

Mobile crane

Note: It is recommended that you read the Supporting Information page before you read this factsheet.

Preparation and completing work *(Preparation)*

- Mobile cranes are cranes mounted on a wheeled or road vehicle-based chassis. They have a rotating upper structure fitted with telescopic boom, and the capability both to slew through 360 degrees and vary the working radius. Although equipped with stabilisers for static duties, they also have the capability, in some cases, of travelling with a load. The majority of mobile cranes travel on the public highway to their place of work, which can involve large distances.
- Although mobile cranes tend to be operated by dedicated operators, accidents and incidents do occur, particularly because of instability, and this factsheet aims to highlight some of the factors involved incidents that can and have occurred. Proper pre-use checks are a requirement for the safe operation for any type of plant, including mobile cranes, and the operator is expected to undertake these at the required intervals. As with all plant and machinery, failure to properly check all relevant crane components before work could mean that incidents or injuries occur because faults can affect both performance and safety.
- Checks and inspections that need to be made are indicated in the operator's or user's manual for the crane. Although the frequency of checks will be determined by the manufacturers, unusual operating conditions may require more frequent checks, such as when lifting in adverse conditions such as cold, heat or inclement weather.
- All cranes including mobiles must undergo regular thorough examinations during which all components are thoroughly examined by a nominated competent person. Although regulations suggests every 12 months, it is stated that the competent person will determine when these examinations take place as cranes used in a harsh environment or used continually near maximum capacity may need more regular thorough examinations.
- Although operators tend to undertake the daily checks, they should only undertake in-depth weekly checks and adjustments if they have had the additional training for the checks required on that model of crane.
- A requirement under legislation is the devising of a lift plan for the particular lifting operation that is to be carried out, as constructed by the lift planner/appointed person. Amongst many factors, the lift plan would have identified all risks, the measures to be taken, the sequence of work and the number of personnel involved in the lifting operation.
- It is also important for all those involved in the lifting operation to be informed of the contents and required actions. All personnel, including the operator, must take note of the lift plan contents and what is required of each individual as they may notice an error or that something is not correct or missing.
- The operator should immediately relay any concerns about the lift plan to the lift supervisor or appointed person/lift planner if they are present. If the lift plan needs amending before or during the lifting operation, only the lift planner/appointed person is allowed to alter the lift plan.
- The method statement should further identify additional external operations that may affect the lifting operation, such as nearby tower cranes. If the mobile crane is working close to a tower crane, the sequence of operations should be determined before work starts and on larger sites, where there may be various crane operations happening at the same time. A crane-co-ordinator may be present and it is them who will determine the sequence of work between each crane and lifting team.
- When work has been completed at the end of the shift or before a break, the boom of the mobile crane must be lowered sufficiently so that there is no risk of striking the jib of the tower crane. This is particularly important at the end of the shift, as the jib of the tower crane must be placed into free slew, and will weather vane or be moved by the wind direction.
- When it arrives on site, the crane may need to travel to the place of lift, which can involve manoeuvring within busy or restricted areas. The travel route must be clear of all hazards, other vehicles and personnel. All members of the lifting team need to identify any hazards or obstructions and inform the site manager. It is they, and not the lift planner, who remains responsible for ensuring that there is clear and unrestricted access to the place of lift.

Lifting practices and working with others *(Working tasks)*

- All lifts should not only be planned but the crane must also be kept within the rated lifting capacity for the relevant configuration e.g. radius, height and boom length. Many types are also equipped with an extension or jib, which is usually stowed on the boom and swung-around when required to increase the height and reach.
- The crane's rated capacity indicator (RCI) provides warnings to the operator and others nearby when the crane both approaches and exceeds maximum rated capacity for the configuration. Some RCIs can be overridden but this is purely for diagnostic and testing purposes during the maintenance programme. They must never be overridden by anyone during lifting operations, otherwise over-lifting could put the crane at risk of overturning.
- All cranes, including mobiles, are designed to lift a load vertically. This means that the hook of the crane must be placed directly above the centre of gravity for the load, not the centre of the load. Depending on the load, the measured centre of the load and the centre of gravity of the load (the point that it is in balance) is not always at the same place.
- If the hook is offset to the load, when the load is at the point of lift, it can drag along the ground – if the load snags whilst being dragged, an overload can occur.
- The rated capacity of a crane only applies to a freely suspended load, and does not apply at all times or for all situations. For example, if a load is still attached to a structure, vehicle etc. or embedded in the ground, the increased resistance when being lifted can overload the crane.
- The lifting of personnel in a specifically-designed personnel carrier can take place providing a specific method statement is undertaken for the lifting of persons. This would include additional considerations such as an additional number of thorough examinations (6 monthly) and plans for evacuation at height in case of emergencies or crane malfunction.
- Lifting operations take place in a variety of places, including near or next to areas with public access. The area of lift and the area of placing the load must be segregated from pedestrians. This also applies to a site where non-lifting personnel, such as other workers, must be kept clear of the lifting and landing areas.
- Lifting guidance states that wherever possible, the moving of a suspended load above other workers or pedestrians should firstly be avoided. Only where this is not possible can other measures such as netting around a load or additional securing or protection features then be considered.

