

Are you weather

Our industry can become more "weather smart" to minimise the impact of projects being slowed down by the effects of wind. EDUARDO ESTELLES explains

With better data and closer analysis comes advantage: Accurate recorded weather data minimises the impact of projects being winded off, allows site planning with less margin for error and gives companies competitive advantage in disputes.

A comprehensive study of more than 2,000 contracts over 148 building types in the UK concluded that an increase in project duration always means an increase in cost. Adverse weather always impacts on time spent on site and, if weather is not properly assessed and measures taken to prepare, there is always a cost.

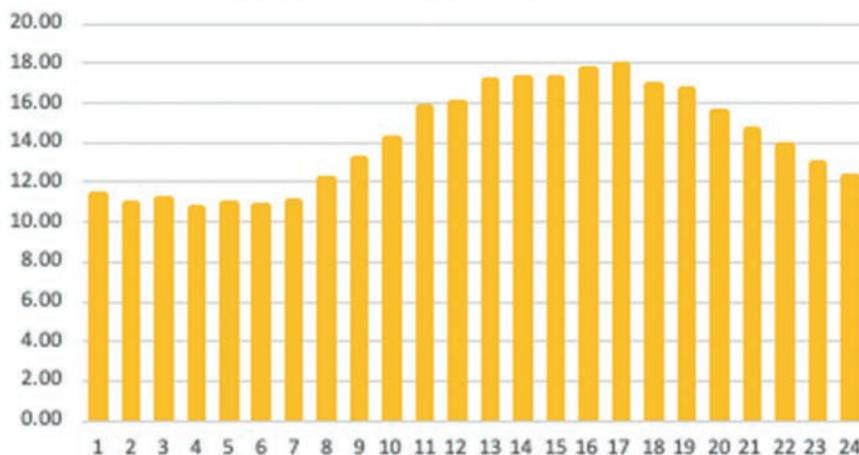
One day lost on a €200 million (US\$ 235 million) project can cost €250,000 (\$294,000) in direct costs such as labour, leased equipment, and contractual penalties. These are costs contractors and clients alike want to minimise.

Viewing the cost of adverse weather, however, only in terms of the direct time lost would be a mistake. Indirect costs, arising from health and safety incidents, contract disputes, loss of profitability and reduced margins, far exceed these.

This article looks at how weather and in particular wind can cost construction even before a project is on site. It also discusses how investment in a comprehensive weather monitoring service can reduce risk, boost

Weather var. daily value	Earthworks	Formworks	Concrete	Steelworks	Scaffolding	Outdoor paint
☀️	⚠️		⚠️	⚠️		⚠️
☁️	⚠️		⚠️	⚠️		⚠️
☔️	⚠️		⚠️	⚠️	⚠️	⚠️
❄️		⚠️	⚠️	⚠️	⚠️	⚠️

TYPICAL DAILY WIND SPEED PATTERN FOR MAY IN UK



Average wind speed per time of day for May in the UK

efficiency and aid the recovery of losses.

What is the financial impact of adverse weather? In the UK weather extends project durations by an average of 21 percent. The table below shows how adverse weather conditions significantly decrease productivity in six key external construction activities: earthworks, form works, concrete pouring, steelworks, scaffolding and outdoor painting.

It is worth noting that wind in excess of 30 to 35mph (48.6 to 56.7 km/h) negatively impacts the majority of these activities, if not all of them. Wind, precipitation and extremes in temperature can cause project delays, decreasing productivity and sometimes halting construction. Contractors need to adequately assess all risks from the start.

By being "weather smart", by carefully choosing the best project start date and adjusting times for activities, contractors can reduce extra time on site due to the weather by an estimated 5.7 %, therefore reducing the risk of increased costs.

The chart of typical daily wind speed shows the average diurnal distribution for wind in May. It would make sense to plan critical lifting activities very early in the morning as the probability of winds doubling in speed is higher in the afternoon.

What is the cost of wind?

Taking the cost to contractors of €250,000 per

day lost, (Source: NOAA climate.gov. Climate & Construction) for a contract duration of 30 months as follows.

With no attempt to schedule a "weather smart" project, the weather would potentially increase the length of a project by 21 % or 189 days, costing an extra €47,250,000 (\$55,470,000).

This can be reduced by 5.7 % (51 fewer days) by choosing the best project start date and adjusting activities in light of long term forecast adverse weather – a potential saving in direct costs of €12.8 million (\$15 million).

So far so good, right? Let's look into the details and complexity of wind. From a dataset collected by Windcrane during 2019 and 2020 averaging 100 cranes spread around the UK, we have an example below.

