Hawaii Pacific Architecture

November 1995

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Marshalling in On retailing...

"When we were first coming to Hawaii, we heard that interior improvements would cost double, take twice as long and the quality would be half of what we were used to..."

That's the way Marshalls' Project Manager Robert Lambert remembers it a few years ago. But the Boston based mega-retailer was in for a big surprise when Allied Builders System was hired to construct its Pearl City store.

"We thought it might be a nightmare, instead the work went like a dream," Lambert says. Several Marshalls' stores here later, with Allied Builders as negotiated contractor, Lambert's superlatives remain glowing: "Great quality, cost-efficient workmanship, excellent communications, thorough and caring crews. We've either opened early or right on schedule."

Architect Daniel Uesugi,AIA, agrees, adding: "Allied's people cut to the work. The team spirit is tremendous. And when they say they're finished, they are finished. The punch list is nearly negligible."

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ABS Project Manager Patrick Tom
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Architect Daniel Uesugi

Volume 2, Number 11

November 1995

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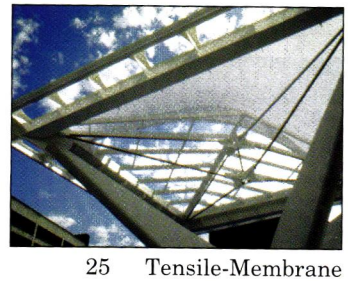
ALTERNATIVE CONSTRUCTION METHODS



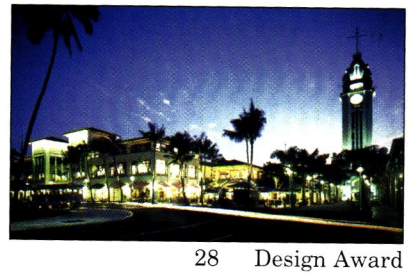
25 Tensile-Membrane Technology

KITCHENS AND BATHS

DEPARTMENTS

IN THIS ISSUE ...

Hawaii Pacific Architecture focuses on alternative construction methods. Bob Mandich, AIA, discusses the use of bamboo as an alternative building material, and Arius Hopman tells how Hawaii is poised for an architectural revolution. Emily Zants explains how she created a "sack" house, while John Bravo, S.E., covers fiber-reinforced plastics. The Aloha Tower Marketplace is presented as an AIA Award of Excellence winner. This month's cover displays unique features of bamboo construction. The photograph was provided by Harry R. Highkin, Ph.D. The Hawaiian Tapa used on the cover and throughout the magazine is courtesy of Bishop Museum.



28 Design Award

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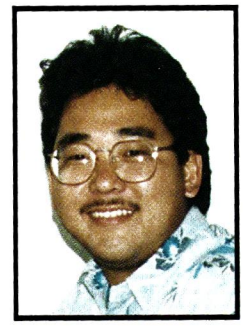
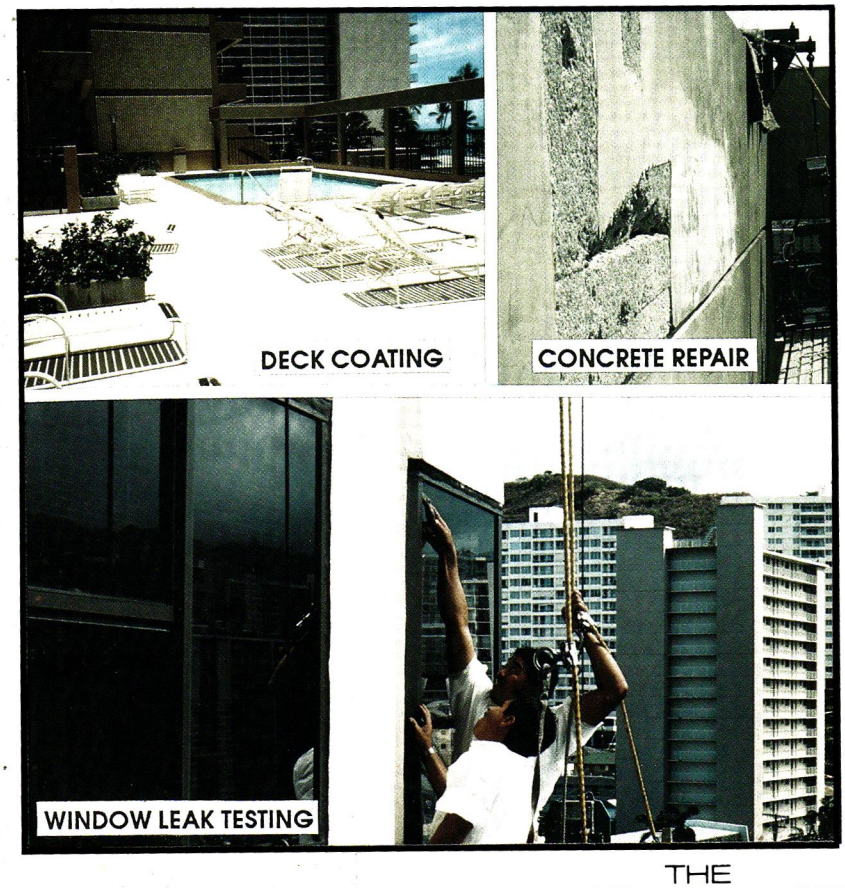
A New Generation of Leaders

Heading a team of over 40 technicians are left to right: Alvin Nishikawa, Ken Matusumura, John Kobayashi, Al Gardner, Steve Kramer, and Jim Hiramatsu

Meet Alvin Nishikawa.



Alvin is Vice President of The American Coating Company. He is in charge of all field and estimating operations. Previously, Alvin was employed with an engineering firm in Chicago and Honolulu where he focused primarily on restoration and water infiltration problems. Alvin holds a M.S. and B.S. in Engineering from Purdue University.



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News Briefs

Life Safety Symposium Scheduled for November

The four ancient Greek elements, Fire, Air, Earth and Water provide the theme for the multidisciplinary Life Safety Symposium, Nov. 10-11 at the Japanese Cultural Center.

The program will feature presentations and discussions on evolving design strategies, regulatory changes and technical innovations for topics ranging from earthquakes, hurricanes and fire to indoor air quality.

Fire, Air, Earth and Water is a joint symposium organized by the Honolulu Chapter of the American Institute of Architects, American Society of Heating, Refrigerating and Air Conditioning Engineers, American Society of Civil Engineers, Society of Fire Protection Engineers Systems and Structural Engineers Association of Hawaii.

For information or registration, call the Honolulu AIA office at 545-4AIA.

'Preparing and Reviewing Substitution Requests'

"Preparing and Reviewing Substitution Requests" will be hosted by the Construction Specifications Institute, Honolulu Chapter, and the University of Hawaii School of Architecture from 8:30 a.m. to 4 p.m., Nov. 18.

The program will review sample substitution request and backup information requirements, including procedures and policies for city and county, state and federal projects. This seminar was developed for architects, engineers, project managers, product representatives and distributors, and is accredited for 12 continuing education credits by the American Institute of Architects.

For more information, contact Sandy Tottori, 848-0711 or Richard Malmgren, 545-2177.

UH Architecture Students Awarded Scholarships

Two students at the University of Hawaii's School of Architecture recently were awarded scholarships for the 1995-96 school year. The American Institute of Architects and the American Architectural Foundation awarded a $750 scholarship to Roger Gaspar and a $1,000 scholarship to graduate student Brian Major.

Brian Major

Gaspar and Major were among 241 students from 79 schools in the United States and Canada who received awards ranging from $500 to $3,000. Scoring for the scholarships was based on each student's personal essay, letters of recommendation, grade point average and financial need.

Roger Gaspar

A total of $260,500 was awarded for the school year by AIA and the Foundation.

EPA Requires Lead-Paint Disclosures in Remodeling

The U.S. Environmental Protection Agency now requires anyone involved in remodeling, whose work could stir up lead-based paint, to provide information on the dangers of lead to occupants of houses they remodel. These workers include painters, roofers, drywall installers and electricians.

Violation of the EPA rule can result in fines of up to $25,000 a day. If someone willingly breaks the rule, criminal charges can be filed.

This rule went into effect in October, along with a regulation requiring anyone selling a house built before 1978 to give potential buyers written information on the dangers of lead.

BIA Home Building And Remodeling Show

The second annual Building Industry Association Home Building and Remodeling Show will be held Nov. 30-Dec. 3 at the Neal Blaisdell Center. The Show, sponsored by BIA of Hawaii and First Hawaiian Bank, attracted more than 22,000 people in 1994.

The Show will feature more than 200 exhibits, as well as a series of seminars presented by professionals in home building, remodeling, interior design and landscaping.

For more information or applications for booth space, contact Barbie Watanabe, BIA project coordinator, at 847-4666, Ext. 202.

AM Partners Recognized By Interior Design Magazine

In the September issue of Interior Design Magazine, AM Partners was ranked the 175th largest interior design company in the country. AM Partners, which is celebrating its 10th anniversary this year, was the only Hawaii firm on the list.

The ranking was a result of research, conducted by the magazine's staff, of more than 3,000 architectural firms across the nation. A company's rank on the list was based on interior design and facility management fees.

AM Partners also was listed in the magazine's October issue as one of the top 75 hotel and restaurant interior design architectural firms in the nation.

