Inside: Brian Van Bower on Perpetuating Success

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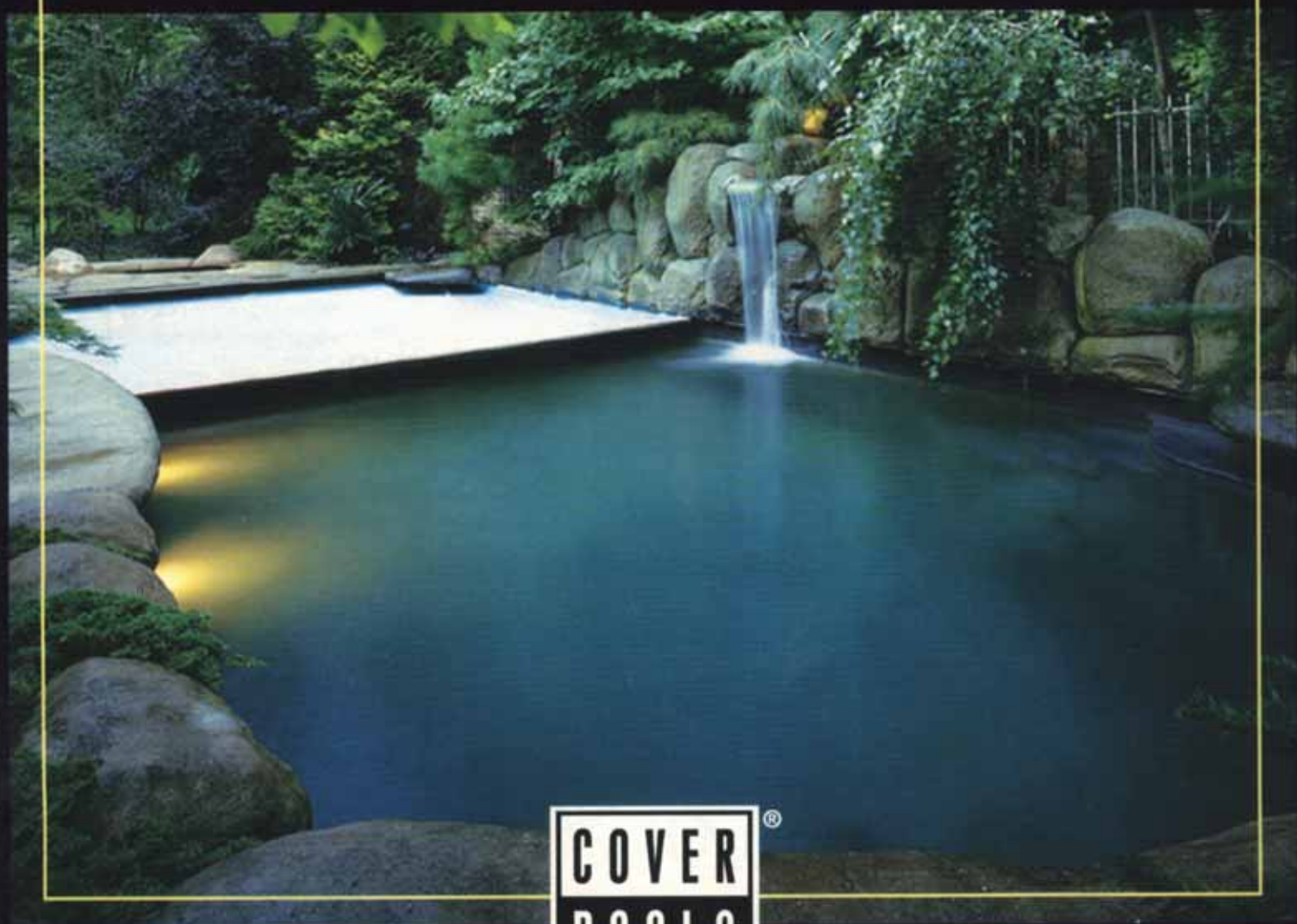

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Contents March

Features

22

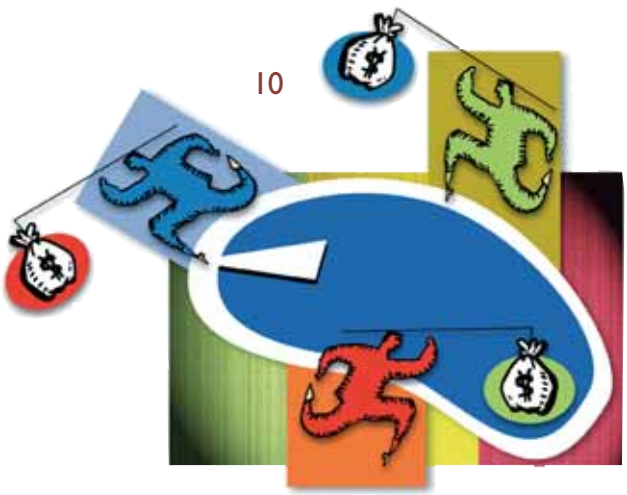
34

42

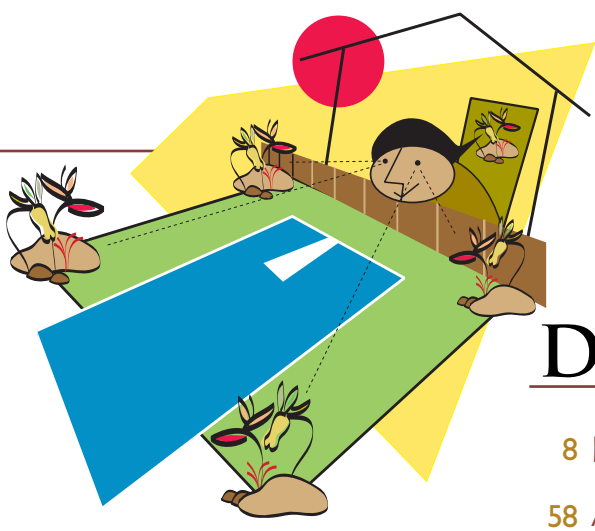
WATERSHAPES

Volume 2 • Number 3 • March 2000

COLUMNS



10



16

DEPARTMENTS

On the cover:
Photo by Eric Herman

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By Eric Herman

Starting to Click

It's really too bad that no one was around with a camera, taking pictures when the Egyptians built the great pyramids. Just imagine the volumes of scholarly conjecture and debate that could've been avoided had the pharaohs insisted on taking some construction shots along with them on their journey into the great beyond.

Well, at least the ancient Egyptians had an excuse: Photography was still a couple of millennia away. But when it comes to the fantastic monuments being built today, there really is no need to create lingering mysteries for the future.

Through the past year and a half, I've talked to so many of you who are excited about having recently completed what can best be described as some of the most exciting projects of your careers to date. Time and time again, you've described the thrill and satisfaction that comes from reaching for a higher level of design and vision and construction proficiency. Then, in the next breath (and you know who you are), you've told me that you didn't take pictures along the way.

What's done is done and there are always the beautiful shots to be had of these finished projects. Still, the things to be learned from the process of creation are limitless. Fact is, there are lots and lots of good reasons why it's a good idea to document the work you do with photographs – only one of which is possible publication in a technique-oriented trade magazine like ours.

For starters, and on an entirely pragmatic level, taking pictures during construction is the only real way to determine what was actually done on a job. Suppose a pool shell cracks and a (rightly or wrongly) suspicious client raises questions about the thickness of the shell or the amount of steel in the cage. Sure, you can cut up some concrete to prove your point – or you can pull out a stack of color prints or a carousel of slides and put any such questions to rest.

And it's not all about potential litigation: Perhaps your client wants to have additional work done in their backyard some time after you've built a watershape and simply needs to know where the plumbing, gas, electrical and irrigation lines are buried. If you've been thorough, it'll all be there in pictures.

More than anything, photographs of your projects provide you with a valuable way to preserve a record of the good work you do. It's a way to remind yourself of ways you've approached certain challenges or to teach others how to do the same. In fact, a good set of photos gives you and anyone interested a great way to see what it took to build the watershape in question.

On page 10, Brian Van Bower discusses the challenge of working effectively during these prosperous, busy times. It's a truly insightful and valuable discussion – and a column to which I'd like to add just this one more thought:

During these frantic times, as you're building watershapes that are bigger and better than anything you've ever done before, don't forget to keep a camera on hand to record the major steps of the construction process. My guess is that you'll have many occasions to be glad you did. And who knows? The pictures you take today may end up in a magazine article someday.

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IN THIS ISSUE

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Russell Penick is a commercial project manager for Intercoastal Pools and Spas, a builder of residential and commercial watershapes based in Melbourne, Fla. A veteran of more than 40 years in the pool and spa industry, Penick's career started in 1959, when he began working as a chemical delivery driver distributing glass bottles of chlorine and acid to residential and commercial clients in Florida's emerging pool market. Since then, he has worked for several firms and held a broad range of positions and for 22 years ran his own construction/service company.

Larry Long is founder and president of

Interested in writing for WaterShapes *on design, engineering or construction topics? Contact Eric Herman at (714) 685-1854!*

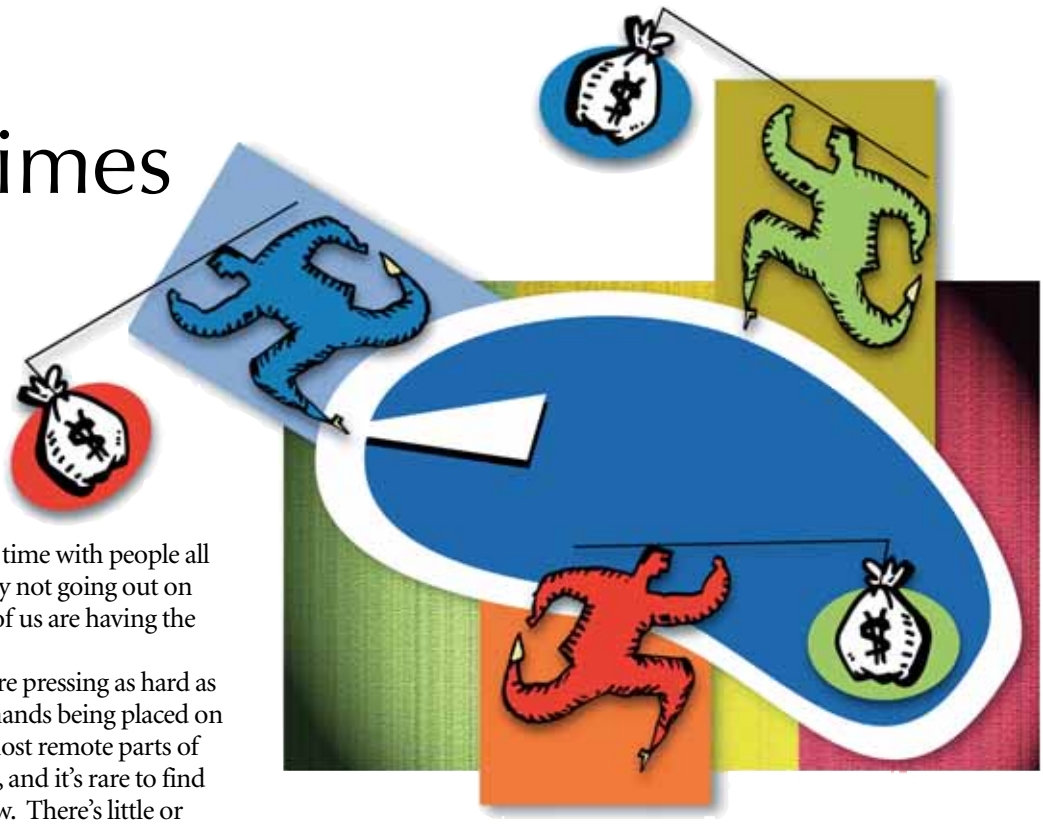
Long's Swimming Pool Steel in Anaheim, Calif. He began his career as a teenager, working part-time and tying steel with his father in the 1960s. Long founded his own company in 1972 and has since installed the steel for approximately 35,000 residential and commercial swimming pools in Orange County. Today, the firm not only ties steel but also offers services in excavation, remodeling and artificial-rock fabrication. Long now runs his company with his son, Larry Long, Jr.

George Forni is president of Aquatic Environments, an Alamo, Calif.-based design, installation and service firm specializing in lakes, ponds and other large waterfeatures. He started his career in the waste- and reclaimed-water industry in the mid 1980s. Before long, he became project manager for an aquatic service firm, for which he managed a number of projects in conjunction with the U.S. Army Corps of Engineers as well as in other regulatory agency-controlled jobs. His company now focuses mostly on the needs of large commercial clients in the Western United States.

FORNI

In These Best of Times

By Brian Van Bower



I've been paying attention to what goes on in this industry for a long time, and I'd have to say that these times are better than any I've ever witnessed. And it's not just me: I talk all the time with people all over the country, and it's probably not going out on much of a limb to say that most of us are having the best times we've ever had.

Everywhere you look, people are pressing as hard as they can to keep up with the demands being placed on them. And it's true even in the most remote parts of the country: Business is on a roll, and it's rare to find someone who'll say it's flat or slow. There's little or none of that right now.

True, this is based on my personal conversations and observations, and I suppose there are more formal ways to measure this current trend. In fact, it would be really interesting to look at things like building permits pulled throughout the country – but who has the time for that right now? The bottom line: Coast to coast, Canada to Mexico, it's boom time!

Just Too Busy

For reasons including the hot economy and a mild winter (among others), we're being inundated by all these people who have disposable income and are willing to spend some of it on our products. It's wonderful to enjoy such success, collectively and individually, especially considering the lean times we all experienced just a few short years ago.

New pools, spas, ponds and watershapes of all sorts are going in all over the map, and there's a tremendous opportunity to make a great deal of money while providing people near and far with the pride and joy that comes from owning a beautiful watershape. All of this prosperity, however, brings real challenges with it – and even a significant dark side.

I worry that, in struggling to keep up, we may be compromising both the end product and the level of service we're providing to customers.

If you watch closely, it's plain to see that, along with all the glowing reports of massive business rolling in at every turn, most people in the industry are truly struggling to keep up. In just about every conversation, you hear about project delays, the need to hurry and, above all, a need to get to projects that have been put off for weeks or even months. The fact is that most of us are working as hard and as fast as we can, bringing on additional staff and breaking in new subcontractors – and it's *still* impossible to keep up, let alone get ahead of the game.

This raises some serious concerns and, I believe, forces each of us to consider how we're handling this time of prosperity and what we're doing to ensure the durability of our success.

Stop and think about what happens when everyone is really busy. Even from customers, I've heard it said that there's an expectation for reduced performance because everyone is stretched so thin. Think about the number of times you've heard someone end a sentence with, "but I'm just too busy." I've said it, and I suspect we all have at some point during the past couple months.

What worries me is that when you lower expectations, things that are acceptable to our clients and us in the here and now may not look so great when things cool down later on. I worry that, in struggling to keep up, we may be compromising both the end product and the level of service we're providing to the customers – and in the process creating a whole set of basically dissatisfied buyers.

Not to wish bad times upon anyone or to foretell the end of a great roll, but it is reasonable to assume that this mild weather will turn and that the economy will cool off as well. I'd love to think we could sustain this high indefinitely, but that's not realistic. As a result, I think it's critical that we consider how what we're doing now will influence the way things go when we really can't afford to make excuses.

Not So Fast

I probably don't need to go into too much detail about the challenges being too busy throws your way: My guess is that most of you reading this know exactly what I mean all too well. But for the sake of highlighting a few key areas, let's break things down into some basic categories, starting at the top:

❑ **Response to customer calls:** If there's one thing I really don't have any patience for anymore, it's non-response to a phone call. In my own business I do design work for customers who are shopping for contractors, and I've heard over and over again from folks who have a drawing in hand and are looking to build a watershape that they can't get local contractors to return their calls.

I don't care how busy we are, that's just plain unacceptable. Even if your call is to say no more than, "I can't help you right now because I'm just too busy," you still have an obligation to make that call. We're talking about basic professional courtesy here, even common civility.

What kind of impression do you leave when you don't even return the call? Maybe a few will persist and try again or call other contractors, but it doesn't take too much discouragement here before these frustrated clients might take their disposable income and decide to bestow it on a travel agent or a boat or RV dealer.

It's tough, but I make it a point to treat customers who call me when I'm swamped as though they were calling at

a time when I had to cherish, covet and pursue every single sales lead that came my way.

❑ **Divided attention:** Going one step down the line in the process, when you're meeting with a prospective client whose call you've returned and are now trying to sell them a watershape, be sure to give that prospect your full attention.

When you're running a mile a minute, putting in big overtime hours and pressing harder than you ever have before, it's very easy to get distracted by the other four appointments you have to squeeze in before dinner and lose track of the moment.

We've all seen that look on other peoples' faces – that vacant, not-at-home look – and if we don't see it, we sense it. Be aware that when you move too fast, you run the risk of giving your customers that blank expression or impression. Believe me, it pays to slow down, focus your attention and take the time to be with your customers when you're with them.

