

Workplace Safety and Health Guidelines

Safe Use of Lorry Cranes



WSHCOUNCIL

Tripartite Alliance for
Workplace Safety and Health

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1. Introduction

The use of lorry cranes, otherwise referred to as Lorry Loaders in the Workplace Safety and Health (Operation of Cranes) Regulations, is a familiar sight in Singapore. They are deployed extensively by the logistics and transportation, construction and landscape, marine, hospitality and entertainment sectors (non-exhaustive). Lorry cranes are preferred due to the shorter set-up time, lower costs and ease of mobility in comparison with other types of mobile cranes.

As the use of lorry cranes has become more prevalent, there has been a significant increase in dangerous occurrences involving lorry cranes over the past few years. Some causes (direct or indirect) of these dangerous occurrences are improper deployment of outriggers, failure of the ground, mechanical failure and unsafe operations. Similar to other lifting machines, the use of lorry cranes for lifting operations can be potentially hazardous if not carried out properly.

1.1 Scope

These guidelines aims to raise the workplace safety and health (WSH) awareness of all relevant stakeholders such as owners, users and operators. It covers the planning these guidelines will cover the planning, roles and responsibilities, relevant hazards, set-up, operation and maintenance aspects of lorry cranes.

1.2 Relevant Legislation

Some relevant legislation (non-exhaustive) with regards to the use of lorry cranes are:

S/No	Agency	Legislation	What it covers
1.	Ministry of Manpower	Workplace Safety and Health Act (Chapter 354A)	• Workplace Safety and Health obligations of relevant stakeholders such as occupiers, principals, employers and employees. • Covers all workplaces unless exempted.
2.	Ministry of Manpower	Workplace Safety and Health (Operation of Cranes) Regulations 2011	• Workplace Safety and Health obligations of relevant stakeholders with regards to operation of cranes. • The relevant stakeholders include personnel such as the responsible person, lifting supervisor, crane operator, rigger and signalman.

3.	Land Transport Authority	Street Works (Works on Public Streets) Regulations	• Power to control works on public streets. • Application and approval to work on public streets for any person other than the Authority.
4.	Land Transport Authority	Road Traffic Act (Chapter 276)	• Power to place traffic signs on public streets. • Provisions to the use of highways. • Prescribed traffic signs placed on or near any roads.

Table 1: [Legislation relevant to use of lorry cranes](#)

2. Planning of Lifting Operation

To ensure all lifting operations are carried out safely, careful planning must be done. This includes:

- Conducting a Risk Assessment;
- Preparing a Lifting Plan;
- Identifying changes to the Lifting Plan;
- Communicating the Lifting Plan to all relevant personnel; and
- Reviewing the Lifting Plan before the lifting operation and incorporating any changing circumstances.

These activities are explained in the sections below.

2.1 Risk Assessment

Under the Workplace Safety and Health (Risk Management) Regulations, every workplace must conduct a Risk Assessment (RA) for all work activities. Workplace risks can be assessed in three simple steps:

STEP 1: Hazard Identification

Determine hazards associated with the activity of each work process, along with the potential accidents or ill-health that could result from these hazards. Person(s) who may be at risk as a result of being exposed to these hazards can also be identified.

STEP 2: Risk Evaluation

Estimate the risk levels of the identified hazards and their acceptability on:

- the severity of the hazard; and
- the likelihood of the incident

STEP 3: Risk Control

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

These risk controls should be effective yet practicable. To control hazards and reduce risks, control measures should be observed in accordance with the Hierarchy of Control (See Figure 1).

Hierarchy of Control

The type of control measures in the Hierarchy of Control are ranked in order of effectiveness. As far as possible, priority should be given to upstream risk control measures.

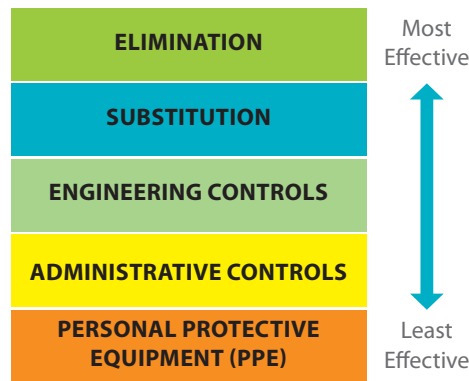


Figure 1: The Hierarchy of Control

It may be necessary to use more than one risk control measure to reduce risks to the lowest possible level if a single measure is insufficient. For example, engineering controls such as using safer equipment, can be implemented together with administrative controls, for instance, training and Safe Work Procedures, to reduce a workplace risk.

Elimination

Elimination of risk refers to the removal of the worker’s exposure to the hazards, effectively making all identified possible accidents and ill-health impossible. As elimination is the most effective method of risk control, it should be attempted first. Once the risk is eliminated, it will not appear in subsequent risk assessment forms.