Environmentally friendly material offers versatile structural solutions

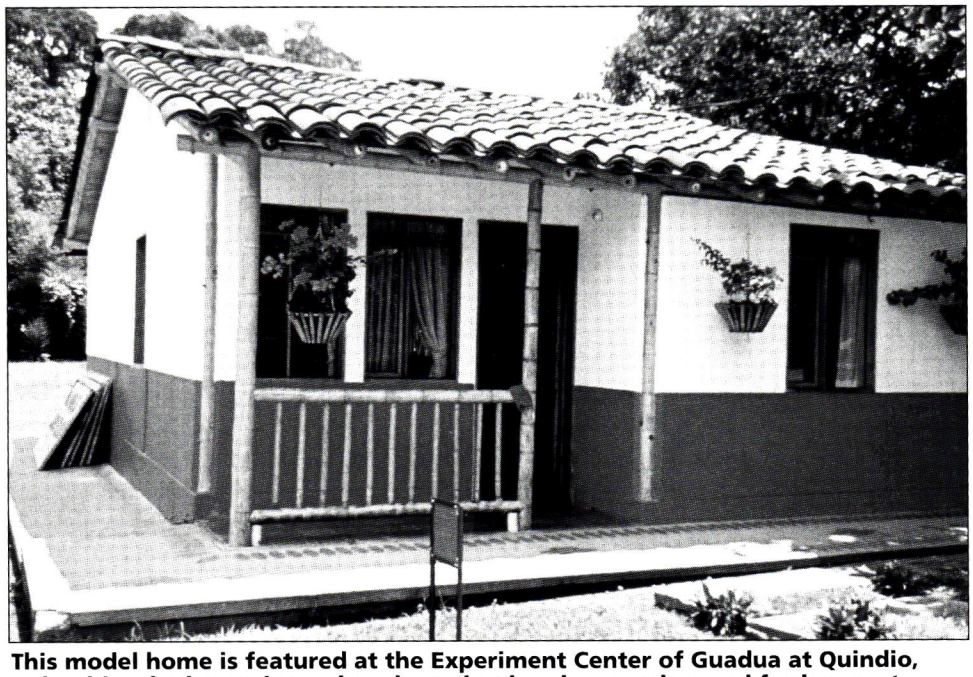
Bamboo, a Viable Alternative

by Bob Mandich, AIA

Bamboo is believed to be one of the oldest construction materials, beginning with the history of man's development. A member of the grass family, bamboo proliferates in as many as 1,500 species, and has been in existence for at least 60 million years. Bamboo is found on every continent, either as native or introduced species, growing at latitudes as high as 45 degrees north and 45 degrees south, and at altitudes of up to 4,000 meters, sometimes covered in snow year-round.

An ever-increasing number of architects and engineers are experimenting successfully with bamboo construction. Some are exploring the use of building techniques for new architectural and structural solutions or tests to produce various composite materials using bamboo. The Fourth International Bamboo Congress, held this year in Ubud, Bali, Indonesia, produced an abundance of examples to support bamboo as a viable building material alternative. Architectural examples of modern bamboo buildings have been designed and built, demonstrating that bamboo can be considered an effective structural and aesthetic solution.

The Colombian architect Simon Velez has built more than 40 modern bamboo structures ranging from residential projects to shopping arcades. The largest structure free-spans most of its 30 meters by 90 meters and functions as the clubhouse for a new 2,500-unit custom housing project in Colombia. This building could possibly represent the largest built bamboo building structure in existence to date. Vladimir Mauzit of France shared his experimentations with tensile structures and mentioned the success of the several dozen bamboo structures he has built.



This model home is featured at the Experiment Center of Guadua at Quindio, Colombia. The house is used to show that bamboo can be used for low-cost housing as well as upscale projects. Photo by Ana Lucia O'Connor

The works of Colombian architect Oscar Hidalgo Lopez and German architects Klaus Dunkelberg and Frei Otto also were available for review.

The most important structures produced using bamboo include columns and beams, frames, roof rafters, arches, grid shells, suspended and tension structures. Bamboo is one of the strongest building materials with a tensile strength of 28,000 per square inch verses 23,000 for steel. Projects which include both suspended and tension structures that incorporate fabric into the design are structural-

ly and aesthetically powerful.

This author is currently working with two projects located on the north shores of Kauai and Oahu. Both projects—a yoga/meditative space for a local ashram, the other a three-car carport—incorporate fabric, sailing and mountaineering hardware and living bamboo set in tension to create the respective spaces.

Examples for other uses of bamboo as described by Nigel Simmonds of the Environmental Bamboo Foundation are numerous, including the instruments from which musicians make melodies, the paper on which friends communicate and the tissue with which we dry our eyes. Bamboo is used for scaffolding, desalination filters and formed Alexander Graham Bell's first phonographic needle. It also provided Thomas Edison with one of the first filaments for the electric light bulb.

The bamboo shoot provides nutrition for millions. Bamboo litter makes fodder for animals and food for fish. The stem oil and sap, roots and leaves are used in many cultures as medicines. Bamboo also is used for ladders, fence posts—an excellent replacement for 4-inch-by-4-inch wood posts used as temporary or permanent job site security or for screening purposes—fencing, weapons, chopsticks, landscaping, reinforcement for concrete, laminated flooring—bamboo is twice as stable as oak, and harder than walnut, cherry and teak. One resource book lists more than 5,000 uses for bamboo.

The structural stability of bamboo buildings allows the buildings to stand in the aftermath of devastating tsunamis and earthquakes due to bamboo's relatively low weight and elasticity. In addition, bamboo survived the Hiroshima atomic blast closer to ground zero than any other life-form. Its hollow, cylindrical form provides the ideal structural member for construction, and a modern day solution to environmental problems because it leaves nothing behind.

In past centuries, half the world's population has developed and depended on bamboo to solve the most varied of building tasks. In the developing world, bamboo no longer has the significance it traditionally had as a con-

These household items, made of bamboo, are displayed at the Experiment Center of Guadua as samples of the numerous uses for bamboo.

Photo by Ana Lucia O'Connor

This clubhouse, designed by Colombian architect Simon Velez, free-spans most of its 30 meters by 90 meters.

Photo contributed by Harry R. Highkin

Bamboo Conference Set for May 24-26

With the demise of the sugar industry in some of Hawaii's counties, diversified agriculture is becoming increasingly more important to the state's economy. Bamboo is a potentially valuable forest crop that could be used to help meet the demands for food, fiber or building materials in Hawaii.

The Big Island Resource Conservation and Development Council, together with the University of Hawaii at Hilo Campus College of Agriculture and College of Continuing Education will present the first conference and trade show on bamboo ever held in Hawaii, May 24-26, 1996. The three-day conference, which will be held at the University of Hawaii at Hilo campus will explore potential uses and the propagation of bamboo.

Internationally-recognized bamboo experts from Asia and North and Central America will address the history, cultural uses, farming practices, economics and valued species of this versatile plant. Some of the many products derived from bamboo will be featured at the trade show.

The conference also will provide attendees an opportunity to network with growers, suppliers, users and manufacturers of bamboo products.

For more information on this conference contact Judith Fox-Goldstein at (808) 933-3555; fax, (808) 933-3684, e-mail, foxgolds@ UHUNIX.UHCC.Hawaii.edu; or by mail, Director of Conference Services; University of Hawaii at Hilo; 200 W. Kawili St., Hilo, HI 96720-4091.

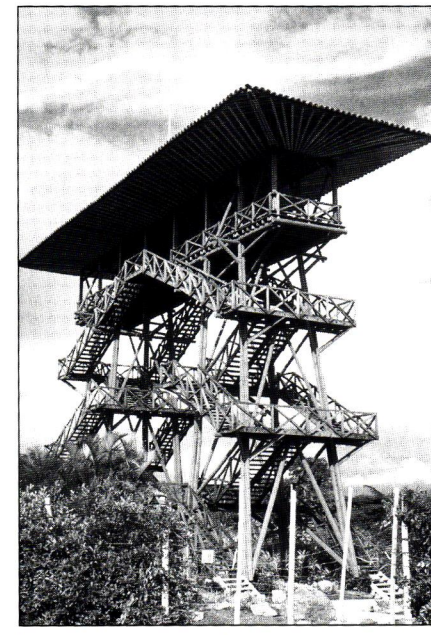
struction material, although bamboo and its related industries provide income, food and housing for more than 2.2 billion people worldwide. It is highly probable that building with bamboo will, however, experience a resurgence in popularity due to its versatility, sustainability and the ever-increasing need for housing for the growing world population.

Bamboo is utilized in 35 percent of all houses in Indonesia, 60 percent of the houses in Bangladesh and Burma and 85 percent of the houses in the Philippines. A Costa Rica national bamboo project is building 7,200 low-cost bamboo homes in 38 rural communities with 700 planned bamboo plantations. Representation by the Office of Hawaiian Affairs at this year's Bamboo Congress indicates interest in using bamboo in low-cost housing construction locally.

Bamboo grows rapidly and in large quantities with extremely favorable material properties, such as low weight, high resistance to tension, compression and deflection and it is easily processed. Its growth rate far exceeds that of trees and can be employed with a high level of economy. It is possible to build the wooden structures of the future, even when the available worldwide forests have been decimated.

While in attendance at this year's Bamboo Congress, the delegates from the Philippines indicated that they have a need this year for more than 2 million housing units to be built. They are intent on accomplishing this task. If this need is met with so-called modern building methodology, we all are in trouble. The people of the world cannot withstand the implications of this current and growing need for shelter. Trees are coming down and cannot be grown quickly enough to keep up with industry demand. Bamboo, which has a high yield and is a renewable resource, may be the solution to the depletion of the earth's forests.

Linda Garland, festival organizer for the Fourth International Bamboo



Bamboo was used to construct this watch tower for the Forestry Service in Colombia.

Photo contributed by Harry R. Highkin

Congress said, "Bamboo's anti-erosion properties create an effective watershed; it stitches together the soil along fragile river banks, deforested areas and places prone to earthquakes and mud slides. Bamboo is the fastest growing canopy for the regreening of degraded areas and generates more oxygen than its equivalent stands of trees. Bamboo is life, and offers solutions to worldwide environmental and economic crises, not tomorrow, but right now," she added.

Bamboo is a versatile, adaptive and ecologically sound material which has not been utilized to its full potential in the local building industry. Professional employment of bamboo structures for contemporary applications could advance the further development of bamboo technology. This may contribute toward the improvement in the quality of life of millions of people.

Local building professionals, including those who work in developing countries now, have the opportunity to not only encourage the use of bamboo but to foster a sensitivity of using indigenous materials overall.

Bob Mandich, AIA, president of Sopray Inc., has special interests in alternative architecture.

