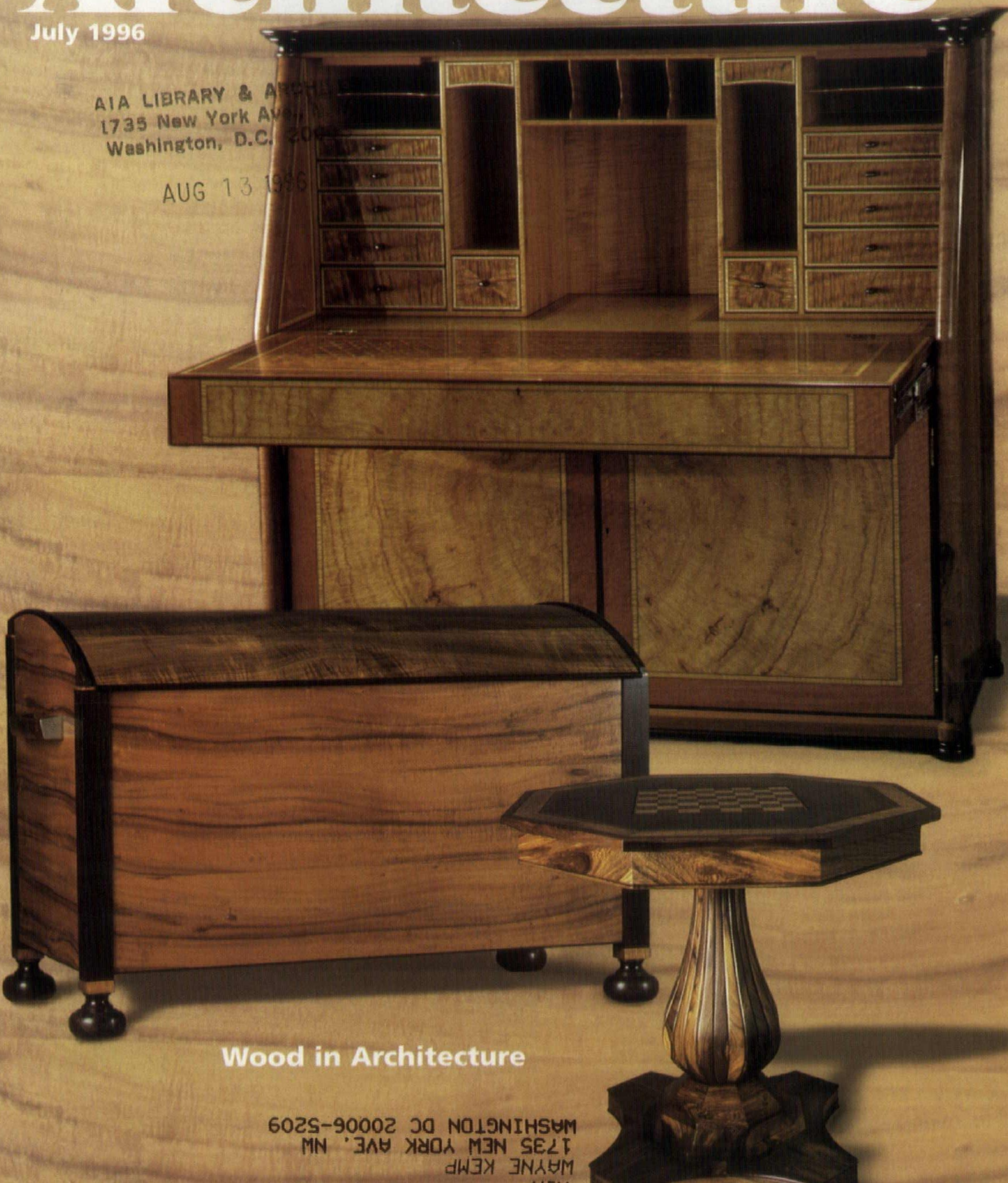
Hawaii Pacific Architecture

July 1996



Wood in Architecture

PMP Company, Ltd., Publishers
1034 Kilani Ave., Ste. 108
Wahiawa, HI 96786

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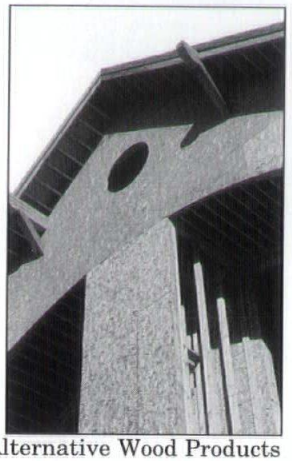

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Hawaii Pacific Architecture focuses on wood in architecture. Jim Reinhardt, AIA, examines the problem of wood treatment. David Lundquist offers thoughts on incising as a possible treatment for wood. C. Barton Potter discusses the history and appeal of koa. This month's cover features past entries in the Hawaii Forest Industry Association's "Woods of Hawaii" annual showcase. They include John Gonczar's inlaid desk, Robert Butts' game table and Alan Wilkinson's curved-top chest.

Hawaii Pacific Architecture is the monthly journal of the AIA Hawaii State Council. Subscriptions are $36 per year. Opinions expressed by authors do not necessarily reflect those of either the AIA Hawaii State Council or the publisher. The appearance of advertisements or new products and service information does not constitute an endorsement of the items featured.

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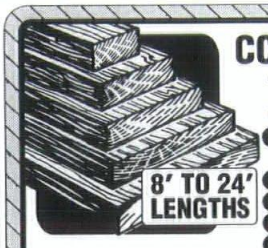

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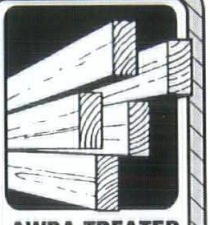

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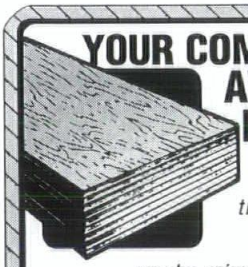

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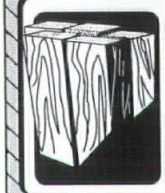

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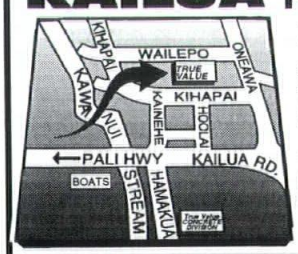

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News Briefs

Maui to host regional conference

"Maui Aloha '96," the 1996 Regional Conference for architects and planners, will be held July 31 to Aug. 3. The conference will be hosted by the American Institute of Architects, Maui Chapter.

Organizers of this year's conference hope to promote resort architecture that is sensitive to the region's environment and economic future, illustrate resort architecture that enhances the region's cultural and historic background, discuss examples of regional resort architecture that exemplify a "sense of place" and encourage architectural and planning trends in resort architecture where tourism and the environment achieve a winning balance.

After June 30, the registration fees for the conference are $275 for FAIA, AIA, associate and affiliate members; $300 for non-AIA registered architects and other design professionals; and $225 for guests, spouses, students and staff.

Headquarters for the conference will be at the Aston Wailea Resort. For more information about the conference, call AIA Maui at 244-9574. Registration payments should be sent to AIA Maui, P.O. Box 929, Wailuku, Hawaii 96793.

Kwong to head engineers group

James Kwong was recently elected president of the Consulting Engineers Council of Hawaii.

Kwong, who will guide the council during the upcoming fiscal year, is the senior project manager-geological engineering for Woodward-Clyde Consultants.

Past president Lester Fukuda will become a national director to the American Consulting Engineers Council in Washington D.C., the national affiliate of CEC/Hawaii.

James Kwong

Other officers elected were president-elect Brian Bowers, vice president of KFC Airport Inc.; secretary David Bills, vice president of Gray, Hong, Bills & Associates Inc.; and treasurer Gary Yamamoto, vice president & business practice leader for Earth Tech.

Directors elected were Keith Chan, president of Benjamin S. Notkin/Hawaii; June Nakamura, president of Engineering Solutions Inc.; and Roy Yamashiro, vice president & treasurer of Consulting Structural Hawaii Inc.

CEC/Hawaii consists of 80 consulting engineering firms, representing 200 principals and more than 1,800 employees, which offer independent consulting engineering services to clients in the public and private sector. Member firms vary in size from the sole practitioner to firms with nearly 200 employees.

HCPO conference planned for Aug. 28-30

The Planning Department, City and County of Honolulu, is organizing the 1996 conference of the Hawaii Congress of Planning Officials. The event will be held Aug. 28-30 at the Neal Blaisdell Center.

The theme for this year's conference is "Planning Hawaii for a New Century: Building Public, Private and Community Partnerships." Those attending the conference will explore some of the significant concepts, issues and ideas that will shape county planning efforts over the next 10 to 20 years.

The registration fee is $165. The fee covers admission, parking, program materials, morning and afternoon refreshments, Wednesday's reception and Thursday's lunch and banquet. Tickets to attend a half day on Thursday or Friday are $45. Tickets for the banquet only are $50. Separate fees will be charged for each of the activities on Wednesday, including golf tournament, tennis tournament, field trips, walking tours and hiking trips. Tickets for the APA breakfast Friday morning are $18.

For more information or registration package, contact Frances I. Mossman at the Planning Department, 527-6075 or fax at 523-4950.

PBR Hawaii opens office in Wailuku

W. Frank Brandt, president of PBR Hawaii, recently announced the opening of an office in Wailuku.

The office is located at 2123 Kaohu St. and can be reached at 242-2878, fax, 242-2902, or e-mail at pbrhi@aloha.net.

PBR Hawaii is a land planning, landscape architecture and environmental planning firm that was established in 1969. It has completed award-winning projects such as Kehalani and the Lahaina Master Planned Project as well as Maui Business Park, Kapalua Plantation Clubhouse and Golf Course, Maui Prince Hotel, Kahului Airport terminal complex expansion, Maui Mall Shopping Center, Wakea Garden Office Building, Wailuku Regional Plan, Wailuku Community Center, Wailuku and Piihana Project District and the Maui Tropical Plantation.

Auwe

Hal Lum's photo credit for the Award of Merit photos in the June issue of *Hawaii Pacific Architecture* was inadvertently omitted. HPA regrets the omission.

An overview of the fight to preserve wood

The Wood Treatment Wars

by Jim Reinhardt, AIA

In January of this year, the Honolulu daily newspapers reported on a suit by Conrad Wood Preserving Co. of Oregon against the building department of the city and county of Honolulu and its director. The suit asked the federal court to restrain the building department from accepting wood treated with borate wood preservative, Hi-bor, for use as structural wood in construction within the city and county.

The judge decided to deny the restraining order but added that he didn't think proper administrative procedures had been followed in approving borate-treated lumber for structural use and urged more study and hearings.

What does this mean to architects specifying wood treatments, contractors using treated wood and consumers who are the ultimate owners of the structures with treated wood?

