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Guam and Developing Asian Countries

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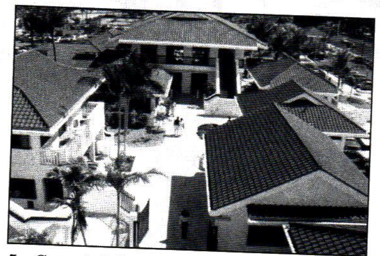

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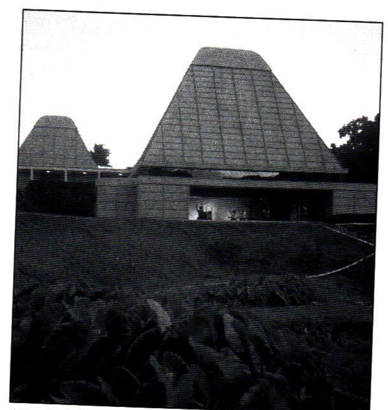

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Although working in Guam and Asia presents a number of challenges to building industry professionals, the results of their efforts can be some of the most innovative and structurally-sound buildings in the world. *Hawaii Pacific Architecture* explores some of the practical and cultural issues facing design and construction professionals working in these developing areas.

COVER: Guam is a sleepy little island no more, thanks to tourism-related development such as Planet Hollywood. Photo courtesy of Fletcher Pacific Construction, a contractor for the project.

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Buildings constructed to withstand nature's wrath

Guam's Muscle Architecture

by Ron Smith, AIA

It's business as usual in Guam, just months after the island was battered by Typhoon Paka. On Dec. 16, 1997, the island was hit with sustained wind speeds of 158 miles per hour and maximum peak gusts of 173 miles per hour. The eye of the storm crossed over the northern and most populous end of the island and Tumon Bay, the heart of the tourist economy.

Damaging winds lasted from 6 p.m. until 2 a.m. During the height of the storm, as the eye wall passed over, the southwesterly gale pumped water under pressures upwards of 75 pounds per square foot through door and window frames, precast panel joints, and glazing gaskets. Few buildings were spared the infiltration of water. But the vast majority of buildings survived the wind intact.

Although damage was extensive to some buildings, in general "the building inventory on Guam performed very well," as stated in the March 1998 Final Report on Typhoon Paka by the Federal Emergency Management Agency (FEMA) and the Government of Guam. The damage was primarily in older buildings, substandard buildings, newer buildings that had ignored lessons learned in past storms, and superficial damage, not structural.

Valuable Lessons

Guam has experienced three other major storms in the past 35 years (Karen in 1962, Pamela in 1976 and Omar in 1992) and each one has taught valuable building lessons. The application of the Uniform Building Code and its strict monitoring by the Department of Public Works has meant that each time the island is devastated, replacement buildings are built to the latest codes and standards. Incidentally, this inventory of relatively new, code-compliant buildings also made it possible for Guam to survive an 8.1 magnitude earthquake in 1993.

Within a few weeks of each other in 1992, Hurricane Iniki struck the island of Kauai, Typhoon Omar devastated Guam and Hurri-

Photo by Philip Noble

The standing seam metal roofing atop the Government of Guam's Long Term Care Facility designed by TRS+A Architects survived typhoon winds intact.

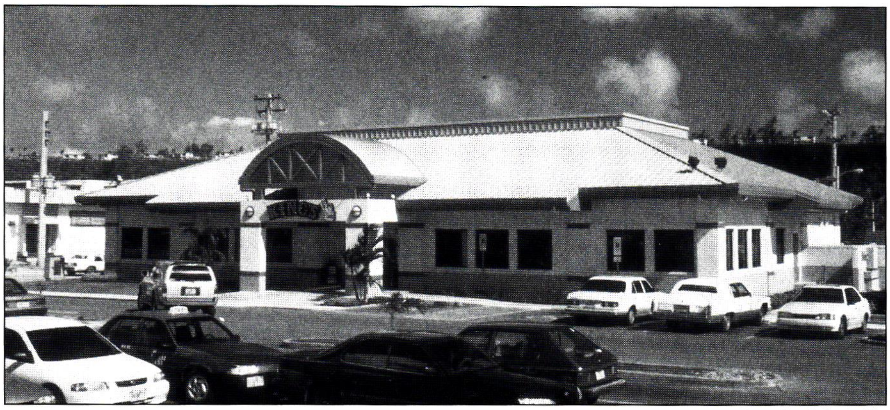


Photo by Philip Noble

The recently built King's Restaurant designed by TRS+A Architects was open for business the day after the typhoon.

cane Andrew hit Homestead, Florida. The communities in South Florida especially learned some tough lessons from Andrew. As a result, Dade County responded with its own set of modifications to the Southern Building Code and its own set of standards for approval of materials used in construction. These actions set the pace for a wave of changes throughout the U.S. building industry in areas subject to high winds.

In 1995 the American Society of Civil Engineers (ASCE) updated its wind-resistance design guidelines in ASCE-7-95, also influenced by the experience of Andrew. Far more detailed in its analysis of wind forces than any design standard has ever been, it is resulting in more sophisticated designs and allowing architects and engineers to fine tune their buildings.

Local Expertise

When it comes to designing for resistance to wind, unlike many other specialties in our professions, it is rare on Guam for architects and engineers to bring in the "outside expert." On Guam, the new codes are providing the theory for what many local architects and engineers already knew empirically from experience with past storms, especially Omar in 1992.

Architect Jack Jones, FAIA says that "since Hurricane Andrew and the resulting increased sophistication in codes and manufacturers' standards we now can observe where wind damage follows the codes." Jones has long been a keen observer and analyst of the effects of wind forces on buildings. He points out that the kind of damage Guam saw from Paka was different from that of previous storms. It was limited, and it was predictable. The damage on Paka occurred exactly at the places where the codes focus their concern.

Substandard buildings, buildings which made no attempt to be wind-resistant, suffered the worst damage. This a diminishing but persistent category, as many homes are hurriedly thrown back together in the weeks following a storm.

Older buildings with components such as sliding glass doors that were manufactured and installed under lower standards more than 20 years ago were severely challenged. One hotel on Tumon Bay is still closed for major repairs. Buildings with "weak spots" were vulnerable. Jones cites the many cases of total damage to pre-engineered metal buildings in Typhoon Paka that resulted from the failure of fastenings at corners, eaves and gables, or the collapse of a roll-up door. Once the envelope is penetrated and the interior of a building is subjected to severe wind pressures, there is little defense.

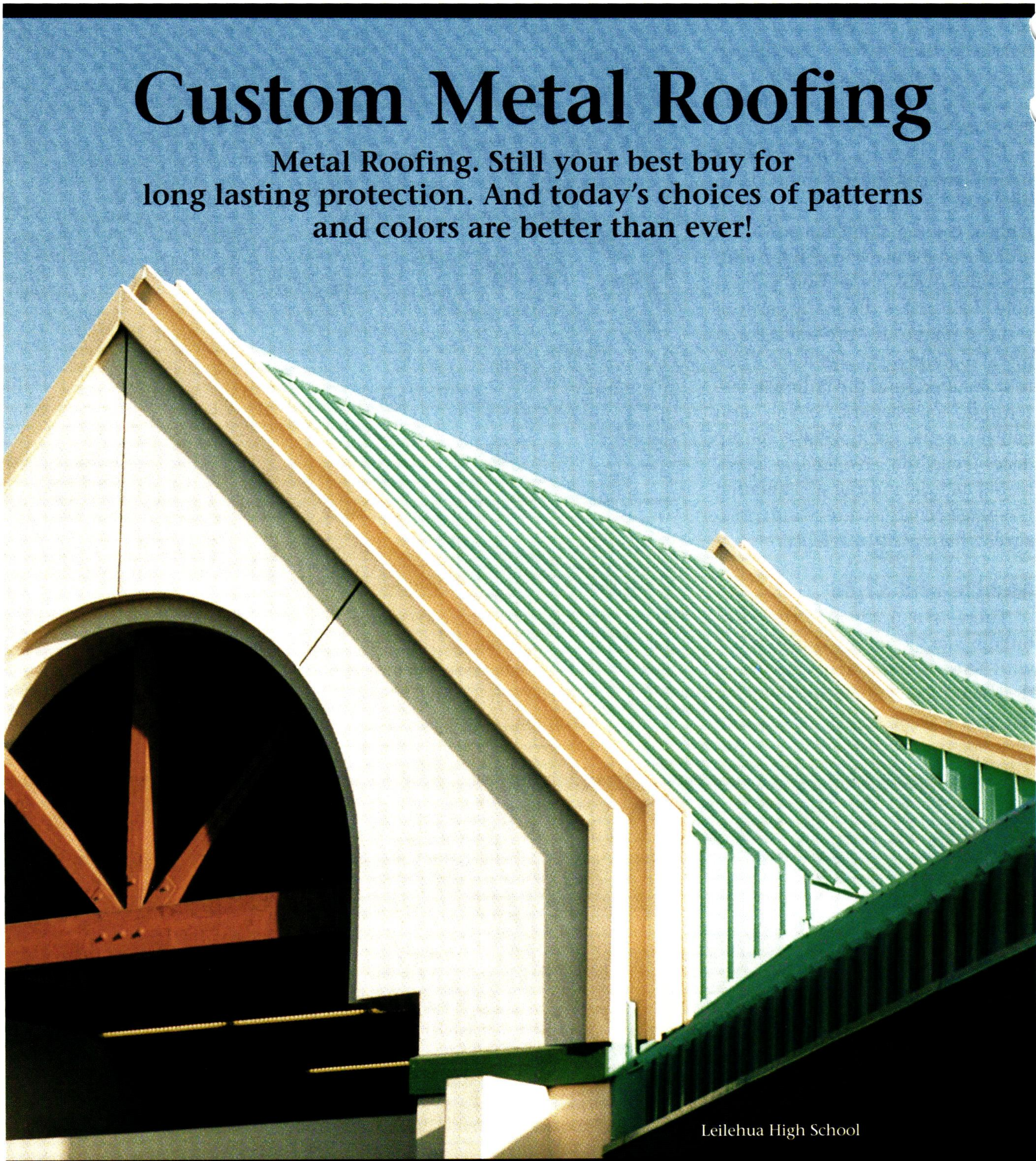
JB Jones Photo

Installing the clay roof tiles in a full mortar bed with stainless steel screws prevented the tiles from flying off the buildings at the Guam Public Market, designed by JB Jones Architects.

Muscle and Style

There is a myth that the ideal building for Guam is a concrete box with few windows and with doors that seal like a submarine hatch — not true (except maybe for the submarine hatch). Both the codes and the empirical data agree that the "box" is not the most aerodynamic shape. Square corners and edges develop turbulence that produces tremendous pressures, up to twice as great as those on the vertical sides of structures.

A far more suitable shape has resulted from efforts by Guam's ar-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Leilehua High School

chitects in recent years to look back at the island's historical buildings for stylistic references. The hip roof style of pre-war Agana and Inarajan homes turns out to be highly appropriate for high winds. The moderate slope on all sides mitigates turbulence and lets the wind flow smoothly over and around the roof.

Some contemporary examples: King's Restaurant had just opened a few weeks before Typhoon Paka. The day after the storm it was open for business with a generator running and its landmark roof still intact.

At the Government of Guam's Long Term Care Facility on Barrigada Hill, 40,000 square feet of standing seam metal roofing over concrete withstood the winds with no damage to its graceful hip roofs.

At the Guam Public Market, 60,000 square feet of clay roofing tiles, installed in a full mortar bed and set with stainless steel screws, remained intact while elsewhere around the island flying roof tiles were one of the chief causes of impact damage to cars and buildings.

The "sealed box" myth did not deter the designers of the sweeping roof and monumental curtain wall of A.B. Won Pat International Air Terminal. Working with the codes and with the detailed engineering data now available, these were designed and wind-tunnel tested for 155 miles per hour wind loads. The Southwest-facing curtain wall took a direct hit from Paka's gales with no failures.

Guam's architecture has proven, in its survival of Typhoon Paka, that it is moving toward greater sophistication in design, and is in many ways leading the world in development of wind-resistant building applications.

Ron Smith, AIA, NCARB, is a senior project architect with Watkins Hamilton Ross Architects in Houston. Formerly with TRS+A Architects in Guam, he is a past president of the Guam & Micronesia Chapter, AIA, and has 30 years of experience in designing for island environments.

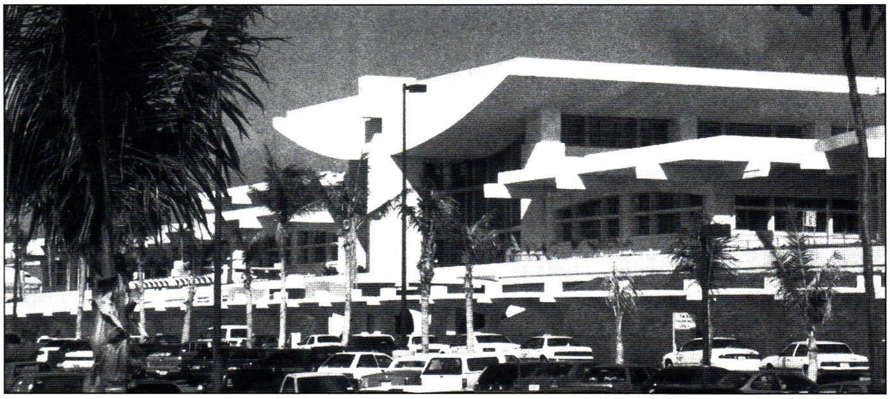


Photo by Philip Noble

Gale force winds were merely a breeze to the roof and curtain wall of A.B. Won Pat International Air Terminal, designed by Gensler.

