



BFRL News

Building and Fire Research Laboratory

National Institute of Standards and Technology • U.S. Department of Commerce

2010 CIB World Congress

August 2009

The International Council for Research and Innovation in Building and Construction (CIB) was established as an association whose objectives are to stimulate and facilitate international cooperation and information exchange between governmental research institutes in the building and construction sector, with an emphasis on those institutes engaged in technical fields of research. CIB has since developed into a world-wide network of over 5000 experts from about 500 member organizations with a research, university, industry or government background, who collectively are active in all aspects of research and innovation for building and construction.



The construction and built environment sectors are already hugely important to achieving a world in which people are properly housed, in which buildings and transport systems support the efficient operation of our economies, and in which people are happy and healthy. Connecting and channeling the full capacities of the construction and built environment industries to meet the needs of the human race, head on, will transform the world, for us and for future generations.

Hundreds of researchers from around the world will be meeting at the Congress, representing a strong multi-disciplinary mix of over forty CIB Working Commissions and Task Groups.

BFRL has enjoyed a long and productive relationship with CIB. Currently, I am honored to serve on the CIB Board of Directors. Due in large part to the fact that CIB's mission is well-aligned with our strategic goals, we see tremendous advantages in continuing our interactions with CIB including both opportunities to broaden our knowledge of international developments in research, standards, codes, and practices; and, opportunities to develop cooperative relationships.

I would like to take this opportunity to alert you to the upcoming 2010 CIB World Congress (<http://www.cib2010.com/>), which is focused on Building a Better World. It will be held May 10th - 13th, 2010, The Lowry, Salford Quays, United Kingdom.

Sincerely,
Dr. S. Shyam Sunder
Director, Building and Fire Research Laboratory

Focus on Recruiting

BFRL is actively recruiting at all levels in many key areas (e.g., Simulation & Analysis of Building Mechanical Equipment and Controls, Photovoltaic Module/System Measurement Science, Information Systems Integration, Characterization of Indoor Contaminant Exposure). For more details, please visit the [BFRL Career Web Site](#).

BFRL's programs are focused on five strategic measurement science goals:

[Net-Zero Energy, High-Performance Buildings](#)

[Advancing Infrastructure Delivery](#)

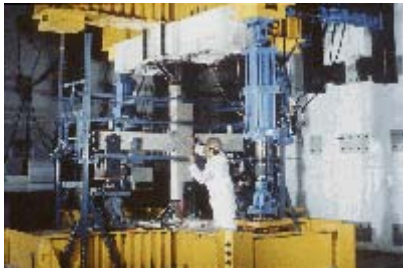
[Sustainable Infrastructure Materials](#)

[Innovative Fire Protection](#)

[Disaster-Resilient Structures and Communities](#)

In addition, BFRL carries out major statutory responsibilities assigned to it by the Fire Prevention and Control Act (1974), the National Earthquake Hazards Reduction Program Reauthorization Act (1977, amended 2004), the National Windstorm Impact Reduction Act (2004), and the National Construction Safety Team Act (2002).

At the Intersection of Research and Practice



Precast beam-column connections undergoing earthquake motion tests in NIST's tri-directional test facility. (Photo credit: NIST)

As the lead agency for the National Earthquake Hazards Reduction Program (NEHRP), NIST operates the NEHRP Secretariat, which is housed within NIST's Building and Fire Research Laboratory. In recent years, the secretariat has coordinated the development of NEHRP's annual reports to Congress as well as the program's new strategic plan. Following publication of the strategic plan in October 2008, the secretariat engaged the National Research Council to convene a national workshop and develop an implementation road map to achieve the

goals set out in the plan.

NIST has begun building an earthquake engineering research program aimed at narrowing the gap between earthquake engineering knowledge and practice. In its first intramural project, NIST is developing an online database of findings generated over the years by NEHRP-funded research projects. This tool will help NIST and others access and apply the valuable knowledge that has been created through NEHRP, especially the results from basic research conducted in hundreds of projects supported by the National Science Foundation (NSF).

NIST has initiated several extramural projects through the NEHRP Consultants Joint Venture, a partnership between the Applied Technology Council and the Consortium of Universities for Research in Earthquake Engineering. In one project, researchers are testing an improved method of quantifying the seismic performance of structural systems, a method developed for use with model building codes. Another project is responding to the need for seismic design guidance for the Nation's vital container-shipping ports. This team will carry out applied research to translate basic research results generated by an NSF-supported study into design prestandards for engineers and building-code developers.

