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Cover: Photo montage by Ted Garduque
Indian architect C.P. Kukreja states the following in his book, *Tropical Architecture*: “The twentieth century has brought new dimensions to our living conditions and environment, through successive industrial and scientific revolutions. The invention of various ‘comfort gadgets,’ like air-conditioning, and the use of new materials and building techniques have altered our approach to the design of buildings. To practice architecture today one must have an understanding of the arts, science, and the technology of our times. For, though architectural principles may be universal, they have to be applied in a particular environment, and climate is the most important environmental factor to be considered in the design and construction of buildings.”

The world's critical energy situation has focused on the design profession's extravagant use of energy in many of their projects, and as a result, has refocused attention toward more efficient designs using nature's elements singularly and in conjunction with contemporary technology. I believe that the unique climatic conditions of our islands give us a “built-in” advantage over most areas of the world, but to be fully utilized, will take some relearning on our part. One of the most enjoyable and rewarding aspects of serving as your president is the exposure I have to other architects serving their chapters in a similar position. Along with the pleasure of making new friends, it is also comforting to find that they and their Excoms wrestle with similar problems of budgets, dues increases, membership drives, politics in and out of the chapter, program attendance, committee effectiveness, and the rest. This interchange of information and fellowship occurs for Hawaii delegates primarily at the Northwest Regional Convention and at Grassroots. This year, instead of the three separately zoned meetings normally held across the country, Grassroots 1981 was held in Washington, D.C., with presidents and presidents-elect from across the country meeting as a body.

Opening session officially began Wednesday evening, January 28; however, Francis Oda and I spent most of the day with the four members of Hawaii's Congressional delegation making a brief presentation of the Institute's goals for the 1980s. We were both most impressed by their interest, knowledge, and concern for the built environment.

All four have since received copies of the AIA's policy positions on housing and urban development, energy efficiency in buildings, professional liability legislation, and federal building design and A/E selection.

Our first full day started off with a colorful presentation by Texas Congressman Jack Brooks, author of the “Brooks Bill” that calls for the selection of architects by ability. He was followed by Vermont's Robert Stafford, who stated he will continue to push for the Public Buildings Act of 1980 that would require a design competition for all federal projects both large and small. Another interesting speaker was Maryland's Senator Charles Mathias Jr., who discussed product liability reforms with regard to our insurance premium problems.

Under the heading, “Ask not what your AIA can do for you, but what can I do for the AIA,” I would like a round of applause for our own Elmer Botsai. President Randy Vosbeck spoke of the Institute's seriously declining financial position over the past several years, their agonizing on how to broach the membership with a dues increase, and of Elmer's dramatic floor speech saying in effect, “To hell with a $10 increase, make it $35,” its passage resulting in an again healthy Institute.

Energy. I know I must be sounding like a broken record, however, if you haven't spent some time recently with your brother and sister architects on the mainland, or haven't kept abreast of what is happening in the schools of architecture, you're in for a surprise. The Institute is also moving full steam head to develop energy educational programs for the profession to keep the energy crisis from becoming a design crisis.

The Energy Professional Development Program is one of the first survival courses coming on stream, designed to teach yourself the skills required to implement BEPS. It was stated that designers can and should be able to use 40 percent less energy over designs of only five years ago. Seems to me a real opportunity to bring back regional architecture. This program will be presented over an extended time frame with advancement through four levels: (1) Basic Information; (2) Foundation for Architects; (3) Level of Knowledge Expected of Practicing Architects; and (4) For Architects Specializing in Energy on a Consulting Basis.

I'm told Will Rogers once said, "We Americans think we're pretty good, when we want to build a house we cut down a few trees, when we want to build a fire we dig a little coal; when these things run out, we'll see how good we really are." Keep up your design, ethical and educational standards and you should have no problem saying to the mirror, "Babe, you're good."
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The question central to this issue and to this article is “What is a Hawaiian architecture? Or — “Is there a Hawaiian architecture?” Many definitions and descriptions have been offered in this issue by design professionals and citizens concerned with the future development of our islands and involved to varying degrees in the past and present architecture we live with today.

Little, if any, of today's architecture could be labeled truly Hawaiian. There are many buildings and urban environments both new and old which exhibit characteristics that are pleasing, perhaps tropical, and if not indigenous to Hawaii, are commonly defined as Hawaiian because they feel good and respond sensitively to the surroundings, the climate, and our images of the “good life” in Hawaii. These buildings, mostly residential, represent an enduring and valuable reminder of Hawaii's past, and of the values and lifestyles that existed, and help to define and shape the architecture most of us so lovingly admire (and wish for) today.

This Hawaiian architecture can and should be utilized in defining and developing Hawaii's future architecture, especially its residential architecture. However, it has not provided the answers or the clues to our future direction in commercial and high-rise (C/HR) development.

Much of the C/HR architecture has been the result of poor, insensitive, or no planning. It has been pushed, pulled, and kicked by various economic interests. It has been designed as if it were to sit and “fit” in downtown Los Angeles, Houston, St. Louis, or Chicago, rather than specifically in Honolulu or the other developing urban areas of the islands. This is not to imply that our city is bad or that all of Hawaii's C/HR buildings are tasteful and insensitive. We have many notable examples of fine architecture to be proud of: aesthetically pleasing, highly functional, well-planned, and well-designed buildings. We still have a very comfortable, clean, and pleasing environment to live in.

We do not, however, yet have a C/HR vernacular that is truly “Hawaiian”; one that is sensitive to Hawaii's varied cultures, lifestyles, and climates. Can we or should we ever hope to establish a commercial and high-rise architecture distinctly Hawaiian? If so, why and how?

