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journal of the hawaii society/american institute of architects

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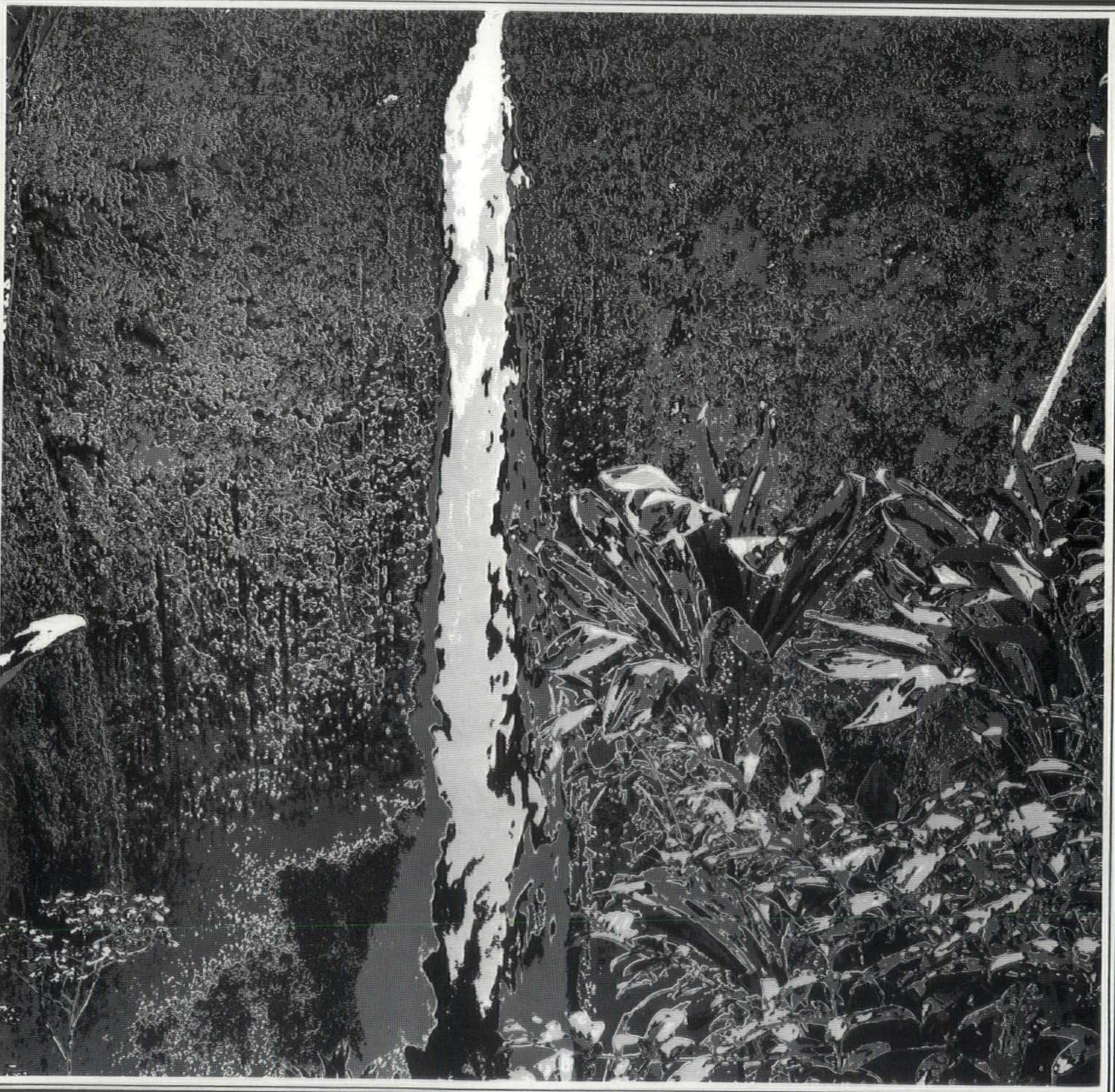
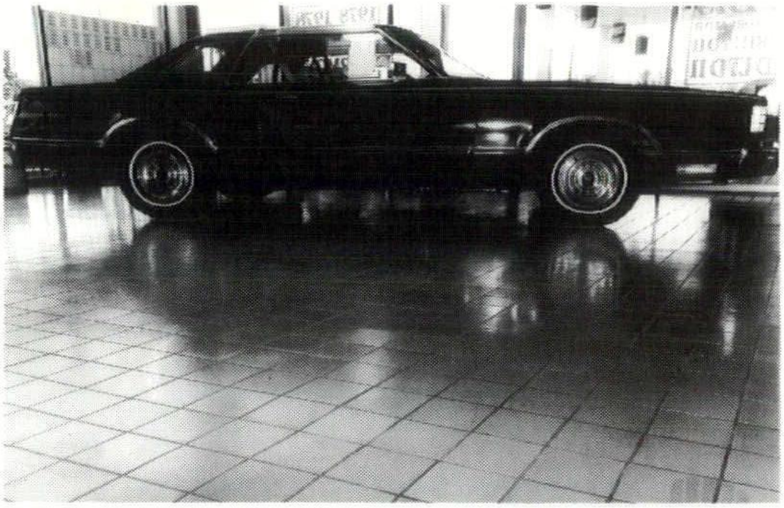
HAWAII ARCHITECT

MARCH, 1978

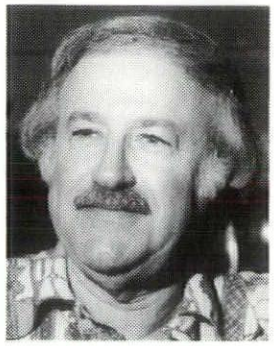
Water





Ceramic Tile in Cutter Ford showroom reflects the beauty of this 1978 Ford LTD. Richard Cutter, general manager, also shown here, points with pride both to facilities and sales records of the company. General contractor for the Cutter Ford facility: Harvis Construction Inc., Honolulu, and Raiser Construction of San Mateo, California.

Indoors and out Ceramic Tile helps display and sell for Cutter Ford



Richard Cutter

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HAWAII ARCHITECT

March, 1978

Hawaii Architect is a monthly journal of the Hawaii Society/American Institute of Architects. Subscriptions are $10 per year. Opinions expressed are those of the editors and writers and do not necessarily reflect those of either the Hawaii Society or the AIA.

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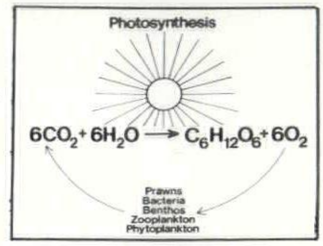
Published by:
Crossroads Press, Inc.
863 Halekauwila Street
P.O. Box 833
Honolulu, Hawaii 96808
Phone No. (808) 521-0021

