



◀ **BEST PRACTICE GUIDE** **LIFTING OPERATIONS**



MOVING LONDON FORWARD



A best practice guide produced
in collaboration between:



This guide has been completed through voluntary contributions from Crossrail and Crossrail Contractor staff. The guide content has also utilised valuable information supplied by Crossrail subcontractors, namely: Laing O'Rourke, Dragados Sisk Joint venture, GGR Cranes, Lifting Gear UK and Hewdens.

Index

INTRODUCTION	2
HISTORY	3
THE BASICS	4
Lift Plan Basics	5
Team Structure & Roles	6
Competency	7
Communication	8
Slinging	9
Lifting Accessories	10
Lifting with Plant	11
CROSSRAIL ASPECTS	12
Blind Lifting	13
Tight Space Lifting	14
Crane Coordination	15
Lorry Unloading	16
TOP 10 CHECKS	17
LIFTING AFTER CIVIL CONSTRUCTION	19
Spider Cranes	20
MEWPs (Mobile elevated working platforms)	21
Manual Winches & manual gantry cranes	22
Counter Balance Cranes & Vacuum Suction Pads	23
Telehandlers & Pump trucks	24
NOTES	25

Target
Zero

Introduction ▶

The Crossrail Lifting Operations Best Practise Guide has been created using lessons learned from lifting operations across the Crossrail project. The intent of the document is to:

- Raise awareness and improve understanding of lifting operations.
- Act as a reference document for all operatives.
- Demonstrate “what good looks like”.
- Provide Legacy information to future projects.

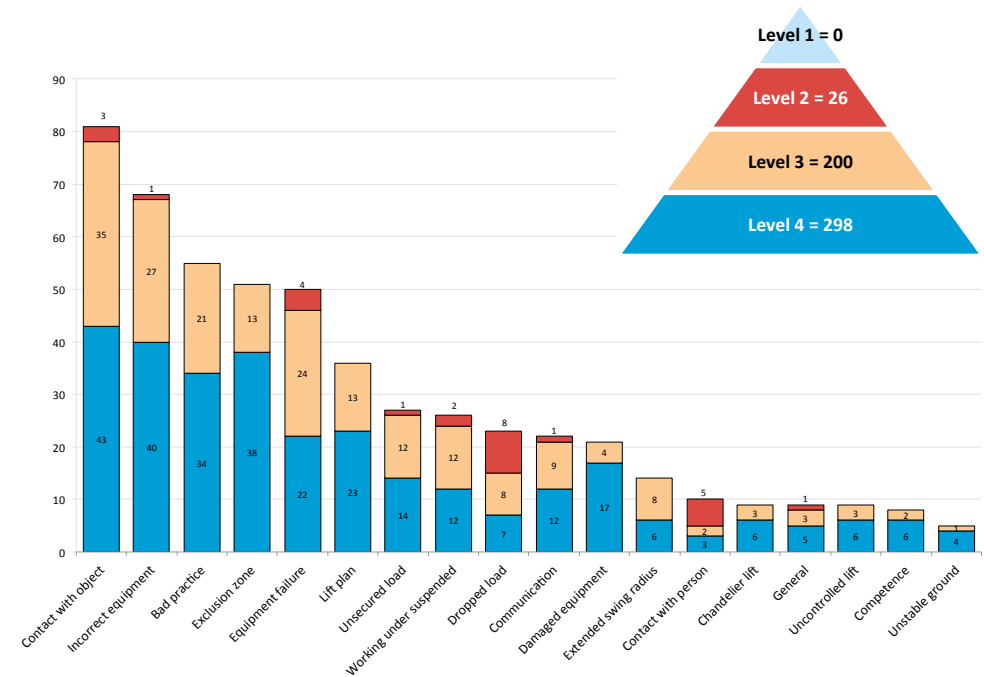
This guide includes references to innovations, developed during the Crossrail project. Details of these are available through the Crossrail Learning Legacy website learninglegacy.crossrail.co.uk

History ▶

- ‘Lifting Operations’ is one of Crossrail's nine High Risk Activities (HRAs). A review of incidents from Period 1, 2013/14, to Period 10, 2014/15, identified 524 incidents in relation to Lifting.
- A breakdown of these by Incident level and classification is provided below.