Substitution

This involves replacing a hazard with one that presents a lower risk.

Engineering Controls

Engineering controls are physical means that limit the hazard. These include structural changes to the work environment or work processes.

Administrative Controls

These controls reduce or eliminate exposure to a hazard by adhering to procedures or instructions. Documentation should emphasise all steps in the work processes and controls needed for work activities to be carried out safely.

Personal Protective Equipment

Proper use of PPE can keep workers safe at work. However, PPE should only be used in addition to other control measures (e.g. engineering control measures) or when all other measures are

not feasible or practical. For PPE to be effective, it must always be properly worn when the user is exposed to the hazards. The PPE must also fit the user correctly, and kept cleaned and stored in an appropriate place when not in use.

For more information on risk management and risk assessment, refer to the Code of Practice on Workplace Safety and Health (WSH) Risk Management.

2.2 Lifting Plan

A Lifting Plan should be developed based on the consideration of factors that can affect the safety of any lifting operation. The factors can be broadly classified as:

- Machine - Selection of appropriate lifting equipment for the job as well as the integrity of the equipment to perform the job;
- Material - Load that is intended to be lifted;
- Medium - Environment in which the lifting operation is to be carried out, which includes the setting up and stability of the equipment;
- Man - Competency, roles and responsibilities of personnel involved in the lifting operation; and
- Method - Planning and procedures to be adopted for the lifting operation.

To provide guidance, a sample Lifting Plan is provided in Annex 1. The template lists the following key elements that should be included:

- Details of the load;
- Details of the lifting equipment such as lifting machine and lifting gears to be used;
- Means of communications;
- Personnel involved in the lifting operation;
- Physical and environmental considerations;
- Sequence/ special precautions; and
- Sketch of the zone of operation.

The elements recommended in the sample Lifting Plan are non-exhaustive and personnel involved in planning lifting operation must consider factors that are unique to the situation; particularly for more complex lifting operations.

2.3 Changes to Lifting Plan

The Lifting Plan is developed based on a pre-determined set of parameters and considerations. Any significant changes should result in a temporary stoppage prior to or during the lifting operation. A review of the Lifting Plan would then be required. Review the Lifting Plan if the following scenarios occur:

- Changes to the type and capacity of lifting equipment used;
- Changes to the sequence of operations;
- Changes requiring reconfiguration of the crane;

- Changes in the rigging details which could result in a reduction in rigging strength or significant increase in rigging weight;
- Changes in surrounding environment such as sudden presence of a temporary structure obstructing the operation; and
- Changes in the weather and environmental conditions which have an adverse impact to the lifting operation.

3. Roles and Responsibilities of Relevant Personnel

3.1 Responsible Person

The responsible person in relation to lorry crane operations refers to either the employer of the lorry crane operator or a principal who is directing the manner of work.

The roles and responsibilities of the responsible person should include but not limited to:

- Establish and implement a lifting plan. Ensure that the lifting plan is available for inspection when required;
- Appoint competent lorry crane operators and ensure that they are adequately trained or re-trained before executing any lorry crane operations; and
- Ensure competent lifting supervisors, rigger and signal man are appointed before any lorry crane operations.

The relevant training courses that the stakeholders should attend are:

S/No	Role	Relevant Courses
1.	Lifting Supervisor	• WSQ Supervise Safe Lifting Operations
2.	Lorry Crane Operator	• WSQ Operate Lorry Crane (5 years validity)
3.	Rigger and Signalman	• WSQ Perform Rigger and Signalman Tasks

Table 2: [List of relevant courses](#)

3.2 Lifting Supervisor

The roles and responsibilities of the appointed lifting supervisor should include but not limited to:

- Coordinating all lifting activities in accordance with the Lifting Plan;
- Briefing all lifting team members on the Lifting Plan, safe lifting procedures and Risk Assessment;
- Ensuring that only authorised and competent lorry crane operators, appointed riggers and appointed signalmen participate in any lifting operation;
- Ensuring that the ground conditions are safe for any lifting operation to be performed;
- Being present during all lifting operations to ensure that the lift is carried out in accordance with the lifting plan;

- Keeping within his/her sight and view of all lifting operations; and
- Taking suitable measures to rectify any unsafe conditions to ensure the lifting operation can be conducted safely.