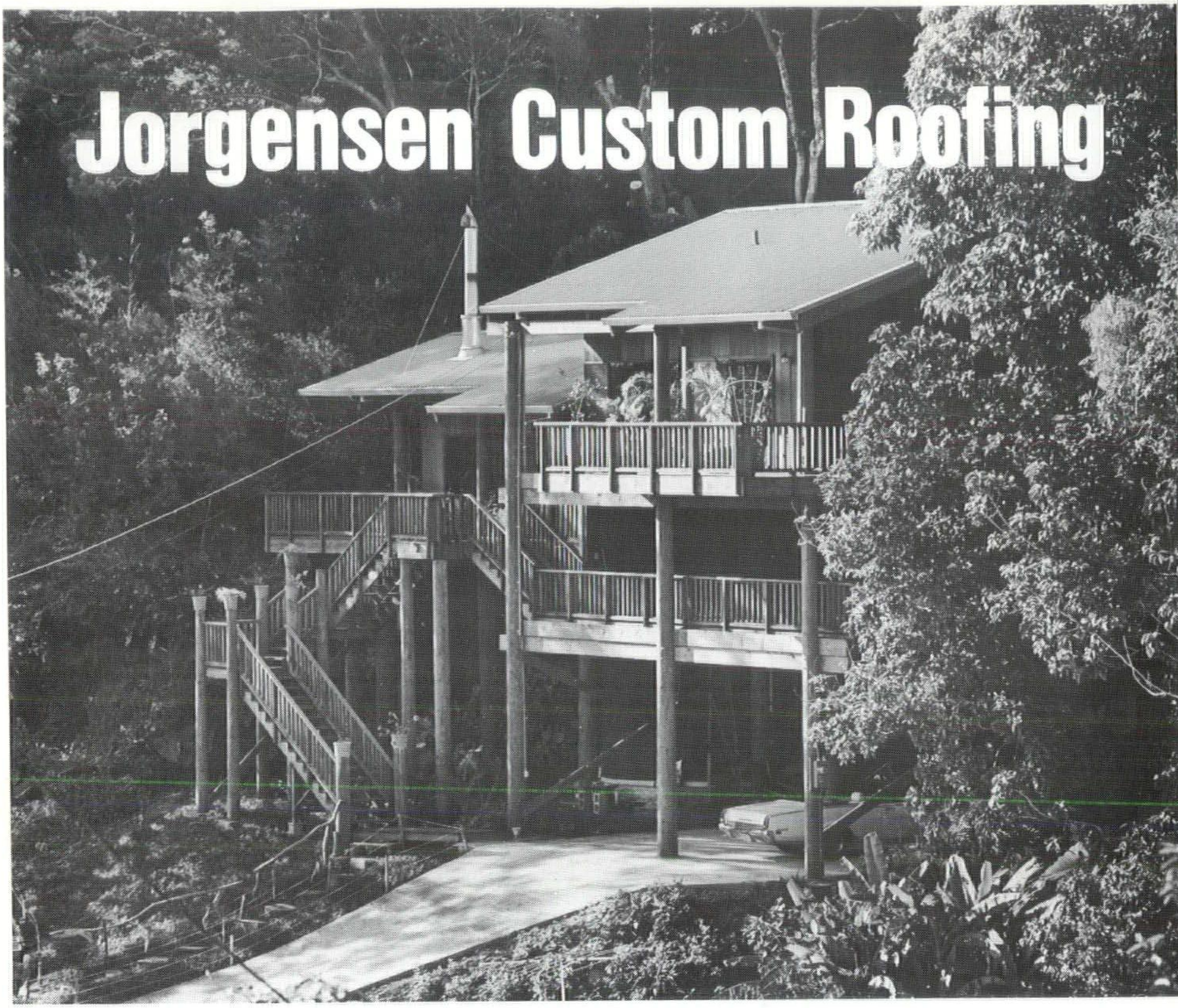
Stephen S. Lent, Publisher
William B. Roberts,
Advertising Director

Hawaii Architect (063170)
controlled circulation
postage paid at Honolulu, Hawaii

Contents:



Cover Story: A striking effect of dynamic Akaka Falls on the Big Island is produced by high contrast posterization. The photo was reproduced from a serigraph by Hans H. Juette. This artwork commissioned by Hawaii Architect. For more waterfalls see page 10.


Jorgensen Custom Roofing

Water Conserving Fixtures

by GLENN E. MASON, AIA

Architects are in the position of being able to encourage water conservation in very direct ways. New construction and remodeling of commercial, institutional, and residential buildings offer possibilities for significant savings not only of water, but of water and sewer charges to the consumer.

Literally dozens of new products are now on the market which offer water savings; so many in fact, that it is impossible to cover even the general principles of all categories in the space provided here. Nor is that necessary: some of the categories of water-saving devices are very expensive and probably nearly impossible to get locally; some require the expenditure of energy as a water substitute which can rarely, if ever, be justified in our energy importing economy. Therefore this discussion is limited to some of the most promising and interesting conservation fixtures.

About 45 per cent of the water which passes through indoor fixtures is literally flushed down the toilet. Since this is the largest single user of water the average household has, it will be considered first. Subsequent installments of this water conserving fixtures series will cover fixtures used for bathing and personal hygiene and kitchen fixtures.

CONVENTIONAL TOILETS

Within this group there are variations in design which can save thousands of gallons per year per household. Unfortunately there is some tradeoff between the noise produced and amount of water used in a toilet. This is because generally the more pressure the water exerts in the flushing action, the less water is needed. This is why the old two-piece toilets with a detached tank hung high on the wall and a washdown bowl used only two and one-half gallons per flush.

The most commonly used arrangement in residential use today uses a two-piece toilet with tank attached and a bowl using a siphon jet action. These tanks use about five to seven gallons per flush.

Water displacement devices can be added, ranging from the plastic bleach bottle filled with pebbles and water to commercially available water dams; but experimentation must occur to determine that proper flushing action is not impaired.

The siphon vortex uses an action which causes the water to swirl in a strong vortex motion. It is the quietest fixture in residential use. It is often made in a low silhouette one-piece unit, which is also the greatest water user, requiring from six to eight gallons of water per flush. The one-piece flush valve toilets of either siphon jet or blowout actions use about four and one-fourth gallons per flush, or about 12.5 per cent less water than tank type toilets.

URINALS

Water consumption of urinals varies widely with the flushing action and type of urinal. The floor-mounted stall type urinal uses only about one gallon per flush, as do wall hung urinals with a washdown action. The next most efficient is a pedestal urinal with a modified washdown action, which uses about one and one-half gallons per flush.

Any unit which uses a siphon jet action will be quieter, but uses about three and one-half gallons per flush or four gallons with the blowout action.

SHALLOW TRAP TOILETS

This is a relatively recent variation of the conventional floor mounted close-coupled toilet. It looks similar to conventional toilets with a smaller tank provided. The smaller diameter, shallower trap leaves less water and hence less inertia for the siphon jet action to overcome. The toilet requires only three to three and one-half gallons per use, saving at least 15 per cent of all water consumed within the home.

The unit cost is about 10 dollars more than the equivalent conventional unit. Presently the unit is not carried in all colors or style lines, but this promises to change.

Manufacturers include: American Standard—*Water Saving Cadet;* Briggs—*Conserver;* Crane—*Water-Economy Siphon Jet;* Eljer—*Emblem;* Kohler—*Water Gard;* and Mansfield—*130-8.*

WASTEWATER RECYCLING TOILET SYSTEMS

This is essentially a conventional water flushing toilet with an aerobic on-site wastewater treatment system. The water is treated, charcoal-filtered, and reused. There is practically no water consumption beyond the initial charge. It presents no aesthetic problems but its cost is in excess of $2,000, limiting its use to areas where access to conventional sewer systems are non-existent.

Manufacturers include: Aera-filt; Multi-Flo; and Thetford.

None of these is available locally.

PRESSURIZED FLUSH TOILET

This toilet uses a combination of pressure and gravity to propel waste on its journey. It uses about two quarts of water per flush, a substantial savings, but requires the hookup to a small compressor. It is installed conventionally except that it needs only a 1½-inch soil line instead of the conventional 4- or 5-inch lines.

The vitreous china model is available for a little more than $300 on the Mainland, Savings could be effected by ganging the units or in a high-rise structure where a common pressure line could exist. The

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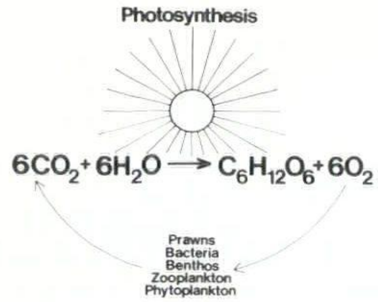
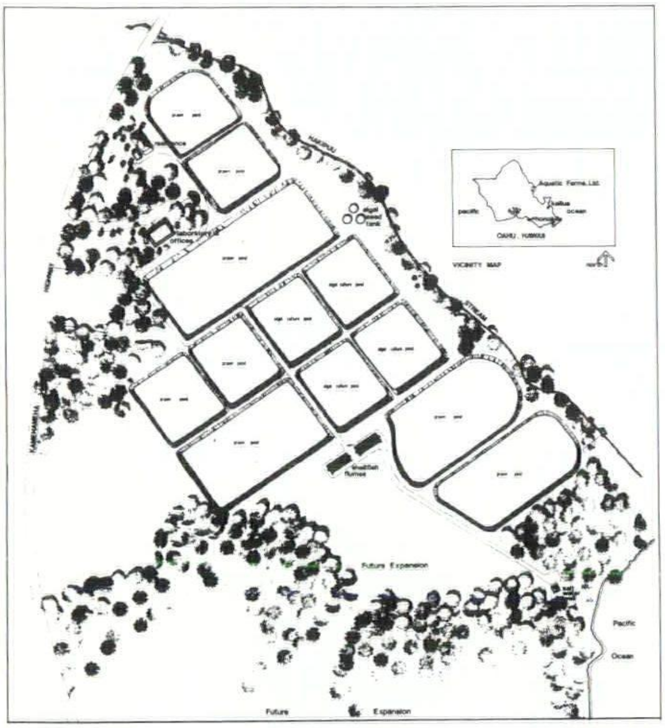


Aquaculture and Hawaii's Water Resources

by LINDEN A. BURZELL, Ph.D.
Vice president, Aquatic Farms, Ltd.

