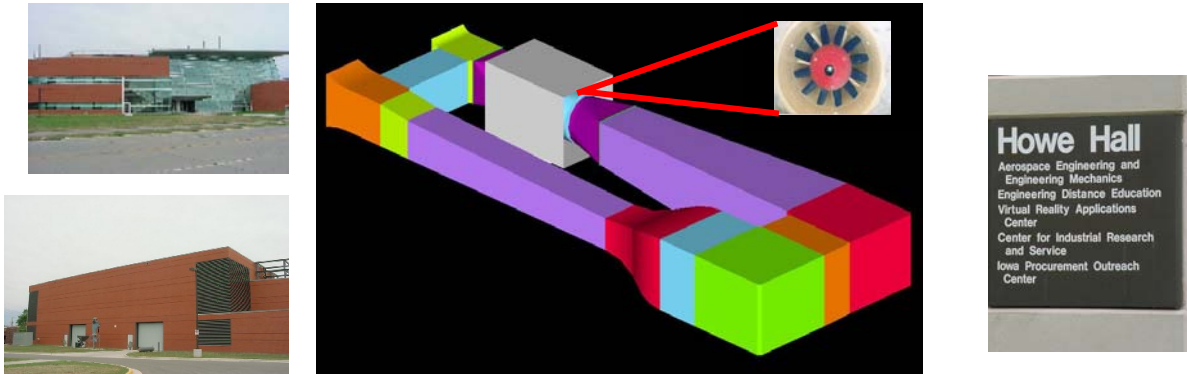


IOWA STATE UNIVERSITY WIND SIMULATION AND TESTING (WiST) LABORATORY



Impact of the WiST Lab

A world-class **Wind Simulation and Testing (WiST) Laboratory** is being setup at Iowa State University (ISU). This laboratory that occupies a space of 12,000 sq. ft. is located in the Department of Aerospace Engineering and Engineering Mechanics in Howe Hall on the ISU campus. WiST Lab will be a *state-of-the-art experimental* facility for conducting research, education, consulting and outreach in the subject area of wind-structure interaction. When completed it will be a one-of-a-kind facility for applications in wind engineering, aeronautics and industrial aerodynamics. It will include a wind tunnel with two test sections, aerodynamic and atmospheric boundary layer, along with features that are unique among all university-operated wind tunnels in the nation. WiST Lab will help ISU provide high-quality educational and research opportunities to young engineers to prepare them for the challenges of the 21st century.

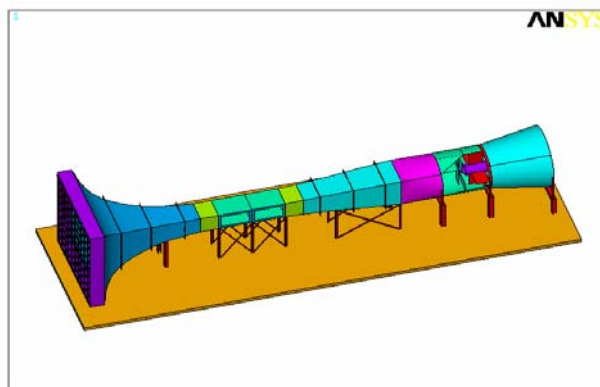
Facilities

Aerodynamic/Atmospheric Boundary Layer (AABL) Wind and Gust Tunnel

- closed circuit tunnel (see figure on top of this brochure) with two test sections, one for aerodynamic testing (8 ft wide by 6 ft high section) with a wind speed capability of 105 mph, and the other for tests that require simulation of atmospheric boundary layer wind (8 ft wide by 7.25 ft high section) with a wind speed capability of 85 mph. This tunnel will have gust-generation capability and it can be also run in open circuit mode (in operation, completed in October 2004).

Bill James Wind Tunnel

- open circuit tunnel for aerodynamic testing (3.0 ft wide by 2.5 ft high section) with 180 mph wind speed capability (in operation, see next figure).



Tornado/Microburst Simulator

- microburst and tornado simulators with 20 ft wide x 44 ft length x 18 ft high test section frame with capabilities for generating a translating microburst-like jet (6.0 ft diameter) and a tornado-like vortex (4.0 ft diameter) for model testing (in operation; see next figures).



