented together with administrative controls such as training and safe work procedures.

Elimination

Elimination of risk refers to the removal of a worker's exposure to the hazards, effectively making all the identified possible accidents and ill-health impossible. This option should be explored as much as possible. This is because once the risk is eliminated the item does not appear in subsequent Risk Assessment forms.

For example, if a particular activity, such as reversing vehicles at workplaces, is causing a significant number of incidents, the most effective way of eliminating such a risk is to implement a one-way traffic system at the workplace.

Substitution

This involves replacing a hazard with one that presents a lower risk. For example, instead of having a worker stand on a loaded lorry to drag a plastic canvas over the materials, it would be safer to use a lorry that comes equipped with an overhead cover and canvas "curtains".

Engineering Controls

Engineering controls are physical means that limit hazards. These include structural changes to the work environment or work processes by erecting a barrier to interrupt the transmission path between a worker and a hazard. For example, prior to transportation, loose goods should be properly secured through suitable means to ensure that the goods do not topple in the process.

Administrative Controls

These controls reduce or eliminate exposure to hazards by adherence to procedures or instructions. Documentation should emphasise all the steps to be taken and controls to be used in carrying out the activity safely. For example, use of fleet management software to track vehicle travelling speed and location.

Personal Protective Equipment (PPE)

The proper use of PPE can help to keep workers safe at work. However, it is important to note that PPE should only be used in addition to other forms of control measures (e.g., engineering control measures) or when these other measures are not feasible or practical. PPE can also be considered for short term contingencies such as emergencies, infrequent maintenance or repair works.

For PPE to be effective, it must be of the correct fit for the user and properly worn at all times when user is exposed to the hazards. PPE must also be cleaned and maintained regularly and stored in an appropriate place when not in use.

See Annex 1 for a sample Risk Assessment Form pertaining to workplace traffic management. For more information, please refer to the Code of Practice on Risk Management

2.5 Safe Work Procedures

Safe work procedures are any procedures for carrying out work safely. It also includes any procedure taken to protect the safety and health of persons in the event of an emergency.

After risk assessment has been carried out, SWPs should be implemented to manage safety and health risks. Other than emergency plans and safety precautions, it should also reiterate the importance of proper usage of PPE.

2.6 Training

Safety and health training is important to equip staff with the required knowledge and skills to work in a safe manner. Management should identify safety training needs for their employees and work out a training plan. For traffic safety, it is important to ensure that drivers are familiar with the model of vehicles they will be operating. Hence, in-house training with support from vehicle's supplier is strongly recommended.

2.7 Emergency Response Plan

The establishment and effective implementation of an emergency response plan is crucial for saving lives and minimising losses in any emergency (e.g., worker being struck by moving vehicle).

Management should ensure that all employees are familiar with the safety plans and procedures in the event of an emergency by conducting regular drills and exercises. An evaluation of the drill performance should be carried out and learning points used to improve the plan.

The following items (non-exhaustive) may be included in the establishment of an emergency response plan:

- procedures for raising an alarm;
- procedures for evacuation and rescue of victims;
- provision of means of rescue and first aid; such as a stand-by vehicle (see Figure 3);
- provision of means of communication with relevant government authorities and response agencies;
- establishment of an emergency response team with the duties and responsibilities of each member clearly defined; and
- creation of an emergency contact list.



Figure 3: A stand-by vehicle for emergency response purposes.

2.8 Incident Investigation

Incidents can be prevented or avoided if the situation(s) that caused the incident were known beforehand and actions were taken to prevent recurrence. Injuries, damages to equipment, structures and interruption to work due to incidents can add up to a significant cost to an organisation. Investigations are conducted to find out the cause of the incident so that preventative measures can be taken to create a safer and more productive workplace. Even if incidents do not result in any injuries or damages, it should be investigated to find the root cause of the matter to ensure workers' confidence in the company's operating system.

The three main parts of the investigation process are:

- Information gathering:
 - conduct interviews; and
 - check incident area and take photographs.
- Analysis:
 - analyse information; and
 - find root cause.
- Review and implement:
 - review Risk Management System;
 - implement changes; and
 - communicate all relevant information to workers.

Refer to the *Workplace Safety and Health (WSH) Guidelines on Investigating Workplace Incidents for SMEs* for more details.

3. Factors Affecting Traffic Safety

There are three main factors that contribute to traffic accidents, namely the driver, vehicle and driving environment. Usually, it is a combination of factors that leads to fatalities or damages. Hence, all three factors must be managed to prevent traffic accidents.

3.1 Driver

3.1.1 Competency

In general, drivers have two main duties. He operates a vehicle to transport goods from one location to another and he loads and unloads the goods.

Safe Driving

All drivers must possess a valid Singapore driving licence for the class of vehicle that he is required to drive. For more information on driving licences, refer to the Singapore Police Force website.

Only qualified and authorised drivers should be permitted to operate designated transport vehicles. Drivers should receive proper training in the operation of the vehicles before they are authorised to operate them. Beside mandatory driving courses, drivers should also attend defensive driving courses offered by training centres. These courses inculcate drivers in safe driving habits, including the ability to assess the driving environment correctly, watch out for other drivers' behaviour and stay focused when driving.

