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Workplace Safety and Health Guidelines

Safe Operation of Forklift Trucks



Preface

Forklifts play a vital role in the logistics and transportation, construction, marine, and manufacturing industries. They are useful when heavy loads need to be handled and transported easily and quickly. However, if they are mishandled or used inappropriately, property damage, serious injuries or even fatalities can occur.

The unsafe use of forklifts can cause incidents in the workplace. Some examples of unsafe situations include: using untrained personnel to operate forklifts, poor workplace traffic management, fatigued workers and adverse ground conditions. These unsafe situations could be improved with proper training and active management involvement.

This publication provides practical guidance for industry stakeholders to enhance their understanding of safe operation of forklifts at their workplaces.¹

¹All counterbalance forklifts must be operated in compliance with prescriptive guidance of Singapore *Standards Code of Practice SS CP 101 : 2004 Code of Practice for Safe Use of Powered Counterbalanced Forklifts*, or equivalent. *SS CP 101 : 2004* has also been issued as an Approved Code of Practice under the Workplace Safety and Health Act since 15 Feb 2011.

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1. Introduction

1.1 Scope and Application

This publication provides practical guidance on the management, safe operation and maintenance of forklift trucks (“forklifts” in short) at workplaces. The hazards associated with the use of forklifts and the corresponding control measures are highlighted in this publication. This publication aims to raise awareness among all relevant stakeholders on the safe operation of light and heavy duty counterbalance forklifts to prevent workplace incidents.

2. Terms and Definitions

The following are terms and definitions used here.

Term	Definition
5S	Refers to the Japanese Workplace Organisational method. The 5Ss are : 1. Sorting: Separating the wanted and unwanted items; 2. Straightening: Keeping required items in appropriate places for easy and immediate retrieval; 3. Shining: Keeping the workplace clean, neat and tidy; 4. Standardising: Making “sorting”, “straightening” and “shining” habitual; and 5. Sustaining: Maintaining established procedures.
Authorised Person	Refers to a person who is granted approval by his company to carry out the defined task.
CNG	Abbreviation for Compressed Natural Gas.
Hazard	Any item, source or situation with the potential to cause bodily injury or ill health.
LPG	Abbreviation for Liquefied Petroleum Gas.
PPE	Abbreviation for Personal Protective Equipment.
Risk	The likelihood that a hazard will cause a specific bodily injury to any person.
RA	Abbreviation for Risk Assessment. The process of evaluating the probability and consequences of injury or illness arising from exposure to an identified hazard, and determining the appropriate measures for risk control.
SWP	Abbreviation for Safe Work Procedure. Any procedure for carrying out work safely, and includes any procedure which is to be taken to protect the safety and health of persons in the event of an emergency.
Torqflow	A category of forklift control, referring to power shift and automatic transmission.
WSH Council	Abbreviation for Workplace Safety and Health Council.
WSQ	Abbreviation for Workforce Skills Qualifications.

3. Legislative Requirements

When any person operates a forklift to carry out work, the Employer and/or Principal shall comply with the regulations strictly. Under the Workplace Safety and Health (WSH) Act, the safe use of forklift has to be ensured. The legislative requirements required by the WSH Act can be broadly categorised under Safe Forklift Trucks, Safe Operation of Forklift Trucks and Maintaining a Safe Workplace.

3.1 Safe Forklifts

- Ensure that forklifts are maintained regularly; this includes pre-operation checks of forklifts according to manufacturers' recommendations and statutory requirements.
- Ensure that the appropriate forklift is selected for the job; this includes making sure that the fittings and attachments are suitable.

3.2 Safe Operation of Forklift Trucks

- Ensure that proper procedures are in place and forklifts are only used by authorised operators.
- Adequate training, instruction, information and supervision provided for forklift operators.
- Attend the WSQ "Operate Forklift Course" by training providers accredited by Workforce Development Agency (WDA).

3.3 Maintaining a Safe Workplace

- Organise traffic routes in the workplace to ensure that forklifts, and other transport vehicle can move around safely.
- Identify, for example, markings of physical hazards in the workplace for safe operation of forklifts.
- Demarcate the routes for pedestrians and vehicles for transporting or handling material.
- Ensure that there are safe means of access to and egress from the workplace for forklift movement.

4. Roles and Responsibilities

The roles and responsibilities of these personnel should be established:

- forklift owners;
- forklift operators;
- employees; and
- forklift suppliers.

4.1 Responsibilities of Forklift Owners

The main responsibility of forklift owners is to ensure that forklift operations are carried out safely and in accordance with established policies and procedures. Other responsibilities of forklift owners should include and not be limited to:

- Ensuring that all operators are trained, competent and authorised;
- Defining and designating area for forklifts to manoeuvre in the operating zones;
- Providing adequate lighting in the forklift operating zones;
- Ensuring a safe system of work. This means that all foreseeable hazards are identified and control measures implemented to eliminate or mitigate the risks through the RA process;
- Ensuring that the worksite is physically safe (e.g., there is no physical obstruction in the travel paths);
- Ensuring that only competent and trained subcontractors are engaged;
- Ensuring that all accidents, near misses, equipment failure or damage are reported and recorded; and
- Providing load information to the forklift operators.

