ABOUT NEES
THE TOOLS OF NEES
SYSTEM INTEGRATION
SHAKE TABLES
LARGE-SCALE LABORATORIES
TSUNAMI WAVE BASIN
GEOTECHNICAL CENTRIFUGES
FIELD TESTING EQUIPMENT
NEES GRAND OPENING

Buildings, cars and personal property were destroyed when an earthquake struck Northridge, California, Jan. 17, 1994. The earthquake damaged approximately 114,000 residential and commercial structures and caused 72 deaths. Damage costs were estimated at $25 billion.

Credit: FEMA News Photo

About NEES

More than 75 million Americans in 39 states live in towns and cities at risk for earthquake devastation.

Credit: J.K. Nakata, U.S. Geological Survey

The National Science Foundation (NSF) created the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) to give researchers the tools to learn how earthquakes and tsunami impact the buildings, bridges, utility systems and other critical components of today's society.

NEES is a network of 15 large-scale, experimental sites that feature such advanced tools as shake tables, centrifuges that simulate earthquake effects, unique laboratories, a tsunami wave basin and field-testing equipment. All are linked to a centralized data pool and earthquake simulation software, bridged together by the high-speed Internet2. The new NEESgrid system, a communications web that uses collaborative tools and tele-presence technologies, allows off-site researchers to interact in real time with any of the networked sites.

With these tools, engineers and students from all parts of the country can collaborate on multi-site experiments using simulators that generate earthquake effects strong enough to bring down full-sized buildings.

From that knowledge will come a new set of rules from which engineers can design structures and materials that will better withstand earthquake forces.

NEES Operations

NEES will operate from Oct. 1, 2004, through Sept. 30, 2014. The nonprofit NEES Consortium, Inc. (NEESinc) will operate and coordinate the network's activities. NEESinc provides open access to the 15 sites by allocating research time at the facilities while leading training, education and outreach activities and establishing ties with U.S. and international partners.

The Consortium of Universities for Research in Earthquake Engineering (CUREE), under an NSF development award, led the project to establish NEESinc. Partners in the consortium's development included the Civil Engineering Research Foundation--the research arm of the American Society of Civil Engineers--the Earthquake Engineering Research Institute, faculty members from academic institutions across the United States and practicing engineers.

An executive director and a board of directors guide the public-benefit NEESinc. Those involved in the organization's planning, leadership and management broadly represent the earthquake engineering community and provide expertise in areas such as organizational planning, earthquake engineering research, information technology, simulation and assessment.

NEESgrid

A pioneering cyberinfrastructure known as NEESgrid connects earthquake engineering researchers throughout the United States and the world. Integrating real-life and computational simulations, NEESgrid software brings together various components to share knowledge and enables researchers to breach traditional disciplinary and geographical barriers to design innovative, safer civil infrastructure.

NEESgrid software represents the culmination of several years of effort to develop a national, virtual "collaboratory" for earthquake engineering. With NEESgrid, geographically distributed teams efficiently plan, perform and publish earthquake engineering research, ultimately producing increasingly complex, comprehensive and accurate design and performance models of at-risk civil infrastructure.

Credit: FEMA News Photo

The core features include tele-presence services that allow users to remotely observe and control an experiment; streaming data services that transfer data to remote users; and preliminary data and metadata management services that will ultimately allow data storage and retrieval from the NEESgrid repository. Users access this collaborative environment through a Web-based, customizable user interface that integrates a suite of tools for experiment planning, execution, analysis and publication.

OpenSees, a software framework for computational simulation of structural and geotechnical systems, provides the computational simulation capabilities in NEESgrid. FedeasLab serves as a toolbox for nonlinear structural analysis for Matlab software. The NEESgrid Simulation Portal allows users to remotely access OpenSees.

NEESgrid is the product of close collaboration among a broad spectrum of civil engineering departments, computational science centers, national laboratories and private-sector partners, led by the National Center for Supercomputing Applications and the University of Illinois Department of Civil and Environmental Engineering. Development partners included Argonne National Laboratory, the University of Michigan, the University of Southern California, Stanford University, Washington University at St. Louis, the University of California at Berkeley, Mississippi State University, Pacific Northwest National Laboratory and Creare, Inc.

NEESit

The NEES Cyberinfrastructure Center (NEESit), led by the San Diego Supercomputer Center in partnership with Oregon State University, the University of Michigan, the University of California at Berkeley, and Creare, Inc., will oversee NEES operations and maintenance.