Linden A. Burzell, Ph.D., is vice president and a founder of Aquatic Farms, Ltd. He is the acting chairman of the Hawaii Prawn Farmers Association and a member of the Hawaii Governor's Aquaculture Advisory Council. His research background is in aquatic microbiology, especially as related to aquaculture development.



Aquaculture is the cultivation of aquatic plants and animals under conditions more or less dictated by man. As such, it is even more dependent than terrestrial agriculture on a reliable supply of high quality water. If Hawaii's fledgling aquaculture industry is to grow in line with its demonstrated economic and technical potential, and basic water policy decisions to be made in the next few years must be compatible with aquaculture needs. Clearly, accurate information about the aquaculture industry is basic to developing rational policies in this field.

In this context, it might be interesting for Hawaii Architect's readership to consider a few facts about aquaculture as it relates to the use of water.

First of all, aquaculture is not necessarily as big a consumer of potable water as is generally believed. Generally speaking, most tropical freshwater aquaculture (including the cultivation of freshwater prawns and many species of fish) need only consume enough water to compensate for evaporation and seepage losses from ponds. There need not be much, if any, net flow through such ponds under normal operating conditions.

With careful pond design, siting, and construction, the actual consumption of water on a per-acre basis can be less for pond aquaculture than for many terrestrial crops, including sugar cane and certain types of diversified agricultural produce. As an example, Aquatic Farms' prawn operations in Windward Oahu use less than three gallons per minute per acre of pond surface under normal conditions.

Aquaculture can figure prominently in systems for the multiple use of water. Perhaps the simplest such system, and the only one currently employed in Hawaii, involves the use of water first for aquaculture and subsequently for the irrigation of terrestrial crops. In many cases, effluent from aquaculture facilities has been rated by terrestrial farmers as superior to virgin groundwater for irrigation purposes.

Aquaculture technology is rapidly developing to the point where it can be a significant element in the reclamation of sewage effluent. Municipal sewage represents a tremendous potential water resource that becomes progressively more attractive as the costs of developing new sources of water continue to increase.

It may soon be practical, under certain circumstances, to produce aquaculture crops of commercial value in advanced waste treatment systems that also give substantial yields of high quality irrigation water. Particular emphasis can be expected on crops for purposes other than direct human consumption. Potential examples include seaweeds grown for their extractable colloid content, certain fish for animal feeds, aquatic plants for fermentation leading to the produc-

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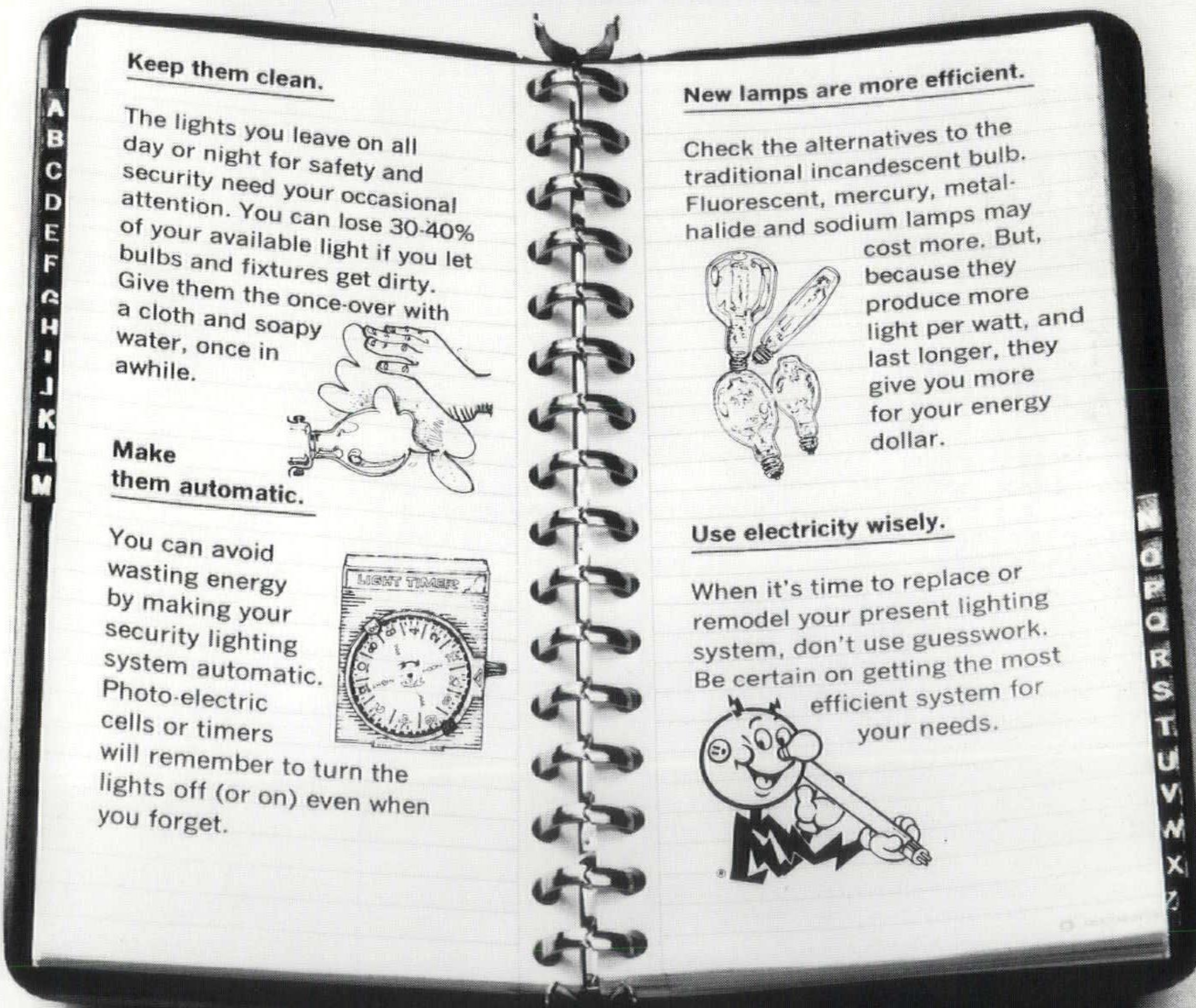
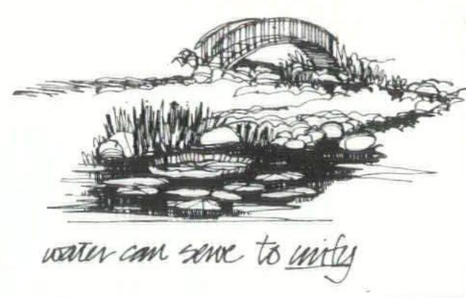
FACTS ON LIGHTING EFFICIENCY



HAWAIIAN ELECTRIC



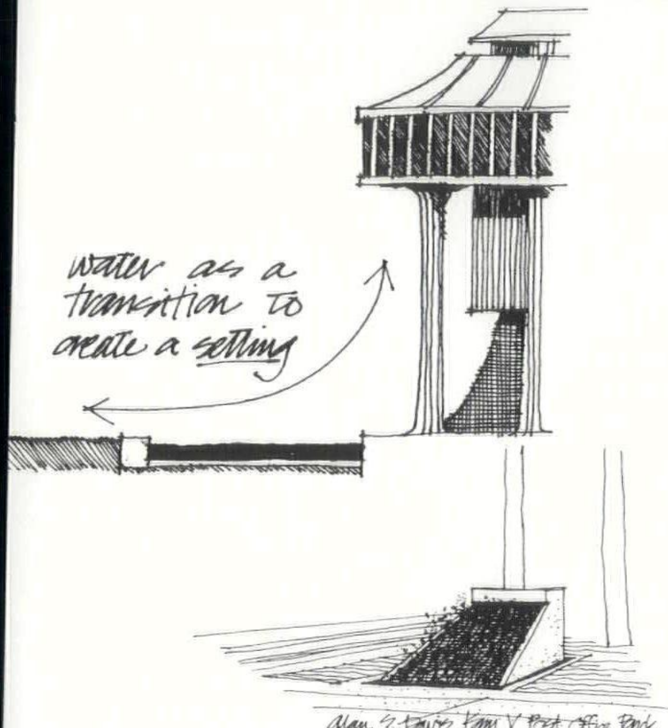
Water is perhaps the single most versatile landscape design element. Through a variety of visual, auditory, and tactile sensations, water contributes greatly to our enjoyment of the world around us. As with any other landscape design element, the use of water requires careful consideration of scale, mass and volume, form, texture, and color. This article will address itself primarily to looking at the aesthetic role of water in the landscape in these terms.