4.2 Responsibilities of Forklift Operators

The responsibilities of forklift operators before or during forklift operations should include and be not limited to:

- Securing and handling of goods safely (i.e., no overloading);
- Using only approved and appropriate PPE;
- Driving safely (adhere strictly to the in-house speed limit);
- Always wear a seatbelt when operating a forklift;
- Parking only at allocated locations;
- Inspecting the forklift prior to use for damage and wear;
- Starting and stopping the forklift slowly to keep load stable and under control;
- Ensuring that the forklift's travel path and its surrounding area is firm, level, and free from obstructions during its operation;

- Reporting any defects immediately to the supervisor, and recording such defects in maintenance log records;
- Stopping the operation at any time if unsafe conditions occur;
- Sounding the horn to alert pedestrians when approaching corners or bends, or reversing;
- Not allowing passengers on the forklift;
- Not transporting or lifting anyone with the forklift;
- Not engaging in any dangerous operation;
- Not operating forklift if feeling unwell; and
- Only handling loads within the stipulated capacity of the forklift.

4.3 Responsibilities of Employees

The responsibilities of all employees or visitors before entering or moving in a forklift operating zone should include and not be limited to:

- Keeping a safe distance from operating forklifts;
- Be alert and look out for any warning signages or signals;
- Never ride the forklift as passengers;
- Understanding and complying with the in-house safety rules and regulations; and
- Visitors must always be escorted to ensure their safety.

4.4 Responsibilities of Forklift Suppliers

The responsibilities of forklift suppliers should include and not be limited to:

- Providing pre-delivery inspection (PDI) certification for new and used forklifts;
- Recommending effective preventive maintenance programmes;
- Providing consultation on technical needs; and
- Providing appropriate training for operators who are handling forklifts with capacity for more than 5 tons.

5. Selection of Forklifts

It is important to select the right type of forklift for performing the right type of tasks. The characteristics of counterbalance forklifts are that they have longer turning radius and larger wheels for better stability. Generally, counterbalanced forklifts are categorised into different load capacity. By varying the type of power source, control, tyres and mast,the forklifts can be used for different load capacity (see Tables 1–4).

Type of power source	Type	Advantage	Disadvantage	Applications
	Diesel engine	• Low fuel cost	• High initial cost • Exhaust emission and noisy	• For open areas
	Gasoline (i.e., petrol)/ LPG engine	• Low initial cost • Easy maintenance	• High fuel cost	• For enclosed and open areas
	LPG/ CNG hybrid	• Low fuel cost • Cleaner emissions	• Bad smell	• For enclosed and open areas
Type of power source	Batteries	• Low maintenance cost • Less vibration • Low noise	• High initial cost • Long charging time	• For enclosed areas and food industries

Table 1: Different types of power source.

Type of control	Type	Advantage	Disadvantage	Applications
	Torqflow (power shift, auto transmission)—most common	• Easy control	• High initial cost	• For all type of industries
	Clutch (direct)—rarely used	• Low initial cost	• Clutching operation required	• For all type of industries
Type of control	Solid state (more widely used in Europe)	• Step-less control— easier to control • No wearing of contact point • Less battery consumption	• High initial cost	• For all type of industries

Table 2: Different types of control.

Type of tyres	Type	Advantage	Disadvantage	Applications
	Pneumatic	• Better cushioning	• Probability of puncture	• Stable operation for handling bulky loads
	Elastic cushion	• No puncturing • No pressure maintenance	• High initial cost • Hard cushioning	• Stable operation for handling loose loads
	Solid cushion	• No puncturing • No pressure maintenance	• High initial cost • Hard cushioning	• Stable operation for handling loose loads
	Single front tire	• No additional cost • Normal operation	• Less capacity in high lift	• For handling normal loads
	Double front tire	• Stable operation (increased stability)	• Increased overall width • Additional cost	• For handling long or wide loads

Table 3: Different types of tyres.

Type of mast	Type	Advantage	Disadvantage	Applications
	Two-stage, free view	• No additional cost • Vast visibility		• For high-ceiling operation
	Two-stage, full free	• Full-free lift • Vast visibility	• Additional cost	• For low-ceiling operation
	Three-stage, full free	• Full-free lift • Low overall height	• Additional cost • Capacity reduction	• For low-ceiling operation

Table 4: Different types of mast.

A proper forklift selection process needs to take into consideration:

- work conditions (e.g., enclosed, confined or open areas, indoor or outdoor operation, height and ceiling constraints, types of industries, etc);
- maximum load required; and
- cargo types.

Each individual feature type described in Tables 1 to 4 has different applications. Therefore, training must address the unique characteristics of the type of vehicle(s) the operator is to operate.

6. Hazards and Control Measures

Under the WSH (Risk Management) Regulations 2006, RAs are to be conducted to address the safety and health risks posed to any person who may be affected by the activities in the workplace. RA 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.