Three core objectives for NEESit are:

- develop a distance-independent environment for collaboration that fosters large-scale, integrated, earthquake engineering studies required to address many of the complex problems of earthquake engineering
- build an end-to-end data environment that captures, manages and preserves the vast amounts of experimental data and associated metadata, and ensures that the information is readily accessible to NEES's research, education and practitioner communities
- ensure that earthquake engineering researchers have easy access to high-end computational resources and visualization and simulation capabilities

For more information on NEES, see https://nees.org/ .

George E. Brown, Jr.

The NEES project was named in memory of the late George E. Brown, Jr., former chairman of the House Science Committee and a champion of engineering and science in Congress for more than 30 years. Representative Brown authored the legislation creating the interagency National Earthquake Hazards Reduction Program in 1977, which in turn, led to the creation of the George E. Brown, Jr. Network for Earthquake Engineering Simulation.

By Josh Chamot

ABOUT NEES
THE TOOLS OF NEES
SYSTEM INTEGRATION
SHAKE TABLES
LARGE-SCALE LABORATORIES
TSUNAMI WAVE BASIN
GEOTECHNICAL CENTRIFUGES
FIELD TESTING EQUIPMENT
NEES GRAND OPENING

The Tools of NEES

Versatile Real-Time Hybrid Testing Facilities

State University of New York, Buffalo
http://nees.buffalo.edu
Shake Table

Large High-Performance Outdoor Shake Table

University of California, San Diego
http://nees.ucsd.edu
Shake Table

Biaxial Multiple Shake Table Research Facility

University of Nevada, Reno
http://nees.unr.edu/
Shake Table

Reconfigurable Reaction Wall-Based Earthquake Simulator Facility

University of California, Berkeley
http://nees.berkeley.edu/
Large-Scale Laboratory

Large Displacement Soil-Structure Interaction Facility for Lifeline Systems

Cornell University
http://nees.cornell.edu/
Large-Scale Laboratory

Multi-Axial Full-Scale Sub-Structuring Testing and Simulation Facility

University of Illinois, Urbana-Champaign
http://nees.uiuc.edu/
Large-Scale Laboratory

Real-Time Multidirectional Testing Facility for Seismic Performance Simulation of Large-Scale Structural Systems

Lehigh University
http://www.nees.lehigh.edu/
Large-Scale Laboratory

System for Multi-Axial Subassemblage Testing

University of Minnesota, Twin Cities
http://nees.umn.edu/
Large-Scale Laboratory

Multidirectional Wave Basin for Remote Tsunami Research

Oregon State University
http://nees.orst.edu/
Tsunami Wave Basin

Geotechnical Centrifuge Facility

University of California, Davis/Georgia Institute of Technology
http://nees.ucdavis.edu/

Geotechnical Centrifuge

Next-Generation Earthquake Engineering Experimental Capability Using 100 g-ton Geotechnical Centrifuge

Rensselaer Polytechnic Institute
http://www.nees.rpi.edu/
Geotechnical Centrifuge

Permanently Instrumented Field Sites for Study of Soil-Foundation-Structure Interaction

University of California, Santa Barbara/University of Southern California/Brigham Young University
http://nees.ucsb.edu/
Field-Testing Equipment

Field-Testing and Monitoring of Structural Performance

University of California, Los Angeles
http://nees.ucla.edu/
Field-Testing Equipment

Large-Scale Mobile Shakers and Associated Instrumentation for Dynamic Field Studies of Geotechnical and Structural Systems

University of Texas, Austin
http://nees.utexas.edu/
Field-Testing Equipment

NEESgrid

University of Illinois, Urbana-Champaign
http://it.nees.org
System Integration

The NEES@Colorado equipment site is no longer part of the NEES network, effective October 1, 2009.

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

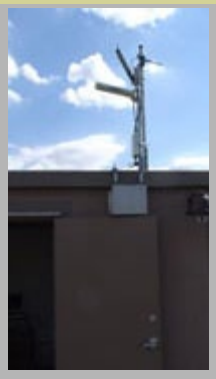
LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING



The 802.11b antennas transmit data throughout NEESgrid as part of a project involving the High Performance Wireless Research and Education Network (HPWREN) at the University of California, San Diego. One antenna is for the HPWREN uplink and the other two for sensors deployed around Garner Valley, California.