Lifting Incidents *



Part A – The Basics

This section details topics which are common to all lifting operations

Lift Plan Basics ▶

Do you know?

- What basic information and documents should be included in a lift plan?
- Risk assessment/method statement.
- Letter of appointment roles and responsibilities.
- Crane information, including working radius diagrams.
- Schedule of common lifts (minimum columns):

Item	Weight	Lifting Method	Schematic / Photograph	Notes and Good Practise

(Complex lifts should be covered by a separate lift plan).

- Lifting zone control measures.

No item to be lifted without an approved lift plan. The Appointed Person should be immediately informed if one is not in place.

Have you considered?

- The site layout and how it will change with time.
- Construction progress (openings: Access/Egress) and lifting zones.
- Using scaled drawings for mapping.

Crossrail innovations to consider (see Learning Legacy website for details):

- INV00188 LiftPROApp.
- INV00021 Magnetic Logisitic's Board.
- INV00174 Activity Board.
- INV00728 Hazard Identification Meeting.

Team Structure & Roles ▶

Do you know?

To execute safe lifting practise it is important to know and understand the roles and responsibilities of team members.

There are three key positions for planning and executing lifting operations:

Appointed person

Responsible for planning and controlling all aspects of the lift, (producing the lift plan, method statement, risk assessment and choosing the crane and accessories).



Crane Supervisor

Responsible for supervising the lifting operation and ensuring the lift plan is adhered to and the method statement is followed.



Slinger/Signaller

Responsible for attaching/detaching the load and directing the crane using the agreed signalling method.

Have you Considered?

In tunnelling environments such as Crossrail, there are further key roles which will interface with lifting operations:

- **Pit boss** – Overall responsibility for ensuring the safe and efficient execution of works within an area and liaising with Shift Managers, Shift Engineers, Lead Miners and other Pit Bosses.
- **Lead miners** – Responsible for ensuring safe and efficient execution of works within their work area and liaising with Shift Managers, Shift Engineers, Pit Bosses and other Lead Miners.
- The level of competence and the quality of communication are also major aspects for the execution of safe lifting practise.

Competency ▶

Do you know?

- The relevant qualifications of team members related to lifting activities should be approved and recorded.
- Lifting operatives must have a valid CPCS card (Red: Trained Operative, Blue: Competent Operative) or ALLMI (Association of Lorry Loader Manufactures and Importers).
- Training and mentoring should be ongoing for everyone (red card operatives need a minimum 300hrs to be eligible to apply for blue card).

Crossrail innovations to consider (see Learning Legacy website for details):

- INV00239 Interactive Induction.
- INV00758 Coloured Armbands after Briefings.



Have you Considered?

- Competence verification including onsite practical.
- New starters or red card holders, to have documented mentoring until competence is approved.
- CPCS qualification achieved in the language of Project working.

Communication

Do you know?

There are various Communication styles:

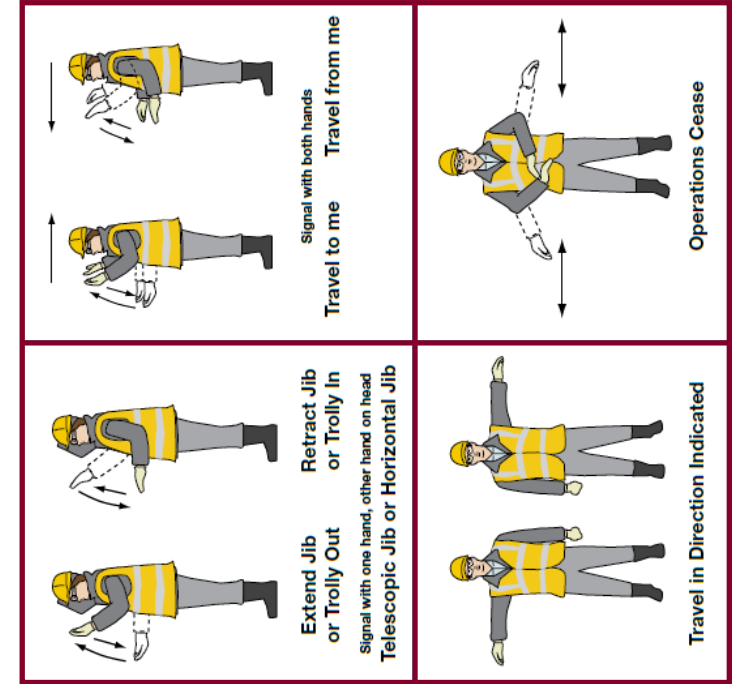
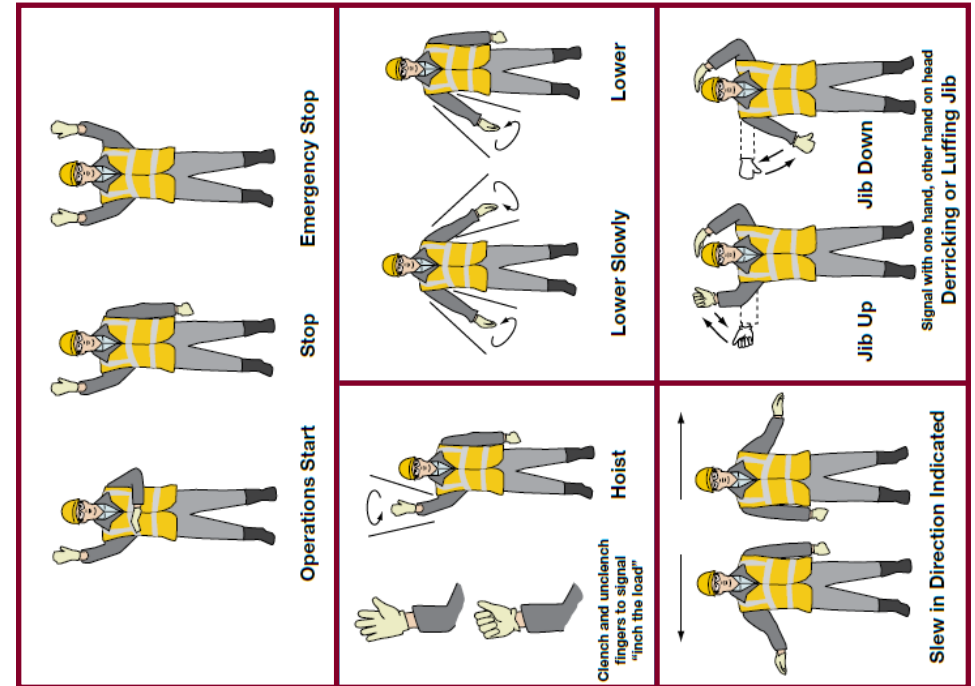
- Audible Communication: Conversation, Radio, Head Sets, Alarms.
- Visual Communication: Hand Signals (BS7121), Signage, Lights, Site Plans.
- Physical Communication: Barriers, Vibration alarm.

Have you Considered?

- Meetings (daily/weekly and task start briefings).
- Forums (Share knowledge and Improve site operations).
- Signage / Exclusion zones to have regular reviews.
- Variation of the lifting warning sound to avoid local workforce becoming desensitised.

Crossrail innovations to consider (see Learning Legacy website for details):

- INV00216 Wind Alert Levels.
- INV00015 Safety Peer Review.
- INV00045 Safety Glove Messages.
- INV00174 Activity Board.
- INV00021 Magnetic Logistics Board.
- INV00239 Interactive Induction.
- INV00810 Wireless Banksman Alarm.
- INV00073 MyZone.
- INV00089 Green Beacon.