Safe Loading and Unloading

To ensure safe loading and unloading, the operation should be carried out at a designated area such as a loading or unloading bay. The driver should follow the safe operating instructions laid out in the operation manuals of the respective transport vehicles.

STEP 1: Parking of vehicle

- Park on firm and level ground; and
- Ensure that parking brakes are engaged and all stabilisers or wheel chocks are properly positioned (see Figure 4).



Figure 4: Wheel chocks are in place after parking vehicle.

STEP 2: Loading

- Do not overload the vehicle;
- Load the vehicle evenly as uneven loads can render the vehicle unstable; and
- Loads must be suitably packaged.

STEP 3: Unloading

- Before unloading, the recipient should check that the goods have not shifted during transportation. He should also ensure that the goods will not move or slid off when restraints are removed before commencing with unloading.

For more information on safe loading, refer to *WSH Guidelines on Safe Loading on Vehicles*.

3.1.2 Habits and Behaviours

Driving Habits

Organisations are encouraged to create a safe driving culture. A safe driving culture holds employees accountable for keeping themselves, other employees, public and customers safe; not only during the performance of their duties but also during off-the-job driving. It encourages drivers to drive in a safe manner and reduces costs due to accidents. A safe driving culture can be achieved through advocating good driving habits such as:

- Wearing of seat belts

The function of a seat belt is to keep drivers and passengers in the vehicle when the vehicle comes to an abrupt stop. Wearing a seat belt before starting the vehicle can reduce the likelihood of death and serious injury (see Figure 5). In the event of a collision, the seat belt tightens to keep the driver in his seat and prevent the airbag from injuring him.

- Keeping within speed limits

Speeding reduces a driver's ability to identify and react to his surroundings. Speeding increases braking distance, and increases the likelihood of a crash, resulting in loss of lives. Always follow the specified speed limit of the vehicle and of the roads.

- Avoid tailgating

Tailgating is an act of driving very close to the vehicle in front. It is dangerous because it gives the driver little time to react if the vehicle in front slows down or brakes suddenly. Tailgating may also make the driver in the front vehicle nervous. Vehicles must always be operated at a safe following distance.



Figure 5: Driver putting on seat belt before driving off.

- Safe parking
 - Drivers should park their vehicles at designated parking areas. Parking areas should be level, firm, well-lit, well-drained and clearly marked;
 - Drivers should ensure that their vehicles are properly parked with the brakes engaged, engines turned off, starter keys removed and load or equipment lowered and secured;
 - For parking or stopping the transport vehicles on slopes, drivers should follow the previous step with the gear engaged (if safe to do so) and wheel chocks used, where appropriate; and
 - “Failure to engage handbrake” alarm system should be installed in vehicles to remind drivers not to leave the cabin without engaging the handbrakes.

- Avoid overturning

The following are safety measures (not exhaustive) to be observed to prevent overturning of transport vehicles:

- Do not drive on steep slopes;
 - Do not drive on slippery surfaces such as oil patches;
 - Do not drive on soft ground, potholes or uneven terrain, curbs, steps or other edges;
 - Do not overload;
 - Do not load unevenly;
 - Do not drive too fast, especially around corners;
 - Do not use a transport vehicle for unsuitable tasks; and
 - Do not carry loads above the height limit; and
 - Find out traffic conditions in advance, where possible.
- Avoid distracted driving

The most common distraction for driver is the use of mobile phone while driving (see Figure 6). The use of mobile phone while driving is inconsiderate and dangerous. It distracts a driver from the road and affects a driver's ability to control his vehicle. Drivers should not use mobile phones while driving. Drivers who wish to use their mobile phones should ask their passengers to make or receive calls on their behalf. If driving alone, drivers are advised to stop at the nearest car park to make or answer a call.



Figure 6: Do not use mobile phone when driving.

System-driven Behaviours

With faster pace and greater demand in Singapore, employees who need to drive for work purposes may need to drive for longer periods of time, feel obligated to drive faster and engage in distracting activities in the vehicles to meet their job responsibilities. These factors may increase the possibility of traffic accidents. Employers play a big part in protecting their businesses by educating their employees about safe driving practices.

- Remuneration Practice

Many drivers are paid by “per-trip” basis. This practice may lead to speeding and working longer hours for some drivers. Speeding increases the likelihood of road accidents and working for longer hours without adequate rest can lead to fatigue. When a driver is suffering from fatigue, he will lose concentration and his ability to react to situations on road will also be hampered. Therefore, employers must ensure that measures are taken to mitigate these risks. Employers are also encouraged to consider and adopt a remuneration framework that will motivate their drivers to drive safely.

- Rewards and Incentives

Appropriate incentives or rewards given to employees for their good WSH performance will recognise and encourage them to strive for better WSH performance. When employees are motivated to perform well in WSH, the overall WSH performance of the organisation will, in turn, improve.