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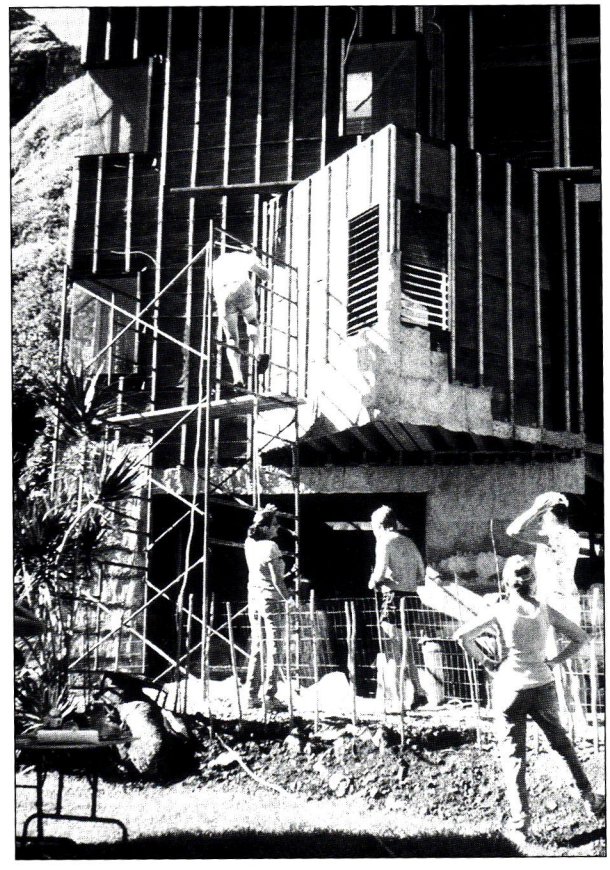
Indigenous materials used in alternative construction technique

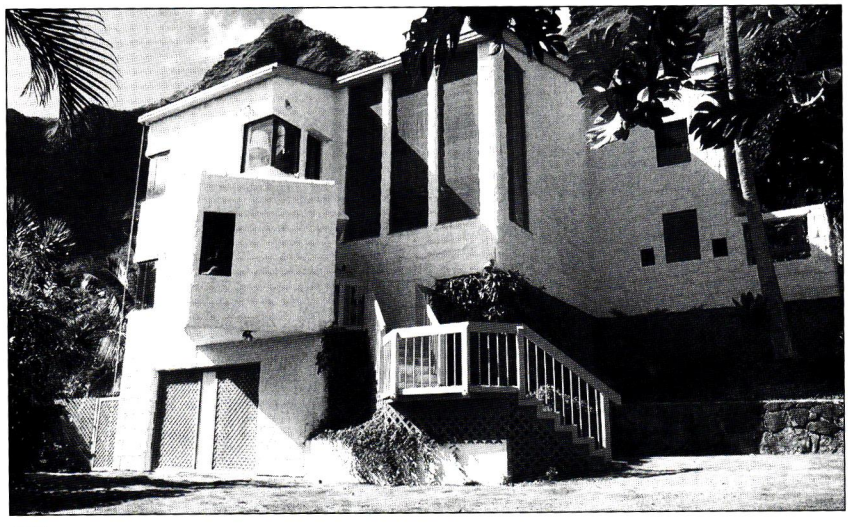
Maybeck's 'Sack' House

by Emily Zants



Right, using Maybeck's technique, a structure must be wrapped horizontally in line-wire before the bags of concrete can be hung.

Below, the pattern created by the sacks of concrete is similar to block construction, but it creates a softer scalloped effect.



While not a standard construction method, Bernard Maybeck's "sack" house construction technique forms a well-insulated product which requires minimal maintenance. The technique was selected for this particular project because it used materials that are indigenous to the islands—sand, cement and jute—was basically chemical-free and could be built predominately by non-skilled labor.

Though not an approved uniform building code method of construction, a permit to use Bernard Maybeck's 1923 sack house or burlap bag technique is not too difficult to obtain using Section 105 of the UBC. After all, there are 70-year-old models of the technique still standing in Berkeley, Calif.

Painted in a light color, the sagging bags give a soft, scalloped effect that, while regular, avoids the hard, commercial feel of block. The technique consists of burlap bags thrown into a concrete mixer with sand, cement and water, then hung over line-wire strung horizontally around the house—12 inches on-center over 2-x-2s nailed on the outside of a felt-wrapped stud wall. Old potato sacks will do, but for this project 18-inch-by-30-inch lots were ordered. It's hard to come by 3,200 old potato sacks!

Labor intensive? A contractor was finishing a lap-sided house about the same height and floor area next door and we compared time of completion. I hung 100 sacks a day—going up five stages of scaffolding as did the contrac-

tor—with one workman tossing bags in the mixer and hoisting mixed ones up to me in buckets. The contractor said it would have taken him 30 days to put lap-siding on the same house, and he usually has two carpenters working with him.

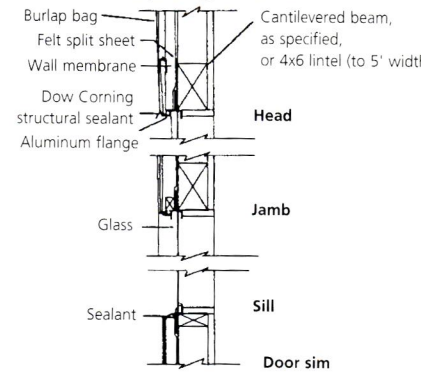
However, he didn't have to nail 2-x-2s on the outside of every stud and wrap the house in line-wire first. But none of this requires any careful measuring as does lap-siding. So no one need be skilled for sack construction—except the person who knows how to finish off openings.

As a morale booster at the start, I invited 20 friends to hang 500 bags; they would have done 600, after I set the first two courses. Laie Concrete and Aggregate provided a truck and operator-by-the-hour to keep churning out bags as runners unloaded them and took them to the bag hangers. Three hundred sacks were tossed into the mixer in the morning and none were torn when the last one came out just before noon.

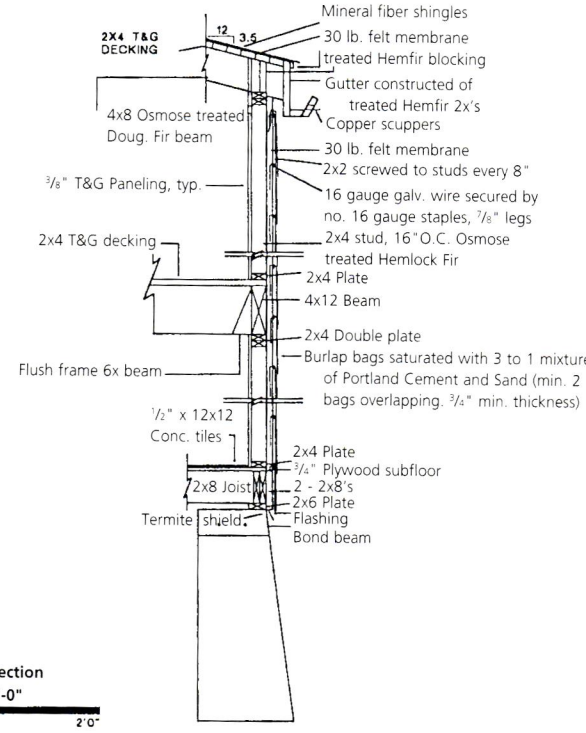
With a one-story design and a large family to help, a house built with this technique could be finished in no time. Just remind everyone to smooth the bag out a little as they would a pillowcase on a clothesline.

Due to her interest in the use of locally produced materials, Zants designed and constructed this Kaaawa "sack" house. Zants is a professor of French (literature and film) at the University of Hawaii, she obtained her bachelor of architecture degree from UH School of Architecture. She also is president of Emily Zants Assoc. Inc., a firm which provides computer graphics support to architects.

Burlap bag details



Typical window detail
Scale: 1½" = 1/-0"
0'0" 1'0"
Door detail similar



Typical wall section
Scale: ¾" = 1'-0"
0'0" 2'0"

Locally produced materials could be used

Hawaii Perfectly Poised for Architectural Revolution

by Arius Hopman

Anthropologists agree that mankind's early inventions resulted in ever-expanding mastery over nature, or to put it in modern parlance, "...unsustainable encroachment of natural ecosystems." Certainly, the invention that resulted in the most habitat encroachment was agriculture that brought with it architecture and a sedentary lifestyle. Much of the world's current imbalances can be traced to the psychological effects of living in an artificial bubble that can be built anywhere and excludes nature. World economic imbalances are calling for an urgent re-evaluation of our architectural practices.

As encroachment has continued, the trend in shelter costs has reached outrageous proportions, enslaving people for decades of their working lives to pay off astronomical mortgages and leaving an entire segment of the population homeless. According to a report in a 1994 issue of the *Kauai Times,* approximately 40 percent of the population in Hawaii is just two pay checks away from being homeless.

Importing building materials means exporting hundreds of millions of dollars worth of Hawaii's jobs. Also, treating wood with toxins seems inappropriate as well as unsustainable.

We will not, cannot, nor do we even want to stop development. It must go on so we can get back to a sustainable lifestyle. Houses could embellish the landscape, blend in or be invisible. The structures could be environmentally friendly, elegant and fun to build.

Perhaps no other place on the planet is more suited or poised for an architectural revolution than Hawaii. In these balmy island climes, the airtight architecture designed for the mainland is inappropriate.

Another reality is that "hurricane-proof" structures don't have to mean expensive structures. The home of Kahuna Angeline Locey, a resident of Anahola, Kauai, withstood Hurricane Iniki without a scratch. The house has a corrugated six-foot overhang roof and the walls are screened and latticed. Locey reports that the storm simply cleaned her screens as it blew through. She took shelter with her pos-

Frequently, tourists come to Hawaii in search of authentic island architecture as found in these thatch houses of Southeast Asia.
Photo by Phan Nguyen Barker

sessions in a closed octagonal room.