A luxury hotel for presidents and kings

Six-Star Service in Malaysia

by Norman G. Y. Hong, AIA

For the world's most prosperous people, grandeur in travel accommodations never goes out of style.

Royalty, heads of state and corporate executives have long found five-star luxury to their liking in the great Western cities of Europe and America and in Asian sites including Hong Kong, Bali and Singapore. Today, however, Malaysia is the rising star of urban hospitality, starting with its new $1.2-billion redevelopment project in the center of capital city Kuala Lumpur.

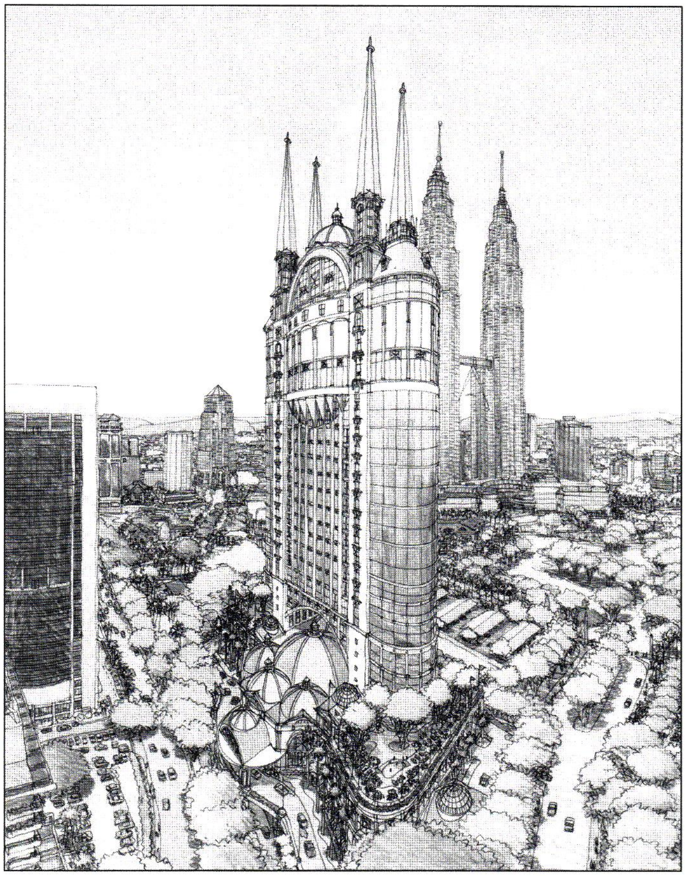
Thanks to enlightened government leadership, an open economy and an inexpensive workforce, billionaires as well as low-profile consortiums are investing considerable sums of money to whet the vacationing appetites of the world's most wealthy and influential.

Kuala Lumpur is emerging as a very appealing destination. Within its new commercial center, Petronas Towers rises 88 stories high, currently the world's tallest building and an international landmark. Here, too, a master-planned park – big enough to rival New York's Central Park – is being created.

Group 70 International has been tapped to participate in this progress. In 1996 the firm received the opportunity to design an as-yet unnamed six-star hotel that will be situated near Petronas Towers. Scheduled to open by the year 2001, the 43-story structure is intended to be the flagship operation of a multi-national hotel conglomerate which owns five-star hotels in several major cities. Asia's current economy does not dampen the enthusiasm of the people who are behind this project.

An obvious question to be asked at the outset of this endeavor is: "What exactly is a six-star hotel?" The answer is one that we would help our client define as we went along, returning to it repeatedly in our design efforts.

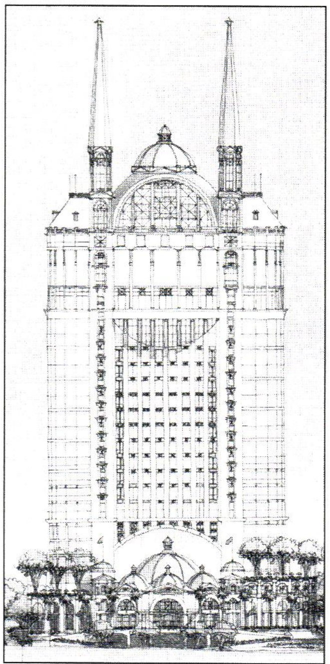
This hotel is being designed as the ultimate in guest accommodations, service, dining opportunities, business experience and



The design of Kuala Lumpur's six-star hotel (foreground) will be complementary to that of Petronas Towers (background).

social amenities. The same may be said of its physical features and finishes.

Visitors will experience the highest levels of comfort. Every detail will be conducive to pleasing the tastes of people who in bygone years would be called bluebloods. Such world players are all but immune to economic dips and depressions.



This grand hotel will have the grandest of design.

Situated on the "Central Park" of Kuala Lumpur, the hotel's top two floors will be the Royal Suite. These floors will be exclusively devoted to visiting royalty while the next floor will comprise the Presidential Suite. Here, heads of state will enjoy accommodations conducive to the highest level of international business conduct, multi-national entertaining, rest and reflection.

There will be a special entrance for royalty and heads of state, who also will have their own bank of elegantly-tooled elevators. Additionally, a sky lobby will be the private gathering place for visitors to these upper floors, where breathtaking city views and sensuous landscaping will be waiting.

Granite, marble, exotic woods, precious metals and stones, plus commissioned artwork that reflects the best in Western and Eastern expression are among the materials selected for the interior design. Domes and spires are the exterior influences. The spires will bear a visual relationship to Petronas Towers as Kuala Lumpur's most desirable reference point.

The hotel design will include a four-story podium providing elegant interior public spaces with natural lighting and interior landscaping. The various spaces include the grand porte cochere and entry lobby, promenade, main and specialty dining rooms, ballroom, business center and others which will graciously flow into one another.

Each room in the hotel will be a full suite. Bedroom, bath and living area appointments will be sumptuous.

The tower will rise above the podium and here, tradition will meet technology in a design that could never have existed at the start of the vanishing 20th Century. Two vertical elevator and service cores will support an arch that spans the vaulted public spaces and ballroom below. This arch will then support the 40 floors of guest rooms above.

The exterior wall of the guest room floors will serve as a Vierendeel truss to provide stiffness and resistance to lateral loads. The tower will be capped with guilded domes and spires, providing a grand terminus to this grandest of hotels.

When viewed in combination with Petronas Towers, this six-star hotel will insure that Kuala Lumpur is placed at the pinnacle of the world's most recognized – and remembered – cities.

Norman G.Y. Hong, AIA is vice chair of Group 70 International, Honolulu.

Guam presents unique challenges to contractors

East Meets West in Guam Construction

by Maude Omai

Fletcher Pacific Construction's first project on Guam was in 1986 when the company upgraded four barracks at Andersen Air Force Base. Fletcher Pacific immediately saw Guam's potential and understood that making a commitment to the island was critical. Twelve years later the company's commitment to Guam is stronger than ever.

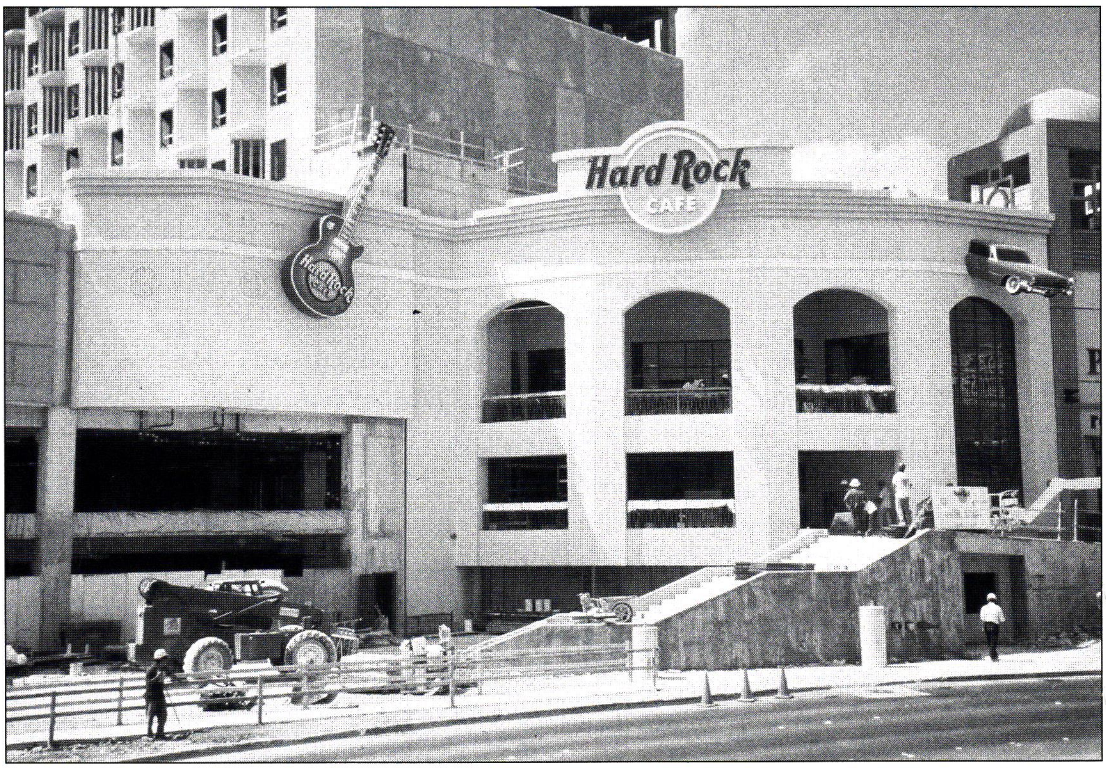
Fletcher has constructed more than 30 buildings on Guam including hotels, condominiums and retail centers, and more than 50 specialty interior fit-outs at such icons as Planet Hollywood and Hard Rock Cafe. "All of this development may be surprising to some who still consider Guam a remote Pacific Island, but Guam is a place where unexpected surprises abound, and Fletcher Pacific continues to find the island a wonderful place to do business," said Denny Watts, president and chief executive officer.

There are challenges in Guam's construction business, but careful planning and a well-developed sense of cultural awareness can help contractors work through them.

Lack of Labor

One of the biggest challenges is Guam's small labor pool, especially for crafts people.

(Continued on page 13)



A steady increase in Japanese tourism has led to a construction boom along Tumon Bay in Guam. Tourists and local residents alike enjoy first-class shopping and theme restaurants such as Hard Rock Cafe.

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Pacific Rim SPECIFICATION STANDARDS

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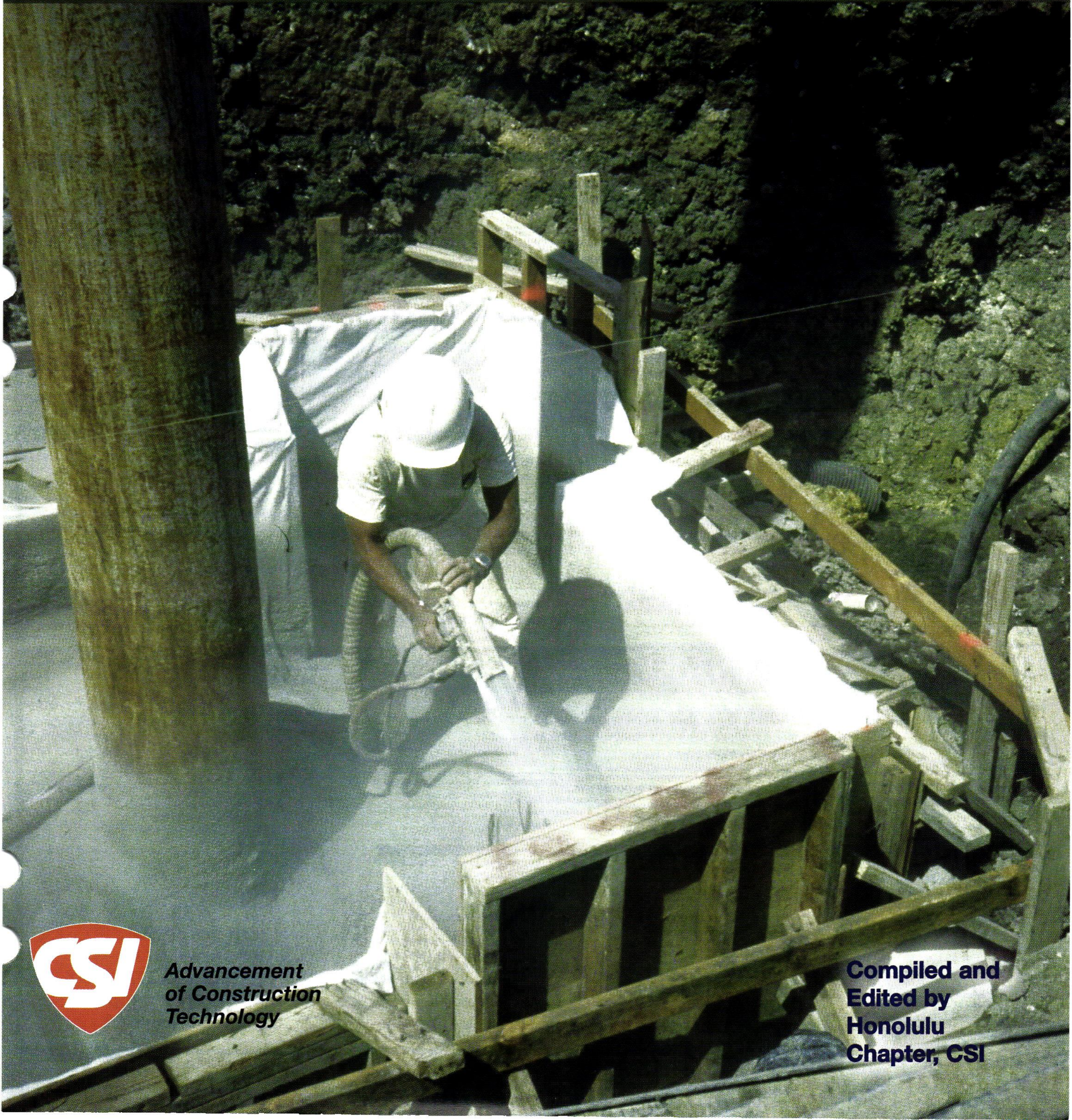