RA allows us to identify the hazards at workplaces and implement effective risk control measures before it escalate into accidents and injuries.

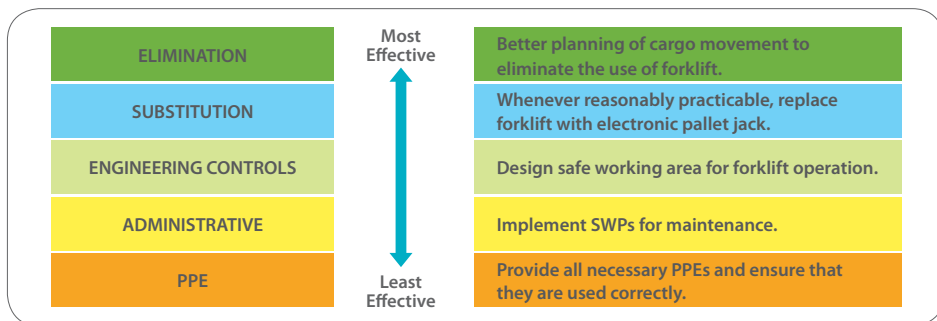


Figure 1: [Hierarchy of control](#).

Under the WSH (Risk Management) Regulations 2006, every workplace should conduct RA for all routine and non-routine work. The control of hazards and reduction of risks can be accomplished by following the WSH Hierarchy of Control (see Figure 1). These control measures are usually not mutually exclusive. Generally, it may be more effective to use multiple control measures, for example, engineering controls work better with administrative controls like training and SWPs. For a more detailed description of each type of risk control method, refer to Code of Practice on Workplace Safety and Health (WSH) Risk Management.

6.1 Different Types of Hazards

Accident statistics have shown that forklift accidents accounted for several workplace fatalities and injuries. Forklift operators and related stakeholders in the workplace are exposed to different hazards in the course of their daily work duties. Knowing the hazards and risks of forklift operations will facilitate the implementation of control measures to prevent occurrence of similar incidents. Hence, it is important to consider the following categories of hazards:

- fall-related hazards;
- physical hazards;

- chemical hazards;
- fatigue-related hazards; and
- other hazards.

Refer to Annex 1 for a tabulated version of some of the hazards mentioned above and their corresponding control measure(s).

6.1.1 Fall-related Hazards

Forklift operators are exposed to fall-related hazards in a variety of ways described below.

6.1.1.1 Falls of Forklift Operators and Co-workers

During normal operations, operators will need to access the cabin frequently. While climbing into or down from the cabin, they may slip and fall when they miss a step or when ground conditions are poor.

Under no circumstances should the forklift be used for ferrying or elevating personnel (see Figure 2).

6.1.1.2 Struck by Falling Objects

Objects or cargoes handled by forklifts can range from palletised load to odd-shaped loads like cylindrical pipes, I-beams, and so on. As the shape of cargo becomes more irregular, the potential of loads falling during the transportation process increases. The forklift operator and nearby co-workers are exposed to falling loads and crushing hazards. Several factors contribute to falling cargo;

- overloading (loads exceeding the lifting capacity of the forklift truck; see Figure 3);
- unsafe stacking (e.g., load height exceeding the height of load backrest);
- uneven and unsecured load during transportation; and
- abrupt turning.

6.1.1.3 Toppling of Forklift Trucks

Forklifts may tip over either forward or sideways. Factors that can cause a forklift to topple include:

- Heavy load was raised too high thus affecting the stability and Center of Gravity (CG) thereby making the forklift prone to tip-over incidents;
- Turning at high speed or steering the forklift wide when making turns causing the forklift to overturn;



Figure 2: **Unauthorised use of forklift to elevate personnel.**



Figure 3: **Example of an overloaded forklift.**



Figure 4: **Example of a ramp operation.**

- Improper use (e.g., rough handling) of the side-shift will result in a sudden change of CG and cause the forklift to tilt;
- Driving over obstacles, potholes, uneven, wet or oily surfaces (i.e., bad ground conditions);
- Lifting with forward tilt on the mast;
- Travelling the wrong way on the slope;
- Careless driving or poor coordination on loading docks, ramps or slopes; and
- Trailer may move inadvertently during loading and unloading.

6.1.2 Physical Hazards

The following sections explain the types of physical hazards:

6.1.2.1 Temperature

Loading and unloading of material may be conducted under harsh climatic conditions while working outdoors (e.g., the temperature gets too high) or indoors (e.g., working in cold room conditions). Extreme temperature conditions can be uncomfortable and may affect the forklift driver's physical health and induce psychic stress.

6.1.2.2 Vibration (Hand-arm, Whole-body)

Forklift operators may be required to drive long hours; this will expose them to vibration from the forklift trucks. Vibration of the forklift trucks may also arise from the rigid construction, lack of suspension of driver's seat and rough terrain. Prolonged and excessive exposure to whole-body vibration may lead to health issues concerning the neck and lower back.

6.1.2.3 Lighting

Workplace lighting can have a significant impact on forklift operators. Inadequate lighting in the work area may affect forklift operators' visibility and judgment.