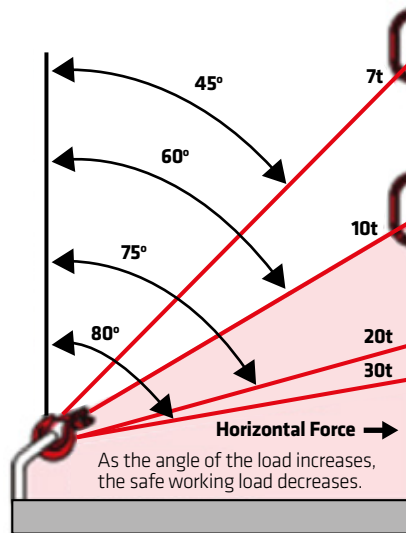
Slings

Do you know?

- The Lift Plan (Item, Weight, Lifting Method, Lifting Points, extra notes).
- Manufacturer's lifting Instructions.
- Lifting accessories and their correct attachment configurations.
- Common slinging arrangements (pictures).
- Crossrail do not allow Chandelier Lifts.
- Any lift not in the schedule of common lifts, should have its own bespoke approved lift plan signed by the Appointed Person.



- Conducting a test lift (should be conducted for all lifts).
- The slinging method and the associated reductions to the load capacity.
- The security of the load (An extra method may be required to secure the load, i.e a ratchet strap).



Crossrail innovations to consider (see Learning Legacy website for details):

- INV00562 Bespoke Lifting Cage.

Have you Considered?

- Are the slings single use, will multiple lifts be required.
- How you will safely attach and detach the load.
- Where will the centre of gravity will be.

Lifting Accessories

Do you know?

- Which accessories can be used for which loads.
- How to correctly inspect you accessories before and after each use.
- When the equipment was formally inspected (Maximum 6monthly- which colour code is currently active).
- How/where to quarantine/discard defective or damaged equipment.
- Crossrail do not approve the use of 1 Tonne single-use bags, as a lifting container, in and out of a shaft. They should be placed in a lifting cage of other approved lifting container.

Have you Considered?

- Checking the lift plan for recommended accessory to be used.
- The reduction in load capacity due to lifting accessory and slinging method.

		Single leg in-line	Single leg choked
Sling Material	Chain	1	0.8
	Wire Rope	1	1
	Webbing	1	0.8
	Fibre Rope	1	0.8
	Round	N/A	N/A



Single leg in-line



Single leg choked

Lifting with Plant ▶

Do you know?

- The safe working load limits (WLL) of the plant.
- Each lifting plant requires its own lift plan, tracked lifting should be included in the schedule of common lifts.
- Excavator lifting requires additional CPCS qualification.
- All excavators lifting loads over 1t must have an installed Safe Load Indicator (SLI) and must have check valves.
- Lorry Loader (hiab) require an offloading check sheet with test certs and driver competency.

Have you Considered?