For more on NIST's research role in NEHRP, see the June 2009 *Seismic Waves* article on the NEHRP website:
<http://www.nehrp.gov/pdf/SeismicWavesJun09.pdf>.

NIST Energy Saving Office Study

The Building and Fire Research Laboratory has embarked on a project to reduce the energy used to heat and cool offices within its general purpose laboratories. The project consists of retrofitting an existing office with energy saving features and making a series of measurements to quantify the potential energy savings compared to an adjacent unmodified office. The impetus for this study was an article authored by A. Hunter Fannery, Director of the Building Environment Division, "[Ideas to Reduce NIST Energy Consumption and Peak Demand Charges](#)," documenting a number of ways in which NIST could reduce its energy consumption.

The original NIST laboratory buildings were constructed in the 1960s when energy usage concerns were minimal. The current windows consist of a single pane of glass and the walls are typically un-insulated. Add to this the fact that the

NIST and French Lab to Study Weathering of Advanced Composites for Bridges and Piers

NIST has signed an agreement to collaborate with the French Laboratoire Central des Ponts et Chaussées (National Scientific and Technological Institute, LCPC) to investigate further the implementation of fiber-reinforced polymer (FRP) composites in civil infrastructure. These FRP composites are of mutual interest to both countries because they could be used for high-strength applications such as wind turbines or bridges and piers.

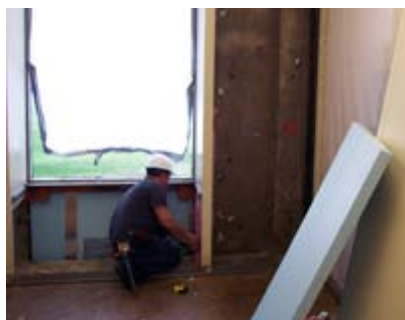
The first planned project is to test the long-term weathering effects on advanced composite materials using NIST's SPHERE (Simulated Photodegradation via High Energy Radiant Emission), a source of high-intensity ultraviolet rays that accelerates outdoor weathering of polymeric materials and composites. For more details on the LCPC research program, see the laboratory Web site at <http://www.lcpc.fr/en/home.dml>.

Live Fire Experiments Provide Data on the Effects of Fire Resources

In February 2009, NIST participated in a demonstration of fire safety experiments, as part of a group of firefighting, public safety and scientific organizations to examine the effect of firefighting crew sizes and equipment arrival times on fire growth rates and a person's ability to survive in a structure-related building fire. Funded by the U.S. Department of Homeland Security (DHS), this firefighter safety and resource deployment study will help governments make informed decisions to better match resources with risks to the public and firefighters in their communities.

The results from these fireground experiments will complement a fire incident survey involving 400 fire departments from across the country. Together, these two

heating units in each office are not thermally insulated from exterior metal panels and significant paths for air leakage exist and we have a recipe for a significant waste of energy. NIST spent over \$16M on electricity and \$11 M on natural gas in FY 06.



Insulation being installed in the project room.
(Photo Credit: NIST)

The project consists of a number of improvements to a single office within the Building Research Laboratory. The improvements being made include replacement of window units, insulation of exterior walls, insulation around ducts, and replacement of outdated HVAC units.

A series of measurements were made to capture the energy saving benefits associated with the retrofits. The retrofitted office and an adjacent office have been vacated for this study. False walls made from extruded polystyrene were

constructed in both offices to isolate the exterior walls of both offices from the interior of the building. A calorimetric technique was used to compare the energy lost through the exterior wall of the retrofitted office to the unmodified control office. A blower door test was conducted to measure the decrease in air infiltration from the exterior. Finally thermographic images were made of the exterior walls of the control office and the retrofitted office.

For more information, see the project webpage:
http://www.bfrl.nist.gov/863/heat_transfer_group/office_study.htm.

NIST Study Offers First Detailed Look at the Progress of a Wildland-Urban (WUI) Fire



Ruins of two homes in The Trails community burned during the Witch and Guejito fires in 2007. (Photo Credit: NIST)

WUI fires are becoming more prevalent as housing developments push into former wilderness areas. Drought is believed to also be a major contributor to larger wildfires. In addition to southern California, WUI fires also burn across the southern United States and in countries such as Australia, Greece, Italy and Spain. Little research has been conducted on understanding WUI fire behavior and on the effectiveness of current risk mitigation strategies.

A new NIST study examines in detail the events in one representative community during the Oct. 21-22, 2007 Witch Fire north of San Diego, Calif. The Witch Fire

was the largest of the 2007 California fire storm. The fire burned 197,990 acres and destroyed more than 1,100 homes. Fire damage was estimated at \$1.8 billion and suppression costs were \$18 million.

