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NCPTT Notes

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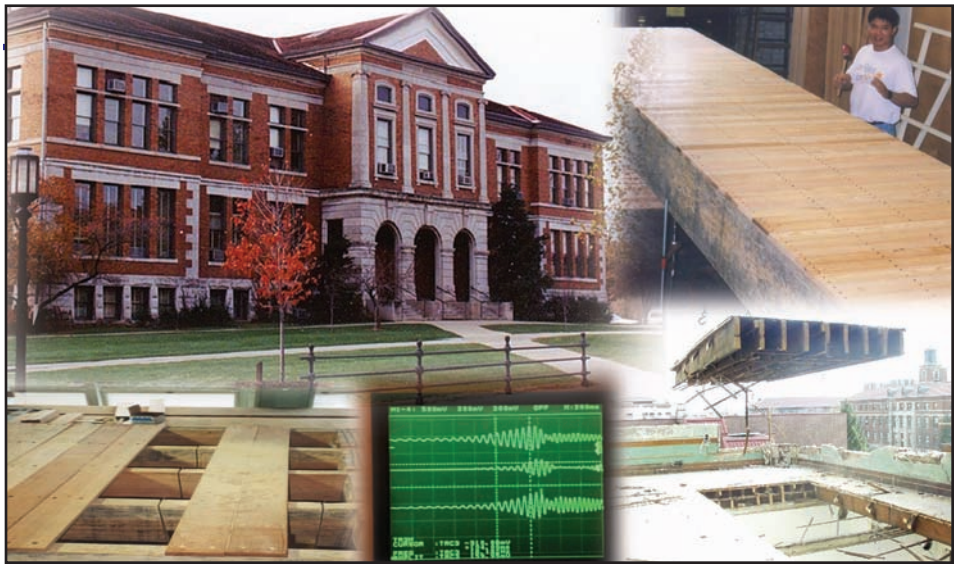
Preservation Technology from the Ground Floor

By Mark Gilberg
Director of Applied Research and Technology Transfer



Researchers at Purdue University are using historic structures, wooden test floors, and actual historic wood floor systems to develop new technologies for preserving wood floors in older buildings.

Historic buildings are being abandoned and demolished at an alarming rate across America. One of the principle structural reasons for this is our inability to accurately assess the load bearing capacity of the wood floor systems in these buildings.

With the help of NCPTT, wood scientists at Purdue University and the USDA Forest Products Laboratory are developing a rapid, cost effective method for nondestructively evaluating the structural integrity of wood floor systems in older buildings. Researchers are studying the use of vibration frequency and stiffness as a means to assess the structural integrity of wood floor systems. The wooden floor is placed under a transverse load and the vibrational frequency and stiffness are measured. Researchers believe that this information will provide a new methodology for determining the soundness of wooden floors.Currently, there are no standard methods for examining and assessing the integrity of wood floors. Consequently, any methods used tend to lead to results that are extremely subjective and arbitrary. Under these circumstances building inspectors and engineers often assign overly conservative load bearing capacities for existing wood floors.

The assignment of low allowable floor loads often means that the continued use or adaptive reuse of older buildings becomes unfeasible, which can lead to their continued disuse or even demolition.

Researchers hypothesize that wood decay reduces the strength and stiffness of the floor, which should affect the dynamic behavior of the wood floor when subjected to loads. The relationship between the natural frequency and stiffness of a structural system is based on mathematical equations governing the motion of an idealized beam subjected to transverse loads.

This relationship yields the curve seen in Figure 1. Although this is an idealized system, it was hoped that this relationship could be used to assess the condition of an in-place floor system.

To test their hypothesis, researchers measured the fundamental frequency and stiffness of a floor and then compared these data to the curve generated by the theoretical model. First,

(continued on page 2)

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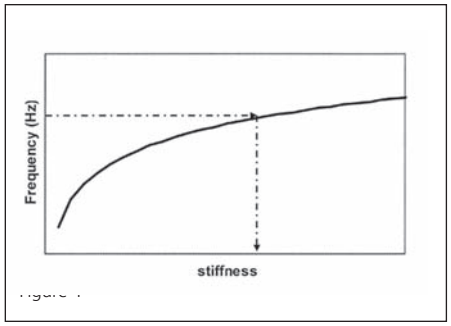


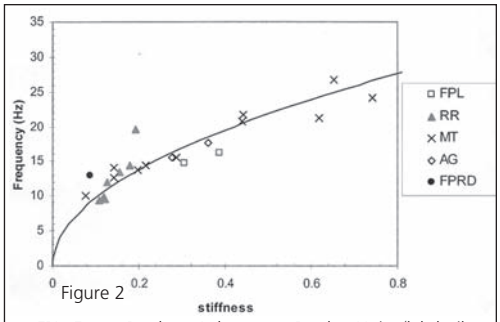


Figure 2

FPL=Forest Products Laboratory, Purdue Univ. (lab built floors)
RR=Railway Station, Lafayette, Indiana (in place floor)
MT=Michigan Tech Univ. (lab built floor)
AG=Agriculture Hall, Purdue Univ. (in place floor)

Wood Flooring...