❑ **The work itself:** I'm sure we could all tell horror stories about the challenge of managing projects when everything is behind schedule. We know about delays in getting blueprints from engineers, difficulties in scheduling subcontractors and problems with material availability or slow deliveries. We know that when one thing slows up or falls out of schedule, a whole series of other things are affected. Really, it's almost too much to consider – the worst kind of headache.

There's no magic trick that'll pull you out of a big hole, but it's a clear indication that you need to step back and take a hard look at your operation. Most of all, it means you need to be realistic about scheduling, which is something I'll get to shortly.

The one sure thing we can say about all of these "hazards of prosperity" is that if you let them get the upper hand, you won't really be prosperous at all. Instead, you'll be tired and stressed out, your staff will be disorganized and dissatisfied and may even become resentful – and, if you're not careful, you might not even be making any money. That's right, your costs may be so out of control because of delays that even in these best of times you can go broke or worse.

Even if you have a good handle on most things, the bottom line is that when you over-promise and under-deliver, some bad things are bound to happen; namely, you won't leave your customers with a good impression. In addition, it may cost you money and enjoyment while robbing you of any sense of satisfaction in your work.

A Time To Every Purpose

Let's jump back to the positive side of this discussion and talk about steps we all can take to ensure the durability of

Continued on page 14

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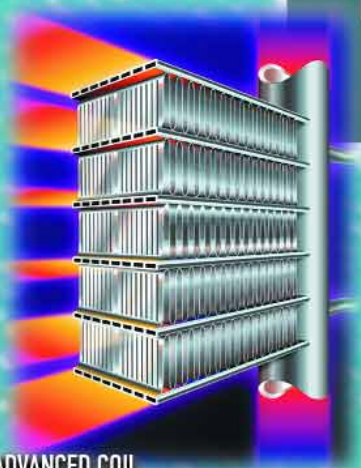

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Continued from page 12

our prosperity.

For starters, we all need to take the time to think about what we're doing – and do things more carefully than ever. This means, for example, that no matter how badly your day is going, you need to take the time to return phone calls and pay attention to the people you talk to along the way.

Second and of equal importance, we all must set realistic expectations with our customers. This means taking a hard look at scheduling and putting things off until later if need be – even if that means losing a job or two along the way. Odds are we're more likely to keep our customers happy by giving them truthful estimations of start dates and completion dates than by telling them what they want to hear. It's when you tell them one thing and something else happens that things get difficult.

I know of some people who organize their work into "periods." For example, they may know that they can effectively run 16 jobs over a given period of time, say two or three months. When that time span fills with 16 jobs, then they'll tell new customers, "We can do it, but it will be after a certain date." Customers are more likely to understand waiting for a while because you're busy than they are a constant stream of excuses and rationalizations.

Setting real expectations means, in turn, that you have to be closely in touch with reality with respect to what's going on in your company. Remember: As you get busy, it's not difficult to march forward without time for reflection and analysis – but this may be the time when you need them the most. So step back and discover the truth about your own ability to perform. Pull apart your schedules, get real with suppliers about delivery dates and work with your subcontractors in determining when they can realistically get to work.

When you *do* get a handle on where you are, then act accordingly: Create schedules that mean something and do all you can to stick with them. You'll find that this will stretch things out some – but that the net result at a minimum will be a significantly lower level of stress.

Finally – and this can be a tough one – learn to say "No." For my part, I've learned to *enjoy* saying no: There's a real sense of satisfaction that comes with comfortably and politely passing on a project, and I've talked to other people who've said the same thing.

In fact, there's a certain confidence and tranquility that comes from being in a position to say no. Beyond that, most customers respect you for being honest – and you may even be pleasantly surprised by how many of them are willing to wait for your services. Declining to do work you're not capable of handling makes common sense: It's good business, and it's completely professional.

Necessity's Children

It's one of those clichés that holds up: Necessity really and truly is the mother of invention. And I believe that we all can surprise ourselves how inventive we can become when the pressure is on.

If ever there was a time to be innovative and to try to fine-tune the way we do things, this is it. As you review your situation, look for ways to streamline processes and build efficiency into what you do. Again, improving operations may not be your top priority when there's so much business at hand, but if you step back and take a long look at how you run things, it's likely that you'll be able to identify ways to get things done more quickly and efficiently – without sacrificing quality.

You may also want to consider reviewing your pricing structures, because doing business when things heat up means that materials and equipment may cost more, that subcontractors will want more and that staff may be working overtime and driving up your overhead in ways of which you're not fully aware. It's important to be sure that your customers are paying you at a level that provides you with the resources you need to keep up with those diverse demands.

Finally, and most important, it's critical to remember to take care of yourself and your staff. I know that there are some people who are really impressed by workaholism, whether in themselves or in other people, but it's really not worth it. When work is long and hard, periods of rest and relaxation are doubly important: Don't demand so much of yourself and others that you drain all the enjoyment and satisfaction out of the work, and keep an eye on good nutrition, regular exercise and proper rest – especially when you're "just too busy."

Sure, it's great to be successful. I love the good things that money can buy, but that's not the whole reason that I'm in this business, and I suspect that if money were really all that mattered, lots of us would be doing other things. But we're here because it's exciting to deliver great watershapes to our customers and great to make people happy with the work we do.

After all, as much fun as making good money can be, it's even better to be happy – in the best of times and in all the others in between.

Brian Van Bower runs Aquatic Consultants and is a partner in Van Bower & Wiren, a pool-construction firm in Miami. He is also a co-founder of Genesis 3, A Design Group; dedicated to top-of-the-line performance in aquatic design and construction, this organization conducts schools for like-minded pool designers and builders.

Making More of a Good Thing

By Stephanie Rose

By repeating something from one place in the yard to another, you tie everything together – and expand upon an idea that has already worked somewhere else in that yard.

With landscaping, this doesn't always have to mean plants. When you find something that works and you like it, why not stick with it?

Last month, I told you how we turned a small wasteland into an indoor oasis for one of my clients. When we were finished with the project, the clients were so pleased by the look and feel of their atrium that they wanted to continue the process of re-landscaping their home, this time outdoors.

The look and feeling created in the atrium can't be defined as a specific style, but the result epitomizes tranquility and a naturalistic look. They wanted to carry this same positive feeling outdoors, starting with the pool area.

❑ **The pool.** I brought in a watershaper to work with the clients on this part of the project. We realized that most of the existing hardscape and pool had to be redesigned to get the feeling and natural look they wanted to achieve.

Like the house and its atrium, the pool had been built in the '60s and had been replastered – but was in need of much more attention. The challenge was how to redesign the pool while taking advantage of the existing grade of the yard and simultaneously expanding the visual length and appeal of the yard.

The rest of the property also would need some attention but was visually and physically divided from the pool yard by the family room "wing" of the house. The only thing this other yard would need as far as hardscape was concerned were new patios off the living room and bedroom and stepping pads in between.

We concentrated first on the pool area, knowing that the style of the other yard could be different because of the visual barrier. In the end, however, we linked the two by repeating the soft, brushed finish of the concrete pool decking for the patios and stepping pads.

❑ **The slope.** We decided to start by slowly removing existing overgrown brush, including some very nasty bougainvillea (those thorns are deadly), plumbago, pittosporums, and various other volunteer plants that had been allowed to overgrow the yard for the past 20 years or more. The clients were behind the deliberate approach, because they weren't sure where we should stop

When you find something that works and you like it, why not stick with it?

– or what we would find beneath the overgrown plants.

We didn't realize when we started that we would end up removing *all* of the plantings in the yard except for some border plants and the large pine trees. This ended up changing the whole plan: As it turned out, the yard gently sloped up toward the neighbor's yard behind the existing pool, getting gradually steeper near the top of the slope.

About eight feet behind the existing pool was a concrete-block retaining wall that was unsightly but retained much of the slope, including the pine trees.

Rethinking The Site

With all the old plantings stripped away and the contours of the site clearly visible, we began the process of redefining the pool yard.

The watershaper came up with a plan that simulated a raised bond beam. By adding the new beam, placing soil be-

Figure 1: The pool's wall, with its random ledgering interspersed with large, flat stones, ties the exterior landscape to a similar stonework treatment inside the house in its atrium.

Figure 2: The same ledgering detail adds texture to the barbecue, taking a feature that might have stood out too prominently and blending it with treatments used effectively both indoors and outdoors in the pool area.

tween the new pool walls and the existing retaining wall and also bringing down the retaining wall a little so we could cover it over, we were able to create a smooth, gentle slope that blends the pool into the landscape more easily.

The old retaining wall still holds back the soil and slows down any excess irrigation runoff created by the new landscaping – but now you can't see it.

In refurbishing the pool, the watershaper kept the coping on the slope side at a minimum, with grass planted right up to it. Now, instead of seeing a pool, then a deck, then a wall, then a slope with a wall of plants, you see the pool and then a vast, expansive, lushly planted slope – quite a different and more natural impression.

The clients and the watershaper also decided to repeat the wall treatment of the atrium on the raised walls of the pool. Masons veneered the notched beam by randomly ledgering it with chocolate moss stone interspersed with

larger, rounder stones to make the wall look even more natural/less man-made (Figure 1 on page 17). (The builder waterproofed the rear of the raised beam to prevent calcium from leeching through to the applied stone veneer.)

Since you can see both the pool and atrium from most of the family room, it creates a nice visual tie between the two, drawing your eye more to the landscaping and giving the room a nice indoor/outdoor feel.

To add another nice touch, the watershaper took the ledgering element and repeated it on the barbecue – with a special twist. He built the barbecue around a very large boulder that had been in the yard. He ledgered the corners of the barbecue randomly, partially covering the stone with concrete to give the barbecue a time-weathered look (Figure 2).

He also considered the client's desire for a natural feel when he decided to leave a cutout for planting at the junction of the boulder and the barbecue. This enabled us to soften up the concrete look while tying what otherwise might be an intrusive structure in with natural elements that already existed in the yard.

The yard around and above the pool was planted with a combination of succulents, roses (that we're putting in as you are reading this), herbs, vegetables, a variety of large shrubs and many drought-tolerant and Southwest-style plants.

The client wanted a full, natural yard without the look of a chaotic cottage garden. By using this mix of plants, we were able to tie the desert-like look of the raised pool wall in with the plantings.

Stephanie Rose runs Stephanie Rose Landscape Design in Encino, Calif. A specialist in residential garden design, her projects often include collaboration with custom pool builders. If you have a specific question about landscaping (or simply want to exchange ideas), e-mail her at sroseld@earthlink.net. She also can be seen this season in four episodes of "The Surprise Gardener," airing Tuesday evenings on HGTV.

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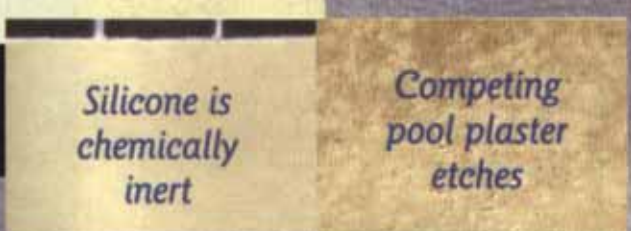

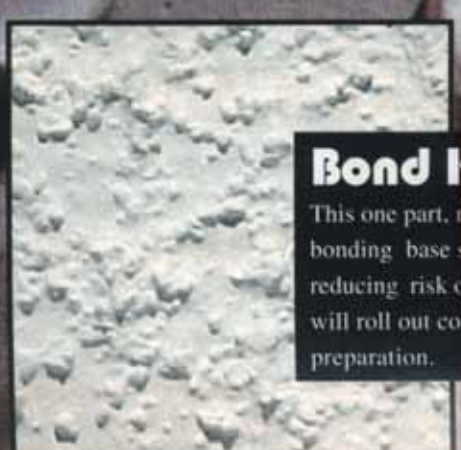

Bond Kote 2000

has become a great product for preparing pools to be replastered. This one part, roll on (to be mixed with water) scratch coat provides an extremely strong, highly textured bonding base surface for a new coat of plaster to be applied. Bond Kote 2000 is white, thus reducing risk of contamination or highlighting in the new plaster. Bond Kote 2000's textured surface will roll out consistently with a paint roller. This is a guaranteed product and method of replaster preparation.

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Mix Design & Custom Manufacturing

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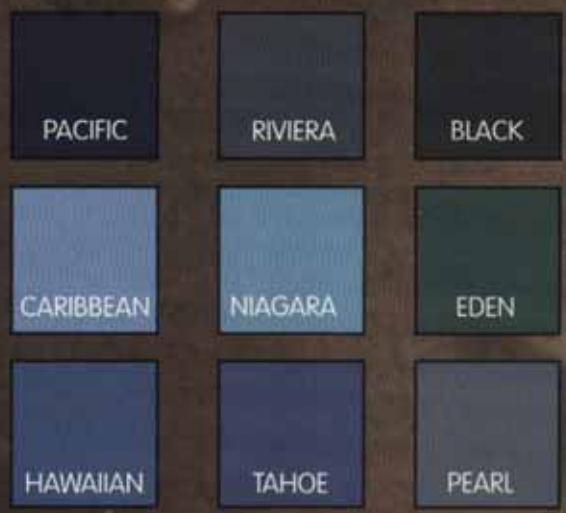
are water soluble plastic bags filled with Colour Shield (100% inorganic, non-fading, quick dispersion) pigments. The pigment and the bag are dropped in the mix water, and together they dissolve in ten seconds. This premeasured color plaster admix is precisely added to your mix at a ratio of one Pigment Pack to one 94 lb bag of Type I White Portland Cement. This system allows you to sell one of our nine beautiful water colors from our Colour Shield Sample Board and then duplicate that color, with no guessing, no measuring and no mess.
Materials are stocked nationwide. Sample Boards are available upon request.




SHELL ISLAND


INDIAN SPRINGS

MOTHER of PEARL

is a **premixed** pool plaster that requires no job site formulating. Mother of Pearl finishes are striking natural pebble finishes, that feature combinations of select tumbled pebbles, complimenting colors, and a high performance Portland cement. These finishes are a landscape designer's dream. CRS Systems provides both water washing equipment for installation and training necessary to create these beautiful natural stone finishes. No dealer agreements required.
Materials are stocked nationwide. Sample Boards are available upon request.


PERLE NOIR


EMERALD ISLE


BERMUDA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TAHOE

Maui Gem

New for 1999! Six unique pool plaster mix designs, combining 3M colorquartz, color pigments, and the Silicone Shield Protection System. We have designed this plaster product so you can easily add our preblended mix of Silicone Shield, colorquartz, and color pigment, in one premeasured bag to your Type I White Portland Cement, and your marble aggregate. This allows us to economically provide you with various mix designs, cutting everyone's material and freight costs. Maui Gem pool finishes are a new generation of colorquartz pool finishes, combining higher levels of water chemistry protection and stain resistance with the beauty of marble aggregate, color, and colorquartz particles. Maui Gem finishes are easily installed without water washing. A light acid wash after install is recommended. As an alternative, all Maui Gem finishes (because they are marble based) can be sanded silky smooth.
Materials are stocked nationwide. Sample Boards are available upon request.


MAUI GEM


PACIFIC BLUE


PACIFIC GEM


KUAI FALLS


REFLECTION GREY


KONA COAST

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Les Fontaines

Even under favorable circumstances, installing watershapes beyond the borders of your own country can offer formidable challenges. For his Canada-based fountain company, says Paul L'Heureux, success in establishing effective communications, eliminating wasteful snags and performing up to clients' expectations means following a clearly defined process – one that keeps his team and its work on track from start to finish, around the globe.

By Paul L'Heureux

Internatio

It's a fact: Creating large watershapes for international clients is enough to send a project team's stress levels off the charts.

You start with all the usual pressures of time, money and prestige that go along with performing on the global level. Then there are cultural differences, not to mention local environmental concerns having to do with water usage. And these factors can give you trouble even when you think you know what you're getting yourself into.

Through the years, our company has learned many lessons about the importance of accommodating the cultural and economic overtones of what we do. From our base in Toronto, Crystal Fountains pursues projects the world over and always strives to act with sensitivity with respect to social, cultural and environmental issues that inevitably arise.

The key to our success is discipline. With every job, no matter where it might be, we apply the same seven-stage process to the tasks at hand and address three basic questions in each: Can we work with water and fulfill a sense of design? Can we work with water and maintain a sense of the human element? Can we work with water in an entertaining and delightful way that meets our customers' expectations?

As you'll see in this article, the answers to those questions inform all seven phases of our design and construction process.

SEVEN KEYS

To see what I mean, let's examine six high-end commercial watershape projects, using each to define a specific step as we take a photographic trip around the globe. But first, two important observations:

• This process isn't something we invented. In fact, it's derived from the program many architectural firms use to keep their projects on track and offers us a way to manage all of our projects, regardless of size or location. For nearly 30 years, we've applied these principles with success in locations around the world.

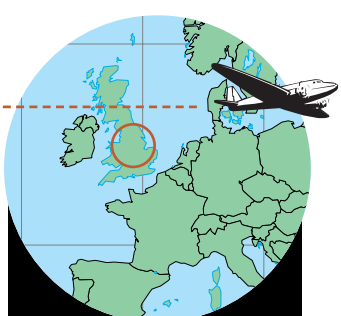
• Although most of these international projects start with and are driven by our North American architectural and design teams, we recognize that collaboration among professionals within our firm and those we encounter elsewhere is a requirement, a fact of life.