Credit: University of Illinois, Urbana-Champaign

(Note About Images, Copyright)

System Integration

NEESgrid

Developed by a multi-organizational team led by the University of Illinois, Urbana-Champaign, and now operated by the NEES Consortium, Inc., Davis, California.

http://it.nees.org

Credit: University of Illinois, Urbana-Champaign

(Note About Images, Copyright)

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING

Shake Tables

Shake Table: University at Buffalo, State University of New York

Shake Table: University of California, San Diego

Shake Table: Equipment: University of Nevada, Reno

More Special Reports

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING

Large-Scale Laboratories

Large-Scale Laboratories: Cornell University

Large-Scale Laboratories: Lehigh University

Large-Scale Laboratories: University of California, Berkeley

Large-Scale Laboratories: University of Illinois, Urbana-Champaign

Large-Scale Laboratories: University of Minnesota

More Special Reports

The NEES@Colorado equipment site is no longer part of the NEES network, effective October 1, 2009.

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING

Tsunami Wave Basin

Tsunami Wave Basin: Oregon State

More Special Reports

National Science Foundation
WHERE DISCOVERIES BEGIN

Network for Earthquake Engineering Simulation

A SPECIAL REPORT

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING

Geotechnical Centrifuges

Geotechnical Centrifuges: Rensselaer Polytechnic

Geotechnical Centrifuges: University of California, Davis

More Special Reports

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING

Field Testing Equipment

Field Testing Equipment: University of California, Santa Barbara/University of Southern California/Brigham Young University

Field Testing Equipment: University of California, Los Angeles

Field Testing Equipment: University of Texas at Austin

More Special Reports

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING

Northridge Earthquake, CA, January 17, 1994 -- Many roads, including bridges and elevated highways were damaged by the 6.7 magnitude earthquake. Approximately 114,000 residential and commercial structures were damaged and 72 deaths were attributed to the earthquake. Damage costs were estimated at $25 billion.

Credit: FEMA News Photo

NEES Grand Opening

Credit: R. Kachadoorian, U.S. Geological Survey

On November 15th, the National Science Foundation hosted the grand opening of the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES).

The grand opening included live, remote demonstrations from four of the network's research sites, including a test that inflicted the forces of historic earthquakes upon a 70-foot-tall wind turbine.

Following remarks from NSF Deputy Director Joseph Bordogna and Assistant Director for Engineering John Brighton, the demonstrations were presented by the president of NEES Consortium, Inc., Ian Buckle.

Following question and answers via telecom with all 15 sites, guests were invited to attend a reception featuring a live, scaled-size demonstration of one of the NEES tools.

View the archived webcast at http://www.nsf.gov/news/mmg/mmg_disp.cfm?med_id=59393 Please see below for additional information.

>>Webcast

>>Media Advisory

>>Agenda

ABOUT NEES

THE TOOLS OF NEES

SYSTEM INTEGRATION

SHAKE TABLES

LARGE-SCALE LABORATORIES

TSUNAMI WAVE BASIN

GEOTECHNICAL CENTRIFUGES

FIELD TESTING EQUIPMENT

NEES GRAND OPENING

Northridge Earthquake, CA, January 17, 1994 -- Many roads, including bridges and elevated highways were damaged by the 6.7 magnitude earthquake. Approximately 114,000 residential and commercial structures were damaged and 72 deaths were attributed to the earthquake. Damage costs were estimated at $25 billion.

Credit: FEMA News Photo

NEES Grand Opening

MEDIA ADVISORY
Nov. 3, 2004

STANDING UP TO EARTHQUAKES

Network of laboratories will rock the next-generation of earthquake-resistant structures

Arlington, Va.--From the Pacific coast to our nation's interior, more than 75 million Americans in 39 states live in towns and cities at risk for earthquake devastation.

While scientists are digging into the origins of seismic waves, engineers are pushing the boundaries of design to create structures that remain safe when an earthquake ultimately surfaces.

On Nov. 15, the National Science Foundation (NSF) will host the grand opening of a research network that addresses this important design need--the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES).

Created with $81.8 million of NSF support, the system of 15 facilities is distributed across 10 states and linked via Internet2 grid connections. Researchers can run experiments simultaneously at any of the sites with tools ranging from building-scale shake tables and ground-altering field equipment to large testing laboratories and a tsunami-generating wave basin.

The grand opening will include live, remote demonstrations from four of the network's research sites, including a test that inflicts the forces of historic earthquakes upon a 10-story wind turbine.

For additional details about the event and its webcast, see the NEES grand opening webpage at: http://www.nsf.gov/news/mmg/mmg_disp.cfm?med_id=59393

Following remarks from NSF Deputy Director Joseph Bordogna and Assistant Director for Engineering John Brighton, the demonstrations will be hosted by Ian Buckle, president of NEES Consortium, Inc.

Following questions and answers via telecom with all 15 sites, guests are invited to attend a reception featuring a live, scaled-down demonstration of one of the NEES tools.

RSVP is required to gain access to NSF. To attend, register with Josh Chamot, NSF Media Officer for Engineering, at jchamot@nsf.gov.

