XL Insurance

Construction

Risk is in the air: Construction wind hazards

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No one can tell me,
Nobody knows,
Where the wind comes from,
Where the wind goes.
— A.A. Milne

Poets have had a lot to say about wind. It's long been a mysterious natural force. One that can bring both great joy with dancing kites and swaying trees, as well as untold devastation with downed trees, shattered homes.

Milne was onto something with the above verse. Despite advances in meteorological science, wind remains a capricious natural phenomenon.

Weather forecasts provide insight on the maximum wind speed that can be expected on a given day, but it is hard to know precisely when or to what level wind events will occur. And lack of precision in forecasting is what makes wind events so dangerous.

High winds can create a wide range of hazards that subsequently cause power outages, damage to buildings and vehicle transportation disruptions; even injury and death.

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It's not just the speed

Wind events can take a variety of forms, each with its own characteristics and risks. High winds are typically those characterized by 10 to 40 mph with gust up to 50 mph or more at any moment. But wind speed is just one factor in a wind event's potential for damage. The chart below summarizes the most common in North America.

Straight-line winds

Typically blow in one direction but can vary during the event.

- Speeds exceeding 50-60 mph
- Associated with intense low atmospheric pressure
- Large storms called derechos can produce straight-line winds across an area of more than 240 miles (400km)

Thunderstorm

Storms capable of producing high wind speeds, heavy rain, and hailstones.

- Sometimes accompanied by tornadoes
- Can trigger straight-line winds

Tornado

- Associated with a severe thunderstorm
- Violently rotating column of air
- Wind speeds range from 65 to 300 mph

Downburst, includes microbursts (<4km across) and macrobursts >4km across)

- Associated with a thunderstorm
- Powerful downdraft can cause severe, localized damage
- Unlike straight-line winds, these radiate out in all directions

Hurricanes

- The highest intensity of a tropical cyclone weather system
- Counterclockwise rotation around a center of low pressure
- Maintains strength over water
- Associated with bands of strong thunderstorms and possibly tornadoes
- Well-defined low-pressure center ("eye")
- Sustained winds of 74 mph or greater

While most often associated with storm events, straight-line winds can occur at any time, even on perfectly sunny days. A good rule of thumb for anticipating dangerous winds is to assume that gusts can reach two to three times the average wind speed. For instance, if the anemometer measures 15 mph, gusts can reach 30 to 40 mph.

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Huff and puff

On a construction site, wind events present significant risks. The project and even the land on which the project is built can magnify these risks.

Wind speed increases with stories above the ground. Therefore, the taller the building structure, the greater the speed and, hence, the greater the wind loads. Changes in topography, such as hills, ridges, and bluffs, can cause wind speed-up; therefore, any building structure located near a peak would receive higher wind loads than an office building located on relatively flat land.

In projects that use tower cranes, the maximum wind speed for safe operation is typically 20 mph and required to be checked with the manufacturer's limitations. However, loads and lifts generally are suspended when the wind speed approaches 20 mph to avoid any gusts that can cause unsafe movement.

So much power for something invisible

While we can't see the forces that create wind events, we can certainly see and feel their impact. High winds can cause property damage, personal injury and result in lengthy project delays.

While the exact and unique scope of work will determine what hazards high winds can create on a worksite, the following chart provides an overview.

High Winds Can Cause	Resulting In
Employee to lose balance on an elevated location, such as scaffolding, ladder or roof	Fall that can cause serious injury or death.
Loose tools, equipment or building materials to become airborne	Injury to personnel and damage to equipment or the project itself.
Flying dirt, dust and debris	Workers could sustain eye injuries or even damage to lungs caused by inhaling airborne particles.
Material to be pulled from employee's grip	Airborne material can damage nearby structures or injure other personnel. Worker who was carrying material could fall or suffer injury, particularly to fingers and wrists.
Equipment to become destabilized and tips over	Damage to affected equipment and/or project. Employees nearby could sustain injuries from the equipment or soft tissue injuries caused by trying to avoid falling equipment.
Doors (on storage facilities, project access, equipment access) to close on workers entering or exiting	Injury to arms or legs (soft tissue or broken bones).
Doors (on storage facilities, project access, equipment access) to be pulled from workers' hands	Injury to fingers and wrists (soft tissue, lacerations or broken bones).
Temporary fencing to be blown over	Damage to fencing, vehicles and equipment.
Powerlines to be brought down	Electrocution hazard and property damage. Possible fire hazard, too.
Downed trees or tree limbs	Injury to personnel, damage to equipment and property.
Work in progress to destabilize	Damage to structure and delays in project completion.

In cold weather, high winds can be especially hazardous. Construction work often occurs in extremely cold to freezing temperatures and cold stress hazards are greatly amplified in windy conditions. In certain situations, the combination of low air temperature and high wind speed can cause frostbite on exposed skin within minutes.

Battening down the hatches. It's a Thing.

Prevention is the best measure. According to the Occupational Safety and Health Administration (OSHA), when a project involves material handling and winds may exceed 40 miles per hour, the employer must take precautions to protect employees from the wind's hazardous effects.

Check the weather reports and monitor conditions continuously. This can be achieved with a weather station on-site at the construction location, which both trained employees and management can access.