Our answer to the first question is not only that we can and should hope for it, but that we must strive for it.

Why? First, because of Hawaii's history, heritage, and pride — Hawaii is a special place and remains a paradise of the Pacific. We must not participate in its devaluation to “paradise lost.” We must cooperatively and creatively define and develop new ways for our architecture to become truly Hawaiian in spirit. We must sensitively consider and respond to our communities, cultures, and human needs to develop an architecture that will not only help to define more suitable and functional urban forms, but also inject more vitality, richness, and diversity into our lives.

The second reason is the most urgent and compelling: ENERGY! Energy has been frequently and accurately defined as one of our state's (and nation's) most pressing problems. Hawaii has and will continue to have a petroleum-based economy for decades, even if we become the leader in alternate energy sources. But rather than view the problems of energy with disgust or dismay, the architects and entire building industry of Hawaii must accept it as our greatest opportunity and challenge.


R. Randal Vosbeck, AIA president, recently said in the AIA Journal:

"Potentially, it (the energy crisis) can create a new design vocabulary and is far more revolutionary than anything that has happened since the Renaissance. By infusing the design process with energy consciousness, architects will pay more attention to bulk and mass and shape, to fenestration, orientation and daylighting — all those things we should do intuitively, but have been ignoring ... it really has the potential for changing the whole character of the built environment, for changing entire cityscapes."1

We must answer together, as a profession and an industry, how we are to create this new Hawaiian architecture. The ideas that follow are certainly not exhaustive or absolute and are intended instead to act as catalysts for thought and action.

First and foremost a united team effort on many levels in the building design process is vital. These team efforts must involve more than rhetoric. Without planned, patient, and executed action we will accomplish very little or it will be very slow in coming. We are already years behind. Active cooperation, communication, and interaction between all members of the building industry must occur, including clients, developers, contractors, Realtors, regulatory agencies, product manufacturers, researchers, the university, the design team including the engineers and architects, all associated professional organizations and unions, building and architectural journals, and last but not least our politicians and communities. This is the primary and perhaps most important HOW of them all!

Within the Hawaii Society/AIA there is a vital need for organizing an active and extensive system for intercommunication of new ideas concerning Hawaii's specific prob-

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A Path To Our Future

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As a profession, we are alone in our reluctance to share the fruits of our individual experiments, successes, and failures. Imagine if doctors and scientists were as reluctant to share their research as we are! The fields of science and medicine would be where the field of energy technology is today!

Within individual offices and firms there must be a commitment to the team approach in energy conscious design. The team must work closely together from the first day. An essential part of teamwork within the office is frequent and open communication of new ideas to stimulate growth and knowledge among the entire design team and staff. The energy conscious design firm must become as serious about energy savings in design as they are about structural integrity. A special consultant or energy engineer must be included on the team. This may or may not be the mechanical/electrical engineers depending upon their personal understanding of “architectural” energy analysis.

Board of Water Supply Bldg., 1958. Notice the effective sunscreen system of the makai elevation.

Hale Manoa, 1963. Proper orientation with effective horizontal and vertical shading.

Each design decision, especially the earliest ones, has an effect on the ultimate energy performance of the building. It is essential that the architect and the team understand the effects of those design decisions on energy performance. Some effects are obvious, but many critical ones are more subtle and complex and require in-depth computer analyses. Such services must be accounted for in the initial fee proposal and contract.

It is the architect's responsibility as a professional to demand satisfactory energy performance in each building design just as he demands structural integrity — and appropriate fees must be charged to ensure such performance. This issue must be addressed frankly and openly with each potential client if we hope ever to solve the problems before us.

The second how in the development of a Hawaiian architecture involves the development of responsible, realistic, and appropriate criteria, or standards for Hawaii. Preferably, these standards would be voluntary rather than mandatory — the “carrot” rather than the “stick.” The final outcome of this question may well rest on the architects' shoulders and their ability to be concerned and responsible; not only to get involved with the process of criteria development but also execute that criteria effectively in each design.

This situation may soon be influenced as much by client demand as it is by incentive and/or mandate. If we in the profession do not take the lead, legislative mandate will force action. This has already happened in California.

On the local level it is essential that we accept our opportunity to get involved as a professional community to help establish appropriate standards. Currently, Article 8 of the UBC is the only regulation on the books governing energy performance. It will continue to grow via revisions and additions as a result of input from both the private sector and government review agencies, especially the state Department of Energy.

UBC's Article B may be the state's only mandatory standards

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imposed unless the long-awaited national Building Energy Performance Standards (BEPS) pass their final hearings this spring and make it through Congress. If BEPS is passed without major revisions in the “energy source weighting factors” then Hawaii’s architects will be at a great disadvantage because of the poor rating allowed “all-electric” buildings.

BEPS is but one more reminder that local architects must get involved in order to define and protect our local interests, as well as identify and solve our unique design problems. It is even foreseeable in the future that architects may have to accept legal liability for the energy performance of their designs, which emphasizes the necessity for our concerned involvement.

The third ingredient involves knowledge, which we classify in two categories: design considerations and economic considerations. Knowledge involves the understanding of the multitude of design concepts and cost management systems associated with energy conscious design as applied to Hawaii’s and each project’s specific conditions and climate.

These concepts may well be influenced or dictated by the standards previously discussed, or they may be design elements which are utilized creatively to achieve such standards.

This is where uniqueness enters into the design process and where shared ideas (knowledge) are utilized by each design team to create sensitive, efficient, and diverse Hawaiian architecture.

