

# City Talk



## TIGHT CONTROL KEEPS TOWER CRANES SAFE

Seeing a lot of tower cranes in construction activities, we never cease to be amazed to watch them growing like trees on top of buildings, rising with the built floors and then suddenly disappearing when the building is completed.

To those familiar with lifting equipment, there are a lot of technology and skills associated with this “magic” show.

The erection process of a tower crane starts with the securing of the mast, in the form of a square vertical truss, to a strong foundation, usually a large reinforced concrete base.

On top of the mast is a turntable that the “hammer head” of the tower crane sits on, with the lifting jib on one end and the shorter counter-jib on the other.

Using a mobile crane next to the tower crane, the shorter counter-jib is installed first, and then the lifting jib is installed in sections to cover the long sweeping arc.

A trolley is installed under the lifting jib to allow the lifting hook to traverse along it. Then counterweights are installed in the counter-jib to balance the great weight that the crane will be lifting, minimizing bending forces in the mast.

This assembly on top of the turntable becomes the slewing unit that will be used for subsequent lifting activities.

As the building gathers height with the construction activity, the slewing unit must be raised to ensure adequate vertical clearance for lifting. This is usually done by extending the height of the mast with additional truss sections.

To achieve this, a collar-shaped truss structure that sheaths the mast on three of the four sides is installed. After climbing to a certain height, the lower part of the collar section is bolted securely to the mast, while structural connections between the upper and lower part of the mast at this level are removed and supported by hydraulic jacks.



## Nuts and bolts

Edmund Leung

The upper part of the mast together with the slewing unit can then be gradually raised by the jacking action.

Rachets in the collar section ensure that the rising upper mast will stay in place in the remote event of failure of the hydraulic jacks. The collar section hence acts as part of the “telescopic” mast during the operation.

Once the desired height is achieved, that additional mast section can be lifted by the crane itself and pulled into the clearance now created beneath the raised section. It is then structurally connected to become part of the extended mast.

The collar section, providing temporary support, can then be removed. This process can be repeated many times to reach the desired height.

This superficially simple process requires special skills and experience. The mast sections must be kept upright and the jib from rotating to avoid undue turning moment to the mast structure below. As the mast become slender with height, to ensure that rigidity is not compromised, it is connected at different levels to fixed points by bolts or guide wires.

By reversing the installation and extension process, a tower crane can be lowered and dismantled at the end of the construction.

The fact that we hear only of rare cases of failure of tower cranes proves that stringent controls are applied all the time.

As with all tools and equipment in the construction industry, skilled and experienced technicians are vital to ensure safety to their team and, more importantly, to the public.

**Veteran engineer Edmund Leung Kwong-ho casts an expert eye over Hong Kong's iconic infrastructure**

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