No matter who is involved or where we're working, the program we follow – with distinct focuses on conceptual design, design development, construction documentation, construction administration, commissioning and programming, maintenance training and product development/R&D – is the common thread that ties these diverse projects together.

Through the years, we've completed projects on five continents and in dozens of countries. In the course of doing business with an international clientele, we've learned the value and satisfaction of close collaboration with developers, architects, designers and contractors to bring ideas to life with creativity, attention to detail, quality equipment, proven engineering and eye-catching movement of water.

As we'll see on the following pages, the seven steps – and the people in our firm who practice what we preach – help us transcend national borders, vault language barriers and provide the matrix upon which we repeatedly build strong finished products.

Photo by David Jewell



The luxury-liner theme of the food court is highlighted and dramatized by the 'deck-top' pool, which suggests the movement of the ocean with a series of jets and lights

Conceptual Design

Project: The Trafford Centre, Manchester, England

The client's consulting team for this facility designed its food court to recall the decks of the great ships of the White Star Line (the fleet that included Lusitania, Olympic, Titanic and many others). This approach played off local nostalgia: Manchester had been a large shipbuilding area during the era in which those great floating palaces went to sea.

As part of this design scheme, the restaurants pose as ports of entry and reinforce an international theme by offering many different cuisines – all seemingly within the confines of one great architectural ocean liner. To reinforce this ocean-going impression, we were asked to provide a waterfeature that would serve as a metaphorical deck-top pool to be surrounded by Art Deco-style railings, a mock diving board and wooden deck.

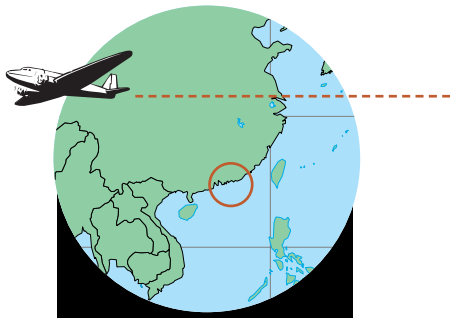
"We came up with this idea of a surging wave in our conceptual-design sessions," says Doug Duff, our director of design. "The client's team needed these water-element suggestions early in their own design process to complete the area's programming and theming. The system mimics the sound and the look of the sea, and we authenticated our ocean waves by producing a contrast between white, foamy water and clear water."

Adds Michael Denman, our director of European operations, "When you sit in one of the replica deck chairs, the sound created by the waterfeature puts you right back to the 1920s. And we made the waves look even more authentic by aerating the flow and providing for individual adjustment across the 30 nozzles."

Design Development

Project: The Centre, Hong Kong

Photos by Doug Duff



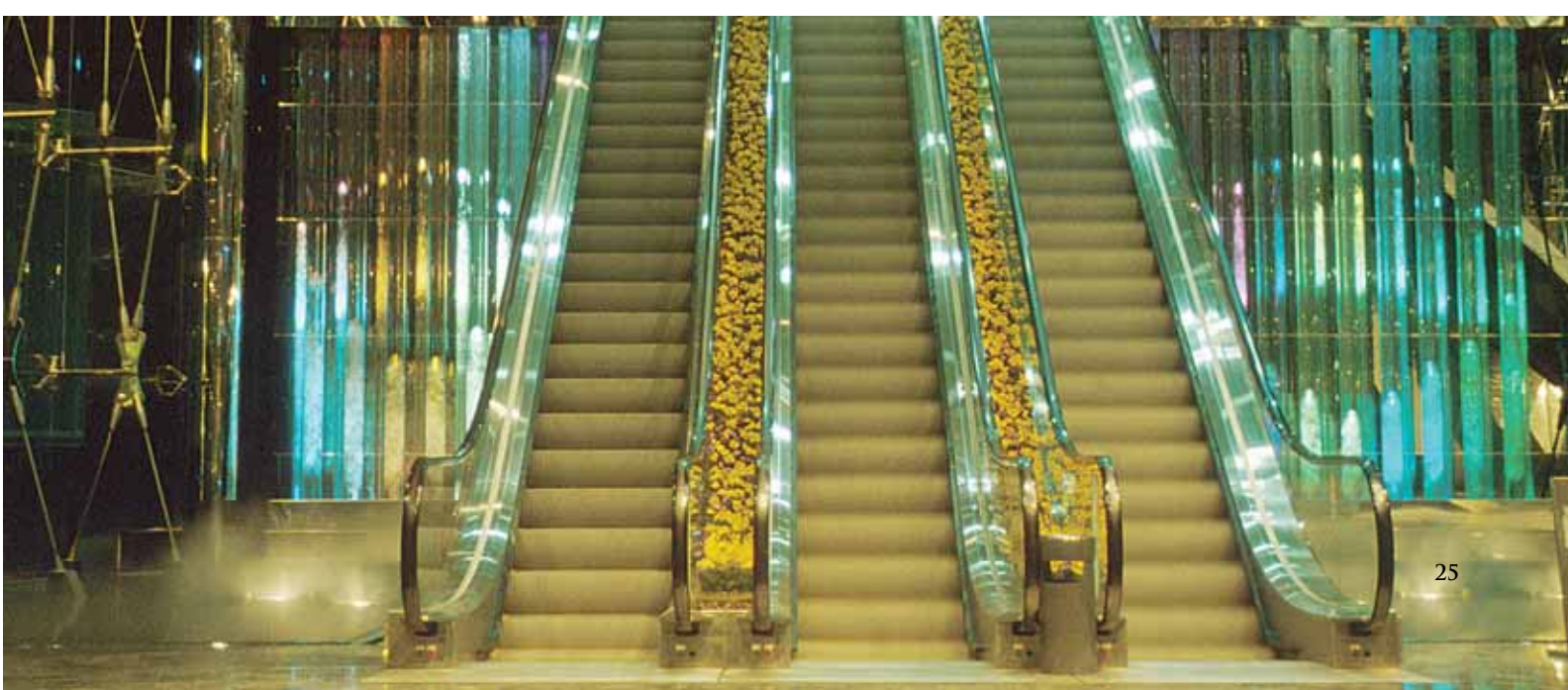
Using elements of *feng shui*, we developed a waterfeature that harmonizes expressively with the architecture that surrounds it. The tubes you see are filled with tiny, rising bubbles set off in changing patterns of light.

The design development phase is the most critical and time-consuming in any waterfeature project. This is where factors as diverse as aesthetics, system design, product selection, custom vendor selection and project budget confirmation all come together, often in the course of many meetings with clients and their project teams.

This also is where the most important decisions are made. In fact, once a project is completed and you look back at all of the things you wish were different, you can trace their roots back to design development. The key here is time: You must manage your client relationship to give your team enough time to complete this stage. Nearly always, we've found, a poor process leads to a poor outcome!

Sensitivity to and awareness of cultural and environmental factors are critical during this phase. In this case, for example, our design work was influenced by *feng shui*, an ancient Chinese philosophy teaching that wealth and well-being are held and nurtured internally within individuals, homes, public places and organizations. To represent this ideal visually in our work, we came up with a solution using extruded glass tubes, mirrored stainless-steel structural elements and precise patterns of rising bubbles – all illuminated in a kaleidoscope of changing colors.

"The whole thing is designed to rise visually with the architecture of the facility," says Bob Moronde, director of business development. "Here, the design staff worked carefully with the client's vision and needs. We also wanted to soften the interior space, because everything is so slick and modern with lots of glass, stainless steel and marble. By adding color, the swirling effect and small, almost misting bubbles, the waterfeature adds warmth and interest while blending with the design."



Construction Documentation

Project: Cribbs Causeway, Bristol, England

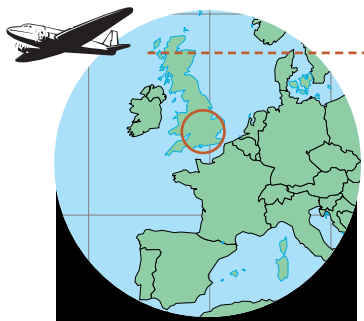
This project's developer had the challenge of getting permission to construct what may be one of the last suburban retail centers ever to be built in England.

Here and elsewhere outside North America, says Michael Denman, government agencies reach into all aspects of the construction process and can make life extremely difficult. "As a result," he observes, "highly detailed construction documents are absolutely vital. If you expect that typical North American drawings will suffice in Europe, the Middle East or Asia, you're in for a rude awakening!"

Extensive, detailed documentation is mandatory on projects such as the one depicted here: It's crucial to make sure you understand, going in, the exact requirements of government officials and agencies. Amassing that knowledge can be time-consuming and difficult, but this is extremely crucial when it comes to avoiding delays that will result from on-site problems with inspectors.

Furthermore, we've found that this European-style documentation process (and not the U.S. model) has taken hold in most of the world. This comes as a shock to many U.S. firms trying to work overseas, but you can't break through without a thorough understanding of local conditions.

Market-to-market differences here are extensive, and shedding even limited light on them would take a whole series of lengthy articles. Suffice it for the moment to say, any firm moving into international work of a commercial nature must expect to rethink basic approaches and expand the time and effort devoted to documentation.



Weaving this watershape in and around and down from the dramatic architecture of the entrance to this retail center was an artistic challenge more than matched by the challenge of presenting a plan that passed muster with government officials.

Photos by Charlotte Wood

Construction Administration

Project: Via Catarina, Porto, Portugal

Photos by Max Liorca

Located in the heart of Porto's retail downtown core, this center offers four levels of retail and leisure in what is by U.S. standards a remarkably compact space.

"The client wanted a waterfeature with a small footprint that would impress passersby and even be able to touch the emotions of the patrons on the upper levels as they drank with friends or watched a soccer match on a jumbo-screen television," says Denman.

To meet the need, we nestled a spectacular waterfeature between two escalators, with jets in a 16-foot diameter pool performing an elegant ten-minute sequence that climaxes with three 55-foot bursts of water that rise above the railing of the shopping center's fourth level. The main challenge, of course, was reducing the risk of water splashing outside the fountain area. This put a premium on very tight tolerances, proper construction supervision and steady interaction among the various trades participating in the project.

"Attentive construction administration is critical for this kind of project *anywhere*, but it's even more important overseas," says Paul Connally, project manager. "We have developed ways of projecting discipline and influencing our overseas work. Good relationships with installing trades have played a key role in the success of our export work – and they've taken *years* to build."

Please turn to page 30

The available space for this watershape was minuscule, but with careful attention to construction details, we were able to set up an effect that unifies all four levels of this retail/leisure space without splashing beyond the fountain's footprint.

Would You Like to Check Our References? Here's A Partial Resume...

Mayor Usovicz of Salem, Massachusetts:
"The Forest River Pool is clearly the jewel in the crown of the City of Salem Park System. The rehabilitation of this unique seaside pool will provide our citizens with a safe, healthy, recreational environment for many years. I am most appreciative of the tremendous effort and teamwork of all the individuals who produced this high tech facility in time for the opening of the summer season. On behalf of the City of Salem and personally, I sincerely thank you."

Dave Baker of Noah's Ark had this to say about Astral:
"The filters are working great. We are very happy with them."

Greg Stewart of the Atlanta area YMCA:
"You have a great product! The design allows the Y (YMCA) to quickly train individuals on its use and we have had excellent results. It works like a gem! We've been in operation since last June 1998 with a lot of new staff each season. We have had zero down time and enjoy its ease of operation. The ease of use really puts this product heads above the competition. It makes guards and all staff comfortable to open, operate, and close down the pool each season. Thanks so much for a great product!"

Astral Commercial is proud of their capabilities on large projects. From bumper boat rides, utilizing 36" filters to special projects utilizing 93" filters fully automated. But don't take our word for it. Take our customer's...

Dear Mr. Svehla:

I want to thank you personally for the service you have provided both *R. Johnson Design Associates Inc.* and our clients during the last year. You have represented yourself and *Astral* in a very favorable manner, and have assisted us in completing projects to the satisfaction of our clients.

As you know, *RJDA* specifies fiberglass shell, high rate sand filters on many of our projects. During the past year, three such projects have had *Astral* filter systems provided and installed by the contractor. In our experience, both the horizontal and vertical filter systems manufactured by *Astral* have met or exceeded our specification criteria.

To date, our clients continue to express satisfaction with the filtration ease of use and water quality achieved on their projects. In particular, the community of Seymour has expressed appreciation of the automatic backwash system installed on their project. Again, thank you for working with the contractor to ensure that the system functioned as the client desired.

RJDA looks forward to working with you and *Astral* on future projects.

Sincerely,

William Todd Rollins
Director of Design
R. Johnson Design Associates, Inc.

Salem, Massachusetts:
(4) 93 inch filters - fully automated.

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George Foster at Camp Duncan had this to say about Astral:
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Commissioning & Planning/ Maintenance Training

Project: Easton Town Center, Columbus, Ohio, USA

The challenge here was to design a typical dry-deck waterfeature more exciting than anything that had yet been constructed – for a total budget of under $150,000. "The client was Steiner & Associates, an innovative developer but one with limited funds for this aspect of the project. We had to come up with 'exciting' and 'inexpensive' at the same time," says Maronde. "We knew the waterfeature would need programming to make the most of a limited quantity of sequenced nozzles."

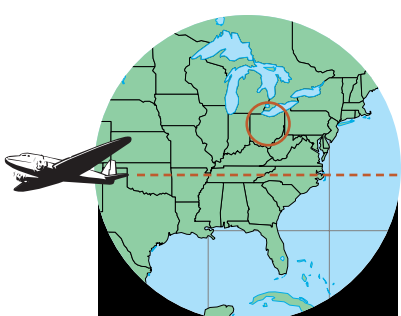
As a result of this budget-consciousness, the commissioning stage became crucial. "We simply couldn't afford the huge start-up costs that can go along with these types of installations in the programming phase," recalls Simon Gardiner, project designer. "Drawing on existing palettes of sequence programs developed over years of designing and installing similar projects, we were able to provide the client with programmed sequences – including one that spelled E-A-S-T-O-N with a matrix of nozzles."

Even though Easton wasn't "overseas" work, the project benefited in this respect from our years of experience with fountain-programming issues. Without that experience, we wouldn't have been able to deliver the desired level of excitement.

This project also serves to illustrate the importance of the maintenance phase: These installations are quite complex, so technical-support staff from our company spent two weeks on site, teaching supervisors and technicians the fine points of maintaining and repairing their systems. In this case, we taught on-site personnel how to flush the system, add chemicals, monitor dials and reset the program. All of this information is then presented as a manual we assembled during the project.

Photos by Owen Smithers

Please turn to page 32



It's possible to achieve captivating results on a limited budget: Just draw on experience to minimize costs in the commissioning and programming of your waterfeatures – and document what you do so the system can be efficiently and effectively maintained.

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Photos by Doug Duff

Product Development/R&D

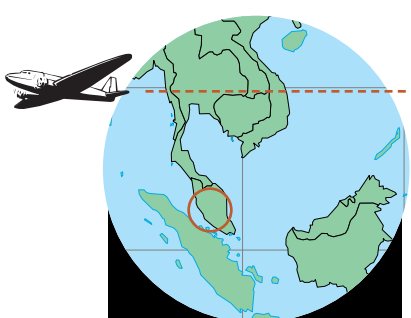
Project: City Centre, Kuala Lumpur, Malaysia

Situated at the foot of the world's tallest twin buildings – the Petronas Towers – the City Centre Lake Symphony Fountains were built under commission from Kuala Lumpur's City Centre Parks Commission. It's a breathtaking installation, with more than 380 sequenced effects stretched over a length of 80 meters and featuring a geyser that reaches a height of 42 meters – more than 130 feet.

Our R&D division was given the challenge of successfully developing a new sequencing device that could 1) function in poor water quality, 2) cycle up to five times per second and 3) have a functional life of more than 3 million operations without need of parts replacement.