In addition to various alternative construction methods, there are many locally produced materials that could be used to build most of the houses in the state. Attractive building material alternatives include field rock, chiseled rock, adobe of various colors—tested successfully on Kauai—clay, colored slips, pebbles and sand.

Adobe is the most widely used building material in the world. Solar adobes command the market in Arizona and New Mexico, but centuries-old adobes still stand in Germany and England. Adobe's thermal properties make the houses ideal for passive cooling. In Hawaii, adobe can be stabilized with asphalt emulsion or cement stucco exteriors. Construction costs compare favorably with imported materials.

Many hardwoods would be appropriate for use as beams and structure work, ironwoods for shingles—an Indonesian variety outlasts redwood two-to-one according to appropriate technologist Peter Zigler—thatch from various species, bamboo for various applications and pandanas hale, a native species. Some tropical hardwoods don't have to be treated with toxins or even varnished. The woods are termite- and mold-resistant.

Tropical hardwoods make economic and ecological sense, and a timber industry is long overdue in the state. According to the Governor's Agricultural Coordinating Committee Report, November 1993, the value-adding capability of the industry is tremendous—"as $800,000 of raw material is processed into products with estimated annual revenues of $28.9 million." Eight-hundred people are employed in this process.

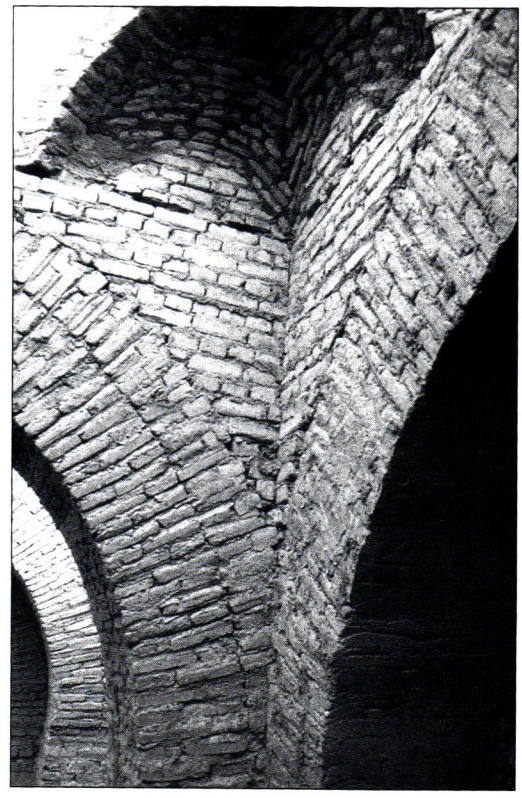
The report also states that after value-added processes, the value per acre, $48,167 per year, far exceeds other crops. Sugar comes in at the bottom with $961 per acre per year. In addition, trees restore the soil, promote ground water retention, cleanse the air and provide a great habitat for humans and animals. At $2 to $4 per board foot for locally grown hardwoods, home prices would increase by a quarter of today's cost. However, the homes could last three times longer and have a better appearance.

Likewise, stone houses are more expensive to build but are cost effective for their indestructibility. Just the low insurance rates make the structures good investments.

With this smorgasbord of materials, design professionals have an entirely new range of creative play. Redesigning habitat is redesigning lifestyle and attitude. There may be no more important task at hand.

The building materials, design expertise and even the ethnic master craftsmen are available in Hawaii to generate an architectural revolution toward sustainability. However, there is an institutional barrier—current building codes do not allow sustainable architecture in many cases. This is an issue that must be addressed.

Arius Hopman of Kauai has designed and built extensively with adobe and timber-thatch materials. He holds two U.S. patents, one in poured adobe construction, the other in a solar heating/cooling wall design.



Adobe is a versatile material that can be molded and remodeled with ease. It is ideal for extreme climates.

Elegant floors can be produced by using end-grain wood and field rock, both readily available in Hawaii. Photos by Arius Hopman

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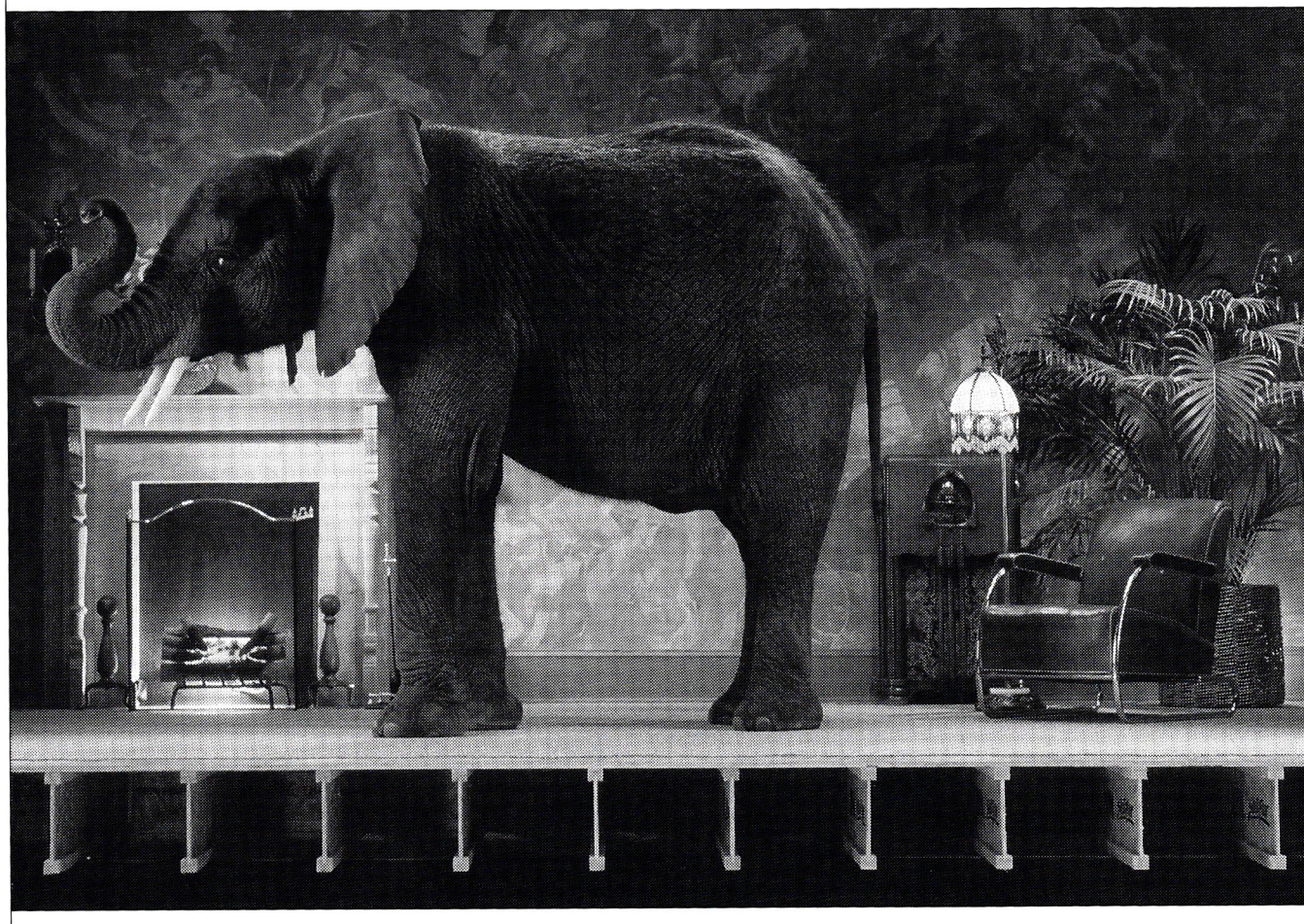

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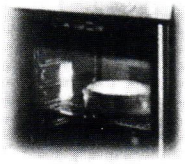
Save on a wide selection of intriguingly beautiful stainless steel ovens like the unusually large 300 with it's 35 1/2" capacity. It comes with a rotary-spit rotisserie, built-in temperature probe, and real baking stone for perfect crusty breads and pizza.

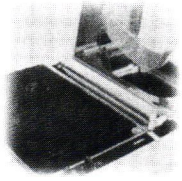


GAGGENAU

Incentives are also available on Gaggenau's extensive line of gas or electric cooktops and exhaust systems.

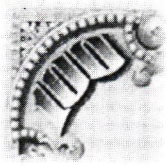
The new Gaggenau CK 394 electric ceramic hob (PICTURED AT BOTTOM) impressively blends unique design with space-age ceran that transfers intense, radiant halogen heat to cooking pans, and then cools down in seconds to keep you and your kitchen cool.

Quiet as a whisper, ventilation systems such as the innovative Gaggenau 350 provide dual motor power, integrated lighting, and a sensor to remind you when to drop the easy-care filter into the dishwasher.