The key to this dispute is section 2516(c)4 of the Honolulu Building Code, a local amendment to the underlying Uniform Building Code. That section requires all structural lumber used in new wood frame residential buildings, supported by a concrete slab-on-grade or by concrete or masonry foundations, be treated with ammoniacal copper zinc arsenate, copper chromated arsenate, borate or other preservative as approved by the building official. It goes on to clarify that the treatment must be done in accordance with American Wood Preservers Association standards or the former American Wood Preservers Bureau Hawaii Local Area Standard, and that all end cuts must be treated in the field in accordance with the manufacturer's instructions.

The standards

The nationally recognized standards for treatment of wood are those formulated by AWPA. AWPA standards are revised on more or less of a yearly basis; the current edition is 1995. The treatment standards most widely

The battle to preserve wood requires substantial investment and equipment.

used for general construction are AWPA C-2 and C-15, for above-ground use.

The terms "LP-2" and "LP-22" refer to standards of AWPB, a former sister organization of AWPA for monitoring compliance with the standards. LP-2 was the AWPB specification for lumber in above-ground use; LP-22 was for lumber in ground-contact use. Although AWPB no longer exists, these terms are sometimes used as a convenient shorthand description for a complex set of requirements.

Lumber treated under AWPA standards is required to be tested by an independent third party to verify compliance with the standards. That function was previously performed by AWPB. Monitoring of lumber treatment is now done by independent testing laboratories. The program is less rigorously enforced under the American Lumber Standards Committee, resulting in some decrease of quality control standards. Lumber treated in Hawaii is inspected, but not in accordance with AWPA standards.

Until recently, most lumber used in Hawaii was treated under a special standard developed by AWPB that allowed a lesser level of treatment than the LP-2/LP-22 standards, called the Hawaii Use Only standard or the Hawaii Local Area Standard. With the demise of AWPB, HUO standard also ceased to exist. However, wood treated to the old HUO standard is still produced and accepted by the building departments.

The woods and wood products

Heartwood vs. sapwood: As a tree ages, the wood in the center area of the tree trunk, known as the heartwood, accumulates resins and other chemicals. The newer outer portion of the tree, the sapwood, has less of those chemicals. This accumulation of resins and chemicals, combined with the internal cellular structure of the wood, makes heartwood very difficult to penetrate with wood-treating chemicals. Penetration of the preservative into sapwood is much better.

Douglas fir: Most of the structural and framing lumber used in Hawaii is Douglas fir. Most of it arrives in Hawaii in a "green" condition with a very high moisture content. If the treatment is to be done to AWPA standards, Douglas fir must be dry at the time of treatment. In addition, because Douglas fir has a high percentage of heartwood (70 to 80 percent), it is very difficult to treat. Even if the treater follows the prescribed procedures very carefully, treatment meeting the standards of AWPA C-2 cannot be assured.

Hem fir: This is a mix of hemlock and firs other than Douglas fir. These wood species tend to have higher percentages of sapwood than the Douglas fir and therefore, good penetration of the preservative is easier to achieve.

Pine: Most pine lumber has a high percentage of sapwood. Therefore, good penetration is easier to achieve; "thru treatment" can be expected. Obtaining pine lumber, however, is more difficult and requires special effort.

Redwood: Contrary to the common myth, redwood is not immune or even highly resistant to termite infestation. We commonly encounter termite-infested redwood lumber. While old-growth, all-heart redwood is more termite resistant than most other woods, that old-growth material is nearly impossible to get and, given the voracity of Hawaii's termites, should not be relied on to provide protection. Use the standard preservative pressure treatments.

Plywood: While most construction plywood is Douglas fir or a combination of Douglas fir and hemlock or larch, thru treatment with CCA is readily achievable because of the thin laminations, lathe checks and alternating grain direction. For most uses, CCA is the treatment of choice for plywood. Excellent penetration and retention can also be ob-

Terms commonly used in the treating industry

- **Retention** is the amount of preservative that remains in treated wood. This must be determined by a laboratory. It is usually measured in pounds of preservative per cubic foot of wood but is sometimes described as a percentage, comparing the weight of the preservative retained to the weight of wood.
- **Penetration** is the depth that the preservative penetrates into the piece of wood, measured from the surface of the wood.
- The **assay zone** is the designated depth of the zone in which the quantity of preservative is measured to determine retention. AWPA utilizes a standard assay zone depth of 0.6 inches for its standards. For the HUO standard, the assay zone was at 0.2 inches.
- **Incising** is a process of making small slits in the surface of the wood, parallel to the grain, in order to obtain deeper penetration of the preservative. Standard incising produces about two slits per square inch. "Micro-incising" or "double-density" incising produces about six slits per square inch and is less noticeable than the standard type. There is some controversy about possible reductions of strength as a result of incising.

tained with borate.

Glu-lam lumber and engineered wood products: Most laminated and engineered wood products, such as glu-lam beams, micro-lam beams, oriented strand board, Masonite and particleboard, cannot be treated with waterborne preservatives (ACZA, CCA or borate) without invalidating the underlying product warranties. Oil-borne preservatives can be used but their effectiveness against termites is not as good as that of the waterborne preservatives and the cost is significantly higher. Some investigation is under way into the use of wood that has been treated with borate prior to lamination or fabrication of the composite product, but these products are not yet available.

Naturally resistant species: The UBC recognizes that some species of wood are more resistant to decay than others and lists four species as acceptable. The HBC does not make this distinction for termite resistance, however, and requires "treated wood" for all structural lumber. Treated wood means treated with an approved preservative under treating and quality control procedures.

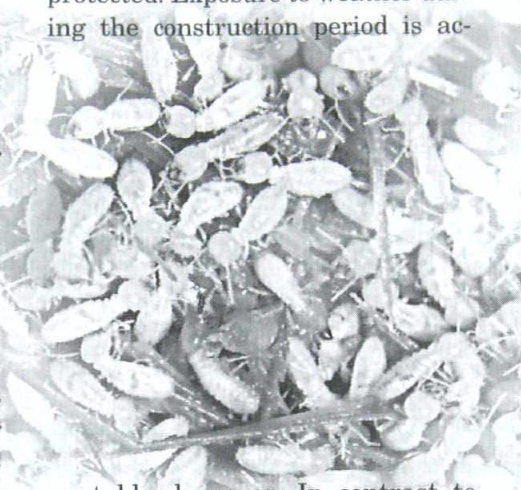
The preservative chemicals

Currently only three chemicals have been approved by Honolulu's building department for use on structural lumber.

CCA, "wolman" or "osmose," was historically the most widely used preservative in Hawaii. It is a waterborne preservative with a very good "kill rate," approved for weather-exposed use, but provides very limited penetration into Douglas fir heartwood. At this time, the only Hawaii company treating with CCA is Hawaii Wood Preserving Co. on Maui.

ACZA, or "Chemonite," is also a waterborne preservative that uses ammonia as the carrier. ACZA achieves better penetration into Douglas fir than most other preservatives, has an excellent kill rate and is appropriate for weather-exposed use. The treated wood is blackish/greenish in color and is normally only available incised. No companies in Hawaii are currently treating with ACZA.

Borate, disodium octaborate or Hi-bor, is an "environmentally friendly" waterborne preservative that does not chemically bond to the wood, making it inappropriate for weather-exposed use, unless protected. Exposure to weather during the construction period is acceptable, however. In contrast to the other waterborne preservatives, wood to be treated with borate should be green at the time of treatment, as the moisture within the wood causes the borate salts to diffuse within the wood after treatment, eventually leading to distribution of the chemical throughout the wood. Borate is colorless in its natural form but Hi-bor has a bluish dye added for identification. Borate has no AWPA approval for Douglas fir lumber at this time, although it is approved by AWPA for use with Southern pine and hem fir.



The effectiveness of borates against subterranean termites is the focus of the current controversy. Achieving an adequate level of retention seems to be the key. As with all waterborne preservatives used in Douglas fir, penetration is difficult and uneven.

Some other preservatives are available, but for limited usage.

Tribucide is a clear oil-based preservative used on interior trims and cabinets, and can be used to treat glu-lam beams. While it is less effective in resisting termites than the waterborne preservatives, it causes less grain raising, twisting and warping. However, the costs are about three to four times that of the waterborne materials. Tribucide is a locally formulated preservative and has no AWPA approvals.

PermaClear 65, or PermaTrib, is similar to tribucide in both its uses and cost. "Penta," or pentachlorophenol, a clear preservative that was previously used for trim and cabinets, was banned by the Environmental Protection Agency for use in occupied areas in 1988 and can no longer be used.

ACQ, ammoniacal copper quat or "preserve," is a new environmentally friendly waterborne preservative that is currently being evaluated by the building department for approval of structural lumber use. It is appropriate for use in weather-exposed conditions and the effectiveness appears to be about equal to ACZA. It is green in color and more expensive than the other waterborne preservatives.

Field treating of "cut ends"

A special solution of the CCA preservative is also available from some treaters for use in end treating. Copper naphthenate, or Wolman Treat 00, is an oil-borne preservative widely used for field treating "cut ends" and drilled holes. Zinc naphthenate and a diluted version of the borate treating solution can also be used.

Specifying or ordering treated wood

While AWPA standards describe preservative type, penetration and retention for each wood species, a wide range of treatment levels is available. The depth of penetration and the retention vary widely. It is critical that you identify the level of treatment that you want, make your specifications accurate and clear and be sure that what is ordered is what you expect.

↔ *Jim Reinhardt, AIA, is president of Architectural Diagnostics Ltd.*

Opinion

Wood Treating — What You Should Use

by Jim Reinhardt, AIA, and Elmer Botsai, FAIA

We are frequently asked, "What wood treatment should I use for my project?" The answer, of course, depends on the specifics of the project. However, there are some useful guidelines.

Incising improves the penetration of the preservative. For concealed framing and even exposed lumber which can be "a little rough," incising will provide better treatment.

It is important to remember, however, that incising may reduce the structural capacity. Therefore, caution should be exercised where the structural design margins are close. Sapwood accepts treatment better than heartwood. Pine and hemlock have more sapwood than Douglas fir and therefore will accept treatment better. Once again, the structural capabilities of the specific wood species must be considered.

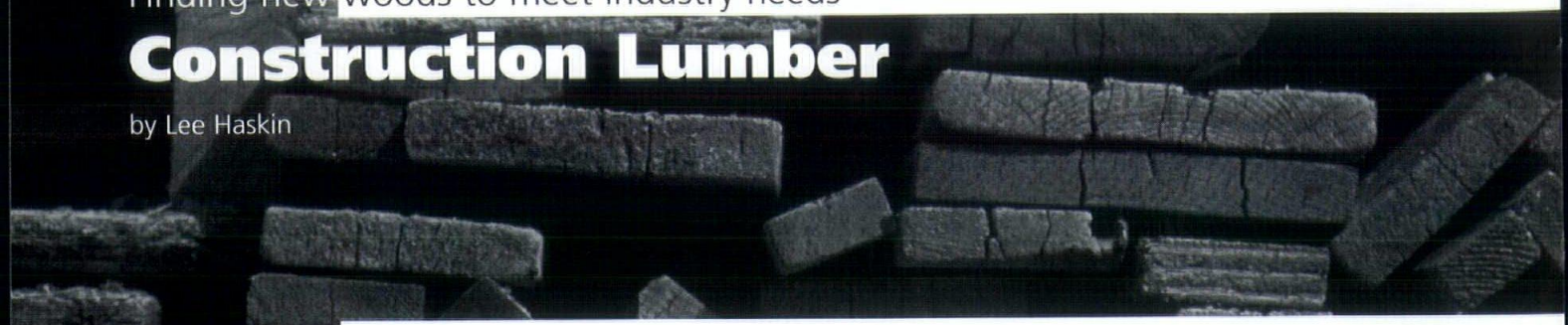
Wood treatment is only as good as the depth of penetration into the wood and the quantity of chemical that remains. If you are really concerned about the quality of the treatment, a laboratory assay should be required before the lumber is shipped. Once the wood is on the job site, it's too late to correct a problem. Defining the assay zone as one-thirty-second to five-eighths of an inch (the outer one-thirty-second of an inch is to be removed before the sample is taken) will avoid loading up the outer surface of the wood while getting nothing into the core.