Undergraduate Aerospace Wind Tunnel

- closed circuit tunnel for aerodynamic testing (1 ft wide by 1 ft high section) with 150 mph wind speed capability (in operation; see next figure).



- a smoke tunnel with a 2D section for flow visualization (in operation; see next figure).



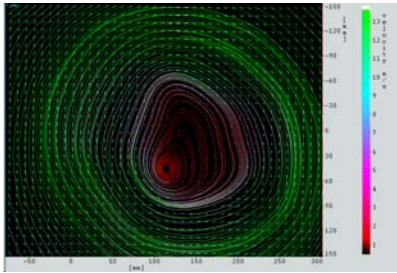
- a workshop that includes a 3D router and access to Rapid Prototyping and other tools with capability to build models (in operation).

Instrumentation and Software

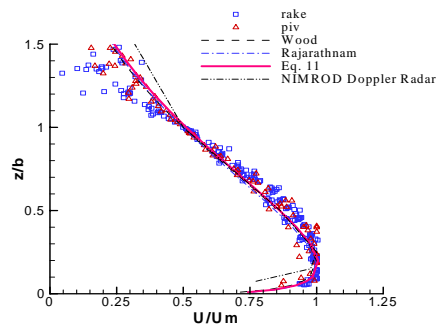
The laboratory is equipped with state-of-the-art instrumentation for measurements of flow, pressure, force and response.

- Stereoscopic Particle Image Velocimetry (PIV) for flow visualization and measurement of steady flow

- Three-Channel Hot-Wire Anemometry with a Traverse System
- Research-Grade Smoke Generator



Tangential Speed in Model Tornado Simulator



Radial Speed in Model Microburst Simulator

- Multi-Channel Pressure Transducers (up to 500 Hz sampling per channel)
- Six-Component Base Balance for Force and Moment Measurements
- Several Strain-Gage Conditioners and Amplifiers
- LabView Software with National Instruments DAQ System

Benefits

Education

Students in engineering will get a hands-on experience in laboratory courses covering topics on aerodynamics, fluid mechanics, and wind engineering. Undergraduate students will get a head start in acquiring research experience that will encourage them to pursue graduate studies.

Research

Graduate students and faculty will get an opportunity to conduct research in wind-structure interaction problems with emphasis on experimental methods. Excellent facility for attracting sponsored research.

Consulting

Industries seeking wind-tunnel tests will have a state-of-the-art facility available for a nominal fee. WiST Laboratory has a potential to attract a good market share.

Outreach

Attraction for media coverage to demonstrate effects of extreme wind. Visiting spot for potential ISU students seeking a degree in engineering or physical science.

Research Topics

- aeroelastic response of long-span bridges, tall buildings and other flexible structures.
- wind loads on low-rise structures.
- aerodynamic performance of vehicles and traffic-related structures.
- aerospace applications such as landing and take-off characteristics of aircrafts.
- agricultural applications such as effect of wind on plant stress and soil erosion.
- environmental studies such as pedestrian-level winds, snow drifting and air pollution.
- wind energy applications involving design of wind turbine units for optimum performance.
- sports related applications such as aerodynamics of race cars, sails and sportswear.
- basic wind-structure interaction problems.

Potential Users at ISU

- Department of Aerospace Engineering
- Department of Civil, Construction and Environmental Engineering
- Department of Mechanical Engineering
- Department of Architecture
- Department of Agricultural Engineering
- Department of Meteorology
- Department of Agronomy
- ISU Research Centers

Dedicated Faculty and Staff

- Partha P. Sarkar, Ph.D. (Johns Hopkins), *Associate Professor and Wilson Chair, Director of WiST Laboratory, Departments of Aerospace Engineering and Civil, Construction and Env. Engineering*
- Fred L. Haan, Ph.D. (Notre Dame), *Assistant Professor of Aerospace Engineering*
- William Gallus, Ph.D. (Colorado State), *Associate Professor, Department of Geological and Atmospheric Sciences*
- Hui Hu, Ph.D. (University of Tokyo), *Assistant Professor, Department of Aerospace Engineering*
- *Graduate research assistants*
- Bill Rickard, *Laboratory Technician*
- Gayle Fay, *Secretary*

Please contact Dr. Partha P. Sarkar, Director of WiST Laboratory (ppsarkar@iastate.edu), Department of Aerospace Engineering at Iowa State University for further information.

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