Design considerations occur at all scales — urban and architectural. A few examples include:

1—A 24-hour mixed-use area where residences and offices share the same block (a concept used to influence traffic flow, commuting and parking, scale and density, building occupancy and utilization, and the rest.)

2—Proper shading on all glass exposed to solar radiation. This can reduce interior heat gain by 90 percent and is the most effective protection we can provide (far more effective and less obtrusive than reflective glass).

3—Maximum utilization of natural daylighting wherever possible and appropriate, by means of courtyards, skylights and shaded exterior windows.

4—Utilization of energy management systems to provide hourly, zoned control of all mechanical, electrical, and lighting systems.

5—Careful and studied use of natural ventilation where appropriate. (It is possible in high-rise office buildings — we just haven’t identified the solution yet).

6—Detailed energy programming during the initial schematic phase to satisfy both the clients’ needs and the energy performance criteria. Energy programming defines the energy demands of each department, space, or job. This program then translates into energy-zoning and space efficiency.

Economic considerations involve cost management, the means of ensuring that the functional components of the project perform at the highest degree of efficiency at the most economical investment cost without forfeiting quality. This too involves computer cost control and use of life-cycle costing and where appropriate, value engineering. Life-cycle costing defines the total costs of
A Path to Our Future

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ownership. In addition to the initial cost of the building and equipment, it includes costs of operation, maintenance, and replacement.

This is essential if clients are to receive the most building for their investment dollar, and it must be employed at all stages of design and development.

Number four involves the definition of human comfort in Hawaii's climate. This is a key question when examining the requirements for mechanical systems necessary to provide that defined level of comfort and also when examining the potential for using the natural elements for the same purpose. It is important that we clearly define our threshold between comfort and discomfort, and whether we are willing or capable today of accepting infrequent conditions of "discomfort."

This decision dramatically effects our peak-energy-load demands. It is an extremely controversial subject that must be more thoroughly researched and addressed by the local professional design community.

Our last idea regarding how we achieve a new Hawaiian architecture involves the challenge we have been offered. It involves vision by all involved, an expanded and creative vision into the future. It involves, more simply stated, a new way of looking at things to solve our problems. It involves creative research into new building materials and components for glazing, lighting, shading, natural ventilation, cooling, and building skins.

It involves some bold and daring "experiments" in design and construction to break new ground so we can all move ahead.

It requires courage, insight, and faith. Perhaps most importantly, though, we must begin to define the mind, the body, and the spirit of this new Hawaiian architecture so that once again we may all take pride and pleasure in its existence.

HAWAII ARCHITECT
The Real Issues: An Interview with Elmer Botsai
by WILL BEATON AND JAMES N. REINHARDT, AIA

(The following excerpts and ideas are taken from a conversation with Elmer Botsai, dean of the School of Architecture, University of Hawaii at Manoa. Although most of the statements are not direct quotes, we have tried to capture the essence of his responses as accurately and colorfully as they were presented.)

Hawaii Architect: Is there an identifiable Hawaiian architecture today?
Botsai: No, there certainly is no Hawaiian vernacular, for we haven’t been around long enough to establish a style as has been the case in Europe and Asia. There are perhaps residential characteristics that are called “Hawaiian” but they are more the result of migrations than of a specially developed Hawaiian architecture.

As for commercial and high-rise development, there isn’t yet a U.S. commercial vernacular, and certainly not a Hawaiian one. There are many reasons for this. Foremost is that it takes time, generation upon generation of developed, shared ideas, and we haven’t had that here. Secondly is that urban growth and the bulk of development has only occurred recently in relation to Hawaii’s history of 200-plus years and much of that development has been influenced by modern economics and mainland migrations — thus destroying any pure “regionalism” that may have existed before that surge. But other parts of the world have lost their vernacular too, and were also affected by the international movement.

If one is to examine “style” it must be in regards to housing, but “the weakest point of Hawaii’s building industry is the housing — I think the housing stock smells.” Why? “If you look at the price of land and housing in this state, it’s got to be the lowest use return on the invested dollar in the U.S., if not the world.”

H.A.: Why has there been such a lack of development adapting to and taking advantage of the local climate — or “climatic architecture”?
Botsai: This question must again be answered in relation to the residential sector. First of all, Hawaiians are outdoors people and historically lived in simple dwellings whose foremost purpose was to provide protection from the elements. Migrations occurred from all parts of the Pacific, Asia, and the U.S.

The cultural heritage from which the new housing sprung was one of low housing standards and not a rich housing heritage. Much of what transpired were tracts of housing totally foreign to this climate — one most notably being the transplanted southern California suburban tract. But many of the buyers were willing, even desiring, to accept this status quo.

Other situations which have influenced or demonstrated this lack of sensitivity have been the exorbitant cost of land, the lack of appropriate building materials suited to this climate and the buyers’ acceptance of what is being provided.

“There will be no change until the buyers become educated and get wise to the fact that they are being shortchanged. The construction industry has also accepted these limitations and not searched out new solutions to these specific local problems.”

H.A.: What are your views concerning energy efficiency in design?
Botsai: “Apart from the fact that all housing in Hawaii should be naturally ventilated and not air conditioned, I can’t make a case for energy conservation in housing except for looking at the total energy required to produce and deliver appropriate building materials.

“Energy” is not in short supply — only petroleum. Unfortunately, that affects our local situation more than on the mainland since they have coal, hydro and other sources more readily available to supplant oil-base power.