Chemonite (ACZA) provides the best protection for Douglas fir. This is partly because the ammonia carrier penetrates better than water and the ACZA is almost always incised. Copper chromated arsenate provides excellent protection in plywood and in woods which are mostly sapwood, such as pine and hemlock. For most uses, borate is acceptable if it is treated to a minimum retention of 0.4 pounds per cubic foot. However, some grazing may occur on borate-treated wood.

Finding new woods to meet industry needs

Construction Lumber

by Lee Haskin



Historically, Hawaii has drawn on the West Coast as its wood basket. The reasons are simple. Tide water mills and proximity of the source to the destination make shipping more economical. Oregon, Washington and California provide the largest share of lumber from pallet grades to finish lumber.

The most common lumber species brought to Hawaii is the Douglas fir. Douglas fir is valued for its high strength, stability, workability and availability. Fir can be produced and manufactured into products ranging from moldings to heavy timbers and all items in between. No wonder it is the species of choice by architects and specifiers. Its only drawback is that it is not the best species to treat. Other species have greater treating retention than fir. However, they are lacking in other structural and appearance qualities.

In past years we have seen lumber prices escalate. These price increases have not been out of line with other building products. The increase and fluctuation of prices are motivated by supply and demand because wood is a commodity. It is bought and sold like grain, produced into lumber and then sold like bread.

There are three major influences on pricing — availability of raw material, demand by consumers and labor costs. Supply and demand definitely determine prices. If there are lagging sales at the production level, the price drops to stimulate business. If the demand is too great from the consumer, the prices go up to capitalize on the gains. It has always been that way, and will probably always stay that way.

What do I think prices will do in the future? I think they will, like all other building material products, continue to increase. They will not increase out of proportion in relation to other products or prevailing economic conditions.

One thing that is certain with the wood market is if it goes up, it will come down. There will be a lot of peaks and valleys along the way, and prices will continue to go up a little during each cycle.

Hawaii is behind in a lot of the innovative changes in product marketing that have taken place over the past few years, possibly because we are not very daring as a community. We fall into the comfortable trend of doing it the way we have always done it. We don't accept change.

This shortcoming is perpetuated by everyone from the architects and specifiers down the line to the laborers in the field.

Recently, there has been a lot of pressure put on the supply, production and technical sides of our industry. We all remember the horror stories of the spotted owl. We are aware of the impact environmentalists have had in lobbying to have government land taken off the market. These folks make statements to protect our future and our children's future. Even though their actions have had a detrimental impact on jobs, costs and product availability, they have forced us, as an industry, to look at ourselves and how we can utilize products and conserve and protect our environment.

Thirty-five years ago, I was deer hunting near Ryderwood, Wash. Ryderwood was an early logging community in an area that was originally logged by Longbell Lumber Co. in the 1920s and 1930s. I stood on hemlock stumps that were more than 8 feet in diameter. The sad part was that the tree itself had been felled and left to lie on the ground and decay just to create easier access to logging

the valued Douglas fir. Hemlock was a weed; it had no or limited commercial value.

In the early years of forest management, hemlock was wasted because its properties did not allow it to dry well. It had a lot of twist and distortion and was not as structurally strong as Douglas fir. No one cared if it had value. Coast region Douglas fir was plentiful and everything else was trash.

We now know that hemlock has value. We use it as decking, dimension finish lumber and moldings. The clear finish produced in hemlock is as workable and beautiful as that from Douglas fir. The moral of this story is we need to educate and be educated! We need to learn about other species and the variety of products that are available.

In recent years we have seen a number of builders and developers experiment with metal framing. It is my understanding that this hasn't been truly successful because of a number of problems, such as product inconsistency, workability and acceptability.

There is nothing wrong in using metal framing for studs and interior partitions. However, we should consider the potential of combining them with treated truss joists for the floors and headers, using treated framing lumber for exterior wall and roof systems, and using hardboard sidings and solid wood trim to beautify the structure. This should provide a high quality of livability for the owners.

Unfortunately, in Hawaii the environment causes a lot of the alternate products to be undesirable. Almost all wood has to be treated to protect it from termites. We can't treat many of the composite products that are available in other markets, making them unacceptable in our marketplace. Products like wafer wood and oriented strand board are probably not going to be highly accepted in Hawaii until there is a way to treat them without the swelling caused by the absorption of water.

This doesn't mean that there aren't areas and products that we can't discover. What it means is we have to be more open to look at other alternatives. A couple of weeks ago, I noticed that on the No. 13 tee box at Olomana Golf Links, yellow, plastic 2-by-2s were used as stakes. Even on golf courses, alternative products are finding their way.

There is still another side to this story. In the nearly 20 years I have lived in Hawaii, I have seen a lot of change in how we specify. Architects, specifiers and contractors have become more aware of grades and uses. The take-off lists now being provided for pricing are evident of the knowledge that has been gained. Very seldom is the "da kine grade" or construction grade asked for. However, there is much more to be learned about grades, uses, alternative products and how to specify more precisely to eliminate misunderstanding, increase quality and cost efficiency.

Wood is truly a wonderful resource. As a construction material, no other resource offers the same positive aspects as wood. Wood is very strong relative to its weight, which allows it to support heavy loads. Wood is flexible yet dimensionally stable. Wood is workable with tools, offering professionals as well as weekend carpenters the opportunity to express themselves creatively.

Wood is renewable. Today, the forests of the United States contain 20 billion cubic feet more timber than they contained in 1952. We can agree that the new timber is second and third growth and even that is being restricted in many instances from harvest.

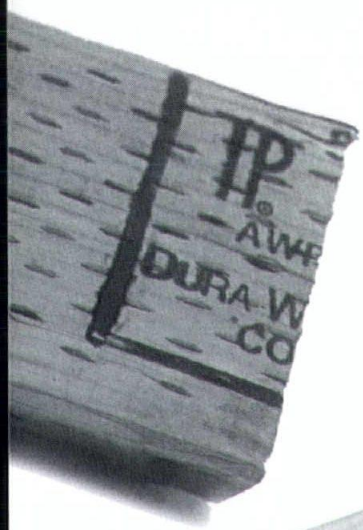
The more we know about products and their limitations, the better job we can do in providing for our customers and keeping our costs in check. The more we know about uses, products and specifying, the more protective and conservative we can all be of our environment.

↔ *Lee Haskins is president of Forest Products Hawaii Inc.*

The debate over wood treatment

The Incising Question

by David Lundquist



In the past, the use of "treated wood," not the type of treatment or how it should be used, was the main concern of many. However, this blind faith in all forms of treated wood has been replaced by doubts, confusion and fear of vulnerability. What do the facts show about various wood treatments available in Hawaii? What about the proposed changes to the Honolulu Building Code?

A recent federal lawsuit raised concerns about borate treatment. In a number of independent tests by the University of Hawaii and by Chemical Specialties Inc., varying degrees of Formosan termite feedings have occurred on borate-treated Douglas fir at all levels. Borate or disodium octaborate tetrahydrate is known in Hawaii as Hi-bor.

These results occurred even when test wood was treated under ideal laboratory conditions, such as an 18-hour pressure treatment cycle directed through the end grain of thin slices of wood, as was the case in at least one UH test. In actual treatment conditions, poorer results might be expected in view of the shorter two to two-and-a half hours minimum commercial treatment cycles, the nearly impermeable nature of Douglas fir heartwood and the dependence of borate treatment on the diffusion process.

Since adequate borate diffusion into the heartwood's side grain beyond the pressure treatment's initial penetration is dependent on the presence of ample moisture in the wood, treatment should occur as soon as possible after milling. However, prior to treatment in Hawaii, Douglas fir may be subject to uncontrolled and highly variable moisture loss due to long periods of transit and storage. This exposure creates the potential for poor diffusion beyond a shell of treatment. In fact, independent tests by Timber Products Inspection and Oregon State University show that the retention levels of most 2-by-4s tested fell short of required levels. After treatment, borate-treated wood may be subject to unmonitored chemical losses if exposed to leaching processes such as rainfall inundation.

Dr. Jeff Morrell, wood pathologist, professor and researcher at the OSU Forest Products Laboratory, sums up the problems of borate-treated Douglas fir usage in Hawaii, "(these factors) should raise major concerns among all who specify these products for the Hawaiian market. I would add that it seems inconceivable that such (borate) standards would be promulgated in an area which presents some of the most severe decay and insect challenges in the 50 states of the union."

By way of contrast, however, side by side in the CSI tests, nonincised copper chromated arsenate-treated Douglas fir, known commercially as HUO (Hawaii Use Only — also known as wolmanized, osmose and supatimber), was essentially immune from penetration.

Treatment Standards

Why are neither borate- nor CCA-HUO-treated Douglas fir standardized by the American Wood Preservers Association? For geographical and architectural reasons, Hawaii is dependent on Douglas fir, which is extremely difficult to consistently treat. The AWPA standard C-2 for CCA treatment in above ground use requires 0.25 pcf retention and a penetration of 0.4 inches in lumber less than 5 inches thick, 0.5 inches penetration in members 5 inches thick and greater. However, the AWPA penetration depth is not consistently achievable with Douglas fir even with incising, which increases penetration only slightly. Although the AWPA penetra-

tion depth is consistently achievable in hem fir with incising, the incising process excessively damages most dimensions of kiln-dried hem fir, rendering incising an inappropriate procedure in a wood that already treats well without incising. CCA can meet achievable standard AWPA treatment for plywood, meeting all specifications. AWPA does not standardize borate treatment of Douglas fir lumber or plywood.

Why doesn't AWPA have an achievable standard for CCA-Douglas fir? Most of our nation's treatment plants are CCA treaters, specializing in "easy-to-treat" nonincised Southern pine for specialty uses such as decks or piers. Most other construction lumber on the mainland is not treated. If the mainland had the same need to use treated Douglas fir for general construction as Hawaii, the AWPA would have long ago written an achievable standard for CCA-treated Douglas fir — both incised and non-incised.

In the absence of an achievable AWPA standard for CCA-treated Douglas fir, another related organization, the American Wood Preservers Bureau, recognized the problem and created the CCA local area standard HUO, successfully used in Hawaii for more than 20 years.