Working safely and at height *(Working safely)*

- Conditions on site need to be taken into account before, during and after work. The boom must be kept well clear of any overhead power lines. Guidance issued by the energy networks utilities indicates what minimum distances must be kept from overhead power lines and the higher the voltage in the power line, the greater the distance that must be kept. This is to reduce the danger of arcing if the boom is close to but not actually touching the power line.
- Wind speeds should be regularly monitored so that they are below the maximum authorised speed as stipulated by the crane manufacturer. Gusts of wind may also need to be taken into account, even if overall wind speeds are below the set limit. Loads with a large surface area can, in high winds, move and/or swing, making the hoist rope go out of line vertically, which could cause the crane to go out of radius.
- Mobile cranes can generally only lift loads when the crane is level both longitudinally (forward/backward) and laterally (sideways). The stabilisers provide some levelling effect on shallow slopes. If a heavy load is lifted and the crane is not level laterally, the load will be hanging offset, placing a side loading on the boom or jib.
- Excessive lateral leaning could cause the crane to become unstable and overturn, particularly as the load is raised higher. Slewing with a load, especially one that is near to the rated capacity for the configuration, needs to be undertaken with caution as slewing too fast can cause the jib or boom, again, to be subjected to additional side stress. This could also cause the load to overshoot the landing place and strike a structure or object.
- Pre-use checks or reconfiguring requires, in most cases, access to many parts of the crane that in some cases requires working at height. Where a portable ladder is being used to access part of the crane, amongst other requirements, it should be secured and there should be at least three rungs or a minimum of 1 metre beyond the

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landing level. Where temporary or inbuilt access ladders are being used, there should be sufficient foot penetration on each rung – that is, the centre of the foot can reach the rung, providing sufficient foot grip and minimising any slipping.

Travelling to and from sites *(Travelling)*

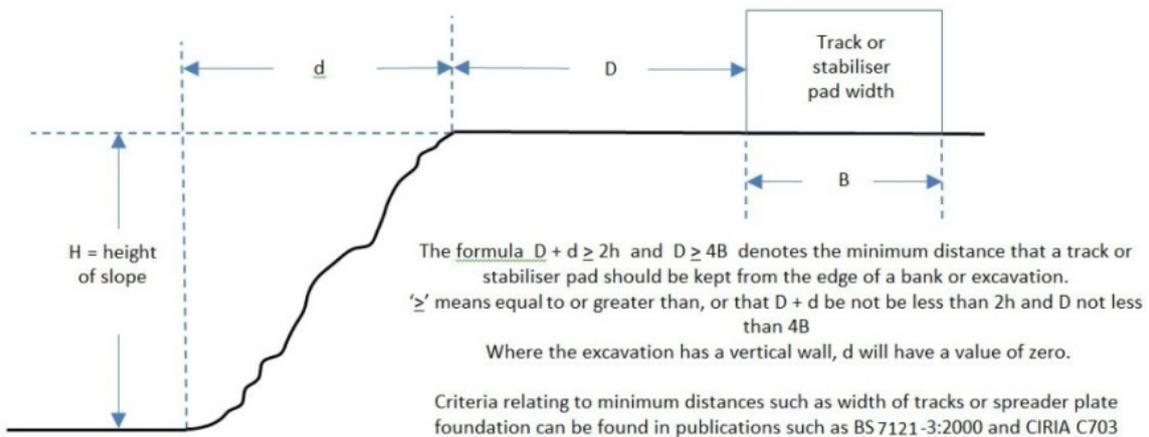
- Mobile cranes, in most cases, spend a reasonable proportion of their working time travelling to and from a site for which Road Traffic Act requirements need to be followed. Before joining the public highway, the overall height of the vehicle when it is in road transport configuration needs to be checked and noted.
- Under the Road Traffic Act, the height of the vehicle when it is above 3 metres must be displayed in the cab. Bridge strikes by over-height vehicles are common. Traffic warning or prohibition signs on or at bridges show the maximum permitted vehicle height when the bridge height is less than 16 foot 6 inches/5.03 metres. Bridges that have an arch tend to have goal posts which the crane must be kept between.
- If a crane does strike a railway bridge, the first course of action by the driver or other person is to immediately call the telephone number shown on the bridge, quoting the bridge number.
- When a large crane having an authorised mass in excess of 100 tonnes is travelling on the public highway, an escort vehicle is required, which must have constant contact with the crane driver.
- Oil leaks that are present prior to the crane driving on the public highway must be addressed before the crane can travel. Road users have been fatally injured after oil leaking from a mobile crane contaminated the road surface.
- When travelling to a site or even on a site, the crane may need to travel or manoeuvre on temporary roadways or haul roads. In some cases this can involve large distances and driving up or down long inclines.
- In most cases, these types of temporary roads do not have kerbs. Driving too close to the edge of a temporary or minor roadway can (and has) caused the sides of the roadway to collapse and cranes have been known to overturn when driving too close, severely injuring the driver.
- Travelling in urban areas means that there is a risk of contact with vulnerable road users such as pedestrians and cyclists. Studies have shown that cycle-related incidents have occurred when at road junctions, the cyclist are positioned alongside the front nearside corner of the vehicle or just in front, after weaving through stationary traffic. They are situated in the driver's potential blind spot and when the vehicle turns, accidents and fatalities have occurred.
- Even if indicating, drivers must ensure that there are no pedestrians or cyclists alongside the vehicle before turning left or right, and if need be, wait until the cyclist or pedestrian has left the danger zone. Drivers must further scan all their mirrors when approaching junctions in case cyclists or pedestrians enter the blind spots.