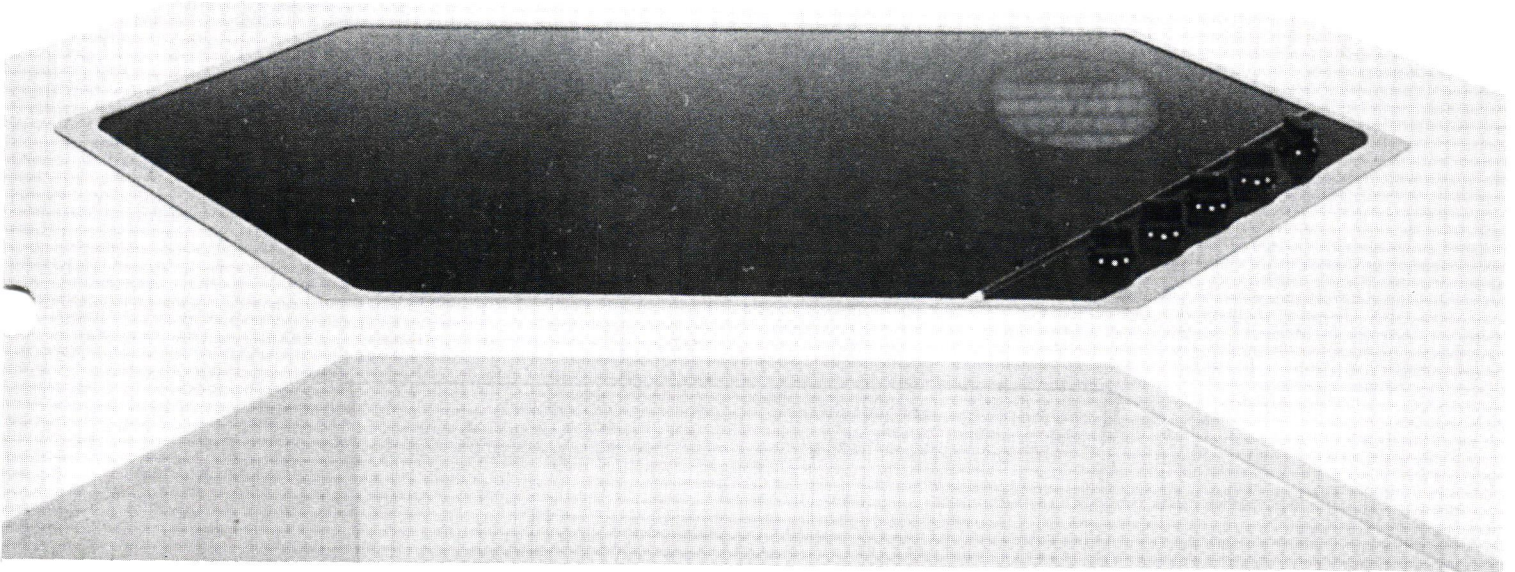


You'll appreciate more than just the savings when you integrate a quiet Gaggenau 336 dishwasher into your kitchen. In addition to the durable beauty of its stainless steel construction, these units offer an automatic water softening system and turbo fan for faster drying without spotting.

With savings of up to $250 on each appliance, there's never been a better time to design your dream kitchen. But hurry! This savings program is only being offered for a limited time, so see your local dealer today for complete details.



For the Gaggenau dealer nearest you, call Sub-Zero Distributors at (808) 593-1055.



New material offers high strength-to-weight ratio

Fiber-Reinforced Plastics

by John C. Bravo, S.E.

A new construction material with vast application potential is now being utilized in strengthening both damaged and undamaged structures in areas prone to high seismic activity, particularly in San Francisco, Northridge, Calif., and Kobe, Japan. This material is commonly referred to as fiber-reinforced plastics and has a promising future in new building construction as well as retrofits. FRP evolved from materials similar to those used in the exterior covering of the U.S. military's Stealth bomber, racing boats and surfboards.

Woven fabrics are available made from Aramid, E-Glass and carbon graphite of various combinations and orientations bound together with epoxy. This advanced composite material is noncorrosive, nonconductive, nonmagnetic (except carbon composites) and has a high strength-to-weight ratio. Carbon FRP is the strongest and the most expensive, but is emerging as the most appropriate for construction applications.

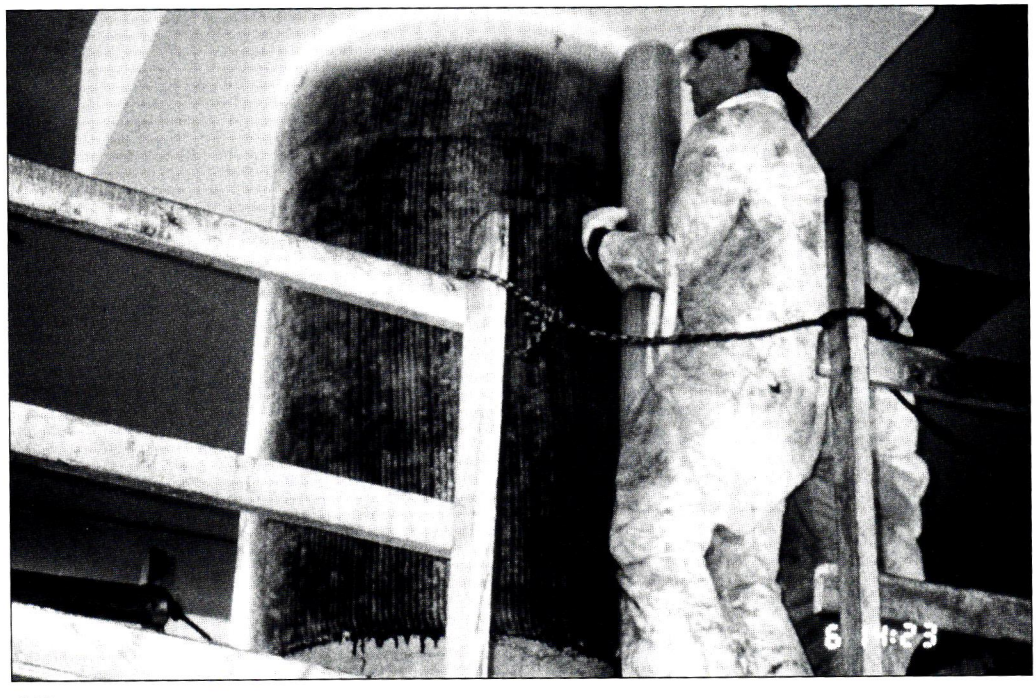
FRP, combined with the common basic building materials, will potentially produce a product of superior quality to structures completed using current construction practices. Of course, the big question is when, not if, FRP composites will be economically competitive for new construction.

The early development of FRP for building applications can be traced back to the mid-1980s. Germany, Switzerland and the United States focused on the strengthening of structural steel and reinforced concrete beams by bonding FRP plates, while Japan's development focused on column and chimney FRP wrapping and exterior wall panels.

FRP has found an immediate practical application primarily in the strengthening of existing columns in buildings and bridges that are deficient in lateral reinforcing ties as evidenced by the spectacular highway overpass failures in San Fernando, Calif., 1970; Oakland, Calif., 1989; Northridge, Calif., 1994; and most recently in Kobe, Japan, 1995.

The California state Department of Transportation has installed experimental FRP fabric to armor-wrap several massive columns supporting elevated freeways and bridges

Workers use fiber-reinforced plastics to strengthen this round column at the Nugget Hotel in Reno, Nevada.



throughout the state. Extensive full-scale testing has shown this strengthening can double or even triple the resistance of the columns to seismic loadings, depending on the extent of the column tie reinforcing in the existing column.

FRP adds confinement to the main steel, dramatically improving the lateral load capacity and ductility. Round columns are most effectively strengthened because the radial bursting forces are resisted efficiently by the circumferential tension strength of the FRP. Rectangular columns can also be strengthened, but with some minor restrictions.

The FRP column wrapping is fabricated in 30- to 40-inch-wide by 150-foot-long rolls. Multiple layers are applied—like exterior wallpaper only with epoxy resin instead of glue—until the required epoxy saturated thickness is attained, from a fraction of an inch or more.

Full-scale testing of a five-story reinforced masonry building with epoxy injection and FRP wall overlays was performed in 1993 at the University of California, San Diego. The building was tested to structural failure—not collapse—without FRP, then strengthened and retested. The results indicated that, not only was the capacity restored, the damaged building was stiffened by a factor of eight. A number of masonry buildings in the Los Angeles area are currently undergoing "armoring" by FRP overlays.

E-Glass FRP material for use in concrete column and masonry wall retrofits and strengthening is being installed today in California for as little as $7 per square foot for large jobs. However, the trend is to install all carbon fibers at $10 to $25 per square foot. In Hawaii, the price today might be $15 to $35 per square foot. One might expect, as happens in the computer industry, that prices will decline over time with increased usage and more competition. The first installation has yet to be made in Hawaii.

Is there a place for this "stealth" technology in new building construction? Certainly the possibilities are there, but the actual applications have been few. Ongoing testing in Japan is utilizing FRP to combine as permanent formwork confinement ties and exterior finish for large circular columns in high-rise buildings. This material combined with high strength self-placing concrete will result in stronger yet smaller columns.

Another potential application is for rigid permanent formwork for walls or beams and slabs. It is especially applicable to bearing wall structures, a popular method for hotel construction in Hawaii. At the current time FRP material is not adequately fire resistant and would have to receive a fireproof coating. A recent breakthrough has been announced that a compatible intumescent paint coating has been developed that will provide equivalent fire protection for FRP that is currently available for structural steel members.

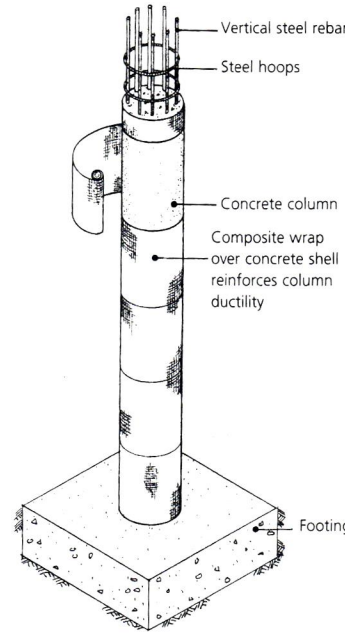
A new composite which uses all carbon fibers flat, rather than woven, with a cementitious binder, rather than epoxy, is currently undergoing extensive testing in California. Ceramic-based binders also show promise. Narrow, flat, carbon straps for strengthening slabs and beams were introduced to the U.S. market this past summer from Europe. The new products keep coming at an accelerated pace.

The ultimate goal is to provide a material which satisfies the architectural, structural, life safety, thermal, noncorrosive and acoustical requirements and is cost efficient and environmentally safe. There appears to be no single material currently available or under study that satisfies most of this criteria better than FRP and carbon composites.