“I hate to say this but the response to the energy shortage seems to be a typical kneejerk, unstructured reaction. The people of the U.S. are impatient and want answers now! What is important, however, is whether the right questions are being asked. I think not.”

Energy efficiency must be balanced against other design considerations, i.e. structure, life safety and privacy/security. These conditions are more influential in high-rise construction, especially residential. “I don’t believe in sacrificing fundamental life safety considerations for energy efficiency. More people are killed in residential fires each year than any other cause, except for autos. We also cannot forget about the potential effects of tsunamis, earthquakes, and the rare but devastating hurricane that can occur here.”

Energy efficiency is affected, however, by certain fundamental design considerations that too

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Hawaiian Architecture

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often are not considered a priority. Most important among these include orientation of the building; its relationship to site, landscaping, and other structures; solar shading and the placement and size of windows and other penetrations in the skin.

"These are important and should be major considerations in the design of every building. However, high-rise buildings are a different ballgame altogether and I'm not sure I could solve all the difficult conflicts between life safety, privacy, and energy efficiency."

The new technology, however, is still to be scrutinized. Some concepts, such as solar cooling have still not proven efficient or cost effective. Other technologies, which are already developed for other purposes have not been offered to us in new forms and should be explored, such as microwave hot water heaters.

Again, the problem is asking the right questions, and the profession is not seeking the proper answers — we still are too affected by the vogue and are not adequately involved with research. The AIA research is good but too little and will not/cannot identify or answer Hawaii's particular problems. Therefore, those answers must come from the local professionals and the university.

We are trying to ask the right questions and teach the students (and hopefully professionals) to ask those very questions."

H.A.: Are Hawaii's architects sensitive to "Hawaii" and its unique characteristics?

Botsai: They certainly are not insensitive — not most anyway! Most or many seem concerned but don't have the answers and don't have the time to look for the answers to solve all the problems we are facing. I certainly do not feel this is wholly the fault of the professional.

"First of all I don't know the answers and I believe they are beyond the grasp of a single generation.

"If we are trying to define "Hawaiian architecture" and energy efficient architecture, we can look to the past but I don't think we'll find the answers. What is intrinsically Hawaiian about C.W. Dickey? Is a double-pitched roof any more "Hawaiian" than a single pitch? It certainly is a beautiful form, but somewhat arbitrary and capricious."

A typical description of "Hawaiian architecture" is predictable: Open plan, low eaves, pitched roofs with overhangs, oriented to the wind, with generous lanais. But these images of old are not going to solve today's problems, especially in high-rise construction.

"We must begin to demand adequate fees . . ."

Land is less available and very costly; construction costs are skyrocketing and lifestyles are changing.

"We need to learn to share our new ideas as we begin to experiment; for the transfer of knowledge is essential for the growth of such an architecture and the profession. Law and medicine have an extensive and sophisticated structure for communication and sharing, but the architectural profession does not — and the professional journals too often emphasize the wrong things or aren't sensitive to Hawaii's problems. This is something that we must solve here in Hawaii."

In addition the "market" must reorient itself and put its money where it really counts.

"The bankers, the developers, the Realtors don't argue about the price of land, the price of money, the price of streets and utilities, the processing costs, and the rest, but they do argue about building costs with their cries for 'economic feasibility.' They want 'social responsibility' but at no extra cost.

"The dollars are going to the wrong places. Their priorities are wrong and until they change, the architect will seldom be able to provide buildings that are worthy of our community and our people. It's our buildings which last and should not be the target of constant and indiscriminate budget slashing — we all suffer as a result.

"We've got to put the squeeze on the government to set up a stable loan market."

Related to this is the problem of the architect having inadequate time to find new answers to the "right" questions — and this requires time for research and design. Too often the developer or client won't allow adequate design time.

"We must begin to demand adequate fees to find the answers. We are 'professionals' and must accept the responsibility to pursue and apply appropriate new ideas. We must also represent ourselves as responsible professionals. This is where we've brought the problems on ourselves. If we'd charge what we're worth, clients wouldn't quibble. Fixed fees are crazy — percentage fees too.

"We aren't selling products — we're selling opinions and time. Seldom do clients haggle over fees or opinions with lawyers or doctors, but we are constantly faced with the dictates of others' opinions and demands. We've got to find an acceptable compromise if we're ever going to being to solve our real problems."

H.A.: What is your image of a future "Hawaiian" vernacular and how do we get there?

Botsai: "I don't really know how to predict what it will become, but we do need to search. I believe we
must accept Honolulu as an urban city — and a successful one. There's no blight, it has a strong neighborhood structure, and a healthy, alive downtown core which is not being killed by suburban shopping centers.

"Initially the answers will arise at the residential level, because experimentation is more common and acceptable since the budget is larger relative to the invested dollars. But this alone will not translate into a modern 'Hawaiiana,' applicable to commercial development as well.

"We must look forward. I don't want a future that looks backwards. We must find new forms — both urban and architectural that fit our unique circumstances. I strongly believe it must be a series of criteria — not styles. If we work from criteria we will have excitement and diversity rather than sterility and redundance that results from the dictates of 'style.' Architects should remain concerned with their personal styles, but augment this individualism by utilizing the standards of the new criteria.

"We must commit ourselves to creating buildings which enhance our surrounding. We're still too concerned with producing 'publishable buildings' to the detriment of our environment. An example would be several of the new glass buildings which don't enhance their environment. They are too individualistic and are rude neighbors."

Architects must also utilize their skills as urban designers in designing to fit each setting. This is particularly critical in multi-family housing, large housing tracts, and new urban development.