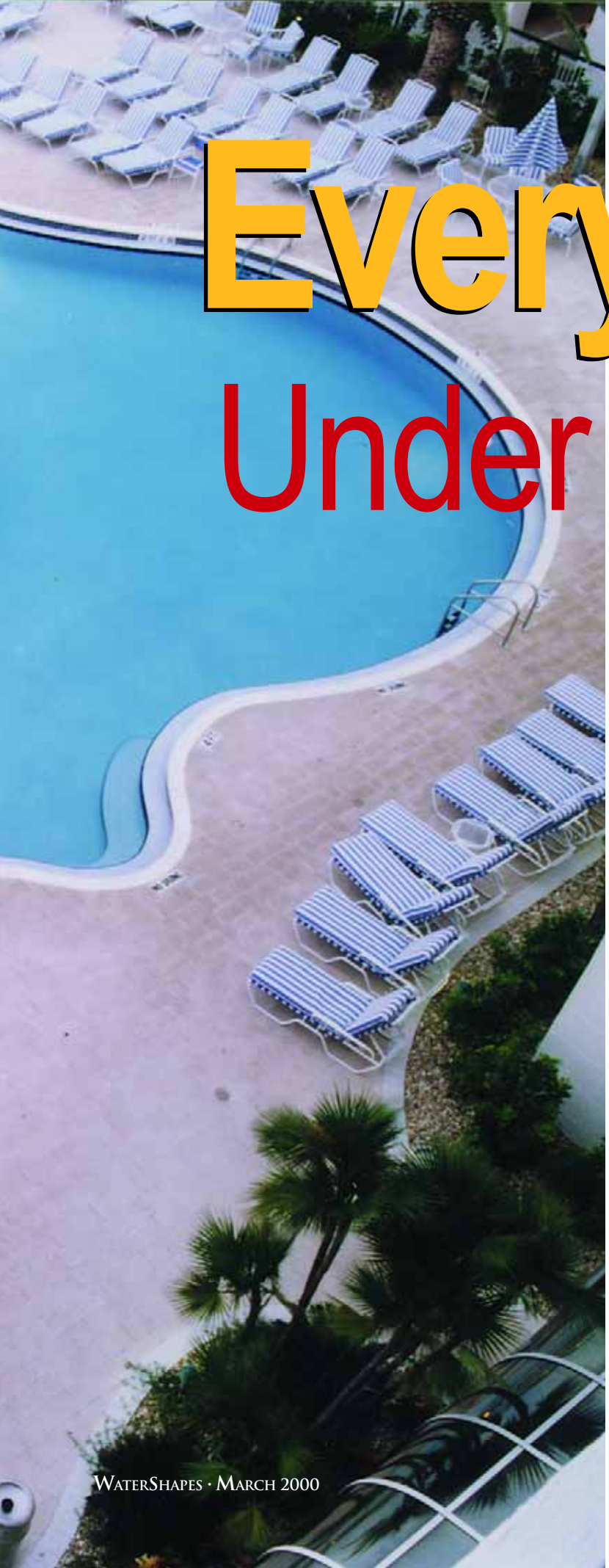
"In order to meet the project's design and construction schedule, we didn't focus on *one* solution," says George Ayer, our director of product development. "Rather, we invested in two completely different product-design solutions in order to guarantee timely success. The time and investment has paid many dividends here and elsewhere because no single sequencing device will provide all the cost and performance solutions we need."

When working in faraway places, obviously, one of those requirements is reliability. "Overseas work *demands* reliability," declares Connally. "Look at it this way: It costs us $7,000 to make a service call in Asia, so we know we'd better get it right at our testing facility. It's like the old oil filter commercials: 'Pay now or pay later' – *much* more later."



When you're working in the shadow of the world's tallest twin towers, it's clear you need to think big along all axes – especially the vertical. In cases like this, it also helps if your product development team likes a challenge.

It was a massive commercial installation, one that included a decorative fountain, a large free-form swimming pool, a tile-lined stainless-steel spa, a massive rock waterfeature and a high-tech, interactive children's play feature – all meant to add to the appeal of an exclusive Florida resort. Teamwork was the key, says the project's manager, Russell Penick, with success resulting from the combined effort of architects, engineers, suppliers and contractors.



Everything Under the Sun

By Russell Penick

Everything about this job was big: the budget, the number of watershapes, the upscale location and, especially, the customer's expectations.

The owners, Town Realty of Milwaukee, envisioned their five watershapes as the key amenities for a new condominium development in Cocoa Beach, Fla., a signature element that would woo potential buyers who visited the 124-unit vacation complex. To reach that goal, their project team gathered aquatic experts from all over the Sunshine State to create the plans and specifications, supervise the bidding process, oversee construction and work with the state's Health Department.

Before long, their Florida Dream Team had been assembled: Architect John L. Ribar of Marcet, Ribar and Ikegami of Rockledge designed the watershapes. Aquatic Design & Engineering of Montverde attended to the engineering. A state-of-the-art, interactive fountain system was designed and manufactured by Hall Fountains of Fort Lauderdale. Our firm, Intercoastal Pools of Melbourne, was brought in by the general contractor, Benko Construction of Cocoa Beach.

From start to finish, this job was meant to be something extraordinary. By the time we all were finished and the water began flowing through each of the systems, we all knew that we'd more than met all the owners' needs and desires.

Specified Variety

Intercoastal Pools first became involved in February 1998, when owner Thomas Arnault and sales engineer Steve Peters received a set of plans and specifications for the project. Right away, we knew we wanted to be part of it and were confident that our company's experience

First Impression

As is true with other elements of this project (including the kiddie feature, the planter and the pool's water wall), the fountain at the resort's entryway is circular, a two-tiered fountain with a 30-foot-diameter lower base and an upper basin 22 feet across. It boasts a series of vertical spouts on the upper level, with a center geyser that shoots 15 feet into the air.

The construction here was simple, just a gunite shell finished with the same tile and plaster as the pool eventually would have, along with requisite plumbing tied back to a small equipment vault. A special twist here is a system designed to activate when winds in the area exceed 10 knots.

Like many fountains, this one has a wind sensor. But instead of shutting off the entire system when the wind picks up (as do most fountains of similar design), this one only shuts off the vertical aerating jets. The flow that would usually go to the jets is redirected to returns in the upper level and then falls over the sides.

A unique valve-control system that could be opened and closed by the wind sensor was needed. In this case, the staff at Hall Fountains of Fort Lauderdale, Fla., knew what was required – and the system works perfectly.

Finished months before the rest of the construction began, the entryway fountain served as a preview of the installations that were to follow. The trouble-free execution of this phase-one project turned out to be a great omen for the way the rest of the project would go.

– R.P.

in commercial installations equipped us to meet the challenge.

As commercial coordinator for our firm, I soon became involved with Peters in the process of estimating and drafting some preliminary documentation. We won the bid and immediately began working with Aquatic Design & Engineering and Hall Fountains in setting precise design criteria.

For the most part, the watershapes we'd been asked to prepare weren't particularly exotic, with the possible exception of what became known as the "kiddie feature," which I'll describe in some detail later on. Most of the complexity came in coordinating the simultaneous installation of four of the five watershapes.

The first phase of the project was easy enough to manage, as it included only the installation of a simple circular fountain at the facility's street entrance during the initial phases of the overall project (see the sidebar on this page for details). The owners wanted the fountain in place to draw and direct would-be buyers to the property – and give them a taste of things to come.

Things picked up considerably in the second phase, however, which included everything else – pool, spa, waterfeature and kiddie feature. Almost as soon as the pre-construction design and planning sessions began, I could see that this job was going to dominate my life for months to come.

It helped us that our work went forward while the rest of the high-rise facility was being built. Access was a breeze, but even here, we learned early on that it was important to coordinate schedules with the other trades on site to keep things running smoothly.

I also want to note the importance to this project of our suppliers, who worked with us from start to finish to make things happen on schedule. So many were involved, and I've given them credit where it's due throughout this article.

All at once, we began with four big jobs:

• The free-form pool, which includes a beautiful circular waterfall supplied by Polaris/Florida Falls of Vista, Calif., is located in a common area where guests could swim and lounge in the bright Florida sun. With lots of sweeping contours, the pool is roughly 78-by-76 feet –

2,865 square feet of surface area and a capacity of 76,000 gallons of water.

• The spa, a stainless-steel, tile-lined therapy model made by Bradford Spas of Wilmington, N.C., is set near the pool, up a flight of steps on top of a parking structure.

• An indoor waterfeature, featuring natural rock, is positioned in the facility's main lobby.

In addition, we started on the kiddie feature, which actually became the centerpiece of the whole watershape complex. It was this element of the project that took the lion's share of my time in the pre-bid and pre-construction phase – and a great deal of my attention once construction began.

Forms And Functions

Phase-two construction began in January 1999 and was completed in June, on schedule for the resort's grand opening ceremonies.

Through that time, I was on site every workday, making sure that all was going according to plan. There was a tremendous amount of work to do, but coordination made it come off without a hitch or anything close to it. We all had living proof by the time this was over that the months and months of detailed planning that went into the project were well worth it.

It also helped that the project team brought worlds of experience and expertise on site with them. Aquatic Design & Engineering had done a great job in putting hard engineering to the creative vision of the design, and the interaction between our firm and Aquatic Design & Engineering's staff really helped keep things on track from start to finish.

The free-form pool, with rambling edges and a depth that ranged from 3-1/2 to 5 feet, was designed so that it could be accessed and used comfortably from any point around its perimeter. The shallow end is divided by a peninsula that accommodates a circular planter and the circular waterfall I mentioned above.

The waterfall itself is a neat touch: A gentle wall of water flows from the top of the planter down to the water's surface around a 22-foot radius. Water is moved at 550 gpm by a 10-hp pump made by ITT Marlow of Cincinnati. A bench below the falls offers bathers a great place to cool off – even at night, when a white, fiberoptic illumination system designed and manufactured by Supervision Lighting of Boca Raton, Fla., bathes the falls in a soft glow.

It certainly made life easier in some respects that we worked on this huge project while construction was going on all around us on the high rises of the condominium complex. At the same time, it put a premium on coordination with other construction groups as we moved an amazing array of steel, plumbing components and masonry on site and put it to good use.

The rest of the pool's perimeter features a formed gutter system dressed in blue tile. All water is returned through the floor, in accordance with Health Department requirements for commercial pools of more than 30 feet in length. In all, the amoeba-shaped pool has 20 returns, evenly spaced. The plumbing ranges in diameter from 1-1/2 to 10 inches and runs off a single 5-hp unit made by Berkeley Pumps of Delavan, Wis.

The water turns over every six hours and is filtered by a diatomaceous-earth filter made by Compac Filtration of Jacksonville, Fla. The water-treatment system was designed and installed by CES, an engineering firm based in Jupiter, Fla., and uses an ORP controller made by Stranco of Bradley, Ill., to feed bleach via a positive-displacement peristaltic pump supplied by G.H. Stenner of Jacksonville.

Around the pool, the deck features pale beige pavers trimmed by thin, buff bullnose coping – nothing fancy, but very crisp and clean in appearance. The pool's interior is finished in a white plaster with flecks of blue – a premix product offered by Florida Stucco of Boca Raton.

Adding To The Fun

Away from the main pool area, up a flight of stairs and over one of the facility's parking garages, is the stainless-steel therapy spa. The initial design had called for a custom concrete spa, but evaluation of the parking structure revealed that the weight would be too great. As a result, the decision was made to turn to stainless-steel construction.

Bradford Spas provided the 10-by-12-foot spa fully plumbed and ready to install, complete with a gorgeous ceramic tile finish and 15 therapy jets. We craned the spa into place and went through some heavy-duty finagling to get the water up there (a long story in itself that I won't tell here). But beyond that, it was much like installing a portable spa.

Over in the main lobby, we worked on a massive, natural-rock waterfeature. More than 18 tons of imported corkstone rock were hauled in and set in place by Dean Zack, an independent designer and installer based in Cocoa Beach. Water flows down a total of five feet over a series of complex cascades stretched out over the structure's 30-foot length, feeding two separate pools at the base. The watershape carries about 3,000 gallons and is powered by two 3/4-hp pumps made by Sta-Rite of Delavan, Wis.

The beauty of this installation is a direct expression of Zack's creativity. Working within some fairly basic guidelines, he was free to follow his artistic instincts in arranging the boulders – with spectacular

results. Now, the varied sounds of running water and the impressive rocks lend a soothing natural look and feel to the lobby area.

I've saved what became most everyone's favorite piece of the project for last: As mentioned above, a custom-designed "kiddie feature" was seen as an important part of the project package – a way to make the entire facility stand out in the minds of family-oriented prospects. When the job went to bid, it was vaguely described as an "interactive waterfeature with leaping jets controlled by computer."

Fortunately, true professionals were brought in to turn that broad vision into working reality. Speaking entirely for myself, I was happy to be working once again with the folks at Hall Fountains: I've known them for more than 20 years, and every single project I've ever installed that included one of their systems has worked perfectly.

A Tall Order

Even for a firm with that kind of experience, this project was a stretch.

When you look at it, there's not much to see – just a circular slab covered in a special non-slip material made by No Fault Industries of Baton Rouge, La., called Safe-Deck, a colorful rubbery surface with a nice spongy texture that we mixed and troweled into place. The water shoots out of 36 deck-level brass nozzles that are virtually invisible, and the water drains over and through the spongy surface material to a small gutter system that encompasses the feature and leads to a small holding tank mounted below grade. All of the pumps, filter, valves, relays and the computer system are invisible as well, housed in a completely prefabricated vault that is also set below grade.

From the start, the owner made it clear they wanted this feature in particular to be something special, and the folks at Hall Fountains were glad to oblige.

The 36 jets are arranged in three zones. Each zone includes a special "control jet" that children can use to change the pattern of the dancing waters: When a child steps on one of these three jets or puts a finger on it, the system senses the pressure differential and activates the computer, which cycles through several patterns it has stored in its memory.

Each zone has a dozen different programs in which the height, pattern and sequence of the spouts is varied. When you combine the spouts of all zones, each working on a different program, the possible combinations of jet action run toward infinity. Not only is the concept fun: The kids have taken to "their area" with gusto, and the feature provides precisely the "hours of fun" the owners were after.

Because of the work Hall Fountains did ahead of time on this job – designing the system, manufacturing the components and pre-assembling the complete package – the

B

The resort's large swimming pool spreads through the courtyard like a giant amoeba (A) and brought along a need for care and feeding. Florida Health Department codes add a lot to these large commercial installations – including rigorous guidelines for gutter systems and, in this case, a requirement for 20 floor returns. The planter that juts into the pool's center adds the sight and sound of moving water (B). At night, a fiberoptic lighting system (housed in the white vault in the center of the unfinished planter on page 37) adds color to the display.

on-site installation was a snap.

The structure consists of a round, 6-inch slab, 24 feet in diameter, that contains the lines for each nozzle. The nozzles, flush-mounted in the concrete, have adjustable eyeball fittings that enabled fine-tuning once everything was installed.

The greatest challenge here was laying out the lines before the concrete was poured and pressure testing each line to be sure that each was fully sealed and had been installed with the correct spacing to ensure performance according to plan.

For all the fun it produces, the system carries only 4,000 gallons of water driven by four separate 3-hp pumps made by Sta-Rite of Delavan, Wis. The water is filtered through a small Sta-Rite sand filter and fed to a collection tank; solenoid-operated valves open and close the 36 lines according to the programs in use.

All of the equipment is contained in a buried concrete vault – a real thing of beauty with relays and computer mounted on one side and valves and hydraulic equipment on the other. Everything is arranged neatly, square, plumb and buttoned down to perfection.

The concrete spa originally conceived for the resort would, as planned, have proved too heavy for the roof of one of the resort's parking structures. Seen here, the fully tiled stainless steel spa fell within the weight restrictions, and the fact that it arrived fully equipped and plumbed simplified the installation – a fact that didn't displease us.

It's difficult to get an angle on the lobby's waterfeature that gives you a clear sense of its span, but it stretches out across an impressive 30 feet in the facility's lobby. The more than 18 tons of rock were laid out by Dean Zack and lend a natural look as well as the soothing sounds of moving water to a grand public space.

Finishing Touches

The engineers who designed the software spent a full day setting up the electronics and then testing and retesting. Minor adjustments were made, and the system was ready for the kids. In all, it took two months to install this unique waterfeature.

Knowing how specialized this system was, I made it clear from the start that all I wanted our crew to do with the control systems and lines was lower the equipment into place in the vault, hook up the power and make sure that we'd connected the right lines to the proper outlets. As I had hoped, it all came off without difficulty.

Throughout this article, I've stated over and over that everything moved forward without hitches. As a veteran of 40 years in the pool-construction trade, I've been involved in just about every kind of job you can imagine, from the smallest residential jobs to high-end commercial work. In all that time, I've never worked on a project that covered such a broad range of water bodies – and on few that moved so smoothly from start to finish.

More than anything, I had a sense that we were fortunate to be involved at every level with top-notch professionals, from the owner and architect and general contractor and on to all of the suppliers who pitched in with their expertise and products tailor-made to our needs and specifications. How smoothly and seamlessly these systems went in – and how well they work now – is true testament to what can happen when you have the right people on your team.

The most diverting of all the watershapes we installed for the complex was the one we dubbed the "kiddie feature." It seemed humble enough in early construction (A), but anticipation grew as all of the plumbing lines were installed (B), various connections were made to the equipment vault (C), the deck material was troweled on (D) and the folks from Hall Fountains came and turned on the magic (E). The accompanying text goes into detail on just how special those effects are; suffice it to say that this area is a hit with its intended users and their parents.

BENT To Last

Locked in the middle of walls and floors in everything from tiny fountains to gigantic commercial swimming complexes, a proper cage made up of steel reinforcing bars is the hidden strength that allows a concrete vessel to hold its form, come what may. Here, veteran steel contractor Larry Long takes a look at this key shell-shaping material, explaining what it takes to set up structures that will last a lifetime – and beyond.

By Larry Long

Watershapes come in lots of configurations and sizes, but when you get right down to it, they mostly share two basic materials of construction – concrete and steel – that in combination have the potential to withstand generations of use.

Fashioning these structures is at the heart of what watershapers do: Everything else, from the plumbing or the plaster to the tile or the decking, is really secondary. Sure, the pool won't function without plumbing or look pretty without tile, but it wouldn't even *exist* without its skeleton of steel and its concrete flesh.