3.3 Lorry Crane Operator

The roles and responsibilities of the appointed lorry crane operator should include but not limited to:

- Carrying out the lifting operation in accordance with the Lifting Plan;
- Inspecting the lorry crane prior to use to check for abnormalities;
- Checking that all safety devices (e.g. limit switches) are functioning properly;
- Visually ensuring that the ground is stable and the surrounding is free from any structures or materials that may obstruct the lifting operation;
- Ensuring that any outrigger is fully extended and secured when required;
- Carrying out the lifting operation only when a lifting supervisor is present on site;
- Disengaging from any manoeuvre that is dangerous;
- Monitoring environmental effects such as thunderstorms and strong winds that will affect the lifting operation;
- Reporting any defects immediately to the lifting supervisor, and recording such defects in maintenance log records;
- Stopping the lift whenever unsafe situations occur; and
- Checking the crane wire rope (where applicable) to ensure it is still safe for use.

3.4 Rigger

The roles and responsibilities of the appointed rigger should include but not limited to:

- Ensuring all slings, webbings, shackles and other lifting gears used to rig the load are within the Safe Working Load (SWL) of the lift, in good condition and duly certified;
- Ensuring that the load is rigged up in a such a manner that it is stable, balanced (i.e. centre of gravity beneath the hook) and secured (i.e. no loose items);
- Ensuring that the lorry crane operator has been informed of the weight of the load;
- Establishing tag lines to control the load as it is being manoeuvred; and
- Reporting any defect in the lifting/rigging materials to the lifting supervisor.

3.5 Signalman

The roles and responsibilities of the appointed signalman should include but not limited to:

- Ensuring the load is correctly rigged up prior to giving signals to commence the lift;
- Giving correct and clear hand signals to the lorry crane operator to manoeuvre the load safely;
- Ensuring communication is maintained with the lorry crane operator throughout the lift in

accordance with the lifting plan;

- Ensuring the lift is controlled throughout the duration of the operation;
- Ensuring that the immediate areas within the lift (start point and final position) are clear of any hazards during the manoeuvre;
- Maintaining his/her position so as to ensure line of sight during the controlled phase of the lift and to ensure this position is free of danger; and
- Refraining from handling load/rigging simultaneously when giving signals to the crane operator.

3.6 Combination of Roles

Role combination may take place after evaluating the site-specific risks of the lifting operation by the responsible person and the lifting supervisor. It should be authorised and detailed in the lifting plan. In this process, there should not be any role conflict and the lifting team must be able to proceed with the operation safely.

The responsible person should ensure that :

1. The person undertaking all the combined roles to be appointed, trained and competent for each role; and
2. Other relevant factors (non-exhaustive) such as type and size of load and the ability for a single person to also perform rigging in a safe manner are adequately considered.

All relevant stakeholders of the lifting operation must be consulted and agree with any proposed role combination before the commencement of the lifting operation. The onus will be on the Responsible Person to make the final decision for adopting any combination of roles.

4. Common Hazards

Table 3 below shows some of the common hazards:

S/No	Hazard	Consequence	Illustration
1.	Outriggers not fully extended/ deployed properly	Improper/partial deployment of outriggers which may result in the toppling of lorry crane due to instability.	 
2.	Overloading or poor maintenance	Overloading or poor maintenance of the lorry crane can lead to structural or mechanical failure.	

3.	Improper deployment of outriggers on unsafe ground conditions	With improper deployment, outriggers might punch through the soft ground or foundation with inadequate strength. This can result in the toppling the lorry crane.	 
4.	Carrying out lifting operations over human and property	Lifting over human and property is hazardous. Any failure in the lifting operation can lead to potential fatality and property damage.	
5.	Use of faulty lifting gears or improper rigging	Using faulty lifting gears or improper rigging can lead to potential fatality and property damage.	 

Table 3: Common hazards of lorry cranes

5. Set-up of Lorry Cranes

5.1 Ground Conditions

The ground on which the lorry crane is being set up must be able to handle the forces being imposed. Therefore, a pre-operational assessment of the ground conditions should be done to ensure that the ground has sufficient load bearing capacity. This operational assessment should be made by a competent person, taking into consideration relevant information (e.g. maximum vertical load per stabiliser) provided by the manufacturer and load details.

5.2 Deployment of Outriggers

The term “outriggers” refers to the stabilising system and includes the outrigger arms and vertical stabiliser legs. The main function of the outrigger is to improve the stability of the crane and vehicle during the lifting operation.

As required by Regulations 16(c) of the Workplace Safety and Health (Operation of Cranes) Regulations, it shall be the duty of the crane operator to ensure that, when required, any outrigger must be **fully extended** and properly secured. The proper deployment of the outriggers can provide the necessary stability and balance when operating the lorry crane. Exceptions for full extension of outriggers can be considered for lorry cranes that are installed with a stability control system (refer to section 7.2) or other equally effective means.



Figure 2: Fully extended outriggers

In addition to being full extended, outriggers should not be set up on the following surfaces (non-exhaustive):

- Grassy patch
- Manhole cover
- Drain grating
- Excavated trench
- Cemented footpath
- Soft or sandy ground



Figure 3: Locations where outriggers should NOT rest on

Some do's and don'ts of setting up outriggers are shown in Figure 4.