(continued from page 1)

researchers demonstrated that it is possible to accurately measure the fundamental frequency of vibration of an in-place floor. Next, researchers compared the vibrational response of individual joists with that of laboratory built floor sections as well as similarly constructed in-place wood floor systems in older buildings. Floors were vibrated at various frequencies and at different locations using an electric vibrator attached to the plank sheathing. Then researchers compared the natural frequency of each joist as an individual and as part of the floor system. They found that joist response is similar in both cases irrespective of the location of the electric vibrator. Finally, they determined the floor stiffness of wood floor systems by measuring the deflection of floors when they were weighed with bags of rock salt.

Having determined experimentally both natural frequency and floor stiffness, the researchers plotted these values against the theoretical curve. As can be seen in Figure 2, there is a strong correlation between the model and the experimental results.

These results demonstrate that the fundamental frequency

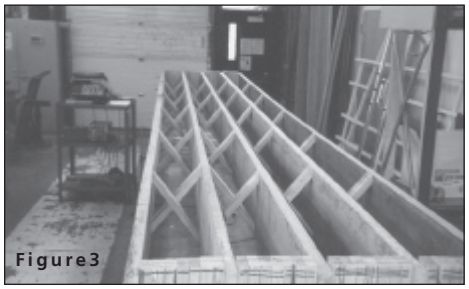


Figure3

of a wood floor can be used to estimate floor stiffness by simply referring to the graph in Figure 2. The derived value for stiffness can then be compared with building code design requirements to determine load bearing capacity. This is a major advance and with continuing trials it is hoped the compiled data will form the basis of computer software that will help structural engineers look beyond water and insect damage as well as age to accurately determine the load bearing capacity of wood floors in older buildings. For further information contact Dr. Michael Hunt, Purdue University, at (765) 494 - 3636 or e-mail mhunt@fnr.purdue.edu.

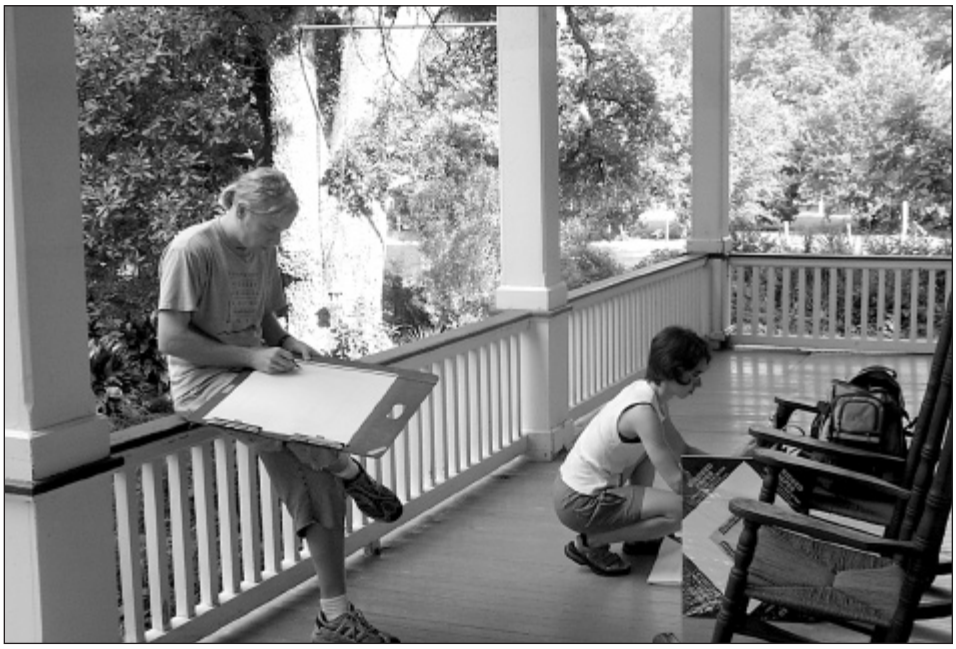
Mark Gilberg is NCPTT's Director of Applied Research and Technology Transfer. His most recent publication is "New Termite Baiting Technologies for the Preservation of Cultural Resources," in the spring 2002 edition of the NPS Bulletin *Park Science*. Contact him at mark_gilberg@nps.gov