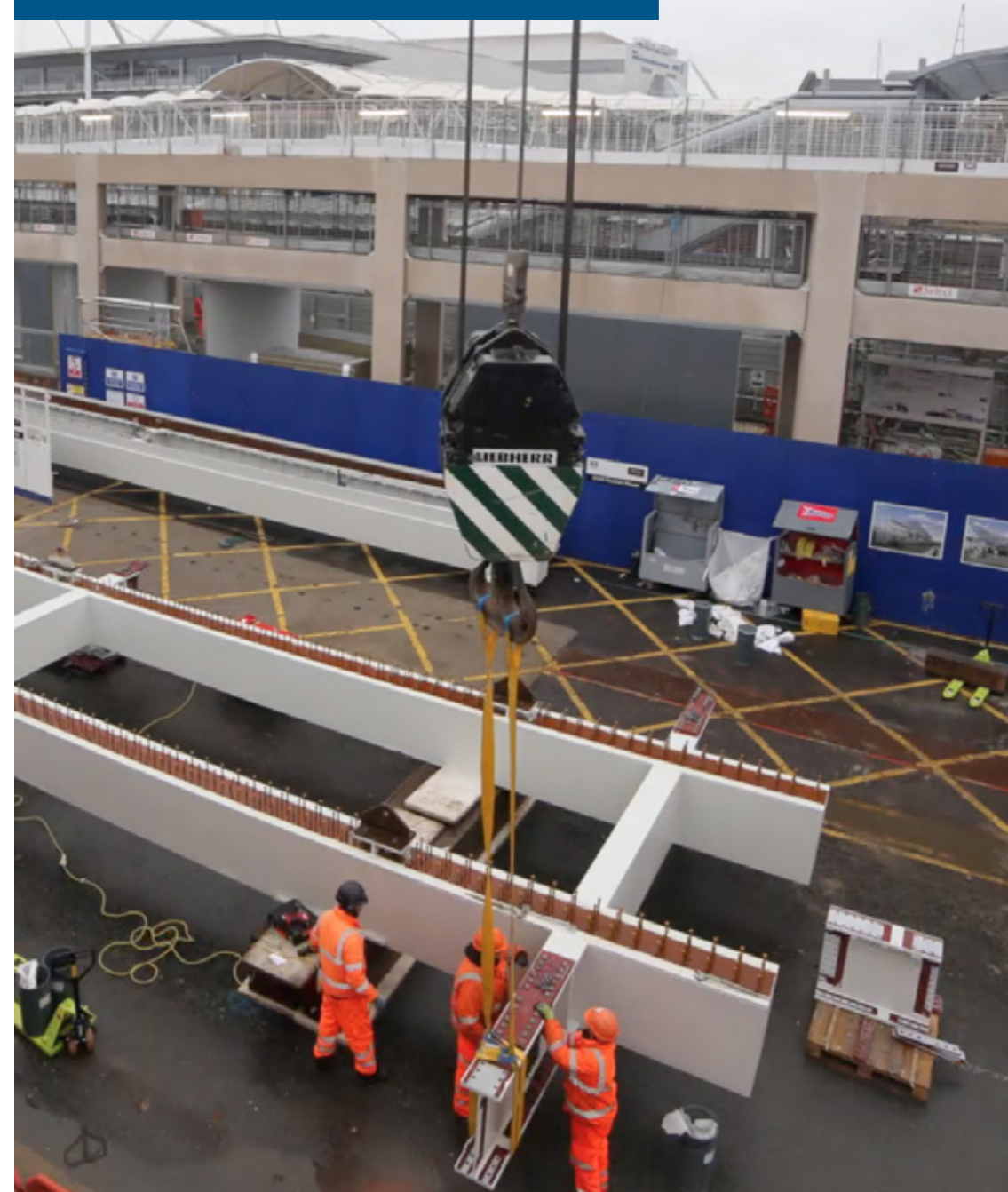
- The suitability of selected plant and lift plan.
- The ground stability and slope of your lifting area, (Beware of slopes and excavations).
- How the load will move/rest when tracking during lifting.
- The tracking route and interface with pedestrians/other.

Crossrail innovations to consider (see Learning Legacy website for details):

- INV00144 360Degree CCTV.
- INV00740 Optronics.
- INV00352 Lifting of Plant.
- INV00504 Excavator Warning Lights.

Part B – Crossrail Aspects

This section details topics which common to the Crossrail project



Blind Lifting ▶

Do you know?

Blind lifting associated incidents are typically related to:

- Communication.
- Load path and when the load becomes blind.
- An understanding of the blind zone (layout, exclusion zones, controls in place, personnel, etc).

Have you Considered?

- Communication method between all members of the lifting team.
- Can at least one slinger/signaller see the load throughout the entire lifting operation.
- The noise in the lifting environment.
- Adopting the “Two second rule” when the driver loses contact with the slinger the lift is ceased until communication has been re-established. (Radio’s: check your battery and have a spare one to hand).
- That the jib is centralised over the load prior to lifting.