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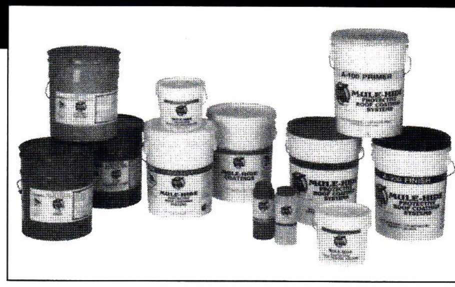
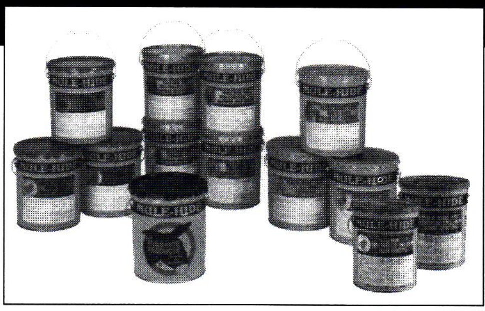
- A-400-W Acrylic Masonry Wall Coating.



ASPHALTIC ROOFING PRODUCTS



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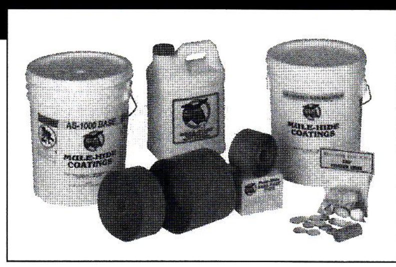

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Pacific Rim
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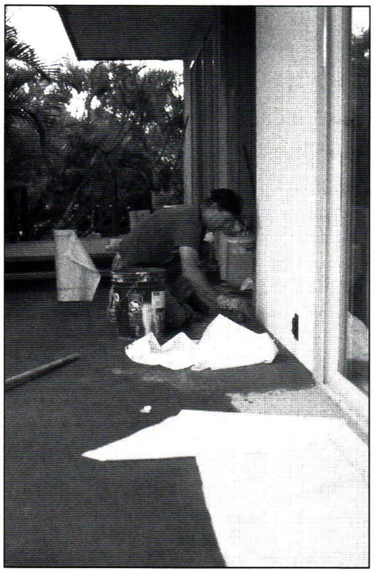


THE FUNCTION OF WATERPROOFING

Once one has a roof over his head, why would one need waterproofing? In fact, people can live quite comfortably throughout most of the Pacific Basin with little more than roofs over their heads. Despite this fact, most modern structures and construction projects in Hawaii and around the Pacific Rim involve several forms of waterproofing. These range from roofing, tub and shower enclosures in residences, retaining walls and elevated lanais, to downtown high-rises with multiple levels of below-grade and below-water-level parking, and hillside condominiums with multiple retaining walls and stepped lanais which serve as the roofs of the units below.

Waterproofing is an invisible element which protects people, property and building materials from the ravages of nature. Its function is simple: to keep water on one side of the waterproofing barrier. Being generally concealed, waterproofing often does not get the attention it deserves until the structure leaks; then it gets plenty, from building owners, contractors, architects and attorneys. At that point the problem may be difficult or even impossible to correct, as an entire building structure may rest on it. An understanding and careful consideration of materials, conditions and application will help assure that waterproofing works as intended.

Definition of Waterproofing

Waterproofing is commonly defined as a treatment or material, usually a membrane or applied compound, used to make a surface impervious to water under hydrostatic pressure. Waterproofing differs from dampproofing in its ability to resist water under pressure. The term waterproofing is usually used to describe below-grade applications but it can also be used to describe above-grade and exterior wall applications if elastomeric wall coatings are considered. It is similar to roofing in that many waterproofing materials are identical to those used in low-slope roofing and are often applied by the same contractors.

History of Waterproofing

Waterproofing materials have been around for a very long time, but along with the rest of modern technology are being developed at an exponential rate. Archaeologists have found bitumen-covered foundations dating to 2800 B.C. The familiar coal tar and asphalt waterproofing which have been used since the 18th century in France have set the standard for 200 years. Asphalt and fiber felts might still be found on a job site, but other materials have become more common.

Some current products like bentonite clay are as old as the Earth itself, but their uses are new. Some synthetic rubbers and plastics incorporate the latest designer molecules with "new and improved" versions coming out every day. Many of the new products are touted as being superior products but are untried and have no track records. The appropriate selection of waterproofing materials depends on a wide range of factors, including the nature of the substrate, anticipated range of movement, permeability, cure time, exposure to sunlight, cost, warranty, drainage and termite activity.

Selection of an appropriate type of waterproofing is important if the material is to function as intended. There is no single waterproofing material that is appropriate for all conditions. Generic categories of waterproofing systems include

1) fluid-applied systems, including single-component, multi-component and asphalt-based systems,
2) sheet-applied systems, from rubber sheets to a variety of plastic sheets, and
3) bentonite systems, either sheet-, panel- or spray-applied.

The range of possibilities for specific waterproofing products is nearly endless. The selection of products depends on a number of criteria. The first is usually the condition of use. The initial selection usually follows from a series of "either/or" choices:

1) below-grade or above-grade use,
2) below-water-level or above-water-level exposure,
3) protected or unprotected exposure, such as below a topping slab or tile,
4) interior to exterior or interior to interior use or
5) vertical or horizontal use.

The conditions defined by these choices will greatly narrow the range of choices.

Other criteria that will affect the choice of the basic system include:

1) Is a fluid-applied system or a sheet-applied system desired?
2) Is there a concern with volatile organic compounds (VOC) compliance?
3) How dry will the substrate be, and what is the definition of "dry"?
4) Is there moisture behind the substrate and, if so, is it in the form of a liquid or a vapor?
5) How clean will the substrate be?
6) What contaminants are likely to remain on the surface of the substrate?
7) What means of cleaning are possible, given the conditions of use?
8) How rough is the surface?
9) How stable is the surface?
10) Are there cracks in the surface and, if so, are the cracks due to movement or shrinkage?
11) Will the waterproofing membrane be exposed to abrasion or ultraviolet light?
12) Will the membrane be exposed to chemicals, wear or traffic?

After these concerns have been addressed, the available choices will be narrowed to a small number of system types. Then comes the choice of the specific manufacturers and products.

1) How does the technical data pertaining to the product compare with that of other manufacturers?
2) Is the manufacturer a large company or affiliated with a large company?
3) How long has the manufacturer been in this business?
4) What is the manufacturer's reputation for dealing with problems?
5) If there is a product failure, can the manufacturer bear the financial obligation?
6) What independent evaluations of the product are available from such organizations as the International Conference of Building Officials (ICBO), Underwriters Laboratories (UL), Factory Mutual (FM) and National Evaluation Service (NES)?
7) How is the manufacturer represented in Hawaii, Guam, Yap or any other Pacific Rim locations in which the product is to be applied?
8) How stable is the manufacturer's local representation?
9) How large is the pool of contractors who can bid on the product?
10) How large is the available pool of workers who are trained to install the product?
11) How critical is workmanship to the product?
12) What is the life expectancy of the product?
13) What is the product warranty?
14) What is the cost of the product relative to other similar ones?
15) How much lead time is required to get the product?

Understanding the function of waterproofing is simple. Waterproofing is needed to keep moisture where it belongs, and to safeguard health and other components of the building and property. Getting the waterproofing to function, however, is not always easy. The specification of appropriate products should begin with the selection of a knowledgeable, unbiased consultant. The application should be performed by a skille experienced contractor.

When one is faced with a potentially bewildering array of choices ar decisions, not to mention potential liability when things go wrong, it is advisable to consult professionals.

FLUID-APPLIED WATERPROOFING SYSTEMS

The "building envelope" is a term used to describe the sometimes complex exterior skin of a building that must be properly sealed to prevent the intrusion and subsequent migration of moisture into a building. The building envelope most often includes above- and below-grade waterproofing.

Most above-grade waterproofing materials allow for negative vapor transmission, while below-grade materials are not designed for negative vapor transmission. Several waterproofing systems form integral parts of the total waterproofing system. The building materials consist of joint sealers, weather strips, membrane-applied waterproofing, roofing, fluid-applied waterproofing and others.

Fluid-applied waterproofing systems (FAWS) are solvent-based mixtures that in some cases include water and/or emulsions. Solvent-based mixtures usually contain a polymeric base, such as urethanes, rubbers, vinyls or polymeric asphalts, or various combinations thereof. As the name implies, FAWS are applied as liquids and cure to form continuous seamless sheet membranes.

Advantages of FAWS

Some of the major advantages of FAWS are that they have "conforming, self-leveling and self-flashing" capabilities. These attributes enable the material to be applied without any seams around substrate protrusions, changes in substrate elevations, complex structural or architectural formations and floor-wall interfaces or junctions.

On the other hand, sheet-applied membranes have an advantage in thickness uniformity over FAWS. For example, maintaining a constant dry film thickness of 60 mils (1 mil = 1/1,000 of an inch) for FAWS requires very stringent quality control. In some cases, application of FAWS to complex areas is almost impossible. Although the proper thickness of applications is important, it is only one criterion for long-term performance.

Requirements for Proper Performance

FAWS, because of their liquid nature, exhibit characteristics of coatings as they are applied. For FAWS to perform properly, several requirements must be met:

Design or Specification

The product must be appropriate to its function under all conditions that it is exposed to, from the beginning of the project to completion of the installation. This includes the continual integrity of the underlying substrate and any connection to all other waterproofing systems.

Integrity of the Product

The coating material must consist of the components specified by the manufacturer and must perform as specified by the manufacturer.

Surface Preparation and Cleanliness

The substrate needs to be cleaned and prepared to allow the product to adhere well and to perform as designed.

Application

To allow it to perform as designed, the product must be properly placed on the substrate.

In many cases FAWS are the first line of defense against moisture and sometimes are the foundation of subsequent applications. FAWS, as with other barrier types of coatings, must be continuous to protect the substrate from the environment. The long-term success of FAWS, for the most part, rests on their ability to remain continuous and to adhere adequately under the environmental conditions in which they are applied. For FAWS to perform properly and continually, every factor stated above must be met.

When FAWS are used in conjunction with other types of waterproofing systems, compatibility must be checked. For example, caulking and sealing applications at door and window areas where FAWS are to be joined must be compatible, as must be waterproofing over expansion joints and joint sealers. If incompatibility exists, disbonding usually occurs.

Binder Types

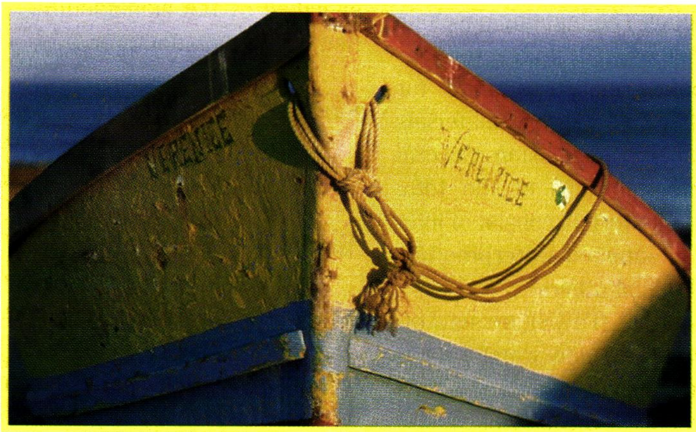
In general FAWS are classified by their binder type, including:

Urethane

Urethane is available in one- or two-component solvent-based materials. Black coloring is added to the product to achieve the "black mastic" appearance. Urethanes have elastic properties and give good resistance to all chemicals. In addition, they are generally resistant to ultraviolet (UV) light and therefore guard against premature degradation from sunlight.

Rubber Derivatives

Rubber derivatives include butyls, neoprenes or Hypalons in a solvent base. These materials are flammable



nd toxic. They are elastic but not as elastic as urethanes. Rubber systems are usually well-suited for below-grade application because of their resistance to the chemical environment.

Asphalt

Asphalts are sometimes suited for below-grade waterproofing but, unlike other FAWS, are not resistant to various chemical attacks.