CCA-HUO Defense

The effectiveness and importance of nonincised CCA-HUO as a component of termite defense in Hawaii is greatly underrated in the current hysteria whipped up by the supporters of competing treatments. HUO is a rigorous, third-party-enforced quality-control program. It sets a detailed standard for the methodology of the best possible CCA treatment of Douglas fir and hem fir.

The CCA-HUO barrier is relatively shallow (0.1 inches in Douglas fir heartwood), but it is potent. Based on evidence from huge volumes of warranted jobs, the incidence of termite attacks on nonincised CCA-HUO has been low in Hawaii, even after effective chlordane treatment was banned in the '80s. When CCA-HUO-treated lumber is used and implemented correctly, failure is rare. Termite attacks that do occur are almost always associated with specific, unwise building practices and architectural design deficiencies that are well-known and preventable, such as the frequent failure to apply end-coat solution to sawn ends.

The relatively few incidences of attack associated with HUO-stamped wood must be analyzed in terms of the causes of such failure in the context of, and in contrast to, the vast majority of successful outcomes.

The reputation of CCA-HUO has also been unfairly tarnished by the widespread use of undertreated, unstamped, so-called "green and go" lumber and plywood in Hawaii. Failure of unstamped, undertreated products must not be confused with the performance of CCA-HUO-treated lumber and AWPA-CCA-treated plywood, which have performed very well in service.

However, because CCA-HUO has been the dominant Hawaii treatment for so many years, it has been a convenient scapegoat. Treated-wood failure is directly related to the incorrect implementation of an overall anti-termite system. Regardless of treatment type, failures will continue to occur as they have with CCA-HUO when protocols are not followed. Those jumping to another treatment may be jumping from the frying pan into the fire. Furthermore, in the treatment of plywood, the AWPA standard is achievable with CCA. In fact, AWPA CCA treatment of plywood is widely recognized as the most effective treatment, being nearly termite proof.

Those specifying CCA as a proven alternative must be sure to specify CCA-treated lumber with the HUO stamp and CCA-treated plywood with the AWPA C9 stamp. Then these products will be covered by the strict third-party quality-control treatment procedures and results will be dictated by those standards. Unstamped products invite undertreatment and potential termite infestation. Be sure that the user responsibilities of HUO, particularly job-site coating of sawn ends, are performed rigorously.

Hem fir Alternative

Since Douglas fir is so difficult to treat, should we be using other woods which treats much better without incising such as hem fir? My answer is yes. The minimum chemical penetration of non-incised CCA-treated hem fir is double that of incised Douglas fir and the average penetration is many times greater. The standard proposed to the building department, PR-3/hem fir, specifies 0.4 pounds per cubic feet CCA retention at 0.2 inch penetration, nearly triple the effective level, and 60 percent greater than the 0.25 pcf CCA specified by AWPA and AWPB. While Douglas fir cannot be completely replaced, seasoned hem fir is competitive in both price and quality, and is ideal for use in

the 2-by dimensions in lengths of 8 to 24 feet and longer, including studs, plates, 2-by-4s, 2-by-6s, 2-by-10s and 2-by-12s.

Based on recent large-scale U.S. Forest Service tests, the current national Uniform Building Code has upgraded the strength of hem fir so that its Fb base value for No. 2 is now within 3 percent of Douglas fir. Unfortunately, if nonincised PR-3/hem-fir treatment is not approved, then hem fir, which treats well nonincised, will not be available for Hawaii because the incising process excessively damages kiln-dried products, particularly the wider dimensions of kiln-dried hem fir. This would be a sad result because hem fir, the wood that treats better than any wood normally available in the Hawaiian market would be eliminated.

Incising Question

Incising may soon be required of all Hawaii construction, but will it improve wood treatment? In CCA treatment of Douglas fir, incising will give no increased penetration in sapwood — the tree exterior already enjoys excellent 90 percent penetration — and little increase between incisions in the nearly impermeable heartwood. Since CCA treatment is already proven effective without incising, further improvement due to incising may be wishful thinking. In borate treatment, incising will not forestall potential difficulties relating to insufficient moisture content, post-treatment leaching processes or low termitic effectiveness at a retention that allows termite feeding.

Incising will turn Hawaii's lumber business upside down, with tough and costly consequences for all lumber users. Since incising will only be required of unexposed lumber, lumberyards will be forced to stock both incised and nonincised in every size and length for these numerous and frequent application dichotomies.

Incising may soon be required of all Hawaii construction...

In addition, since the incising requirement cannot be effectively enforced by the building department, the loophole created will mean that contractors, architects and consumers will often choose nonincised lumber for both visible and unexposed applications since they dislike the cracking, chipping, brittleness, loss of strength and disfigured appearance of incised lumber.

To handle such dual inventories, lumberyards will have to double space, capital, inventory money, rent money and labor money. These costs will be in addition to and, in fact, much greater than the actual costs of incising. Furthermore, the purchasing, sales and movement logistics, already difficult and costly for a society on a remote island far from sources of supply, will double in complexity, proving extremely difficult, adding even more cost and lessening competitive forces.

Consumers will be impacted not only by these increases in cost but by purchasing and delivery hassles, delivery delays, frequent job stopping, out-of-stock situations, general inefficiency and rigmarole, great consumer dissatisfaction and a high degree of frustration.

The Best Alternative

We believe that the best alternative is for incising to be required of all Douglas fir studs, plates and posts, thus limiting incising to these front-line structural members most likely to be attacked and which when combined with well-treated plywood represent a large portion of a house's structural package. This alternative would eliminate the need for dual inventories.

The other alternative would be to simply not require incising. Since incising would have little actual impact on reducing termite attacks, this option would avoid the costly and troublesome consequences of required incising altogether.

Our city government is on the brink of making major changes in wood-treatment standards that will have far-reaching consequences for Hawaii's building industry. Powerful economic interests are lobbying to require incising of other treatments while exempting their own, thereby crippling their competition because most consumers would avoid incised lumber if they could.

If, at press time, the City Council has not yet voted on Bill 43, anyone concerned about changes being made are encouraged to make their voices heard.

↔ *David Lundquist is president of Hardware Hawaii True Value. The Lundquist family has been in the lumber business for 55 years, with David taking the lead for the past 25 years. Extensive personal research, interviews with leading scientists, treaters, inspection agencies and contractors, and visits to lumber mills, treatment plants and job sites provide the basis for this article.*

Annual show features islands' best crafts people

HFIA presents "Woods of Hawaii"

The Hawaii Forest Industry Association's fourth annual statewide Furniture & Woodworking Show, "Woods of Hawaii," will be held from 11 a.m. to 10 p.m., Sept. 7-15 at Aloha Tower Marketplace, Pier 10.

The juried furniture and woodworking show will feature the latest in craftsmanship and design from some of the state's best furniture builders and wood crafts people. All show entries will be made from Hawaiian-grown woods.

HFIA organizes the show to promote the use and acceptance of Hawaiian-grown introduced tree species, while encouraging craftsmanship that extends existing supplies of valuable hardwoods, both native and introduced.

One of the important objectives of "Woods of Hawaii" is to highlight tree species worthy of planting now and managing for future generations.

The show will present an overview of the continuum of life cycles in the forest that make it possible, with proper long-range planning and management, to balance growth with production and biodiversity with economic value.

All entries will be judged on three criteria:

- attention to the spirit of the show (building with show criteria in mind)
- inspiration of design
- excellence of construction (i.e., implementation of design).

First place awards will be presented for best of show, furniture, architecture, wood turning, sculpture, musical instrument and open class. Judging and photographing of entries will be Sept. 4 and 5. Everyone attending the show can vote for the "People's Choice Special Award."

Show set up will be Sept. 6 from 9 a.m. to 4 p.m. The invitational opening night reception will follow from 6:30 to 10 p.m. During the reception, awards of recognition suitable for display, including artists' choice, first place in each category and honorable mention, will be presented to entrants. The people's choice award will be presented after the show is completed.

Examining the king of Hawaii woods — koa

Restoring the Hawaiian Monarch

by C. Barton Potter

The king is dead! Long live the king! This injunction aptly addresses the koa situation in the Hawaiian Islands. While the wood of the koa tree is becoming scarce in the marketplace for a number of reasons, the species itself — Acacia koa — is not endangered. There are many reasons to believe that the future is brighter than might be expected for this monarch of the Hawaiian forests and for the eventual sustainable production of its coveted wood.

The majestic koa tree.

By 1994 estimates of the state Division of Forestry and Wildlife, there are approximately 2 million acres of forest land in Hawaii existing in a wide spectrum of microclimates and soil types. The state of Hawaii owns about half, administering them under a variety of conservation and agricultural designations. Other than occasional trees salvaged from storm damage or fencing projects to control wild herbivores, no significant amount of koa removal has been permitted from any state lands since 1978.

The balance of 1 million acres of privately owned forest lands, significantly including the "koa belt" or historic range of koa on the Big Island where the species reaches its finest form (6-foot base diameter, 100-foot height), has been the source of the bulk of koa wood that has found its way to market in the last 20 years.

Acacia koa is endemic to the Hawaiian Islands. It evolved here before the arrival of man and exists naturally nowhere else. Koa is found as a component of several forest types from elevations of 300 to 7,000 feet in varying soil conditions and rainfall zones on the five largest islands.

The early Polynesian settlers who gave Hawaii its name around 750 A.D., adapted the local plants and woods to their needs and traditional uses. Because of the size and availability of its logs, koa was used in a wide number of applications, being particularly prized for canoes, canoe paddles, surfboards and 'umeke or calabashes.

The coming of Captain Cook in 1779 marked the beginning of a new migration and of a new range of use. Records documenting

trade in koa lumber in the 1830s indicate that even then it was apparent that koa was too valuable to use as a building material and it enjoyed a reputation as a fine wood for craft and cabinetry.

Locally as well as abroad, myths and generalizations abound about koa. The one generalization that can be safely made is that the species is extremely variable both in external form and in the quality and character of the wood. This variability can apparently be attributed more to genetics than to environment, as koa trees of the same age growing in proximity with one another may produce wood of different color, density and figure.

Properties of koa

A 1968 analysis of the mechanical properties of koa (R. Skolmen, USFS) found its specific gravity to be 0.55 and its mechanical properties to be comparable to those of black walnut. Koa's range of coloration from orange-blond to deep reddish-purple and its tendency to have a pronounced "flash" or luster are basic reasons for its popularity, but it is the highly figured material that can cause palpitations and covetousness in otherwise blase wood connoisseurs.

Koa wood is highly variable, both in the density of the wood and in the figure and color of the grain structure.