Water serves many different functions, creating a setting for architecture, for instance, such as the State Capitol or the chapel at Punahou, where water acts as a base and transition from building to land.

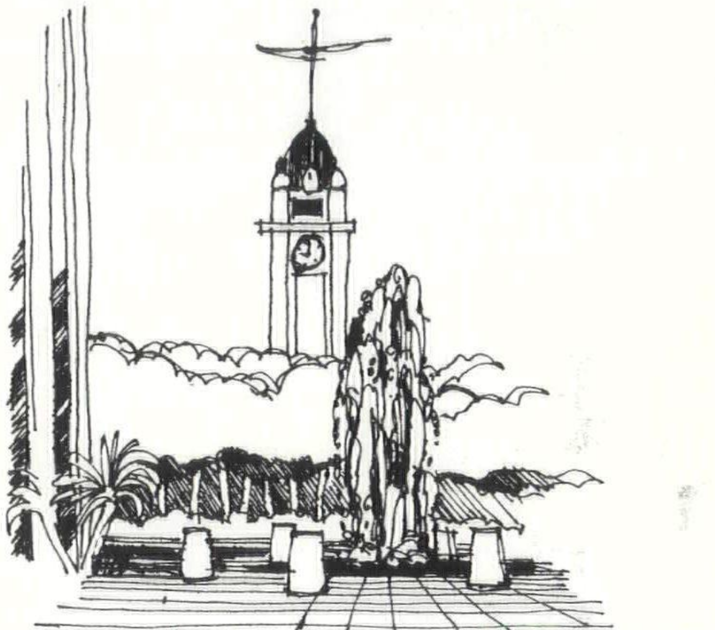
It can also provide a sense of unity, direction, and theme. Examples where water becomes the common thread that weaves different parts into a cohesive whole are

Water As a Landscape Design Element

by MIKE MIYABARA



water as a focal point



the amfac fountain, Fort St.

found at the Ethnic Gardens, Honolulu International Airport, and Waimea Falls Park.

Water can be an audial screen, substituting undesirable noise with pleasant sounds of water in motion, such as the use of water in the pedestrian underpass at King and Fort streets.

A feeling of enclosure can be achieved by forming barriers and edges, actual or implied, evidenced at the Blaisdell Arena.

In the majority of instances, however, water is the primary focus of visual attention. Some familiar examples are the Amfac fountain (and other fountains along Fort Street Mall), the Federal Building sculpture, and fountains at the Financial Plaza, Davies Pacific Center, and the Alan S. Davis Kam V Post Office Park on Merchant Street.

Some water features, by virtue of location and visual impact, have become landmarks, such as the Kapiolani and Aala Park fountains.

Water is a very special design medium for two unique reasons. The first is that water assumes the shape and volume of its container and secondly, acts according to the universal laws of gravity. Together, these obvious characteristics allow water to achieve an almost infinite variety of effects. However, water appears in basically two forms or states—moving and nonmoving.

Water in motion, usually perceived as falling, spilling, flowing, or jetted, evokes a sense of aliveness and action, varying in degree from the intimacy of a private garden to the raw excitement of an urban fountain, depending on volume, velocity, and surface texture.

Nonmoving, or static water is, in most cases, a pool or pond, varying widely in size and shape. Generally, a still body of water encourages a feeling of calm and passivity. Form becomes a very critical factor—rectilinear edges of containment reflect a formal character and conversely, free-form more relaxed.

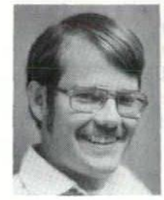
In any case, whether moving or not, used to form a setting or be a focal point, to unify or diversify and add interest, the success of the aesthetic use of water depends on how it satisfies essential design functions. Any water element in the landscape must be in scale using the correct mass and volume, be contained in the appropriate form, perform with the proper texture, and reflect the presence of color and light.

In terms of its almost unlimited possibilities, the aesthetic use of water seems barely touched. By understanding and becoming sensitive to the way water acts and reacts, we can begin to realize this vast potential. HA

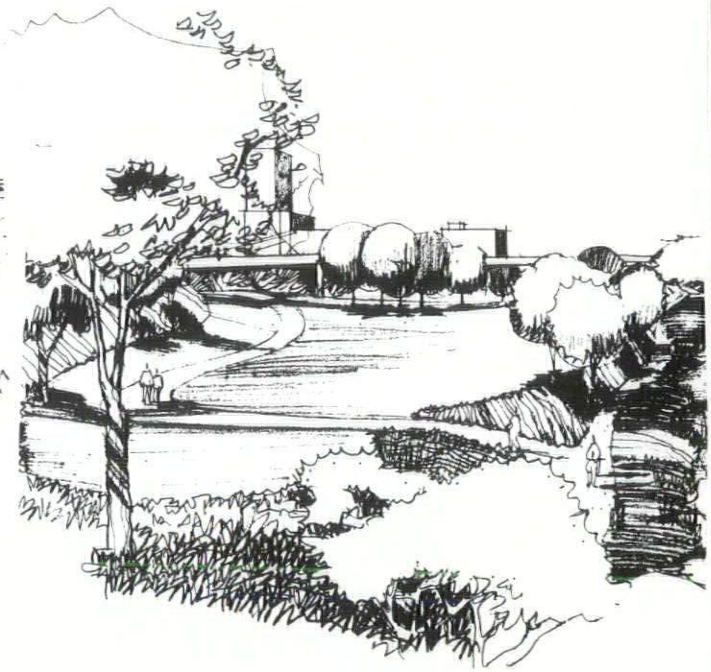
BALLPOINT
Commentary

Manoa Stream Park Plan

by CHARLES A. EHRHORN, AIA
Chief Planner, Architects Hawaii, Ltd.
Served as project planner for the Manoa Stream Study.



MAKAI VIEW NEAR
WAIALAE AVENUE OVERPASS



MAUKA VIEW NEAR
LUNALILO FREEWAY OVERPASS

In the past, the location of urban settlements was often related to the proximity to major water features. Rivers, lakes, streams, and the sea coast were often utilized for transportation, food, and defense. Over time, mankind came to appreciate the relationship to water as an amenity that can enrich the urban environment.

Throughout the United States today, the presence of beautifully developed water features is being seen as a major contributor toward the enhancement of adjacent property values. This is frequenty the case of large residential developments which often go to the extreme of creating artificial water features to create value and recreational amenities.

Today, cities are rediscovering streams that flow through their central core areas. While these streams formerly played a role in the original surrounding urban development, they fell into disuse and neglect as commerce became less dependent upon water.

These cities are viewing their waterways as a major resource to planning and urban design. A lively streamway with its variety of characteristics and moods offers many aesthetic attractions and numerous recreational and open space opportunities within the urban fabric. Streamways can serve as natural exciting linkages between urban elements, becoming circulation corridors safely separated from automobile traffic.

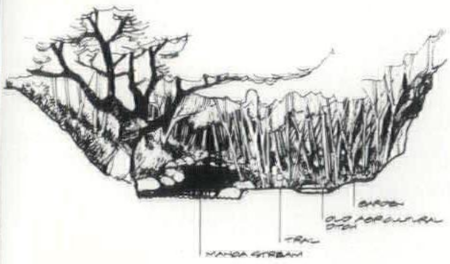
Within this context, urban planning for Manoa Stream Park was conducted under the direction of the Office of Physical Planning and Construction, University of Hawaii, Manoa Campus. Planning was completed by Architects Hawaii and Hawaii Design Associates, a joint venture. That study demonstrates the feasibility and potential for a six- to seven-mile parkway running from Ala Moana Beach Park to Manoa Falls.

Two objectives or elements were addressed.

The first was the development of an overall conceptual plan illustrating both short- and long-range implementation strategies. The optimum stream concept showed the development of a significant recreational resource through the use of natural features and urban qualities. Continuous passage between land use and open space elements was proposed using the stream's natural linearity. Secondary connecting elements such as Palolo Stream were noted for their potential to extend the primary concept to areas not immediately adjacent to Manoa Stream.

A second element was the presentation of urban design

A 14-member citizen's advisory committee of community, university, city, and state representatives served as a reviewing body. DeLos Seeley, formerly director of the Department of Parks & Recreation, served as chairman. All work was discussed with the committees and the University of Hawaii's planning department.



MANOA STREAM SECTION BEHIND UNIVERSITY OF HAWAII

standards to guide the physical development of a stream park concept, the redevelopment of abutting properties, and aid in formulating appropriate legislative controls. These illustrated how specific areas might redevelop over time and how future development can affect and be affected by desirable park development.