There are many ways that an organisation can consider to incentivise its employees to strive for better WSH performance, such as monetary rewards for no traffic violations or fines.

3.1.3 Health

Operating a vehicle requires drivers to be alert, exercise good judgment and have reasonable physical ability. Other than driving, drivers may also be tasked to meet tight schedules, take care of passengers' safety or ensure that goods are not damaged. The general health standard of drivers must allow them to cope with the work requirements. It is also recommended that organisations promote the benefits and importance of adopting a healthy lifestyle to all its employees.

- Ergonomics

Driving forces drivers to sit in a constrained posture and may create significant stress to their necks, upper and lower backs. Prolonged driving may expose drivers to the risks of lower back pains or other musculoskeletal disorders (MSDs).

There are things that an organisation can do to help drivers reduce the suffering from back pains or other MSDs.

- As much as possible, try to vary work activities (e.g., good mix of driving and administrative work);
- Drivers should take a short break every few hours (e.g., 15 minutes rest for every 2 hours of driving);
- Drivers should stretch their bodies as often as possible;
- Drivers should adopt good driving posture (e.g., sit straight and do not slouch); and
- Drivers should adjust the drivers' seat, steering wheel, head support cushion and backrest to a comfortable position before driving.

- **Fatigue**

Fatigue is a state of tiredness leading to reduced mental and/or physical performance that can compromise workplace safety. The onset of fatigue while driving can decrease a person's alertness and compromise his or her reflex ability, judgment and decision-making. A fatigued driver will not only compromise his health and safety but also of those around him.

Inordinately long working hours and poorly planned shift work can result in drivers' fatigue. Fatigue among drivers can lead to workplace accidents and/or near-miss incidents arising from reduced alertness and concentration. Therefore, factors contributing to the onset of fatigue must be addressed.

The best approach to prevent fatigue affecting drivers is to ensure that they have adequate sleep or rest (see figure 7). However, there are other methods that can slow down the onset of fatigue and reduce the risk. Some recommended good practices are listed here for consideration.

In terms of facility improvements, the following are recommended:

- provision of adequate lighting;
- provision of sufficient ventilation; and
- provision of facilities for breaks or rest.

Administratively, the following are recommended:

- Limit shift work to not more than 12 hours including overtime;
- Plan shift schedule ahead of time and communicate to drivers;
- Job rotation (e.g., 50% driving plus 50% administrative work);
- Encourage drivers to take short and scheduled breaks to relieve fatigue due to monotony of driving;
- Educate driver on the dangers and symptoms of fatigue; and
- Install fatigue management technologies in vehicles.



Figure 7: Provide proper rest area.

3.2 Vehicle

3.2.1 Choice of Vehicle

The safest type of vehicle is one most suited for the job. Therefore, to ensure the safety of drivers, workers and public, choosing the right type of vehicles for the intended function is important.

Here are some useful pointers to look out for when choosing a vehicle for a task:

- The vehicle must be able to withstand the weight from the cargo;
- Appropriate type of vehicle should be used according to the type of loads; and
- Vehicle must not exceed the maximum laden weight when carrying the load.

3.2.2 Maintenance

No matter how competent a driver is, he and his passengers will not be safe unless the vehicle is in good condition. Organisations should ensure that vehicles are in a condition for safe operation by having the vehicles properly maintained during suitable intervals. The driver should also perform daily checks on the vehicle before operating it. If checks are not conducted properly, the vehicle could fail at a critical moment, and may lead to serious accidents.

- **Vehicle servicing regime**

The maintenance regime of the vehicle should closely follow the manufacturer's recommendation. A well-maintained vehicle is more likely to work better and last longer. The vehicle manufacturer should also provide advice or information regarding its maintenance schedule and requirements. Maintenance requirements and regimes vary widely from one vehicle to another.

To ensure that the vehicle's warranty remains valid, it is important to follow the manufacturer's servicing schedule and conditions. Generally, servicing is done at a prescribed period of time or mileage intervals, and is carried out by trained and qualified technicians.

- **Daily pre-operational check**

Conducting daily vehicle checks is a simple and useful way to spot potential risks or defects before vehicles are operated (see figure 8). Companies should have a routine and system of daily checks in place to ensure that vehicles are in good working condition at the start of each working day or shift.

A sample daily vehicle checklist can be found at **Annex 2**.



Figure 8: Driver performing daily pre-operational check on vehicle.

3.2.3 Safety Devices and Technologies

There are a number of safety devices and technologies to improve or monitor different aspects of vehicle safety, such as:

- Reverse sensors and camera

As a driver's natural line-of-sight looks naturally to the front, it is ideal if the need to reverse vehicles (especially heavy vehicles) can be kept to a minimum. Other than the side-mounted and rear-view mirrors, vehicles can also be fitted with reverse sensors and reverse cameras to assist drivers while they are reversing the vehicle. Reverse cameras enhance a driver's view of the rear while reversing. While reversing, reverse sensors will signal (e.g., a beeping sound) drivers when the rear of the vehicle is near objects or persons.