Coal Tar

Coal tar, or asphalt-modified urethane, lessens the cost of FAWS while still offering performance. Coal tar derivatives are toxic and present concern for application in confined spaces. Safety must be exercised in their proper application.

Other FAWS

Other FAWS, primarily for above-grade waterproofing, include elastomeric coatings, such as urethane or acrylic binders and silicones. These waterproofing coatings basically consist of one or more pigments or particles that offer color, substance and hide; a binder, which is the material that holds the coating together; and vehicles or solvents, which give the coating its fluid nature for application.

FAWS are a broad topic. The basic elements of a waterproofing system need to be followed to achieve long-term performance. Improper or inadequate sealing of the building envelope by the total waterproofing system can cause numerous problems for buildings. The integrity of the building envelope is produced by the appropriate choice of materials, the purchase of reputable products, the proper surface cleanliness and preparation, and the correct application of all contiguous waterproofing systems of the building.

Correction:
In the April/May 1998 issue of Pacific Rim Specification Standards, Fred Sekiya and George Stewart were inadvertently left off the credits for Editorial Contributions and Reviews. We regret the error.

"PEEL & STICK" SHEET MEMBRANE WATERPROOFING

"Peel & Stick" sheet membrane waterproofing systems consist of a rubberized asphalt membrane to which is laminated a polyethylene film on the face and a siliconized release sheet on the adhesive side. Sheet membrane waterproofing systems are usually available in 36- and 48-inch-wide sheets. They are applied over primed surfaces, and weighted rollers are used to assure sound adhesion at the laps.

Sheet membrane waterproofing is suitable for a wide variety of applications, such as waterproofing below-grade foundation walls, earth shelters, tunnels, under-floor or roof tiles, and split-slab applications. Sheet membrane waterproofing is not recommended for applications in which it will remain exposed to continuous sunlight, nor is it recommended for immersion conditions unless in a between-slab condition.

The advantage of sheets over fluid-applied materials is that the thickness of the sheets is factory controlled, thereby eliminating one of the major problems of fluid-applied coatings. There is very little variation in the thickness of the material. Sheet membranes are easy to install on surfaces that do not have many penetrations. Their greatest disadvantage is that they are difficult to work with on extremely rough surfaces or when there are many penetrations or corners.

HOT RUBBERIZED ASPHALT

The use of hot rubberized asphalt to provide an immediate waterproof membrane originated in the early 1960s in response to specific conditions of construction jobs and applications. Hot fluid-applied products were first used in geographical areas characterized by extreme environmental conditions, such as wide ranges in temperatures or cold weather in which salt is used to prevent the build-up of ice. As methods of applying hot rubberized asphalt improved, a wider range of job conditions could be addressed.

The primary features of hot rubberized asphalt are that it

1) can be applied relatively quickly,
2) can be used over a rough substrate,
3) can be applied in most weather conditions with few restrictions,
4) is self-sealing, and
5) adheres well to substrates.

Hot rubberized materials can take very limited foot traffic upon cooling, and can be applied during a light rain or in cold weather. The thickness of typical applications ranges from 125 to 215 mils. This ensures excellent elongation properties in response to such conditions as concrete shrinkage cracks and can also provide self-sealing junctions should the membrane become punctured by mechanical fasteners or small debris at job sites.

Applications

Typical applications include between-slab waterproofing, planters, pools, back-filled vertical walls above or below grade, mud slabs, water features and plaza decks with paved or fully landscaped toppings. Substrates of concrete, wood and metal decking are able to accept hot rubberized asphalt systems.

The typical hot rubberized asphalt system incorporates a cut-back primer, application of the liquefied membrane by squeegee, reinforcing of drains, expansion joints and termination points with sheets of uncured neoprene, and a final course of protection board. A fabric-reinforced detail calls for the use of a layer of spun polyester fabric sandwiched between thick applications of membrane. All installations of hot rubberized asphalt require a protection sheet or bond breaker before the traffic-bearing surface or other final topping can be applied.

The use of a hot rubberized asphalt system can provide years of protection to a structure by insuring a tight bond to the substrate and the overall protection of the membrane from environmental or mechanical damage.

TROUBLESHOOTING WATERPROOFING FAILURES

Most waterproofing articles describe the procedures for selecting the appropriate materials and techniques for installing waterproofing correctly. Unfortunately, a significant percentage of the waterproofing systems in Hawaii were not selected and/or installed correctly and, as a consequence, have failed. What do you do then?

First a cautionary warning: this is not intended to enable you to tackle those devilishly difficult problems. For those, do as you would for any other difficult problem: consult the experts.

Determining why the previous system failed is an important step in the repair process. The need to make claims against the responsible parties is one of the reasons for making that determination, but an even more important reason is to avoid making the same mistakes that caused the failure the first time. Was something more than an incorrect spec or improper application involved? Is the substrate really sound? Is there cracking? Is there moisture in the concrete or CMU? Is there contamination? Is there hydrostatic pressure on the location? Where is the water coming from? Is the quantity of water at the problem location unavoidable? Is there something that can be done to reduce it?

Perhaps the most important question of all is whether or not the location is accessible. Assessibility is, of course, a relative concept. A retaining wall which is backfilled with 8 or 10 feet of soil certainly has restricted accessibility. Access is more difficult if there is also an on-grade slab covering the soil side, and even more difficult if there are also four stories of occupied space, each with on-grade slabs above the leak. The cost of access must be weighed against the cost and likelihood of success of the other repair options.

For locations which are in some away accessible, the preferred approach is to re-excavate the backfill from behind the wall and apply the waterproofing on the soil side (the positive-side), only doing it as it should have been done in the first place. Many applicators have had good results from the "peel & stick" sheets. While the contractor has the wall excavated, be sure to install foundation drains (puka pipe) and drainage material (crushed rock with no fines) against the wall.

For locations which for some reason are really inaccessible, or where the cost of access is completely unacceptable, "negative-side" waterproofing is a possibility. Negative-side waterproofing carries with it risks not encountered with positive-side waterproofing. The obvious one, of course, is that the water pressure on and in the wall will blow off the waterproofing membrane. Another potential problem is that the water which is in the wall may move somewhere else that you're not anticipating.

If you're stuck with using negative-side waterproofing, three general types of systems are available: coatings, penetrating sealers and injected grouts. Several types of coatings are available, including metallic/cementitious composites, polymer/cementitious composites, thick epoxies and fluid-applied elastomerics. These are applied to the interior side of the wall or floor with the goal of creating a watertight barrier. They require a clean, sound substrate and, even with the best of applications, are vulnerable to failure because of hydrostatic blow-off and cracking of the substrate. They can work, however.

The second type is the penetrating sealers — crystalline and thin epoxies. These penetrate into the substrate material with the goal of providing the watertight seal within the substrate and are less likely to fail because of pressure blow-off, but are still subject to failure because of substrate cracking. They can be combined with surface coatings to provide a higher probability of success. Compatability between the two parts of the system must be carefully verified, however.

The third type is the through-wall injection grout systems. These are usually polymeric foams injected through holes drilled through the wall or floor and create a localized barrier on the positive side. They overcome the typical negative-side problems by being applied on the positive side, but are by definition done "blind," and since you don't know what's really on the backside of the wall, you don't know exactly where the waterproofing material is going to end up. Multiple applications are sometimes required. Two general types are available — hydrophilic (water loving) and hydrophobic (water hating). The hydrophilic materials require the presence of water to properly react and remain reacted. When reacted, they form a tough gel that is impervious to water. The hydrophobic materials form a foam barrier that does not require the presence of water and is impervious to it. Different contractors swear by each type.

Epoxies can also be injected into cracks, for both structural bonding and waterproofing purposes. Two methods of injection are available – the normal high pressure injection and, less well known, low pressure injection. Low pressure injection has the advantage of providing better distribution into small cracks, but both methods can work.

Metallic/cementitious coatings and through-wall injection systems are described in the National Roofing Contractor's Association (NRCA) *Roofing and Waterproofing Manual, 4th Edition,* in the "Waterproofing and Dampproofing Manual." (The NRCA *Roofing and Waterproofing Manual* is one of those books that every architectural office must have.) *Sweet's Catalog* and the various product manufacturers have detailed installation descriptions of the other systems. Find a contractor thoroughly familiar with below-grade waterproofing repairs and work out the details with him. Then tailor your specification to those discussions. The important part is to read the instructions fully and carefully and be sure that the contractor follows them to the letter.

USE OF SEALANTS

A sealant is a plastic or rubber material, placed within a joint to fill and seal the joint, to prevent the passage of moisture while allowing horizontal and lateral movements. Sealants should not be confused with caulking or mastics. Caulking is the term describing the process of filling cracks, crevices, joints or similar openings with a semi-drying or slow-drying plastic or rubber material. A mastic is a thick adhesive usually consisting of a mixture of bituminous, resinous materials, which retains a measure of elasticity and is commonly used as an organic adhesive. This article will deal with sealants.

In selecting a sealant, both the specific conditions where the problem exists and the materials being considered to solve the problem must be considered.

The conditions at the problem location must be accurately defined:

1) exterior or interior exposure,
2) traffic or non-traffic, pedestrian or automobile exposure,
3) the width of joint, and
4) potential movement of the joint, the minimum and maximum joint width and the change between the two.

Note that the conditions must be defined for each joint.

Similarly, the capabilities of the sealant materials being considered must be examined:

1) elongation capability of the proposed material — expansion and contraction,
2) compatibility of the sealant with the substrate, coatings or paint,
3) horizontal or vertical application,
4) the life expectancy of the sealant, and
5) the ability to do maintenance and its cost.

The substrate is the material to which the sealant is adhered. It must be strong enough to withstand the stresses placed on it by the sealant as it moves. It must also be chemically compatible with sealant materials. The characteristics of the substrate will influence the need for primers and other surface preparation.

Surface Preparation

Prior to installing the sealant in a joint, the installer should carefully review the manufacturer's requirements for this type of sealant as used in this exposure. The installer should inspect the joint walls to ensure that they are clean and free of oils, grease, curing compound residues and any other foreign matter that might prevent bonding. He should then check the surface to ensure that it is sound, with no spalling or cracking, and dry or moisture-free as required by the manufacturer. Having previously examined the substrate materials to determine compatibility, the next step is to prime the surface as required by the manufacturer.

Joint Shape

In order to perform properly, sealant joints must be shaped to take advantage of the adhesion and elongation characteristics of the sealant. Usually the sealant is to act as a bridge, attached at each end and free-spanning in the middle. A good sealant joint has adhesion to the substrate at only the two end points. A joint adhered along three sides will withstand movement far less successfully than one with attachment at the two ends only. The commonly seen fillet joint, the triangular joint between two surfaces meeting at 90 degrees, is far more likely to fail than a properly shaped one. Joint design is a complex consideration but is usually described in an elementary way in most sealant literature. Use of a bond breaker to help define the proper sealant shape is usually required.

One Component or Two?

Most sealant types are available in both single-component and multi-component (two- or three-part) formulations. The single component materials cure by interaction with moisture from the air. In Hawaii, the high relative humidity makes these formulations work very well. Curing problems sometimes occur in dryer climates. Single-component materials are available in prepackaged cartridges, in gun-grade and self-leveling grades. They are available in a wide range of formulations suitable for a wide range of uses. Take care to match the sealant with the use and conditions, including the need to prime. Some single-components do not require priming on some substrates. Special coatings, such as Duranar and Kynar finishes may require special primers.

Multi-component sealants cure by interaction of the various parts. It is critical that the components be properly mixed prior to installation. Mixing instructions must be followed very carefully or the material won't cure. Color is usually added to the neutral sealant with a color pack, which is included in the mixing procedure. Multi-component sealants are available in non-sag and self-leveling grades. They usually require priming and are most suited for large joints.

Shore Hardness

Hardness is a measure of the resistance to plastic deformation (the springiness or elasticity) of a material relative to that of other known materials. The most commonly used reference scale for the hardness of sealants is the Shore A hardness, which uses a scale ranging from 0 to 100. Zero is the softest; 100 is the hardest. In a general way, the lower the Shore hardness, the more flexible the sealant is. An automobile tire has a Shore A of about 70; a "pink-pearl" eraser is about 40. Most "low-modulus" sealants have a Shore A in the 20 to 30 range; most "high-modulus" sealants are in the 70 to 85 range. A sealant with a high Shore A number (very rigid) will not expand and contract effectively and may not perform properly.

Sealants which are to be used in pedestrian traffic exposures should have a Shore A of at least 45 to resist women's high-heeled shoes and other sharp objects that tend to deteriorate or destroy the joint filler. Expansion/contraction joints can be designed to be small, minimizing the exposure to heel damage.

High-Performance Sealants

High-performance sealants are generally those capable of providing plus or minus 25 percent elongation capability after aging. Three materials normally considered in th category are: polyurethanes, polysulfides and silicones.

Polyurethanes

Polyurethane elastomeric sealants are widely accepted today for most horizontal and vertical applications. They are available in one-component, moisture cured versions and two-component, chemically cured formulations. Urethane sealants can be applied in 40 to 100 degree F temperatures and have a service range of -40 to 170 degrees F, are considered easy to tool, and can be totally immersed after the required cure time.

Urethanes are available in a range of modulus formulations. Some single-component, low-modulus urethanes and two-component low-modulus urethane sealants are now approved for use with curtain wall systems and exterior insulation and finish systems (EIFS), a use previously restricted to silicones. Urethanes are less expensive than silicones and can be considered where longevity is not a prime concern.

