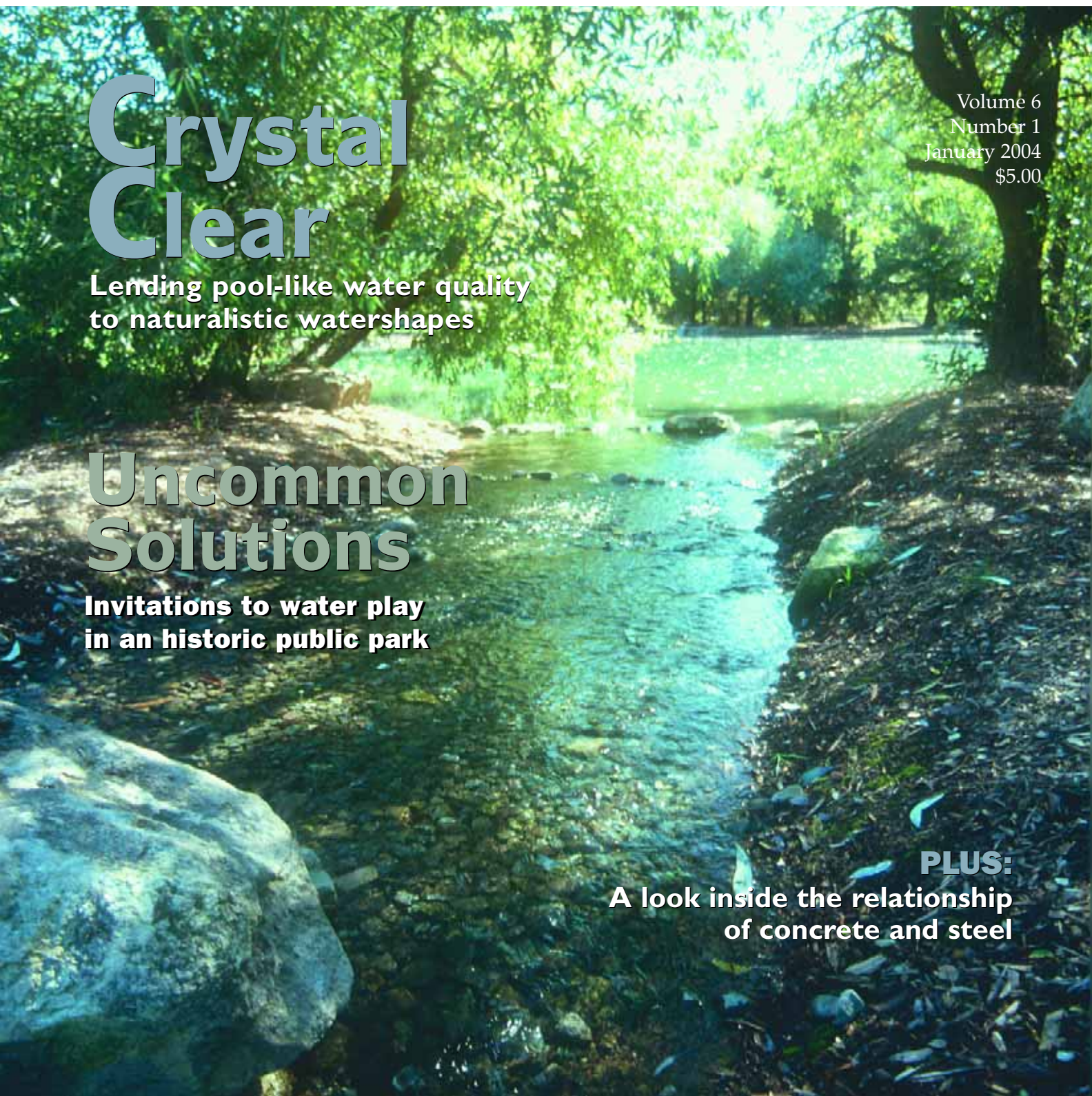
Inside: Brian Van Bower Tracks the Trends