6.1.2.4 Noise

When operating a forklift inside a warehouse, the noise it generates may be excessive. Exposure to excessive noise levels may lead to hearing impairment. The WSH (Noise) Regulations 2011 spell out the mandatory requirements for stakeholders.

6.1.3 Chemical Hazards

Chemical hazards are caused by the contamination of an area with potentially harmful chemicals in the form of solids, liquids, vapors, gases, dust, fumes and mists. Chemical hazards may affect the operator or any other personnel in the workplace as follows:

- Eye and skin irritation:
 - During the transportation of hazardous cargo, especially in fragile containers, spillage of hazardous materials may occur. Eye and skin irritation may result from contact with such hazardous materials.
- Intoxication or suffocation due to emissions of fumes from forklifts:
 - Fumes emitted during forklift operations may build up in poorly ventilated environments; this may lead to intoxication or suffocation.

6.1.4 Fatigue

Forklift operations require concentration, but operators are often required to work night shifts or for prolonged hours; this can lead to the onset of fatigue. The onset of fatigue can impede drivers' reflexability, judgment and decision-making.

6.1.5 Others

6.1.5.1 Facility Layout

The layout of the facility is important to prevent any incidents. Improper segregation of pedestrian pathways and vehicular roadways may cause unnecessary hazards. Blind spots may be present due to design of the workplace or poor arrangement of materials.

6.1.5.2 Exceeding Speed Limit

Poor speed limit controls in the workplace often result in forklift operators speeding.

6.1.5.3 Refuelling

During refuelling of diesel, fires and explosions may occur if an ignition source is introduced, for example, using cell phones, static electricity, or smoking (see Figure 5).

Spillage during refuelling may affect the stability of moving vehicles if it is not cleaned up properly. The greasy slick from spills may reduce grip and traction of the forklift's tyres.

6.1.5.4 Defective Forklift

Forklifts may be defective due to prolonged usage, for example, worn-out tyres, brakes (see Figure 6) or defective lights.

6.1.5.5 Unauthorised or Untrained Forklift Operators

Leaving forklift keys unattended in the ignition point or duplication of forklift keys can be hazardous because unauthorised or incompetent personnel could have access to operate the forklift.



Figure 5: No smoking while refuelling.



Figure 6: Worn-out tyres.

6.2 Control Measures

To address the above hazards, the following are identified as some of the control measures that can be implemented:

- Traffic management (see Section 7.1.1 for more details):
 - Establish traffic management plan to address potential risks in the workplace.
 - Traffic management plan should consider forklift traffic, other vehicular traffic and pedestrian traffic (e.g., improve visibility at intersections and other blind spot corners by installing blind spot mirrors; see Figure 7).

Forklift inspection and maintenance (see Section 8 for more details):

- Prepare and establish a forklift inspection and maintenance programme.
- Keep records of inspections, repairs and maintenance at workplace.
- Daily inspection and periodic maintenance will allow forklift operators to detect any abnormalities before the operations.
- Establish work procedure on the nature and frequency of inspection and maintenance.
- No modifications shall be carried out on the forklift without prior approval from the manufacturer.
- Always adhere to manufacturer's recommendation or instruction including maintenance frequency.
- Ensure that forklift operators are properly trained (see Section 9 for more details):
 - Forklift operators are required to attend safety training courses conducted by MOM-Accredited Training Providers; and
 - Only competent forklift drivers are authorised to operate forklifts.
- Workstations at forklift operations:
 - Whenever and wherever practicable, install physical barriers to ensure that workstations are protected from forklift operations (see Figure 8).
- Work Environment
 - Keep workplace well-ventilated to prevent accumulation of gases and vapours;
 - Provide adequate lighting whenever forklift is operating; and
 - Maintain floor surfaces to avoid bumpy rides or prevent tipping over of forklifts.
- Pedestrians and workers in the vicinity of forklift:
 - Pedestrians and workers should be protected from forklift traffic;
 - Wear clothing highly visible even from a distance; and
 - Stay within the pedestrian walking zone.



Figure 7: Example of blind spot mirrors



Figure 8: Example of physical barriers at workstations.



Figure 9: Example of well-maintained floor surfaces.

- Fatigue management:
 - Develop fatigue management plan for forklift operators;
 - Provide adequate breaks during shifts;
 - Practice shift rotation; and
 - Limit the maximum number of consecutive working hours.
- PPE:
 - Analyse the hazards in the working environment, and provide protection whenever appropriate and necessary (e.g., wear respirators in chemically hazardous environments, see Figure 10).
- Safe work procedures:
 - Establish SWPs for all activity involving forklifts, including inspections and maintenance and refuelling (e.g., travel and turn with the forks height as low as reasonably practicable with the operator wearing a safety belt and staying within the forklift overhead guard [cage] throughout the lifting operation).
- Speed limit:
 - Set a reasonable in-house speed limit. This speed limit should take into consideration the type of activity, environment, traffic flow (vehicles and human) and ground conditions. This speed limit should allow the forklift to be brought to a complete stop in a safe manner. It is recommended that speed limiting devices are installed.
- Seat belt:
 - Seat belts should be secured at all times in order to allow the operator to stay within the forklift cage during operations. Only in some exceptional cases, the use of seat belt should be addressed separately based on RA (e.g., when working near wharves, where there is a risk of falling into the waters).
- Irregular-sized load:
 - When transporting irregular-sized load, (e.g., long pipes, metal frames, cylindrical pipes, etc), which protrude beyond the width of the forks, RA has to be done to consider the safe movement of the irregular-sized load. Such loads need to rest on the forks in a stable manner and they should be properly secured before any forklift movement.