Urethane sealant joints should be a minimum depth of one-fourth of an inch. Single-component urethanes should not be installed in widths in excess of one inch. The recommended depth is one-half of the material's width. For joints wider than one inch, a two-component material should be used.

While most urethanes are paintable within 24 hours after application, they should not be applied to surfaces previously painted with acrylic-latex paint as they may cause the paint to peel. Most manufacturers recommend the use of a primer prior to application of the sealant. Compatibility with the substrate materials should be verified with the manufacturer. Specific primers are required for different materials.

Some urethanes are fuel-resistant and can be used in an environment in which fuels or other petroleum products are present. Sensitive or unusual uses should be verified with the manufacturer prior to specification.

Most urethane sealants are low in solvents and therefore have limited shrinkage. The clean up is with solvents.

Polysulfides

Prior to the development of urethanes, polysulfides were considered the premier caulk. Since the widespread availability of urethanes, the use of polysulfides has greatly decreased. Recently, as a result of many failures of urethane sealants in environments in which the chlorine levels exceed five parts per million, urethane manufacturers are withdrawing their approval of the use of urethanes in that exposure.

Polysulfides have been shown as very reliable in chlorinated environments such as swimming pools and hot tubs, with no softening. The temperature of the air during application can range from 40 to 100 degrees F. The service range is 40 to 170 degrees F. One day curing is required for immersion.

Polysulfide sealants, also available in one-component or two-component formulations, have a small shrinkage factor but a strong odor. Compatibility with underlying coatings and surfaces is more critical than with urethanes and should be investigated with the manufacturer. Usually they cannot be tooled immediately and cannot be painted until fully cured for one to three days. Clean up is with solvents.

Silicones

Silicones, because of their very high resistance to UV and environmental chemicals, have been shown to have a very long service life — in excess of 25 years. Silicones are available in low-modulus and medium products and can therefore be installed on curtain wall systems, EIFS systems, skylights and other installations except horizontal walking surfaces. Probably the most visible use is in glass-to-glass applications including large storefronts or lobby entries. High-modulus silicones are available but are specifically engineered for in-shop uses.

Silicone sealants are available in one-component or two-component and in low-modulus and high-modulus formulations. They offer very high elongation factors and can accommodate plus 50 to minus 50 percent movement. Their limitations are that they cannot be painted over and are at the expensive end of the sealant range. They are not normally used for below-grade applications. Clean up is with solvents.

Other Sealant Materials

Acrylic Sealants: This is an emerging technology. In the past, acrylics have been limited to low/moderate performance products primarily used for cosmetic purposes (see Acrylic-Latex Sealants below). One of the major manufacturers of acrylic resins has been developing acrylic sealants, with greatly improved characteristics, capable of competing with silicones. These are not widely available yet, but soon will be. Acrylics are notable for excellent UV resistance, paintability and easy workability.

Acrylic-Latex Sealants: These are primarily used for cosmetic preparation of surfaces prior to finishing. They are usually water-based compounds that dry tack-free within minutes and can be painted over with acrylic latex paint within one hour. Oil-based paints require 24 hours before they can be painted over. They tool easily and clean up with water, making them very "user friendly."

Primary limitations are that they typically offer very limited movement capability (plus or minus 12.5 percent) and should not be used for exterior applications requiring a high degree of waterproofing reliability.

Butyl Rubber Sealants are an older technology with specific uses. They should be limited to applications where the joint movement does not exceed 10 percent of the joint width. They are available only as a single-component material, cure by solvent evaporation, and tend to have a high shrinkage factor. Because of the solvent loss, they cannot be painted for at least two weeks and require solvent clean up. They are widely used in glazing as edge seals between formed metal roofing and siding panels. Butyl sealants are also useful in sealing to wood.

Oil-Based Sealants: This commonly refers to the old caulking materials which are rarely used for construction applications, as they are not elastic, tend to crack and chalk from exposure to weathering and UV.

Mildew-Resistant Sealants: These are typically one-component, moisture-cured formulations which contain a fungicide to resist mold growth. They typically have a strong odor, are available only in white, translucent, marble and almond colors, and are intended for use in bathrooms, showers, sinks and kitchens. They are not recommended for continuous water immersion and require clean up with solvents.

Fire-Resistant Sealants: These are frequently silicone based, are most commonly available in single-component materials and offer no choice of color. They are generally used with another fire-retardant material such as a mineral, wool, cera blanket or retardant foam. They are normally used in floor or wall penetration, most commonly in concrete construction.

Fire Putties and Caulks. Intumescent materials remain inert until the temperature reaches 200 degrees F, but expand when exposed to fire. Often, depending on the nature of the specific materials, they expand as much as 20 times their original size, insulating the protected area from the heat. The advantage is that they can be removed easily to allow additional work in the area and can then be replaced. It is important to match the fire rating of the joint filler with that of the surrounding construction.

GLOSSARY

accessory materials: filler boards, bond-breakers and backup materials and primers.

adhesion: the tendency of a material to bond to another substance or material when under a separating stress.

aggregate: any granular mineral material.

ambient: the temperature of the surrounding air.

application rate: the quantity (mass, volume or thickness) of material applied per unit area.

articulated joint: a joint with movement that is limited by restraints.

asphalt: a dark brown to black cementitious material in which the predominant constituents are bitumens, which occur in nature or are obtained in petroleum processing.

back-up material or joint filler: material placed in a joint cavity behind the sealant to control the joint depth of the sealant without inhibiting joint closure. Often made of polyethylene or polyurethane foam.

"band-aid" joint: a sealant joint composed of a bond-breaker tape over the joint movement area with an overlay of sealant lapping either side of the tape sufficiently to bond well. Used where extreme movement occurs and conventional joint design is not possible (i.e., metal joints, deep V joints, etc).

base coat: the first coat of any multicoat system.

bead: the shape of a sealant in a joint after application. Usually it is a continuous convex circular section having a cylindrical surface. Examples are caulking bead and glazing bead.

bed joint: a caulking joint that has something embedded in it.

bentonite: a clay, formed from decomposed volcanic ash, with a high content of the mineral montmorillonite. It has the capability of absorbing a considerable amount of water and swells accordingly.

bleeding: the absorption of oil or some other base vehicle from a sealant into an adjoining porous surface.

bond: the adhesive and cohesive forces holding two components in intimate contact.

bond-breaker: a material, placed in joints, to prevent adhesion to the rear joint surface. This allows the sealant to have maximum extension and compression capabilities.

brooming: the use of a broom or other mechanical device to smooth the traffic topping and to assure positive contact with the underlying adhesive.

butyl: a synthetic rubber formed by the copolymerization of isobutylene with isoprene.

caulking: the filling of cracks and crevices to make them airtight, watertight or steam-tight, using a putty-like compound that remains plastic for an extended time after application.

capillarity: the action by which the surface of a liquid, where it is in contact with a solid, is raised or lowered.

cohesion: that tendency of a material to maintain its integrity without separating or rupturing within itself when subjected to external forces; that tendency to bond within itself.

cohesive failure: splitting and opening of a sealant. It is usually the result of sealant over-extension due to excessive movement or to improper depth-to-width ratio.

composite: a construction product comprised of various materials.

compression: being pressed together and compacted by pressure.

conductivity: transmitting moisture through a material.

counted lashing: a formed metal or elastomeric sheeting secured on or into a wall, curb, pipe, rooftop unit or other surface to cover and protect the upper edge of a base flashing and its associated fasteners.

dew point: the temperature at which air becomes oversaturated with moisture and the moisture condenses.

drainage course: a layer of washed gravel that allows water to filter through to a drain or drainage line.

elastomeric: relating to the elastic, rubber-like properties of a material.

elongation: amount of stretch exhibited by a sealant before rupture. Also, an increase in length expressed as a percentage of the original length.

embedment: the process of placing a material into another material so that it becomes an integral part of the whole.

emulsion: the intimate dispersion of an organic material and water achieved by using a chemical or clay-emulsifying agent.

equilibrium moisture content: the typical moisture content of a material in any given geographical area.

expansion joint: a structural separation between two building elements that allows free movement between the elements without damage to the waterproofing system.

fabric: a woven cloth of organic or inorganic filaments, threads or yarns.

finish coat: the top layer of a traffic topping system.

flashing: sheet metal or synthetic elastomeric sheet material used to cover open joints in exterior construction.

flood coat: the top layer of certain traffic topping systems. Aggregates may be embedded into it.

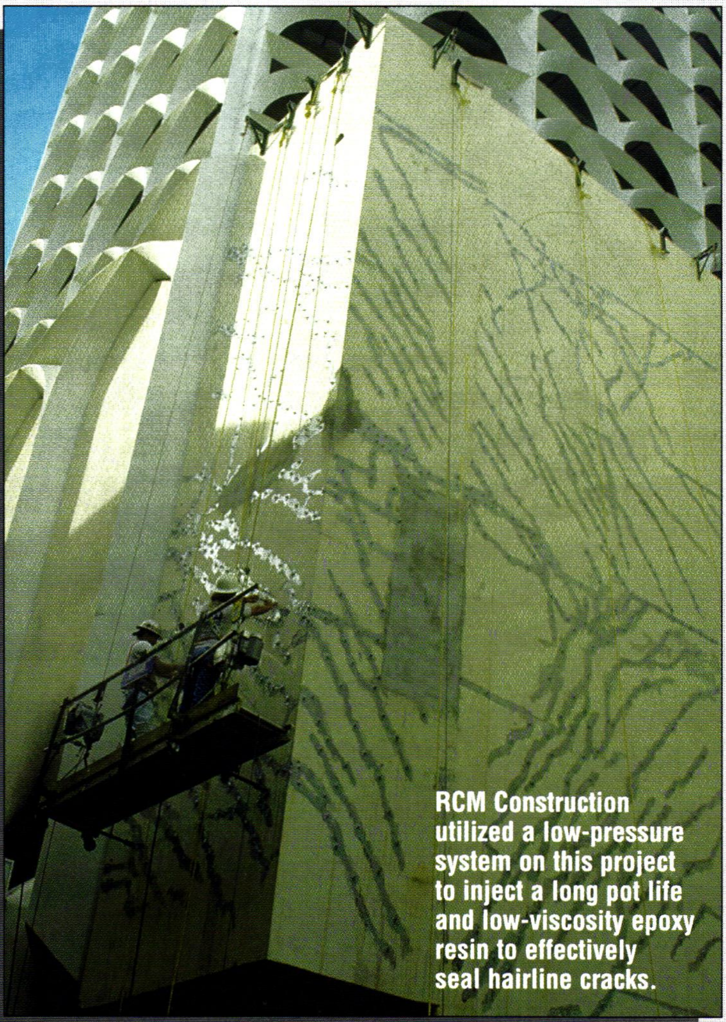
fluid-applied elastomer: an elastomeric material, which is fluid at ambient temperature, that dries or cures after application to form a continuous membrane.

gasket: a preformed material placed between two adjoining parts to provide a static seal. Gaskets are cut, formed or molded into the desired configuration.

geomembrane: an essentially impermeable membrane used as a liquid or vapor barrier.

geotextile: any permeable textile used with foundation, soil, rock,

ATTACK THE CRACKS



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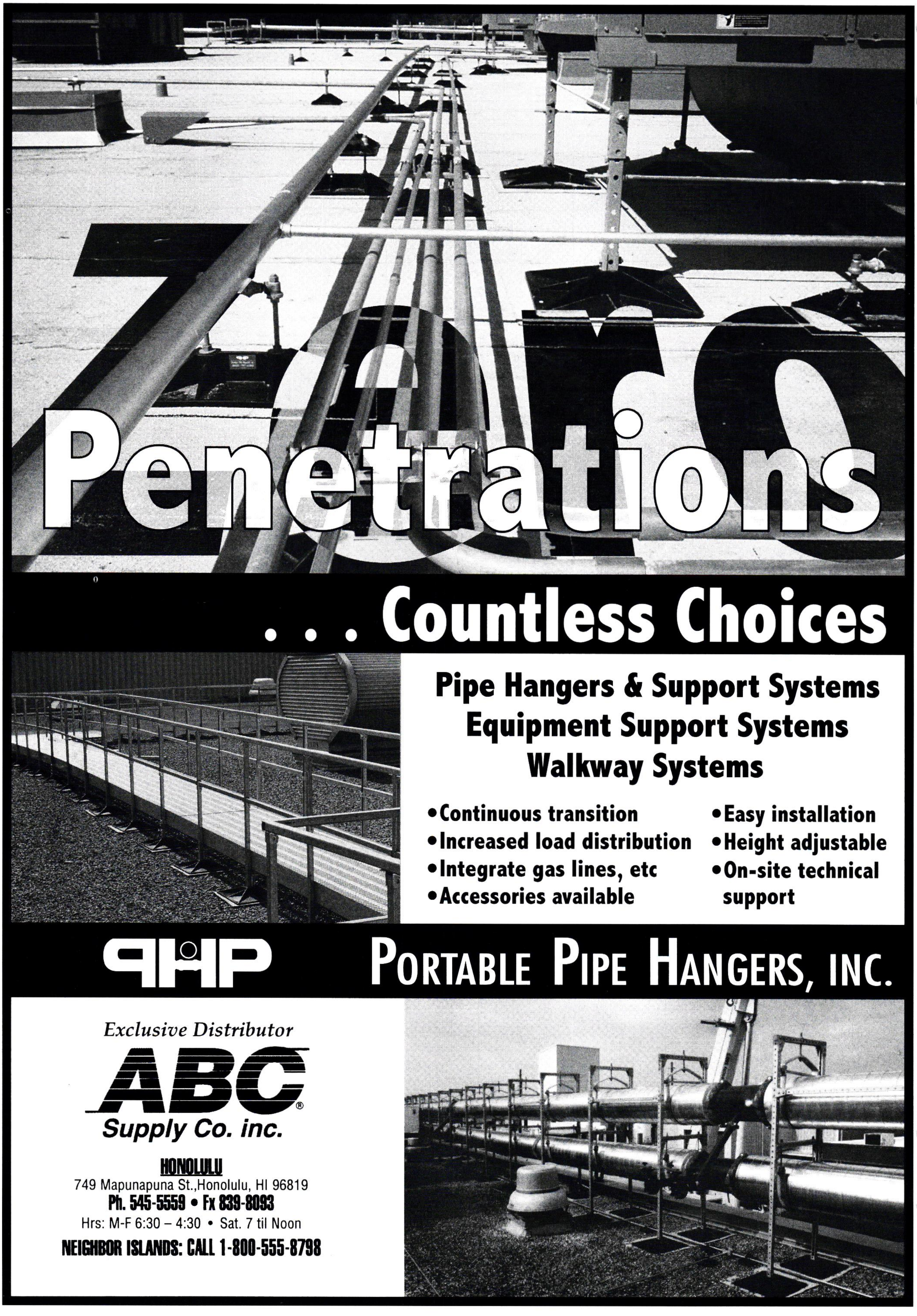

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earth or any other geotechnical engineering-related material as an integral part of a human-made project, structure or system.