WaterShapes

Design • Engineering • Construction



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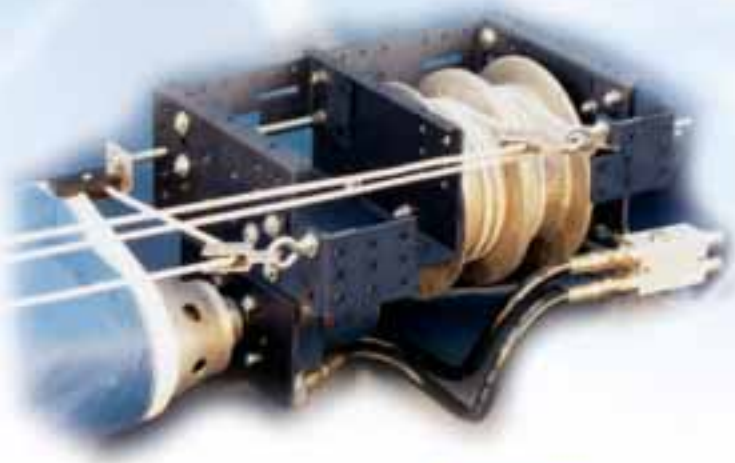

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WATERSHAPES

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Photo by John Ramez, Aquatic Environments, Danville, Calif., courtesy Pentair Pool Products, Sanford, N.C.

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WATERSHAPES (ISSN 1522-6581) is published monthly by McCloskey Communications, Inc. 6119 Lockhurst Dr., Woodland Hills, CA 91367. A controlled circulation publication, *WaterShapes* is distributed without charge to qualified subscribers. Non-qualified subscription rates in the U.S., $30 per year; Canada and Mexico $48 per year; all other countries $64 per year, payable in U.S. funds. Single copies $10 per issue in the U.S. and Canada. All other countries $15 per issue. Subscription requests must include name, job title, business location, address information and a signature and date.
POSTMASTER: Send address changes to *WaterShapes*, P.O. Box 1216, Lowell, MA 01853-9930.
Periodicals postage rates paid at Woodland Hills, CA 91365 and additional mailing offices.

By Eric Herman

Free Floating

Imagine how you'd feel if you couldn't move your body well enough to operate a wheelchair, let alone walk under your own power. Then imagine the feeling of liberation you would have in rising out of those physical confines and moving freely.

It's tough for those of us who don't face such challenges to perceive what life would be like if we were almost completely dependent on a wheelchair and other people just to get around, but it might even be tougher to recognize the sense of joy we would experience in liberating ourselves from that circumstance, if only for a while.

For the past several months, I've had the opportunity to watch someone go through this process of discovery and delight. Mario Aiello is 18 years old and, despite a bright smile, has a range of disabilities too long to list. He and his uncle, Ignacio, and his older brother, Juan, work out together in the indoor swimming pool at the health club I visit in southern California. As a devotee of the benefits of swimming, I log lots of laps each week and, on numerous occasions by now, have been in the pool when Mario, Ignacio and Juan go through their routine – and it's really something to behold.

For starters, there's the warmth and laughter the three of them share from the moment they enter the club that puts a smile on the face of just about everyone they meet. Getting Mario ready for the water takes several minutes, and they move through the process with obvious anticipation and a great deal of patience. When he's ready, Mario, in water-skiing vest and goggles, is lowered into the water via a lift. Once he's immersed, Ignacio and Juan carefully ease him out of the seat and stay by his side in the water at all times.

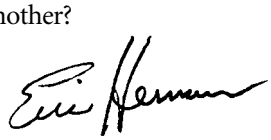
As a unit, they splash and laugh and slowly move up and down one of the pool's 25-meter lanes. While in the water, Mario uses his arms to move under his own power, and it's clear from the look on his face that he's quite intoxicated by this degree of physical freedom. They usually stay in the pool for about an hour. The entire time, Mario churns along in what can only be described as a vigorous workout.

I'm sure this is a scene repeated daily in thousands of other locations around the world, and I can only hope that others who observe these aquatic activities are as struck as I am by the joy and power of it all.