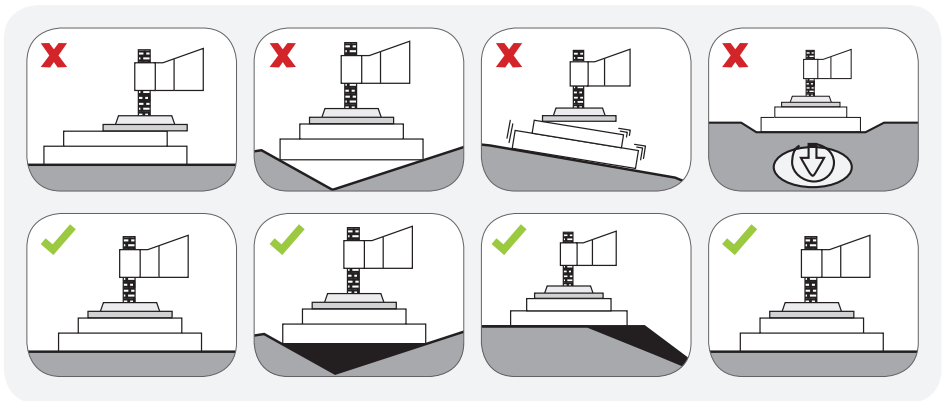


Figure 4: Do's and don'ts of setting up outriggers

If the pre-operation assessment of the ground conditions reveals that the ground has insufficient load bearing capacity, additional measures should then be put in place before setting up the lorry crane. These measures can include using stabiliser pads to spread the applied forces. Details of any foundation or load spreading arrangements should be documented and well communicated to the lifting team.



Figure 5: An outrigger sitting on a stabiliser pad

5.3 Clearance

The chosen location for the set-up must have adequate space for the lorry crane to move into position, set up and operate. To minimise the presence of any trapping hazards or damage done to any property, there should also be sufficient clearance between the lorry crane and surrounding objects/structures/buildings.

5.4 Public Roads

When carrying works on public roads using lorry cranes, the requirements stated by the Street Works Act and the Road Traffic Act must be adhered to. Reference should always be made to the:

- Code of Practice for Works on Public Streets
- Code of Practice for Traffic Control at Work Zone

When lorry cranes travel on public roads:

- Always observe the vertical height clearance of structures (e.g. overhead bridges) and ensure that there is sufficient clearance;
- Ensure that the crane boom is fully stowed. Do not disable or bypass the boom stowing limit switch;
- Always keep within the speed limit of the road.

For more information on traffic safety management and safety tips for vehicles travelling on the road, refer to the Workplace Safety and Health Guidelines on Workplace Traffic Safety Management.

5.5 Adverse Weather Conditions

Singapore has two monsoon periods — December to March and June to September, and two inter-monsoon periods — April to May and October to November. During the monsoon seasons, heavy rainfall, strong winds and thunder are expected. Therefore, it is recommended to put in place preventive measures to mitigate risks such as strong winds and lightning, posed by such adverse weather conditions, such as:

- Check the weather forecast at the National Environment Agency's website before starting outdoor works;
- Stop all outdoor works and stay under a safe shelter when adverse weather approaches and have an appointed person to monitor the weather conditions.

5.6 Test-lift

Before doing the actual lift, the operator should carry out a test-lift by lifting the load slightly off the ground and stopping to observe for any abnormalities. This is a critical step that all operators must observe, as it can confirm the stability of the load and ensure no overloading.

6. Safe Operation of Lorry Cranes

6.1 Rated Capacity

The rated capacity of a lorry crane is the load that the crane is designed to lift for a given configuration or position of load.

The rated capacity should be determined based on the following factors (non-exhaustive):

- The crane manufacturer’s rated capacity for a particular outrigger size and configuration;
- Type of lorry chassis fitted with the crane structure;
- Method of mounting the crane to the lorry chassis;
- Stability tipping factor chosen for the crane-lorry combination; and
- Presence of derated capacity zones.

Other factors that can influence the rated capacity during operations are:

Factors	Action
Tire pressure	Ensure that tires are inflated according to manufacturer’s recommendation.
Wind load	Be cautious when lifting large objects during strong winds. Use taglines or stop lifting operation when necessary.
Operation manner of crane	Operate the crane smoothly as far as possible. Do not jerk or start/stop the crane abruptly.
Load level of lorry	A loaded lorry can make the lorry more stable.
Extension of outriggers	Extend outriggers fully.
Surface or ground quality	Ensure that the lorry is on solid, stable and level ground.
Weight of sling accessories	Always take into consideration the weight of any lifting beam, slings or accessories plus the load to be lifted.