HABS performs 12-week survey of

By Rob Morgan
NCPTT Public Outreach Intern

The National Center for Preservation Technology and Training is serving as the headquarters for the Historic American Building Survey (HABS) team during their 12-week study of the Magnolia Plantation.

HABS's mission is to create an archive of American architecture and engineering to offer a better understanding of America's diverse ethnic and cultural heritage. It is the nation's oldest federal preservation program.



HABS participants Brian Carnahan and Oxana Tulejova prepare sketches for their survey of Magnolia Plantation

A program originally created by the National Park Service (NPS) in 1933 as a make-work program during the Great Depression for unemployed architects, draftsmen and photographers, HABS has played an important role in the development of the historic preservation field, in the country and in the state of Louisiana.

Presently, college students undertake much of the documentation through the HABS summer program. Beginning in the 1950's students pursuing degrees in architecture, engineering, history and related fields have been the backbone of the recording activities.

Several structures were documented by the HABS team last year in the Cane River National Heritage Area including the Texas and Pacific Railway Depot, the

(continued on page 6)

NCPTT presents paper on stone conservation

Where better to discuss stone conservation than in the hallowed stone halls at the University of Oxford, England which exhibit centuries of stone weathering and preservation?
In April, Dr. ElizaBeth Bede, the DuPont Materials Research Fellow at NCPTT, traveled to Oxford to co-present a paper on NCPTT's research on stone conservation treatments. Bede co-presented with Kathryn Hallett at Stone Weathering and Atmospheric Pollution Network (SWAPNet) 2002.

The paper entitled "Effects of Fluorinated Organic Resin Treatments on Gaseous Pollutant Deposition" reported the results of the first phase of a large joint research project between NCPTT and the DuPont Corporation.

Bede

This phase of the project measured pollutant uptake rates on untreated stone and stone treated with resins currently under development by Dupont. The results indicated that the treatments decreased pollutant deposition on the limestone and was independent of the concentration of the treatment.

"Developing new treatments with pollutant deterrent capabilities is an exciting development in our field and the paper was exceptionally

(continued on page 7)

Preservation in Practice

Andy Ferrell, research associate at NCPTT, was recently detailed to the Historic Preservation Training Center (HPTC) to participate in a project that involved replacing the slate roof, copper gutter and flashing components, and repairing and repainting the wood dormers and chimney of the museum located adjacent to Arlington House, the Robert E. Lee Memorial in Arlington, Virginia.

Constructed circa 1888 as a potting building, the two-story rectangular building with a slate clad-hipped roof was originally attached to a green house. This building was turned over to the National Park Service in 1929 and the bottom floor was converted into a museum in the 1950's. In the 1980's, the upper floor was converted into a museum textile storage area.

Located in Frederick, Maryland, HPTC is dedicated to the preservation and maintenance of historic structures of the NPS and its partners. The Center operates an on-going developmental training program structured to produce a cadre of trained individuals who are placed in the national park system after certification and three years experience at the HPTC.

The HPTC provides technical consultants to other units of the NPS, federal agencies, and international preservation organizations. All HPTC work is performed in compliance with the Historic Preservation Act of 1966 and other relevant Federal and state laws and regulations.

Workers replaced the slate roof and copper gutter and flashing components as part of their duties at the Arlington House Museum

Meet NCPTT's Summer Interns

Cappeto

Jennifer Cappeto is the American Cemetery intern at NCPTT this summer. She will be working with Dr. ElizaBeth Bede, the DuPont Materials Research Fellow, to develop a conditions survey and site map for the American Cemetery in Natchitoches, Louisiana. The American Cemetery is believed to be the oldest cemetery in the Louisiana Purchase, having been in continual use as a non-denominational burial ground since the founding of Natchitoches in 1714.

Cappeto's duties include creating a survey for the historic cemetery and assessing the condition of nearly 2000 grave markers and tombs. Also, she will develop a site map for the cemetery and photo-document each surveyed grave. In addition she will train local volunteers from the community to assist with the cemetery survey.

