Technical Session 2:
Colley/Hartford Memorial Lecture and Research Symposium

2023 Colley/Hartford Memorial Lecture
Fire Protection Research at the Forest Products Laboratory

Laura Hasburgh
USDA Forest Products Laboratory
Madison, Wisconsin

ABSTRACT

Timber use is vital to the sustainability and heath of American forests and building materials represent a significant market for wood. However, due to the combustible nature of wood, wood building products are at risk of both becoming target fuel and contributing to the fuel load/fire spread. To reduce risk, fire protection measures, such as fire-retardant treatments, can be employed. Here, a summary of current research related to the fire protection of wood building products is provided from uses in the wildland-urban interface to tall wood structures.

Assessment of Incipient Decay in Wood Structures

Tamara França
Mississippi State University
Starkville, Mississippi

ABSTRACT

Early assessment of wood decay in wood structures is needed to avoid failure of the construction and unnecessary replacement. However, the determination of changes in the structure still relies on destructive methods. The objective of this study is to show ongoing efforts to determine incipient or early decay in southern yellow pine caused by brown rot fungal attack. The variables measured in this experiment are stress wave velocity, mass loss, grading based on visual observation of susceptible samples, and an analysis of tension perpendicular to the grain. The results of this research will provide reliable methods for builders and inspectors to assess the integrity of wood buildings.

Machine Vision for Determining Penetration with Fluorescent Surrogates

Andy Zahora
Viance, LLC
Charlotte, North Carolina

ABSTRACT

Machine vision technology has been demonstrated to be an alternative to human visual assessment of penetration in copper-based preservative treated wood. Little is known about the applicability of machine vision for evaluating penetration in wood treated with non-metallic preservative systems that rely on surrogate UV fluorescent tracers to show penetration. This study reports some preliminary results from an investigation into the use of machine vision technology for determination of penetration in southern pine wood treated with a preservative system using a surrogate UV fluorescent tracer.

Initial trials were conducted with a machine vision light box originally designed for copper based preservative systems, but modified to use UV lighting to detect the penetration of the added tracer. The overall procedure is more complex than that for copper penetration testing, as separate analyses must be made in both visible light as well as UV light to determine both heartwood zones as well as penetrated and unpenetrated sapwood zones. The initial light box setup used UV LED lights and camera settings that produced very different results from those observed using fluorescent UV lighting. Results are presented on the sensitivity of the system, the impact of core orientation, early and latewood zones and the use of heartwood indicator on the intensity of fluorescence, as well as differences associated with the UV source and camera settings.

Developing Quality Control Methodologies for Thermally Modified Wood That Predict Performance

Gerald Presley
Matthew Konkler
Jed Cappellazzi
Oregon State University
Corvallis, Oregon

Jeff Lloyd
Nisus Corporation
Rockford, Tennessee

Kelly Bartz
Jon Heyesen
Arbor Wood Company
Duluth, Minnesota

Adam Taylor
University of Tennessee
Knoxville, Tennessee

ABSTRACT

Thermal modification of American wood species is an increasingly popular method for improving wood product durability and stability. Currently there are two major hurdles to the expansion of thermally modified wood (TMW) in North America: 1) the lack of product standardization and methods for third party treatment verification and 2) susceptibility to termites. The authors are initiating a multi-year effort to correlate several measures of treatment (mass loss, equilibrium moisture content, near infrared, infrared, and visible spectroscopy) for thermally modified southern pine and ash to strength and performance in

standard tests (AWPA E16, E18) in three different climates. This work will also attempt to improve the termite resistance of thermally modified wood by incorporating borate treatments into the process. Borate treated southern pine lumber will be added to select thermal modification treatments. Leachability of the borate treated material will be assessed using simulated rainfall in a custom leaching apparatus. Finally, borate treated materials will be exposed to subterranean termite cultures according to AWAP E1 to test their resistance to termites. This work will provide useful information to enable third party verification of thermally modified wood performance and help improve the product's termite resistance.

Utility Pole Assessment

Frederico França
Mississippi State University
Starkville, Mississippi

ABSTRACT

Treated wood utility poles are currently the backbone of the US electrical grid and the total market size for utility poles is up to 70% of this market with these materials being natural are not uniform. Because of this, natural materials are penalized 2-2.5 times in engineering standards and software to account for this variation. This costs wood producers by giving up value and causes a misperception that wood is less strong than its alternative counter parts. The longitudinal stress wave technique is an alternative to measuring the stiffness of structural materials. The objective of this study is to predict the strength of wood poles in the production process. This reading can be stored and tracked for each individual pole throughout production and once in use can continue for its life. This would increase the value of wood poles, reduce the variation among classes, and increase wood use across the utility systems. This data would also greatly benefit utilities, increasing reliability and resiliency, by having a known strength and tracking that strength through the wood pole life cycle.

Performance of SmartFume Internal Remedial Treatment in Douglas-fir Utility Poles

Gerald Presley
Matthew Konkler
Jed Cappellazzi
Oregon State University
Corvallis, Oregon

Guy Helsing
Smartfume Co.
Corvallis, Oregon

Jeff Morrell
University of the Sunshine Coast
Queensland, Australia

ABSTRACT

Regular internal remedial treatment of utility poles with fumigants enables wood pole performance well beyond what would be possible with the original preservative treatment. This is particularly important in thin sapwood species such as Douglas-fir where untreated heartwood can easily be exposed to decay organisms. Chloropicrin is a highly effective pole fumigant that was used as a liquid fumigant applied to treatment holes. However, concerns about applicator safety have led to this treatment falling out of use in test and treat programs. An encapsulated chloropicrin product was developed to limit worker exposure and is now being used under the SmartFume label. Field testing of encapsulated chloropicrin treatments containing 15, 30, or 45 g of chloropicrin in 2.4 m long penta-treated Douglas-fir pole stubs was done near Corvallis, OR. Here we present the 10-year assessment of the 15 and 30 g treatments. Pole stubs were sampled at three locations, at groundline, 450 mm, and 900 mm above groundline. Cores were separated into inner and outer segments and total chloropicrin was quantified in each core section. Both treatment levels produced chloropicrin levels that were on average above the inhibitory threshold for decay fungi (20 µg/g) at all locations. As expected, chloropicrin levels were generally higher in the 30 g treatment. These results shows that encapsulated chloropicrin can maintain inhibitory levels of fumigant in Douglas-fir poles at least through a normal 10-year inspection cycle.

Efficacy of a Non-pressure Wood Protection System in an Above Ground Protected Field Test

Mark Mankowski
USDA Forest Products Laboratory
Starkville, Mississippi

Lukas Dant
Syngenta Crop Protection
Greensboro, North Carolina

ABSTRACT

The efficacy of a spray-on combination formula containing the insecticides thiamethoxam and chlorantraniliprole was tested against subterranean termites using a covered ground proximity test. The test consisted of six treatments where five were various chemical treatments and one was a water control. Equally sized southern pine wood samples were treated with varying rates or applications of the aforementioned insecticide combination, chlorantraniliprole alone, borate alone, or no chemical (water) treatment. Treated samples were installed at the Harrison Experimental Forest in Saucier, MS using a modified protocol described in the AWPA E26 – Standard Field Test for Evaluation of Wood Preservatives to be Used for Interior Applications (UC1 and UC2); Ground Proximity Termite Test. Using this method, test samples were placed in three arrays and monitored for termite attack at six months and annually thereafter. Four-year ratings for termite attack averaged 9.5 and above for all treatments tested except the water control which was rated at 4.2. Decay ratings were also taken and will be discussed along with differences in levels of biological attack per test array.