- Speed Limiter

A speed limiter is installed to restrict the maximum speed of a vehicle without affecting its other features. A vehicle installed with a speed limiter will limit the amount of fuel fed to the engine, thus controlling the maximum speed that it can travel.

- Fleet Management Software

Fleet management software is a computer programme which allows companies to manage their vehicle fleet through a complex information system. Specific tasks that the fleet management software can assist in include operations such as vehicle procurement, maintenance and disposal.

One major feature of a fleet management software is its real-time vehicle tracking ability. Some of the more relevant functions of the software that may be useful to an organisation include:

- vehicle's travelling speed (ensure that vehicle does not exceed limit);
- vehicle's location;
- driver's behaviour (such as monitoring a driver's fatigue and concentration level when he is driving);
- occurrence of an accident; and
- vehicle's idling speed (increase productivity and reduce fuel wastage).

- Driver Fatigue Management Technologies

One example of a driver fatigue management device is the fatigue management camera. This device will monitor a driver's eyelids, head orientation and driver's concentration level. All this information can be downloaded and tracked by a supervisor or management.



Figure 9: Example of a fatigue management camera.

- Night Vision Enhancement

Driving at night can be hazardous as visibility is significantly reduced. To assist drivers who are driving at night, organisations can make use of night vision enhancement technology. The technology uses infra-red to warn a driver in advance of any object (e.g., animals, pedestrians and cyclists) ahead of the vehicle. This technology can provide drivers with more reaction time thus reducing the occurrence of accidents. Such systems can be retrofitted on vehicles.

- Intelligent Incident Notification System

The Intelligent Incident Notification System is a device that allows monitoring of vehicles in real-time. The system can be installed in a vehicle to identify, record and report dangerous incidents. Accidents, severe deceleration or deployment of airbags will trigger the system. The system will then send a remote signal back to the company. Such systems can even provide information such as the accident location, severity of accident and identify the driver to ensure a timely emergency response.

3.3 Environment

3.3.1 Within Premise

- Workplace Traffic Layout or Routes

The safety of the drivers and people on the premise are the most important part of a Workplace Traffic Management Plan. Therefore, workplace traffic layout or routes should be planned based on risk assessment conducted on the movement of pedestrians and transport vehicles at workplaces. Potentially hazardous points or areas that pose a higher risk of collisions between pedestrians and transport vehicles, or transport vehicles and buildings or facilities, should be identified so that necessary control measures can be put in place.

The following pointers are useful for planning layout, routes, facilities and signage at workplaces:

- The perimeter of all workplaces involving the use of transport vehicles should be fenced to keep out unauthorised access. People who need to enter the premises should be directed to the appropriate entry point(s) to facilitate effective control on movement within the workplace traffic area; and
- All designated workplace areas for traffic routes, storage areas, passageways and pedestrian walkways should be clearly marked with appropriate floor lines, or traffic or safety signs.

The following points (not exhaustive) should be included in traffic layout and route planning for workplaces:

- Maintain a safe distance from transport vehicles during use as stated in the operations manual; and
- Enhance driver's visibility by minimising intersections, traffic cross-flows and blind spots. Convex mirrors should be erected to eliminate blind spots (see Figure 10).
- Keep pedestrians out of the path of transport vehicles by setting up physical barriers to barricade the workplace;
- Draw highly visible traffic lines (see figures 11 and 12) and/or use signage to differentiate the pedestrian walkways from the work areas and provide operational personnel stationed at these areas with reflective vest(s);
- Provide and maintain adequate lighting and good ground conditions along internal roads and at workplaces;
- Provide highly visible markings and/or signage to warn against any obstruction, low height, doorways, edges or drains at workplaces;
- Provide pedestrian crossings where required; and
- Erect speed limit signs and boundary lines at the traffic operational areas of the workplace.



Figure 10: Example of a convex mirror.



Figure 11: Demarcated pedestrian walkway.



Figure 12: Demarcated pedestrian crossing.

Visibility

Good frontal visibility allows drivers to spot and avoid hazards with ease. Stipulated speed limits and safe stopping distances at work areas will help drivers maintain good visibility even when they are changing directions, thus avoiding hazards. Other factors affecting visibility are illumination, dust levels, weather conditions, height of vehicle above road level and the positioning of the vehicle's windows.

Good visibility at junctions and around bends is vital to safety as it allows drivers and pedestrians to spot and avoid potential hazards. Avoid creating sharp or blind bends where possible. If blind spots are inevitable, consider measures such as mirrors to aid vision around corners.

When visibility at a blind spot cannot be improved for safe driving, convex mirrors, road humps, stop signs and suitable traffic signals should be installed. Alternatively, a one-way traffic system or entry prohibition should be considered for implementation in the area.

Reversing

Accident statistics revealed that a substantial number of fatalities and cases of damage to vehicles, equipment and property were caused by vehicles reversing at workplaces.

The most effective way of reducing such risk is elimination. However, if the need to reverse at a drive-through loading or unloading bay is unavoidable, then the traffic route at this area should be re-organised into a one-way traffic system.