Crossrail innovations to consider? (see Learning Legacy website for details):

- Hook Cam mounted on the hook block to assist the crane driver.

Tight Space Lifting ▶

Do you know?

- Tight Space lifting is often similar to Blind lifting, though communication problems are heightened by dimensional issues with the load and proposed load path.
- The dimensions of the load.
- The dimensions of the opening/ load path.
- What is creating the obstructions? Propping systems, electrical/mechanical services, Scaffolding/ Edge protection (Think: Risk, Mitigation, Recovery).

Have you Considered?

- Slinger/Signaler safe location and sufficient visibility of the load path.
- Off level slinging and associated effects to load capacity.
- Utilising a lifting bag/quiver.

Crossrail innovations to consider? (see Learning Legacy website for details):

- INV00562 bespoke Lifting cage.



Crane Coordination▶

Do you know?

- Crane coordination increases the demand for clear, concise designation of roles and responsibilities and associated communication.
- Interface Construction Documentation.
- Load Path interaction with working zones and site boundaries (multiple principal contractors).
- How to programme a lift (daily/ weekly crane coordination meetings).
- Who has overall responsibility and control for each lift.

Have you Considered?

- Oversailing of the load (clear defined boundaries).
- Utilising SMEE restrictions.
- Notification of lifts and implementation of temporary exclusion zones (typically for over sailing: signage, alarms, lights).
- Different lifting warnings for different cranes.

Crossrail innovations to consider? (see Learning Legacy website for details):

- INV00021 Magnetic Logistics Board.
- INV00073 MyZone.
- INV00089 Green Beacon.
- INV00810 Wireless Banksman Alarm.
- INV00146 Collaborative Planning.

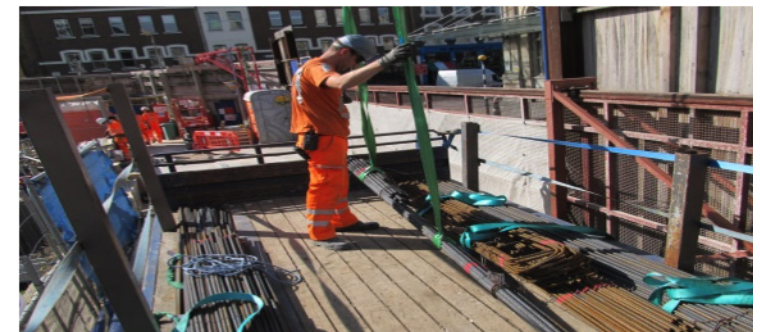
Lorry Unloading▶

Do you know?

- Is the load pre-slung or will it require slinging.
- Can the load be attached from ground level.
- Is assistance required to sling the load.
- Is there a safe method to access the load; walking route on the lorry bed, working at height (edge protection, harness, designated anchor points, rescue plan).
- Is there other materials on the lorry bed preventing safe access or lifting.

Have you Considered?

- Can the lifting operator see the load and the full surrounding environment.
- An exclusion zone to prevent people entering a pinch point or crush zone.
- Can the lorry access site to a location that will require a singular lift to storage or delivery location (avoid double handling).
- Is there sufficient space allocated for delivery (avoid stacking and double handling).



Part C – Top 10 Checks

The section details a simple checklist to consult prior to lifting operations



Top 10 Checks ▶

Before

- Have you checked the Lift Plan?
- Have you inspected the equipment for damage?
- Is the load secure and will it be stable during lifting?
- Are all staff ready to commence and in positions of safety?
- Where is the lifting/load path/laydown areas?
- Will there be communication or visibility difficulties during the lift?
- Is the load path clear? Communicate the start of the Lift.
- Has a practise lift been performed?

After

- Have you inspected the equipment for damage?
- Is there anything which could be improved?