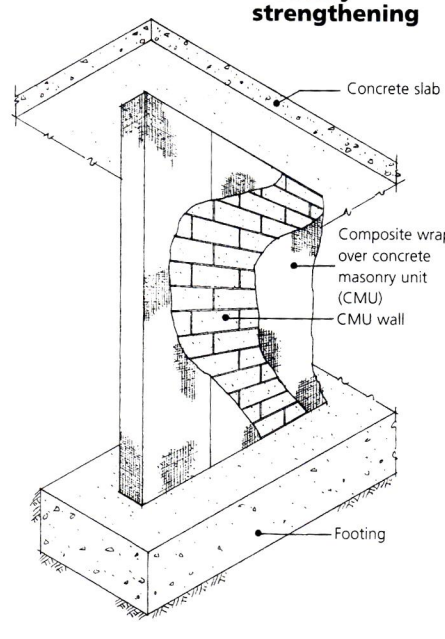
As the 21st century approaches, there will be many improvements contributing to an evolution of utilizing this material compositely with concrete in high-rise construction while, simultaneously, development will progress in single-family residential and low-rise structures utilizing prefabricated composite honeycomb construction for the total wall, floor and roof systems.

John C. Bravo, S.E., president of Martin & Bravo Inc., Structural Engineers, has been in private practice for more than 30 years, 22 years in Hawaii. He is a licensed structural engineer and civil engineer in Hawaii, California, Washington and the Commonwealth of the Northern Marianas Island.

Detail of column strengthening

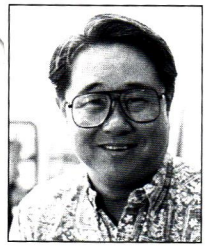


Detail of masonry strengthening



Market Place

A Lawyer's Perspective



Review Indemnity Requests Carefully

by Michael D. Tom, J.D.

In both this and the December issue, the subject of indemnity provisions will be addressed; this article will focus on indemnity provisions in general and next month's article will focus upon indemnity provisions within the construction industry.

One of the most difficult matters faced every time a contract for the provision of professional services is prepared is whether an indemnity should be provided. Indemnity provisions, particularly within the construction industry, are tricky legal devices that are used to shift legal responsibilities. These matters have the most far-reaching liability ramifications and can be the most difficult to negotiate.

Broadly speaking, an indemnity provision is an agreement to assume another person's liability in the event of a loss. The risk of that loss is shifted from one party to another. It is essentially a form of insurance. When the design professional is requested to provide an indemnity covering the loss caused by another, he/she is being requested to serve as the insurer for another.

It is not surprising, therefore, to discover that the AIA B141 Standard Form of Agreement between owner and architect does not contain an indemnity provision. Any request should be carefully reviewed.

Among the items to be considered are the nature and extent of the indemnity requested; the risks involved in the particular project; and the extent to which professional liability insurance will cover the loss. Consultation with counsel and insurance advisors is not only appropriate, it may be absolutely necessary.

Michael D. Tom, J.D., is a partner in the law firm Tom & Petrus. Educated as a civil and structural engineer, his practice focuses on the construction industry.

A Fresh Approach To Design

These raised-square panel, thermofoil doors add character to this kitchen.

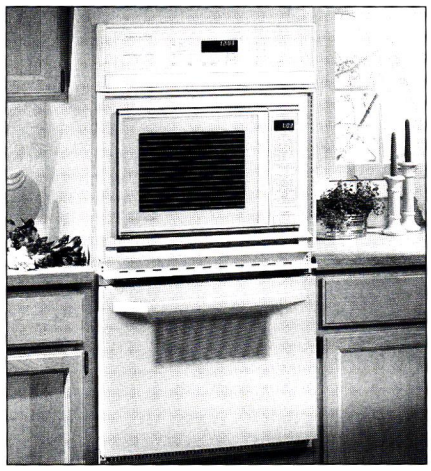
Design professionals and developers are striving to create more exciting kitchens and bathrooms by using high-end appliances, cabinetry and some different design techniques.

"We look for surprise elements in each house," said Kathy Inouye, director of product development, Castle & Cooke Homes Hawaii. Inouye explained that Castle & Cooke tries to include something special in each home that would interest a home buyer.

Inouye said that one design concept, which Castle & Cooke began using in the Pacific Traditions, Mililani Mauka development, that has been well accepted is the great room. Kitchens and family rooms are integrated as one large room. According to Inouye, this design appeals to families in which both parents work. Parents can keep a closer watch on children in the family room while preparing the evening meal in the kitchen.

Another design alternative noted by Mike Smith, CKD, CBD, CGR, Kitchen Concepts Plus, is the kitchen "built for two" cooks. "In these kitchens, the cooking area needs to be spread out a little more; stoves may have six burners instead of four; and there are usually two sinks, one for cleanup purposes and one for washing produce, etc.

"We are noticing that most people are choosing more high-end products, especially in the kitchen," said Don Jones, vice president, Servco Special Market Group. "People are looking for more ease in cooking and the higher-end products tend to offer more convenient features. Consumers appear more



interested in including built-in microwaves in their kitchens," Jones said. Although certainly not a new product, today's microwaves come with more features, in different colors and are frequently installed as built-in appliances, Jones added.

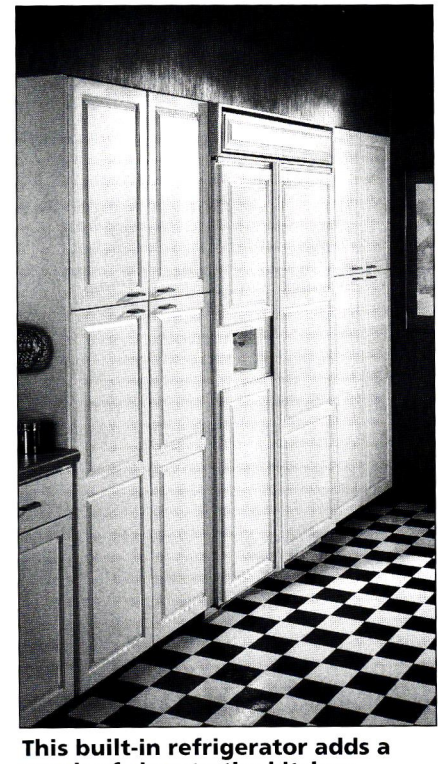
While appliances are a vital part of the kitchen, variations in cabinetry also are an eye-catching point of a kitchen or bathroom. "Clients are more educated today about cabinet features, inside and out. The white-on-white color scheme is changing more to bisque and consumers are choosing more woods—maple, cherry, etc," Smith said.

Distributors are experiencing an increase in requests for built-in microwaves.

Another fresh approach to kitchen design that Smith practices is the use of an accent color on specific cabinet doors. An example would be mixing a navy blue or forest green with an off-white color scheme.

In addition to wood, rigid thermofoil cabinet doors are being utilized in many of Hawaii's kitchens. RTF doors are made from a one-piece construction medium density fiberboard which is shaped and hand-sanded prior to the thermo foil being applied. Heat and pressure cause the foil to conform and adhere to the routed profile, producing a surface that is very durable.

The RTF materials also incorporate an ultraviolet protection top coat. "The RTF doors resist scratches, cracks, dents and stains and tolerate reasonable heat without cracking or peeling," said Wayne Lincoln, executive vice president, Midpac Lumber Co.



This built-in refrigerator adds a touch of class to the kitchen.

Designers also are paying special attention to the cabinetry in bathrooms. "Because items found in the bathroom are typically smaller and less cumbersome than those found in the kitchen, some cabinets are being installed which have swing-out, pull-out or rotating shelves," Smith said.

One approach used to enhance the appearance of the bath area is the use of accent color bands in the ceramic tile tub surround. A technique used to make small bathrooms seem more spacious is the extension of mirrors beyond the vanity area. This allows for more light reflection and creates a brighter room.

While some new products and design techniques are being used to create kitchens and bathrooms which will appeal to the home buyer or homeowner, the key to these fresh approaches is attention to detail.

New Products

Eclipse Opening Roof Previewed

The Eclipse Opening Roof, which allows owners to control light, shade, ventilation and rain protection, was recently introduced to the Hawaii market at Honolulu Wood Treating Co.

Using a button, owners can rotate the aluminum louvers approximately 180 degrees, allowing an outdoor area to be used all year. The Eclipse Opening Roof can be installed as an awning, a roof for glassed or screened enclosures, a swimming pool cover or a privacy screen.

The louvers overlap when fully closed to protect the area from rain. Angling the louvers during a light rain will allow the water to drain away in the contours, adding to the unique weatherproofing characteristics.

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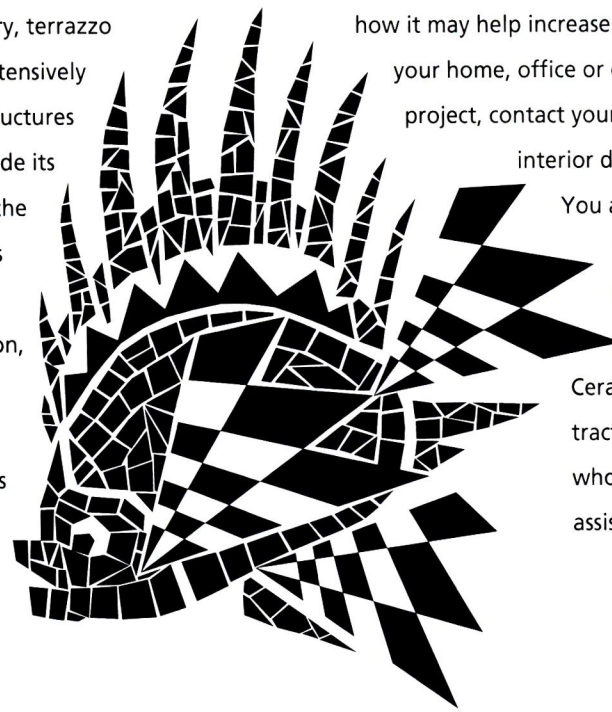
Translating Terrazzo.