Cappeto will complete her master's of science in historic preservation at the University of Pennsylvania next spring with a concentration in building materials conservation. She earned her bachelor's degree in the history of art and architecture from Middlebury College in Vermont.

Seth Fornea is working with NCPTT and Northwestern State University of Louisiana as a chemistry intern this summer. Fornea's main tasks are to assist Dr. Deig Sandoval, the NCPTT/NSU joint faculty, to measure sulfur dioxide deposition on consolidated stone.

Fornea will help prepare stone samples for exposure, treatment and analysis. He will assist in artificial weathering experiments in conjunction with this project. In addition, Fornea will occasionally assist in other projects, such as the American Cemetery Project, as needed. His internship with the center will last for at least 10 weeks.

Fornea

Fornea is a junior at NSU and is majoring in chemistry with a minor in math. He is an active member of the chemistry club, the NSU Crew and the

(continued on page 6)

NCPTT partners to survey historic

By Rob Morgan
NCPTT Public Outreach Intern

Photo by Gary Hardamon

Jennifer Cappeto, NCPTT intern, examines a broken ornament on a gravemarker in the American Cemetery

The American Cemetery has become a much livelier place through the recent efforts of the National Center for Preservation Technology and Training, the Cane River National Heritage Area, the American Cemetery Association and the City of Natchitoches.

A project that began as an extensive cleanup of the cemetery grounds coordinated by the American Cemetery Association, with the assistance of the City Natchitoches, has entered a massive surveying endeavor.

This summer NCPTT began an in-depth survey of the gravemarkers in the American Cemetery, a project requiring the Center to recruit a number of volunteers throughout the summer.

"It is a big project and we have a lot of things we are doing to the cemetery," Jennifer Cappeto, an intern at NCPTT, said.

Cappeto is responsible for the bulk of NCPTT's part of the American Cemetery project. Assessing the conditions of the markers and developing a site map for the historic cemetery are the two main goals the Center has set for her. The work done by Cappeto will benefit the city in future maintenance efforts towards the cemetery.

"I'm excited about the project," Cappeto said. "I think it is a really great opportunity for me to learn about the history and people of Natchitoches."

Cappeto earned her bachelor's degree in the history of art and architecture from Middlebury College in Vermont. Currently, she is working on a master of science in historic preservation with a concentration in building materials conservation at the University of Pennsylvania

Surveying the condition of nearly 2000 grave markers and tombs translates into a great deal of work for an individual. NCPTT provides training for volunteers willing to help Cappeto during this summer-long preservation effort.

"We are looking for people in late high school and older," Cappeto said. "People with an interest in history or science-basically, anyone who would like to learn. It is a great learning opportunity."

A burial ground for early French colonists, the Cemetery was the site for the second Fort St. Jean Baptiste erected in 1737, according to Payne Williams, author of The American Cemetery, the Oldest Cemetery in the Louisiana Purchase, and a Shrine to God and History.

Louis Juchereau de St. Denis, the founder of Natchitoches, is believed to have been buried in the church contained within the fort. The American Cemetery is suspected to be the oldest cemetery in the Louisiana Purchase, having been in continual use as a non-denominational burial ground since the founding of Natchitoches in 1714.

HABS survey...

(continued from page 3)

Roubieu-Jones House, the Coin Coin-Prudhomme House, the Piece-Sur-Piece Building at Ducorneau Plantation and outbuildings at Oakland Plantation, a unit of the Cane River Creole National Historical Park.

"I see the HABS program as an opportunity to get hands-on experience in historical research," Tony Bremholm, HABS' Architectural Historian, said. "My interest is in the cultural aspects of the history of technology, in this case of vernacular architecture in the agricultural landscape."

Members of this year's HABS team are Bremholm of Norman, Oklahoma, Felicia Atwell of Mobile, Alabama, Brian Carnahan of Joplin, Missourri, Oxana Tulejova of Kosice, Slovakia and Andy Sanders of Simsboro, Louisiana.

During their work on the plantation, the HABS team will produce drawings taken from their measurements of the structure, create an overall site plan demonstrating how Magnolia Plantation worked and provide historical research on the plantation.

Atwell, the supervising architect on the HABS team, said the team's work would provide information for other professionals in the preservation field while also increasing the public's awareness of the property.

HABS has a long past with investigating the cultural architecture of Louisiana. Beginning with the rebuilding of Fort St. Jean de Baptiste here in Natchitoches and projects in the Cane River Area: the Africa and Yucca Houses on Melrose Plantation and the Lemee Houses in Natchitoches.

