

Tower crane

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

Preparation and completing work *(Preparation)*

- Tower cranes are commonly used within the construction sector on a wide variety of projects and are usually in place for most of the project. Two main types of tower crane are the horizontal trolley jibs and the luffing jib.
- Pre-use checks are a requirement for the safe operation of tower cranes for which the operator would undertake at the required intervals although some check may be made by the maintenance team at the required intervals.
- If the operator or maintenance staff fail to properly check all relevant parts and components of the crane, incidents or injuries could occur because faults have affected both performance and safety.
- Checks and inspections that need to be made are indicated in the operator's manuals or other official documentation for the crane. Although the frequency of checks will be determined by the manufacturer, extreme or unusual operating conditions may require more frequent checks.
- All cranes including towers 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.
- A requirement under legislation is the devising of a lift plan for the particular lifting operation that is to be carried out, constructed by a lift planner/appointed person. Amongst many factors, the lift plan would have identified all risks, the measures to be taken to mitigate those risks, the sequence of work, the number of personnel involved in the lifting operation and the weight of any loads that are to be lifted.
- It is also important that all those involved in the lifting operation have been informed of the lift plan's contents and actions required of them. 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, and in which an incident could occur.
- The main duty of the crane operator is to only lift loads that are detailed in the lift plan. They should immediately relay any concerns they have with the lift plan or operation to the lift supervisor or appointed person/lift planner, particularly if they are asked to lift loads not in the plan.
- 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 lift plan should identify additional external operations that may affect the lifting operation, such as nearby tower and mobile cranes, with the sequence of operations determined before lifting operations begin.
- If the tower crane is working close to other cranes, the order of work should be determined before work starts and on larger sites, where there may be various crane operations, a crane co-ordinator may be required to determine the sequence of operations.
- As the cranes can stay on a site throughout a project, access to the base of the tower and the conditions for an access route can change frequently. The site manager remains responsible for ensuring clear and unrestricted access to the tower base; although the operator and or members of the lifting team should identify any hazards or obstructions they see and inform the manager immediately.
- The access ladders in the mast should be kept clean and free of all obstructions to allow the operator (or others such as maintenance staff) to climb the ladder without hindrance.
- If tools or small items of equipment need to be taken by the operator (or others) up to the cab or jib area, guidance suggests that a suitable method of carrying equipment is the use of a small rucksack that is worn on the chest of the individual.

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- On completing work, typical practice for trolley jib types in normal conditions is to place the hook block at minimum radius, with luffing jibs left at the radius prescribed by the manufacturer's or the company's procedures.
- The jib must also be placed into the out of service condition according to manufacturer's instructions for that model type and year of manufacture, and able to free slew to minimise the area presented to the prevailing wind and that a check must be made to ensure that, when weather vaning (changing direction in the wind), the jib will not collide with nearby cranes, plant or structures.
- Post work checks should be undertaken following company procedures so that, if a fault or defect is identified, the maintenance team can carry out early repairs and minimise downtime.

Working safely and with others *(Working safely)*

- Lifting operations occur in a variety of places within the radius of the crane, including near or next to areas with public access. The area of lift and the area of placing the load must be segregated from nearby pedestrians and should be planned before work starts by the appointed person.
- 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.
- On a site with a multitude of tower cranes, nearby cranes, structures and other plant such a boom-equipped concrete pumps, there is a risk of collision. Anti-collision systems are fitted to minimise contact but operators need to be aware that these systems in general only work with other tower cranes, and not with other types of crane or plant.
- Radio communication is now the commonest form of contact between the ground-based team and the operator, but the operator needs to ensure that they are receiving the correct instructions intended for them and not for operators of nearby tower cranes.
- It is recognised that, when with working with a number of various contractors and teams on site, that the crane operator can be under pressure as everyone seeks to meet schedules and deadlines. The result has been friction and arguments over contentious issues between the lifting team and other workers. Guidance provided by tower crane employer groups advises that the operator, at the earliest opportunity that issues or concerns become apparent, contacts their supervisor immediately for further advice and direction.
- Conditions on site need to be taken into account before, during and following work. The crane's position should be planned so that all parts of the crane are 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 jib is close to but not actually touching the power line.
- 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 subject the jib or boom to additional side stress, which could also cause the load to overshoot the landing place and strike a structure or object.
- Wind speeds should be regularly monitored so that work is only undertaken when 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.
- Wind speeds should be regularly given to the person acting as the crane supervisor (the appointed person may not always be on site) because the work schedules may need to alter if rising wind speeds force a crane to stop work.
- Loads with a large surface area, such as shuttering, can in high winds, move and/or swing and could cause the crane to go out of radius. Operating luffing jib cranes near to minimum radius needs particular care in high winds has caused jibs to be blown backwards.
- Poor housekeeping (areas of untidiness) is an area of concern to employers. Materials, tools and components on the crane's walkways are both a trip hazard to the operator or maintenance team, and can also cause objects to be knocked over the edge which become falling objects that are a hazard to those below.

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- During a changeover between operators in the cab during, for example, a shift break, the operating controls should be isolated from the time the first operator leaves their seat until the replacement operator is properly seated.
- Although now not very common, operators of tower cranes may still need to access the jib, for which a risk assessment and method statement need to be devised. Not only should fall arrest equipment be specified but that a rescue plan must be in place in case the operator (or other person) falls from the jib.

Lifting practices *(Working tasks)*

- All lifts should not only be planned but the tower crane must also be kept within the rated lifting capacity for the relevant configuration e.g. radius, number of falls etc. The operator should only lift loads that have been detailed in the lifting plan.
- The crane's rated capacity indicator (RCI) provides warnings to the operator 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 and the RCI must never be overridden during lifting operations, otherwise the crane may over-lift.
- Tower cranes 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.
- 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 additional thorough examinations and a plan for evacuation at height in case of emergencies or crane malfunction.

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. What is considered to be the best method for an operator to take small tools and equipment up to the cab?



In a bag suspended from and below the body



In a small rucksack worn on the back



In a small bag slung from the left or right elbow



In a small rucksack worn on the chest

Q2. The lifting of personnel in a carrier is only allowed under what condition?



When the lift supervisor is in the carrier during the lift



When there is a site-specific method statement for the lifting of persons



When it is restricted to maintenance work



When there are no more than two passengers in the carrier

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. Who determines when a thorough examination takes place.
2. What the purpose is of the thorough examination.
3. What should be contained within the lift plan.
4. Why mistakes in the lift plan must be reported immediately.
5. What procedures should be put into place when there are a number of cranes working within the same area.
6. Who is responsible for ensuring that the route to the tower crane base is clear of hazards.
7. What configuration the crane must be in when put out of service.
8. Why post-check works should be carried out.
9. What the procedures should be if loads have to be lifted over persons.
10. How anti-collisions systems work and what their limitations are.
11. What the procedure should be if pressure is applied to the operator when working with a number of contractors.
12. Why minimum distances must be kept from overhead power lines.
13. Why wind speeds must be constantly be monitored.
14. What the effects can be of lifting loads with a large surface area in high winds.
15. About the effects of untidiness in the cab and on the walkways of the crane.
16. In what situation does the rated capacity of the crane apply.
17. What the effects on the crane may be if the hook block is not positioned correctly above the load.
18. What are the requirements and restrictions when the lifting of persons has to take place.

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