"We must fully realize the limitations of our resources and take full advantage of each and every opportunity offered us. I am really tired of laws and regulations that restrict our good judgment, but if we architects continue to be irresponsible, we will continue to feel the burdens of new laws."

This does not have to be our fate. We have the knowledge, the skills, the concern, and the spirit to develop an exciting, diverse, livable, humane Hawaiian architecture if we choose to accept the challenge together.
A tropical building would invite me to enjoy its shade and protective overhang even as a passerby. Should I wish to enter, I would be greeted by shaded courts, plants, and trickling water surrounded by spaces bathed in filtered sunlight. As I push a window, it would actually open and tree-cooled breezes would refresh me. The building would not loom or glint or give me an icy stare; it would just smile.

Smiling tropical buildings are rare and endangered for, like the nene and palila, they have been eliminated in the name of progress. They also seem to reproduce very slowly. That is not to say that they are not being husbanded by eminent architects such as Val Ossipoff whose Pacific Club, C. Brewer offices in Hilo, and numerous residences smile at me graciously.

If we are to encourage the significant growth of tropical architecture, however, we have to look at the very foundations of our lifestyle and laws. We require an efficient working day that is often contrary to climate and relies on conditioning. Our need for safety makes illegal the natural ventilation of modern high-rises. We need quick transit and multi-laned freeways. We have a high concentration of people doing business in a high-rise downtown. These are a few characteristics of our society endangering our tropical life-style as much as our tropical buildings.

Are we willing to change? If we do change, our architecture will surely follow.

Francis S. Oda
Group 70, Inc.
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Nostalgia may cause some people to desire building designs that could make better use of our natural climate. Many will point to the “good old days” when there wasn’t a means to improve on our wonderful climate. The population densities and people’s expectations of the future in Honolulu are

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One of the most difficult architectural decisions to make in Hawaii is how to design. It's easy enough to follow mainland precepts: discover the program of needs (how much space is necessary for the obvious requirements, how much for non-essential but desirable wants and how much will be left over, if any), see how all of this fits the site, cut and twist the program until it works well (perhaps brilliantly) in the space available, and then project it into elevations that reflect the current, fashionable mode.

These translations of the program into architecture may be simple and ingenious, as so many of our new condominiums are; they may be tinged with modernist cliches, as are so many of the buildings on the University campus; or they may, in this day and age, contain partially concealed historic allusions. That is, they could be contemporary, or modern, or post-modern. Those seem to be the "styles" that are followed today, and if anyone is to be admired in Hawaii, one certainly can't be out of step with current practice.

Once in a while, though, an architect here breaks the mold. The program is considered not a rigid statement of required needs, but a spark to stimulate the imagination: demands are fixed, of course, but in a way that starts the mind working instead of stultifying it. Perhaps space is needed for living — but in what way? As one does in Dubuque, Iowa, or in a way appropriate to our peculiar climate and particular winds and views? Maybe there is a call for a work area. What sort of work, under what conditions? Pleasant, uncluttered, calm, in the way most indoor labor in this balmy atmosphere has always been accomplished — or tight, hurried, constricted, as so many of the daily stint areas on the mainland are designed?

A great deal of the translation of the program, as it turns out, will affect the appearance of the building. A house or an apartment will be turned to catch the almost constant breezes, and will be open to the sun to catch all the radiance we can. An office building will allow the clean fresh air that we still have here into the building (being careful, of course, that notes and papers remain fixed in their places), and will allow most daylight work to be done in the good abundant light that nature obligingly provides.

At least that used to be true. It was true when architectural design was primarily a matter of fitting the requirements to the site and its peculiarities. But we've become sloppy and careless. Now we work backwards: the site is studied for its maximum use and requirements are fitted into the space indicated. If the balmy breezes blow in the wrong direction, or if the natural daylight isn't available, these difficulties can be solved by mechanical means. We have a great portfolio of modern techniques at our command: an artificial environment to substitute for nature's own; a mechanically lighted interior to take the place of that provided by the sun.

I've remarked before that the ability to use engineered means of shaping the climate to suit us marked the end of architecture as we had known it through the ages. It meant that an architect no longer had to study orientation, wind movements, the direction and intensity of the sun.

"Architecture," said Le Corbusier, "is made from sun and space." Again we are thrown back on them. The sun is as essential as it always was; space is needed to catch all the radiance we can.

Suddenly we realize that we have been completely careless of the way we use energy. It becomes something to be consumed sparingly; it is scarcer, and is becoming terribly high priced as natural resources dwindle. We study ways to conserve it, to spread its essential uses wisely instead of lavishly.

Many still are prodigal in its use, they point to nuclear fuel, which they tell us can be produced, gradually, less expensively than at present. But here in Hawaii we are fighting against the disposal of its wastes (still an unsolved problem) in the Pacific — along with most of our neighbor islands.

Suppose we forget, for the moment, the substitutes for oil and coal and begin again to design as we should, anyway, in Hawaii. Let's face the fact that energy is going to become increasingly difficult to obtain. Let's get ahead of the rest of America and find a design solution without it. Eventually, in Hawaii, we will have all kinds of alternatives that will in time be usable. But they'll always be expensive and will always have to be used economically.

No other place in the world has the advantages we have: the sun itself, shining most of the time; the wind, almost constant; the sea around us, with its geothermal changes; the volcanoes with their inexhaustible energy. They all offer us great design opportunities.

Why not develop an architecture of our own that makes full use of our peculiar characteristics? In the first place, let's think: why do we need energy in our buildings in Hawaii? Surely not for heating. Lighting can be minimal, depending on the orientation of a building. Air conditioning? We got along without it at all, until perhaps 1930.