Part D – Lifting after Civil Construction

This section details lifting plant to be utilised in the future of the Crossrail Project



Spider Cranes

Regulation

- Operatives should be CPCS A66 qualified.
- Check and utilise as per manufacturing specifications.
- Check regulation safe working load of the crane, Spider cranes should have a safe load indicator.
- The maximum wind speed a spider crane should be used is 10 meters per second.

Ticks / Do's

- Check for a firm and level ground. Testing and outrigger mats may be required.
- Lift plans are required. Spider cranes always require a lift plan.
- All loads to be attached and detached by CPCS accredited slinger signallers.

Crosses / Dont's

- Do not feel pressured to utilise plant up to its safety limits. (ie wind speed 10m/s). Always access the conditions as per the environment.
- Do not use if you are not qualified, have not been briefed, are not familiar with the plant.



MEWPs ▶

(Mobile elevated working platforms)

Regulation

- There must be a rescue plan in place in the unlikely event that someone is injured or equipment fails.
- Operatives must be able to prove competence and training by holding IPAF or CPCs accredited qualifications.

Ticks / Do's

- MEWPs come in all shapes and sizes, from Boom lifts (articulated and telescopic lift) to scissor lifts (vertical lift). Use the right MEWP for the task.
- Sequence activities to minimise risks when utilising a MEWP. (Obstructions, Concurrent Works, Entrapment, etc).

- Try to eliminate working at height if possible. If a MEWP is required, having a banksman is considered best practise.

Crosses / Dont's

- Use unsecured tools and materials. Make sure equipment cannot fall and set an exclusion zone below a MEWP.
- Utilise a MEWP without considering the working environment. Be cautious for entrapment and overturning.



Manual Winches & manual gantry cranes ▶

Manual Gantry Cranes

- Must be used by operatives who have been familiarised with how to operate this equipment.
- Must not exceed safe working load at any time.
- Ground conditions must be suitable for the gantry crane to manoeuvre with a load.
- The person operating the gantry crane must assess the planned route prior to operation.
- Consider the motion of the load when manoeuvring (swinging of the load).
- Should have a lift plan.



Manual Winches

- Firstly check that the equipment is fit for use and that there is no damage to the equipment.
- Never exceed the safe working load (This should be visible on the equipment!)
- Should always establish where the centre of gravity of the load is by assessing the load prior to lifting.
- Must have regular inspections, which should be documented. Always visually inspect before use.



Counter Balance Cranes & Vacuum Suction Pads

Counter balance crane

- Should be fit for use with no damage to hook or crane.
- Should not exceed the safe working load. If this is not clearly marked – do not use the equipment.
- Operatives must have been familiarised with the piece of equipment and prove competency before use.
- Must be used in accordance with manufacturers specifications.



Vacuum suction pads

- Must be regularly inspected and documented.
- Must be the correct type of suction pad suited to the material it is lifting.

- It is best practice to have a fail safe mechanism e.g. dual action suction pads.
- Exclusion zone under the lifting operation are mandatory.



Telehandlers & Pump trucks

Telehandler

- It is essential that you first look at the load and whether it is suitable for transportation.
- Ideally lifting of materials will have specified points for the forks to be placed. On occasions this will not be available, materials should be positioned to be evenly balanced across the forks.
- The route for transportation is key as you aim to have a steady load at all times whilst in transit.
- If a pallet is being used, check for damage before every use, quarantine damaged pallets.
- Underslung loads only to be permitted when operators have undergone additional CPC Cat E training (suspended loads) covering this activity.



Pump Trucks

- Instead of using telehandlers or forklift trucks to move palletised materials you can use pallet trucks.
- Pump trucks must be suitable for the load to be lifted and must be used within the manufacturer specifications.
- This method reduces manual handling but still requires manual labour to transport the load.
- Ground conditions must be suitable for transportation via a pump truck.
- Check the pallet is not damaged before every use, quarantine damaged pallets.



Notes

Notes