For all that importance, however, most people tend to give the steel in particular little thought or care. It's invisible once the gunite is in place, so there's a tendency even among those who know better to blow it off and save a few bucks by using too little steel or by doing quick, sloppy work. And why should you care? No one will ever see what you've done, right?

Actually, given the role that steel plays in the durability and viability of the concrete structure, this should be the *last* place to compromise or slack off. To me, good steel is an insurance policy: It's a way of guaranteeing that the structure of the watershape will do what it's supposed to, for the long haul.

GOOD STEEL, GOOD PLANS

There's a lot to good steel work, as we'll explore here in detail, but all of it begins with a sound structural plan. That's so fundamental that it would seem to go without saying, but in practice many problems start either with a plan that fails to meet structural needs or soil conditions – or with a contractor who can't follow a good plan made by someone who knows what needs to be done.

In our work, we have the luxury of working with great engineers, including Ron Lacher, who's written for *WaterShapes*, done seminars on structural engineering and is well known for getting structural engineering right. Whenever we get a plan from Lacher's office, we know it is right for the soil conditions and the design – and that it will tell us *exactly* what to do, from spacing, sizing and radiuses to all of the design details, from skimmers to vanishing edges.

Let me make an important point right up front: Even though watershapes of all types are growing in complexity when it comes to features, elevations and visuals, most of the structural elements – no matter how complex – are made up of what can be considered as "standard" design elements. This isn't a *minimum* standard by any means; rather, what I'm saying is that many of these structural

features are repeated over and over again from job to job.

For example, most residential pools built in our area have a standard 12-by-12-inch grid pattern, with additional reinforcement of the radius in the deep end with #3 or #4 rebar at 6 inches on center. That's what I mean by "standard." Of course, there are variations for deeper pools and watershapes set in challenging soil conditions, but you keep seeing standard structural details for skimmers, benches, edges and beams even in work that is otherwise highly customized.

Most of the mistakes made by steel companies occur because they haven't followed these standard schemes – particularly when it comes to *clearances*.

If the plan calls for steel to be installed in a 6-inch-thick wall, the steel *must* be properly raised away from the dirt so that it will end up exactly in the middle of the wall, 3 inches from the inside and 3 inches from the outside. And it must be right on the button: If you're off by just an inch, which is not hard if the steel crew isn't careful, now you have 2 inches on one side and 4 inches on the other, and the structural integrity of the shell is compromised as a result.

Getting the right clearances isn't difficult. You take 2-by-3-inch concrete blocks and place them at regular intervals around the pool beneath intersections of steel bars. If the steel needs to be 2 inches off the soil in a 4-inch wall, you lay the blocks on their sides. If you need 3 inches, then you stand them up. If you need 4 inches, you stack two blocks flatways – and so on for whatever clearance you need.

It's a simple concept, but it's often ignored and results in shells in which the steel isn't where the engineer says it should be – an error that can cause all sorts of problems.

STANDARD VARIATIONS

As I just mentioned, beyond the basic structure of walls and floors and bond beams, most watershapes will feature one or more details that must first be shaped in steel.

If the shell is to be set up in special conditions – on an upslope or downslope, for instance, or with a vanishing edge or a raised spa – then you should be given a plan detail that spells things out clearly. It always amazes me (and scares me, frankly) to see steel guys making these shapes without a proper plan. There's no reason for it, because most of those details are also highly standardized.

We deliver our steel on site using special racks mounted on the sides of our trucks. The low height makes transferring the heavy rebar a much easier proposition – but it's still hard work.

Take the downslope situation: The big difference here is that the walls will be thicker, with perhaps 6-1/2 inches of clearance behind the steel and 4-1/2 inches in front. All that extra concrete is in the radius, which is where the shell needs more support. In these situations, it's critical to work per plan. If you don't, the pool might fail: "Close" simply isn't good enough under such conditions.

(Our company has installed steel on more than 35,000 pools, many on hillsides and in expansive soils and all of them in seismically active Southern California. As far as I know, our failure rate is practically zero – not a single crack we're aware of, and we know it's all because we follow plans that have been set up with proper engineering principles and in response to surrounding conditions.)

Beyond ensuring the structural integrity of a pool, adherence to plans is es-

Inside and Outside

There are two basic ways to tie steel: You can either tie "bottom up" or you can tie "top down." Here's the distinction – and reasons why I prefer the former method to the latter.

Working bottom up, you start by bringing the steel into the pool and then run it up in the deep end, splicing 20-foot bars along the full length of the pool and bending them to conform to the contours of the bottom. Then you place horizontal bars and work up the sides to the very top. With all the steel in the bottom of the pool, you bend the steel over at the forms to create the bond beam. That's the way most people do it.

The other way, top down, is where you first bend the right angles for the bond beam and hang them from the forms. After they've been hung all the way around the pool, then you splice onto these and criss-cross your way around the pool. Some people like that way because it looks a little neater.

In a bottom-up pattern, however, there are far fewer splices, because you usually splice in the middle and go up the side and then bend it over the beam. In a top-down approach, there's usually a lot more cutting and splicing.

These approaches have nothing to do with the eventual structural integrity of the pool. It's just about the way the steel looks before it's shot – something that matters to some people.

– L.L.

pecially crucial at the steel stage because this is where the important dimensions of the pool are truly being established. Inspectors are supposed to monitor this and make certain dimensions are right.

The first inspection comes after steel and plumbing are done, and one of the key things the inspectors look for is proper blocking. This is a good thing, because sometimes the plumbers will come in after us, step on the steel, rotate the cage a bit and knock bars off of the blocks. At that point, we're called back to reposition the blocks.

But in my experience, the inspectors who follow steel crews often do not look at the details closely enough, so we believe it is incumbent upon us to go in and make sure what we're doing *exactly* reflects what the engineer has put on the page before the concrete is applied. The way we look at it, if we don't catch the mistakes, the job will proceed and the resulting shell may not be built according to specifications.

Of course, there's a step that happens before the steel company comes on site that also has a lot to do with the overall quality of the execution when it comes to dimensions and elevations – that is, the excavation, which we'll discuss next.

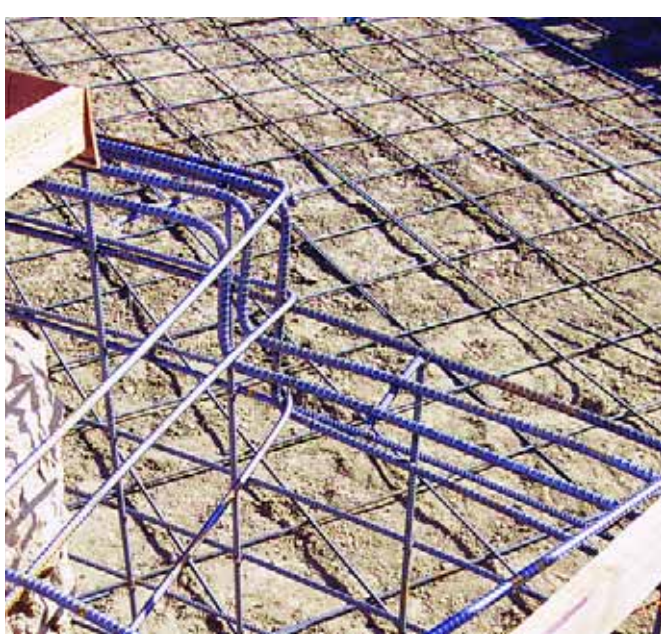
DOWN IN THE DIG

Accuracy in steel configuration absolutely flows from accurate excavation – and, once again, from the plans created by the designer or builder.

As the pool is dug, the soil is carved according to these plans. By the time the steel contractor arrives on site, the shape of the soil and forms should define the interior contours of the watershape and elevations – at which point we step in to "tie" the vessel according to the dig.

The first thing we always do is check to see if the dig conforms to the plans we have in hand. That's vitally important: You'd be surprised by the mistakes we find – a missing love seat, for example, or an elevation or position that's slightly off. We've found that it pays to watch plans *very* carefully at this stage to be sure that the features the customer wants are actually reflected in the excavation.

If adjustments need to be made, now's the time to make them. At this point, it's relatively easy to change the shape of the



A tool called a Hickey bar is truly indispensable when it comes to bending small-gauge steel on site. With two of them in hand, the steel can be turned to any angle you need – particularly handy in setting up beams.

watershape, eliminate a feature or add a new one. It's also possible here to "alter" the design a bit rather than go back and correct a problem – an especially common solution when it comes to the dig being slightly out of position on the site. Regardless of what decision eventually is made, it's our responsibility to point out any mistakes the excavator has made so that the builder and the customer can decide how best to proceed.

Getting back to the elevations for a moment: When a watershape is built, the elevations should always be within 1/4 to 1/16 of an inch or less. That's not rocket science, but it's a pretty tight construction tolerance over a long perimeter. We're always aware that it's easy to knock things out of level once work begins – and that if we don't catch the errors, then the gunite contractor might come out and shoot the pool according to steel and forms that aren't set correctly.

From this point forward, the problems associated with errors multiply in severity. Shell elevations relate to things like slopes, adjacent structures, proper drainage and associated slabs, and "missing" even by as much as 1/16 of an inch can matter. (It should come as no surprise that missed elevations account for the most expensive of all mid-project corrections.)

What should happen (and *does* happen when you work with quality people) is that every trade should come in and check for deviations from the plan – but that doesn't always happen. We've also seen instances where a *major* detail like a raised bond beam hasn't been accounted for at all or hasn't been set at the right level. That's a huge mistake, but you *do* run into these things – and my point is that it's easy to miss even these huge details if you aren't following a plan.

There also are times when the plans don't give us a detail we know we need. For example, if we're working in a downslope configuration but the plans do not include a detail of the sort we're accustomed to seeing, we'll go ahead and include the extra steel in accordance with a standard plan we work with all the time.

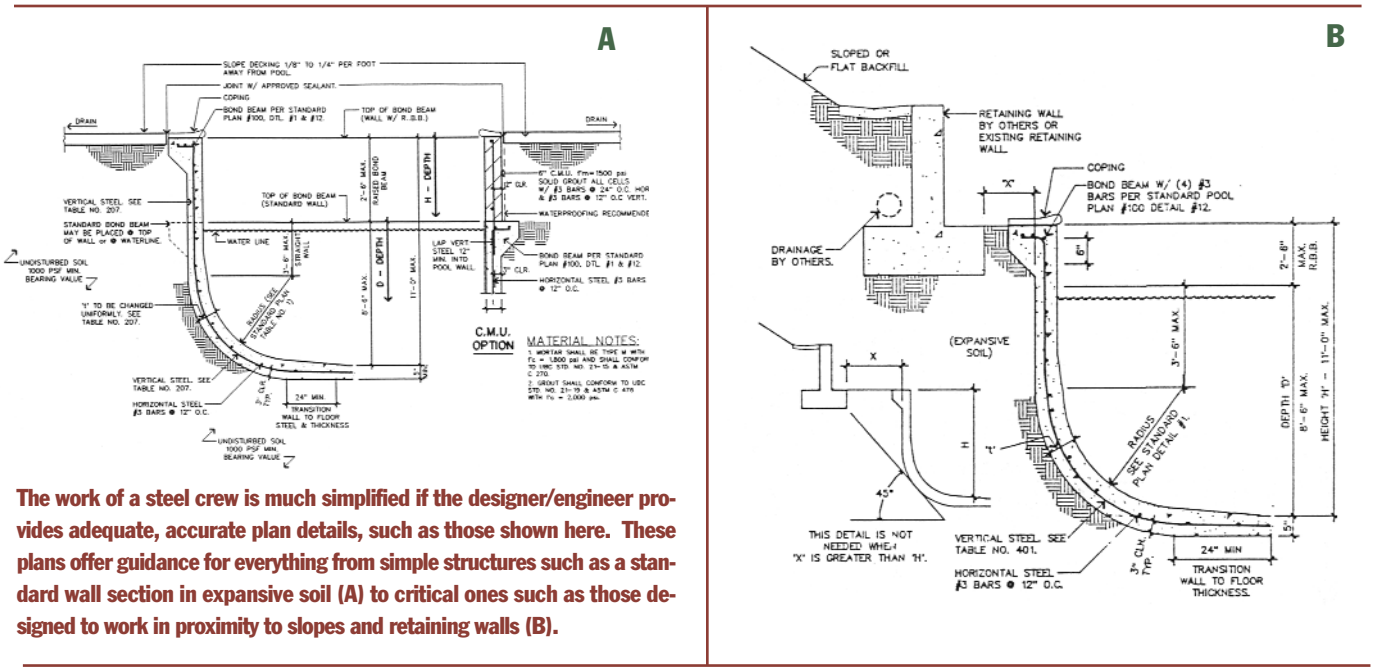
We feel confident and comfortable making these decisions on site because we know that if we don't address the problem in the here and now, it's almost certain the inspector will make the call and insist that more steel be added in certain locations. That will certainly hold up the job, so we'll find the necessary plan and often take it upon ourselves to do the job correctly.

WORKING WITH THE PLAN

There are certain features with which this need for plan details often arises. If a design includes artificial rock or an elevated waterfeature of some kind, for instance, you can be certain of a need for added structural reinforcement and should ask for a plan detail if it's not there. Or if we're installing a vanishing edge, we want to be sure we know the exact elevation of the edge. And if we're working with an octagonal spa, we'll be sure that the sides are formed at precise angles and lengths.

Experience is a huge help here. Every job we do offers us measures of guidance in all the other jobs we do, and we always strive to get things right knowing that all the trades that follow us right through the entire construction process will echo any mistakes we've made.

Given the seriousness of that responsibility, it's nice to know that what's appropriate for a tiny rectangle is generally appropriate for a free-form goliath in structural terms. In fact, shape and style don't make nearly the difference that surrounding soil conditions do. True, when you get to greater depths (such as those you'll find in a commercial pool) you'll see increased radiuses, more steel and thicker walls. But again, the basic engineering re-



The work of a steel crew is much simplified if the designer/engineer provides adequate, accurate plan details, such as those shown here. These plans offer guidance for everything from simple structures such as a standard wall section in expansive soil (A) to critical ones such as those designed to work in proximity to slopes and retaining walls (B).

Tying steel isn't so much an art form as it is a skill that requires attention and care. We bind about 50% of the intersections in our watershapes, basically because we don't want anything at all to move once we're ready to turn things over to the next crew.

quired to make a watershape work in given soil conditions at a given depth will remain the same from job to job.

Experience also teaches us that following a plan doesn't necessarily mean going with the bare minimums. At 8-1/2 feet, for example, you're going to have a 5-foot radius with steel installed on 6-inch centers in the radius and a 6-1/2-inch gunite thickness. If you have expansive soils, however, that thickness should be 9 inches.

The difference in cost here is insignificant, so we recommend that people always build for expansive conditions. What's a yard of concrete weighed against the extra stability it gives the shell? (Personally, I divide quality builders from the rest of the pack by their willingness to do it the right way and not stick to the minimums.)

The great thing here is that all of these factors, variables and dimensions are known to engineers and experienced steel contractors. This standardization helps streamline the estimating and planning of jobs.

We estimate materials based upon perimeter and square-footage measurements. If you have a 15-by-30 foot rectangle, we'd count that as 90 perimeter linear feet and about 500 square feet in surface area. We know that's going to take about 1,500 pounds of steel – just about average for residential pools installed in our area. If we do a 20-by-40 foot rec-

Before or After?

In addition to the excavator and the gunite contractor, the plumber links his or her performance on our ability to lay out steel.

The main issue between our trades is one of timing. Sometimes plumbers come in after the steel is installed; other times, they'll install the plumbing in the hole before the steel goes in; in still other cases, the two trades work on site concurrently. In our experience, it works best when we install the steel after the plumbers have run their lines – and I think most plumbers would agree.

Still, there's really no right or wrong way to do it, so long as all eyes are fixed on the plan. When plumbers show up after the cage is in, for instance, we're always careful to recheck spacing and clearances after they've left. It's also a good idea to tie every other intersection of steel if you know a plumber will follow you. It doesn't add that much time to the project – and it really makes sense when it comes to being sure that nothing will be knocked out of place.

There are some obvious instances where it makes more sense for plumbers to come in after the steel has been set, such as when they're hanging jets in a spa's dam wall. If there's no steel cage there, it can be very difficult for them to eyeball the location of the wall. Once the steel is there, however, the cage acts as a guide. Otherwise, if we have to conform that wall to the plumbing, the spa might turn into an oval rather than the circle everyone wanted.

If work is being done concurrently, we've found it best to coordinate the installation so plumbers are busy in areas where we aren't. We'll have them set up the main drain while we work in the shallow end, for example, and on the skimmer before we get to the bond beam's steel.

– L.L.

True circles are easy to fashion when the dig is good and the forms are true. Note that we work about six inches below the forms in setting up the cage (A). When we insert the blocks (B), the cage rises up in the hole to just the right elevation.

tangle, which is 120 perimeter feet and 800 square feet, the steel requirement rises to nearly one ton.

MAKING THE SHAPE

Once we've signed on, the steel work comes together pretty quickly.

