TIN 040 — Lifting of Persons with Tower Cranes

This Technical Information Note deals with the use of tower cranes for the lifting of persons. It covers both persons who are at work and those being lifted for the purpose of entertainment.

NOTE: *Tower cranes are supplied as complying with the essential health and safety requirements (EHSRs) of the Machinery Directive 2006/42/EC. As they do not comply with the EHSRs for machinery for lifting persons, their instructions state that persons must not be lifted with tower cranes.*

Once a tower crane has been supplied, its use is governed by the Use of Work Equipment Directive 2009/104/EC (UWED), which states in Clause 3.1.2 of Annex 1 that:- "Without prejudice to Article 5 of Directive 89/391/EEC, exceptionally, work equipment which is not specifically designed for the purpose of lifting persons may be used for that purpose, provided appropriate action has been taken to ensure safety in accordance with national legislation and/or practice providing for appropriate supervision." LOLER is the UK's implementation of the lifting aspects of UWED and consequently the requirements of Clause 3.1.2 have been incorporated in Regulation 5 of LOLER.

1.0 Lifting of Persons at Work

The lifting of persons at work using a tower crane is subject to Regulation 5 of the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER). The Approved Code of Practice to Regulation 5 of LOLER says *"The raising and lowering of people by work equipment which is not specifically designed for the purposes should only be undertaken in* ***exceptional circumstances****, when it is not practicable to gain access by less hazardous means. Where it is necessary to use such work equipment then you should ensure that all necessary precautions are taken to ensure safety, including appropriate supervision."* This means that tower cranes should only be used for lifting persons where it is not possible to use a less hazardous means of access. A less hazardous means is the use of equipment that has been specifically designed for carrying people such as a mobile elevating work platform (MEWP) or a mast climbing work platform (MCWP).

An example of exceptional circumstances is the external inspection of cladding on a tall building above the height where a MEWP could reach and before the window cleaning cradles have been installed.

1.1 *Planning*

BS 7121-1:2006 specifies that the lifting of persons should be classified as a complex lift, consequently it is essential that each lifting operation involving the lifting of persons is individually planned, taking account of all the hazards identified by the risk assessment. In particular the following control measures should be taken into account.

1.2 *Carrier*

The type of carrier selected when raising/lowering personnel should depend on a risk assessment and varies according to the application. New carriers should comply with BS EN 14502-1

1.3 *Compatibility of carrier and tower crane*

1.3.1 Capacity

The tower crane selected to lift the carrier should have a rated capacity at the appropriate working radius (or radii) of at least twice the weight of the carrier and lifting accessories, together with its load of people, tools, materials etc.

1.3.2 Motion control system

The tower crane should be equipped with a motion control system that brings motion to rest automatically when the controls are released. The controls should be checked for correct operation each day before personnel carrying operations are carried out and the check recorded (See Clause 6.5.2 of BS 7121-2-5:2012)

Cranes with free-fall capability should not be used to lower and raise persons unless the free-fall facility is locked out.

Load bearing hydraulic cylinders should be fitted with a device to stop movement in case of hose rupture or pipe fracture.

The tower crane control system should be able to provide a smooth transition of the carrier. The working speed of the carrier should be limited to a maximum of 0.5 m/s on all motions.

Means should be provided so that if the power supply or control system fails, the carrier can be positioned to enable access/egress without risk.

1.3.3 Ropes

Ropes used for hoisting and lowering the carrier should have a minimum diameter of 8 mm.

1.3.4 Hook

The tower crane hook should be provided with a safety catch.

1.3.5 Lifting Accessories

Lifting accessories used to connect the carrier to the tower crane hook should :-

- require a tool to make or break any connection to the carrier and masterlink;
- only to have been used previously for the lifting of persons;
- have a masterlink sized to fit the tower crane hook.

1.4 *Thorough examination and pre-use checks*

Additional recommendations for the thorough examination and pre-use checks of cranes and carriers for lifting persons are given in BS 7121-2-1:2012, Clause 12 and BS 7121-1-5:2012 Clauses 6 & 8.

1.5 *Other devices/facilities*

1.5.1 Anemometer

The tower crane should be fitted with an anemometer or other device to monitor in-service wind speeds.

1.5.2 Storage

Storage accommodation for equipment, including any emergency egress equipment, should be provided in the carrier.

1.5.3 Rated capacity limiter/rated capacity indicator

The rated capacity limiter/rated capacity indicator on the tower crane should be maintained in good working order. Limit switches should be provided to prevent over-hoisting, over-lowering or over-derricking.

The operator should check limit switches for correct operation each day before personnel carrying operations are carried out. Limit switches are not necessarily fail safe and therefore care should be taken if motion limits are approached.

A fail safe procedure should be provided to ensure that sufficient hoist rope remains on the winch drum at all times to prevent the end of the rope running off the drum while lowering the carrier.