For sites where reversing is unavoidable:

- Reversing areas should be planned, clearly marked, and made visible to drivers and anyone else in the area;
- Non-essential personnel should keep clear of the area;
- Portable radios or suitable communication systems should be used;
- Install vehicle reversing alarms and keep them in good working order. Alarms should be loud and distinct enough so that they can be heard over background noise;
- Use visible warning systems such as flashing warning lights;
- Fit vehicles with other safety devices such as "sensing" or "trip" systems, which either warn the driver or stop the reversing vehicle when it comes too close to or into contact with an obstruction;
- Install physical barriers or buffers in highly visible colours in suitable positions at loading or unloading bays;
- Paint lateral white traffic lines on the floor to help the driver position the vehicle accurately. In areas where vehicles need to reverse up to structures or edges, barriers or wheel stops can be used to warn drivers when they need to stop;

- Use a trained signaller or banksman to assist in directing the vehicle at the workplace when the rear-view is compromised and where rear-view aids are unavailable during reversing; and
- When in doubt, the driver should alight from the vehicle for to assess the situation better. However, before he alights from the vehicle, he should ensure that traffic is clear and safe.
- The visibility and safety for drivers and pedestrians can be enhanced by:
 - increasing the space allowed for reversing;
 - installing fixed mirrors;
 - keeping vehicle mirrors clean and in good working condition.

Traffic Signs and Signages

Suitable workplace traffic or safety signs should be used to warn or inform driver and pedestrians at workplaces. See Figure 13 for some common traffic or safety signs used at workplaces.

In general, workplace traffic or safety signage can be summarised as follows:

- Use route markings to give instructions to drivers (e.g., "SLOW") and indicate traffic lanes, route edges, priority at junctions, stop lines, pedestrian crossings, and so on;
- Use warning signs to indicate hazards along the way. Traffic lights, speed sensors and flashing warning signs can be used to control traffic flow and speed;
- Use white traffic markings to regulate traffic flow and yellow ones for parking;
- Ensure that signs are prominent so that people can see them early and take necessary steps to avoid the hazards; and
- Use warning signs where overhead clearance is limited. Reflective or illuminative signs should be used to enhance their visibility in darker areas.



Stop Sign



Speed Limit Sign



One-way traffic lanes must be marked with a no-entry sign on the exit



Signage to prohibit pedestrian access



Signages to reinforce safety guidelines



Workplace Traffic or Safety Signs on display



Signage to remind drivers to chock the wheels of their vehicles

Figure 13: Examples of traffic signs.

Speed Limit

Limiting vehicle speed is an important measure in traffic control. The best way to limit vehicle speed is to use fixed features (e.g., traffic calming features) to prevent speeding. Some examples include installing road humps and “rumble” strips, raising kerbs or chicanes, and narrowing routes with the use of bollards.

It is important to note that the use of wrong speeding prevention features can sometimes increase risk by affecting the stability of vehicles or rendering loads less-secure. Hence, traffic calming features such as road humps must be installed with discretion.

Companies should assess the various traffic calming features available and select the appropriate features specific to the needs of the work area. Another point to note is that these features and measures should be lit or made reflective to ensure that they are made clearly visible.

Speed limits should be determined and implemented at the workplace by taking the following factors into consideration:

- traffic routes or layout of work area;
- weight and type of loads being transported;
- type of road surface;
- work activities being carried out at the workplace; and
- other potential hazards.

To decide an appropriate speed limit, consider the route layout and road usage at the workplace. For example, a lower speed limit would be appropriate where pedestrians are present or where fork-lift trucks and road-bound vehicles share the roadway. Different speed limits should apply for different work areas depending on the various considerations.

Housekeeping

All workplaces including traffic and pedestrian routes should, as far as reasonably practicable, be kept free from obstruction and anything that may cause slips and falls (see figures 14 and 15). Spilled loads, anything that falls from a transport vehicle, used packaging and anything else that poses a falling or tripping hazard should be removed promptly.



Figure 14: A well-maintained driveway that is free of obstruction.



Figure 15: A well-maintained loading or unloading bay that is free of obstruction.

- Lighting
 - Adequate lighting should be provided for all workplaces such as internal roads, junctions, pedestrian walkways, loading or unloading bays, and so on.
 - Situations may require additional measures to ensure adequate lighting. For example, lighting placed at the centre of loading or unloading bays may be blocked by tall transport vehicles. To solve this, additional lights should be placed between the bays to ensure sufficient lighting.
 - Lighting should be strategically placed such that they do not affect a driver's vision when reversing into the work area either directly or indirectly via their mirrors.
 - There should not be sudden changes in lighting levels between different work areas – lighting levels in the internal and external areas of the work area should not contrast sharply. Gradual changes in lighting levels will allow the eyes to adjust safely.
- Permanent or Mobile Ramp
 - The following requirements are to be considered when using a ramp:
 - Ramp is of adequate width and strength;
 - The gradient of the ramp used does not exceed what is permitted under the operational manual of transport vehicles used;
 - Ramp surface has good traction even in wet weather; and
 - Ensure that a proper securing mechanism is in place if a mobile ramp is used.