We have a yard at our facility where steel is delivered in 25-ton loads. Two-person crews transfer the steel required for any given job to our own vehicles for transportation to the site. These vehicles feature low, side-mounted racks so the material doesn't have to be moved too far or lifted too high.

As delivered, the steel comes in 1-ton bundles, but it's also sub-bundled for easier handling and loading. When we get to the job, the crew normally unloads the steel where the tractor comes in. We lay the bars, which we always get in 20-foot lengths, in one spot and then move them as needed to all parts of the backyard.

People often compare building steel cages to basket weaving, and I think that's a pretty good analogy. We're working with bendable material placed in intersecting patterns. And just as making baskets is easier when you have a form to guide you, bending steel to its proper shape is really pretty easy when you have a nice excavation: You simply bend it to mimic the contours of the excavation.

With a good dig, we just follow along, check the plans and maintain the proper clearances, spacing and elevations. Things get tougher, however, when you have to eyeball it – as with a deep-end ramp. Here, we have to build free-standing walls just as though the dirt

All Tied Up

There's no code governing steel ties and how often they should be made, so inspectors aren't concerned. As a rule, however, most companies tie a minimum of about 30% of the intersecting points of the steel, although I've heard of some people doing as little as 10%.

For my part, I always tell my people to go the extra distance and tie at 50% of the intersections, basically because it helps the steel stay in place through thick and thin.

After we leave, all sorts of people will be walking on our work and using it to climb in and out of the pool. As a result, there are lots of opportunities for the steel to be moved or to be knocked off the blocks before the gunite is shot. If every other junction has a tie, we're fairly certain things won't move enough to matter. It's an insurance policy.

Beyond the frequency question, the main issue in tying is how you "dress" the tie once it's done. In our case, we don't want to leave pieces of wire dangling off the tie, nor do we want to leave any of the trimmings behind. The thinking is that they might rust and cause cosmetic problems later on.

Frankly, I think that any time you see rust from a tie wire, it's most likely because the gunite was applied too thinly across the top of the steel. It shouldn't even be close: That'd be one *wild* piece of wire sticking up above the steel more than three or four inches!

As for the tying itself, there's no real trick to it, just a matter of wrapping, twisting and snipping the wire. We use 16-gauge black annealed tie wire – pretty standard.

– L.L.

were there, visualizing and following the shape of the pool to create the feature with the steel cage. It also gets tricky if sections of the dig collapse – as shown in the in the four pictures below, for example. These are times that truly test your eyeballing abilities.

Again, the standardization factor really works in our favor: There simply aren't too many of these details we haven't seen before – many times. So long as we have a good set of plans and a Hickey bar to bend sharper angles, we're on our way. On a typical pool, we'll set up the steel cage 6 inches below the top of the forms, then elevate the whole cage 3 inches by blocking it up. Now it's 3 inches below the forms, right where it should be – and we're just about done except for our final, pre-gunite inspection.

TOUGH WORK

In all of this discussion of how simple setting up a steel cage can be – with good plans and a good dig, that is – I have yet to mention that installing steel is one of those jobs that can be both physically grueling and mentally demanding.

It's truly hard to find people who are good at steel work and will do it for very long. It's stoop labor: You bend over a lot of the day and are constantly lifting, positioning and wrestling with heavy material. It can get old in a hurry.

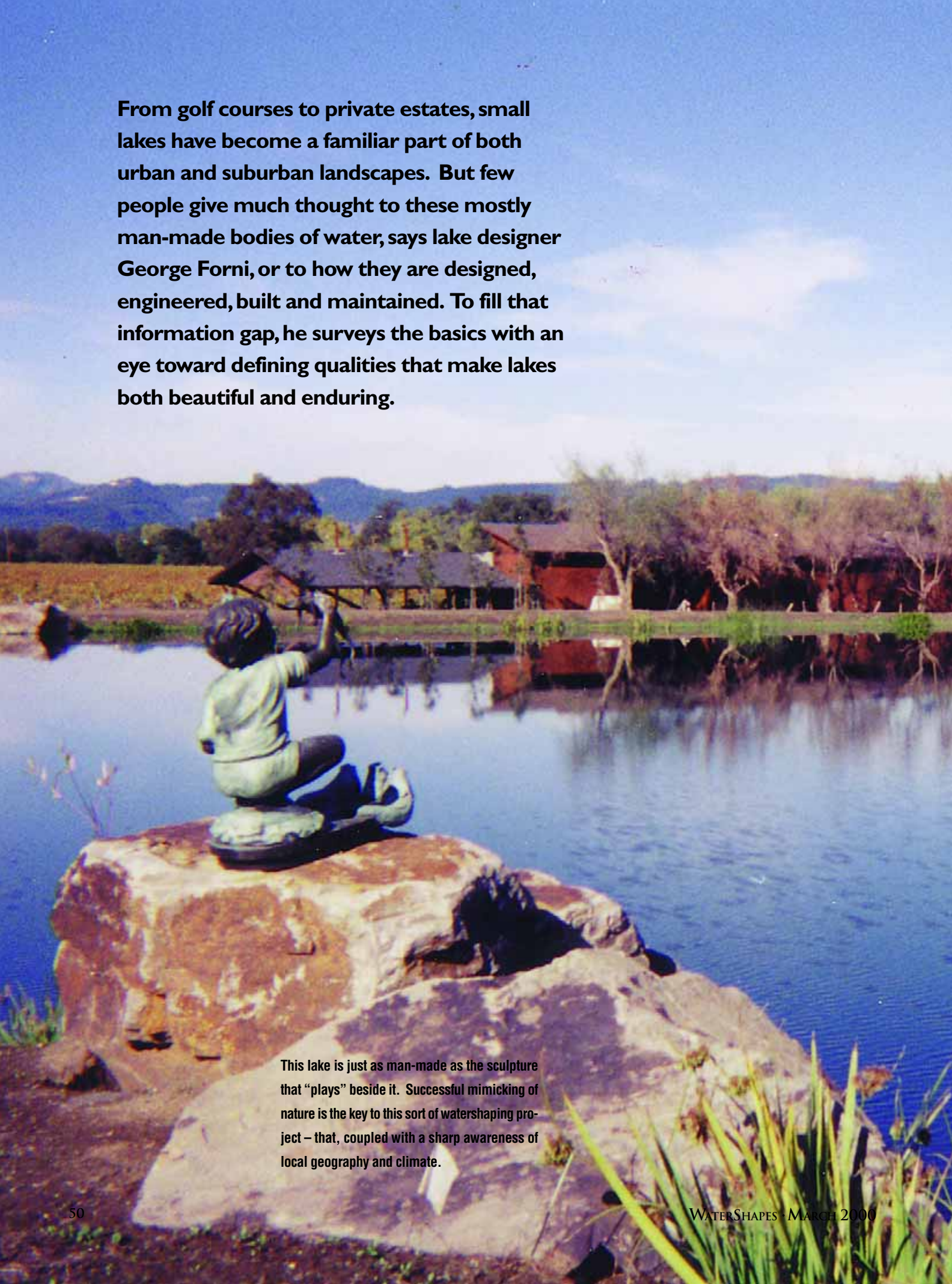
In our company, we've been lucky enough through the years to hire experienced people, but for the most part we train our own crews. And when we find people who are really good at this work, we do all we can to take care of them and keep them happy, because they're hard to replace.

To be good at it, you have to work smart and take care of yourself. We constantly remind our people to lift only what the body will handle and not to move too fast, but rather to work steadily and efficiently. The reasons for this are obvious: With such hard work, it's easy to get tired, which in turn leads to injuries or mistakes of the kind we all try to avoid by taking care to follow the plan.

We take pride in the fact that good steel jobs, along with good excavation work beforehand and good gunite application afterwards, really create watershapes. As the intermediate stage of the process, we see our role as the pivotal one and get a lot of satisfaction out of knowing that what we do makes concrete shells stable for the long haul.

It's a real pain: Excavated walls sometimes collapse (A) and make an unholy mess of wooden forms (B). In these cases, the steel crew must have the ability to 'fill in the blanks' and shape the cage as though nothing were the matter (C & D). This skill in eyeballing contours is one of the hallmarks of a capable steel contractor.

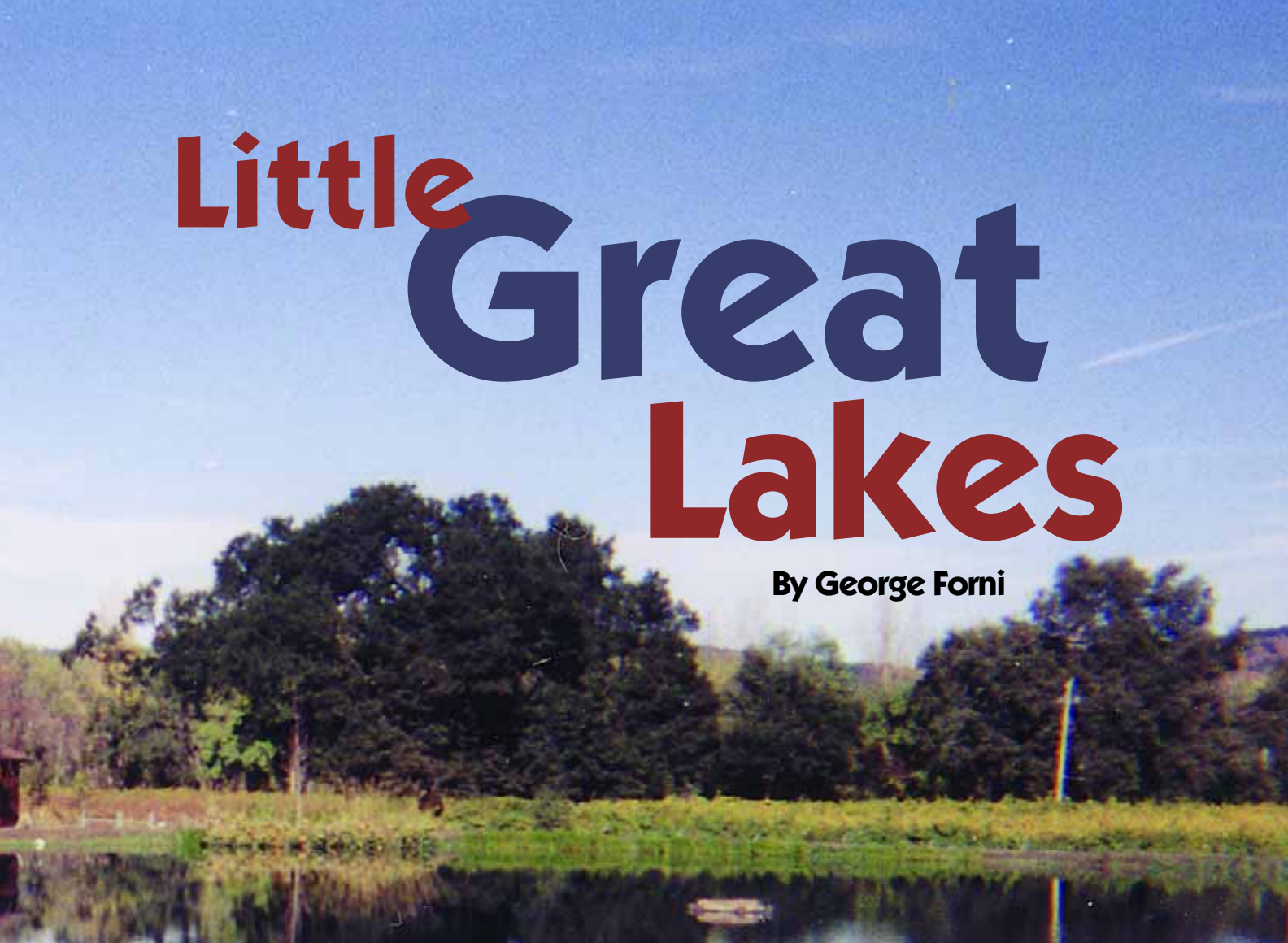
From golf courses to private estates, small lakes have become a familiar part of both urban and suburban landscapes. But few people give much thought to these mostly man-made bodies of water, says lake designer George Forni, or to how they are designed, engineered, built and maintained. To fill that information gap, he surveys the basics with an eye toward defining qualities that make lakes both beautiful and enduring.



This lake is just as man-made as the sculpture that "plays" beside it. Successful mimicking of nature is the key to this sort of watershaping project – that, coupled with a sharp awareness of local geography and climate.

Little Great Lakes

By George Forni



What is good lake construction? What makes some pristine and beautiful while others seem fetid and slimy? To discover the answer to these and other questions, we need to start by defining what we mean by "lake."

It may seem arbitrary, but the distinction can be an important one, especially to people who own them. You don't want to insult anyone by calling their lake a pond or lagoon, for example. By the same token, you don't want to seem ill-informed or unprofessional in referring to their waterfeature as a lake. Given the different ideas people have about what these terms mean, I take the tactful high road and refer to most everything as a "body of water" until I'm certain.

I bring this up because terminology can get confusing with respect to lakes – and is something that must be straightened out to make these fascinating watershapes more accessible to professionals as well as their clients.

As a "lake contractor," our firm specializes in design, installation, management and aquatic remediation. In other words, we build many new lakes and troubleshoot and fix many others that are experiencing problems. In this line of work, the definitions we use help us determine an accurate scope of work and/or develop a sound maintenance program. In doing so, we've come to understand the key components that make lakes work on one hand – or turn them into mosquito pits on the other.

What Makes A Lake?

Back to definitions: Anyone can look at Lake Tahoe and be correct in the assumption that it is, in fact, a lake. But what makes it a lake?

According to *Webster's New World Dictionary*, a lake is "a large inland body of water," but that's too vague – and gets even more obscure when you consider regional definitions and what constitutes a lake in, say, Minnesota as opposed to Arizona.

The definition we choose to use in our work is more precise, but still general enough to apply across a broad range of circumstances: "A lake is a body of water, captured by natural or man-made means, effectively being a minimum of one surface acre in size, and will typically support an ecosystem without human interaction (or minimally thereabouts)."

Having an acre as a guideline helps, but that's not quite enough, because a lake with a one-acre surface that is only 12 inches deep doesn't fit this one-size-fits-all description. In other words, a lake, by

definition, must also have some minimum volume or depth. Therefore, in addition to possessing the one-acre surface minimum, a lake also must have a volume sufficient to support the ecosystem, year 'round.

This leads us to an immediate problem for many bodies of water aspiring to be lakes: For example, that 12-inch deep acre of water will most likely be a skating rink during the winter months and a Petri dish full of pungent green, yellow and brown algae during the warmer summer months.

So what is the minimum depth? We consider a "treatable" body of water to be a true lake when the depth and volume are stable from season to season, have sufficient depth to support the use of watercraft and have a minimum volume of 1,000,000 gallons. Thus, a one-acre lake of three-foot-average depth would be just shy of a million gallons.

Beyond basic issues of size, volume and depth, the more compelling question about our body of water is about whether it supports an ecosystem. If not, why not? In answering that basic question, we need first to define *ecosystem* and what it takes to know if this body of water we now have defined as a lake with respect to size, volume and depth will actually support one.

That may seem a devilishly complicated question, but it's generally pretty straightforward: Only under the most extreme situations – elevated pH, increased temperature or localized toxicity – will a lake as we've defined it not support some form of ecosystem. Even fish fry qualify as an ecosystem here and tend to lead to more sophisticated systems that support not only fish and invertebrates, but also waterfowl and reptiles as well as many other forms of wildlife.

So once we have life, our outsized body of water is very close to deserving all of the respect and accolades due a lake. But there's one more factor to be considered: *intended use*. More than anything else, what ultimately defines a lake and how it's designed is that intended use. Whenever our firm designs a new lake, the majority of our efforts focus on this intention and how this functionality will be maintained.

The Artful Hand

As we've seen, lakes can be broken down into several categories based on intended use. They can also be broken into two over-riding classes: natural or man-made.

• *Natural lakes* occur as a result of nature finding a low collection point or location in which water is captured and held for an indefinite period of time. These lakes have earthen, rock or some other semi-impervious bottom material that allows the water to remain captive. Unless fed by an underground water source, most lakes will have a natural form of flow-through circulation, fed by surface sources like streams and drained by them as well.

Although not every natural lake is perfect in the circulation aspect, in general

Lakes are being installed in lots of places Mother Nature never would have thought to put them, including business parks (A), personal residences (B), agricultural settings (C), public parks (D) and housing developments (E). Making long-term results align with the owner's desires in commissioning such an outsized watershape is a substantial challenge. The key, I've found, is doing all that can be done to shape systems according to natural models.

Mother Nature seems to hit a lot more home runs than builders do in this respect. In other words, natural lakes tend to work just fine on their own, and we can learn a great deal by looking at them from a design and engineering standpoint.

• *Man-made lakes* are just that – our imposition of a lake where nature didn't create one or intend for one to be created. To my mind, this is a fairly arrogant exercise, but it can be done effectively.

Lots of man-made lakes excel in the aesthetics department, but they tend to fall short when they seek to improve upon nature rather than mimic it. This is, in fact, the most common problem in lake design and the one we as a company are most frequently called upon to remedy.

If the water is clear, can't we just make it clearer by adding a sand filter? If that doesn't work, then why not try some algaecide, chlorine, flocculating agent or even dye? This impulse of lake managers to try continually to improve on nature is understandable but frightening, especially since the time-tested answer is right in front of us – that is, to build as much like nature as we can.

