

AERODYNAMIC FORM OPTIMIZATION: BUILDINGS



Our aerodynamics studies empower innovative design.



In aerodynamics, performance is in the details. We find the change—it may be a tiny one—that moves a shape from satisfactory to superb.



Our Service

When an ambitious architectural concept is translated into built form, the concept is sometimes diluted by compromises. Often these compromises are necessary to ensure that the structure will be safe in high winds, especially for tall or flexible structures or bridges.

We help you find an external building form that is fully realizable in construction, yet still true to your vision. Our aim is to move the design toward a shape that is more in tune with the elements and with its location in the world, more effective in its use of materials, cheaper to build and cheaper to manage in the long term.

[Redefining possible.](#)

We know timing is crucial. We'll engage a multi-disciplinary team who will tackle all aspects of the problem in a short time. This team integrates with your design team early on, to build trust and clarity. You can count on our team to provide scientifically informed design guidance at each point in your conceptual design process. In this way, issues related to wind loading and aerodynamic performance can be tackled as the structure is being envisioned—when changes are far less expensive.

We have exceptionally deep and broad expertise not only in wind climate and aerodynamics but also in the relationship between aerodynamics and the dynamics of structures. Over decades, we've seen a very large variety of shapes and concepts—and many creative solutions to render these shapes buildable and safe.

RWDI is a valuable partner
to clients seeking to...

Explore Innovations

- Set the stage for a finished building that faithfully realizes the original concept

Create Opportunities

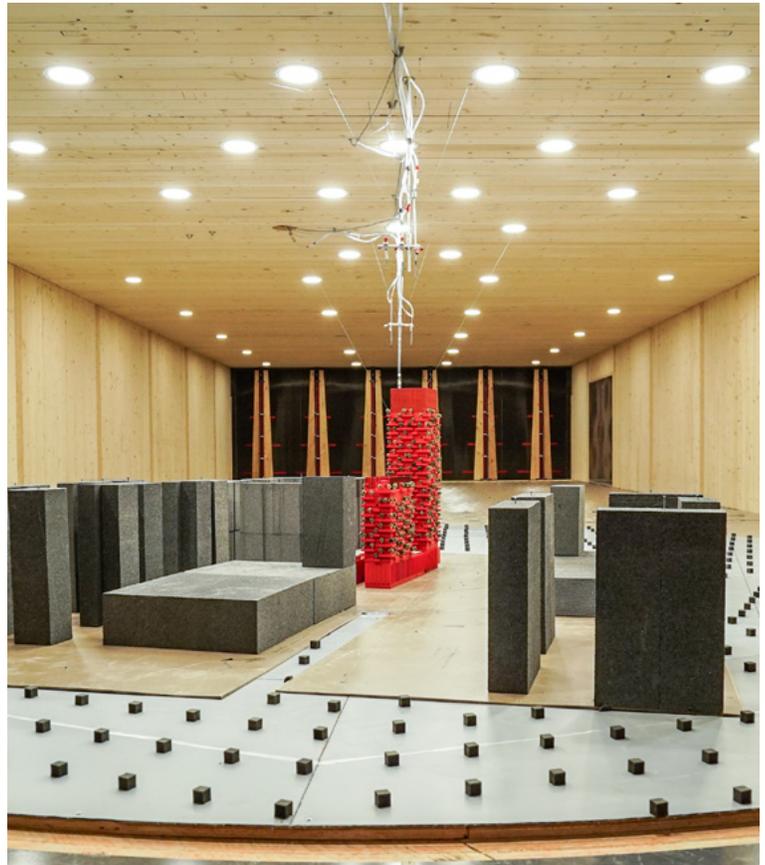
- Preserve or add desirable features without compromising aerodynamic performance
- Find early cost-savings opportunities by identifying the form features that will drive structural design costs

Meet Challenges

- Quickly analyze trade-offs between form and myriad structural concerns

Fulfill Expectations

- Produce quantified design options in a fast-moving context
- Deliver a demonstrably buildable design



How we work

Our goal is first to understand and describe the forces that are exerted by the wind on a bluff body, whether a structure or another form. Then we consider how to change the shape of the body to minimize or control these forces to enhance performance.

We typically use custom numerical models, but for detailed or unusual questions we build instrumented physical models and test them in our wind tunnels. We operate various state-of-the-art boundary-layer wind tunnels, including some that can accommodate very large models.

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In the wind tunnel, we study the layer of air that flows smoothly along the body's surface—the boundary layer. This layer may separate from the surface, then change direction or rejoin the surface at another location. These patterns of flow separation and reattachment create various aerodynamic forces.

The forces of interest are along-wind forces (drag), across-wind forces (lift or side force) and overturning moments in pitch, yaw and roll. These forces can be stationary or fluctuating.

Small changes in a form's shape and orientation to the flow can cause large changes in the patterns of flow separation and reattachment. The aerodynamic forces change accordingly. By finding exactly the right changes, we can “tune” these forces so that they play in favor of the form or structure instead of causing instability.

In our work with you, we will listen closely, to learn which factors guide your decisions, and collaborate closely, to seek creative, effective solutions. We know communication is critical, so we present our results in design-ready form, including visuals that make it easy to convey our findings your broader team.