"Architecture of Louisiana, especially along the Cane River, is for me very interesting as it differs a lot from what I have experienced at my home country," said Tulejova. "I am glad to be here, join the HABS team, share my knowledge and in the same time learn."

Rob Morgan is the summer intern for the public outreach program at NCPTT
Contact him at keystock@hotmail.com

Meet NCPTT's Summer Interns

(continued from page 4)

First Baptist Church. His future plans include becoming an environmental chemist and growing 'really big watermelons' on his parent's farm.

George

April L. George has joined the staff of NCPTT as a summer intern in the Public Outreach Program. She is a senior at Northwestern State University of Louisiana working on a degree in business administration and marketing.

Her duties at NCPTT will be creating a community outreach program for the Natchitoches area to inform citizens of the work the Center performs. Her responsibilities include preparing periodic newsletters, organizing web-site content and promoting NCPTT to the public.

George is from Lafayette, Louisiana. After graduating from high school in St. Martinville, Louisiana, she was awarded an athletic scholarship to play volleyball in Jacksonville, Florida. She played there for two years and earned an AA degree in Business.

George transferred to Northwestern State University to continue her volleyball endeavors and will graduate this fall. April plans to attend Louisiana State University to pursue a master's degree in marketing.

Darren J. Modzelewski is working with NCPTT this summer to compile information on Native American consultation, training and other cultural resource management information for the NCPTT website. He will also be working on a project involving the integration and training of federal agencies in dealing with issues related to Native Americans.

Modzelewski

(continued on page 7)

Meet NCPTT's Summer Interns

(contined from page 6)

Modzelewski will work to develop an interactive distance-learning training on consultation with Native Americans in cooperation with the Department of Justice and Tribal Governments. This is a cooperative effort of NCPTT's Federal Preservation Institute, Department of Justice National Advocacy Center and Northwestern State University. A graduate of Brown University with a concentration in anthropology and history,

Modzelewski plans to apply to graduate programs in anthropology and historical archeology in the fall. Following a graduate degree, he would like to return to Brown University as a faculty member and create a Native American Studies Department.

Judi Moon is working with NCPTT and Northwestern State University as a materials testing intern this summer. Her primary responsibilities include conducting research on the interaction of air pollution with conservation treatments for limestone and marble alongside Dr. Deig Sandoval.

Moon will assist NCPTT staff in developing testing methodologies for evaluating sulfur dioxide interaction with consolidated stone. She will also develop a methodology for artificial aging of treated stone samples. Moon will be a part of the NCPTT and NSU staff for 10 weeks.

Moon is a recent graduate from the University of Pennsylvania with a Masters of Science in Historic Preservation. Her focus has been on architectural conservation and she has participated in saving world heritage sites such as the Mesa Verde National Park. Judi plans to continue her work in the field of preservation and to work as an international conservator.

Morgan

Rob Morgan started on May 13th with NCPTT's public outreach program and will work with the Center for a 10-week summer internship.

Morgan's main goal while at the center is to gain public support for NCPTT and its various activities spanning the Natchitoches community and the rest of the United States.

His duties include designing brochures and newsletters, writing press releases and writing articles for the Center's newsletter, *NCPTT Notes*.

Morgan attends Northwestern State University of Louisiana and is majoring in journalism with an emphasis in public relations. At NSU, he is involved with *The Current Sauce*, the student newspaper; the *Potpourri*, the school's yearbook; and the Rowing Team.

SWAPNet

(contined from page 3)

well-received," Bede said .

Kathryn Hallett has recently completed her Master of Arts degree in Conservation Science at the Royal College of Art in London. The work presented was undertaken by Hallett as an NCPTT intern during the summer of 2001. Other authors of the paper are Dr. Mary Striegel of NCPTT and Dr. Robert Swingle and Fred Best, both of DuPont Corporation.

SWAPNet is an informal association of academics, conservators, geologists, and scientists, who share a common interest in studying the process of stone weathering and the application of scientific methods and technologies towards preserving stone structures.

This year's participants hailed from such institutions as the Budapest Technical University in Hungary to the Office for the Investigation of Preservation of Historic Buildings in Austria and from the Essex and Centre for Developing Area Studies in Montreal, Canada, to the Institute of Geochemistry in Prague, Czech Republic.

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NCPTT
NCPTT promotes and enhances the preservation and conservation of prehistoric and historic resources in the United States for present and future generations through the advancement and dissemination of preservation technology and training.