One could wrongly assume the wind is the wind and you cannot change it. Let's look at it from a different perspective. This is important: Wind speeds above 30 mph for more than 20 % of the working hours of the day (eight hours) is 1.6 hours of higher winds.

Will the wind just blow 1.6 hours a day continuously and the remaining 6.4 hours are okay for work to continue? No, because wind is very erratic and these 1.6 hours could easily spread over the full day, making that day not safe to carry on working.

What about 10 % of the time? That would be about one hour per day... suddenly the

ABOUT THE AUTHOR



EDUARDO ESTELLES started monitoring wind for wind turbines nearly 20 years ago and has been closely monitoring the impact of wind in cranes for the last 10 years. He runs windcrane.com

smart?

impact on unavailable days is much higher.

And here is the critical fact about wind: There is €12.3 million (\$14.4 million) left on the table up for dispute:

At 20 % of the day incidence the cost is €21.5 million (\$25.2 million) and at 10 % of the day incidence the cost is €33.8 million (\$39.7 million). In this example it leaves €12.3 million up for disputes between the parties.

We would like to change wind so it does not affect our projects. Of course we can't but we can make sure our organisation is not the one covering the €12.3 million in dispute because we cannot demonstrate otherwise.

Ultimately, the company with the most reliable and precise wind records has an incredible advantage over any without.

Make wind pay

Keeping long term accurate wind records can make wind pay as the organisation using those records can get more accurate long term profiling for future projects using regressive forecasting and profile the wind distributions into projects.

Direct costs are the main focus but indirect and overhead costs could also be reduced. A delayed handover means delaying the start of an asset's operation, a missed business opportunity or competitive disadvantage. Profits are delayed and reduced.

Contractors rarely benefit from delays, even if they do not pay for the extra time. Pricing the full cost of delays on a construction project can be difficult and often the full impact is only understood after completion. Many indirect costs can be hard to demonstrate and prove, for example, inefficient and unproductive use of personnel and equipment, and the knock-on effect with the next project.

Management and safety

Weather monitoring and forecasting is essential for scheduling when activities will take place and for immediate decision making. In terms of wind data, it is essential to assess the impact of weather on equipment operating at height – tower cranes. Ground level measurements at the construction site do not reflect actual conditions for tall structures and 250 metre tower cranes.

The two wind speed maps show how monitoring wind conditions at crane height will paint a very different picture from data collected at ground level. Wind speeds increase with altitude, as the wind is disrupted by obstacles at ground level.

Gusts are sudden increases in wind speed, and they can start in seconds. They are very dangerous on construction sites, causing the following: sending materials and other objects flying at high speed; causing construction workers to lose their balance; damaging or collapsing building elements that are still a work in progress.

Gusts are particularly dangerous when tower cranes are involved. Lifting operations should be suspended if the weather becomes unfavourable since gusts can easily destabilise a crane. Even gusts of 30 knots or 35 mph (57 km/h) or more can delay activities like concrete pouring, scaffolding and outdoor painting. Wind is also of huge significance to health and safety.

Accidents, a result of unsafe acts, activities and conditions, can be directly caused or aggravated by adverse weather. Lack of adequate warning to take full preventative measures, poor assessment or lack of communication of the weather risk by management, is also a major factor.

The cost to construction following an



accident is high. Direct cost to employers of accidents has been calculated as £433.22 (\$508.6) per employee per year. Let's assume a small contractor has 30 staff members. With only one accident a year, which statistically is very likely, the cost would be: 30 staff members x €450 = €13,500 a year. It should be noted this is a conservative figure.

What about indirect costs, for example, the time to deal with the consequences of the accident, replacement staff, investigation and corrective measures, lost production from lower employee morale and absenteeism?

Indirect costs have been calculated to outweigh direct costs by more than 2 to 1: Every €1 in direct costs due to an accident brings €2.12 in indirect costs. This in comparison could convert the example from €13,500 per year in excess of €40,000 per year for the same small contractor.

In light of the above, accurate and timely forecasting and monitoring of weather, particularly wind at crane height, is essential to reduce the risk of accidents on site. Live access to this data by all key site personnel would greatly improve the lines of communication and enable key decisions to be made speedily and in time, reducing risk and saving money and lives.