Substitutions

As is typical even today with lesser known species, attempts were made in the 1800s to gain acceptance and to elevate market value by creating a name, incorporating that of a more widely established wood, in this case calling koa "Hawaiian mahogany." Now that koa is well-established, other woods are occasionally introduced to the marketplace that may either bear a resemblance to koa or share the same genus. Australian blackwood (or Acacia melanoxylon), a case in point, is sometimes sold in Hawaii under the misnomer Australian koa. There is, however, more than a bit of regional loyalty to the real McCoy. Local demand is high and most koa cut in Hawaii is eventually used in Hawaii, though value adding sometimes takes place elsewhere. Economics of scale currently make it more feasible to have veneers from cants cut in Hawaii sliced and laid up on the mainland or in the Orient and (decreasingly) some producers ship milled koa to the mainland to be dried, which is largely returned presold to island dealers.

Factors Affecting Supply

Koa's current scarcity and high price on the market are both alarming and somewhat artificial and is the result of several interrelated factors, among them:

- more than 100 years of management of its historic range lands for grazing of cattle
- past conversion of vast tracts of forest and non-forest lands to sugar and pineapple production
- an abundance of alien plant and animal species
- the recent choice of some large private landowners to re-evaluate their management strategies (thereby temporarily curtailing koa production)
- the policy of the Division of Forestry and Wildlife to have a blanket "hands-off" koa policy.

Each of these is worthy of a dissertation. Together, they interweave to dictate the koa supply and access to it and to influence the future of koa management.

Given the chance, cattle will consume young koa seedlings that naturally germinate readily and grow quite fast after a disturbance of the earth (or "scarification"). The koa seed can lie dormant yet remain viable in the ground for more than 50 years and depending on the elevation and rainfall, can produce trees that grow up to an inch in diameter per year.

Long-term cattle ranching on lands where

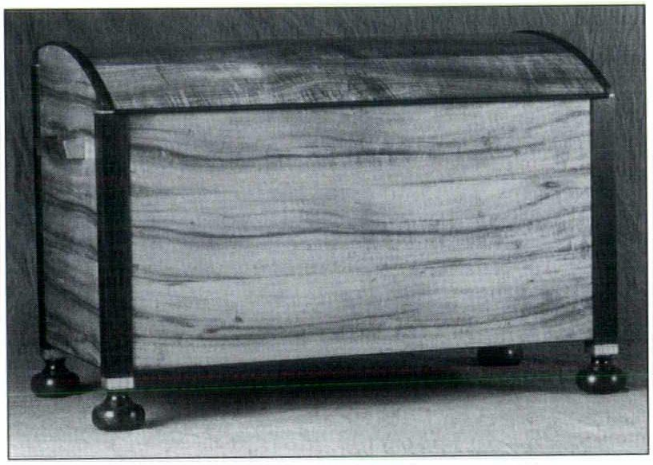
John Gonczar's inlaid desk, a '93 Woods of Hawaii entry, uses koa and various woods.
Ric Noyle photo courtesy of DBEDT

koa exists naturally results in an indefinite interruption of continuous regeneration, which in time results in an old-age resource. Koa is not a long-lived tree by temperate standards. The oldest koa may be 300 years old with a more average life span thought to range from 75 to 100 years. The net result is that the bulk of the commercial koa supply today comes from overaged and senescent or dead trees. This resource is often high in defect, being composed of a high percentage of rotten and/or hollow wood. Preparation of these logs and sawing around the defects is exacting and labor intensive.

Conversion of much of Hawaii's best low elevation (500 to 2,000 feet) forest lands to the production of sugar and pineapple began in 1835, and removed from the landscape large tracts of forest, some of which were part of the koa belt. These public and private lands are worthy of mention because due to changes in the world prices for pineapple and sugar, both of these industries are being forced to radically downsize, freeing large areas for other uses, including potential reforestation. The existing road and irrigation infrastructure is ideally suited to forestry applications and the possibilities are a silviculturist's (tree grower's) dreamscape.

Since the arrival of human beings, Hawaii's unique ecosystems have been subjected to an accelerating torrent of non-native species far outpacing their natural abilities to adapt. Most threatening to the koa forest types are invasive grasses, vines, shrubs, trees, rates, birds, sheep, goats, pigs, ants, snails and even unwelcome fungi. Despite the gloom-and-doom ramifications of this influx, koa as a species remains a strong contender for use in a variety of management, restoration and reforestation scenarios.

Charged with administering half of the forest land and a considerable untapped koa resource that is disappearing on its own under the onslaught of old age, grazing and alien species, the forest division has the task of answering to the needs and demands of a range of interest groups with sometimes conflicting ideas of forest usage and stewardship. One example among many: both environmentalists and the forest industry want pigs out of the forest. The damage they cause to the understory and the pests they introduce deep into the forest threaten irreversible ecological alteration and subsequent loss of many species. Animal rights groups, while concurring with the need for eradication, condemn snaring which is the best way yet found to cut down pig populations in remote areas. Hunters object to legislated elimination of the object of their subsistence sport. DOFAW has to find the common ground. With native species disappearing at an alarming rate, the state, until recently, has been prone to follow environmentally conservative non-management and to avoid allowing potentially controversial harvesting of koa. For compelling reasons that, too, is changing in some situations.



Koa veneer is used by Alan Wilkinson on this curved-top chest entered in 1995 Woods of Hawaii show.

Hal Lum photo

The most significant dent in the production of koa lumber happened in 1992 when Kamehameha Schools/Bishop Estate, the state's largest private landowner, chose not to re-negotiate logging leases with the two largest koa lumber producers in the state, giving rise to the mistaken impression that the state had put a moratorium on the production of koa lumber.

The Future

In the meantime, in spite of, factors affecting the supply and price of koa, a number of extremely positive developments are taking place that bode well for the future supply of koa as well as for the quantity and quality of forested lands in Hawaii. Following are a few of these positive indicators.

- In September 1992, Congress passed the Hawaii Tropical Forest Recovery Act "to develop strategies for the long-term management, protection and utilization of the existing and potential forest resources of the state of Hawaii." A series of working groups composed of representatives from academic, environmental, industrial, ethnic and legislative organizations in the state conducted exhaustive facilitated meetings that resulted in the issuance of an action plan in mid-1994. As concerns commercial forestry, one significant outcome of this act is an initiative currently under way under the joint sponsorship of the U.S. Forest Service's Institute of Pacific Islands Forestry and DOFAW which is designed to stimulate forestry-related enterprise in the small-to-medium sized business range.

- Bishop Estate has shown a commitment to consistently improve its forests and has been a pioneer in koa reforestation, having converted 100 acres a year to that purpose for the last 15 years. It has recently formed its own Department of Forestry and Natural Resources to create as integrated, proactive and forward thinking a land-management program as any in the state.

Additionally, Bishop Estate has

just signed the first-in-the-state lease of lands for a large-scale, long-term commercial forestry venture. It is hoped that this project (undertaken by Prudential Timber, a subsidiary of Prudential Insurance) will not only precipitate investor confidence in the viability of a range of forestry activities but will also lead to the much-needed and long-sought creation of a structure of taxation favorable to the planting and management of forests for wood production.

• Hawaii Forest Industry Association, a broad-based group consisting of 230 members including forest landowners, woodworkers, forestry and environmental professionals, was founded in 1988 with the mission to work for the good of the forest and forest industry in Hawaii. Driven by the significant motivator that the resource upon which it was based was embattled if not endangered, HFIA has sponsored annual symposia drawing together diverse interests to create a positive climate for tree growing in Hawaii.

HFIA has organized "Woods of Hawaii," a statewide juried furniture and woodworking show about achieving sustainability. This annual show, scheduled for Sept. 7-15 at Aloha Tower Marketplace, in addition to fine woodworking, features an educational component explaining local efforts at forestry and environmental consensus. The show encourages the use of woods planted in Hawaii for reforestation and landscaping, emphasizes the importance of planning and planting for the future, and encourages the use of veneers to extend supplies of existing valuable hardwoods as more are being grown.

...a number of extremely positive developments are taking place that bode well for the future supply of koa as well as for the quantity and quality of forested lands in Hawaii.

HFIA's symposium of 1996 will be held in Honolulu in November and will address all aspects of the topic of koa, providing both information about ongoing research, growing efforts, political and cultural issues and a forum for discussion of these and other topics. For more information, call symposium coordinator Mike Robinson in Hilo at 934-0502.

• The National Tropical Botanical Garden of Kauai is the principal entity charged with official propagation of rare native species and has the responsibility and authority to collect rare seed and grow propagules from which offspring can be outplanted in appropriate environments.

• The state DOFAW has developed cost-sharing programs to assist landowners in implementing tree farms and silvicultural management.

• Research on and activity in different aspects of silviculture are being conducted on private and public levels. In the private sector, the Hawaii Agricultural Research Center (formerly the Hawaii Sugar Planter's Association) is doing a variety of experiments on species improvement of koa and other promising trees while many small landowners are also conducting independent trials. In the public sector, the University of Hawaii has a number of doctoral candidates pursuing koa research, the UH Hilo now offers undergraduate forestry classes and IPIF has forestry research ongoing, some pertinent to Hawaii.

Much of the forest greenery one sees blanketing Hawaii is composed of introduced trees and was planted in the first half of this century to improve watersheds and counteract

the erosive effects of wild cattle. Much of that reforestation included field trials using valuable hardwoods from all over the world. While there have been notable failures and mistakes, many trials have done well and are in need of revisitation, evaluation and possible management. Many undocumented successes will surface in upcoming inventories and will be recommended for greater use in future plantings.

The present abundance had its origin in the time following the Great Depression. Peter Simmons, head of Bishop Estate's forest and natural resources department and a past president of HFIA, remarks that the current era of recovery really began with efforts like the removal by the Civilian Conservation Corps in the '30s and '40s of more than 250,000 feral nonnative pigs, goats and sheep from the forest lands on the Big Island alone. Efforts to drastically reduce those populations helped insure that earlier plantings and the forest being planted at the time would survive. L.W. Bryan, government forester on the Big Island during the period, reported more than 9.7 million trees planted between 1921 and 1946. The result of these efforts has been dramatic and underrecognized.

In short, there is now and has been in the past work on many fronts to insure that koa and other valuable native and non-native tree species get the best opportunities possible to thrive in the future, both in commercial and noncommercial situations.

The greatest "hot potato" currently under debate by wood users, resource managers and environmentalists revolves around creating definitions within the "gray area" that is the gradient of grazed forest types containing salvageable koa. These pasture types range from grass lands containing sparse, severely stressed remnant old-age koa, to grazed lands with relatively intact native forest containing some koa. While there is agreement that

harvest of degraded koa on the most stressed lands could be desirable if scarification and future management were required, as the gradient progresses toward the intact forest, the management debate heats up. It is therefore a priority to conduct an inventory and subsequently create a master plan to identify koa that will disappear due to rot and death by old age in the near future and prioritize it for utilization. In a best-case scenario and with proper planning and management, the resource available now can last to segue neatly into the time when trees being planted today become worthy of a first commercial thinning in 20 to 40 years.

Land managers are rising to the challenge of creating both ecological and economic rewards. Such far-sighted planning can include long-term multiple uses — both active and passive — of property concurrent with and compatible to the growing of trees. Agroforestry and ecotourism are two such concepts and yield passive public benefit of increased watershed, improved water quality, healthier offshore reefs and the marketable "ambiance" Hawaii is known for.