Stability

- Due to the various factors mentioned, mobile cranes have become unstable and overturned, with the usual costly consequences. Effective planning of the ground conditions, working area and other environmental factors must be taken into account before setting up.
- Ground conditions naturally play an important part for stability and a suitable and competent person should ensure the ground can support the bearing pressure applied through each outrigger for all expected loads and configurations.
- Ground conditions are crucial for maintaining stability of a mobile crane during operations. The lifting team, including the operator, need to take into account changes to the ground, such as heavy rain which can weaken the ground and cause instability.
- Ground conditions must be checked by a competent person not only for static lifting duties but also when a load needs to be travelled (pick and carry duties). The sinking of one or more of the outriggers has caused cranes to exceed maximum radius and an overturn can or has occurred.

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- When a crane is being moved from one lifting location to another within the same site, it is normal to only partially de-rig the crane. This has meant that, in certain instances, the upper structure has rotated during travel as it was not correctly locked or braked to the chassis, with the result that the crane has tipped up or tipped onto its side.
- Working near to the edge of a bank or trench has caused accidents. A minimum distance needs to be kept from the edge as the ground is liable to give way and collapse. Guidance indicates that the horizontal distance that an outrigger of a crane must be kept from the edge of an unsupported vertically walled trench is twice the height of the trench.
- If the trench has a sloped edge, the horizontal distance from the foot to the top of the slope is added to the horizontal distance from the top edge of the trench to the crane. The diagram below indicates the minimum distance required.



Sample questions

The following questions are based on the text within this factsheet and indicate how the questions and answers are structured. Based on the factsheet, there is only one correct answer. The correct answer to each question is indicated at the end of this factsheet.

Q1. How can excessive rain affect the stability of a mobile crane?



Timber matting can soak up water



Water can soften the supporting ground



The outrigger legs can slip from any support matting



Additional lifting accessories may need to be used

Q2. If the travelling height of the crane is above 3 metres, which of the following is a requirement under the Road Traffic Act?



The driver must have attended a Driver CPC course



The correct maximum height of the crane must be displayed in the cab



The driver must be in possession of their driving licence



The individual axle loadings must be displayed in the cab

Study checklist

This checklist aims to act as a study aid to ensure that the reader has identified and understood the relevant parts of this factsheet.

Do you know?

1. What the purpose of a thorough examination is and who or what decides when it should be undertaken.
2. What should be contained within a lift plan.
3. Why the lift plan information must be disseminated to the lifting team.
4. The procedures that should be followed if several cranes are working within the same area.
5. Who needs to ensure that the crane travel route on site to the working area is clear.
6. When does the rated capacity of the crane apply.
7. Why the hook of the crane must be located directly above the load's centre of gravity.
8. Under what conditions can the lifting of people take place.
9. What the conditions are if a suspended loads has to moved over other workers or the public.
10. Why minimum distances are specified when working near to overhead power lines.
11. How high winds speeds can affect the lifting operation.
12. The effects on the crane if it is not level when carrying out lifting operations.
13. What can happen if a load is slewed too fast.
14. How the operator is affected by working at height requirements.
15. How ground conditions can have an effect on the stability of the crane.
16. What the recommended minimum distances are when working near to an edge or excavation.
17. What the requirements are to avoid bridge strikes.
18. How driving on temporary roads can affect crane stability.

Answers to sample questions: Q1: B and Q2: B