WHAT:
Grand Opening of the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES)

WHO:
Representatives from NEES sites and the NEES Consortium
NSF Deputy Director Joseph Bordogna
NSF Assistant Director for Engineering John Brighton

WHEN:
Nov. 15, 2004, beginning promptly at 1:30 p.m.

WHERE:
National Science Foundation, Room 1235
4201 Wilson Blvd.
Arlington, VA 22230

(Ballston metro stop)

Media visitors should check in at the security desk located at the 9th & Stuart Streets entrance

For more information, contact: Josh Chamot, 703-292-7730, jchamot@nsf.gov

###

NSF PA/M-04-34

NSF is an independent federal agency that supports fundamental research and education across all fields of science and engineering, with an annual budget of nearly $5.58 billion. NSF funds reach all 50 states through grants to nearly 2,000 universities and institutions. Each year, NSF receives about 40,000 competitive requests for funding, and makes about 11,000 new funding awards. NSF also awards over $200 million in professional and service contracts yearly.

Useful National Science Foundation Web Sites

NSF Home Page: http://www.nsf.gov/

Newsroom: http://www.nsf.gov/news/newsroom.jsp

Science Statistics: http://www.nsf.gov/statistics/

Awards Searches: http://www.nsf.gov/awardsearch/

ABOUT NEES
THE TOOLS OF NEES
SYSTEM INTEGRATION
SHAKE TABLES
LARGE-SCALE LABORATORIES
TSUNAMI WAVE BASIN
GEOTECHNICAL CENTRIFUGES
FIELD TESTING EQUIPMENT
NEES GRAND OPENING

Northridge Earthquake, CA, January 17, 1994--Many roads, including bridges and elevated highways were damaged by the 6.7 magnitude earthquake. Approximately 114,000 residential and commercial structures were damaged and 72 deaths were attributed to the earthquake. Damage costs were estimated at $25 billion.

Credit: FEMA News Photo

NEES Grand Opening

Agenda

NSF MEDIA BRIEFING

Grand Opening
Network for Earthquake Engineering Simulation (NEES)

National Science Foundation
Monday, November 15, 2004—Room 1235
Arlington, Virginia

1:30-1:35 p.m. EST
Welcome
Ian Buckle--Moderator
President, NEES Consortium, Inc.
Professor, Department of Civil and Environmental Engineering
University of Nevada, Reno

1:35-1:45 p.m.
A Catalyst for Research into Earth's Tremors and Traumas
Joseph Bordogna
NSF Deputy Director

1:45-1:55 p.m.
A New Paradigm for Research
John Brighton
NSF Assistant Director for Engineering

1:55-2:05 p.m.
NEES Overview
Ian Buckle

2:05-2:10 p.m.
NEESgrid
Bill Spencer
Nathan and Anne Newmark Endowed Chair in Civil Engineering and NCSA Senior Center Affiliate
Dept. of Civil and Environmental Engineering
University of Illinois, Urbana-Champaign

Demonstrations from NEES Sites
2:10-2:20 p.m.
Site 1-UIUC
NEESgrid – Creating New Frontiers in Collaborative Earthquake Engineering Research
Speakers:
Amr S. Elnashai
D.B. Willett Professor of Engineering
Director, Mid-America Earthquake Center

2:20-2:30 p.m. (Remaining Demo Site Introductions by Ian Buckle)
Site 2-Cornell
Large-Displacement Soil-Structure Interaction Facility for Lifeline Systems
Cornell University
Speakers:
Harry Stewart
Associate Professor,
School of Civil and Environmental Engineering, and
Director, Civil Infrastructure Laboratories

Timothy Bond
Manager of Technical Services
School of Technical and Environmental Engineering

2:30-2:40 p.m.
Site 3 -Oregon State
The Next-Generation, Shared-Use Facility for Remote Tsunami Research
Oregon State University
Speakers:
Daniel Cox
Associate Professor
Department of Civil, Construction and Environmental Engineering and
Director, O.H. Hinsdale Wave Research Laboratory

Cherri Pancake
Professor, School of Electrical Engineering and Computer Science
Director, Northwest Alliance for Computational Science and Engineering

2:40-2:50 p.m.
Site 4--UCSD
Large High-Performance Outdoor Shake Table
University of California, San Diego
Speakers:
Jose Restrepo
Professor of Structural Engineering
UCSD Jacobs School of Engineering

Robert Englekirk
Founder, The Englekirk Companies

2:50-3:30 p.m.
Q & A - All NEES sites

3:30-5:00 p.m.
Reception at NSF Headquarters