A sample workplace traffic checklist can be found at **Annex 3**.

3.3.2 On-the-road

Before a driver embarks on his journey, he should conduct a pre-operation check on his vehicle to ensure that it is in a good working condition. He should check that the vehicle's safety devices (e.g., horns, lights, reflectors, reversing lights, alarms and brakes, and so on) are provided and in good working condition before use. He should also check the weather and traffic condition in advance.

When on the road, the competency of the driver and his interaction with his environment is important.

Weather

Singapore has two main monsoon seasons (December to March and June to September). Between these two monsoon seasons are relatively short inter-monsoon periods (April to May and October to November). The start and end of the monsoons are usually not very distinct. Hence, it is a good practice to check the weather forecast at the National Environment Agency website before starting a shift.

The following are some tips that an organisation can use to educate drivers when they drive in adverse weather conditions:

- Stay alert and focus while driving;
- Look out for other fast moving vehicles, foreign objects on the road or other road conditions;
- Drive at a slower speed to counter hydroplaning (thin layer of water formed between tires and road surface);
- Ensure that windscreen wipers are always in good working condition;
- Keep a wider distance from the vehicle in front as longer braking distance may be required;
- Turn on low beam headlights; and
- Stop vehicle in an appropriate and a safe manner if the situation requires.

- Traffic Condition

When drivers are on public roads, they may be faced with different types of traffic conditions. However, some of these road conditions are beyond the drivers' control, for instance, faulty traffic lights, road works, closure of certain roads for a particular event, or when other road users speed or change lane without signalling. These traffic conditions may pose a hazard to drivers.

Preventive measures can be taken to minimise risks arising from adverse traffic conditions:

- Plan the route of travel. Consider factors such as shortest versus safest distance to destination, lane width, height limits and need to drive near areas where additional attention is required (e.g., schools, hospitals, home for disabled and old folks' home);
- Remind drivers to keep a constant look out for other drivers and road users while driving;
- As far as possible, plan schedule according to drivers' familiarity of the routes;
- Always check traffic congestion, roads works or road closure online before the start of the shift; and
- Ensure that drivers are trained in defensive driving.

Singapore's peak traffic hours are typically in the morning when the public is travelling to work, and in the evening after office hours. There may also be other situations such as traffic accidents that may cause traffic congestion. Together, these situations will cause frustration in drivers resulting in dangerous driving behaviours.

To avoid traffic congestion, companies can consider implementing the following:

- Plan deliveries during non-peak hours, where possible; and
- Plan for alternative routes.

- Road Surface Condition

Surface condition of roads can be a hazard as well. Examples of road-surface related hazards include potholes, foreign objects on roads or spillages of substances on roads. It might be difficult for drivers to avoid these hazards.

Companies can advise their drivers to adopt the following recommended good practices to avoid hazards posed by poor road surface conditions:

- Drive within speed limit and slow down if the situation requires;
- Remain alert and keep a lookout for road surface hazards; and
- Do not multi-task while driving to ensure sufficient reaction time.

4. References

WSH Council Guidance Materials:

- Code of Practice on WSH Risk Management
- WSH Guidelines for Fatigue Management
- WSH Guidelines for Safe Operations of Forklift Trucks
- WSH Guidelines for Investigating Workplace Incidents for SMEs
- WSH Guidelines for Safe Loading on Vehicles

These materials can be found at the WSH Council website – www.wshc.sg

Regulations:

Workplace Safety and Health Act and its subsidiary legislations:

- WSH (Risk Management) Regulations
- WSH (Incident Reporting) Regulations

These regulations can be found at the Ministry of Manpower website – www.mom.gov.sg

Others:

- Singapore Standard SS SS73 : 2012 Code of Practice for Safe use of powered counterbalanced forklifts
- Singapore Safety Driving Centre : <http://www.ssdcl.com.sg>
- ComfortDelgro Driving Centre : <http://www.cdc.com.sg>
- Singapore Traffic Police : <http://driving-in-singapore.spf.gov.sg>
- *Safety Technologies for Heavy Vehicles and Combinations*, Transport for New South Wales, http://roadsafety.transport.nsw.gov.au/stayingsafe/drivers/heavyvehicledrivers/safer_heavy_vehicles_brochure.pdf, last accessed 8 October 2013.
- *Driving at work*, United Kingdom Health and Safety Executive (UK HSE), <http://www.hse.gov.uk/pubns/indg382.pdf> , last accessed 8 October 2013.
- *Guidelines for Employers to Reduce Motor Vehicle Crashes*, Occupational Safety and Health Administration (OSHA), https://www.osha.gov/Publications/motor_vehicle_guide.html , last accessed 8 October 2013.

5. Acknowledgements

The Workplace Safety and Health Council and Ministry of Manpower would like to thank Bok Seng Logistics Pte Ltd and CWT Logistics Private Limited for their valuable assistance with the images used in this Guidelines.