Figure 10: Example of wearing PPE properly

7. Safe Work Procedures

7.1 Pre-operation

This section discusses some of the operational issues that should be considered before using a forklift.

7.1.1 Traffic Management Plan

A traffic management plan is key to addressing many of the risks related to the use of forklifts in workplaces. Effective traffic management plans separate pedestrians, forklifts and other vehicles, to reduce the risk of forklift-related injuries and fatalities.

The following are steps to develop a traffic management plan:

- Discuss and communicate among employer, management, safety personnel, forklift operators and workers when developing a traffic management plan to ensure that the plan addresses all the hazards and is agreeable among all parties;
- Take into consideration the flow of the work process and the movement of people and forklifts, floor loading capacity, forklift braking distance, turning radii, stability, height and type of load being handled when developing the plan;
- Identify any safety and health hazards. Assess the level of risks involved and prioritise measures to control the hazards and reduce the risks (e.g., avoid sharp bends, overhead obstacles, road humps and any underground gas mains or electric cables);
- Provide adequate instructions to visitors and all those at the workplace on the site's traffic management plan;
- Identify the most efficient routes and traffic flows;
- Reduce the frequency of pedestrian access to forklift operating zone;
- Separate pedestrian walkways, forklift routes and operating zones;
- Provide barriers, warning signs, designated walkways or other safeguards to reduce risk of collision between pedestrians and forklifts; and
- Restrict pedestrians' access to areas where forklifts are operating as far as reasonably practicable.

Some examples of control measures in a traffic management plan are:

- Install warning lights;
- Provide speed limit signs and boundary lines at forklift operation zones;
- Provide mirrors for blind spots and intersections;
- Provide adequate lighting;
- Provide demarcated walkways;
- Provide luminous paint markings;
- Provide containment fences; and

- Provide signs or safety barriers at all entry or exit points to a forklift operating zone, intersection of walkway and roadway.



Example of a safety barrier.



Example of a work area with adequate lighting.



Example of forklift crossing pathway.



Example of a demarcated walkway.

Figure 11: Some examples of control measures.

7.1.2 Pre-operational Checklist

At the start of the working day, the authorised forklift operator should carry out an inspection to ensure that the forklift is in a safe working condition (see Figure 12). The site supervisor should ensure that safety checks are conducted and he/she should endorse that on the checklist accordingly. It is critical to report any damages or problems to employer, manager, site supervisor or safety personnel immediately. Once any defect or problem is noticed, it is advisable to cease operation of the particular forklift. An example of a forklift pre-operational checklist can be found in Annex 2.



Figure 12: Examples of forklift inspection items.

7.2 During Operation

During a forklift operation, all stakeholders should ensure compliance to the following:

- Wherever reasonably practicable, the forklift driver should wear the appropriate PPE (safety helmet, safety shoes and reflective vest) during the forklift operation.
- Safety belt should be buckled during forklift operation if the safety belt is installed in the forklift by the manufacturers.
- No part of the driver's body should extend beyond the sides of the forklift during operation.
- Passengers are not allowed when the forklift is in operation.
- The weight of the materials should be confirmed before lifting. The vehicle's rated capacity must not be exceeded.
- All loads should be handled in accordance with the height and weight restrictions on the forklift's load chart.
- Slings, cables or chains should not be attached onto the forks to lift materials or objects, unless specified by forklift manufacturers
- Never add extra load to the counterweight.
- Ensure that there is adequate clearance before passing under or between structures.
- Do not travel under any suspended loads.
- The operator should always look in the direction of travel and should not move the forklift until he is certain that there is no obstruction or people in the path of travel. Always give way to pedestrians.