It is easily understood that not all sites and conditions are perfect for lakes, which is precisely why nature failed to put one there in the first place. What happens is that someone with a better idea comes along and changes the site to accommodate a lake by expanding an existing creek or pond. It may serve an intended need, but will it work as a lake?

In many cases, the answer is *no*. The approach results in man-made problems not initially associated with the site, including rapid water loss and increases in nutrient load that cause chain reactions of problems that might even mask the initial culprit. This is not to say that these situations cannot be rectified, but the truth is that any modifications to an existing ecosystem might take years to undo – if in fact they can ever be undone.

Doing What Nature Does

As lake contractors, our goal is to recreate, as closely as possible, what nature has done rather than shape a rustic, oversized swimming pool. Understanding this one, basic distinction will save tall dollars and a tremendous amount of grief.

First on our list of concerns is whether the new lake will actually hold water. In most areas of the country, if you dig a hole, fill it with water and wait, the liquid will disappear in a few minutes, hours or days. Minnesota is a noteworthy exception: In most places outside "The Land of 10,000 Lakes," however, some form or other of water-retention amendment will be required.

If you are fortunate enough to have a site that has excellent retention capabilities, you need only to address two or three other issues (growth of aquatic vegetation, sedimentation and nutrient reduction, which I'll get into in just a bit). In most places, however, you'll need to step in and add something that will en-

Ponds and Lagoons

As mentioned in the adjoining story, anything smaller than an acre isn't a lake, but does that make it a pond or lagoon by default? Not quite.

Let's step out of this swamp with a couple more of the arbitrary (but sensible) definitions we use in our work. If a *lake* is defined as being greater than one acre in surface area and has a volume of approximately 1,000,000 gallons, a *pond* is smaller in both measurements. Typically, that means a pond is small enough that you can toss a rock over it in any direction so long as it has a simple shape.

For its part, we see a *lagoon* as a body of water that has "fingers," coves and generally abstract shapes. These are not limited to one surface acre and often are larger, but they tend to have consistent depths in the 1-to-7-foot range – too shallow for the typical lake.

– G.F

able the site to hold water.

One possibility is the use of PVC or HDPE liners. Beyond the matter of the size of such a liner, you need to recognize that this same soil that tends to drain so well is also subject to rising groundwater. (Think large, black bubbles in the center of the lake.) Yes, there are engineering solutions to groundwater issues, including drainage, water recovery and hydrostatic relief, but you'd be well advised to consider other options first.

One of these is Bentonite lining. *Bentonite* is a soil amendment that, when blended into the upper 6 to 12 inches of the soil, forms a gelatinous, semi-impervious water seal. Other products on the market include surface-applied sealants. But if your client is paying your firm to create a lake, it might not be best to wait until after the lake is filled to find out if it will or won't hold water.

Impervious finishes such as plaster, concrete or gunite are also options as water barriers. In California, for example, most reservoirs, aqueducts and storage basins are of concrete construction. There are two major factors when it comes to these "placed" materials, the first being considerable cost and the second being elevated winter water tables and expansive soils that can spell disaster for this type of construction.

This is not meant to dissuade anyone from using these materials. Suffice it to say in all cases that initial planning will have to involve exact determination of intended uses of the lake, designing accordingly – and covering all necessary bases when it comes to soils engineering for a substantial bit of real estate.

Working With The Water

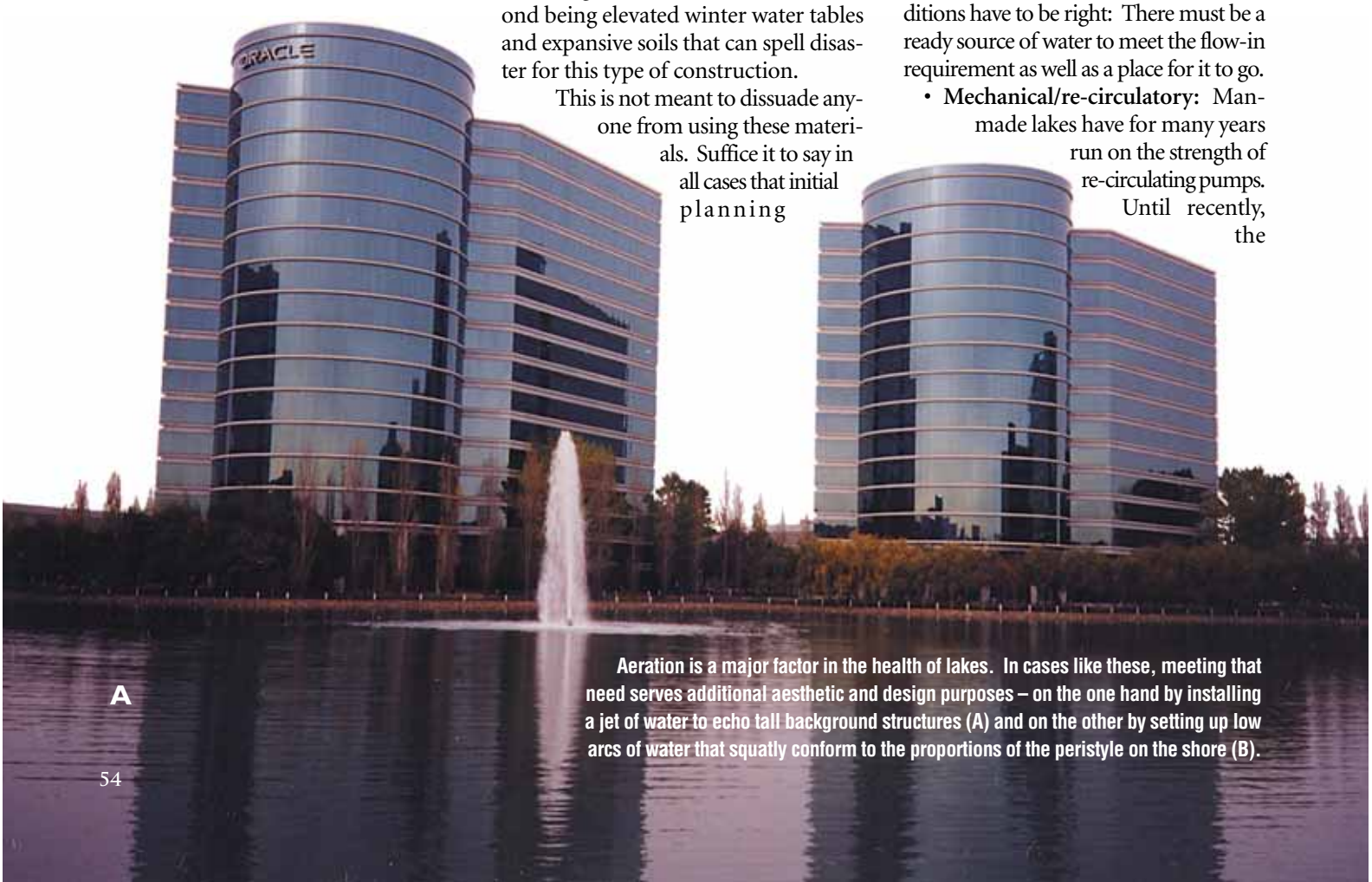
Lakes are not unlike swimming pools and other man-made bodies of water when it comes to hydraulic considerations and the means used to deal with water flow.

- **Flow through:** In nature, a lake or body of water usually has distinct points of inflow and outflow. A flow-through lake almost always appears to be in good health, due in large part to the constant mixing and exchange of water.

Because this is not feasible in many man-made applications, recirculation is necessary. It can work, but as previously mentioned, Mother Nature seems to have a distinct advantage.

In a natural lake, water will either flow in or percolate up throughout the year. At the other end, the water will typically flow out via a stream or watercourse, therein creating a *circulation system* under the broadest interpretation. In many circumstances, this flow-through effect can be recreated in man-made lakes, but the conditions have to be right: There must be a ready source of water to meet the flow-in requirement as well as a place for it to go.

- **Mechanical/re-circulatory:** Man-made lakes have for many years run on the strength of re-circulating pumps. Until recently, the



A

Aeration is a major factor in the health of lakes. In cases like these, meeting that need serves additional aesthetic and design purposes – on the one hand by installing a jet of water to echo tall background structures (A) and on the other by setting up low arcs of water that squatly conform to the proportions of the peristyle on the shore (B).

idea was a direct transfer from the pool industry, wherein suction lines (usually with some sort of skimming system) and returns were laid out to create circulation and collect debris.

The problem arises in the fact that a lake is *not* a swimming pool, and so the operating principles are not completely interchangeable. Where a pool's water system is sustained and facilitated by a range of chemicals, for example, those same chemicals are not suitable for use in any lake's ecosystem. Filtration by means of sand or cartridge systems is another pool-to-lake crossover we often encounter, but no filters are designed for use in the face of such challenges.

These filters indeed work well on pools of various sizes, but you don't get the same results with a lake. The particulates are larger than the filters are designed to accommodate, and there's simply too much material to be removed at any size. Aside from the huge volume/acreage factors, maintenance of these filter systems represents a lifetime of costly intervention for the client.

A far better option with lakes is *bio-filtration* – a new "technology" in the lake-building community but one with a track record as old as Mother Nature herself.

Manufactured bio-filtration systems are mechanically altered versions of what naturally occurs in lakes. These filters provide a place for bacteria (often referred to as *microbes*) to grow and flourish. In turn, these organisms colonize on the filter and grow in response to the available food source in the water column – ideally at a somewhat faster rate than algae or any nuisance vegetation.

Many factors have to be in place for this natural system to take hold, not the least being water chemistry (pH, alkalinity and more), temperature and dissolved-oxygen levels. The key here is *aeration*.

Aeration is indeed the lifeblood of both natural and man-made lake ecosystems. Many of us have winced at the pungent, sulfurous odor emanating from a fluorescent green body of water that once seemed to be a lake. Although ingredients that lead to this sorry state vary, it is most often caused by anaerobic conditions – that is, a lack of oxygen.

Aerating the water column (that is, the process of adding oxygen to a body of water) serves two key functions, the first being to increase dissolved oxygen levels to support almost every living entity within the ecosystem, and the second being to reduce stagnation and the thermal layering also referred to as *stratification*.

B

Beyond Definitions

To be sure, lakes can be used for a variety of purposes.

On estates, for example, these bodies of water are often there purely for aesthetic reasons. On golf courses, however, they might serve as sources for irrigation and as catch basins for runoff. Still other lakes are meant for swimming, in which case water quality is a big issue (and slightly less of one if wildlife will be the main users). In any event, maintenance (or the lack thereof) is something that comes into play.

All of these issues (and more) must be thoroughly examined and discussed in detail with the client before a drafting pencil is set to vellum. The devil truly is in the details in lake design, and the more understanding both you and the client have, the more successful and cost effective the project will be in the long run. Look at it this way: Anyone can dig a hole, fill it with water and call it a lake – farmers and ranchers do it all the time. But it takes real understanding to build a lake that will be beautiful, healthy and happy for years into the future.

And don't forget time in your planning: Lakes and ponds and lagoons all require a period of time to "mature." This can be anywhere from a couple of years to a decade or more, depending on the size, location, climate and a host of other influencing factors.

You also don't want to be fooled by initial aesthetic success: In their first years, most lakes are trouble-free and won't exhibit much by way of growth of aquatic vegetation and algae, sedimentation effects or problems with turbidity or water chemistry. Once the lake is past that point, however, any problems you invited by not covering all the bases in your design work will surely come back to haunt you!

– G.F.

All Lakes Are Local

So far, we've surveyed size, depth, function, circulation and aeration as key considerations in lake design and taken a slight jog over to embrace soils engineering as a major factor in the process. These are factors that come into play wherever you work (even in Minnesota!), but there are others that influence design on a regional or local basis.

These regional (or what we refer to as *elemental*) effects play a huge part in design, construction and overall maintenance (or lack thereof) for a lake. In California,

for example, our seasonal problems differ dramatically from north to south, and monumental differences are observed as you move across the country through different climates and geological zones.

Certainly, there are constants that will hold true regardless of geographical location, but there's no denying the fact that it helps to know your region, its soils and seasonal patterns. These factors will influence physical structures (including the containment strategy) as well as maintenance routines. It's easy to make the mistake of traveling to an area in the warmth of the spring and base a design on that snapshot of prevailing conditions. Trust me, those conditions are subject to changes that can wreak havoc on your lake.

Beyond the weather, there are a number of other variables to consider in good lake design:

❑ **Availability of water:** What is the source of your make-up water? Is it readily available via spring or well, or must it be purchased from the local water agency? As with a pool, anywhere up to an inch per day could be considered average for evaporation during the warmer months. That's 2-1/2 acre feet of water per month or approximately 815,000 gallons monthly off a single acre-sized lake!

❑ **Soil or ground conditions:** This refers back to the water-retaining ability of your site. It's extremely difficult to add soil amendment to sandstone, for example, so a lake in such an area will require a liner. In some cases where a liner is impractical, you might be helped by an impermeable layer known as *hard pan*; the trick here is determining how far down you have to go to find soil that will hold water. You also need to know about geographical/geological features such as rock outcroppings or ground water.

❑ **Temperature:** Anticipation of seasonal changes will influence your design in every aspect of the project. Understanding the relationships between thermal changes and the ecosystem will greatly assist in the long-term health and aesthetics of the lake.

❑ **Waterfowl populations:** The phrase "build it and they will come" could not be more accurate in this respect. Ducks, geese, coots and other waterfowl will show up in significant numbers at just about any suitable body of water – a significant influence on the nutrient load and on areas adjacent to the lake that is exacerbated by the overwhelming desire of humans to feed these creatures. This results in migratory birds becoming not-so-migratory and the increased likelihood of avian botulism or fowl cholera, both of which will kill entire populations in a very short period of time.

(Our staff spends a lot of time educating clients and their lessees, tenants, park patrons and others on the effects of feeding the "poor, little starving birdies.")

❑ **Nutrient load:** This factor and its reduction will determine how the project will appear in a very short period of time. Many types of control are available for use both pre- and post-construction; I believe that it is always more cost effective to negate the potential problem in the design stages of the project through natural nutrient extraction via aquatic plants and the use of biological filters.

Once a problem does exist, we're left with post-construction control-and-management measures, including the introduction of exotic species such as grass carp, chemical applications such as herbicides and algaecides, and/or mechanical control by dredging or harvesting.

Much To Know

There's all of this to know and more when it comes to working with lakes. For all that, it's a fascinating field – and one that has its share of similarities to other sectors of the watershaping industry. But as I've stressed here, making too much of those similarities can lead to difficulties.

Given those difficulties and the complexities of designing, engineering and building on such a large scale, most firms operating in this field thrive by having lots of history and experience behind them. But the ever-growing popularity of "living waterfeatures" almost certainly is leading to customer inquiries about including lakes in extensive landscape-design projects, and this article is intended to introduce valuable concepts and a range of important cautions to those who might be inclined to pursue this new path.

Lakes are indeed complex and live by their own set of rules. The first step in avoiding the nightmare of installing one without a solid understanding of what makes them tick is knowing the kind and caliber of questions and issues that must be addressed in the design phase.

The Regulatory Scene

Contractors and homeowners tend to joke about the difficulty of obtaining a building permit. Just try getting a permit to dredge 5,000 or 10,000 cubic yards from a lake! To make a long story short, working with regulators can be quite daunting.

One of the consequences of this situation is the level of foresight a designer/builder must bring to the project – anticipating needs that might not come until 10, 20 or 30 years down the road. Site access for aquatic remediation equipment, for instance, or dredge/spoils pits must be considered as part of the initial design.

Potential usage is another factor the regulators influence. If human interaction (that is, wading or swimming) is anticipated, you have a choice on the West Coast of fencing the lake in or raising the bottom to a depth of 18 inches or less.

Other jurisdictions are paying lots of attention to chemical treatments, and some won't allow any chemical control, leaving contractors and clients to find a Plan B that almost certainly will be more costly. And even if you can use them now, regulatory pressures are making it increasingly likely that the use of copper algaecides and herbicides will no longer be possible in lakes.

Concerns over sediment transmission and chemically tainted discharge are also big these days – and getting bigger. This means a whole range of "alphabet soup" agencies will want to pay you or your client a visit, including various fish and wildlife services, the EPA and/or other state, local or specialty agencies.

When it comes to working with regulators, you need to think ahead. An excellent motto here: "An once of prevention is worth a pound of cure."

– G. F

When Bad Things Happen to Good Lakes

Just about every new lake has a maturation period in which about a year goes by without any problems manifesting themselves, as in the new lake seen in (A).

That can change rapidly and dramatically as a result of several factors, including excessive nutrient loads (B), invasions by choking plants (C) or visitations by waterfowl that tend to settle in and make a mess not only of the water but everything around it (D).

In some cases, remediation is a matter of adjusting circulation and keeping an eye on proper aeration. In others, however, it's time to call in the heavy machines and rip out the offending vegetation (E).

With proper treatment, even a disaster (F) can be returned to a pristine state (G).