Terrazzo, from the Italian word for terraces, came into existence several hundred years ago in Europe almost by accident. Artistic yet frugal Venetian marble workers discovered that odd-sized leftover marble pieces, which had formerly been discarded, made an interesting and colorful surface for the terraces that surrounded their living quarters. Soon, they began rubbing and polishing these new surfaces to make them more even and comfortable for walking. By the 18th Century, terrazzo was being used extensively in monumental structures and eventually made its creative way into the home of America's first president, George Washington, who selected the Italian import for many of the rooms at Mount Vernon.



Terrazzo's artful qualities were enhanced by American ingenuity in installation techniques and the wealth of marble available in the United States. Architects and designers today have brought terrazzo full circle, utilizing it in contemporary as well as classic design concepts. You might enjoy seeing the fine example in Honolulu's Beretania Street State Office Building.

To find out more about terrazzo, including how it may help increase the value of your home, office or commercial project, contact your architect or interior designer.

You also may phone 591-8466 to receive a listing of Union Ceramic Tile Contractors in Hawaii who will be able to assist you.

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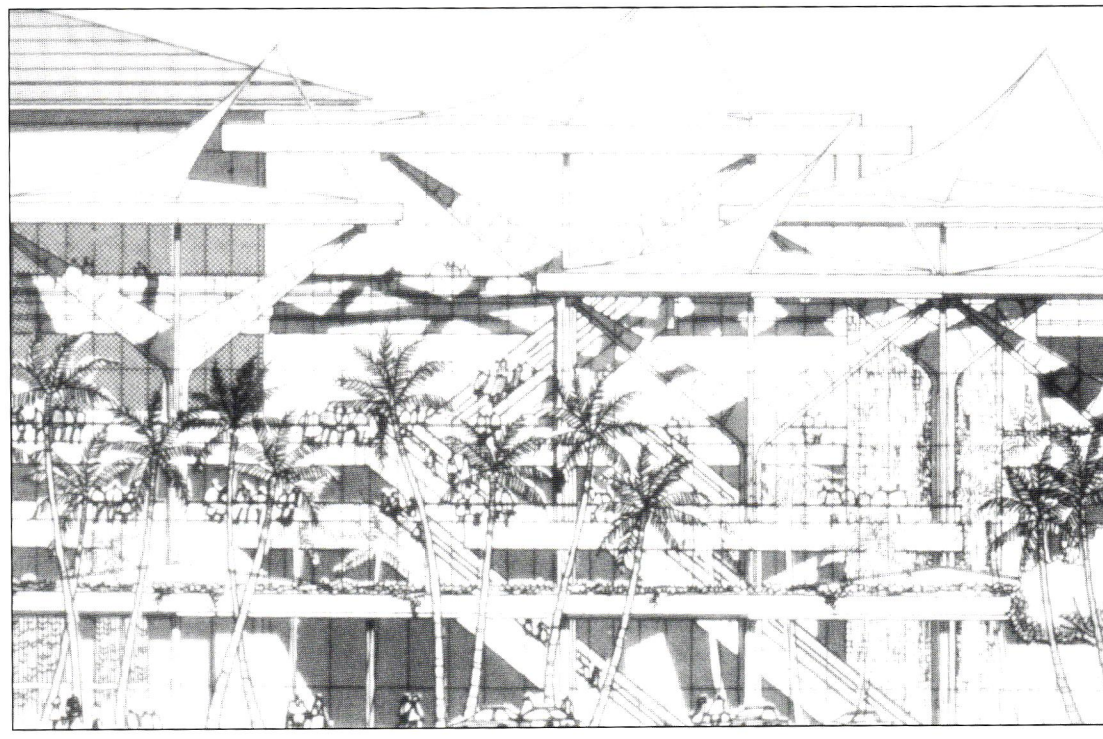
Material offers vast sculptural potential, practicality

Tensile-Membrane Technology

Fabric, in combination with advanced technology, affords an exciting structural material characterized by vast sculptural potential, appropriateness and practicality for a wide range of applications and an environmental advantage.

Fabric-structure technology was established in the 1950s, when it was developed for early warning radar enclosures. For that application, fabric structures answered the need for prefabricated, quickly erected shelters which could service the extremes of a subpolar climate. Next, the technology was extended to swimming pool covers, warehouses, tennis pavilions and specialized traveling exhibits. Acceptance of fabric as a viable architectural medium grew through these early efforts, and the technology gained wide exposure at the New York (1964) and Osaka,

Tensile membranes or fabric stretched on steel frames and supported by stainless steel cables will create the "sails" atop the Hawaii Convention Center.



The 14 metaphorical "sails" above the Hawaii Convention Center lobby suggest a variety of Hawaiian landscape symbols.

Japan, (1970) world fairs.

Subsequent development of tensile membranes led to the extension of this technology to permanently installed educational facilities in 1972 and to domed stadiums in 1975.

Associate support systems for tensile membranes may be air-inflated, structural steel, cable-stay systems or a combination of both steel and cable systems.

Project sizes of tensile-membrane structures range from small entrance canopies to huge terminals such as the 105-acre roof of the Haj Airport Terminal in Saudi Arabia.

Raul A. Barreneche summed tensile-membrane use up in an article (*Architecture,* August 1994) describing Denver's new $3.2 billion international airport when he said, "tensile-membrane technology has moved away from its earliest incarnations...to become as successful as conventional steel or concrete roofing systems. For architects, Denver's roof underscores the increased form-making possibilities of barric roofs, as well as their cost savings and environmental benefits." At 250,000 square feet, the Denver Airport roof is the world's largest enclosed fabric roof and demonstrates the structural possibilities of a Teflon-coated, woven fiberglass membrane.

An example of tensile-membrane use destined to create wide interest in Honolulu will "fly" above the now-under-construction Hawaii Convention Center in the form of 14 metaphorical "sails" suggesting a variety of Hawaiian landscape symbols. Totaling 1,400 square feet and expected to last at least 20 years, the fabric will be stretched on steel frames and supported by steel supports and stainless steel cables.

The translucent sails will rise above—together with skylights and glass walls—and endow a 30-foot-high lobby with natural light, enabling real palm trees to thrive and center visitors to experience the feeling of outdoors Hawaii without ever getting wet by *mauka* showers.

Tensioned membrane structures and air-supported domes and buildings can be manufactured from a variety of membranes. The recommendation of a specific membrane depends on the proposed structure's size, shape, function, life cycle expectations, economics, etc. The membrane most often used when long life and high strength resistance to loads is required is Teflon-coated woven fiberglass, which offers outstanding performance characteristics.

The physical properties of Teflon-coated woven fiberglass membranes offer architects and engineers new design freedom. The geometric shapes achievable with tension structures puts it at the vanguard of today's architecture. The medium allows for possibilities not found in existing conventional materials. The material is lightweight and translucent, yet extremely durable. It is highly weather-resistant and can meet fire code requirements for virtually all types of construction.

Membrane systems typically offer greater value than conventional glass or roofing sys-

tems. A permanent membrane structure using Teflon-coated fiberglass is considerably lower in maintenance than other systems and extremely energy efficient. This is due in part to the material's superior shading coefficient—the relative amount of solar energy that enters a building space—compared to conventional glazings.

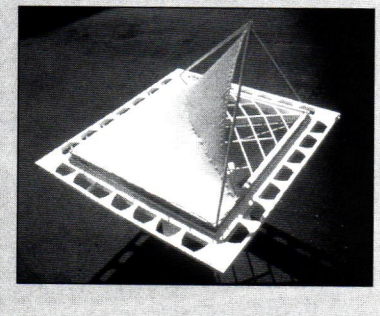
Translucency is the material's most visible feature. It transmits diffuse, color-balanced natural light that reduces lighting and cooling costs while increasing the aesthetic value of interior spaces. Tensioned-membrane structures can be erected in any climate. The material's suitability to extreme conditions is a factor of energy performance and durability.

Contributors to this article included: Douglas C. Radcliffe of Birdair Inc., Amherst, New York, a specialty construction enterprise engaged in the erection of permanent membrane skylights, domes and special structures worldwide; John Fleming of Loschky Marquardt & Nesholm, Seattle; and Donald W. Y. Goo, FAIA, Wimberly Allison Tong & Goo, Honolulu. Information was assembled by Mazeppa King Costa, a Honolulu-based writer/public relations consultant.

Hawaii Convention Center 'Sails'

A Hawaiian Metaphor

The scale of the long-awaited Hawaii Convention Center, now under construction, is unprecedented in traditional Hawaiian architecture. With a total building area of 1,106,671 square feet, no other traditional Hawaiian buildings come close to it.



Center architects Wimberly Allison Tong & Goo, in association with Loschky Marquardt & Nesholm, considered the landscape—in all its splendor and diversity—in searching for design solutions that would satisfy practical requirements and sensitively reflect Hawaii's character.

The design of the Hawaii Convention Center addresses the issue of the building's scale by responding to Hawaii's monumental landscape, taking from it inspiration for the theme "Landscape as Architecture."

Thus, the massing of the building becomes a topographic metaphor of the island—shore to mountains, horizontal to vertical. The concourse connects the lobby and terraces—metaphorically the valley—with waterfalls, streams, fish ponds and taro fields.

Metaphors abound in the building's imagery. The columns in the lobby read as abstractions of coconut palms. Translucent-fabric sails above the lobby call forth images of mountain peaks, rising clouds, white caps, flower petals, fish scales and the *lau hala* sails of prehistoric voyaging canoes that brought the first people to Hawaii.

The beauty of this ambiguity is that these elements evoke images appropriate to the islands. It is Hawaiian—contemporary, simple, complex, regular, irregular. A special place. A Hawaiian place.

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Aloha Tower Marketplace

This evening view from Fort Street beckons pedestrians to visit the Marketplace.

Special lighting and paving patterns enhance the center courtyard of the Marketplace.

The Aloha Tower Marketplace, completed in November 1994, is rooted in the maritime history of Aloha Tower. Since early in the century, ships welcomed by the Royal Hawaiian Band and hula dancers created a celebratory atmosphere that beckoned to visitors and returning kamaainas alike.

After World War II, the waterfront area steadily declined and by the 1980s, the state of Hawaii sought proposals for long-range plans to revitalize the area.