6. Annex

Company & Department: ABC Logistics Pte Ltd, Logistics Department		RA Leader: Mr. JKL (Logistics Manager)		Approved by: Mr. DEF		Reference Number RA_LD_2013_1	
Process: Transporting goods		RA Member 1: Mr. GHI (Supervisor)		Signature: DEF			
Activity Location: Transporting goods around company's premise		RA Member 2: Mr. MNO (Driver)		Name: Mr. DEF			
Last review date: 17th October 2012		RA Member 3: Mr. PQR (Driver)		Designation: Managing Director			
Current Assessment date: 7th October 2013		RA Member 4: Mr. STU (Banksman)		Date: 8th October 2013			
Next review date: 7th October 2014		RA Member 5: Mr. VWX (Banksman)					

HAZARD IDENTIFICATION			RISK EVALUATION			RISK CONTROL			Remarks				
Ref	Work Activity	Hazard	Possible injury/ill-health	Existing risk controls	S	L	RPN	Additional Controls	S	L	RPN	Implementation Officer	Due Date
1	Operation of transport vehicles within the company's premises.	Getting involved in an accident with other road users or transport vehicles.	Serious injury or fatality to road users and drivers.	<ul style="list-style-type: none"> Drivers are briefed on in-house traffic rules and regulations. (e.g. speed limit of 15km/h) Ensure only qualified and authorised drivers are permitted to operate transport vehicles. Ensure drivers conduct pre-operational checks on their transport vehicles before operation. 	5	2	10	Keep pedestrians out of the path of transport vehicles by installing physical barriers to barricade the workplace.	5	1	5	Operations Supervisor	20th October 2013

Annex 2 – Sample Pre-operational Checklist

Vehicle plate number : _____

Vehicle model : _____

Date of inspection : _____

Driver's name : _____

Description	Yes	No
Fluid level within manufacturers' specifications		
Engine oil level		
Brake fluid level		
Radiator fluid level		
Battery water level		
Window washer water level		
Fuel level		
Windscreen washer level		
Lights are in working condition		
Headlights (high beam)		
Headlights (low beam)		
Licence plate		
Reverse		
Cabin interior		
Brake indicator		
Hazard		
Indicator turn signals		
Ensure the following are adjusted to suit driver's view		
Driver seat		
Rear view mirror		
Side mirrors		
Pedals		
Foot brake holds, stops vehicle smoothly		
Parking brake holds against slight acceleration		
Clutch and gearshift shift smoothly without jerking		

Description	Yes	No
Tyres		
Inflated and free of excessive wear or damage.		
Nuts are tight.		
Adequate thread.		
Check spare tyre (i.e., inflated and no visible cracks).		
Ensure the following are in working condition (others):		
Seat belts are working and free of damage.		
Mirrors are clean and no visible damages.		
Doors and door locks operate correctly.		
Dash control panel are fully operational (i.e., all lights and dashes).		
Steering wheel moves smoothly.		
Horn is loud and clear.		
Vehicle reverse alarm (if fitted) is working.		
Hydraulic systems are operating smoothly (i.e., no visible leaks and systems).		
All loads (if any) are secured.		
Reverse warning buzzer is working.		

If you answer **No** to any of the above, state the condition(s) and its respective corrective actions.

Driver's signature/ Date:

Supervisor's signature/ Date:

Annex 3 – Sample Workplace Traffic Checklist

A sample inspection checklist (see below) can be used when conducting regular safety and health inspections. Go through this checklist to identify and remove possible hazards, unsafe acts and conditions at workplaces.

Workplace Traffic Checklist

This checklist is designed to assess traffic hazards at the workplaces. This checklist is NOT exhaustive and there may be hazards or controls that have not been covered. Specific hazards at each respective workplace should be identified and included in this checklist for actual implementation at the workplace.

Name of Company/ Department/ Section : _____
 Location : _____
 Date and time : _____
 Name of inspectors : _____

		Yes	No	NA	Remarks
A. Workplace, traffic layout, traffic routes and pedestrian walkways					
1	Are roads and walkways suitable for the types of vehicular traffic and pedestrian traffic?				
2	Are surfaces of roads and walkways slip-resistant?				
3	Are transport vehicles and pedestrians kept safely apart?				
4	Are roads, walkways and parking areas marked properly according to the traffic management plan?				
5	Are lighting levels sufficient in the pedestrian areas and for vehicle activity?				
6	Do transport vehicles traffic routes have firm and even surfaces?				
7	Are traffic routes for transport vehicles and pedestrian walkways free from obstruction and other hazards?				
8	Are traffic routes marked properly?				
9	Are standard traffic signs installed at necessary locations?				
10	Are convex mirrors (to provide greater vision at blind bends), road humps (to reduce transport vehicles speeds), or barriers (to keep transport vehicles and pedestrians apart) provided where necessary?				
11	Are traffic routes wide enough?				
12	Is the width of the passageways wide enough?				

