



# NAC Executive Insights

## Safety Insight: Weather-Related Failures

### Key Points

- Weather-related failures—especially those involving wind loading—are often underestimated or excluded from temporary support design and sequencing plans.
- These failures typically occur during transitional phases: scaffold erection, rebar cage lifts, tower retrofits, and formwork staging.
- Wind-induced collapse is frequently linked to inadequate tie-ins, missing anchorage, or misaligned hoisting geometry.
- Governance interventions—such as wind threshold stop-work policies, onsite anemometers, and wind load design for temporary systems—are critical.
- This insight outlines the operational signature, governance triggers, and training priorities needed to address this failure mode.

### When the Environment Becomes the Primary Load

In construction, structural loads are often calculated with precision—but environmental forces, especially wind, are frequently treated as background conditions. That assumption is dangerous. Wind is not a passive factor. It is a dynamic, directional, and sometimes violent force that can destabilize scaffolds, topple rebar cages, and collapse towers in seconds.

Weather-related failures are especially common during transitional phases—when structures are partially complete, temporarily supported, or suspended mid-hoist. These are moments of vulnerability, and wind loading can turn a stable system into a collapse scenario with little warning.

What makes these failures systemic is their invisibility in planning. Wind thresholds are rarely embedded in pre-task briefings. Temporary structures are often erected without wind load design. And stop-work decisions are left to field judgment, rather than tied to measured conditions.

### Representative Case: Rebar Cage Collapse During Lift

A high-rise foundation project involved lifting a multi-ton rebar cage into position using a tower crane. The cage was suspended mid-air when a sudden wind gust caused it to rotate and destabilize. The cage struck the formwork and collapsed, killing one worker and injuring two others.

The investigation revealed that the cage had not been rigged with wind stabilization in mind. No wind load analysis had been performed. The site lacked an anemometer, and no wind threshold had been defined for lifting operations. The failure was attributed to environmental loading—but the root cause was governance absence.

## Why This Failure Mode Persists

Weather-related failures are often dismissed as “acts of nature,” but they are preventable with proper planning and controls. Several systemic factors contribute to their recurrence:

- **No Wind Load Design:** Temporary structures and suspended systems are rarely designed for wind exposure.
- **Missing Wind Thresholds:** Stop-work policies tied to wind speed are often undefined or unenforced.
- **No Onsite Measurement:** Many sites lack anemometers or rely on regional forecasts rather than real-time data.
- **Rigging Geometry Gaps:** Suspended loads are often rigged without consideration for wind-induced rotation or sway.
- **Training Deficits:** Crews may not be trained to recognize wind risk or respond to changing conditions.

These failures are not inevitable. They are the result of governance blind spots in how environmental forces are integrated into construction planning.

## Governance Triggers and Operational Controls

To prevent weather-related failures, governance must embed environmental risk into every phase of construction. Recommended controls include:

- **Wind Load Design for Temporary Systems:** Scaffolds, formwork, and suspended structures must be designed for site-specific wind exposure.
- **Onsite Anemometers:** Real-time wind measurement must be available and monitored during critical operations.
- **Wind Threshold Stop-Work Policies:** Defined wind speed limits must trigger automatic work stoppage for lifts, scaffold use, and temporary support transitions.
- **Rigging Geometry Verification:** Suspended loads must be rigged to minimize rotation, sway, and wind catch surfaces.
- **Environmental Risk Briefings:** Daily safety meetings must include weather forecasts, wind risk assessments, and contingency plans.

These controls transform weather from a passive backdrop into an active governance domain.

## Training Priorities and Cultural Shifts

Environmental risk management requires both technical training and cultural reinforcement.

Recommended modules include:

- **Wind Risk Literacy:** Crews must understand how wind interacts with structures, loads, and rigging systems.
- **Suspended Load Protocols:** Training should cover hoisting geometry, stabilization techniques, and emergency response.
- **Temporary Structure Exposure:** Workers must be trained to assess scaffold and formwork vulnerability to wind and rain.
- **Regulatory Compliance:** OSHA 1926.550, 1926.451, and ANSI/ASCE wind load standards must be embedded in practice.
- **Case History Briefings:** Real-world collapses due to wind loading should be studied to reinforce the consequences of environmental neglect.
- **Safety Culture Activation:** A mature safety culture ensures that weather is not treated as incidental or unpredictable. Toolbox talks, Accident Hazard Analyses, and pre-task planning must embed environmental risk into daily routines. Leadership must model safety-first behaviors, empower stop-work authority, and reinforce the expectation that every crew member is responsible for monitoring conditions and challenging unsafe operations.

This training must be paired with a cultural shift: weather is not a backdrop—it is a structural load that demands governance attention and a safety culture that prioritizes vigilance, real-time decision-making, and continuous improvement.

## Why This Insight Matters

Weather-related failures are often framed as unpredictable. But wind is measurable, modelable, and governable. When collapses occur due to environmental forces, it's not just nature—it's a failure to plan, measure, and respond.

This Executive Insight provides a roadmap for prevention. It shows where environmental risk must be integrated into design, where measurement must be real-time, and where stop-work authority must be automatic. It's a call to treat weather not as a variable, but as a load—one that must be governed with the same rigor as steel, concrete, and sequencing.

## **About the Author**

Bob Prieto was elected to the National Academy of Construction in 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries. Bob received the 2024 ASCE OPAL Award (Outstanding Projects and Leaders) for his Outstanding Lifetime Achievement in Management.

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