Table 4: Other factors that can influence rated capacity

The rated capacity of a lorry crane is the load that the crane is designed to lift for a given configuration or position of load.

Before the start of any operation, an operator should refer to the manufacturer’s load chart and the Ministry of Manpower’s “Certificate of Test/Thorough Visual Examination of Lifting

Equipment” for the crane’s SWL as tested by the Authorised Examiner.

6.2 Lifting Near Personnel or Members of Public

When loads are lifted near persons (e.g. workers or members of public), appropriate risk control measures must be put in place, e.g. demarcating the lifting zone and ensuring that no unauthorised personnel enter the zone while the lifting operation is in progress.

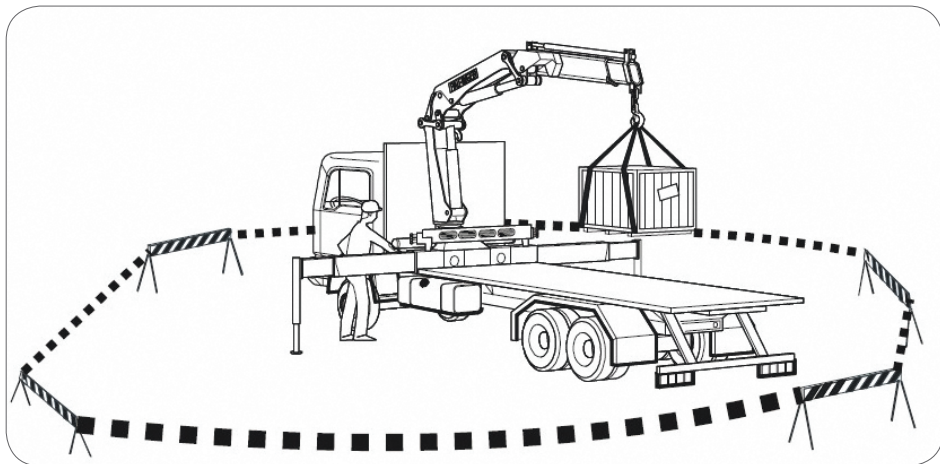


Figure 6: Demarcation of lifting zone

The load should not be lifted or suspended over any person. When personnel are required to enter the lifting zone during a lifting operation, the operator must be informed of their presence through voice or visual contact.

6.3 Health

As stated in Section 7(2) of the Workplace Safety and Health (Operation of Cranes) Regulations, a registered crane operator may be required to produce a medical certificate to certify that he/she is medically fit to operate a mobile or tower crane. Although lorry crane operators are not required to be registered crane operators, it is recommended for them to undergo periodic medical examinations to identify early signs of ill-health or other personal health risks such as diabetes. Intervention programmes can then be put in place to manage the ill-health to prevent further health risks downstream.

Other health-related hazards such as fatigue and ergonomics should also be identified in the risk assessment and appropriate control measures put in place. Such hazards can impair judgement and result in catastrophic accidents.

6.4 Security

Records (e.g. log books) documenting the use of lorry cranes should be well kept to prevent any unauthorised use of equipment. Untrained and/or unauthorised personnel must not be allowed to use lorry cranes as it can be extremely hazardous.

Where a lorry crane is equipped with a remote control, care should be taken to ensure that the key to the remote control is removed when not in use. If the remote control is not used for an extended period, it should be kept in a secure location accessible only by authorised personnel.



Figure 7: Remote control



Figure 8: Keys to activate remote control

6.5 Safe Use of Remote Controls

Remote controls provide advantages such as flexible positioning, which enable the operator to have a better view of the lifting operation. It also allows the operator to stay in a safer position away from moving parts and possible falling debris.

However, remote controls could be hazardous if they are not used safely or as recommended by the manufacturer. Some preventive measures to be taken while operating a lorry crane using a remote control are:

- All operational and functional checks involving the use of a remote control for a lorry crane should be conducted as part of the daily pre-use inspection. Always activate the various control buttons/levers and emergency stop button to check they are functioning properly.
- Always use the neck strap provided correctly. This frees both hands for rigging and getting up and down the lorry crane. It also prevents the remote control from getting damaged or lost. To prevent accidental operation of the lorry crane, the strap should also be worn before switching on the remote control.
- Always ensure the remote control is fully charged and a spare battery is available.
- The operator should be aware of the operating environment and position him/herself to ensure clear view of the load, lorry, crane and its intended path at all times.
- Do not use the remote control while walking and operating a lorry crane at the same time as it is very dangerous. If there is a need to re-position, the operator should deactivate the

remote control before moving to the new location.

- The remote control should always be deactivated when not in use as the consequences of accidentally operating the crane could be fatal.
- Never stand or walk underneath the crane boom or the load while lifting.
- Never stand between the load and the lorry crane or a fixed structure.
- Never stand too near to the load.
- Always isolate the controller using the emergency stop button if there are no lifting operations to be done.