To ensure that sufficient rope remains on the drum at all times, the empty carrier should be lowered as a trial to the bottom of the shaft, cofferdam or caisson as follows:

- The first time it is lowered;
- After each time the shaft, cofferdam or caisson depth increases;
- If the tower crane hoist rope is replaced.

Care should be taken when the tower crane is erected in a different location to ensure that sufficient rope is fitted for each operation.

Operation of limit switches, check valves and similar devices could prevent some motions of the tower crane with the carrier still suspended. Precautions should be taken to ensure that persons in the carrier are not left suspended for an excessive period, and/or a procedure for raising or lowering the carrier to a safe position should be provided.

1.6 *Operation*

1.6.1 Organizational requirements

Lifting, lowering and supporting the carrier should be carried out by the operator in controlled conditions from the normal control position, directed by an appointed signaller. The operator must not operate the tower crane from the carrier.

It is essential that the tower crane operator is present at the normal crane control station when the carrier is occupied. Visible and audible communication should be possible between the persons in the carrier and the tower crane operator at all times during the lifting operation. If a wireless control station is used it is essential that it is being worn by the operator whenever the carrier is occupied. The controls must be switched on and the carrier in full view of the operator at all times.

During the operation:

- An adequately trained and briefed person should be present to perform any emergency recovery procedure;
- The tower crane operator and signaller should not perform any other work at the same time. The tower crane operator and signaller should only be responsible for operating one tower crane or directing one carrier;
- Machines should not operate simultaneously in the same place if there could be a risk of collision;
- All movements should proceed gently and not exceed 0.5 m/s.

Load lifting attachments for carriers should not be used for any other purpose.

Carriers should not be used in the following conditions:

- Winds exceeding 7 m/s (25 km/h). Windspeed measurements should be taken using a calibrated handheld anemometer at a similar level to that to which the carrier will be lifted;
- Electrical storms;
- Snow or ice;
- Fog;
- Sleet;
- Other weather conditions that could affect the safety of personnel.

Unintentional rotation of the carrier should be prevented, for example by using guide ropes or anchoring. The means of preventing unintentional rotation should not inhibit any emergency procedures and otherwise interfere with the safe operation of the carrier.

Lifts should not be made on any other hoist lines of the tower crane while any person occupies a carrier attached to the tower crane.

1.6.2 Precautions for persons in the carrier

The payload of the carrier should not be exceeded.

The stability of the carrier should not be affected by the operation.

Additional care should be taken if the carrier is of a length that could lead to excessive tilting through movement of persons or tools within the carrier.

It is strongly recommended that all users of carriers wear suitable full body harnesses with work restraint systems attached to a suitable anchorage point in the carrier. The most suitable type of work restraint system is an adjustable lanyard, adjusted to be as short as possible to ensure that a person is restrained within the carrier. Further information on the use of personal fall protection equipment is given in BS 8437.

Any tools/materials in the carrier should be secured to prevent displacement, tipping and/or falling out.

Personnel should remain entirely inside the carrier during raising, lowering and positioning to avoid pinch points. Personnel should only stand on or work from the floor of the carrier.

Carriers should be secured so that access and egress can be accomplished without danger.

1.6.3 Rescue plans

Consideration should be given to the rescue of persons from carriers if the carrier is unable to be lowered for any reason, such as machine malfunction or carrier entanglement. Any rescue procedure should be properly planned, taking into account the reasons why the carrier is stranded at height and any need for urgent action. In many circumstances the rescue plan simply involves lowering of the carrier by the supporting crane.

In the event that fall arrest equipment is selected, a rescue plan is required to avoid the consequences of suspension trauma when a person is suspended from a fall arrest harness.

1.6.4 Work from a carrier

NOTE: *Exposed electrical conductors in the vicinity of the lifting operation can present electrical hazards. Exposed high voltage conductors can cause electric shocks or burns even if not touched by personnel. If there are electrical conductors adjacent to the work area, seek advice from the owner of the conductor. Overhead lines usually belong to the local electricity supplier or the National Grid company. These suppliers can provide advice on safe working distances from electrical conductors. Additional guidance is given in the HSE Guidance Note GS6 (fourth edition) - Avoiding danger from overhead power lines.*

If electric arc welding is carried out from a carrier, precautions should be taken to prevent stray welding return currents from flowing through the load lifting attachments, tower crane hoist rope, or other part of the tower crane. Electric arc welding should be carried out in accordance with HS G 118. The return welding current lead should be secured to the welded part, as close as practicable to the point of the weld.

NOTE: *Complete insulation of the tower crane hoist rope or use of clean dry webbing lifting attachments can also prevent stray currents.*

Electric powered hand tools, if used, should be battery powered.

Power cables provided to the carrier should not interfere with safe operation of the carrier.

Power cables should not be used as steady lines.

2.0 Lifting of Persons for Entertainment Purposes

The Steering Committee of the Construction Plant-hire Association's Tower Crane Interest Group, has discussed the use of tower cranes for lifting people for entertainment purposes and concluded that tower cranes are definitely not suitable for this activity.