- The forklift operator's view should not be obstructed while driving (e.g., materials stacked above his front view).
- In situations where a clear view of the path is impeded, the forklift driver would need to be guided when driving the forklift. The forklift operator should always look over his/her shoulder to check for blind spots when reversing.
- If the movement of a load or any part of the forklift creates a danger to workers, the employer should ensure that workers never remain within the range of the moving load. Workers or pedestrians should only be moving in the demarcated walking zone.
- When forklifts are in motion, loads should be carried as close to the ground or floor as the situation safely permits.
- Loads that may tip or fall and endanger a worker should be secured properly.
- Forklifts should not be used to support, raise, lower or transport humans.
- Forklifts should not be used to tow or push other vehicles or equipment.
- Maintain adequate clearance from overhead structures such as power lines, beams, and so on.
- Slow down on wet or slippery areas.
- Slow down and sound the horn when approaching junctions, building entrances, exits and blind corners.
- Stunt driving and horseplay are prohibited.
- If a forklift driver believes that the load being moved is unsafe, he should stop the operation immediately and report accordingly.
- When a forklift is required to enter or exit a vehicle to load or unload, the vehicle should be immobilised and secured against accidental movement.
- The forklift driver is responsible for the safety of other workers in the vicinity of the operating zone.
- Workers in the vicinity of a forklift should be aware of the forklift's path of travel and avoid contact with the forklift at all times.
- When a forklift is parked in position, the forks should be in the lowered position or be firmly supported.
- When a forklift is left unattended, turn off the forklift's engine, place all the controls in the neutral position, and set the brakes to prevent any accidental movement.
- The height of the forks should not be adjusted while the forklift is still in motion. The forks' position should only be adjusted when the forklift comes to a complete stop.
- Forklifts should not be used to hoist any goods unless equipped with approved attachments from the manufacturer.

7.3 Post Operation

7.3.1 Refuelling: Diesel

- The forklift engine should be switched off, properly parked and the operator out of the forklift before refuelling.
- Forklifts should only be refuelled by competent personnel.
- Care should be taken to avoid fuel from spilling over the exhaust or engine system.

- Wipe away any spillage properly before restarting the engine.
- Refuelling area should have adequate ventilation to prevent the accumulation of flammable vapours.
- Open flames and sources of ignitions in the refuelling area are prohibited.
- A fire extinguisher of appropriate class and size should be in close proximity to the refuelling operation and the operator should be trained on how to use the fire extinguisher.

7.3.2 Battery: Safe Charging or Changing

- Forklifts should be properly positioned and brakes applied before charging or changing batteries.
- Charging or changing of forklift battery should only be carried out by competent personnel.
- A designated battery charging area should be set up with adequate ventilation to avoid build up of explosive hydrogen gas and the area should be free of potential ignition sources.
- Always add the acid slowly into the water and not water to the acid. Use non-metallic containers and funnels.
- Take extra care to avoid spilling or splashing the sulphuric acid solution. It can destroy clothing and burn the eyes and skin.
- Always wear facial protection when checking or adding acid.
- A water hose is required for flushing spills.
- Do not store acid in warm locations or under direct sunlight.
- The charging area should have a safety eye wash station.
- If batteries are removed from forklift, an approved battery hoist should be provided.
- Batteries should be properly secured in the forklift.
- Inspect cables and replace any visible insulation damage or deterioration with new ones.
- Smoking is strictly prohibited in the charging area.
- Precautions should be taken to prevent open flames, sparks or electric arcs in battery charging areas.
- Tools and other metallic objects should be kept away from the top of uncovered batteries.
- Reinstalled batteries should be properly positioned and secured in the forklift.

7.3.3 Changing of LPG Cylinders

When replacing a gas cylinder, take note of the following:

- Fully close the discharge valve and stop valve.
- Detach the piping to the engine side.
- Detach the gas cylinder fixing cover and number plate wing nut.
- Replace the old gas cylinder with a new gas cylinder. When installing the gas cylinder, install it in such a manner that the "TOP" mark on the surface of the cylinder (valve end) is at the top.
- Fix the new gas cylinder with the fixing cover and wing nut.
- Make sure that the joint seal is faultless, and reconnect the piping to the engine side.
- Fully open the discharge and stop valves, and make sure that there is no gas leakage from the joint.

When replacing the gas cylinder, extra care has to be taken in order not to damage the mounting band or bracket during the removal or installation operation. Be extremely careful when handling the high pressure rubber hose to prevent damage to the mouthpiece at the tip and the rubber packing.

Operators have to remember to always carry out the replacement operation on flat ground. After completing the replacement operation, they must always lock the gas cylinder mount.

Warning

Replace the gas cylinder in a well-ventilated area and away from any ignition sources. Only trained and authorised personnel may change LPG containers.

7.3.4 Authorised Key Lock System

- A steering lock mechanism can be used on the forklift steering wheel to prevent unauthorised use of forklift by workers (see Figure 13).
- A log book should be maintained by the supervisor to record any sign-in and sign-out of the chain system key for authorised forklift driver verification.
- The supervisor should review and sign the log book for compliance verification.



Figure 13: **Steering lock.**

7.3.5 Parking of Forklifts

- Sufficient and suitable parking areas should be provided for all forklifts. These areas should be separated from main traffic routes and away from loading and unloading bays.
- Before getting off the forklift, lower the forks to ground level, ensure that the parking brake is engaged, the controls are in neutral and the power is shut off.
- Do not park the forklift near a source of ignition, for example, near a doorway or a pit.
- Remove the ignition key and secure the forklift at all times when not in use.
- Choke the wheels if there is a risk of the forklift moving.

8. Maintenance and Servicing

This section highlights the necessary and reasonably practicable safety measures to be taken in order to avoid incidents related to servicing and maintenance work for forklift trucks. Work should only be carried out by authorised personnel and in specified areas.