6.6 Other Safety Considerations During Lorry Crane Operation

A lorry crane should only be used in accordance to the manufacturer's design and recommendations. Other safety recommendations that should be adopted are:

6.6.1 Leaving a Lorry Crane

If the operator has to leave the lorry crane during a lifting operation for any reason, he should:

1. Land the load (if boom has a load attached)
2. Put all controls in the 'off' or 'neutral' position
3. Secure both the crane boom and the lorry against accidental travel
4. Stop the engine
5. Ensure the remote control (if any) is kept securely
6. Lock the cabin door.

6.6.2 Demobilising a Lorry Crane

At the end of an operation and before moving off, the operator should ensure that:

1. The crane boom is properly stowed (see Figure 9)
2. All outriggers are retracted back to stowed position
3. All remaining loads on the lorry are properly secured
4. No loose items are protruding beyond the lorry crane
5. Power take-off is disengaged
6. Parking brake is not released until all the above procedures are completed.



Crane boom fully stowed (home position)



Crane boom rested on deck

Figure 9: Proper stowage of crane boom

Below are some other additional safety considerations to take note of:

- No lifting over cabin unless specially designed for or approved by the manufacturer.
- Tyres should not be off the ground.
- No pulling or dragging of any load.
- During lifting operations, the boom should not be lowered below ground level.
- Lifting into buildings or higher levels is possible with lorry crane attachments approved by manufacturers. Proper planning and training must be conducted for the lifting team.
- The load should be free to be lifted and not fixed or attached to other structures.
- Do not lift or swing load over any person.
- Do not use the crane boom to create a downward movement or force.
- Always operate the crane by standing at suitable locations where the load can be seen clearly.
- Do not leave a load suspended when the operator is not around.
- If a winch is mounted to the boom and used for lifting, do not exceed the winch or winch line capacity.
- Watch out for any change in stability as the load is extended. For example, the operator must always keep an eye on the outriggers and stabiliser pad during the lifting operation.

7. Safety Devices

7.1 Audio Warning System

For cranes which can be fully stowed, a limit switch is to be installed at the base of the crane and linked to an audio buzzer in the driver's cabin.

When the crane boom is fully stowed, it will rest on a mechanical lever of the limit switch. When it is not fully stowed, the lever is lifted and this triggers an audio warning to the driver.

For crane booms which cannot be fully stowed, an angle sensor can be installed on the inner boom instead of a limit switch. This sensor will alert drivers when the crane is not fully stowed and is above its maximum stowed height.

There are two types of audio warning systems to alert the driver when the crane is not properly stowed:

Limit Switch Audio Warning System

A limit switch audio warning system consists of a mechanical lever switch linked to an audio buzzer in the driver's cabin. The limit switch is installed at the base of the crane (or home position) and the crane boom rests on a lever of the limit switch when the crane boom is fully stowed. When it is not fully stowed, the mechanical lever will be lifted, and the buzzer in the driver's cabin will be activated to warn the driver that the crane is not fully stowed.

Angle Sensor Audio Warning System

An angle sensor audio warning system consists of an angle sensor linked to a warning buzzer in the driver's cabin. The angle sensor could be installed on the inner crane boom and measures the angle of the inner crane boom. When the crane is raised above its maximum stowed height, the buzzer in the driver's cabin will be activated to remind the driver to lower the crane boom adequately before moving off.

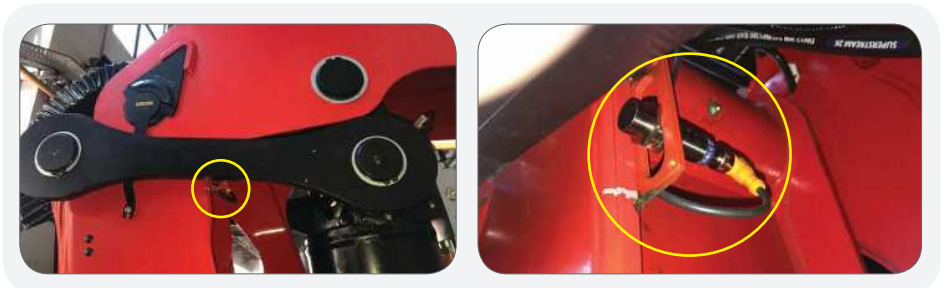


Figure 10: Angle sensor

7.2 Stability Control System

If the lorry crane needs to be deployed in restricted areas where the outriggers cannot be fully extended, the lorry crane must be installed with a manufacturer approved stability control system (SCS - with reference from BS EN12999:2011+A1:2012 Cranes – Loader Cranes) or an equivalent system which ensure the stability of the lorry crane during the lifting operation.