Fortunately, today there is even more available technology to help contractors' monitor weather. New technology solutions allow contractors to monitor weather in real-time across all their jobsites. While weather can seem so unpredictable at times, there is an unbelievable amount of weather and now companies like Athenium Analytics are using this data to provide tools specific to the construction industry. Their tool, GaugeConstruction is a holistic risk analysis dashboard that provides hyperlocal weather analytics for

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construction sites across the U.S. Through the platform, contractors receive weather and natural hazard risk notifications that include configurable 7-day forecast alerts for hail, rainfall, freezing rain, snowfall, cold, heat, heat index and even wind gusts.

Make a Plan Before the Wind Blows

Like so many other high-risk exposures, the first step in effective risk management is to develop a preparedness plan. A wind plan should identify areas of high vulnerability and in need of protection or of being secured, for example:

- field office trailer (plus equipment and files)
- electrical feeds (e.g. powerlines)
- tools
- heavy equipment
- generators
- compressors
- welding machines
- cranes (land and barges)
- tugs and workboats
- fuel tanks
- permanent materials and structures.

If the work is on or near water bodies, develop a relocation plan. If practicable, best practice dictates you first relocate and then protect all equipment and watercraft, including tugs and barges.

Also, don't wait until the last minute. Windstorms can spring out of nowhere. Tropical events, like hurricanes, can trigger a run on supplies. In any event, it's best to secure the necessary supplies in advance. When the National Weather Service has identified a tropical storm, make sure tie-downs, banding material, blocking, anchors, and other essential protection supplies are available and organized.

Wildfire-prone locations should also be prepared to combat incipient fires caused or aggravated by high wind events.

- Monitor weather, humidity and wind patterns on any given day, especially during periods of high wildfire risk (Red Flag Warnings)
- Employees should be trained in risks associated with wildfire and safely attacking small incipient fires caused by worksite hazards like hot exhaust or sparks.
- Workers should also be trained in firefighting techniques and identifying fire characteristics
- Equip vehicles with brush firefighting equipment for laypeople, fire rakes, hoes, and hand pump water tank backpack units. Usually 5-gallon tanks with a wetting agent are very useful in managing small fires.
- Establish parking and equipment parking and operation on combustible free areas, already cleared and grubbed

When High Winds are Forecast

With your plan in place, active monitoring of weather conditions will put you in the best position to respond quickly and effectively. As soon as a high wind event is forecast, you and your team must mobilize.

First, take a site survey for potential hazards that can become airborne during windy conditions. Have a discussion with the team about eliminating or reducing flight exposures to reduce the potential for injury and equipment damage.

Anticipating the day's windy conditions, brace all building components, falsework, tilt-up panels, masonry walls, and other building components. Shore or reinforce temporary fencing so they will not blow over on workers, bystanders, or vehicles.

Anchor all roof panels on partially installed roofs and remove any materials that have the potential of being affected, weld or secure decking.

Finally, properly store materials for windy conditions. Any loose materials such as dirt and topsoil should be covered with a tarp or sprayed with water to prevent erosion. In some locations installing temporary windbreaks can help keep the stockpile from becoming airborne. Tools should be removed from exposed locations or secured from movement.

Securing materials and tools is essential (e.g., metal sheeting, drywall, or plywood), which would become projectiles and cause additional damage if they take flight.

Gusts are always dangerous when tower cranes are involved. Lifting operations should be suspended if the weather becomes unfavorable, as gusts can quickly destabilize a crane and/or its load. Additionally, do not operate man lifts in high winds. 28 mph winds are the manufacturer's limit for lift usage in most cases.

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We might not know where the wind is coming from or when, but by taking appropriate precautions we help protect our people, projects and profits.

Toolbox talks should focus on wind safety, reminding crews to take added precautions, including:

- Pay attention to wind direction before exiting a vehicle or piece of equipment; when parking a vehicle or piece of equipment, park in such a fashion that the wind blows against the side opposite of where you will enter and exit.
- Anticipate wind gusts and maintain a firm grip on the door when entering or exiting a vehicle or piece of equipment.
- When windy conditions are present, or if they suddenly develop, take time to note the conditions on your tailboard and discuss with all crew members what to do to protect against the hazards these winds can create.
- During cold weather, make a note of expected wind speeds and daytime temperatures, and use the National Weather Service Windchill Chart to determine whether a hazardous cold stress condition exists. Ensure workers are equipped with appropriate PPE.

Remain alert to changing conditions and be prepared to eliminate work tasks that become dangerous in excessively windy conditions. During a high wind evolution and landfall is predicted in the job site area within 24 hours, suspend all work activities.

After the Wind Dies Down

Once the event has passed, verify the forecast to ensure the threat is no longer present. Then inspect and assess the damage, take measures to prevent theft, and begin cleaning up. Be mindful of hazards that may have been created that may include downed power lines that may still be energized, unstable structures, and wet/damaged electrical panels.

After you assess and document the damage. Notify the appropriate utility companies and contact your insurance carrier for follow-up. Lastly, if safe to do so, protect damaged areas from further damage (e.g. cover damaged roof sections with tarp to prevent water intrusion).
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