Planning looked at those lands immediately exposed to the Manoa Stream waterway. The study approach was based upon the premise that the entire streamway system is an opportunity for long-range park development. The changing characteristics of the stream as it flowed through natural, suburban, and heavily urbanized areas were considered. Each of these three types of areas were found to relate to the streamway in distinct ways.

The overriding goal has been to increase the public's awareness and involvement with Manoa Stream and to inform the public of the stream's many aesthetic features and recreational opportunities. This is of particular concern as it has been found that many owners of abutting land are unaware of those portions of Manoa Stream above the Ala Wai Canal.

The Manoa Stream Park study also found that state, city, and university lands and facilities comprise by far the greatest amount of land along Manoa Stream. This includes existing parks, schools, play fields, vacant undeveloped properties, and highway fragments. These represent a significant potential for immediate and partial stream park development. This can include

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HAWAII LANDSCAPE

asla american society of landscape architects hawaii chapter

The Less Thirsty Tropical Garden

by PAUL WEISSICH, ASLA, and JANET THEBAUD GILLMAR, ASLA

Photos courtesy of Deborah J. Ward and Foster Botanical Garden

Abundant supplies of irrigation water traditionally important in Hawaii.

No one in Hawaii, especially landscape architects, likes the new problem of water shortages. Water is not only literally part of our lifeblood, but most of the vegetation of the man-shaped, urban and agricultural environment in Hawaii is dependent upon irrigation water for its life.

Life in Honolulu for many people has traditionally been the opportunity to live in the sunny climate of the arid coastal areas while surrounded by the lush foliage of a tropical rain forest. The archetypal Hawaiian house and garden for many people springs from such a setting. Relatively few people have chosen to live in the valleys where such water-loving plants grow without help from irrigation.

Resistance to change to less thirsty landscape.

A paradise aspect of Hawaii has been this best-of-both-worlds situation. For most people here, including landscape architects, the first reaction to the thought of suddenly having to design or live in a "less thirsty landscape" is one of resistance and real concern about the loss of a familiar landscape of proven attraction to resident and visitor alike.

Turning-off-the-faucet conjures up alien images of desert landscapes on the Mainland and a loss of an important part of the special identity of Hawaii.

Begin discussion in response to new situation.

The jolt for landscape architects, in particular, is somewhat analogous to that which architects are starting to feel in the area of limits to building energy appetites—or if architects wake up one day to find concrete would no longer be readily available as a construction material.

It would seem useful at this point to begin discussion about how we can respond to the implications of water supply limitations for the landscape in Hawaii—first a discussion among landscape architects, expanding to include the landscape industry, relevant government agencies, and other design professionals, such as architects, and then, of course, the public, which ultimately has the most say over what the landscape will be.

Limit to urban landscape.

Since most landscape architectural practice concerns the urban landscape, rather than the agricultural, the discussion should begin there. Further, we suggest assuming, for purpose of this dialogue, that the traditional luxury of unlimited supplies of public water water for urban landscape irrigation will *not* be restored—either by curtailing further population growth or by success of any of the various current proposals for increasing available public water supplies.

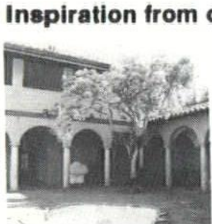
Assume continuing shortage without total cut-off of landscape irrigation.

This is not to expect that there will be no water at all for landscape irrigation but that we can no longer assume unlimited supplies. Population growth is likely to continue and is destined for dry to nearly dry areas, mostly, so more and more water will be taken out of the supply while the replenishment remains constant.

New approach to design.

To start the discussion, we suggest first recognizing that a new, aesthetically pleasing approach to design within a "water budget" just as we have always designed within a construction cost budget. This challenge certainly will make our lives even more complicated than they already are, but there is also the chance that some exciting new solutions will be inspired as a result of grappling with the problem.

Inspiration from other cultures.



Many ways will be found to respond to this new problem of stretching the water budget. First, we can look back on how the many other parts of the world with water limitations have solved the problem. A number of those places are represented in the diverse background cultures of the people living in Hawaii today.

For instance, there is the remarkable way that the mere suggestion of water can effectively establish a garden containing few plants as a pleasant place to be—examples being the small fountain of the Middle Eastern or

Spanish courtyard or the urn containing a few water plants in a Chinese garden. The paved courtyard at La Pietra at Diamond Head, now the Hawaii School for Girls, with its single tree and small central pool provides a local example based on the Italian garden.

The colorful mosaic paving patterns and wall tiles of Portugal are other examples of ways to reduce dependence on vegetation in landscape design. But plants don't have to be banished, for there is the evolving response of Americans in the arid western regions of the U.S. to their own recent water supply limitations, which includes more interest in drought-resistant native plants.

Ways of stretching the water budget.

Ways of stretching the water budget, then would include:

1— Supplement the public water supply.
   A. A rain barrel or cistern under the gutter—or a variation of the Roman *impluvium,* a basin under the opening in the atrium roof.
   B. Make a "watershed" of paved surfaces draining to a tank or other reservoir.

2— Increase the effectiveness of the supply that is available.
   A. Use automatic sprinkler systems regulated by moisture sensors and operated at night. Hand-watering tends to increase water use because it generally is done during the day when evaporation losses are higher, and water is usually applied faster so run-off is increased.
   B. Use drip irrigation, thus further reducing run-off and evaporation losses, although this type of system involves more careful control of impurities in the water which may clog the system.
   C. Use new, more efficient components of sprinkler systems as they become available.

3— Reduce water loss by evaporation, not only as in 2A and 2B above, but through use of:
   A. Mulches
   B. Shade
      - Trees, perhaps the less thirsty varieties or ones using fresh or brackish groundwater near the surface, such as occurs in some coastal areas.
      - Trellises or pergolas, perhaps supporting a vine, which may be one of the less thirsty varieties.
   C. Windscreens of various types, including plants and fences and walls.

4— Use the fresh or brackish groundwater near the surface (as mentioned in 3B above). This occurs in Waikiki, for example.

5— Use plants requiring less fresh irrigation water.
   A. Substitute less thirsty ground covers for lawn areas, which typically require large amounts of water. Where lawns are needed, reduce their draw on the water supply by aerating the soil, applying water at a slow rate to maximize absorption, water at night to minimize evaporation, avoiding over-fertilizing, and mowing at a high level to shade the root zone more and hold the water better.
   B. Research propagation and use of more drought-tolerant plants in design.
      - Hawaiian plants native to the drier coastal areas.
      - Exotic plants are already here.
      - Other ornamental exotics available in other lands which may be suitable to Hawaii's dry climates.

Christmasberry

Naupaka

Use of less-thirsty plants.

6— Zone the planting areas into sections requiring regular irrigation and those requiring water only to get the plants established.

7— Reduce the amount of ground covered by vegetation.
   A. Use more paved surfaces.
   B. Use rock and gravel as groundcovers.
   C. Use trellises, arbors, pergolas.

The possible, or necessary, use of less-thirsty plants (5B above) is an especially challenging and interesting point. It is true that incorporating these plants into the palette of local landscape architectural practice will mean some changes in the complexion of that palette. But first of all, the situation will probably not require that every single plant used will have to be drought-tolerant, and secondly, all drought-tolerant, or semi-drought toler-