The stability control system includes the Rated Capacity Limiter. This monitors the position of the stabilisers and limits the lifting capacity according to the stabilisers' deployment.

The stability control system also calculates in real time on the permissible working range for any slewing angle of the boom system and for any stabiliser situation. It will stop the crane at non-working range to prevent any overloading or toppling.

7.3 Emergency Stop Button

The emergency stop button cuts off crane operations during an emergency. It should be located near the control panel or at other locations which are easily accessible. All operators must know where is the button located.



Figure 11: Emergency stop button

8. Maintenance

8.1 Maintenance of Lorry Cranes

A lorry crane that is not properly maintained can pose a danger to personnel working in its vicinity. Organisations should ensure that lorry cranes are in a condition for safe operation. Proper maintenance should be done at suitable intervals. The lorry crane operator should also perform daily checks on the crane before operating it. Serious accidents may happen if the checks are not conducted properly, as the equipment could fail at a critical moment.

Planned maintenance regime

The maintenance regime of the lorry crane should be planned and followed closely to the manufacturer's recommendation. A well-maintained lorry crane is more likely to work better and last longer. As maintenance requirements and regimes vary widely from one lorry crane to another, the manufacturer should provide advice or information pertaining to its maintenance schedule and requirements.

Follow the manufacturer's servicing schedule and conditions to ensure the validity of the equipment's warranty.

Pre-use check

Conducting a pre-use check is a simple and useful way to spot potential risks or defects before lorry cranes are being operated. Companies should have in place a system of routine checks to ensure that lorry cranes are in good working condition at the start of each work day or shift. A sample Pre-Use Checklist for Lorry Cranes can be found in Annex 2.

8.2 Proper Storage of Lifting Gears

Ensure all lifting gears (e.g. slings, webbings, shackles and chains) are within the SWL of the lift, in good condition and meet the requirements stated in regulation 20 of the Workplace Safety and Health (General Provisions) Regulations. To ensure that the lifting gears are in good condition, it is important that they are kept in proper storage areas. The following are some considerations for proper storage:

- A clean, dry and well-ventilated place
- Away from the ground or floor
- Away from direct sunlight, UV light and fluorescent light
- Away from sources of ignition
- Away from atmospheric or liquid chemicals
- Away from the possibility of mechanical damage



Figure 12: **Example of proper storage area for lifting gears**

Seek further advice from the manufacturer of the lifting gears on their care and storage if necessary.

9. References

1. Workplace Safety and Health Act (Chapter 354A)
2. Workplace Safety and Health (Risk Management) Regulations
3. Workplace Safety and Health (General Provisions) Regulations
4. Workplace Safety and Health (Operation of Cranes) Regulations
5. Ministry of Manpower Circular – Revised Statutory Examination Requirements for Lorry Cranes
6. BS EN 12999:2011 +A1:2012 – Cranes – Loader cranes
7. ISO 15442:2012 – Cranes – Safety requirements for loader cranes
8. CPA – ALLMI Best Practices Guide for Safe Use of Lorry Loaders
9. SS 536:2008 – Code of practice for the safe use of mobile cranes
10. SS 343: 2014 Specification for Lifting Gear – Part 1: Wire rope slings, Part 2: Hooks, Part 3: Shackles
11. Code of Practice on Safe Lifting Operations in the Workplaces
12. Code of Practice on Workplace Safety and Health (WSH) Risk Management
13. WSH Council's Guidebook for Lifting Supervisors
14. Worker's Safety Handbook for Lorry Crane Operator
15. Worker's Safety Handbook for Rigger and Signalman
16. WSH Council's 6 Basic WSH Rules for Lifting Operations
17. Land Transport Authority – Code of Practice for Works on Public Streets
18. Land Transport Authority – Code of Practice for Traffic Control at Work Zone
19. Land Transport Authority News Release – Measures to Improve Safety of Over-height Vehicles

10. Acknowledgements

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3.	Mr Heng Chien Lung	Wong Fong Engineering Works (1988) Pte Ltd
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Annex 1: Sample Lifting Plan

1. General			
Project			
Location of lifting operation			
Contractor carrying out the lifting operation		Date / Time of lifting operation	
		Validity Period of lifting operation	

2. Details of the Load/s			
Description of load/s			
Overall dimensions			
Weight of load	Kg / tonne	☐ Known weight	☐ Estimated weight
Centre of gravity	☐ Obvious	☐ Estimated	☐ Determined by drawing

3. Details of the Lifting Equipment / Lifting Gears			
Type of lifting equipment:			
Maximum SWL as certified on the LM cert			
Max boom / Jib Length	m	Fly jib / offset	
Intended load radius	(Distant between the load and the crane)		SWL at this radius
Type of lifting gears	(Slings / webbing / chains / shackles / spreader beam / receptacle)		
Combined weight of the lifting gears	Kg / tonne	Certification of lifting gears	☐ Yes ☐ No

4. Means of Communications

Can the operator see the loading and unloading point for the load from his position?