HDPE: (high-density polyethylene) a polyolefin sheet formed by solution polymerization.

holiday: an area where a liquid-applied material is missing.

hydrated: a compound formed by combining water with some other substance in a definite molecular ratio.

hydraulic: operated by the movement and force of liquid.

hydrophobic: having no affinity for, or ability to combine with, or ability to dissolve in water. One of the broad classifications of clear water-repellent sealers.

hydrostatic pressure: a state of stress in which all the principal stresses are equal and there is no shear stress, as in liquid at rest. The product of the unit weight and the difference in elevation between the given point and the free water elevation.

hygroscopic: readily attracting, absorbing and retaining atmospheric moisture.

Hypalon: a synthetic elastomer chlorosulphanated-polyethylene compound used as a protective coating on neoprene in certain traffic topping systems.

impermeable: not permitting fluids to pass through.

leaching: the loss of soluble substances from material by the filtering of water through the material.

membrane: a flexible or semiflexible waterproofing layer, whose primary function is the exclusion of water.

mil, MIL: a unit of measure equal to one 1,000th of an inch (0.0254 mm).

mineral fiber felt: a felt with mineral wool as its principal component.

modulus: the ratio of stress to strain.

needle punch: mechanically bonded by needling with barbed needles.

neoprene: a synthetic rubber (polychloroprene) used in liquid-applied and sheet-applied elastomeric membranes. When applied in liquid form, as a component of a traffic topping system, it must be covered with an ultraviolet-resistant coating such as Hypalon.

PVC: (polyvinyl chloride) a synthetic thermoplastic polymer prepared from vinyl chloride. It can be compounded into flexible and rigid forms through the use of plasticizers, stabilizers, fillers and other modifiers. Rigid forms are used in pipes and well screens. Flexible forms are used in the manufacture of sheeting.

permeance: an index of a material's resistance to water vapor transmission.

ply: a layer of saturated felt used in waterproofing systems.

polypropelene: a polyolefin formed by solution polymerization.

polyurethane: a generic term for ethylene carbonate polymers. They are used extensively in the waterproofing and sealant industry.

porosity: a ratio, usually expressed as a percentage, of the volume of voids in a material to the total volume of the material, including the voids. The voids permit gases or liquids to pass through the material.

primer: a compatible coating designed to enhance adhesion.

protection course: semirigid material placed over a waterproofing membrane to protect it against damage during subsequent construction. It is also used to provide a protective barrier against compressive and shearing forces induced by materials placed against it.

reinforced membrane: a waterproofing membrane reinforced with felts, mats, fabrics or chopped fibers.

sag: the flow of an uncured sealant within the joint, resulting in loss of the sealant's original shape.

saturated felt: a felt that has been partially saturated with low-softening-point bitumen.

sealant: a mixture of polymers, fillers, and pigments used to fill and seal joints where movement is expected. Unlike caulking, it cures to a resilient solid.

setback: the distance from the face of the joint filler material to the joint opening; the depth of sealant penetration.

slip sheet: a polyethylene sheet placed over waterproofing to prevent scouring of the waterproofing during settlement.

spalling: surface deterioration of a concrete slab by freeze/thaw cycling, corrosion of reinforcement or other inherent defects in concrete.

substrate: the surface upon which a waterproofing membrane is applied (i.e., foundation wall, structural deck or insulation).

thermoplastic: a material that is soft and pliable, without a change in its inherent properties, whenever heated. Thermoplastic materials may be repeatedly softened by heating.

thixotropy: the property of a material that enables it to stiffen in a short period on standing, but to acquire a lower viscosity on mechanical agitation, the process being reversible. A material having this property is termed thixotropic or shear thinning.

through-wall flashing: a water-resistant membrane or material assembly extending through a wall and its cavities, positioned to direct any water entering the top of the wall to the exterior.

tooling: a method of forcing sealant into a rough or textured surface to improve the seal and achieve the desired smoothness or shape. A narrow-blunt-bladed tool is used for this purpose.

traffic surface: a surface exposed to traffic, either pedestrian or vehicular.

underlayment: materials used to cover deck irregularities before the application of a traffic-topping system. Can also be used to prevent the direct application of materials to a substrate.

vapor migration: the movement of water vapor from a region of high vapor pressure to a region of lower vapor pressure.

vapor retarder: a material designed to restrict the passage of water vapor through a wall or roof. In the roofing industry, a vapor retarder should have a perm rating of 0.5 or less.

waterproof: in the building trades, descriptive of any material or construction which is impervious to water.

waterproofing: the treatment of a surface or structure to prevent the passage of liquid water under hydrostatic, dynamic or static pressure. In the building trades, descriptive of any material or construction which is impervious to water.

water-repellent: a liquid used to make a surface resistant, but not waterproof, to wetting by liquid water.

SUGGESTED STANDARD SPECIFICATION SECTION

The following are a series of suggested specifications developed by many of the specifications writers in the Pacific Rim. These specifications follow the "SpecText" format developed by CSI and the Construction Specifications Research Foundation. They are set up to be edited for content and for insertion of other special information. Special notes to the specifiers are indicated where special care or information is required. Follow these notes closely. A basic knowledge of the subject matter is required before attempting to specify any products. It is recommended that all specifications be done under guidance of a Certified Construction Specifier (CCS) or a Certified Construction Product Representative (CCPR). These people have very specialized education in the preparation of Specifications and have been tested for this knowledge.

SECTION 07900
JOINT SEALERS

PART 1 GENERAL

Specifier Note: *This section includes sealing static and dynamic joints and joints between differing materials and components. This section includes joints which form an integral part of a material, component, or system specified in another section; therefore this section is referenced from many other Sections.*

Specifier Note: *In selecting sealants, consider the performance level required of the application and compatibility of adjacent materials; make the selection of sealant type appropriate to in-service requirements, short and long term.*

Specifier Note: *Sealant materials can be specified by proprietary name, by detailed description of sealant characteristics, or can be specified in a combination of methods. If specifying in combination, ensure accurate coordination of text without contradiction.*

1.1 SECTION INCLUDES
- A. Preparing substrate surfaces.
- B. Sealant and joint backing.

1.2 RELATED SECTIONS
- A. Section 02500 - Paving and Surfacing: Sealants required in conjunction with paving and surfacing.
- B. Section 03300 - Cast-In-Place Concrete: Sealants required in conjunction with cast-in-place concrete.
- C. Section 07240 - Exterior Insulation and Finish Systems: Sealants required in conjunction with joint sealing.
- D. Section 07270 - Firestopping: Sealants required in conjunction with firestopping.
- E. Section 07531 - Elastomeric Sheet Roofing - Fully Adhered Conventional: Sealants required in conjunction with roofing.
- F. Section 07620 - Sheet Metal Flashing and Trim: Sealants required in conjunction with metal flashings.
- G. Section 08112 - Standard Steel Frames: Sealants required in conjunction with door frames.
- H. Section 08450 - All-Glass Entrances: Sealants required in conjunction with glazed entry system.
- I. Section 08520 - Aluminum Windows: Sealants required in conjunction with aluminum windows.
- J. Section 08800 - Glazing: Sealants required in conjunction with glazing methods.

REFERENCES
- A. ASTM C790 - Use of Latex Sealing Compounds.
- B. ASTM C804 - Use of Solvent-Release Type Sealants.
- C. ASTM C834 - Latex Sealing Compounds.
- D. ASTM C919 - Use of Sealants in Acoustical Applications.
- E. ASTM C920 - Elastomeric Joint Sealants.
- F. ASTM D 1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- G. ASTM D 1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
- H. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

Specifier Note. *Do not request submittals if Drawings sufficiently describe the products of this Section or if proprietary specifying techniques are used.*

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE
- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform acoustical sealant application work in accordance with ASTM C919.

C. Prepare sample joints in the construction to demonstrate to the Architect the quality of the work to be performed. Accepted sample joints will be used to judge the quality of the work.

QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

B. Applicator:
   1. Prequalified applicator specializing in performing the work of this section with minimum three years experience and approved by manufacturer.
   2. This applicator shall be a licensed joint sealing specialty contractor.
   3. Submit a list of completed projects of similar local sealant applications.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 COORDINATION

A. Coordinate work under provisions of Section 01039.

B. Coordinate the work with all sections referencing this section.

1.9 WARRANTY

A. Provide five year warranty under provisions of Section 01700.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air-tight seal, water-tight seal, exhibit loss of adhesion or cohesion, or do not cure.

C. Upon written notification of failure due to defective materials or application, repair or replace failure to the approval of the Architect and at no cost to Owner.

PART 2 PRODUCTS

Specifier Note: *Materials can be specified by proprietary name, by detailed description of sealant characteristics, by reference standard, or can be specified in a combination of the three methods. If specifying in combination, ensure accurate coordination of text without contradiction.*

Specifier Note: *If referencing to ASTM C920 in any of the following paragraphs, identify the classifications that are desired. The Type, Grade, Class, and Use classifications are fairly general and should not be relied upon for explicit quality or performance requirements.*

Specifier Note: *The following sealant types can be identified, for purposes of editing this section, by low, medium, and high performance capability. Specifier notes in this article will assist in defining sealant types identified in the schedule at the end of this section and will assist in categorizing sealant "relative "performance characteristics. Many characteristics can be used to categorize sealants; elongation movement and recovery are the most common sealant function.*

Specifier Note: *Other Sections referencing this section contain a statement which identifies the type of sealant required; ensure the identified sealant type is included in the sealant selections below; edit accordingly.*

Specifier Note: *The "Type" designation in the Paragraph title of sealant types, is to assist in sealant scheduling.*

2.1 SEALANT AND MATERIAL MANUFACTURERS

A. Following is a list of acceptable manufacturers of sealants and sealant materials. Inclusion in this list is not intended to imply that all manufacturers make all products. Products made by listed manufacturers must comply with all specified requirements.
   1. ______________________.
   2. ______________________.
   3. ______________________.

B. Substitutions: Under provisions of Section 01600.

2.2 SEALANT TYPES

Specifier Note: *A low performance sealant will exhibit a relative elongation capability of 0 to 3 percent after curing, with full recovery.*
Specifier Note: *A medium performance sealant will exhibit a relative elongation capability of 7.5 to 12 percent after curing, with full recovery.*
Specifier Note. *A high performance sealant will exhibit a relative elongation capability of 15 to 50 percent after curing, with full recovery.*

A. Single-Component Polysulfide (Non-Sag): ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, M.
B. Multi-Component Polysulfide (Non-Sag): ASTM C 920, Type M, Grade NS, Class 25, Use NT, A, M.
C. Multi-Component Polysulfide (Self-Leveling): ASTM C 920, Type M, Grade P, Class 12.5, Use T, A, M.
D. Multi-Component Polysulfide (Water-Immersible): ASTM C 920, Type M, Grade NS, Class 12.5, Use NT, A, M.
E. Single-Component Urethane: ASTM C 920, Type S, Grade NS, Class 25, Use NT, A, M; USDA and FDA status.
F. Single-Component Urethane (Self-Leveling): ASTM C 920, Type S, Grade P, Class 25, Use T, A, M.
G. Multi-Component Urethane (Gun-Grade): ASTM C 920, Type M, Grade NS, Class 25, Use NT, A, M.
H. Multi-Component Urethane (Self-Leveling): ASTM C 920, Type M, Grade NS, Class 25, Use T, A, M.
I. Single-Component Silicone (Non-Acid Cure): ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, M; USDA and FDA status.
J. Single-Component Silicone (Acid Cure): ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, M; USDA and FDA status.
K. Acrylic-Latex Caulk: ASTM C 834.
L. Butyl Rubber: Federal Specification TT-S-001657.
M. Bedding Compound: For installation of thresholds and similar items indicated to be bedded in sealant, use a preformed butyl-polyisobutylene sealant tape. Size of tape as required for the specific application.

