	Construction Plant-hire Association Tower Crane Interest Group	
	Tower Crane Technical Information Note	
TIN 020	**The Effect of Wind on Tower Cranes In Service**	

This Technical Information Note applies to top slewing tower cranes (both saddle jib and luffing jib) and self erecting tower cranes

The wind forces exerted on a tower crane and any load suspended from it, may well be quite large and affect the safe handling of the crane and the load. It is not always appreciated that these forces are due to wind pressure, not wind speed, and that wind pressure varies as the square of the wind speed. Consequently if the wind speed doubles, the wind pressure increases by a factor of ***four*** times. This means that a small increase of wind speed can have a significant effect on the safe operation of the tower crane.

The tower crane's manual will specify the maximum wind speed at which the tower crane must be taken out of service. This is normally 45 mph (20 m/s, 72kph) and is based on the requirements of the tower crane design standards. It is however, a maximum value and does not take into account the time required to take the crane out of service or the difficulty of lifting large area loads in high winds. ***Following a review of in-service wind speeds by the CPA Tower Crane Interest Group, involving tower crane suppliers, major contractors and the Health and Safety Executive, the industry recommended maximum wind speed at which tower cranes operating in the UK must be taken out of service is 38 mph (16.5 m/s, 60 kph).***

It must be emphasised that the operator may decide to take the crane out of service at a lower speed due to the type of load being lifted or difficulty in controlling the crane. ***The operator has the primary responsibility for making the decision, in conjunction with the appointed person or crane supervisor. The operator's decision to take the crane out of service should not be overridden by site management under any circumstances.***

Measuring Wind Speed

It is essential that tower cranes are fitted with anemometers or other wind-speed monitoring devices. These should have their indicators located in clear view of the tower crane operator.

The correct operation of these devices should be determined regularly and they should be maintained in good working order. The sensor of the indicator should be positioned so that it can measure air flow uninterrupted by the tower crane or adjacent structures. Sensors are often positioned on the highest point of the tower crane.

In cases where a number of wind-speed monitoring devices are located on a site, the device fitted on a specific crane must be used for assessing the wind effect on that crane. Devices located on other parts of the site will not give an accurate wind-speed for that crane.

The Effect of Wind on Suspended Loads

Strong winds may swing suspended loads (crates, panels, etc) out of balance and radius, making the tower crane unstable. If the operator feels that he cannot maintain full control of the load, it should not be lifted. For large, light loads such as shutters, this situation may occur some way below the tower crane's design wind speed. For example, with a wind speed of 14 m/s (31 mph) the wind load on an 8' x 4' sheet of ply will be 38 kg. If the wind speed increases to 20 m/s (45 mph) the wind load will rise to 76 kg!

Self Erecting Tower Crane Erection, Dismantle and Jib Folding

The erection, dismantling or jib folding of a self erecting tower crane (SETC) should not be attempted at wind speeds in excess of that specified by the crane manufacturer. The maximum wind speed in which the jib of may be folded back or the crane erected or dismantled is invariably lower than the maximum in-service wind speed. Particular attention should be made to wind direction to ensure that the crane is erected, dismantled or jib folded with the jib in the down wind direction.

If the jib of a SETC is folded back before taking the crane out of service to avoid oversailing issues, care must be taken to ensure that the current wind speed is not higher than the permitted maximum for the folding operation. Failure to observe this limit may well result in the crane collapsing.

Wind speeds should be ascertained with a hand held anemometer prior to the crane being erected, measurements should be taken as close as possible to the final erected height of the crane.

High Wind Conditions and Taking the Tower Crane Out of Service

It is important that the operator monitors the wind speed constantly using the anemometer display in the cab. This will give early warning of rising wind speeds and enable him to take action to take the tower crane out of service and descend down the ladders to ground level ***before*** the limiting wind speed is reached.

Putting the crane in the out of service condition generally includes ensuring that the jib is free to "weather vane" when out of service so that the minimum wind area is presented to the prevailing wind. On luffing jib tower cranes it is also important that the jib is left at the correct out of service radius, not the minimum radius, to ensure that there is sufficient wind area to ensure that the crane is able to "weathervane".

Planning of Lifts

It is important that all lifts are planned and that note is taken of anticipated wind speeds from site specific weather forecasts, to ensure that lifts are not started in rising winds. It should be borne in mind that most weather forecast wind speeds are for a height of 10m above ground and should be corrected for greater heights. In open countryside, wind speed increases with height as shown in the table below:-

Height Above Ground (metres)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Wind Speed Multiplier	1.00	1.10	1.17	1.22	1.26	1.29	1.32	1.35	1.37	1.39	1.41	1.43	1.44	1.46	1.47

In city centre locations the gust wind speed at a height of 100m will be approximately twice as strong as the gust wind speed at pedestrian level (excluding effects from nearby buildings). Nearby buildings can have a very significant influence on wind forces, if they are the same height as the crane they will mostly provide shelter, although local wind loads can be increased in some situations. Where surrounding buildings are significantly taller they will often generate increased wind loading on nearby lower cranes.