8.1 Servicing and Maintenance Personnel

Forklift trucks may only be serviced and maintained by competent and authorised personnel. Any major servicing or overhaul of the forklifts ought to be done by the supplier. Reports and assessment issued by the supplier's representative has to be written in such a way that it is exclusively from the point of view of safety without being influenced by any other operating and economic considerations. The supplier's representative should have sufficient knowledge and experience to assess the condition of a forklift truck and the proper functioning of the protection installations in accordance with the state of the art technology and basic principles for the testing of forklift trucks.

8.2 Inspection Intervals and Items

8.2.1 Servicing and Inspection Intervals

- The servicing and inspection intervals should be in accordance with the specifications of the manufacturer.

8.2.2 Inspections Items

- The annual inspection by the supplier should include an inspection of the condition of the components and installations, together with the completeness and effectiveness of safety installations.
- Forklift trucks also have to be inspected for damage which may be caused by possible misuse. An inspection protocol is to be issued. The results of the inspections have to be filed at least until the next inspection.
- Ensure that any defects are rectified immediately.

8.3 Spare Parts

The only spare parts which may be used are those in accordance with the specification of the manufacturer. An increase risk of incident occurrences may arise due to inferior quality or use of unauthorised spare parts. Anyone who uses unauthorised spare parts assumes full and unrestricted responsibility in the event of any incident occurrence.

8.4 Housekeeping

Proper housekeeping should always be ensured after maintenance and servicing. For instance, the waste materials (e.g., grease, oil, batteries, etc) left over from maintenance, servicing and cleaning work should be properly accumulated and disposed. Care should also be taken to ensure that environmental pollution is prevented.

9. Training for Operators

From 1 October 2009, the WSQ “Operate Forklift” Competency Standards has replaced the Forklift Driver’s Training Course.

Trainees have to demonstrate their skills and knowledge proficiency before they are considered as qualified forklift operators. Existing forklift operators who have already completed the “Forklift Driver’s Training Course” accredited by the Ministry of Manpower (MOM) will continue to be considered as qualified forklift operators.

“WSQ Operate Forklift” is the basic mandatory training for all forklift operators. It is advisable that separate training programmes are conducted for workplaces which require the usage of forklifts with handling capacity of more than 5 tons. It is also recommended that all forklift operators attend refresher training every 3 years.

The “WSQ Operate Forklift Course” covers four competency elements:

- preparation before forklift operations;
- inspection of forklifts;
- carrying out forklift operations; and
- reinstating and handing over forklifts.

For more information on the WSQ Operate Forklift Competency Standards, go to: www.wda.gov.sg



Figure 14: Sample of training certificate.

10. Emergency Response Plan

The establishment and effective implementation of an emergency response plan is crucial in saving lives and minimising losses in any emergency situations (e.g., forklift forks puncturing drums containing hazardous chemicals).

Top management should ensure that all employees are familiar with the plan and procedures in the event of an emergency. Regular drills and exercises should be conducted. An evaluation of the drill performance should be carried out and learning points should be used to improve the plan.

The following list of 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;
- 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
- emergency contacts.

This emergency response plan forms part of the overall emergency response plan for the workplace.

11. Useful References

Ministry of Manpower

Workplace Safety and Health Act (Cap.354A)

Workplace Safety and Health (General Provisions) Regulations

Workplace Safety and Health (Risk Management) Regulations

Workplace Safety and Health Council

Code of Practice on Workplace Safety and Health (WSH) Risk Management

Workplace Safety and Health Guidelines on Fatigue Management

Workplace Safety and Health Guidelines on Managing Heat Stress in the Workplace

Workplace Safety and Health Guidelines on Workplace Traffic Safety Management

SPRING Singapore

CP 101:2004 Safe Use of Powered Counterbalanced Forklifts

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Annex 1 – Table of Selected Hazards and Control Measures

S/No	Hazard Category	Hazard Description	Control Measures
1	Fall hazard: Falling object	Struck by falling objects from forklift due to overloading.	• Authorised operators (must understand forklift capability and cargo load).
		Struck by falling objects from forklift due to unsafe stacking.	• To ensure that load height must not exceed height of load backrest.
		Struck by falling objects from forklift due to uneven and unsecured load.	• Authorised operators must always check, restack and secure the load if necessary.
2	Fall hazard: Fall of forklift	Accidents (e.g., overturning and flipping of forklift) due to operations on slopes, ramps and humps.	• Only authorised operators are allowed to operate forklifts. • Proper signages indicating slope, ramp or hump to warn the forklift operator. • Distinct and reflective colours to warn operators to slow down. • Install side panels on ramp or slope to prevent tyres from going over the edge.
		Forklift incidents such as skidding, overturning, and so on, due to bad ground conditions (e.g., uneven, wet, oily, potholes).	• Long term: Clear up wet grounds, oil spills, patch up potholes, maintain favourable ground conditions. • Short term: Cordon off areas where these unsafe conditions exist or cover up exposed drains.
3	Physical hazards	Forklift incidents due to adverse weather conditions.	• Implement adverse weather trigger SOPs.