Let's turn back the clock and, instead of depending on a manufactured environment, pretend that again we don't have it. It will be uncomfortable at first, on a wet, humid day with a sharp kona wind, and we'll wish we owned it, but...
such days pass quickly and the sun and the trade winds come again.

Hot water? We need energy for that, and for the myriad gadgets that we've become used to around the house, particularly in the kitchen. Here's where Hawaii's substitutes will come in: solar energy, wind power, geothermal and other expedients. What design opportunities! A solar panel catchment itself can be a hand-

Definitions

Continued from Page 21

going to preclude returning to the "veranda" type designs of a simpler time.

The necessity to ameliorate the living and working space of the tens and hundreds of thousands of people in an urban setting will continue the space conditioning practice. Innovative designs may aid in the stabilization of the dramatically rising costs of providing a comfortable environment. But the only long term and significant relief from cartel manipulated energy pricing or cheap oil will be to produce local substitutes for imported oil, in abundance, to begin to slow down the hurtling rise in the cost of the style of life we have become very accustomed to.

John P. Keppeler II
John P. Keppeler II, Inc.
Energy Consultant

There is one major area of resistance to energy-conscious design, and that is a lack of awareness. This is particularly acute at the stage of project conception and design. The two factors critical to this initial phase of the project are developers and architects. They must accept and employ passive design techniques in new projects — and see results — in order for passive design to become an integral part of land development.

Richard Kawakami
Energy Administrator
Study of Energy-Conserving Development Regulations

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"The design and construction of human dwellings and settlements in a region are influenced, besides other factors, to a great extent by the climate and physical environment of the region. In constructing shelters for himself over the centuries, man has always taken into consideration these factors, sometimes consciously in a systematic way but more often unconsciously by following the traditional methods of planning and construction.

However, these traditional methods themselves are the result of generations of planning which have taken into consideration the local technology, materials, climatic factors, and social conditions. The tropical countries, with their varied climatic, physical and social environments, still retain and reflect these traditional features of planning in their buildings and towns to varying degrees."

Before American society changed the forms of Hawaii's lifestyle, culture, and physical surroundings, tropical architecture in this traditional sense was found throughout the islands. The basic Hawaiian house was a response to the needs of a basic agricultural society. The surrounding countryside provided the building materials: timber, bamboo, and thatch.

The rhythm of life included time for building as much as cultivating or fishing. Everyone was a house-builder to an extent; monetary transactions were minimal. Buildings were based on low investment and high maintenance.

From the arrival of the first missionaries and whalers, this society began its transition to one virtually indistinguishable from a mainland one, except in relatively small areas where the traditional ohana survives.

A contemporary lifestyle requires durable, comfortable and permanent furnishings and materials, and usually provides little time for maintenance or repair. (One can anticipate the reaction of a mortgage lender or real estate broker when presented with plans for a townhouse with thatch roof and bamboo walls.) Current attitudes toward material ownership as well as the unfortunately increasing need for security make it difficult to achieve a traditional level of openness in planning and design.

Also, as cheap electricity became widely available we could artificially produce an enclosed climate, and the traditional tropical features of buildings which responded to the climate of the site were no longer important. It is to be expected then that architecture as a response to social conditions and needs would change as those conditions and needs changed.

The constant element throughout this process of social change is the climate. One should expect to find tropical architecture, to the extent that climatic factors influence it, in tropical areas. Perhaps one of the reasons it is scarce in Hawaii is that this is not a truly tropical area for the most part.

The large land masses of tropical Asia, Africa, and South America will have consistent weather patterns, depending on the seasons, due to the large distances over which conditions stabilize. Small low islands cannot influence their local climate and maintain a constant temperature depending on wind and water temperatures. Only larger high islanders develop the patterns of rising and falling air masses which cause cooling of the air, rainfall on windward sides, dryness on leeward sides, sea breezes, and the other climatic variations we experience here.

The results of these wide va...
rieties in cultural and ethnic back­
grounds and in site climate condi­
tions make it unlikely that a uni­
form “tropical architecture” would
(or should) be found among the
houses in Hawaii. Yet satisfying the
requirements of lifestyle and cli­
mate is a basic goal of traditional
homebuilders, one which should
be met in the houses we design in
Hawaii. Not all of them do.

There are several basic ele­
ments of traditional tropical
houses which should be reviewed
and considered when any house is
designed here, to see to what de­
gree each of them applies to the
problem at hand. The first element
is a high pitched roof, which serves
the purposes of encouraging rapid
rainwater runoff, and creating high
interior spaces for an upward flow
of warm air.

Rainwater runoff is of less con­
cern with modern building ma­
terials than it was with thatch, yet
the moss-covered wood shakes
which can be found on newer lower
pitch windward roofs testify to the
need to pay attention to this issue.

The upward flow of warm air is
perhaps the most important single
condition to achieve in a success­
ful tropical house, since an ade­
quate natural ventilation system
can almost ensure a comfortable
house in Hawaii while an inade­
quate system will ensure discom­
fort. The ability to

close vents is also important when
we consider that some houses in
valleys only 10 minutes from Waikiki rely on fireplaces in the winter
to control dampness and cold.

Sun control through overhangs
or other devices is a simple but
often neglected element. Many
tract home designers and builders
minimize the length of overhangs
to save material or to limit dis­
tances between units to code mini­
mums. The result frequently is an
uncomfortably warm interior as the
sun heats up east, south, and west
walls, which transmit that heat to
the residents inside.