2.3 SEALANT COLORS

A. Provide materials matching colors indicated or if no color as indicated, matching the color samples selected from those submitted to the Architect.

2.4 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: Round, closed cell polyethylene or butyl rubber backer rod; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions.
D. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Do not proceed with sealant work until the sample joints specified in Part I of this Section have been prepared and accepted by the Architect.
B. Install sealant in accordance with manufacturer's instructions.

Specifier Note: *Indicate in the following paragraph, either the "required" joint width to depth size OR the desired width/depth ratio of the sealed joint based on anticipated joint movement, frequency of cycling, and temperature and environmental variations expected.*

C. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.
D. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
E. Install bond breaker where joint backing is not used.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
H. Tool joints concave unless detailed otherwise.

3.4 CLEANING

A. Clean work under provisions of 01700.
B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01500.
B. Protect sealants until cured.

JOINT AND SURFACE SCHEDULE

Specifier Note. *Provide a schedule for differing types of sealants, locations, colors or other factors identifiable by schedule.*

Specifier Note: *Consider a low or medium performance joint seal to aesthetically conceal a static joint or junction between two adjoining and perhaps but dissimilar materials. Consider a high or medium performance joint seal to achieve a seal at a dynamic moving joint or junction, a vapor retarder joint, or an air seal joint between two materials, spaced from each other.*

Specifier Note: *Drawing details should illustrate a joint sealant neck thickness dimension of 50 percent of nominal joint width. The sealant bond surface area on each side should be 75 percent of nominal joint width.*

Specifier Note: *The following examples may assist in developing such a schedule.*

A. Pedestrian and Vehicle Traffic Joints - Provide one of the following for each joint type:
   1. Multi-component polysulfide (self-leveling)
   2. Multi-component urethane (self-leveling)
   3. Single-component urethane (self-leveling)

B. Non-Traffic Deck Joints - Provide one of the following for each joint type:
   1. Multi-component urethane (gun-grade)
   2. Single-component urethane

C. Vertical Joints - Provide one of the following for each joint type:
   1. Single-component polysulfide (non-sag)
   2. Multi-component polysulfide (non-sag)
   3. Multi-component urethane (gun-grade)

D. Expansion, Control, and Perimeter Joints - Provide one of the following for each joint type:
   1. Multi-component urethane (self-leveling)
   2. Single-component urethane; use only where dynamic movement will not exceed 50 percent of joint width - above or below grade
   3. Single-component urethane (self-leveling)

E. Curtain walls and Related Assemblies - Provide one of the following for each joint type:
   1. Single-component silicone (natural cure)
   2. Single-component silicone (acid cure)

F. Non-Moving Joints, Interior and Exterior: Butyl rubber.

G. Water-Immersion Areas - Provide one of the following for each joint type:
   1. Multi-component polysulfide (self-leveling)
   2. Multi-component polysulfide (non-sag)

H. Glazing - Provide one of the following for each joint type:
   1. Single-component silicone (natural cure)
   2. Single-component silicone (acid cure)

I. Wood Window Glazing - Acrylic-latex caulk.

J. Acoustical Sealant - Provide one of the following for each joint type:
   1. Acrylic-latex caulk
   2. Butyl rubber

K. Kitchen Areas: Sealant complying with FDA requirements for use in food areas - Provide one of the following for each joint type:
   1. Single-component urethane
   2. Single-component silicone (non-acid cure)
   3. Single-component silicone (acid cure)

L. Toilet and Bath Areas: Sealant containing a fungicide for mildew resistance - Provide one of the following for each joint type:
   1. Single-component silicone (non-acid cure)
   2. Single-component silicone (acid cure)

M. Exterior Doors and Windows: Sealant used for exterior joints or butyl rubber.

N. Interior Doors and Windows - Provide one of the following for each joint type:
   1. Acrylic-latex caulk
   2. Butyl rubber

O. Built-In Cabinet Work: In kitchen, toilet, and bath areas, as specified for those areas. In other areas, single-component silicone (acid or non-acid cure) or acrylic-latex caulk.

END OF SECTION

Because there is little in the way of apprenticeships and training, most of the manpower is imported from Asia. That involves a difficult administrative process which can take up to six months to complete.

Overcoming the language barrier is critical to keeping work performance at its most effective level, so special consideration must be given to translation both on the job site and in written documents. This is especially applicable when translating between English and Japanese or Chinese, when often there is no direct correlation between words. Fletcher also provides housing, transportation, meals and other accommodations for imported workers.

There also remains a difference in the perception of quality, safety, skills and production output between Asian crafts people and their U.S. counterparts. "We have to ensure that our Asian workers understand our expectations and that construction practices in the United States are more stringent than in many parts of Asia," said Watts.

Delivery of materials is another consideration, because it usually takes three to four weeks for items to be shipped to the area. Even items that are typical construction materials in other places may not be stocked on Guam, so contractors must forecast as accurately as possible to ensure the needed materials arrive when they're ready to use them.

Senior staff typically stay on the island for several years and then move to other company offices. This continual staff change is challenging; however, change is a fact of life on

The Galleria at Tumon Bay provides a fun shopping and dining experience.

Guam. A company's ability to redefine itself and adapt is important to its longevity.

Asian and Western Values

The biggest lesson Fletcher Pacific has learned over the years is the necessity of cultural sensitivity. There are profound differences between Asian and Western business practices. They include simple matters such as the manner of formal address, and complex issues such as the subtleties of non-verbal communication and conflict resolution.

"It's not enough for us to know how to behave; we also have to help our Asian business partner understand Western practice, too. That requires the deft skills of a statesman, because it's important to help people understand Western practices but never cross the line into judging another culture," Watts said.

However, Guam has a special way of making all these contrary forces work for the island's benefit, and even the current economic doldrums in Asia have not hampered the island's outlook. Even though the Japanese economy still reels from the yen-dollar exchange, March tourist arrivals were up 4 percent over 1997. Guam tourism tends to do better during economic downturns, when people still vacation, but look for somewhere less expensive than, for example, Hawaii. Guam and Saipan have established themselves as credible tourist destinations with first-class facilities, so there is a continued interest in tourism-related development.

The economies of other Asian countries such as Taiwan and Korea also will turn around, and when they do, Guam and Saipan will be as attractive as always. "We anticipate long-term interest in the islands by developers from these countries, and I expect to see investment once the Asian economies return," Watts said.

In fact, Fletcher considers its biggest success to be construction for the tourism industry. A landmark project is the Galleria for DFS at Tumon Bay, which bills itself as the world's first experiential shopping arcade and includes Planet Hollywood, a Warner Bros.' store and The Disney Store. The project lights up the north side of Tumon Bay and has received several awards.

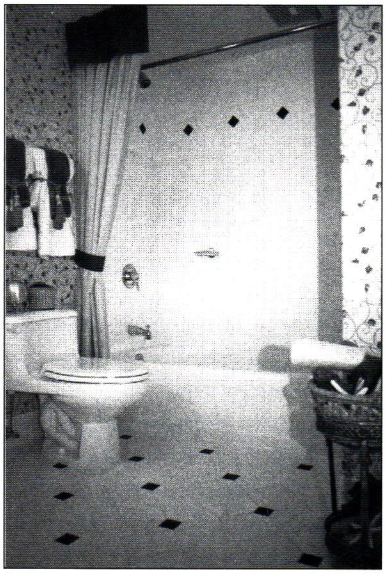
"The commitment made by DFS to develop this amazing arcade, and by Guam residents and tourists to support it, shows the island's commitment to developing truly world-class facilities," Watts said.

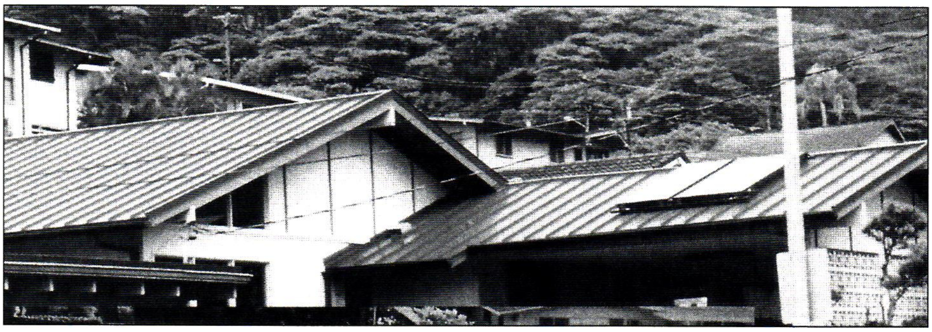
Fletcher expects construction activity on Guam and Saipan to rebound strongly in 1999, especially in the tourism and retail sectors. The company is prepared to help developers make their investments as successful as possible.

Maude Omai is marketing coordinator with Fletcher Pacific Construction, Honolulu.

Showcase

Roofing & Flooring



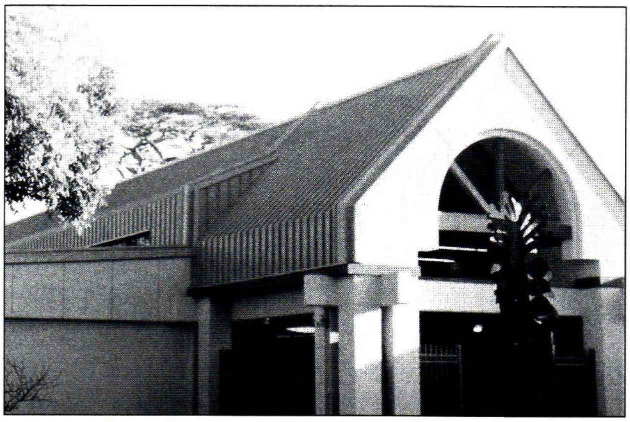


Riteway Builders, Inc.

This project called for Riteway to scrape off the entire roof down to bare lumber, and replace all termite-damaged lumber. Styrofoam insulation measuring 4 x 8 x 1/2-inches was installed, as were 1/2-inch plywood nailing strips. Riteway also installed aluminum paneling throughout the dwelling.

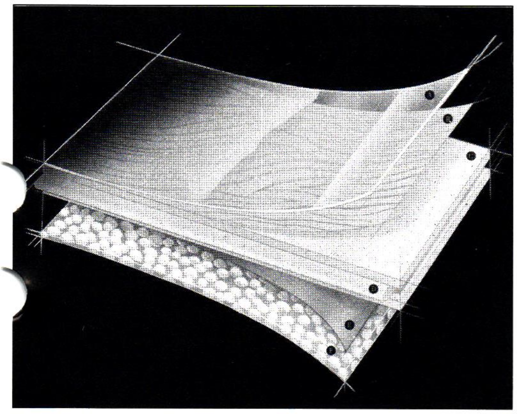
Central Pacific Supply Corp.

The homes at One Archer Lane feature ceramic tiled bathrooms designed by the project architect, Media Five Ltd. The tile was installed by craftsmen from HolBy's, Inc. The general contractor was Fletcher Pacific. The architect wanted to create a timeless yet contemporary look. Florida Tile's "Perfect Partners" series of floor and wall tile achieve the desired style and add to the beauty of the condominiums.



HPM Building Supply

Metal roofing's water shedding abilities are well known, and for this reason it has become a logical and popular roofing material choice in Hawaii. Many advancements have been made to improve appearance and reliability of metal roofing. These include the development of more versatile patterns of corrugations, more corrosion-resistant materials and dramatically improved paint systems and accessories. These technological advances have served to make metal roofing an even more reliable and beautiful roofing material choice.



World Carpet

World Carpet is a local supplier of Formica Flooring, which recently announced that its 15-year comprehensive warranty now covers water damage in addition to manufacturing defects, wear, fading and stains. All Formica Flooring is available in three systems of wood patterns:

- blocked designs with 2 1/2-inch strips representing standard narrow hardwood floors,
- blocked designs in 2 1/2-inch strips with matching end blocks for a seamless appearance,
- designs in a wide plank system for a broad lumber effect.

Opportunities exist for architects, investors and operators

Hotel Development – Asian Style

by Bret Smith

Although current economic conditions in Southeast Asia have put some development plans on hold, good opportunities are still on the horizon for hotel owners, operators, architects and other construction professionals.

Economic recovery in Southeast Asia will occur, but economists have varying opinions regarding when, how, and what will happen.

Traditional Balinese architecture is observed in the design of the Aston Bali Resort & Spa in Nusa Dua.

When these economies do stabilize, hotel developers will place less emphasis on the potential for financial returns based on real estate appreciation of hotel properties, and more emphasis on developing successful hotels with operating profits and cash flows resulting from proper market analysis and feasibility studies which dictate the appropriate facilities, quality standards and budgets for new properties. If this scenario sounds familiar, it is because the hotel industry in America experienced the same cycle of over-developing hotels based on real estate appreciation during the 1970s and early 1980s.

When new property development opportunities do return, foreign owner/investors, design professionals and operators should prepare their representatives for the unique challenges that are common to working in rapidly developing Third World countries.