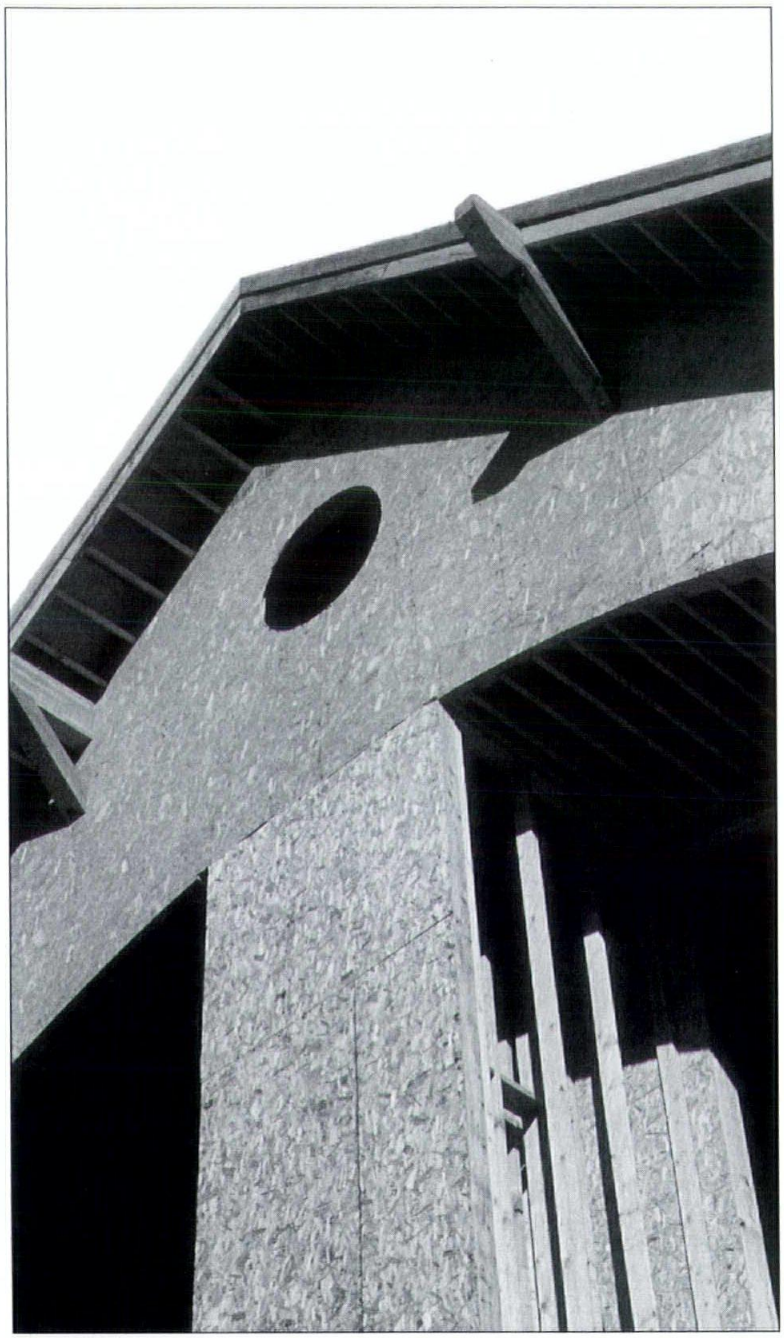
If the current enthusiasm, dedication, goodwill and synergistic momentum of those now dealing with forestry issues in Hawaii can be maintained, Hawaii is poised to be on the threshold of a "harmonic convergence" of economic and environmental circumstance that will make it exemplary in the area of silvicultural research and production. And koa planted by the people for the people shall not perish from the earth. ...

↔ *C. Barton Potter supplies wood for architectural and instrument making uses from a variety of Hawaii-grown woods and is currently producing fine lumber from eucalyptus citriodora recovered from clearing in the Mililani Mauka residential development area. This article originally appeared in a slightly different form in the summer 1994 issue of American Lutherie, the Quarterly Journal of the Guild of American Luthiers.*

A survey of innovative wood materials

Alternative Wood Products

by Jim Reinhardt, AIA



Alternative wood products are a common sight in most construction projects today.

The spotted owl, the Sacramento delta smelt, siltation of the salmon and trout streams, loss of wilderness, shipment of logs to Japan ... much of what we read lately leads to the view that forest products are a diminishing commodity and that we will soon be living in houses built of something other than wood.

The forest products industry is attempting to make its view known — that about 70 percent of the land area of North America, which was in forest in 1600, was still in forest in 1992; that's about the same amount of land area is in forest today as was in 1920, in spite of a 14 percent growth in the U.S. population; and that the forest harvest of today exceeds that of the '40s by one-third. Nevertheless, the impression persists that timber and lumber are endangered products.

In response to both the perceived concerns and the real need to satisfy the constantly growing demands of a worldwide construction industry, the forest products industry has developed, and is continuing to create, a wide range of new products to make more efficient use of the forest resources.

The forest products industry and the Engineered Wood Association (previously known as the America Plywood Association) have aggressively pursued a policy of efficient resource utilization. The underlying idea is to do more with the resources available.

The traditional views of logging and the processing of logs into lumber involve Paul Bunyan, huge logs, whirling giant saw blades (and maidens tied to logs) and sawn timber. The current lumber industry is using smaller logs, faster growing trees, less desirable species and innovative engineering to reduce waste and produce more consistent products, which are easier to use and, in turn, produce less waste on the job site.

These lumber products are being manufactured by bonding together wood strands, veneers, small pieces of lumber and other wood elements to form larger composite structural units. These units can be produced with fast-growing and underutilized wood species from managed forests and tree farms.

According to the literature, these new products provide superior performance that improves upon the inherent structural properties of wood. For example, cross-laminated plywood and oriented strand board distribute the along-the-grain strength of the wood in both panel axes. Glu-lam beams and wood I-joists can be engineered to exacting standards, carrying greater loads over longer spans than is possible with equivalent size sawn wood.

APA groups its glued engineered wood products into four general categories — structural wood panels, glued laminated timber, structural composite lumber and wood I-joists.

Structural wood panels

The structural wood panels group includes plywood, oriented strand board and structural composite panels. Plywood is made from logs that are rotated on a lathe against a stationary blade, peeling it into sheets about one-sixteenth to one-eighth of an inch thick (veneers) and glued together into panels with veneers laminated in alternating grain directions. Plywood was one of the first engineered wood products to reach the market. By now, plywood is so common that we hardly think of it as an engineered wood product.

Oriented strand board: Rather than peeling the logs into veneer sheets as is done to make plywood, when making OSB, logs are cut into flakes 3 to 4 inches long, about one-eighth inch thick and one-fourth to 1 inch wide, then mixed with glues similar to those used for plywood. OSB is available in Exterior and Exposure 1 exposure groups. Exposure 1 will tolerate weather exposure during construction and is used for sheathing and flooring. OSB is subjected to strict performance testing to verify that the panels will provide the performance "advertised."

Wafer board: This is another name of OSB.

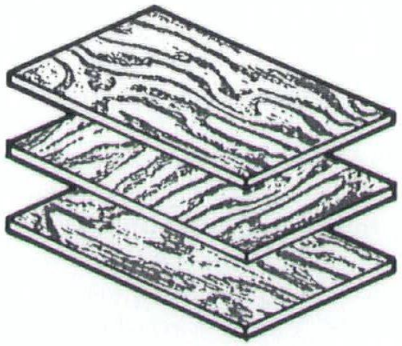
Com-Ply is a composite of OSB and plywood, using OSB for the interior layers and wood veneers for the exterior skins.

Here in Hawaii, we are faced with a significant problem in using wood products — how to deal with the potential of termites and decay. OSB cannot be treated with waterborne preservatives (chemonite, copper chromated arsenate, ACQ or borate). Little is known about the effects and effectiveness of treating OSB with tribucide. Experiments are under way to use borate to treat the wood fragments prior to fabrication of OSB and similar products, but these products are not yet available.

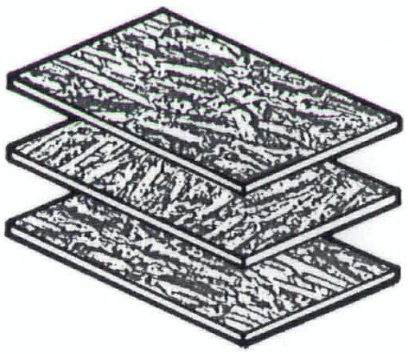
In the array of panel products available, you will also see hardboard, of which masonite is the best known product, and particleboard. Hardboard is partially digested wood, formed into a matt (or felt) of wood fibers, which is then mixed with adhesives and compressed to form a panel product. Hardboard is not an APA product but is manufactured under the guidelines of the American Hardboard Association.

Particleboard is made of small wood chips and "saw dust" that is mixed with adhesives and compressed into panel products. It is manufactured under the guidelines of the National Particleboard Association and is used in the manufacture of furniture and some exterior siding materials.

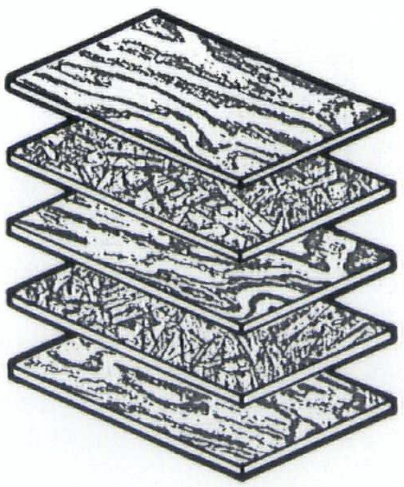
Neither of these are engineered wood products as their uses are typically based on their nature as large size sheets, rather than on their controlled strength characteristics. Their primary building uses are as an exterior paneling or siding. Both products make use of materials that would otherwise be unused waste and scrap from traditional lumber products.



Plywood



Oriented Strand Board



Com-Ply®

Glued-laminated timber

Most people are familiar with glu-lam timber which includes timber fabricated from lumber of 2 inches or less nominal thickness and glued together to form structural units.

As the lumber industry has moved from cutting the old "giants of the forest" to harvesting the much smaller second and third growth trees, the ability to cut large timbers from the logs has diminished. Nevertheless, large wood structural members can be fabricated by gluing together smaller pieces.

The glu-lam process not only enables fabrication of large wood members, but because the grade and strength of the component pieces can be carefully controlled, the strength of the composite member can also be precisely controlled. This allows longer spans with smaller members — another case of getting more with less.

However, you may not have thought much about the problems of treating glu-lams. The underlying problem is what occurs if the glu-lam manufacturer treats the lumber prior to fabrication, which works fine and produces a very durable product? The waste produced when the rough pieces of pretreated lumber are planned and sanded to finished size is a "toxic waste" which requires special handling and disposal.