"The Waterfront at Aloha Tower" was the winning proposal. The plan comprised more than three million square feet of retail, office, hotel, maritime and recreational space in a combination of low- and high-rise structures in a 1920s territorial Hawaiian architectural style.

Aloha Tower Marketplace was the first phase of the master plan. It was designed to create an active and playful environment through which the urban fabric of downtown Honolulu could be extended.

The orientation of the buildings, internal circulation and merchandising program is geared to maximize a connection with the water. An example is the landscaped pedestrian promenade at the waterfront, lined with cafes and restaurants that spill out on dining lanais overlooking the ocean. Two central shopping streets bisect the project and also lead to the water.

Richly colored clay tile roofs shade broad verandas and lanais while towers frame the streets. Terraces and a ground-level bazaar surround the Aloha Tower, restored to its original splendor. Public spaces such as these created by the architecture are in essence the most important features of the project.

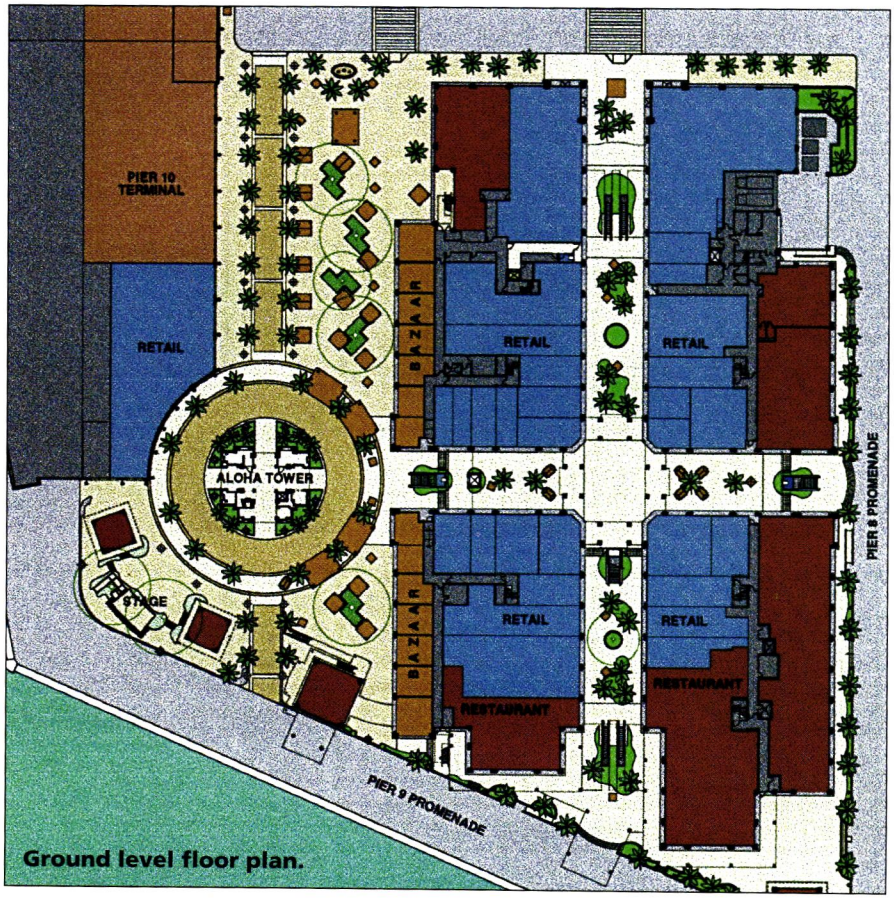
Natural materials such as slate and limestone paving, stucco walls and teak handrails are used throughout the Marketplace.

A working pier apron surrounds the site and can be segregated from public circulation when cruise ships are docked. When ships are out, the apron becomes yet another extension of the Marketplace, allowing access to the water's edge.

Jury's Comments

"The architects open and preserve the view to the Tower, creating an excellent setting for this historic feature..."

The Aloha Tower Marketplace features a vocabulary of arches, towers, canopies, recessed lanais and richly colored clay tile roofs—simple, classic and very much in keeping with the Hawaiian vernacular. Photos by David Franzen



Ground level floor plan.

Credits

Owner/Client
Aloha Tower Associates

Architect
Aotani & Associates Inc.
D'Agostino Izzo Quirk Architects

Structural Engineer
American Structural Engineers

Mechanical Engineer
Critchfield Mechanical Inc.

Electrical Engineer
Toft Moss Farrow Inc.

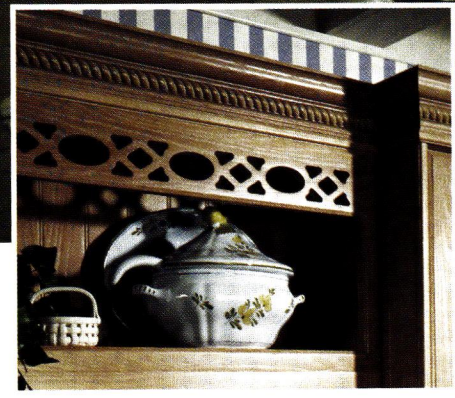
Landscape Architect
Walters Kimura Motoda Inc.

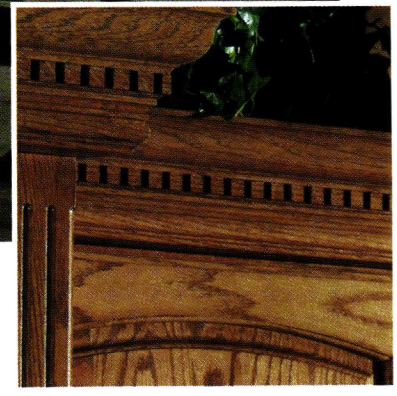
Plumbing
Romine Johnson Industries

Contractor
U.S. Pacific Builders Inc.

THE FINAL TOUCH

DECORATIVE MOLDING





Attention to details an important element of good kitchen design. Proper layout of cabinetry, appliances and work areas are critical to the outcome. KraftMaid cabinetry can be personalized by including crown, light rail and other decorative moldings. Matching end panels give a distinctive finish to wall and base cabinets. Appliance panels, designed to match cabinetry, provide a built-in appearance for dishwashers and refrigerators. Countertop edge moldings elicit a custom appeal. Base moldings transform cabinetry into room furniture. The innovative examples provided here by KraftMaid are just the beginning. Use these ideas to create your own KraftMaid kitchen masterpiece.

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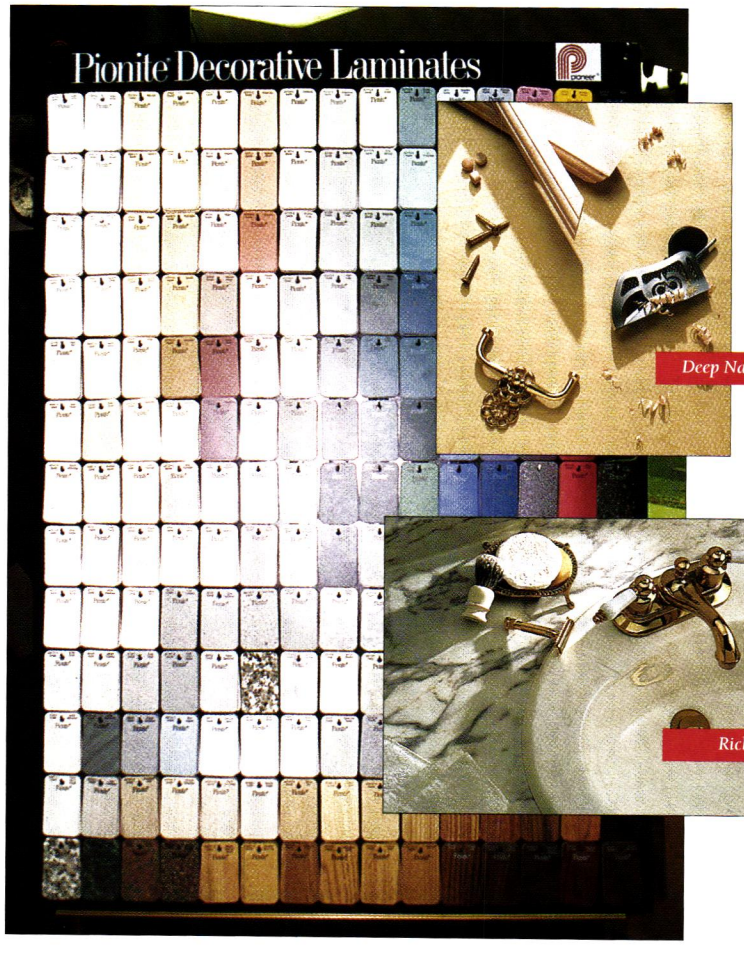
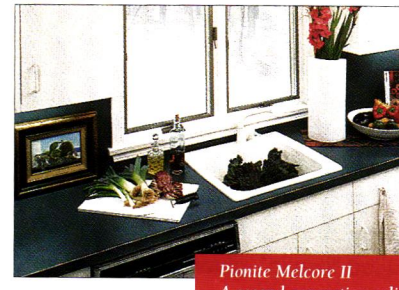


Deep Natural Wood Grains



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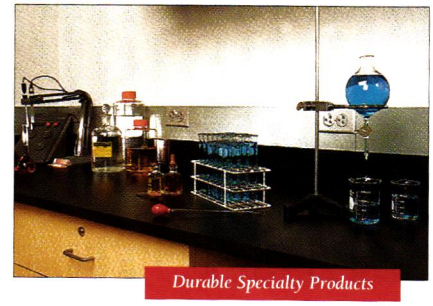

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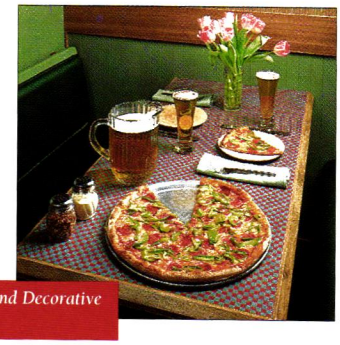

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