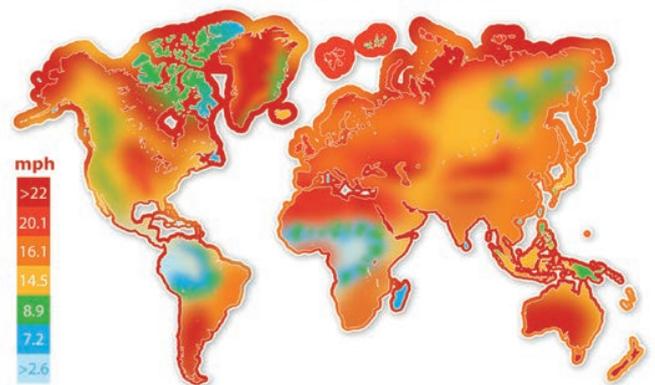
The tables over the page show data collected from 100 cranes in the UK with windcrane.com monitoring. The different



Wind speed at ground level



Wind speed at crane height



levels show the percentage of cranes per day of the year with days where wind gusted higher than 30 and 35 mph.

Small changes and decisions on interpretations of wind data can have a huge impact on construction projects. It is easy to think 'my project will only stop if wind goes over 35 mph and 30 % of the day'; the challenge with that thinking is that wind does not work linearly. It can be most of the time below 30 mph and a quick 40 mph (64.8 km/h) wind gust would be enough to create a situation of panic, or even worse, an accident.

Let me present the data above in a different format; in one year, the cranes above are exposed to more than 22,528 incidents of wind over 30 mph per year and 14,766 over 35 mph. Below is the percentage over one year.

These statistics over a full year, mean that the cranes are exposed to higher winds of 30 mph or more for 42 % of the time and for 27 % of that time (when the wind is between

30 and 35 mph) it may result in a weather dispute where it is not clear if the wind was strong enough to declare it winded off.

Ultimately, the argument is that 27 % of the time belongs to the company that owns the most credible wind data set. They can make those records work for their company.

Accurate recorded wind speed record keeping from the crane at the exact operating height provides specific profile forecasting and not a prediction from a nearby weather station. Live wind speed overviews can support the safety of your personnel and equipment by reducing unnecessary risks with live wind speed data and alert notifications.

Weather and contract claims

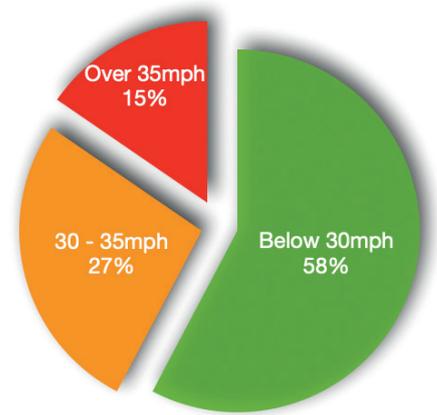
Adequate insurance can cover contractors for some losses arising from the impact of adverse weather but they usually don't cover for delays caused to the project. If a project is delayed by extreme weather, the contractor can request an extension of time (EoT) to be waived from financial penalties. Most construction contracts use the term 'exceptionally adverse' weather conditions, or similar.

Using historical data as the base point, downtime weather reports using accurate measurements from the exact crane height on site can, for example, demonstrate that X hours of wind above this level in a certain month is "exceptional", allowing the contractor to evidence a claim for an extension of time.

Be weather smart

Whatever the cause of delays they negatively impact profitability and lead to reduced margins. This is even before a contractor factors in loss of reputation and negative PR.

Financial settlement is only part of it. A



delayed handover for a client means delaying the start of an asset's operation, missed business opportunities and reduced RoI.

Significantly, a contractor never comes out "winning": weather-related claims are a frequent source of dispute between contractors and project owners, which can escalate into legal disputes and protracted litigation. Pricing the full cost of delays can be difficult and many indirect costs can be hard to demonstrate and prove.

"Forewarned is forearmed": investment in a reliable and accurate on-site weather monitoring and reporting system, including wind monitoring at crane height, is essential to understand and mitigate for the true cost of weather.

Detailed data informs decisions, actions and reports at every stage of the project, allowing the following:

- Assessment of the negative impact of weather on projected contract sequencing and duration so this can be factored into tender calculations.
- Optimisation of project start dates to reduce the impact of unfavourable conditions.
- Adjustment of on-site sequencing of activities, materials ordering and allocation of resources to minimise the risk of delays.
- Forecasting and assessment of conditions on site, enabling proactive measures to reduce delays, protect stored materials and vulnerable structures and reduce the risk of unsafe activities.
- Recording actual conditions on site to back up claims for extension of time.
- Gaining knowledge of how severe weather or seasonal differences impact construction processes, enabling contractors to optimise future construction projects.

Control of weather data goes further than reducing project delays. You are arming your team with unique overview and foresight, giving competitive advantage.

Whoever controls this data has the higher ground (pun intended).

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