4	Chemical hazards	Intoxication or suffocation due to fume emissions from forklifts or the environment.	• Ensure effective ventilation, proper selection of forklift in the appropriate operating environment. • Ensure that proper PPE are worn when required.
		Eyes or skin irritation due to contact with chemicals (e.g., diesel).	• Ensure that appropriate PPE are worn while refuelling.
5	Fatigue	Incidents that arise from operator fatigue (due to long working hours or extreme weather conditions).	• Implement effective administrative control measures to prevent long working hours. • For more information on heat stress and fatigue, refer to <i>WSH Guidelines on Fatigue and Heat Stress Management</i>.
6	Others: Facility layout	Knock down by forklift due to restrictions of layout at workplace (height restrictions, light conditions).	• Implement 5S housekeeping and traffic management plan (signage, proper markings for pedestrians, parking lots, working areas, effective barriers for receiving station, ensure sufficient lighting – refer to relevant Singapore Standards).
		Collision of forklifts with pedestrians, property or other moving equipment due to poor traffic management.	• Implement proper traffic management plan signage, proper markings for pedestrians, parking lots, working areas, effective barriers provided for receiving station).
		Collision of forklifts with pedestrians, property or other moving equipment due to blind spots.	• Traffic management plan (signages, proper markings for pedestrians, parking lots, working areas, effective barriers provided for receiving station, convex mirror).
7	Others: Exceed speed limit	Collision of forklifts with pedestrians, property or other moving equipment due to speeding.	• Install speed limiter or speed warning device on forklifts. For example, it is important to drive slower in a congested environment. • Define and designate forklift travelling zone.

8	Others: Fuel top-up	Incidents arising due to refuelling and charging (e.g., explosion due to smoking while refuelling, electrocution while charging).	• Authorised personnel to do the refuelling and charging (e.g., to refuel or charge at a designated area). • Turn engine off while refuelling and charging. • No smoking while refuelling and charging. • Wear PPE while refuelling.
9	Others: Defective forklift	Incidents arising due to operation of defective forklift (worn-out tyres, brakes , faulty signal lights, brake lights)	• Conduct regular maintenance, pre-operation checklist.
10	Others: Unauthorised/ untrained forklift operators	Forklifts incidents due to unauthorised use of forklift keys (e.g., same keys for all same brand of forklifts and careless operators who leave keys on ignition after using forklifts).	• Implement forklift keys log-in and log-out system or request from manufacturers different keys for different forklifts. • Only authorised forklift operators are allowed to hold the keys.

Annex 2 – Sample Pre-operational Checklist

Description	Yes	No
Turned-off Mode		
The mast or forks are <i>not</i> bent, worn or cracked.		
The lift chains, hoses and limit switches are in good condition.		
Tyres condition : • inflated and free of excessive wear or damage; • nuts are tight; • no gouges, chunking or bond failure; and • adequate thread.		
The battery connecting terminal is tight and free of exterior defects.		
Controls : • move smoothly without binding; and • return to neutral when released.		
Battery water level is enough.		
Battery covers and guarding over other hazardous parts are in place and secured.		
The fan belt is in good condition.		
There are <i>no</i> visible signs of leakage (e.g., oil, water).		
Fuel level is enough.		
Engine oil level is enough.		
Radiator water level is enough.		
Transmission oil level is enough.		
Hydraulic fluid level is enough.		
Brake fluid level is enough.		

Turned-on Mode

Hour meter gauge and gauges on instrument panel are working.		
Battery charge/ discharge indicator is working.		
Steering: • smooth and responsive; • free of excessive play; • without binding; and • without abnormal sounds.		
Foot brakes: • work and function smoothly without grabbing; • free of fluid leaks; • pedal moves freely <i>without binding</i>; and • able to stop forklift truck quickly.		
Directional/ speed control: • moves smoothly without binding; • can only start engine at neutral position; and • plugging functions properly and returns to neutral when released.		
Parking brakes able to hold the forklift on an incline <i>without</i> slippage.		
Lighting equipment for visibility such as head and rear lights are working.		
Lighting equipment for warning purposes such as brake light, blinker light, directional signal light are working.		
Horn is working.		
Reverse warning buzzer is working.		
Driver's seat is free of visible defects.		
Seat belt is accessible and not damaged, oily or dirty.		
Rear view mirror is <i>not</i> damaged.		
The forklift is <i>not</i> producing any abnormal noise.		
Hydraulic control lever is working.		
Lift/ lower system • controls moves freely; • able to return to neutral when released; and • able to perform functions as indicated.		

Lifting chain condition is free of any visible defects.		
Backup alarm (if equipped) is working.		

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

Note
Check the work area before you start your forklift for operational hazards in surrounding areas and report to management all hazardous locations, working environment, work instruction, operating faults, malfunctions and other difficulties that may affect the safe use of forklift.

The following items should be checked weekly to make sure that they are not damaged or worn-out:

- structure, overhead guard, hydraulic cylinders;
- mast assembly; and
- lift chains and rollers condition.

Operator’s Signature/ Date:

Supervisor’s Signature/ Date:
