LICENSED ARCHITECT

Association of Licensed Architects

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Summer 2020

2020 SUMMER Digital Edition

Exterior Insulation Moisture Performance

Continuing Education: Modified Wood

Concrete Subfloors

Lessons Learned from Branding

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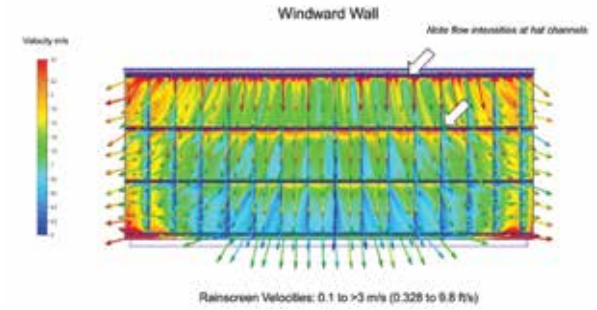

Departments

COVER: Deborah Health Medical Office Building
Architect: Christopher Kidd and Associates, LLC
Design Architect: Randy Guillot AIA LEED AP
Photo Credit: Halkin Mason Photography

PRESIDENT'S message

On behalf of the entire Board of Directors and all the members of ALA, I want to thank you for your continued support and patience during these challenging and uncertain times. We hope this message finds you, your family, colleagues, and friends safe and well.

The ALA, like all not-for-profit organizations, has been impacted hard by the Coronavirus and has made adjustments in order to cope. With this issue of ***Licensed Architect*** the magazine has moved to a digital format and combined the spring/summer issues. The same valuable content is now online here for your review. For the foreseeable future the magazine will remain digital. As you enjoy reading ***Licensed Architect***… you can earn one HSW learning unit for reading the Continuing Education article and completing the ten-question quiz! Lastly, be sure to familiarize yourself with our two Featured Firms, which is often a reader favorite in each issue. Impressive projects, fabulous photos, and enlightening articles highlight the firms' work.

After much consultation and taking into consideration evolving public restrictions and, most importantly with the health and safety of all in mind, this year's Golf Outing will move to 2021. Additionally, the date of the ALA 2020 Midwest Conference has been moved to May 11, 2021. Given the uncertainty and continued evolving nature of the Coronavirus situation, this date is tentative. Currently, we will be utilizing the same conference location and schedule.

We are working to create value for your investment in ALA. To this end we have introduced more webinars since the Pandemic began. The response to the Design Awards has been excellent and has surpassed last year's registrations. We have moved to an online submission platform and the judging will be virtual.

Currently, we are planning a November 2020 virtual mini-conference with a keynote, virtual-tour, and educational seminars. You will be able to earn up to six learning units. This meeting will be conducted over three afternoons, so as not to create online fatigue for the attendees. Stay tuned for the schedule and details as they become available.

Additionally, ALA is planning an Online Exhibit Hall on the www.alatoday.org website. You will be able to find Company contact information, Technical / sales contact information, useful videos, product information and more. We ask that you please support the companies that support ALA by visiting and participating the Online Exhibit Hall.

While we all hope we can get back to some normalcy soon, for the time being, please be safe and stay healthy.

LICENSED ARCHITECT

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Exterior Continuous Insulation: Moisture Performance

How modern construction techniques use rigid foam insulation to address moisture management.

BY LANCE WILLIAMS, ARCHITECTURAL SALES MANAGER AT ATLAS ROOFING CORPORATION.

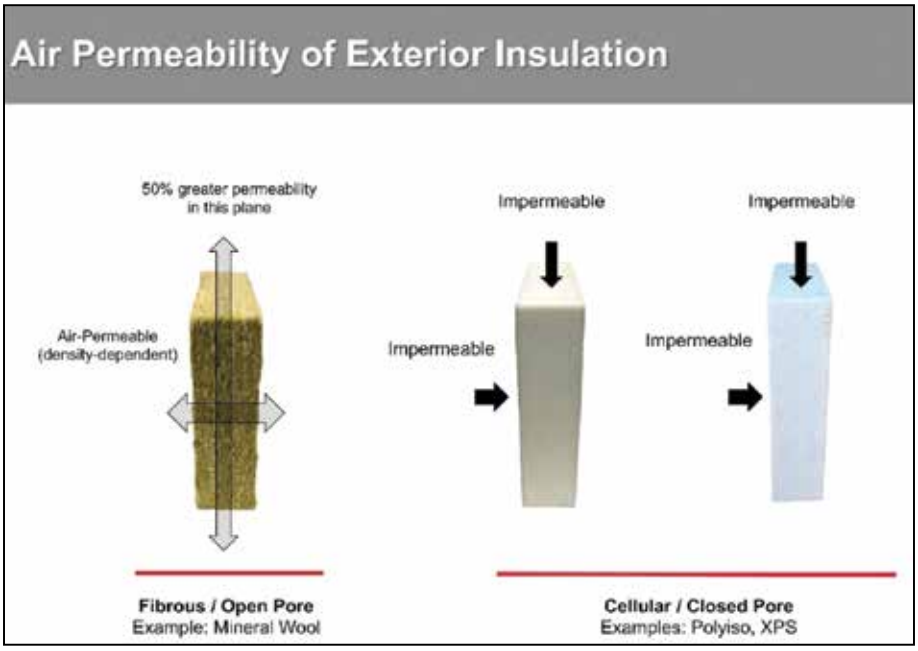
In part one of our three-part series on exterior continuous insulation, we referenced the philosopher-mathematician Blaise Pascal and his great respect for simplicity. Architects understand more than anyone that simplicity is difficult to achieve, as well as the importance of a building material that serves multiple functions in a structure. For part two, our patron philosopher might be Aristotle, who said, "time crumbles things." In the case of modern building construction, that quote could be modified to say, "time and moisture crumble things."

Water always finds a way. Walls today are designed to minimize water intrusion, whether it's by keeping it out completely or allowing it to drain, dissipate and evaporate. Architects and builders want to avoid creating opportunities for moisture to be trapped, as it can degrade a wide variety of building materials, potentially creating conditions that promote mold growth.

THE EFFECTS OF MOISTURE

After discussing fire safety in our last column, moisture might seem like less of a "hot-button" issue. Even though the risk of moisture to a wall assembly may pose less immediate danger than fire, it's much more common and cumulative. Given that building hermetically-sealed walls is not feasible in most construction projects, it's extremely likely that the continuous exterior insulation on your building will come into contact with moisture in some form and degree over its service life.

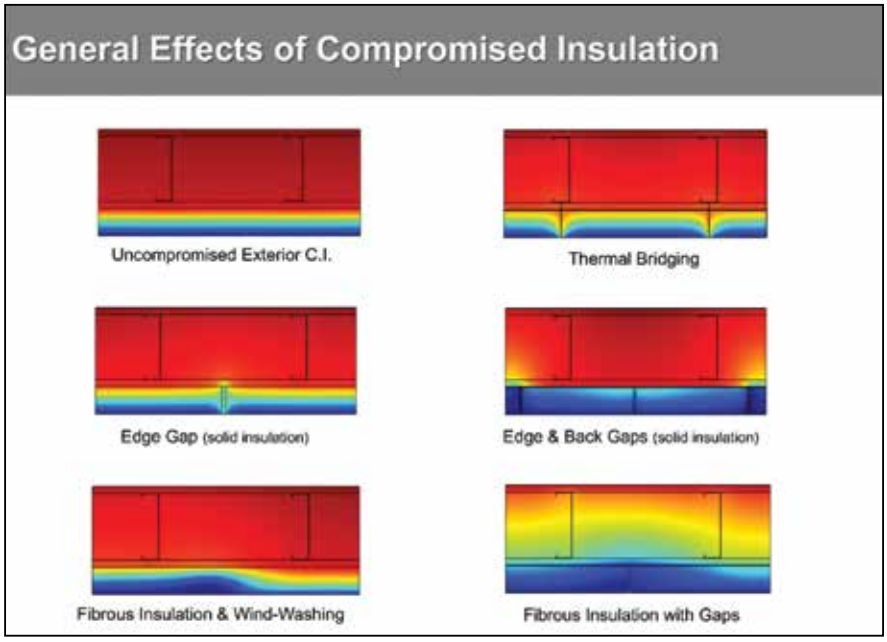
We've already touched on some of the threats presented by moisture – how it can degrade building materials and provide a habitat for mold or mildew – but have not discussed how it can negatively affect continuous insulation's primary function. Unlike insulation, water is an extremely efficient thermal conductor. Some fibrous insulation types, like mineral wool, allow air and moisture to enter the open areas or "pores" of the insulation itself. Because neither water nor air can pass through closed-cell rigid insulations like polyiso, it offers reliable R-value when used for continuous insulation in cavity walls, rainscreen walls and roof assemblies.



The more water a material absorbs and retains, the more it will affect that material's insulating properties. Consider the difference between a wet cotton sweatshirt and an insulated Goretex Parka in a storm. Further, depending on the temperature and degree of water saturation, mineral wool's insulating ability can be reduced by well over 50% following just one wetting cycle. Rigid continuous insulations like polyiso do not absorb any meaningful water content, and therefore have reliable R-values uncompromised by water.

WHAT'S THE RISK?

Energy codes in all U.S. climate zones now require continuous insulation, and because of the energy penalties



incurred by thermal bridging through studs and cladding attachment systems, designing with continuous outbound insulation layers is the wall assembly's best defense against thermal bridging. This new design paradigm exposes CI to wind and water, creating additional challenges for outbound insulations. The exterior CI also creates a rain screen cavity that can allow for wind washing and moisture convection. Further, there is the potential for back gaps, edge gaps, and thermal bridging impacting the wall assembly's continuous insulation.

All of these potential design, install and performance challenges can be thought of in the context of the "Embodied Wall." This is a design concept emphasizing sustainability and tolerance to all conditions while achieving the highest thermal efficiency in its most simple form.

TESTING RESPONSE TO MOISTURE

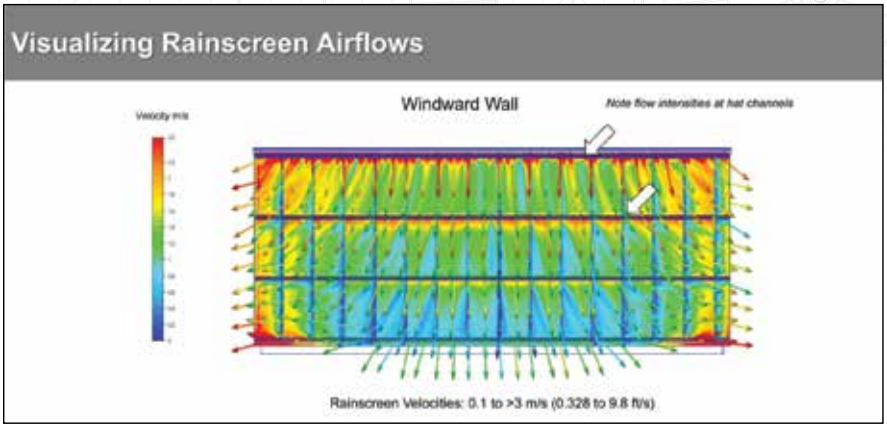
Since the continuous outbound insulation will inevitably come into contact with bulk water, it's important to know how different materials will perform. When testing for water absorption, different types of insulation are subjected to different standards and tests. Foam plastics are often tested using ASTM C209, which requires the material to be submerged in water for two hours,

then air-dried for 10 minutes before being weighed. Mineral wool is subjected to the ASTM C1104 test, which requires it to be exposed to high water vapor, instead of water in a liquid state. After ASTM C209 testing, foam plastic insulation typically absorbs 1% or less of its volume in water. If mineral wool underwent the same test, it can absorb up to 50% of its volume and more during repeated wetting cycles.

Because materials that have absorbed water tend to lose their insulating ability, it's easy to infer that mineral wool would lose quite a bit of R-value when wet. Polyiso outperforms other rigid foam insulations by maintaining its R-value when it's raining, windy, hot, cool, humid or any combination therein. In addition, polyiso insulation comes in a variety of configurations that can be vapor impermeable or semi-permeable, giving architects more choices for how to handle moisture in accordance with their project's goals. Further, because polyiso is extremely lightweight, it's easier to install correctly tight to the backup wall without edge gaps and back gaps that can rob thermal performance.

CONCLUSION

Continuous insulation is now mandated by building codes across the country and consistently acknowledged as a superior design and building practice. Architects considering how to control the way water interacts with their wall assemblies must understand how to quickly divert it away from critical wall components where it could cause damage or reduce the efficacy of the continuous insulation. Thanks to reliable, high R-values; excellent resistance to fire, light weight and multiple joint treatment options; and its ability to resist water as the WRB, polyiso is clearly a strong choice for the continuous insulation layer. Because, when dealing with water, time is not on your building's side. But Aristotle could have told you that.



Christopher Kidd and Associates, LLC
ARCHITECTS ENGINEERS PLANNERS

Christopher Kidd and Associates, LLC is an award-winning architecture and engineering firm headquartered in Menomonee Falls, WI. Additional offices are located in Fort Collins, CO, Sheboygan, WI and Milwaukee, WI. They are an established and proven firm, founded in August 1995; and recognized as experts in healthcare architecture and engineering. They practice throughout the United States with diverse clientele, building typologies, and budgets. Their team of registered architects, licensed engineers, LEED accredited professionals, project managers and designers take the time to listen and learn what matters to you, so they can deliver your vision.

Photo Credit: Halkin Mason Photography

Deborah Health Medical Office Building

This three story patient focused 61,505 sq. ft. medical office building is located on the Deborah Heart and Lung campus with close adjacency to the existing main hospital. This building includes Physician Office Space, an Ambulatory Surgery Center, Imaging Center, Physical Therapy Center, Sleep Center, Pain Management Center, and Wellness Center.

422 Milwaukee

Located in Milwaukee's rapidly growing revitalized Menomonee Valley, this 1929 building is part of Milwaukee's industrial heritage. The renovations include refinished hardwood floors, a virgin timber structure, and the celebrated cream city brick infused with 21st century upgrades.

Photo Credit: AMC-Imagery, LLC

Photo Credit: Endeavour Photography

Comprehensive Care Clinic

Developed on Bingham Memorial Hospitals campus, this new Comprehensive Care Clinic offers a unique approach to medicine. With state-of-the-art medical technology, it houses physicians from a number of disciplines to treat a variety of chronic conditions.

Toyota of Brookfield Automotive Dealership

This new automobile dealership has been designed to meet manufacturer's brand identity requirements and more importantly, to satisfy strict architectural design guidelines of the local municipality. The project fronts on a busy arterial road where the high speeds of passing traffic demand a recognizable architectural form.

Photo Credit: Westin Imaging

Verdure Park

This project is a multi-tenant office/ retail building, the first of six buildings envisioned to be located within this new development. A departure from typical modern commercial shopping centers, this project has a very traditional, residential style that blends seamlessly with its mostly rural surroundings.

Photo Credit: Christopher Kidd and Associates, LLC

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Since 1995, Interwork Architects has brought together people from diverse practices with the common goals of serving our clients, practicing our professions and developing new skills and relationships that meet the challenges of the future. With a staff of both architects and interior designers, Interwork provides a broad-based range of design services, as well as programming/ planning and facilities management assistance.

AAAASF - Gurnee, IL
6,300 SF

When the American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF) purchased a standalone building, Interwork assisted the not-for-profit organization with everything from programming and design through construction of their build-out and coordination of A/V equipment.

Photo Credit: Nick Ulivieri Photography

Bannockburn Lakes Office Plaza Amenities Center
Bannockburn, IL

7,200 SF

Interwork Architects recently converted 7,200 square feet of vacant office space to an amenities center in Bannockburn, Illinois which includes a Wi-Fi Lounge with food service, Conference Training Center and Fitness Facility.

Photo Credit: Nick Ulivieri Photography

Duluth Trading Company

Interwork Architects has been working with Duluth Trading Company on the design and implementation of new standalone stores throughout the country. In addition to the freestanding stores, Interwork has worked with Duluth Trading Company on tenant remodels of existing spaces.

Niles Medical Office Building - Niles, IL

34,000 SF

This new 2-story, 34,000 square foot medical office building was designed such that the first floor would be developed along with the building envelope, and the second floor would remain open and unfinished for future build-out.

Revenuewell - Bannockburn, IL

8,800 SF

This rapidly growing software development company needed a fun and engaging work place for its staff to work hard and play hard. An open plan was imperative to the lifestyle of the programmers who work flexible hours throughout the day.

Photo Credit: Nick Ulivieri Photography

Second Chances: Discussion of Modified Wood

BY: TIMOTHY M. CROWE, ALA, SE, PE, FAPT

Prior Second Chances articles have reviewed different challenges with the use and repair of wood systems. This article takes a different tack and discusses less common wood materials to consider when assessing your project. Selecting the correct treatment of wood materials for exterior decks, cladding, and structural uses creates challenges for designers and builders as they try to achieve a desired appearance and function while addressing wood vulnerabilities to moisture, decay and general durability (Figures 1, 2, and 3).

Figure 1. Advance decay in a timber framed bell tower (left) - (Crowe Photo).

Figure 2. Advance decay and fruiting bodies in a newer multi-family housing development (right) - (Crowe Photo).

It was common practice up until 2003, to use Copper Chromated Arsenate (CCA) treated products, (e.g., Wolmanized) unless a durable species were practical. This waterborne preservative treatment includes various copper concentrations, chromium, and arsenic, and has a demonstrated success since the early 1900s. By December of 2003, in agreement with the EPA, manufacturers voluntarily discontinued manufacturing chromated arsenicals-treated wood products for residential applications. In the immediate time following this change, alternate waterborne preservative treatments were explored in the industry as the search for a “safe” poison was pursued. New formulations needed to replace the chromium and arsenic and began using more significant percentages of copper, ammonia and chlorides such as Alkaline Copper Quaternary (ACQ). These formulations proved to be more corrosive to the traditionally used galvanized connectors and fasteners, and they necessitated a more substantial galvanized coating (such as hot-dipped) or stainless steel components. Formulations had been further altered and employed a combination of micronized copper and borates, such as MicroPro

Figure 3. At lower moisture contents certain wood species are vulnerable to insects. (Crowe Photo)

produced by Koppers Performance Chemicals Inc. The newer formulations are less corrosive to connections, but the use of hot-dipped galvanized or 300 series stainless steel is still advisable for exterior use.

Wood treated with waterborne preservatives (such as that subjected to exterior conditions) remains in high demand in the industry. Although a popular and serviceable material, waste from treated wood is toxic and necessitates added precautions for its disposal. To reduce hazardous wastes, modified wood treatment processes provide viable alternatives for specific wood uses. Modified wood material processes, as described below, are non-toxic, and can provide an eco-friendlier alternative to more traditional preservative treatments. It is through the modification processes, which work on a microscopic level, that the durability of these materials (resistance to rot and insects) and dimensional stability is enhanced. Designs also need to account for the fact that current waterborne wood treatments may experience strength loss of about 10 to 15 percent. When considering modified wood material, it is also important to recognize their effects on wood strength as well as durability. Similar to that of the more conventional treatments, the use of corrosion-resistant fasteners, such as 300-series stainless steel, is advisable.

Wood Material

In reviewing wood treatments, it is important to understand the composition of the wood base material. Wood is a naturally occurring material composed of cellulose, lignin, hemicelluloses and minor amounts of extraneous materials contained within the cellular structure. Figure 4 provides a diagram of a wood log depicting the combination of heart wood, sap wood, and the cambium layer (bark), which is the assembly of cellulous, hemicellulos and lignin. This diagram also illustrates grain orientation and includes larger images of the cellulous structure within hardwoods and softwoods. This discussion will be looking at softwood, the more commonly treated material, due to faster growth rates and more favorable ability to accept the treatment.

Three grain orientations are seen in the enlarged wood diagram, as parallel (along length of log), tangential (tangent to the curved surface of the log), and radially (from the center of the log extending outward). Wood material behavior differs along each of the three grain orientations. Along the length of the member, strength characteristics are greatest and the rate of hygroscopic expansion (changes in volume attributed to changes in moisture content) are the least. Perpendicular and tangential to grain, the strength is dramatically reduced, and the rates of hygroscopic expansion and contraction are vastly increased. Tangential expansion is approximately half of that in the radial direction while longitudinal expansion is generally less than 1 percent from fiber saturation and oven dry. Figure 5, from the Wood Handbook, illustrates

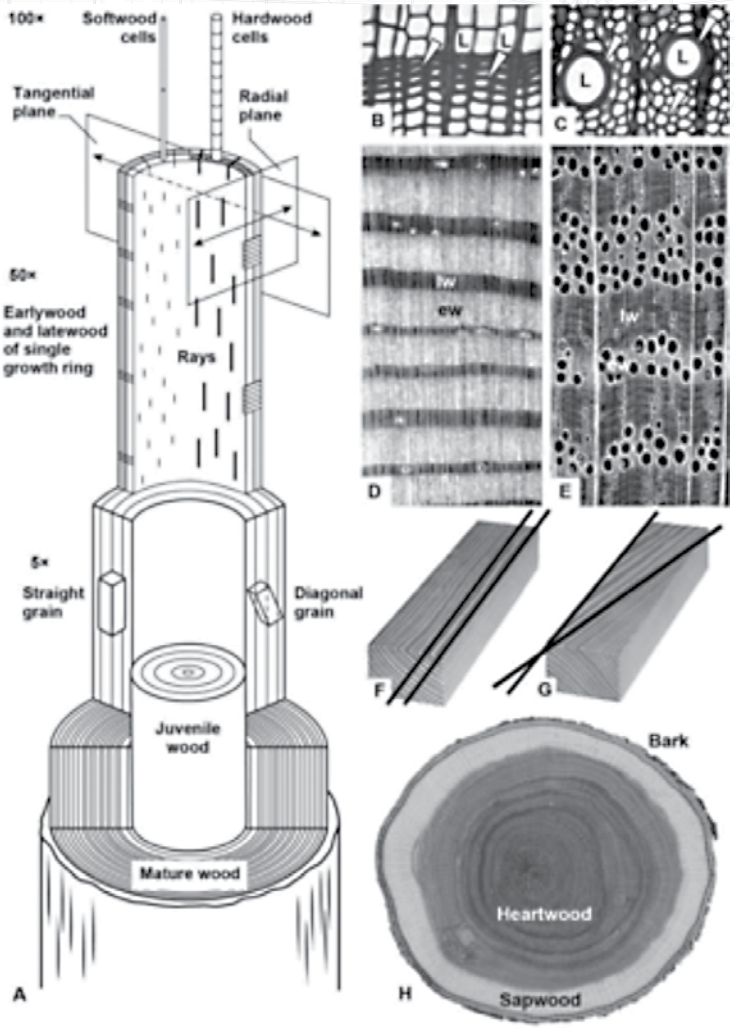

Figure 4. Illustration of labeled log cross section and enlarged views of wood-cell construction. Image from the Wood Handbook published by the Forest Products Laboratory.

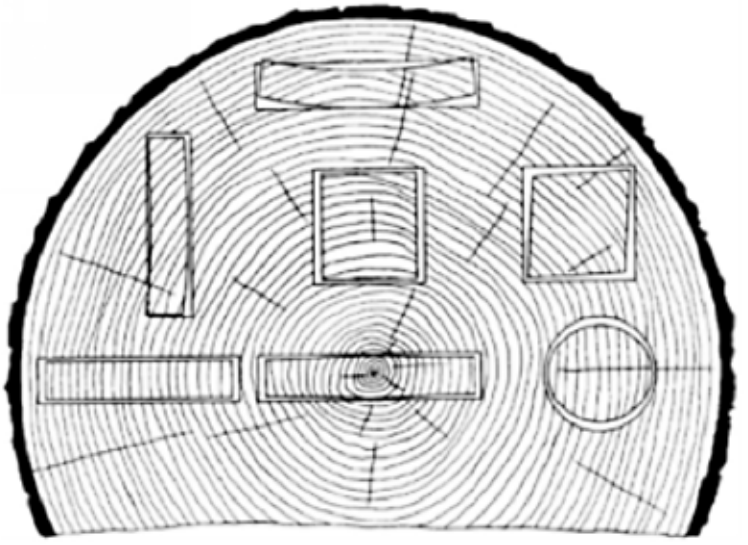

Figure 5. View of log cross section with different piece distortion shown with changes in moisture content. Image from the Wood Handbook published by the Forest Products Laboratory.

the propensity of effects on wood materials with changes in moisture content based on where the wood is extracted from the tree. These volumetric changes in the wood introduce detailing challenges with exterior wood use.

Volumetric changes in wood as noted above are attributed to changes in moisture content. Wood moisture contents will vary with changes in the relative humidity of the wood's environment. This is known as the equilibrium moisture content (EMC), when wood is not absorbing or releasing moisture. The volumetric changes occur when the wood moisture is below the fiber saturation point, which typically falls between 25-and-30 percent based on the material. Although, it may take on additional moisture when wood is at fiber saturation, it will no longer swell. At fiber saturation, wood becomes vulnerable to decay. If the moisture content of wood is kept below its fiber saturation point, decay should not be problematic. The building code defines 19 percent as the actual maximum moisture content within dry service conditions.

Wood will decay when four conditions exist: favorable temperatures (generally between 35 and 100 degrees F), moisture (around the fiber saturation point), oxygen, and food (wood). If one of these can be eliminated, decay can be prevented. Conventional waterborne preservatives work to eliminate food sources in order to prevent decay. Copper is a consistent antimicrobial and bonds tenaciously well to the wood cell walls. Borates also serve as a good antimicrobial; however, borates are diffusible preservatives that can leach out over time with changes in moisture content. While these conventional waterborne preservatives can disrupt the food source, they cannot achieve 100% treatment of the wood cross section, and thus require additional touch-up at cuts and tooling locations.

Wood Modification

Wood modification introduces a non-toxic approach to the preservative treatment of wood. Wood modification technology as discussed herein has been around for most of the 20th century. It was not until more recently, that these materials have become more available.

Wood modification encompasses various approaches to enhance the durability of wood (resistance to decay and insects) for exterior use. These treatments may serve as a viable alternative to convention wood preservative treatments as they can provide benefits such as treatment of 100 percent of the wood cross-section with non-toxic processes. These processes are thermal treatment, kebonization, and acetylation.

Thermal Treatment

Thermal modification of wood (heat treatment - not to be confused with heat sterilization of wood) is a non-toxic process that basically cooks sugars and extractives out of the wood. The sugars and extractives (e.g., waxes, fatty acids, resin acids, and terpenes of a tree) are food sources for fungi and insects. Treated species include redwood, ash, spruce, and radiata pine. The process includes heating the wood to about 400 degrees F, in an oxygen-free environment to remove the organic compounds from the wood cells. The high heat decomposes the sugar compounds creating a durable wood that is resistant to insects and decay. The thermal modification reduces the EMC of the wood approximately 30-50 % lower than that of non-treated wood. Thus, with relative humidity at around 80 percent, (at around 70 F) the resulting EMC of this wood is still only about 8 percent. The result is a more dimensionally stable wood member with less propensity for shrinking and swelling, and reduced cupping or twisting potential.

With the elimination of chemical treatments and the removal of sugars, extractives, and moisture, the wood is also lighter and less dense. Unfortunately, there is also a reduction in strength that generally corresponds with the reduction in density. The treated material is generally marketed for wood siding and similar cladding/vertical surfaces uses that do not include ground contact (Figure 6). Manufacturers recommend coating this material for

Figure 6 Image of Russwood Thermopine®, design by Fife Architects, photo by Keith Hunter.

Figure 7. Photo curtesy of Kebony shows Kebonized wood cladding and decking (SYP) at Onda Restaurant in Oslo, Norway.

protection against ultraviolet rays. Though the material has demonstrated good resistance to beetles, the material is not resistant to termites. Products offered in this category are rated for 20 or 25 years of exterior use.

Kebonization

Kebonization is another wood-modification process that has been commercially available since 2004 and marketed in the US since 2007. This process is generally used with Scots pine, southern yellow pine, radiata pine and maple. This process modifies wood with bio-based alcohol followed by a heat treatment by Kebony ASA in Norway. Initially, the wood is kiln dried to about 4% moisture content and pressure treated with a furfuryl alcohol that is produced from a bio-based liquid (a waste byproduct from sugar cane). The material is then heated up to about 230 F (significantly less than the thermal treated material) at which time the alcohol treatment is polymerized and "permanently transforms the cell structure."

The modification process results in swollen wood cell walls that are no longer vulnerable to the prior ranges of shrinking and swelling. In addition, the changes that take place in the polymerization and thickening of the wood cell also creates a much harder wood material with increased density (~35%), and increased modulus of elasticity (MOE) and modulus of rupture (MOR) values. The feel of the end product is more consistent with that of teak or Ipe (also known as Brazilian walnut) rather than the southern yellow pine and/or maple parent material. This modified wood is widely used as exterior cladding on sloped and vertical surfaces (Figure 7) and is used as an alternative decking and dock material as well. Thirty-year warranties are available for this product, and no coating or other ultra-violet light protection is required for exterior use. This material is not marketed for ground contact.

Acetylation

Acetylation is the third process that we will discuss. This process, which has been commercially available since 2007 in the United States and is primarily used with southern yellow pine and radiata pine, includes a treatment that is somewhat similar to that of waterborne preservatives. The wood is dried to approximately 4 percent moisture content and is then treated with an acetic anhydride (essentially vinegar). This treatment modifies the wood on a molecular level. More specifically, the process removes hydroxyl molecules at the wood cell walls and replaces them with acetic molecules. The result is more swollen cell walls, and a more hydrophobic material that prevents the moisture fluctuations with changes in relative humidity changing the hygroscopic behavior of the wood.

The swollen cell walls and lack of moisture fluctuations result in a lighter and more dimensionally stable material, and the EMC of the acetylated material is drastically reduced. By preventing moisture from approaching fiber saturation, the wood material is not vulnerable to decay. The treatment also provides some termite resistance. The end product necessitates the use of stainless steel fasters. Predrilling is also commonly needed as an increased surface hardness can be prone to splits. However, there is no reduction in MOR or MOE values. Common applications for this material include windows and doors, wood

Figure 8. Wood bridge constructed with acetylated Accoya in Sneek, Netherlands Built: 2008-2010. (Photo Courtesy of Accsys)

cladding, wood decking and structural application (Figure 8). The product can carry a 50 year warranty above ground and a 25 year warranty with ground contact.

Summary

Although waterborne preservatives still maintain a vital role in the construction industry, it is important to recognize both the strengths and limitations of these conventional treatment processes. Where concerns related to durability, dimensional stability, or toxicity of the product are present, wood modification processes may be worth exploring. Similar to that of conventional treatments, not all wood modification processes are best suited for every application of exterior wood. Product selections should be carefully considered. The table below helps to further illustrate properties of these materials for general information. Wood modification such as thermal treatment, kebonization, and acetylation that have become more readily available over the last two decades can, in some instances, produce viable alternative products that may otherwise require traditional (toxic) treatment processes or the use of scarce tropical decay resistant species.

Bio

Timothy Crowe, SE, PE, ALA, FAPT *is an Associate Principal with Wiss, Janney, Elstner Associates, Inc. (WJE) in Northbrook, Illinois, with over thirty years of experience in analysis, investigation, and repair of archaic and contemporary structures. Mr. Crowe is Co-chair of the Association for Preservation Technology International (APT) Preservation Engineering Technical Committee. He can be reached at tcrowe@wje.com.*

Technical Properties Summary of Selected Modified and Treated wood (Note1)

Technical Properties	Units	Non Treated SYP	Treated SYP (Waterborne) UC4A	Non Treated Radiata Pine	Heat Treated Radiata Pine	Kebony SYP	Accoya Radiata Pine
Density (12% Comparison)	pcf	36	32	32	25	43	32
EMC at 70 F and 65% RH	%	12	12	12	6 to 7	6	3 to 5
Bending Strength (MOR)	psi	12,760	11,500	11,700	9,200	13,345	11,600
Stiffness (MOE)	psi	1.81E6	1.62E6	1.48E6	1.2E6	2.25E6	1.27E6
Max Swelling. (Dry to wet) - Tangential direction.	%	5	5	8	4	2.0	1.5
Decay Resistance Exterior	Y/N	N	Y	N	Y	Y	Y
Decay Resistance Ground Contact	Y/N	N	Y	N	N	N	Y
100% Treatment of cross section	Y/N	NA	N	NA	Y	Y	Y
Fire rating ASTM E-84 Class C	Y/N	Y	Y	Y	Y	Y	Y
Coating Required	Y/N	Y	Y, UV and Aesthetics	Y	Y	N	N

Note 1. Properties approximated from available literature and Wood Handbook.

Test Questions - Second Chances: Discussion of Modified Wood

1. In what year did the industry discontinue the use of CCA by agreement with the EPA?
   a. 2000 b. 2001
   c. 2002 d. 2003

2. What issues were discovered with new treatments that replaced the CCA:
   a. There were no problems with the new treatments,
   b. Treated wood required enhanced corrosion protection from the former traditional galvanized coatings.
   c. Only stainless steel should be used with new treatments.
   d. B and C.

3. What conditions must be present for decay to occur.
   a. Oxygen, light, food, and favorable temperatures.
   b. Oxygen, food, moisture, and favorable temperatures.
   c. Non-treated wood, moisture at fiber saturation, and favorable temperatures.
   d. B and C.

4. Waterborne preservative treatments typically result in partially treated wood material while modified wood results in affecting the entire cross section.
   a. True b. False

5. Wood modification is a non-toxic process that has been around since the early 1900s that adds metal and chemical treatments to the wood to enhance the longer term durability of the material.
   a. True b. False

6. Copper and borate treatments do not bond well to the wood cell structure and will leach out over time. These treatments do not provide a long serviceable life.
   a. True b. False

7. Wood will expand and contract with changes in humidity when the wood has a moisture content in between 30 percent to 100 percent.
   a. True
   b. False

8. If you were looking to use a modified wood product in close proximity to grade the most appropriate choice would be:
   a. Acetylated wood material
   b. Kebonized wood material
   c. Thermally treated wood material
   d. A combination non treated and treated material.

9. The acetylation process results in a material that will actually be stronger but have a reduced density when compared to the untreated material.
   a. True
   b. False

10. Select the most accurate statement (s) from below.
    a. Thermal treatment of wood actual results in a weakening of the original wood material with regard to MOR and MOE but will still result in an enhanced durability.
    b. Kebonized wood introduces a bio-based alcohol that results in a swollen wood material that is less dimensionally stable than the non-treated material but provides a more durable product that does not require any exterior coatings.
    c. Acetylated wood material is appropriate for structural applications.
    d. A, B, and C
    e. A and C

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Leave Nothing to Chance When It Comes to Concrete Moisture

BY JASON SPANGLER, WAGNER METERS

Excessive moisture in concrete slabs can cause problems for all types of floors, including carpeting, wood, tile, stone, vinyl, and various coatings. Too much moisture can cause a finished floor to buckle, warp, crack, blister, and discolor. Problems can show up days, months, or years after installation. Once the problems become apparent and damage occurs, the remedy will often be quite expensive. It is estimated that moisture-related flooring failures cost the construction industry $1 billion or more each year.

Fortunately, such problems are nearly always preventable. The best means of ensuring successful flooring outcomes when working with concrete subfloors is to gain a good understanding of the moisture condition of the slab prior to the installation of the finished floor product.

The way to do this is to conduct an accurate test of the concrete slab's moisture. Not just any test will do as we will see. It is imperative that the architect or specifier includes the specification for a reliable, accurate moisture measurement method in the project's plans.

Why Does Concrete Contain So Much Moisture?

Realize that water is one of several key ingredients, making up roughly 16 percent of a concrete slab by volume. Without water, the concrete will not cure properly. It will fail to take on the characteristic strength and hardness that make concrete such a highly valued construction material. Even after concrete cures and hardens, it will still "breathe" with the environment. In humid environments, concrete acts much like a sponge, absorbing significant amounts of moisture from the air. Conversely, dry, warm climates tend to lower moisture in concrete over long periods of time.

How Concrete Dries

Not all the water in a concrete floor slab is necessary for the curing process. Over time much of this excess water will evaporate from the slab's surface. As this occurs, the moisture deeper in the slab moves toward the surface. This creates a moisture gradient with higher levels of water deeper in the slab than at the surface.

When the flooring is installed over the slab, the surface is sealed so that moisture can no longer escape. Once sealed, the slab's moisture condition will tend to equalize and create a "moisture equilibrium." This point of equilibrium is important to keep in mind. If we can obtain a quantitative measure of it, we have a valuable indicator of the long-term moisture condition of the slab after the floor installation. This, in turn, will also indicate if we can expect any long-term performance issues related to moisture.

Fig. 1: Concrete moisture testing issues

People understandably look for ways to speed up the concrete drying process. Dehumidification and/or enclosing the building and turning on the HVAC provide two obvious ways. But the reality is that the drying of concrete takes time no matter the actions taken to speed things up. The rule of thumb is that it takes about one month for each inch of slab thickness for the concrete to dry adequately prior to any finished floor installation and this is once the ambient air conditions are conducive for the drying.

Concrete Moisture Measurement: A Comparison of Two Methods

Two methods of concrete moisture measurement are most commonly used in the United States. Historically, the calcium chloride (CaCl) test was widely accepted. The origins of the test date back to 1941. This method has evolved over the years to become a quantitative test that measures the rate of moisture vapor emission from the concrete's surface. Today it is standardized as ASTM F1869, *Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.*

The second method, known as the in-situ relative humidity (RH) test, is standardized as ASTM F2170, *Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes*. The RH Test method has become increasingly popular in recent years and for good reason.

Fig. 2: Rapid RH L6 concrete moisture test

It is the only method that can be relied on for consistent, accurate test results related to the critically important point of moisture equilibrium within the slab.

The ASTM F1869 (CaCl) test does not give reliably accurate results because it is based on a faulty premise: namely that testing moisture at the surface gives a reasonably accurate picture of the overall moisture condition of the slab. We know that moisture levels at the surface tend to be lower than deeper down.

We also know that once sealed, the slab's moisture gradient will tend to even out, bringing more moisture to the surface and into contact with the finished floor. These key facts reveal why any surface-based method, including both the CaCl test and the use of handheld concrete moisture meters, is likely to yield misleading results.

Advantages of Using the In-situ RH Test

Unlike surface-based methods, the in-situ RH test serves to provide a numeric measurement of the moisture **within** a concrete slab. RH probes are places at a specified depth in the slab. Scientific research at Lund University in Sweden demonstrated that measurements taken at 40 percent overall depth for a slab drying from one side (or 20 percent for a slab drying from two sides) correlate well to the point of moisture equilibrium following a flooring installation. In doing so, these depth-specific measurements give a reliable indication of how much moisture a floor covering or adhesive product will actually "see" after installation.

