CICA – Vic / Tas Branch
Crane Safety Bulletin
#343 August 2024

Greetings all. Today's Bulletin is about the effect of wind on suspended loads.

Wind can significantly impact the movement of a suspended load carried by a crane in several ways:

1. Load swing: Wind pressure causes the suspended load to swing and sway, making it more difficult to control.
2. Deflection: Higher wind speeds lead to greater deflections of the load from its intended path, especially along the axis of the wind direction.
3. Rotational motion: Wind can induce rotational movement of the load, particularly around the vertical axis.

Factors influencing how wind impacts the load include wind speed, load characteristics and crane configuration.

Wind Speed:

As wind speed increases, its effects on the load become more pronounced.

According to the Beaufort scale, a wind speed of 10 - 11 m/s falls between two categories:

1. Fresh Breeze (Force 5): 8.0-10.7 m/s
2. Strong Breeze (Force 6): 10.8-13.8 m/s

Cekus, Kwiatoń and Geisler (2020) tested the effect of wind on mobile crane loads in **The dynamic analysis of load motion during the interaction of wind pressure.**

Their results confirmed that if the wind speed did not exceed 10 m/s, then cargo deflections were negligible. However, if the wind speed was higher, deflections also increased, which caused instability of the mobile crane.

From their findings and recommendations:

Wind Speed (m/s)	Wind Speed (km/h)	Action
Below 10	Below 36	Load deflections generally negligible
10-17	36-61.2	Work continues with increased caution
Above 17	Above 61.2	Reduce load by half
20 and above	72 and above	Suspend crane operations

Load Characteristics:

The shape and size of the load affect its susceptibility to wind forces.

Loads with larger surface areas experience greater wind effects (sail effect).

The total **Wind Surface Area** of a load must be calculated to determine the effect the **Dynamic Wind Pressure** will have on the load. This is calculated by multiplying the **Load Surface Area** by the **Drag Coefficient.**

Heavier loads can help stabilise the crane in moderate winds, however, they also increase the risk of tipping in strong winds

For more information and for formulas on how to calculate:

- Wind Surface Area
- Load Surface Area
- Drag Coefficient

CICA Members can refer to the **CICA Engineer's Guidance Note: Dynamic Wind Loadings – Mobile Cranes** in the CICA Member Portal.

Crane Configuration:

Boom Length and Wind Effects

Longer booms are more susceptible to wind forces. As boom length increases:

- The crane becomes less stable
- Wind has a greater leverage effect on the crane structure
- The load is exposed to stronger winds at higher altitudes

Shorter booms generally provide more stability in windy conditions.

Counterweights and Outriggers

Proper use of counterweights can help offset wind forces.

Extended outriggers also increase the crane's stability footprint.

Crane Type and Design

Different crane types (e.g., mobile cranes, and tower cranes) have varying wind resistance capabilities.

Manufacturers provide specific wind speed limits for each crane model and configuration.

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The manufacturer's maximum limit should never be exceeded for the specified rated capacity.

Be aware of the following when operating in wind:

1. Wind monitoring: Crane operators must continuously monitor wind conditions throughout operations.
2. Wind speed limits: Adhere to manufacturer-specified wind speed limits for safe crane operation.
3. Load control: If the operator cannot maintain full control of the load due to wind, the lift should not be attempted.
4. Gusts: Be aware that sudden wind gusts can cause unexpected and potentially dangerous load movements.

By understanding these wind impacts and taking appropriate precautions, crane operators can help ensure safer handling of suspended loads in various wind conditions.

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