Advanced Technology For Large Structural Systems (ATLSS) Research Center

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The ATLSS Engineering Research Center is a national center for research and education on structures and materials of the infrastructure. Established in May 1986 with a grant from the National Science Foundation (NSF), the Center now addresses the research goals of the NSF, the U.S. Department of Transportation, the Commonwealth of Pennsylvania, the U. S. Department of Defense, and numerous national, state, and local industry and government organizations and agencies. Approximately 80 people, including graduate and undergraduate students, research associates, faculty and staff members representing the disciplines important to large structural systems are active at the Center.

ATLSS research areas include: Advanced Structural Systems and Materials; Measurement, Simulation, and Evaluation of Structural Systems; Infrastructure Reliability, Maintenance, and Life-Cycle Performance; Intelligent Structural Systems; and Infrastructure Hazard Mitigation with particular emphasis on Earthquake-Resistant Structures. The research is conducted in close association with engineers and scientists from several Lehigh departments, industry, government, design and professional groups and other universities.

ATLSS has excellent research facilities and equipment, including two world-class structural testing facilities; the Fritz Engineering Laboratory and the ATLSS Multi- Directional Testing Laboratory, in which researchers study large-scale structural subassemblies under static, dynamic, and/or cyclic multidirectional loading with complete computer-controlled experimentation. A recent grant from the NSF created the real-time multi-directional (RTMD) experimental facility to evaluate the performance of engineering designs and materials during earthquakes, hurricanes and other storms, tsunamis, landslides, and other disasters as part of NSF's Natural Hazards Engineering Research Infrastructure (NHERI) program. ATLSS also has outstanding resources for computing, mechanical testing, welding, metallography, and non-destructive evaluation.

RESEARCH ACTIVITIES

Advanced Structural Systems and Materials

Research is conducted on new structural forms and structural systems to promote efficiency through innovation and to promote the competitive use of high-performance steel, concrete, fiber-composites, and mixed systems for bridge, building, and ship-hull applications.

Measurement, Simulation, and Evaluation of Structural Systems

Techniques for measuring and simulating the behavior of structural systems under realistic loading conditions are being developed and implemented in the laboratory and in the field. Lab and field assessments are made on bridge, highway, railway and ship structures for evaluating their behavior under load, and evaluating the effects of corrosion, fatigue, and other damage.

Infrastructure Reliability, Maintenance, and Life-Cycle Performance

Research is conducted on optimal design, maintenance, monitoring and management of infrastructure systems, and on structural health monitoring, structural damage models and assessment, and predicting the remaining life of structures considering uncertainty.

Infrastructure Hazard Mitigation

Research is conducted on engineering processes and structural systems and materials technology to predict and reduce economic losses and injuries from hazard events, such as earthquake, blast, fire, and vehicular impact.

Intelligent Infrastructure Systems

Research is conducted on materials, components, and systems for sensing, processing and utilizing sensor information, and adaptively controlling the behavior of the large-scale structures of the infrastructure.

Educational Opportunities

The ATLSS Engineering Research Center facilitates broad programs of study and research in the fields of structures and materials. Graduate students in the Center's programs receive master of science, master of engineering, or doctor of philosophy degrees, usually in structural engineering, materials science and engineering, or mechanical engineering. Financial support for graduate students is available through ATLSS by means of fellowships and research assistantships related to sponsored research programs.

Undergraduates participate in the Center's research through summer internships and academic-year special projects.

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