– G.F

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25	Waterworks Intl. (pg. 63)
37	Western Rock & Boulder (pg. 2)

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100	Aqua Master (pg.59)
101	Versa-Lok (pg. 59)
102	Laars/Jandy Pool Products (pg. 59)
103	Santa Barbara Control s (pg. 54)
104	Magnetek (pg. 59)
105	Jacuzzi Bros. (pg. 59)
106	Airplaco (pg. 59)
107	Techstone Systems (pg. 59)
108	A&A Mfg. (pg. 60)
109	Color Crown Corp. (pg. 60)
110	Harter Industries (pg. 60)
111	Martin Pump (pg. 60)
112	G.H. Stenner (pg.61)
113	Increte Systems (pg. 61)
114	Waterco USA (pg. 61)
115	A.O. Smith (pg. 61)
116	Blue-White (pg. 62)
117	Praher Canada Products (pg. 62)
118	CRS Systems (pg. 62)
119	Fountains for Pools (pg. 62)
120	Grate Technologies (pg. 63)
121	Renosys (pg. 63)
122	Hokanson Block (pg. 63)
123	Cover-Pools (pg. 63)
124	Astral Products (pg. 64)
125	Englehard (pg. 64)
126	United Elchem (pg. 64)
127	Caretaker Systems (pg. 64)
128	Schwing America (pg. 64)
129	Intermatic (pg. 64)
130	ICD/Innovative Concrete Design (pg. 64)
131	TXI/Riverside Cement (pg. 64)

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New Fountains Scale the Heights

Circle 100 on Reader Service Card

AQUA MASTER announces the availability of Celestial Fountains. Capable of producing fountain spray patterns up to 100 ft. high, they include four spray patterns in sizes ranging from 10 to 25 hp and feature stainless-steel construction, precision-leveling flotation systems, HDPE floats, easy launching and nozzle interchangeability as well as an optional 500W lighting system and a two-year warranty. **Aqua Master**, Kiel, WI.

Retaining Wall Systems Flyer

Circle 101 on Reader Service Card

VERSA-LOK has unveiled its Mosaic Retaining Wall, a mortarless, interlocking system that combines aesthetics with performance in a randomized, stone-like geometry that mimics natural stone walls. The concrete units install easily without mortar, require no concrete footings and are ideal for shoreline applications. **Versa-Lok**, Oakdale, MN.

Fiberoptic Lighting Showcased

Circle 102 on Reader Service Card

LAARS/JANDY POOL PRODUCTS offers literature on Sheer Radiance, a fiberoptic lighting system featuring a wide selection of illuminators, fibers and fixtures that allow you to tailor systems to owners' lifestyles. Designed to deliver more light with greater intensity and true, brilliant colors, the system features a programmable color wheel and easy interface with remote control systems. **Laars/Jandy Pool Products**, Novato, CA.

Digital ORP/pH Controller

Circle 103 on Reader Service Card

SANTA BARBARA CONTROL SYSTEMS offers information on Chemtrol 250, a digital ORP/pH controller for use in the full range of commercial applications. Easy to install, simple to use, fully adjustable using the front panel, the device also includes an acid/base selector, proportional feed, overfeed safety timers and a waterproof cabinet. System benefits and specifications are covered. Carries a 5-year warranty. **Santa Barbara Control Systems**, Santa Barbara, CA.

Technical Details on Pump Motors

Circle 104 on Reader Service Card

MAGNETEK offers "Bulletin 1081" on its line of pump motors for application with leisure water systems. The literature includes a square-flange and C-face replacement guide, a thru-bolt replacement guide and specifications for its Centurion, Neptune, Century and Commander motors. It also gives information on obtaining additional educational and technical-support materials. **MagneTek**, St. Louis, MO.

Flyer on D.E. Filters

Circle 105 on Reader Service Card

JACUZZI BROS. offers literature on the EarthWorks line of diatomaceous-earth filters. Features include 2-in. ground-level plumbing for easy installation, quick-regeneration systems to extend filter cycles, straight grids to reduce bridging and allow for more uniform flow, easy access to the grid system, engineered thermoplastic tanks and more, with filter areas ranging from 35 to 70 sq. ft. **Jacuzzi Bros.**, Little Rock, AR.

New Shotcrete/Concrete Pump

Circle 106 on Reader Service Card

AIRPLACO introduces its new and improved model P-280 shotcrete and concrete pump. Powered by a 30-hp Wisconsin gas engine or a Duetz diesel engine, this pump delivers up to 28 cu. yd. per hour. When used as a shotcrete pump, the proper mix design will give pulse-free nozzle response. New features such as the central lubrication panel provide for uncomplicated maintenance and service. **Airplaco**, Cincinnati, OH.

Brochure on Synthetic Rock Waterfeatures

Circle 107 on Reader Service Card

TECHSTONE SYSTEMS has published a brochure highlighting its capabilities in fabricating synthetic rockwork for a variety of purposes, moods and projects. Illustrations cover applications with pools, spas, ponds, waterfalls and streambeds with textures from craggy to smooth. The brochure also describes the process by which the synthetic rocks are made and defines their insulating characteristics as well as their finishes. **Techstone Systems**, Phoenix, AZ.

FILTERING POOL CLEANERS HIGHLIGHTED

Circle 108 on Reader Service Card

A&A MFG. offers a brochure highlighting features of its built-in pool cleaning and circulation systems. Designed with safety in mind, the system allows no buildup of excess pressure or pressure spikes as valves change ports. In addition, the system requires no routine maintenance, needs no extra filters or screens – and comes with a plain-language warranty that customers understand. **A&A Mfg.**, Phoenix, AZ.

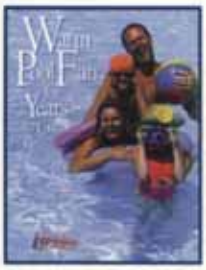
CONCRETE COATINGS HIGHLIGHTED

Circle 109 on Reader Service Card

COLOR-CROWN CORP. offers a brochure on the StarDek system. Not a paint or stain – and designed to be slip resistant and cooler than concrete – the coating uses tough acrylics, color pigments and cementitious materials to achieve a colorful, textured finish with staying power. The brochure carries technical specifications as well as photographs of various watershape-related installations in commercial and residential settings. **Color-Crown Corp.**, Tampa, FL.

SOLAR HEATING FOR POOLS

Circle 110 on Reader Service Card

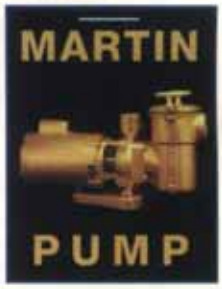


HARTER INDUSTRIES provides literature on its roof-mounted and in-deck solar pool-heating systems. The roof-mounted Hi-Tec system combines tube-on-fin solar absorbers with injection-molded headers to provide high levels of heating and low maintenance. For sites with decking areas at least twice as large as a pool's surface area, the company also offers its Pool Deck heating system – a completely concealed solar heater. **Harter Industries**, Holmdel, NJ.

BRONZE-ALLOY POOL PUMP

Circle 111 on Reader Service Card

MARTIN PUMP introduces its 100 Series of pumps, made using a special bronze alloy offering high quality at low cost. Self-priming, durable, resistant to chemicals and corrosion, the pumps come in four models ranging from .75 to 2 hp and feature 56-frame, industrial-quality motors, bronze impellers and drip-proof seals. Literature includes performance curves and specifications. **Martin Pump**, Torrance, CA.



New Chemical Feeders Introduced

Circle 112 on Reader Service Card

G.H. STENNER has announced the availability of models 45MHP22 and 85MHP40, capable of injecting 22 gal. per day and 40 gpd, respectively, against pressures up to 100 psi with a single pumping head. The new feeders complement the company's line of lower-pressure feeders, which pump capacities from .2 to 170 gpd against pressures up to 25 psi. **G.H. Stenner**, Jacksonville, FL.

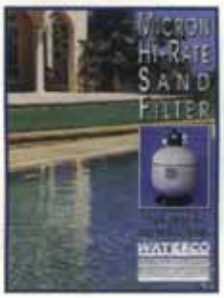
Brochure on Stamped Concrete

Circle 113 on Reader Service Card

INCRETE SYSTEMS offers "Second Only to Nature," a brochure highlighting its line of decorative stamped-concrete treatments. Available in a rich variety of textures, patterns and colors, stamped concrete gives a quality look at a fraction of the cost of the real thing – and offers watershapers a non-skid, stain-resistant, easy-to-clean finish for use in their work. **Increte Systems**, Tampa, FL.

Sand Filters Highlighted

Circle 114 on Reader Service Card



WATERCO USA has published a flyer on its Micron Hi-Rate sand filters. Designed to provide ultra-pure filtration in a compact package, the filters feature corrosion-resistant, abrasion-proof materials in housings made to be maintenance-free – even in the face of environmental extremes. The filters come in seven sizes ranging from 24 to 48 in. diameters with filter areas from 3.12 to 11.6 sq. ft. **Waterco USA**, Scottsdale, AZ.

In-Floor Pool Cleaning System

Circle 115 on Reader Service Card

A.O. SMITH has issued a 14-page guide to its pump motors for pools and spas. The booklet includes information on mounting dimensions and electrical connections as well as complete specifications on its one- and two-speed motors for circulation systems, its pool sweep motors and its jet pump motors. Coverage also includes guidelines for selecting replacement motors. **A.O. Smith**, Tipp City, OH.

LITERATURE ON COMMERCIAL PRODUCTS

Circle 116 on Reader Service Card

BLUE-WHITE highlights its new products in an eight-page brochure covering its commercial-grade chlorinators, flowmeters, metering systems and accessories. Information on the Flexflo A-100 and high-pressure peristaltic chlorinators is included, along with Digi-Flo flowmeters, the Chem-Feed C-600P chlorinator, a full line of accessories and more. **Blue-White**, Westminster, CA.

GATE VALVES HIGHLIGHTED

Circle 117 on Reader Service Card

PRAHER CANADA PRODUCTS has an eight-page guide to its Knifegate Valves. Available for use on diameters from 1 to 4 in., these valves are ideal for quick shutoff in low-pressure or vacuum lines and feature PVC or ABS construction with stainless-steel shaft and hardware. Designed to provide unrestricted flow and to function at pressures up to 50 psi. **Praher Canada Products**, Barrie, Ontario.

POOL PLASTER ADDITIVE SHOWCASED

Circle 118 on Reader Service Card

CRS SYSTEMS has published a brochure on Silicone Shield pool plaster additive, a cement/silicone technology that helps prevent etching, discoloration and corrosion of plaster pool finishes. When added to standard mixes, the additive forms an impenetrable surface that is more resistant to both the erosive and corrosive effects of pool water. Includes a selection guide. **CRS Systems**, Fort Mill, SC.

TELESCOPING POOL AND SPA FOUNTAINS

Circle 119 on Reader Service Card

FOUNTAINS FOR POOLS offers information on its Aquascope line of telescoping pool and spa fountains. Easy to install and use in depths from 8 to 108 in., the system features nozzles that retract flush with the bottom of the pool or spa when not in use. Powered by the pool's standard filter pump and available with four water patterns, all that's needed is a 1-in. line fitted with a gate valve. **Fountains for Pools**, Tarzana, CA.

Custom-Color Grates Available

Circle 120 on Reader Service Card

GRATE TECHNOLOGIES announces its capability to produce grates in custom colors at no additional cost. This new PVC compounding system gives designers and builders the opportunity to match or contrast gratings with decking or coping. The PVC formulation holds up under prolonged exposure to sunlight and features UV stabilizers to keep the colored grate from fading, yellowing or corroding. **Grate Technologies**, Naples, FL.

Soft, Safe Decking Surface

Circle 121 on Reader Service Card

RENOSYS offers SoftSide, a padding designed specifically for the pool environment. Applied in thicknesses from 1/4 to 4 in., the padding is bonded to a watertight PVC membrane surface for use on pool decks, beneath play apparatus in wading pools and around diving boards and diving board ladders. The product also can be applied underwater for waterslide and waterpark attractions. **RenoSys**, Indianapolis, IN.

Sand Filters Highlighted

Circle 122 on Reader Service Card

HOKANSON BLOCK offers EarthStone, an erosion control/retaining wall system that works without the need for pins, mortar or geogrid. The walls are fully plantable and self-supporting and have been built to heights as high as 43 ft. without any tiebacks. **Hokanson Block**, Sacramento, CA.

Booklet on Automatic Covers

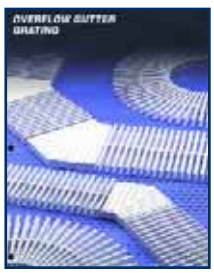
Circle 123 on Reader Service Card

COVER-POOLS has published a 20-page, full-color, consumer-oriented booklet on its full line of automatic pool covers. The text offers background on the company, explains product benefits, defines the full range of applications in residential, commercial and custom settings and gives details on working mechanisms and technical support. **Cover-Pools**, Salt Lake City, UT.

Of Interest

Leaflet on Overflow Gutter Grating

Circle 124 on Reader Service Card



ASTRAL PRODUCTS has a four-page brochure on its line of grates, including straight runs, radius gratings, corner tiles and support systems. The products are designed to meet the full range of application needs and are made of strong, white polypropylene with an anti-slip finish. The material is resistant to chemicals and UV deterioration. **Astral Products**, Jacksonville, FL

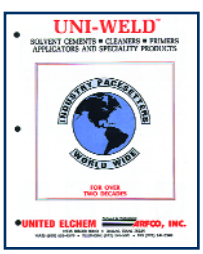
Details on Pozzolonic Plaster Additive

Circle 125 on Reader Service Card

ENGELHARD offers information on MetaMax PA, a high-quality pozzolonic additive for plaster. The product works by reacting with lime in plaster mixes to form additional cementitious products. This results in a more durable surface by limiting lime's ability to leach from hardened plaster to cause discoloration and areas of weakness. The flyer also includes guidelines for product mixing and use. **Engelhard**, Iselin, NJ.

Solvent Cements and Specialty Products

Circle 126 on Reader Service Card



UNITED ELCHEM offers a brochure on its Uni-Weld line of solvent cements, cleaners, primers, applicators and specialty products for use with plastic parts made of PVC, ABS and CPVC. Includes information on intended uses, color, curing speeds, maximum pipe diameters and temperature ranges as well as product performance and benefits. Also offers a troubleshooting guide. **United Elchem**, Dallas, TX.

Laser-Driven Pool Perimeter Alarm

Circle 127 on Reader Service Card

CARETAKER SYSTEMS has released a pamphlet on Prevent, a perimeter pool alarm that uses an invisible laser beam to add another layer of protection around watershapes. When a child enters the beam's path, the alarm sounds and then automatically resets. An optional high-pitch alarm that only pets can hear also helps to train pets to stay away from watershapes. **Caretaker Systems**, Scottsdale, AZ.

Long Boom for Concrete Pumping

Circle 128 on Reader Service Card

SCHWING AMERICA has introduced a concrete pump with the longest boom on a three-axle truck. With a vertical reach of 127 feet and a horizontal reach of 144 feet, the new 39-meter unit operates with a relatively small outrigger spread of just under 26 feet. The outriggers deploy telescopically for easy avoidance of jobsite obstacles, and controls are on both sides for easy access and visibility. **Schwing America**, White Bear, MN.

Pool and Spa Control Catalog

Circle 129 on Reader Service Card

INTERMATIC has published a full-color, 16-page guide to its pool and spa timing controls. Coverage includes enclosures in three different sizes, a selection of time switches, air switches, freeze-protection units, electronic switches and mechanical timers as well as an array of accessories for use in complete control of watershape systems. Also includes details on radio remote controls. **Intermatic**, Spring Grove, IL.

Highly Textured Retaining Wall System

Circle 130 on Reader Service Card

ICD/INNOVATIVE CONCRETE DESIGN offers StoneWall Select, a retaining-wall system that simulates the rugged, rough-hewn beauty of stone. Scaled to look good in walls of any size or height, it easily accommodates steps, corners, radiuses and serpentine contours as well as landscape lighting and more. Light and easy to install, the system works without mortar using interlock clips. **ICD/Innovative Concrete Design**, Milwaukee, WI.

Details on Portland Cement

Circle 131 on Reader Service Card

TXI RIVERSIDE CEMENT has published a leaflet on Portland cement, describing what it is, how it's made and the various available grades supplied by the company, including Type II Standard, White, Type V, Plastic, Block and Rapid Strength. The single sheet also provides specifications and warranty information. **TXI Riverside Cement**, Ontario, CA.

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REMEMBER THIS?

Back in February and April 1999, the first and second issues of *WaterShapes* carried in-progress details on the construction of this pool/spa/fountain "renovation project" set on a hillside in Southern California.

It was David Tisherman's (and our) earnest intention to complete the story of this detail-packed construction series, which we considered as exemplary of the sort of editorial copy we wanted to solicit from and offer to our readers, shortly thereafter – and certainly before the end of the summer of 1999. But for a variety of reasons having nothing to do with the watershapes themselves, we weren't able to do so.

We're happy to report that the project is nearing completion and that Tisherman soon will be bringing it to you in all its glory.

Columnist/contributing editor Jim McNicol will resume his consideration of "Things Electric" in our April/May 2000 issue.

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