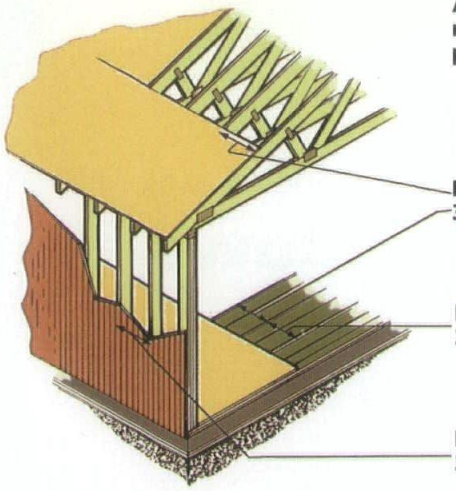
If you read the Honolulu Building Code, section 2516 c4, you will notice that it says that all structural lumber (and surely nearly all glulams are structural) must be treated with CCA, ACZA or borate. Unfortunately, treating glu-lams with waterborne preservatives may invalidate some glu-lam manufacturer's warranties. In the past, glulams have been treated locally with tribucide 2, but the protection provided by tribucide 2 is not as good as that of the waterborne preservatives and the cost is much higher. There are wood treaters that, working together with selected glu-lam manufacturers, can produce ACZA- and CCA-treated glu-lams, but finding them requires some searching.

Structural composite lumber

The structural composite lumber group is primarily composed of laminated veneer lumber, which uses wood veneers like those used in plywood but that are glued together with all grain parallel to long dimension. Typically, the veneers run in the width dimension rather than in the thickness direction as with glu-lams. Microlam lumber is a brand name of LVL manufactured by Trus Joist Macmillan. LVL is commonly used for headers, beams and flanges of wood I-joists. The same preservative treatment concerns apply to LVL as apply to glulams.

TimberStrand is a combination of OSB and SCL. Using longer strands, Trus Joist Macmillan has

produced a product similar to OSB that is fabricated into nominal 4-by beam sizes and 2-by-4 stud sizes to make headers and studs. The literature describes it as being straighter, with no twists, warps, splits or checks and delivered precut to a desired length. It's made from fast-growing aspen and poplar. While it may be all of the things advertised, I would be very wary of its resistance to termites and decay. It will also be subject to the same limitations on preservative treatment as is OSB or LVL.



American Plywood Association ratings are used for various products in construction.

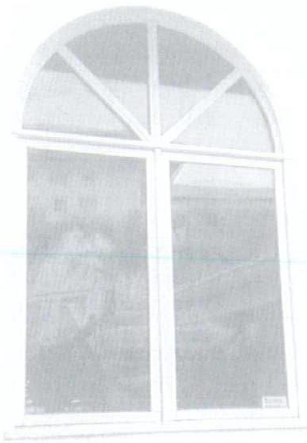
Wood I-joists

The wood I-joists group is made up of the same products that Trus Joist Macmillan has been marketing for many years as TJI-Joists ... 2-by top and bottom flanges with plywood webs. The flanges may now be made of LVL, giving more control over the engineering characteristics. The general industry concern is that the availability, quality and variability of joist-size lumber is decreasing; I-joists are an engineered replacement. APA is developing an I-joist standard that will make specifying, purchasing and using this product much easier.

You may also encounter trim lumber made of finger-jointed material.

Finger-jointed lumber is made by cutting the knots, knotholes and splits out of a lesser grade of lumber, then splicing it together with the finger-joint technique to make a higher grade material. In some instances, it also permits producers to make long lengths of lumber from shorter, less commercially viable lumber.

APA and the individual lumber industry companies continue to look for innovative ways to make better use of our precious forest resources and to create new products for the construction market.



Decay in manufactured wood windows explored

Withering Windows

by Philip D. Haisley Jr., AIA

Wood windows offer a warm, elegant style and a handcrafted look that compliments island living. Although the insulating value of wood is not required in Hawaii, the aesthetics and historical associations of painted or natural wood make it a popular choice for windows, particularly in residential construction.

You might expect your windows to be as durable as the other nonstructural elements of your home or office. They should be, if they are properly designed and manufactured, given the proper preservative treatment and protective coating, and properly installed and maintained.

In recent diagnostic work, far more extensive, rapid and serious decay than expected in relatively new wood windows was observed — enough to merit a note of caution to designers, builders and users of wood windows.

Manufacturers like Pella have produced high quality wood windows for many years, decades in fact, and have created an image of wood windows as a highly desirable, prestigious product. Several new manufacturers have come into the wood window market in recent years, introducing less expensive products. Unfortunately, extensive problems with the factory-primed and factory-finished exterior surfaces of some of these manufactured wood windows are beginning to show. Severe decay in windows has been observed within two years of installation, in spite of design specifications that comply with industry standards.

Decay damages the elegance of wood windows.

Of the known varieties of decay fungi, most of them live in Hawaii and are eager to move in with you and your wood! To survive and grow, a decay fungus needs food, moisture, air and moderate temperatures. The cellulose in wood serves as food for fungi, and the range of temperatures suited to fungi is about the same as it is for humans. For fungi to thrive, the moisture content of the wood must be above the fiber-saturation point, or about 28 percent to 30 percent. For wood to maintain that level of moisture, a water source is necessary because wood will reach an equilibrium moisture content below that required to sustain decay fungi, even in humid conditions.

The industry standards for manufactured wood windows are published by the National Wood Window and Door Association. Recent observations suggest that some manufacturers may not always faithfully follow these standards. Even though they meet current design and industry standards, some of the preservative treatments in current use may not provide enough margin of error to take up the slack. There may soon be a new treatment standard from the American Wood Preservative Association which can be specified to help enforce compliance. This is the first time that AWPA is establishing a nonpressure treatment standard. This new standard should be similar to the NWWDA treat-

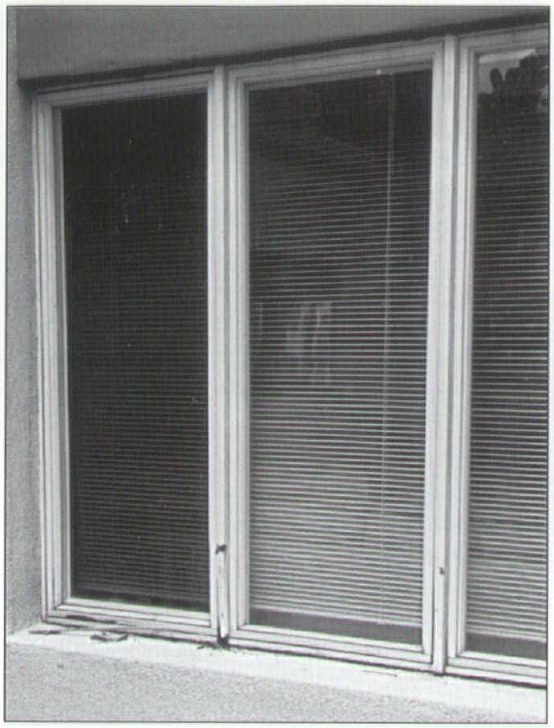
ment standard, but will provide more detailed testing requirements for checking compliance. The new standard is still in draft form, but may be published in AWPA's Book of Standards as early as August 1996.

Protection against decay begins with the choice of wood and appropriate chemical treatments. Most manufacturers use ponderosa pine, Western pine or other fine-grained white pine for their windows. Pine is almost entirely sapwood and, while it accepts treatment readily, it offers very little intrinsic decay resistance. Windows made from more decay-resistant species like cypress, mahogany and teak are available, but at a substantially higher cost. If a species like pine is used, a good preservative treatment is imperative. The industry standards for preservative selection and treatment procedures, and the tests for preservative efficacy, water repellency and penetrability are established in National Wood Window and Door Association Standard I.S. 4-94.

NWWDA does not dictate the chemical formulation to be used by manufacturers, but it does keep a list of formulations that have been tested and approved. A recent study suggests that the approved chemicals and their application methods very widely in effectiveness, and that more effective chemicals may be needed.

The study, directed by wood-treating chemical manufacturer Chemical Specialties Inc. and presented this year at the International Research Group on Wood Preservation in Stockholm, Sweden, compares the effectiveness of five active ingredients on wood L-joint samples exposed to five years of weathering near London and Hilo. (Interestingly, among the other observations of the study, it was found that exposure to the elements for one year in Hilo produced decay equivalent to that of five years at the Wisconsin and London test sites.) Two of the preservatives tested are used in formulations approved by NWWDA for use on windows: TBTO (tributyltin oxide) and IPBC (iodo-propynyl carbamate). Penta (pentachlorophenol) and two new chemicals developed by CSI, RH-893 and RH-287, were also tested.

The most widely used NWWDA-approved formulations are based on the compound IPBC, marketed under the name "Polyphase." IPBC has been in common use since the late 1980s when the Environmental Protection Agency imposed strict limitations on the use of Penta, which until then, was by far the most widely used preservative for millwork. Though Penta is no longer used, CSI included it in its tested formulations as a standard for comparison.



Proper protection begins with the correct choice of wood and treatment.

IPBC proved far less effective than Penta in the CSI tests. However, most wood window manufacturers use IPBC-based treatments and do not offer alternative treatments. The formulation that emerged from the test data as clearly superior was a 1 percent solution of RH-287, an isothiazolin formulation that is not registered for use in the United States. While the manufacturer is not pushing for registration of RH-287, there are other promising chemicals being registered, including tribuconizol, which may offer an improvement over IPBC.

In the CSI Hilo tests, 97.4 percent of the samples dip treated with a 1 percent solution of RH-287 were found to be sound after five years, while only 17.5 percent of the samples dip treated with a 1 percent IPBC solution were still sound. While the 1 percent solution of IPBC proved less than satisfactory in the field tests, 0.5 percent and 0.75 percent concentrations of IPBC are NWWDA approved. The lower concentrations were even less effective in the test.

Without appropriate design, treatment and manufacturing, wood windows can be subject to extensive damage.

A second NWWDA-approved chemical commonly used for treating wood windows is TBTO. TBTO has been found to break down after prolonged exposure to the acids in wood. TBTO should be avoided if a preservative with a long-lasting effect is desired.

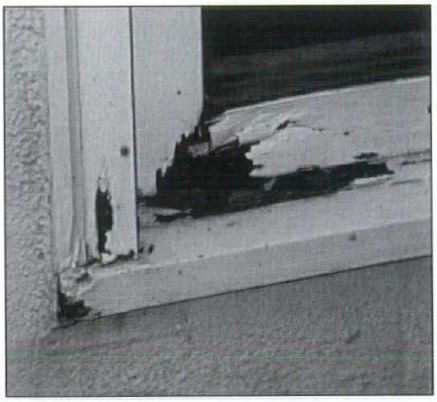
The CSI study also compared the standard three-minute dip treatment with a double-vacuum treatment. While both treatment methods are approved by the NWWDA and considered to be comparable, the study suggests that the vacuum treatment is far more effective, producing three times the preservative retention. However, very few window manufacturers use the vacuum treatment method.

Termites are also a concern with regard to windows. Windows are on the surface of the structure, where they would be among the first wood surfaces encountered by swarming termites. The light from the windows attracts the swarmers, increasing the number of potential breeding termites in contact with the wood. The cracks between adjacent frame members and between the stops and glass are just the sort of "crannies" termites like and need as a place to start their colonies. Moist, partially decayed wood, if it is available, is the ideal environment for starting their families.