☐ Yes

☐ No

What are the means of communication between the lifting crew?

☐ Standard hand signals

☐ Radio

☐ Others _____

5. Personnel Involved In Lifting Operation

Position	Name	Qualification /Experience
Site Supervisor		
Lifting Supervisor		
Lorry Crane Operator		
Rigger		
Signalman		
Others (Please state)		

6. Physical and Environmental Consideration (please include any details in the space provided)

Ground conditions:	Is the ground made safe (e.g. placing steel plate)? _____	☐ Yes ☐ No
	Are the outriggers fully extended? _____	☐ Yes ☐ No
Obstacles:	Are there any overhead obstacles such as power lines? _____	☐ Yes ☐ No
	Are there nearby buildings or structure, equipment or stacked materials that may obstruct lifting operation from being carried out safely? _____	☐ Yes ☐ No
Lighting:	Is the lighting condition adequate? _____	☐ Yes ☐ No
Demarcation:	Has the zone of operation been barricaded (with warning signs and tapes) to prevent unauthorised access? _____	☐ Yes ☐ No

Environment:	Do not proceed with the lifting operation under the following circumstances: ☐ Thunderstorm and lightning strikes in the area. The ground condition must be checked after a thunderstorm. ☐ Strong winds that may sway the suspended load. ☐ Others circumstances (Please specify).
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7. Sequence / Special Precautions	8. Sketch of the zone of operation:
	(It is recommended to include the initial location, final location and path of the load. It is also important to indicate any obstructions or equipment that may obstruct the lifting operation)

Applied by:		Date:
Name:	Signature:	Time:
Prepared by:		Date:
Name:	Signature:	Time:
Assessed by:		Date:
Name:	Signature:	Time:
Approved by:		Date:
Name:	Signature:	Time:

Note:

1. This is only a sample lifting plan/permit-to-work, and is by no means comprehensive. Users are recommended to include key critical document and information such as load capacity chart, range diagram, rigging method, sling angle etc to ensure safe lifting operations.
2. Further guidance can be obtained from the following collaterals:
 - Guidebook for Lifting Supervisors
 - Crane Operator's Handbook
 - Riggers and Signalmen's Handbook

Annex 2: Sample Lorry Crane Pre-Use Checklist

Vehicle Registration Number

:

Lifting Machine Number

:

Crane Operator

:

Date and Time Inspected

:

S/No	Items to be checked	Yes	No	NA	Remarks
Document and procedure checks					
1.	Check the load chart for safe lifting parameters for e.g. the maximum allowable SWL corresponding to the boom length.				
2.	Check the validity of the certificates for the lorry crane and lifting gear used. (i.e. Lifting Machine and Lifting Gear certificates.				
3.	Check that the crane operating manual and operation log book are in the vehicle cabin. Familiarise with the operation and safety aspects of the specific lorry crane.				
4.	Check with Responsible Person* on the details of the Lifting Plan and Safe Work Procedure established for the lifting operation.				
Physical checks on lorry crane					
1	Check the crane structure is in good condition and there are no physical damages.				
2	Check load bearing components such as telescopic boom, boom accessories, hooks, and safety catch are in good working condition.				

3	Check hoisting mechanism is in good working condition.				
4	Check engine and hydraulic system are in good working condition. Ensure that there are no hydraulic leaks and/or damages.				
5	Check fluids such as hydraulic oil, engine oil, cooling water, battery water and clutch oil are topped up according to manufacturer's recommendation.				
6	Check the condition of all wheels, tire pressure and the proper functioning of all brakes.				
7	The outriggers system is free from defects.				
8	No other physical damages or abnormal noise.				
9	Check that lifting gears to be used are in good working condition.				

Functional checks on crane

1	The following are in good working condition:				
1a	Limit switches				
1b	Boom stow limit switch				
1c	Angle sensor limit switch				
1d	Control levers				
1e	Emergency stop switch				
1f	Remote control				
1g	All boom cylinders				
1h	Slewing function				
1i	Power Take-off				

1j	Stability control system (where applicable)				
1k	Outrigger (including stabiliser leg)				
1l	Overload protection device (where applicable)				
2	No other physical damages or abnormal noise				

If you answer “No” for any of the above, state the condition(s) and its respective corrective actions in the remarks column. Stop all lifting operations and report to the Lifting Supervisor or the Responsible Person immediately.

* “Responsible Person”, in relation to a workplace where a crane is, or is to be, operated by a person means —

(a) the employer of the person; or

(b) the principal under whose direction the person operates the crane;

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