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1978 HS/AIA Honor Awards

WIDE-OPEN
photo feature

Photos courtesy of: Wayne Thom Associates
Angie Salbosa Photography
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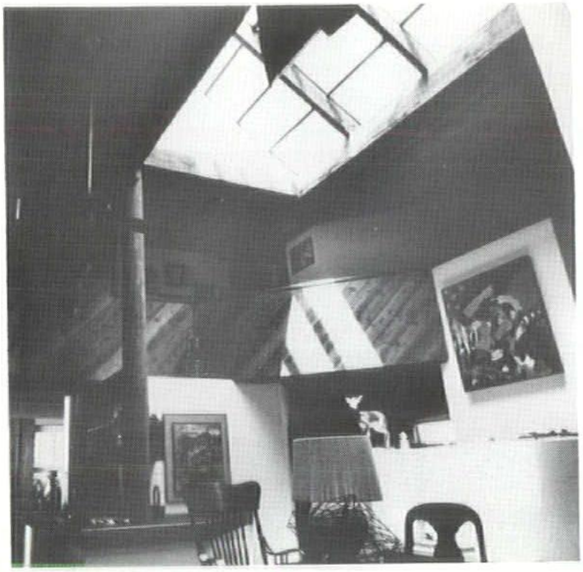
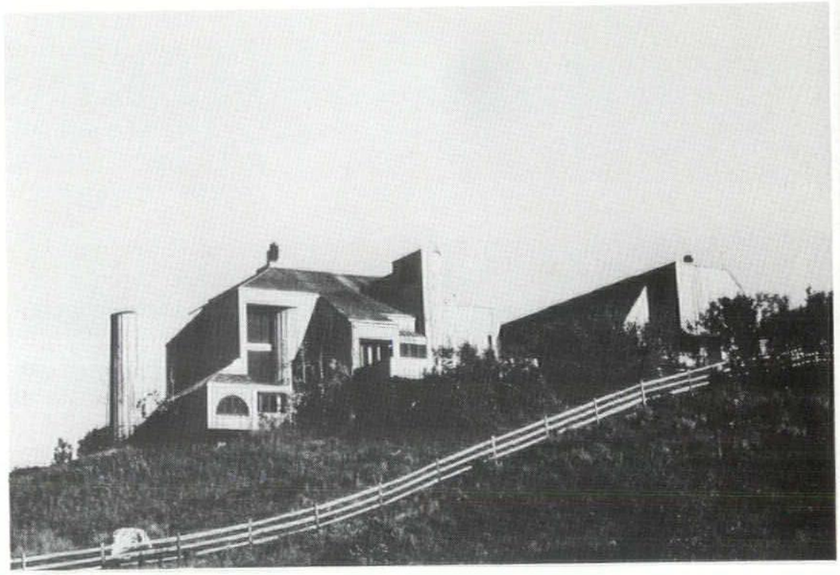
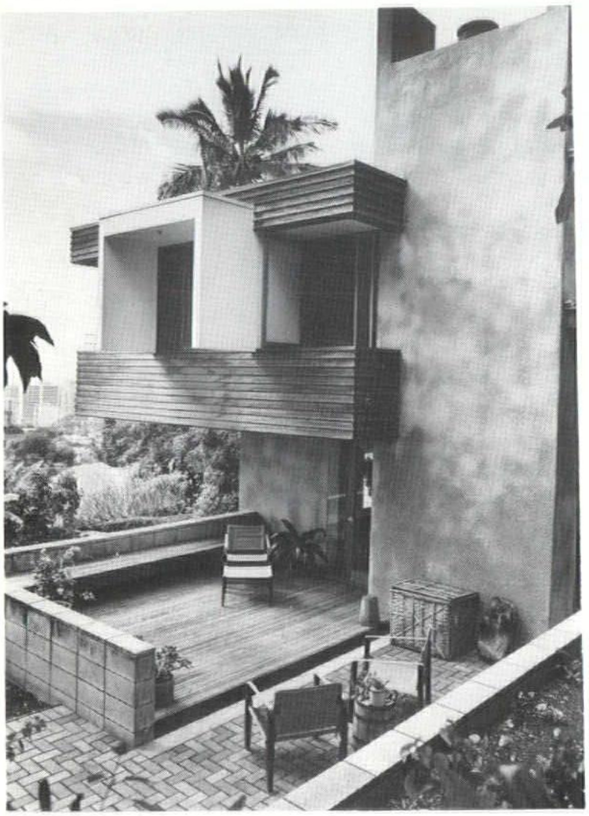


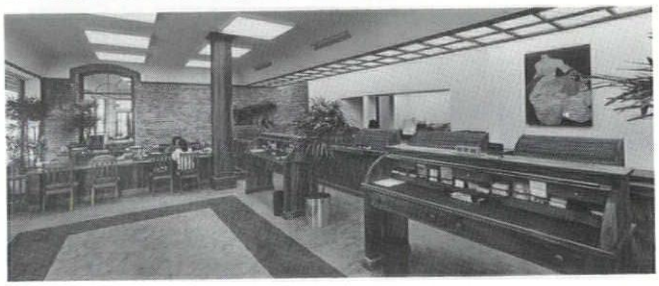
HONOR—Residential
Norman Lacayo, AIA
A residence in Honolulu



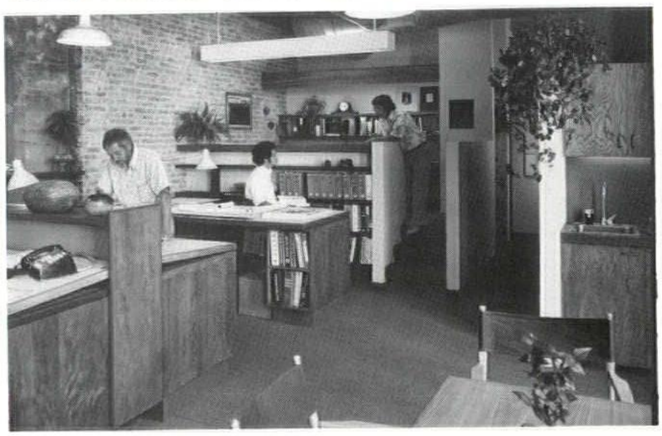
MERIT—Residential
Norman Lacayo, AIA
A residence in Aspen, Colorado



MERIT—Residential
Meyers/Detweiler & Associates
The Detweiler Residence

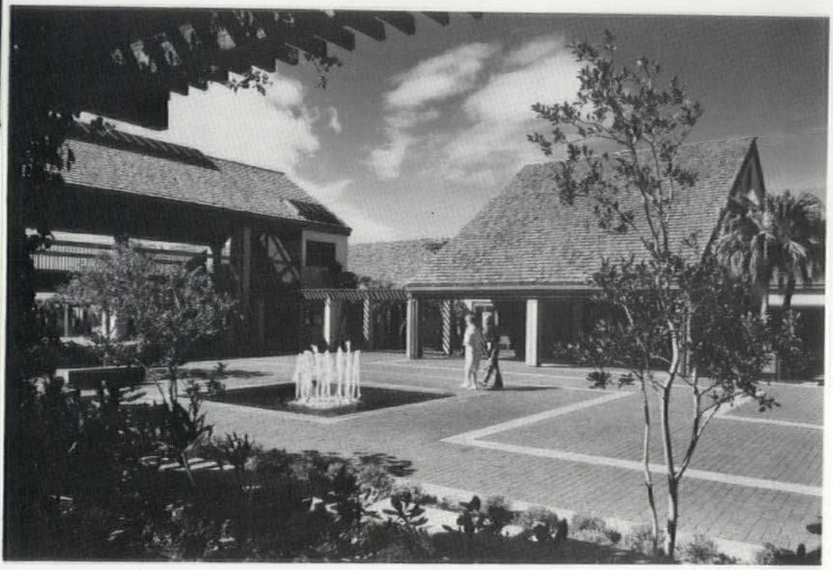


MERIT—Renovation
Ishihara Oda Wong & Partners
Island Federal—Downtown Branch

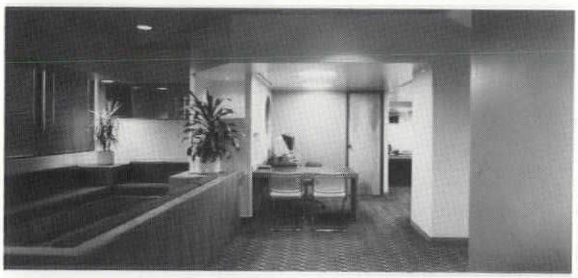


MERIT—Renovation
Johnson-Reese & Associates, Architects
Offices for Johnson-Reese & Associates

This year's award program was juried by Allen Johnson, AIA, Franklin Gray, AIA, Christopher Smith, AIA, Frank Brandt, ASLA, and Ralph Anderson, an architect from Seattle, Washington. Each project will be featured in upcoming Hawaii Architect issues.