For their study, fire researchers Alex Maranghides and Ruddy Mell tracked down every fire captain who worked in the fire at The Trails housing development in

parts of the study will provide an overview of the incident outcomes, along with a detailed understanding of fireground effectiveness. If a third year of funding is awarded, the researchers will develop and validate a computer model that will allow local government decision makers to conduct what if analyses in order to help them make informed choices about the deployment of resources for public and firefighter safety.

NYPD Report on Protecting Buildings Adopts NIST WTC Recommendations

A recently released New York City Police Department (NYPD) report designed to aid the New York City building community by providing information on how to prevent and mitigate the effects of a terrorist attack on a building states that many of its guidelines incorporate recommendations and best practices developed by NIST. The NIST recommendations were a result of the agency's six-year investigation of the collapses of three World Trade Center (WTC) buildings following the terrorist attacks of Sept. 11, 2001. The NYPD report, [Engineering Security: Protective Design for High Risk Buildings](#) may be viewed at the NYPD website: <http://www.nyc.gov/html/nypd/>. Information on NIST's WTC investigation is available at <http://wtc.nist.gov/>. For a list of the NIST recommendations for building codes and standards, see [NIST's Recommendations Following the Federal Building and Fire Investigation of the World Trade Center Disaster](#).

Recognitions

Robert Zarr received the Allen V. Astin Measurement Science Award in recognition of outstanding achievement in the advancement of measurement science. Mr. Zarr was recognized for being solely responsible for the NIST 1-meter guarded hot plate facility, which serves as the nation's standard in the measurement of thermal conductivity of building insulation.

Rancho Bernardo to follow the fires evolution. The NIST researchers, with the support of The Trails Homeowners Association, also collected event timeline information from homeowners. Of the 274 homes in The Trails neighborhood, 245 were within the fire's perimeter. Of those, 74 homes were completely destroyed and 16 were partly damaged.

The study revealed that two-thirds of all the homes destroyed were ignited either directly or indirectly by embers. "This is an important finding because current guidelines to make structures more fire resistant offer little guidance on how to make structures more resistant to an ember attack," fire researcher Alex Maranghides explains. Researchers also learned that one-third of all structures within the fire perimeter were defended by first responders and/or homeowners.

This study is part of NIST's Reduced Risk of Fire Spread in Wildland-Urban Interface Communities research within its Building and Fire Research Laboratory, a program to develop first-generation tools for improved risk assessment and mitigation in WUI communities at risk from wildfires. The report, A Case Study of a Community Affected by the Witch and Guejito Fires, may be found at <http://fire.nist.gov/wui/>.

Comments Sought on NIST Guidelines for Structural Fire Resistance

A new draft report released for public comment by NIST "*Best Practice Guidelines for Structural Fire Resistance of Concrete and Steel Buildings*," was developed in conjunction with the agency's technical building and fire safety investigations of WTC buildings 1 and 2 (the towers) and 7. This draft report is the result of a collaborative effort initiated by NIST that involved experts in the design and construction industry, as well as academia. The report provides a review of existing U.S. and international guidelines and design standards, which use approaches that range from simple prescriptive methods to sophisticated software programs with advanced methods of analysis under a wide range of realistic fire conditions. The report provides general guidance on the approaches to, and practical aspects of, implementing a fire-resistant design approach for concrete and steel buildings.

The draft report is available on the NIST WTC website here: <http://wtc.nist.gov/media/StructuralFireResistance.htm>. NIST plans to hold a series of public workshops sometime in the fall of 2009 (dates yet to be determined) to discuss the contents of the draft report. Details will be made available on the NIST WTC website: <http://wtc.nist.gov/>.

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Robert Zarr (Photo Credit: NIST)

Steven Emmerich received a Distinguished Service Award from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). This award, which recognizes ASHRAE members who give freely of their time and talent on behalf of the society, is based on Emmerich's contributions in the areas of standards development and technical committee activities. The award was presented to Emmerich at the annual society meeting in June 2009.



Steve Emmerich (Photo Credit: NIST)

California Polytechnic State University (Cal Poly) student **Deborah Wang** received the *2009 A.L. Hendry Award*, which recognizes outstanding research by an undergraduate or master degree student. Wang was presented her award at the Coatings Tech Conference, held in Indianapolis, Ind., on April 28 and 29, 2009.



Deborah Wang (Photo Credit: NIST)