Again, the particular site climate
should dictate the length of over­
hang and degree of sun control re­
quired, with hot leeward areas
needing more than cloudy wind­
ward areas.

The proper selection and use of
building materials and colors is an
important element. Masonry con­
struction is frequently used in hot,
arid climates for its thermal fly­
wheel effect, which stores heat
during the day, keeping it from the
occupants, and releases it during
the cool nights, warming the in­
teriors. This flywheel effect is not
as workable in Hawaii where the
day/night temperature differential
may be only 10 degrees instead of
80.

The principle remains the same,
though, and dark-painted west
walls of houses and apartments
can render the interiors almost uninhabitable early in the evening
and into the night. The use of large
expanses of west-facing unpro­
tected glass can turn an otherwise
well-designed home into a solar
cooker as the short-wave light
radiation enters the room and the
long-wave heat radiation builds up.
Pulling the drapes to cut off the
heat only substitutes semi-dark­
ness at the expense of view and
ventilation.

Although this discussion has
focused mainly on houses, the
same principles apply to multi­
family buildings as well. Town­
house buildings can achieve the
same or perhaps better vertical air
circulation than single family resi­
dences, due to their generally
being at least two stories in height.
Single level apartments are more
difficult, with only the upper floor
units able to use pitched roofs, but
cross ventilation is easily effected
in all but double-loaded corridor
buildings.

Sun control is a major element
Continued on Page 26
the Out Basket

SPECIFICATIONS WORD PROCESSING

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Elements

Continued from Page 25

to be considered in multi-family buildings. Site requirements usually dictate building orientation, so west-facing glass is common in apartments, but lanai overhangs and sun control devices can alleviate much of the solar heat problem.

Exterior fabric sunshades are used, but are subject to deterioration from sun and wind. Rolling metal blinds can block all of the sun's heat, but block daylight and ventilation with them, and give a typhoon shelter appearance which may not be desirable. More elegant solutions could be devised, including wood shutters or bamboo shades.

There are also energy implications to these elements. A pie graph would show the greatest amount of residential energy goes to heat water, which of course can be provided by solar systems. Inventive solar installations can use collector panels as sunshades, thereby both using the sun's heat productively while preventing it from entering the building.

The greatest portion of the remaining energy use goes for appliance operation, which is not affected significantly by proper de-
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actor: Hawaiian Dredging
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Elements

Continued from Page 26

...sign except if the appliances include an air conditioner. There should be no need for mechanical devices to control climate in a properly designed residence in Hawaii except for particular site conditions or owner requirements.

What results from considering these elements is a set of principles which can be applied to our residential design projects to produce appropriate and acceptable tropical architecture, within the limits of climate and client dictates. Not tropical as a contrived postcard "style" but tropical as a natural development of the project conditions.

First, consider the site climate for amount and direction of wind, rainfall, and sunlight.

Second, design a building volume which, while satisfying the other program requirements, permits a free flow of air throughout.

Third, control the flow of air with adjustable sidewall openings.

Fourth, select materials and colors which absorb or reflect an appropriate amount of heat.

Fifth, cover the structure with a roof which shades the sidewalls adequately, extends wide enough to protect the openings from rain and sun penetration, and provides adequate ventilation high in the enclosed space.

If these principles are already being applied in your design work, you are probably producing the tropical architecture from which Hawaii should benefit. Your clients should be pleased with the results, and you probably will be also.

Footnotes

3 Kukreja, p. 3
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The architect of Hawaii who accepts and embraces daylight as an important design determinant will have the double reward of creating new and exciting building forms while saving significant amounts of electrical energy. Consider the following facts:

1—In Hawaii, the ambient light level is 100 times greater than is needed for efficient task performance inside buildings.

2—Most commercial buildings consume more than 50 percent of their energy for electric lighting, most of which is used during daylight hours.

3—Even though fluorescent lighting is very efficient, north sky or indirect daylight is four times as efficient as fluorescent in its ratio of useful light to heat. Daylight does not necessarily increase the heat gain in a building.

4—The technology already exists for introducing daylight deep into the interior of a building and controlling it around the perimeter. There are two reasons for studying solar shading and daylighting in Hawaii: for thermal and visual comfort and for energy conservation. These reasons are explored in more detail below:

Thermal and Visual Comfort

In Hawaii’s climate, thermal and visual comfort can be achieved through straightforward architectural means without resorting to mechanical and electrical systems. The environmental issues of light and heat are interwoven, since the provision of light results in an unwanted byproduct: heat. Reference to Victor Olgyay’s bioclimatic chart reveals the parameters of thermal comfort.

When the air temperature climbs above 70 degrees Fahrenheit (which happens in Hawaii every day of the year), shading from the direct radiant heat of the sun is the easiest way to extend the limits of the thermal "comfort envelope." Many buildings which do not have solar shading and control devices use reflective or heat-absorbing glass instead. This treated glass is not as efficient as shading in stopping heat gain to the spaces within.

It is interesting and informative to compare the efficiency of various light sources expressed as a percentage ratio of light to heat:

<table>
<thead>
<tr>
<th>Light Source</th>
<th>Percent Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>incandescent</td>
<td>13</td>
</tr>
<tr>
<td>fluorescent</td>
<td>22</td>
</tr>
<tr>
<td>direct sunlight</td>
<td>35</td>
</tr>
<tr>
<td>blue sky</td>
<td>80</td>
</tr>
</tbody>
</table>

It can be seen that north sky daylight is four times as efficient as fluorescent lighting in its ratio of useful light to heat.
lighting is four times as efficient as fluorescent in providing light without concomitant heat gain to a space. This would be important for thermal comfort in either a naturally ventilated or an air-conditioned room.