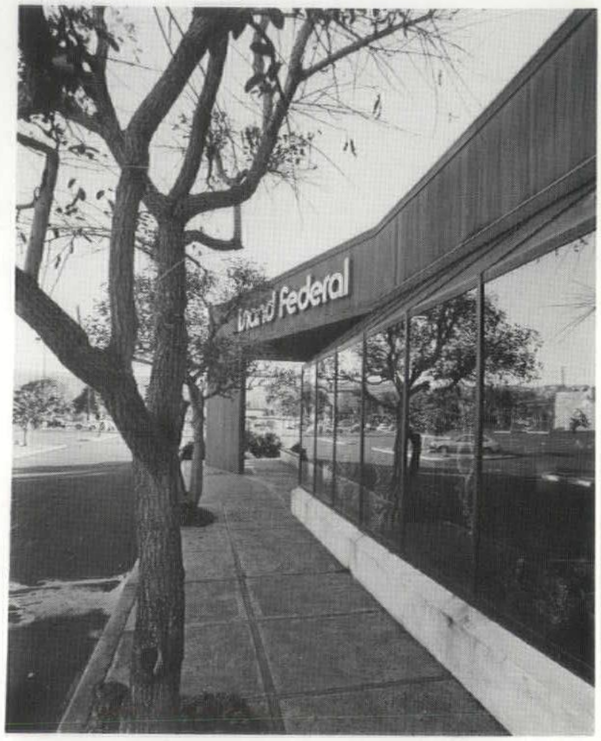


HONOR—Commercial
Edward Sullam FAIA & Associates
Wailea Town Center, Maui

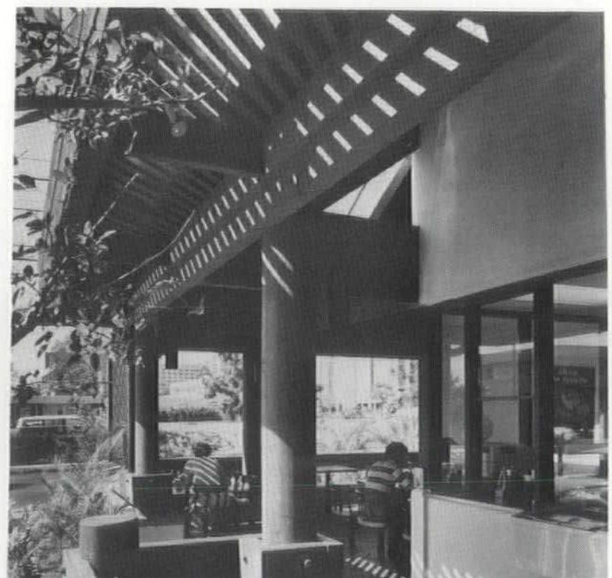


MERIT—Interiors
Media Five Limited
The Straub Satellite Clinic

MERIT—Commercial
Au, Smith & Haworth, Ltd.
The Ward Warehouse



MERIT—Commercial
Ishihara Oda Wong & Partners
Island Federal—Waimalu Branch



MERIT—Commercial
Johnson-Reese & Associates, Architects
Restaurant for Church's Fried Chicken

Fixtures

Continued from Page 5

present models look a little different from conventional units, which may lead to some consumer resistance.

Manufacturers include: Microphor and Enviroscope.

PRESSURIZED TANK TOILETS

This involves a specially designed tank which uses water supply line pressure to build up tank pressures sufficiently to provide much more force to flushing waters, thereby reducing water requirements to two and one-half gallons per flush. It is noisier. The tank is easily installed by the layman and 1976 cost figures place it at about $40.

This unit is available from Water Control Products, Inc., of Troy, Mich.

OIL FLUSH TOILET

This unit uses a clear, odorless mineral oil not readily distinguishable from water. Waste is separated from the oil and stored, the oil then being reused—an expensive application which still leaves the wastes, which must be either pumped out or incinerated. This system has been used in at least one small Vermont office building the author is aware of and is included simply for the demonstration of a fairly high-technology solution.

VACUUM TOILETS

These operate in an opposite manner to pressurized flush toilets. It combines a low water flush with the vacuum transportation of wastes through specially designed toilet, pipes, and storage unit. It is not designed for application to single-family dwellings but to apply to groups of houses or a multistory complex. It has a toilet which resembles conventional equipment. The manufacturers claim cost competitiveness with conventional systems in larger installations. The system requires smaller pipes, can transport wastes vertically to 30 feet, will not work in power outages, and must be emptied once a year. It uses only one and one-third quarts of water per flush.

Manufacturers include: Colt, Electrolux, and Mansfield.

COMPOSTING TOILETS

A relatively simple, self-contained unit which uses no water, has no sewer hookup, and with a by-product of rich humus soil conditioner. It takes kitchen garbage and human wastes and aerobically decomposes the material to a total quantity of three to 10 gallons per person per year.

Initial cost is high but offset in certain cases by the cost of sewer lines or collection of wastes.

The larger units include the Mul-Toa and Clivus Multrum. The latter is available locally from Joni Schreier who has installed one in her home, designed by Jim Pearson and Clifford Terry in Pupukea's Sunset Hills. The firm of Pearson & Terry is presently working on a proposed development of 15 houses, all of which will use the Clivus Multrum unit.

Smaller composting toilets have some problems with maintenance of proper temperature and moisture balance within the unit. While they are less expensive initially they require more frequent emptying and often come equipped with heating coils and thermostats. Some may object to the input of energy in these toilets.

In addition to the different toilet systems which conserve water there are many attachments or replacement valves which can help to conserve water. These cost a few dollars more than conventional units but can save water in a variety of ways. Leak signaling ballcocks avoid leaking problems of conventional ballcock assemblies, which usually occur in the needle valve or seat. The water leaks into the toilet tank and then down the overflow pipe. Even a 1/32-inch leak can translate to 8,000 gallons of water per year.

Flapper tank balls also can reduce leakage by fixing the tank ball to the overflow tube in such a way as to avoid the improper sealing of the ball seat. Many manufacturers of new toilets are using the flapper tank ball now, but it pays to check out the valve characteristics of new toilets.

Another innovation involves the use of a dual flush mechanism. These may be dual function valves or double tank containers. In most cases the lever is pushed in one direction to dispose of liquid wastes and in the opposite to dispose of solid wastes. When the partial flush cycle on most dual units is used, up to half the water is saved.

Dual flush toilet systems are now in wide use in Britain.

One type is available locally: Econo-flush, from Hawaii Exchange.

SELECTED BIBLIOGRAPHY

Residential Water Conservation: Murray Milne; California Water Resources Center Report No. 35; University of California/Davis; 1976. Revised and reprinted 1977. $7.95.

An excellent all around summary of the state of the art in water conserving methods and products. Can't be too highly recommended for anyone interested in utilizing water conservation in buildings.

Stop the Five Gallon Flush; The Minimum Cost Housing Group; School of Architecture; McGill University, P.O. Box 6070, Montreal H3C 3G1, Canada; 1973, $2.

Good descriptions of various water saving toilets, ranging from some very low technology solutions to very sophisticated apparatus. Includes many foreign units not included in the first reference.

Water Conservation Fixture List; Washington Suburban Sanitary Commission; 1976.

Hawaii Home Energy Book; Jim Pearson, AIA, with Clifford Terry and Carl Bovill; The University Press of Hawaii; 1978. Chapter 11. Available at local bookstores for $8.95. Largely advice for the home-owner but of interest to architects as well. Saving water saves energy.

In addition, various reference articles in the April and September 1977 Sunset and the January 1978 Popular Science.

Frank Ifuku of the local Board of Water Supply has been collecting catalogues, brochures, and other information from many manufacturers and welcomes any data or inquiries architects have relative to water conserving fixtures. In addition, he has put together a list of water-saving devices which includes local distributors, most of whom are selling water displacement devices and/or flow controls. HA

Manoa Stream

Continued from Page 11

modifying the interface between developed land such as parks and schools to facilitate access to the streamway and developing adjacent vacant property as stream oriented parks.

A final note should be made as to how the Manoa Stream Park conceptual plan can fit into governmental controls and planning process. It may be appropriate to include the Manoa Stream Park concept in the new development plans for the City & County of Honolulu.

The City Charter directs that development plans are intended to accomplish the objectives and policies of the General Plan. In addition, they are "to contain statements of standards and principles with respect to the land uses for residential, recreational, agricultural, commercial, industrial, institutional, open spaces and other purposes." This means that for each type of land use, planning principles and standards will be prepared.

Also of importance is the consideration that will be given to the inclusion of urban design principles and standards in the development plans. The overall stream concept and related urban design recommendations can be incorporated partially or wholly into both the land use and urban design elements of the development plan for Central Honolulu.

The city is relying on the elected neighborhood boards to provide the principal citizen input for their respective areas. The groups most affected, the Manoa, McCully and Moiliili communities and Waikiki must remain involved in the development planning process to give these park concepts needed support.

Professional groups and others interested in urban design can also play a significant role in inplementing a successful stream park concept. This is important, not only to the communities of Manoa Valley and Waikiki, but can lead to new legislation recognizing other stream systems throughout the State of Hawaii. HA

Aquaculture

Continued from Page 6

tion of energy, and so on.

