

# Wind and Structural Engineering Research Facility



*Saving Lives and  
Mitigating Losses*

**CLEMSON**  
UNIVERSITY



# A State-of-the-Art Facility Supporting Experimental Research on the Performance of Buildings, Bridges and Other Structures

Clemson University's Wind and Structural Engineering Research (WiSER) Facility is a premier laboratory for the study of wind effects on structures. Testing to assess the structural performance of buildings and bridges can also be conducted using both load actuators and pressure to simulate design loadings. **Testing and research performed at the facility ultimately provide information that is essential in designing and constructing more reliable and cost-effective buildings and bridges.**

**Clemson University's academic and research activities in the evaluation of loads or forces that bear down on structures arising from natural hazards such as high winds, hurricanes and earthquakes, and the design of structural systems to resist those loads, have earned an international reputation for excellence.**

There are four primary research areas within the facility, and each area accommodates a specific type of testing.

**The Boundary Layer Wind Tunnel** is one of the largest in the United States. Wind studies are performed to determine design loads for structural systems and design pressures for the building envelope, an essential factor in keeping a structure intact. Recent studies have also been conducted to compare wind tunnel data with full-scale measurements of wind loads on suburban residential structures collected during recent hurricanes.



**The Structures Lab** provides structural testing on light-frame wood and light-gauge metal construction, building envelopes including windows and doors, and structural components for buildings to determine the performance of these systems.

**The Long Span Reaction Platform** provides capability to investigate the performance of large structural steel, reinforced concrete, prestressed concrete and wood systems. Specimens can be as large as 80 feet in length, 12 feet in width and 10 feet in height. Load actuators can be used to apply static or pseudo-static loads to simulate cyclic loads.

**The Outdoor Slab** is used for testing over-sized components or assemblies that won't fit in a traditional laboratory setting.

## Hurricane Field Investigation Program

In addition to providing industry leaders with laboratory testing services, faculty and students test data collected during major wind events. Wind towers are deployed to hurricane watch areas in South Carolina, North Carolina and Florida to collect ground wind speeds at each stage of a storm. This information, along with data collected from prewired homes in the area, provides the opportunity to validate wind tunnel studies of structures within a built environment, including the effects of shelter

and topography. Ultimately, research results are used to improve structures in hurricane-prone regions ... saving lives and mitigating losses along the way.



**Lab performs independent testing on HurriQuake Nail for *Popular Science* magazine.**

Clemson University civil engineering alumnus Ed Sutt, a fastening engineer with Stanley Bostitch, has designed a nail that could save thousands of lives and homes in the event of a hurricane or earthquake. For that, *Popular Science* magazine has named the HurriQuake nail its 2006 Innovation of the Year, beating out 100 of the best new technologies from around the world.

To perform independent testing on the nail, Sutt returned to the WiSER Facility at Clemson along with a *Popular Science* magazine reporter. Civil engineering professor and director of the facility, Scott Schiff, conducted the test.

"I was amazed at the resistance the nail puts up. In one test on the HurriQuake 2 [a thicker version of the original nail], with 20,000 pounds of load on an 8-foot shear wall mimicking what a house goes through in the course of several storms or an earthquake, the nail held. Normally that's what would give first," says Schiff. "This potentially could make a huge difference on insurance premiums and housing codes."



## Wind and Structural Engineering Research Faculty

### The Department of Civil Engineering

The WISER Facility is administered by the Department of Civil Engineering within the College of Engineering and Science. The department offers undergraduate and graduate course work, continuing education and public service activities in the following emphasis areas:

- Applied Fluid Mechanics
- Construction Engineering and Management
- Construction Materials
- Geotechnical Engineering
- Structural Engineering
- Transportation Systems

### For More Information

To learn more about the WISER Facility or to schedule testing time in the lab, contact Scott Schiff, director, at [wiser@ces.clemson.edu](mailto:wiser@ces.clemson.edu) or (864) 656-0456.

[www.ce.clemson.edu](http://www.ce.clemson.edu)

[www.clemson.edu/bigwind](http://www.clemson.edu/bigwind)

#### Patrick J. Fortney, Ph.D.

Assistant Professor of Civil Engineering  
B.S., University of Cincinnati, 2002  
Ph.D., University of Cincinnati, 2005  
Areas of Expertise: earthquake engineering, design of tall reinforced-concrete structures, large-scale experimentation, fire effects on concrete structures, and protective design and analysis

#### Nigel B. Kaye, Ph.D.

Assistant Professor of Civil Engineering  
B.E., University of New South Wales, Sydney, Australia, 1994  
Ph.D., University of Cambridge, Cambridge, United Kingdom, 1998  
Areas of Expertise: environmental fluid mechanics, heat and pollutant transport in buildings, mixing in stratified flows, buoyancy-driven shear flows and wind load on low-rise buildings

#### Abdul A. Khan, Ph.D.

Assistant Professor of Civil Engineering  
B.S.C.E., University of Engineering and Technology, 1986  
M.Sc., University of Alberta, 1989  
Ph.D., University of Alberta, 1995  
Areas of Expertise: computational hydrodynamics, environmental fluid mechanics, sediment transport, hydraulics and hydrology, and wind load on low-rise buildings

#### Bryant G. Nielson, Ph.D., P.E. (Utah)

Assistant Professor of Civil Engineering  
B.S., Utah State University, 1988  
M.S., Utah State University, 2000  
Ph.D., Georgia Institute of Technology, 2005  
Areas of Expertise: structural reliability, highway bridge behavior and earthquake engineering

#### Scott D. Schiff, Ph.D.

Professor of Civil Engineering and Engineering Mechanics  
Director, WISER Facility  
B.S., University of Cincinnati, 1982  
M.S., University of Illinois at Urbana-Champaign, 1984  
Ph.D., University of Illinois at Urbana-Champaign, 1988  
Areas of Expertise: earthquake engineering, wind engineering, bridge engineering and experimental investigation of structures

#### Ben L. Sill, Ph.D.

Alumni Professor of Civil Engineering and Engineering Mechanics  
Director, General Engineering  
B.S., North Carolina State University, 1967  
M.S., North Carolina State University, 1969  
Ph.D., Virginia Polytechnic Institute and State University, 1973  
Areas of Expertise: fluid mechanics and turbulent flows, wind engineering and atmospheric boundary layers

#### Peter R. Sparks, Ph.D.

Professor of Civil Engineering and Engineering Mechanics  
B.S., University of Bristol, United Kingdom, 1968  
Ph.D., University of London, United Kingdom, 1974  
Areas of Expertise: wind engineering and structural performance



# CLEMSON

---

## UNIVERSITY

### WIND AND STRUCTURAL ENGINEERING RESEARCH (WISER) FACILITY