The primary purpose of most lighting systems is to enhance visual performance while providing visual comfort. It is generally accepted that effective sidelighting provides less veiling reflection, improved contrast and thus greater visibility than equivalent footcandles from most overhead lighting systems. Daylighting produces modelling effects which, if carefully controlled, are often pleasing and desirable.

Since the eye and brain evolved under daylight conditions, the color temperature is very pleasing and color rendering properties of daylight are excellent.

In tropical latitudes, the ambient light level is 100 times greater than is needed for efficient seeing or task performance inside buildings. Sky glare and direct beam lighting are highly undesirable for comfortable seeing environments. The problem in daylighting is therefore one of re-directing and diminishing ambient light so it can be delivered in a useful form to interior spaces. This process should have the combined effect of reducing heat gain

Continued on Page 32
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Design for Daylighting

Continued from Page 31

to the interior and enhancing visual performance and comfort.

Energy Conservation

Shading of glass from direct sunlight will reduce heat gain to interiors by as much as 90 percent. If daylighting is to be a concern, tinted glass or mirrored glass are no wise choices to reduce heat gain. Not only do they not admit sufficient light but these treated glasses are not as effective in reducing solar heat gain to interiors as is the physical shading of the glass. While solar shading is necessary for comfort in any space, the energy conservation value of solar shading is greatest in those buildings which require air conditioning. As an example, in Honolulu 50 square feet of unshaded southeast-facing glass require one ton of air conditioning a 9 a.m. on January 21, just to compensate for direct solar gain to the space.

The energy conservation argument for using daylighting in commercial buildings is threefold:

1—Electrical energy savings. A 3 watts/square foot installed power with 2,500 hours-per-year of use there will be a consumption of 7.5 kilowatt hours (kwh)/square foot/year for lighting. Savings of 50 percent are realizable in the periphery zones of most buildings with a well designed daylighted system incorporating on-off or dimmable controls. Thus, up to 4 kwh square foot/year can be saved. Since electricity costs 7 cents per kwh, this has an economic value of about 30 cents/square foot/year. In large buildings these savings become significant in absolute dollar value.

2—Reduction in peak power and air conditioning costs. Charges for peak power demand may represent a significant fraction of a firm's total electric bill. Consider a typical all-electric office building in Honolulu in which 50 to 80 percent

SEMINAR SCHEDULE

WEDNESDAY, March 11

9 a.m., State City: Catalytic for Affordable Housing
10 a.m., Ronan Corp.: Specialty Flooring, Coatings, Waterproofing
11 a.m., Division of Occupational Safety and Health, Hawaii's OSH Program in the 80's
12:30 p.m., Hoo Hoo Club: Lumber Grading
2 p.m., Masonry Institute: Masonry Construction Procedures
3 p.m., Panel: Resourceful Planning for Housing in the 80's
4 p.m., HIC & D: Dames & Moore; The Design of Terrace Wall
5 p.m., Honolulu Federal Savings: How to Build Tax Deferred Dollars
6 p.m., Cocktail Hour
7 p.m., BIA General Membership Meeting

THURSDAY, March 12

9 a.m., HECO: SBA: Bucks, Bonds & Bargains
10 a.m., Huberti Corporation: Latest Concepts in Dishwashers
11 a.m., Home Owners Warranty Program
12:30 p.m., Hoo Hoo Club: Lumber Grading
2 p.m., Hawaii Pest Control Association: Changing Times in Pest Control
3 p.m., Cement & Concrete Products Industry: Masonry in Home Construction

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of energy consumption results from lighting. Assume that one-third of the usable floor space is in the perimeter zone next to windows. Thus, the maximum potential daylighting savings is one-third of the 50 to 80 percent or 15 to 25 percent of total energy. This maximum potential can be realized at peak conditions when ambient light levels, solar heat gain and electric power consumption are all at their greatest.

Under peak load conditions, typical cooling loads are 5 to 10 watts/square foot. This is an air conditioning load of about one ton of cooling for every 350 to 700 square feet. Of this, about 3 watts/square foot represents lighting. With a net coefficient of performance of 2, the cooling power requirement is then 2.5 to 5 watts/square foot.

Under peak load conditions if we turn the lights off in one-third of the

Continued on Page 34
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The cost of new power plant construction is in the range of $2.00 per peak watt of installed power. In a new building, a 100 square foot office with lighting at 3 watts/square foot requires an investment by the utility of $600 in new generating capacity if the lighting and air conditioning is a contributor to utility system peaks.

3—Increased failure tolerance. The electrical supply in Hawaii is adequate; however there are at times citywide and regional power failures due to storm conditions and equipment failures. In a commercial building which does not depend entirely on electrical illumination, activities will be less subject to disruption during times of power failure.

Worker productivity is possible to quantify and has often been used in the argument for increased use of air conditioning. In fact, high lighting levels have been sold on the basis of increased worker productivity. Assume that an office worker with attributable indirect costs and overhead charges added to salary costs a company $40,000 per year. The worker occupies a 100 square foot space in the building, works 250 days, thus costs $160/day ($1.60/square foot/day or 2 cents/square foot/hour). Lighting, at 7 cents/kwh costs up to 60 cents/square foot/year. As a result, savings in productivity in a daylighted office due to the continuation of productive work for even twenty minutes during a blackout or power loss is equivalent in dollar value to an entire year's worth of energy savings!  

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