Salt or brackish water aquaculture is an extremely promising field, especially in areas such as Hawaii where fresh water supplies are uncertain. Saltwater species now under cultivation in Hawaii include mullet, milkfish, at least four species of oyster, two species of clams, and certain seaweeds. Aquatic Farms, for example, will produce in excess of 100,000 pounds of oysters and clams this year for sale to local markets, with no significant impact on potable water supplies.

Public water policies and the future of aquaculture are closely intertwined. As these policies are discussed in response to changing circumstances, we in the aquaculture community look forward to informing the public about our industry's water needs, its potential social and economic benefits, and the potential for increasing available water supplies through advanced waste treatment and other practices involving aquaculture technology.

Aquatic Farms has real confidence in the long-term ability of aquaculture both to have a significant positive impact on the social and economic life of Hawaii and, beyond that, to play a role in meeting world food needs. At the same time, we recognize that both the technology and the economics of our industry have a long way to go before any meaningful impact will be felt in either area.

One of the most crucial needs in aquaculture at present is for a clear demonstration of economic viability. We feel that it is the absence of such demonstrations, more than anything else, that currently poses the most serious obstacle to rapid infusion of new private development capital into the industry. The role of private enterprise in this area is absolutely crucial.

Government can help, but only the private sector can effectively provide the resources and incentives to achieve really meaningful aquaculture expansion. HA

New Members

MICHAEL T. OKADA. Corporate up from Professional Associate; Allen Kajioka & Associates, B. Arch., Univ. of Washington. Wife: kathy. Children: Misa 4, Mari 1.

STEVEN R. DAVIS. AIA Member; Architects Hawaii, Ltd. B. S. Arch., Univ. of Cincinnati. Wife: Janice. Children: Paul 4, Michael 1. Hobbies: Golf.

WESLEY M. YOSHIKAWA. AIA Member; self-employed. M. Arch., Univ. of Hawaii 1974.

DOUGLAS B. SNELLING. AIA Member; self-employed. ARIBA, FIA, AALA. Children: Christopher A. G. 14, Duncan R. G. 12, Andrew A. G. 10. Hobbies: Golf, tennis, swimming, Asian antiques.

ADVERTISER INDEX

Less Thirsty Gardens

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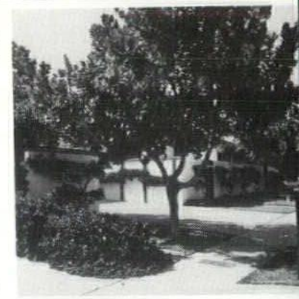


Carissas and autograph

ant plants do not *look* like desert plants—fleshy, cactus-like leaves, grey color, sparse foliage and/or spiny character.

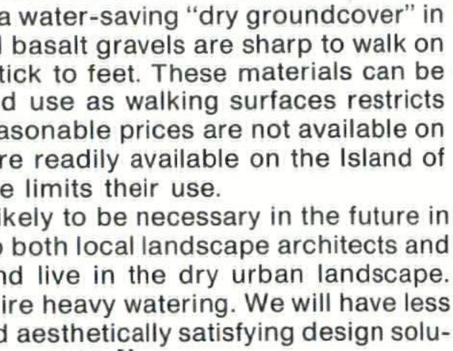
It is true that the tree which perhaps epitomizes "tropical," the palm, is not drought-tolerant—the coconuts which grace dry tropical shores drink the brackish groundwater near the surface. In general, the less-thirsty plants have relatively small leaf texture, and this fact affects the character of the design. But consider how well-furnished with lush, glossy dark green leaves the branches of both the Chinese banyan and the native alahe'e are, for instance, and it starts to become clear that a less-thirsty landscape need not look like a desert.

A list of some drought-tolerant plants follows. This is, of course, only a very small beginning. Considerable research and discussion with the local nursery industry is needed for progress in this area. Nurseries propagate plants which landscape architects and the public will specify and buy, and until recently there has been little incentive to work along these lines. Other lists of plants of varying degrees of drought-tolerance can be developed, also.

- Native Hawaiian plants, many of which are wind and/or salt-tolerant as well, include the following:
  Naio, scaevola coriacea (native dwarf naupaka), common beach naupaka, akia, ulei, mao (native cottons), alahe'e, ilima, dodonaea, Maunaloa vine, wiliwili.
- Exotic (originating outside Hawaii) plants:
  Kiawe, Kolomono (cassia), be-still, Chinese banyan, carissas (natal plum), poinciana pulcherima, koa haole, lantana, Christmas berry (male).
- Exotic plants already naturalized in Hawaii which require groundwater but tolerate brackish water:
  Coconut, hau, milo.

There are also problems in immediate implementation of some of the other suggested ways of stretching the water budget. For instance, there seem to be no local sources of significant amounts of rounded pebbles which have been successfully used as a water-saving "dry groundcover" in places in the American West. The local basalt gravels are sharp to walk on and cinders and coral chips tend to stick to feet. These materials can be and are used already, but their limited use as walking surfaces restricts their use. Good organic mulches at reasonable prices are not available on Oahu, especially, macadamia shells are readily available on the Island of Hawaii, but their lack of fire-resistance limits their use.

Clearly, the less-thirsty landscape likely to be necessary in the future in Hawaii poses a significant challenge to both local landscape architects and the public which continues to buy and live in the dry urban landscape. Present tropical design concepts require heavy watering. We will have less and less water, so let's start now to find aesthetically satisfying design solutions in our naturally dry living environments. HA



Coconut, hao, milo

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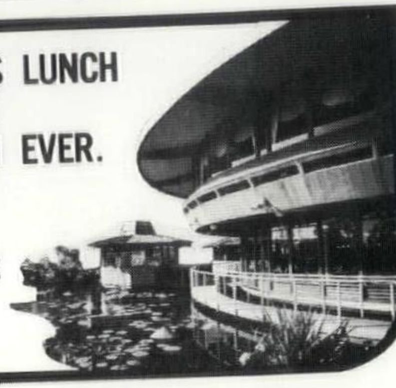

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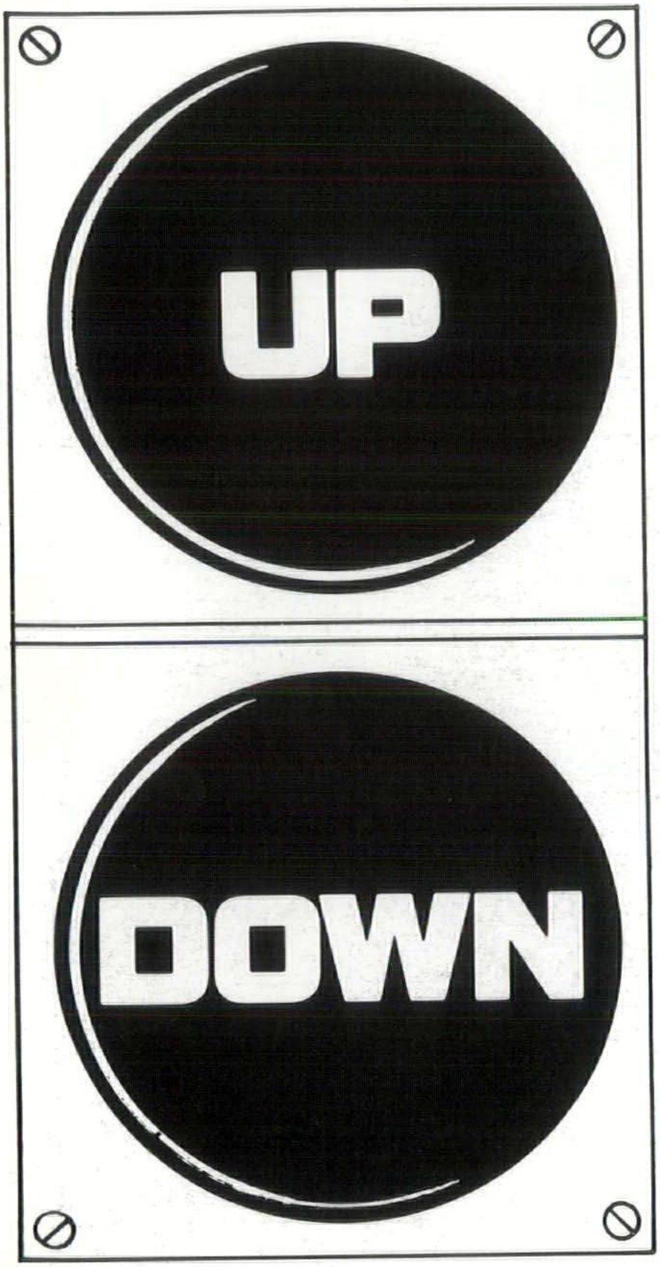

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