A second major advantage of measuring moisture within the slab is that the test results are not particularly

Fig. 3: Concrete moisture test sensor in concrete

vulnerable to changing ambient conditions. Surface-based measurements, on the other hand, are inherently affected by ambient conditions. When the air is humid or damp, the CaCl test and other surface-based methods may give a "false positive" reading suggesting that the slab is too wet for a successful installation when in fact, this may not be the case at all.

Yet another advantage of the RH test is that it can be readily used with electronic devices capable of recording changes in RH within the slab over time. The monitoring of these changes can be helpful in predicting how long it might take a concrete slab to reach an acceptable moisture level.

Leave Nothing to Chance: Always Specify the RH Test

Years of scientific testing, along with extensive use in the field, indicate that only the in-situ RH test provides the type of reliability needed for avoiding unnecessary and costly flooring failures.

For this reason, it is extremely important that your specifications for a project always identify the specific concrete moisture test to be conducted. This decision should never be left to someone who may unknowingly choose a moisture test method yielding misleading or inaccurate results. Specifying the RH test is extremely easy; one can simply incorporate the specification found at www.rhspec.com.

Bio:

Jason Spangler, *Wagner Meters' flooring division manager, has more than 25 years of experience in sales and sales management across a broad spectrum of industries. Jason received an MBA from West Texas A&M University in November 2018 and has extensive industry involvement. Call Wagner Meters today at (800) 933-3506 and ask for Jason or visit www.wagnermeters.com.*

Lessons Learned from Branding Small Architecture Firms

BY EMILY HALL, XYLIA BUROS, AND LISA SALDIVAR, CHARRETTE VENTURE GROUP

Branding work can be truly enlightening and energizing for firms. However, like architecture, a successful outcome relies on an effective design process. Having rebranded numerous small architecture firms, our team has taken a candid look at our experiences over the years. We're sharing our observations in hopes of helping your team follow the best possible process as you approach a rebrand.

A Summary of Ten Lessons Learned:

1. Rebrand for the right reasons.

When considering a rebrand or a brand refresh, examine your reasoning carefully. Are you using branding work as a substitution for lackluster business development activities, inconsistent marketing activities, or as an internal "morale boost?" If so, even the most beautiful graphic identity won't solve these problems. They require different tools.

On the other hand, if all of your marketing and business development activities are solid, and your brand STILL isn't serving you... read on.

2. Understand the problem you're trying to solve.

Why isn't your brand serving you? How is your firm currently positioned in the marketplace compared to where you want to be positioned? How exactly does your firm's brand need to change to elevate you?

Outline these responses in a creative brief. The brief serves as a set of project guidelines. It is an important point of consensus for firm leaders, and a communication tool to guide your graphic designer.

3. Know your target audience (hint: it's not other architects).

Surely your firm knows its target audience(s). Keep them front and center as you work through branding concepts. This is who your brand needs to speak to.

Often the graphic design work becomes so fun for architects, they make it too conceptual. If it begins to feel like you're speaking in code to other architects, step back! Ask close clients for their opinions.

4. Commit to the time, energy, and cost that a proper rebrand will require.

Your brand is your business's calling card. It touches everything you do. Firm leaders should prepare to be fully engaged in the process; once you realize how many layers branding touches, you understand how many decisions need to be made. Firms tend to underestimate the time this will require of them.

That being said, we've never met a firm principal who isn't incredibly busy. That's why structuring the process efficiently, with mutually understood expectations, is so important.

5. Prioritize quality over quantity.

This is especially true when deciding what to share on your site and collateral. Remember, the goal of all communications is to inspire potential clients to contact you! Don't overwhelm them with pages of archives.

This also applies to your messaging. A few strong sentences about your firm's value proposition can be more effective than several paragraphs of philosophy.

6. Err on the side of simplicity.

Don't let your graphic identity compete with your design portfolio. Keep graphic elements and ornamentation to a minimum so that the focus is on your architecture, your team, and your value proposition.

7. Recognize complicated interpersonal dynamics between partners.

Branding is very personal to small business owners. This is entirely understandable, as a brand is often considered a firm's "baby," especially if it includes the names and values of founding partners.

In all honesty, branding work can bring out partnership conflicts and alliances. Be prepared for this. Keep an open mind and communicate clearly and honestly. Refer back to your creative brief to keep the decision-making objective.

If one or more partners choose not to participate in the process, define clear milestones at which point they can provide feedback if they'd like.

8. Designate an internal "rebrand champion" to keep the process moving.

It works best when this champion is an administrator that is fully empowered to "crack the whip."

Designating a busy firm principal in this role often creates a bottleneck and isn't the best use of billable time.

This person's role is to keep the momentum going by:

- Setting deadlines
- Making sure everyone completes their homework
- Gathering and delivering assets (such as written content, photos, graphic files, etc.)
- Ensuring decisions get made in a timely manner

9. Deliver feedback constructively.

As a designer, you know how helpful it is when a client comes to the table with visual examples and can clearly communicate why they do—or don't—like a design direction.

It is also common for firm leaders to ask for external feedback during the decision-making process. Be intentional about whose feedback you request; trusted clients and/or design-adjacent contacts are likely better suited to deliver constructive feedback than, say, your 7-year-old.

Be aware that too many outside opinions can become confusing and result in "design by committee."

10. Trust the experts.

That's what professionals are here for! Just like architecture, following the process is critical. Take advantage of our understanding of where clients tend to get stuck and when decisions get difficult.

Most importantly, have fun during the process. Know that once your new identity is out in the world, it is up to you to build on it, maintain it, and amplify it. A strong brand is an ongoing—and very worthwhile—investment.

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