Most manufacturers include chlorpyrifos (Dursban) in their preservative formulations to keep out the bugs. IPBC plus chlorpyrifos is Tribucide 2, a clear preservative formulated and used by Honolulu Wood Treating Co. primarily to treat trim and millwork. Tribucide 2 is normally used as a pressure treating chemical, which will result in far higher retention than the minimums accepted by NWWDA.

While the preservative treatment of the wood has a profound effect on the durability of the wood, the method of manufacture also plays a significant role. Proper shapes, joints, adhesives and fasteners can improve watertightness. Window frames with horizontal butt joints are far more likely to experience decay than those with vertical butt joints or miter joints. Many manufacturers offer aluminum or vinyl exterior cladding, which lets the wood show on the inside while offering improved protection to the exterior. The extruded aluminum cladding will be more durable than the sheet metal clad type.

The best manufacturers glue wood joints or set them in sealant to keep moisture away from vulnerable end grain. Keeping the water



Rapid decay has been observed in wood windows within two years of installation.

out of the glazing pocket is also important. Placing a bead of silicone sealant against the wood on both sides of the glass or wrapping the glass edge with butyl tape will minimize the amount of water that gets into the wood joints.

Windows should be protected from the elements until they are installed and painted. Be sure painters don't leave unfinished edges — especially the top and bottom edges. Proper flashing and building felts between the window and exterior wall will create and maintain watertight conditions around the window. Never allow direct contact of bare wood with concrete, plaster or exterior finish systems. Slope horizontal surfaces to direct water away from the wood. Lastly, deep window overhangs can help keep water away from the windows, prolong the life of finishes and minimize moisture-related problems.

Wood of all types requires maintenance, particularly in Hawaii with its high ultraviolet radiation, salt air and frequent rains. Maintain wood windows with regular painting — at least every five years and use a paint which forms a good film such as an enamel or varnish. Ensure that the paint laps onto glass, providing a seal between the glass and wood.

NWWDA publishes a two-page flyer on the "Care and Finishing of Wood Windows," which can be provided to every new homeowner.

Though there was little cause for concern in the past, we may need to become more picky and inquisitive to steer around the window decay problems that are beginning to crop up. It will be difficult to change the treatment procedures that are used, however, window manufacturers can be pressed to use the best available chemicals in their treatments, the most effective procedures for their applications and for increased testing and rapid approval of more effective chemicals when they become available.

We might try to use windows that are treated by the double-vacuum method. We can ask window manufacturers if they are Hallmark Certified by NWWDA, meaning they are inspected by the association. We can look for a manufacturer with a local presence or a responsive service and technical staff that will come to the job site to help resolve problems. We can examine details and specifications and select higher quality products. We can advise our clients that a slightly higher cost will be more than justified by improved long-term performance. We can advise the "other" window manufacturers that we didn't select their products because of these concerns. And we can provide wide overhangs to keep the rain away when it can be integrated with design intent.

↔ *Philip D. Haisley Jr., AIA, is vice president of Architectural Diagnostics Ltd.*

Latest craze toward stone counter tops

Natural Trend

by Tisha O'Neill

This Rutt kitchen in solid cherry wood is an example of the move away from white cabinets.

Those looking for the hottest trend in counter tops can say goodbye to cultured, ceramic and plastic laminate materials. Natural stone, in particular granite, is quickly becoming the popular choice for counter tops, according to two industry experts.

"I think right now granite is so popular because people tend to visit their friends and relatives and neighbors and they hear a lot of talk about granite," said Michael Smith, president of Kitchen Concepts Plus Inc. He added that one of the benefits of granite is it can take extreme heat, where solid-surface materials will not.

Mike Ferguson, general sales manager of Central Pacific Supply/Tile Mart, agrees that granite is becoming a popular item, which is why his company recently introduced Dynastystone to the Hawaii market.

Dynastystone is produced by mixing small pieces of natural granite with epoxy and forming squares, he said. These mini-slabs with prefinished edges are 38 inches by 29 inches. With most counter tops being about 25 inches deep, the extra 4 inches are used for the backsplash.

Ferguson said Dynastystone helps cut waste and save money. It also helps cut down on the amount of fabrication.

"Customers can get Dynastystone's natural granite counter tops installed for less then cultured or plastic laminate counter tops," Ferguson said. "It's the least expensive way to put granite on your counter top. That's the reason we brought it into the market."

Natural granite counter tops are typically more expensive than other counter top materials, according to Smith, "but some granites can be comparable in price, depending on where the material comes from."

Smith said at Kitchen Concepts Plus Inc., despite the popular trend

... Corian, Formica and Wilson Art are still desired counter top surfaces.

to natural stone, solid-surface materials such as Corian, Formica and Wilson Art are still desired counter top surfaces.

The solid-surface materials use joint adhesives and are virtually seamless. They are also not as coarse as the natural stone and are reparable. With proper care, Smith said solid-surface counter tops should last a lifetime.

At Central Pacific Supply/Tile Mart, ceramic tile is still a popular item, particularly porcelain tile which comes in a variety of finishes, Ferguson said.

He added that the latest in porcelain tile is the cross-grid tiles that are made at Crossville Porcelain in Tennessee. These tiles minimizes joint size by running the tiles through machines to make each edge uniform, allowing for an end-to-end fit.

According to Ferguson, a ceramic-tile counter top can last anywhere from 10 to 20 years, maybe even longer with the proper care.

Besides specializing in counter tops, Kitchen Concepts Plus Inc. also carries the latest designs for cabinetry.

Smith said most of his customers want wood. "We are seeing a trend of more clients asking for natural wood instead of laminates." He added that ash, cherry and maple with varying degrees of stains seem to be the most popular choices.

Smith's company carries Rutt cabinetry, hand-crafted cabinets made by the Amish in Pennsylvania. The finish on these cabinets is baked on and they are reparable.

The company is also bringing in Alno, a new line from Germany. "The European cabinets still have a strong hold on the market," according to Smith.

He added that one past trend is fading with his clients. "White is not as popular with clients anymore," he said. "The stark white seems to be on its way out."

The prices of cabinets depend on many things, including the door style and finish, Smith said. Both the Rutt and Alno cabinet lines start at a "medium price range and go up."

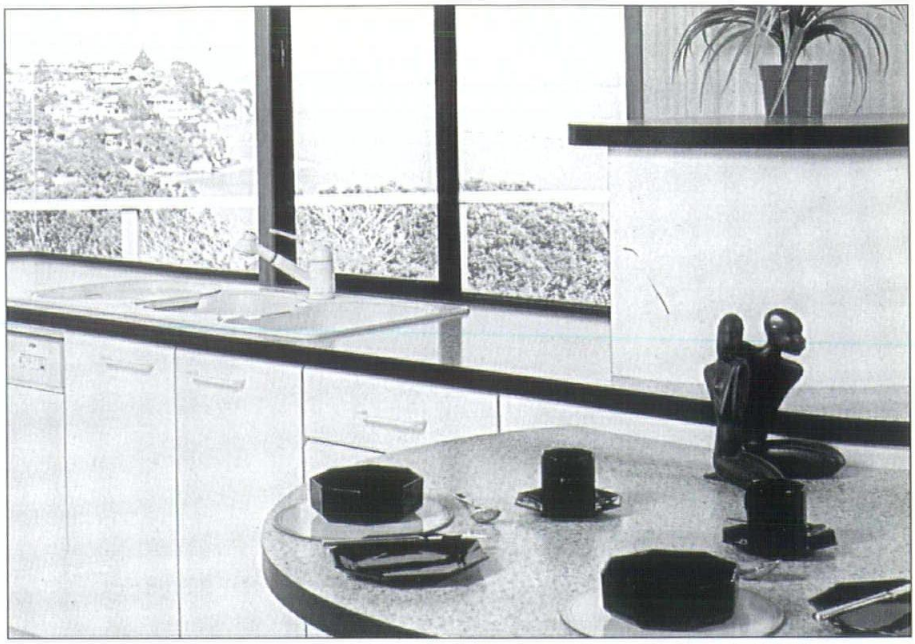
HWT Introduces Moisture-resistant Particleboard

Honolulu Wood Treating Co. Ltd. recently introduced HMR — high moisture resistant — particleboard to the Hawaii market.

This particleboard is a durable, low-cost building product, designed to withstand humid and damp environments. It has an extra-high density panel with special bonding resins that resist moisture, providing all of the advantages of particleboard fabrication without the drawback of deterioration from moisture penetration.

HMR particleboard is termite resistant and does not require the termite treatment specified for plywood panels currently used in high-moisture applications.

For 15 years HMR has resisted swelling and buckling in kitchens, bathrooms, furniture and other applications exposed to high moisture in Australia and the Pacific Basin, including New Caledonia, Papua New Guinea and Fiji.



High moisture-resistant particleboard has a variety of uses in kitchens and bathrooms.

HMR particleboard is manufactured by CSR Timber Products, Australia's largest producer of timber-based building materials.

Honolulu Wood Treating Co. stocks HMR in 4-by-8 foot sheets of three-eighths, one-half, five-eighths, three-fourths and 1¼ inch thickness. It is available in unfinished and prefinished two-sided melamine coating.

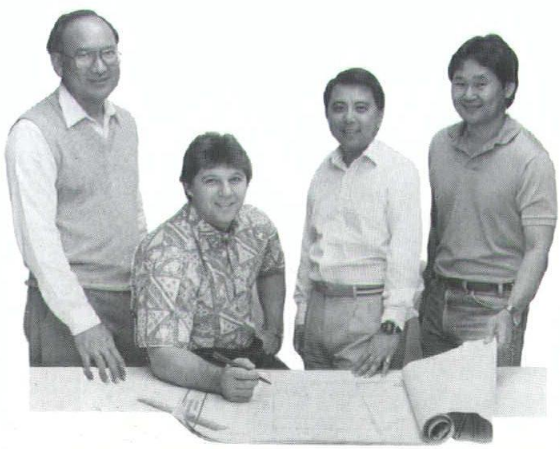
Market Place

When you can't halt hospitality... Allied comes through

Major improvements in scattered areas at the Princess Kaiulani Hotel called for a supremely accommodating contractor. Even as beautifully redesigned lobbies emerged, envisioned by the Gulstrom Kosko Group, and the popular Ainahau Showroom expanded with the overview of Ted Garduque, AIA, the hotelier continued to serve.

"We were on a tight timeline facing a holiday opening," observed Garduque. "Allied's crews were always responsive and concerned with quality execution. Even when the normal problems in renovation occurred, they stayed on top of things."

Adds GKG's David Chung, AIA: "Allied reacts well to the design professional. Beyond this, they know that change at hotels cannot interfere with visitor pleasure. They worked odd hours and with diplomacy when hotel guests were around."



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Architect David Chung, Hotel Food and Beverage Manager Chip Bahouth,
Architect Ted Garduque, ABS Project Manager Ed Sakai