		Yes	No	NA	Remarks
B. Training					
1	Has the driver or employee gone through the company's safety induction course?				
2	Has the driver or employee gone through the company refresher training for drivers (if applicable)?				
3	Does the driver have a valid license and experience to operate the powered vehicle?				
4	Has the signalman or banksman been trained to guide the manoeuvring transport vehicles?				
C. Traffic or operation					
1	Are the transport vehicles and attachments chosen for the tasks suitable for the operators to be carried out?				
2	Have any observations been made of drivers who do not obey the traffic rules (e.g., use the correct routes or drive within the speed limit) and operate their transport vehicles safely?				
3	Do managers/ supervisors/ drivers/ signalmen/ banksmen/ employees wear the PPE provided (e.g., visibility vests)?				
4	Do drivers carry out pre-operation checks before actual operation?				
5	Are personnel cleared of the areas before reversing the powered vehicle?				
6	Is there a signalman or banksman available to guide the manoeuvring transport vehicles (if applicable)?				
7	Does the signalman or banksman position themselves at a safe position?				
8	Are transport vehicles parked on level ground (wheels chocked, if applicable) with their parking brakes on and the ignition key removed?				
D. Loading and unloading					
1	Are loading or unloading operations carried out in an area away from passing traffic and pedestrians?				
2	Are the appropriate vehicle(s) used for loading or unloading?				
3	Are loading or unloading activities carried out on ground that is flat, firm and free from potholes?				
4	Are parking brakes used to prevent unwanted movement (e.g., when coupling transport vehicles)?				
5	Are the transport vehicle's brakes and/or stabiliser used to prevent unsafe movements during loading and unloading operations?				
6	Do the lifting equipment, appliance or gears used for (un)loading transport vehicles possess valid statutory inspection certificate(s)?				

		Yes	No	NA	Remarks
7	Is loading or unloading carried out such that the load is spread evenly to avoid the powered vehicle or trailer from becoming unstable?				
8	Are checks made to ensure that the load is adequately secured and not over-loaded before the powered vehicle leaves the workplace?				
9	Are there any unsafe act observed during loading or unloading?				
10	Do employees follow safe work procedures when (un)coupling, (un) loading and securing loads, and so on?				
E. Management and supervision					
1	Are the workplace traffic rules documented and distributed?				
2	Are managers/ supervisors/ drivers/ signalmen/ banksmen/ employees and others, including contractors and visitors, aware of the workplace traffic rules?				
3	Has risk assessment been conducted for work activities and communicated to all concerned personnel prior to operation?				
4	Has action been taken when the workplace's traffic rules (if any) are violated?				
F. Traffic layout, traffic routes and pedestrian walkways					
1	Are roads and walkways suitable for the types and volumes of vehicular traffic and pedestrian traffic?				
2	Are transport vehicles and pedestrians kept safely apart?				
3	Is there adequate parking places for all parking needs?				
4	Is the level of lighting sufficient for vehicular and pedestrian traffic?				
5	Do powered vehicle traffic routes have firm and even surfaces?				
6	Are vehicular and pedestrian traffic free from obstructions and other hazards?				
7	Are the traffic routes planned to avoid sharp or blind turns?				
8	Are traffic routes marked properly according to the traffic management plan?				
9	Are standard traffic signs installed at necessary locations?				
10	Are convex mirrors (to provide greater vision at blind bends), road humps (to reduce powered vehicle speeds), or barriers (to keep transport vehicles and pedestrians apart) provided where necessary?				
11	Are the passageways wide enough?				

If you answer **No** to any of the above, state the condition(s) and its respective corrective actions.

7. Amendments

This set of guidelines replaces the *Workplace Safety and Health Guidelines – Workplace Traffic Safety Management* published by the WSH Council in November 2009.

1) The obsolete guidance in the previous edition November 2009 are:

Page	Obsolete Guidance
13	Case Study 1 – For case studies in the Logistics and Transportation Industry, refer to Case Studies Logistics and Transport. The publication can be found at WSH Council website (www.wshc.sg)
14	Case Study 2 – For case studies in the Logistics and Transportation Industry, refer to Case Studies Logistics and Transport. The publication can be found at WSH Council website (www.wshc.sg)
21	Case Study 3 – For case studies in the Logistics and Transportation Industry, refer to Case Studies Logistics and Transport. The publication can be found at WSH Council website (www.wshc.sg)
26	Case Study 4 – For case studies in the Logistics and Transportation Industry, refer to Case Studies Logistics and Transport. The publication can be found at WSH Council website (www.wshc.sg)

2) The key amendments in this second edition January 2014 are:

Section	Amendments
3.1.1	Competency – Defensive driving course is recommended.
3.1.2	Distraction – Use of mobile phone is a common distraction for drivers. It is recommended that they should get their passenger (if any) to help to receive the call or stop at the nearest car park to make a call.
3.1.4	System-driven behaviour – Current remuneration system such as pay-per-trip affects the behaviour of drivers and how companies can incentivise drivers for good WSH performance.
3.1.5	Personal health – Health impacts the performance of drivers.
3.2	Vehicles – Choice of vehicle, its maintenance as well as safety devices and technologies impact WSH.
3.3.2	On-the-road – When on the road, the competency of a driver and his interaction with his environment such as weather and traffic conditions would be important.

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