Owner - Investors

Foreign ownership of hotel properties in Asian countries can be very lucrative, but foreigners must be prepared to negotiate in an environment with values that may be contrary to your own culture, education and professional experience. Negotiating a joint venture agreement is likely to take much longer than you anticipate depending on the experience of the local partner, the authority that their representative has to make decisions, and the level of understanding they have regarding the type of operation you are developing. You should select a reputable attorney practicing in the local area, an owner's representative with local language skills, and allocate significant time for your corporate representative to spend away from the office to negotiate the contract.

Hotel contracts are particularly complex for those who have not owned or operated a hotel previously. In general, the joint venture agreement will be in English which is likely to be the second language for your local partner.

It is difficult enough to read legal documents for those whose native language is English, so imagine the difficulty your partner will encounter in trying to decipher the agreement. Be patient and willing to explain every detail that is included.

You should also be prepared to discuss contractual details in face-to-face meetings, complete your meeting with an understanding that you are in agreement, and find yourself meeting again to discuss the same issues during repetitive meetings until your partner fully understands what the agreement says. Meetings are generally face-to-face rather than by fax, telephone or other electronic means, resulting in additional costs.

Do not underestimate the ability for your future partner to negotiate. What may seem like a lack of understanding to you, is probably a strategy to win on your partner's side. You may find a "win at all cost" philosophy with some Asian partners. You may consider many of their proposals unfair and unconventional. Be patient, explain your position, and be flexible. You may find yourself negotiating for days over an issue that is only worth a few hundred dollars per year. Sometimes it is better to give in.

Good communication among all parties involved can lead to outstanding results, as exemplified by the Aston Bali Resort & Spa.

Be prepared that after you have spent all of this time preparing a detailed legal document, your partner will file the agreement away and tell you "Now this is the way we are going to work together" even though it is contrary to the agreement. This can be irritating and against everything you understand about contractual agreements and business integrity, but be patient. Continue to demonstrate the value you bring to the venture and work on gaining your partner's trust and confidence. Be selective on which issues are worth the battle. You should make it clear from the beginning which contractual issues are sacred to your agreement and stand firm when these issues arise.

(Continued on page 18)

Design Professionals

Many foreign design firms working in Asia are contracted to provide design development drawings to local A/E firms who prepare working drawings and specifications. This can be frustrating because in many cases, the level of documentation that is provided by architects and engineers in the United States is more complete than the construction drawings that are provided by the local A/E firms in other countries.

The foreign owner should be involved in selecting the local design firms. All design development documents and the level of detail that will be delivered should be clearly defined. The level of detail that is required in the construction documentation package should also be clearly stated in the contract agreement.

If possible, the local A/E firm(s) should have a project architect based in the foreign architect's office during the design development stage. This will provide a better understanding of the design intent to the local A/E representative, the level of detail that is required, and the ability to better manage the construction documentation phase.

Similarly, the design architects should have a representative from their office based in the local architect's office during construction documentation to help ensure the quality of the work, clarify design intent and answer questions. Personal representation is the best way to manage this process.

Patience and the ability to teach are absolute requirements when working with Asian A/E firms. You should review the local design team's work products, illustrate what is required, and teach them that you have the same expectations for the next area they are working on. They may start to understand after you have explained your requirement several times for the same issue. Then they will return the next day and do it the old way again. It may be the language barrier or trying to break established methodologies, but managing the local design team is a full time responsibility.

Operators

Hotel management companies working in Asia will find negotiating management contracts very similar to owner/investor negotiations. However, operators should be careful not to underestimate the lead time it will take for pre-opening hiring, training, marketing and sales activities.

The general manager should be hired nine to 12 months and the executive team hired five to six months prior to opening. Staff training may require two to three months. Again, patience is critical. Trainers will need to repeat their instructions many times and still may not get what they want. Training is an ongoing process.

The management contract should clearly specify what services are included in the pre-opening fee, technical services fee, and reimbursable costs for the opening. The costs of pre-opening activities are significant and owners tend to incorrectly think these costs are included in the operating management fee.

New opportunities for hotel management companies include condominium conversions. The condominium market in many locations in Southeast Asia has been over-developed. Many of these condominiums are being converted to service apartments or hotel condominiums due to the over-supply of condominiums.

Hawaii experienced this cycle, creating opportunities for management companies to convert condominiums to hotel condominiums or timeshare units which are now prevalent in Hawaii. These same opportunities currently exist in Jakarta, Manila, Bangkok and other locations in Southeast Asia.

Bret Smith is president of Property Development Resources. The company provides consulting and project management services to property developers and operators throughout the Pacific Rim including Hawaii, Guam, Saipan, Thailand, Indonesia and the Philippines.

Award of Merit

Office, Commercial & Industrial

Kauahikaua & Chun Architects

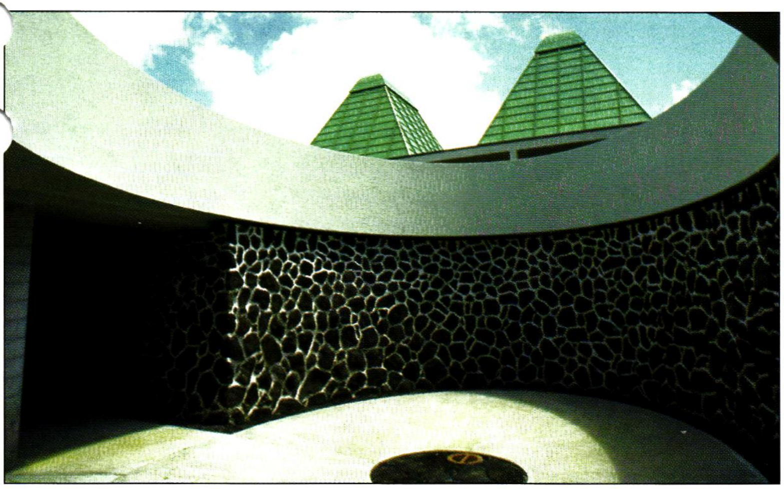
Center for Hawaiian Studies, University of Hawaii at Manoa

The Hawaii State Legislature and Board of Regents desired a landmark building embodying the University of Hawaii's commitment to the Hawaiian people and culture. Kauahikaua & Chun Architects incorporated that goal with design emphasizing the academic strength of the university in Asia-Pacific studies. The building meets the aesthetic goals.

Kauahikaua & Chun selected materials with contrasting colors, weights and textures, such as stone and glass. Stone was also used with high roofs to suggest traditional Hawaiian style. Indigenous materials such as lava field stone make up an extensive portion of the building materials used. The landscaping is almost entirely indigenous Hawaiian or Polynesian-introduced plantings.

The project validates the use of pre-1778 Hawaiian architectural forms in contemporary design. Of all the buildings on the University of Hawaii campus, the Center for Hawaiian Studies has perhaps the closest correlation between architectural style and the academic program housed within.

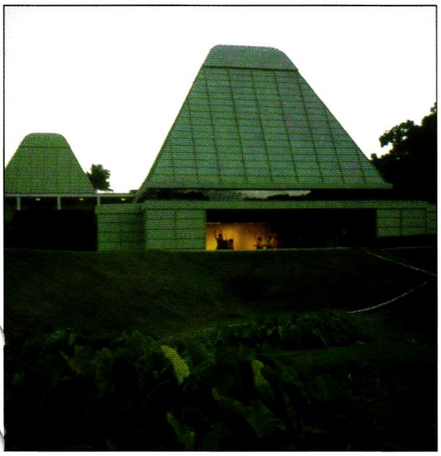
Thin concrete columns and fascia match the faculty housing in the background. The staircase follows the form of the Wa'ahila Valley beyond. (Top) Pre-contact Hawaiian buildings inspired the copper sheathing extending from the rooftops down to the ground.



Jury's Comments:

"Strong building forms achieve its intended public statement. A significant project in the continuing attempt to define 'Hawaiian Architecture.'"

An oculus draws daylight into the lower level.



Native stone revetment protects the foundations from Manoa Street flood waters.

Credits

Owner/client:
University of Hawaii Facilities Planning and Management Office, State of Hawaii Department of Accounting and General Services

Architect:
Kauahikaua & Chun Architects

Contractor:
T. Iida Contracting Ltd.

Consultants:
Civil:
Belt Collins Hawaii, Ltd.

Landscape:
Belt Collins Hawaii, Ltd.

Structural:
SSFM Engineers, Inc.

Mechanical:
Prepose Engineering Systems, Inc.

Electrical:
ECS, Inc.

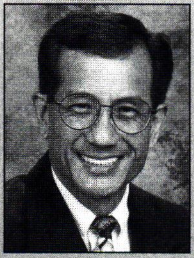
Acoustical:
Smith Fause & Associates, Inc.

News Briefs

New Projects at Expo

"Projects of the New Millennium," a display of upcoming large-scale projects in Hawaii, will highlight this year's Building Materials Expo, Aug. 19-20, 1998 at Neal Blaisdell Exhibition Hall.

The annual trade exposition is geared toward design and construction professionals. For more information, call 847-4666, ext. 206.

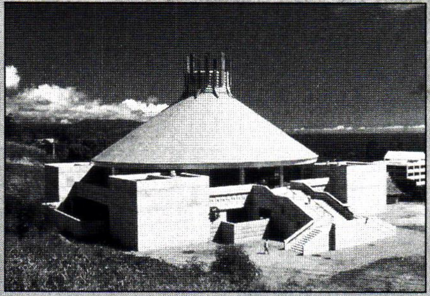


Benjamin B. Lee

Lee Named AIA Fellow

Benjamin B. Lee, Chief of Staff in the Office of the Mayor, City & County of Honolulu, has been elevated to the College of Fellows of the American Institute of Architects. Lee was elected to receive the honor because he has made "...dramatic contributions advancing the principals of design excellence at the City and County of Honolulu, and in doing so has improved the quality of life for the citizens and visitors alike."

Out of a membership of more than 62,000, there are fewer than 2,300 AIA members distinguished with the honor of fellowship.



Solomon Islands Building Wins Award

A Parliament building for the Solomon Islands designed by Wimberly Allison Tong & Goo, Architects, Planners and Consultants, has won its third U.S. Navy award — the NAVFAC Commander's Award for Design Excellence.

The building opened in November 1993 to coincide with the 50th anniversary of the World War II battle of Guadalcanal.

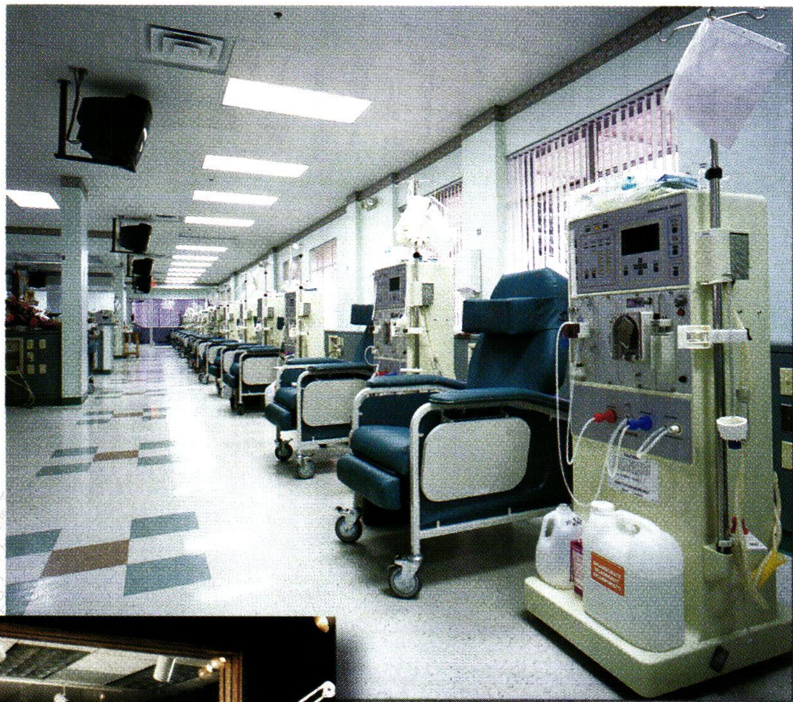
AM Partners Receives Interior Design Award

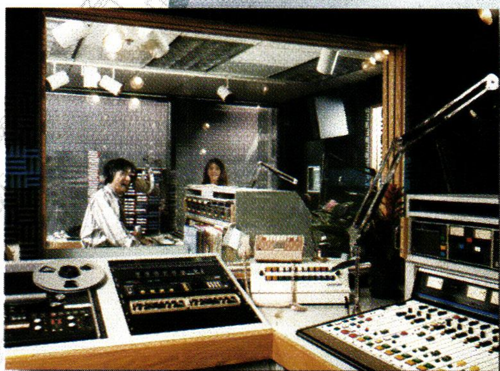
AM Partners, Inc., recently received the "Store of the Year" Grand Prize at the National Association of Store Fixture Manufacturers 27th Annual Awards Reception in Chicago. The Honolulu architectural firm was recognized for the design of La Pelle, an upscale leather goods store in the Ala Moana Shopping Center.

The design was challenged by a row of structural columns located off the centerline of the space. The simple yet elegant solution was created through a theme of curved forms and color contrasts. The columns became important accents when fitted with sculptural benches.

Don't Let a Good Plan Down...

with less than quality construction. Whether the job is new commercial, remodeling or expansion, fast track or minutely technical, small budget or big, hire the contractor who will make sure the design meets the measure of the dream in the real world — and save money, time and worry in the process.





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