After witnessing Mario's routines for many weeks, I found an opportunity to introduce myself to the trio and explained why I was interested in talking to them and hearing about their experiences. Only Ignacio speaks much English, and through most of our conversation all three looked at me as though I had two heads, especially when I told them I was considering writing about them in print. They were polite and cooperative, but it was clear that their sole interest was making sure Mario had fun exercising in the water.

Since our brief discussion, they now smile and wave at me as they go about their business in and around the pool. I'm humbled and inspired by knowing them, however slightly, and it makes me proud to be associated with the design, engineering and construction of watershapes that afford such people, worldwide, with such a simple (yet profound) benefit.

What could be better than fostering simple human dignity and giving families the chance to display their love and support for one another?



WATERSHAPES

Editor
Eric Herman — 714.449-1996

Associate Editor
Melissa Anderson Burress— 818.715-9776

Contributing Editors
Brian Van Bower
David Tisherman
Stephanie Rose
Rick Anderson

Art Director
Rick Leddy

Production Manager
Robin Wilzbach — 818.783-3821

Circulation Manager
Simone Sanoian — 818.715-9776

National Sales Manager
Camma Barsily — 310.979-0335

Publisher
James McCloskey — 818.715-9776

Publishing Office
McCloskey Communications, Inc.
P.O. Box 306
Woodland Hills, CA 91365
Tel: 818.715-9776 • Fax: 818.715-9059
e-mail: main@watershapes.com
website: www.watershapes.com

Printed in the U.S.A.

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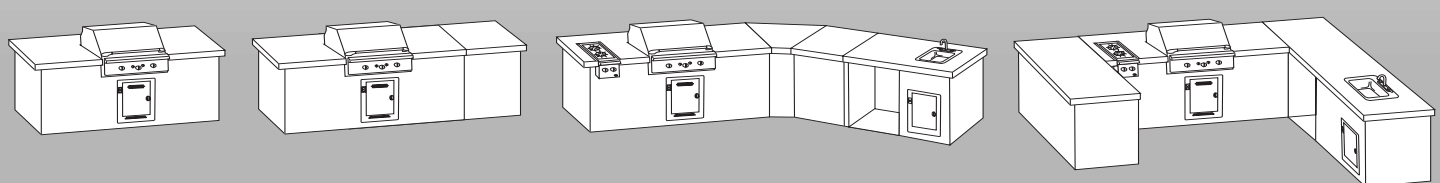

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In Defense of Liners

I would like to respond to many of the comments made by Douglas Roth in his article, "The Trouble with Liners" (October 2003, page 48). It appears that Mr. Roth's comments arise more from personal experience and less from an expertise in the vast diversity of construction methodologies.

Many of his comments regarding the lifespan of man-made structures and projects seem to imply that 300-to-800-year-old Japanese gardens constructed of earth and rock remain unchanged. This is not the case; rather, these gardens reflect the strengths and expertise of their caretakers: Without constant intervention, any garden succumbs to Mother Nature's harsh terms of existence.

While we are gardening enthusiasts, not experts, we have seen modern Japanese gardens in the Midwest and Southern United States that feature reinforced concrete and gunite to support rockwork and pedestrian walkways. The U.S. Department of Interior's Bureau of Reclamation (that is, the builder of the Hoover Dam) assigns a 30-year lifespan to its concrete-lined irrigation canals.

These irrigation canals are some of the best-designed and engineered concrete waterfeatures in the world. The concrete in these canals will persist longer than 30 years, but experience suggests that cracked concrete will in time result in unacceptable water seepage.

Few if any decorative waterfeatures (including the modern Japanese gardens mentioned above) are designed with the level of sophistication regularly employed by the Bureau of Reclamation. Just because a waterfeature has artistic value, blends well with its surroundings or is constructed of naturally occurring materials does not exempt it from the degradation that time can impose.

A thorough, scientific examination of PondGard EPDM rubber membrane (by Firestone Building Products, a company with more than 20 years of construction-trades experience) yields evidence that buried rubber membranes that are only 45/1000ths of an inch thick (45 mils) can provide a seepage barrier for 250 years or more. Mr. Roth underestimates the ability of EPDM synthetic rubber to resist degradation when buried or exposed.

Does this suggest that this is always the best construction material? No, not without the involvement of skilled designers and installers and ongoing attention to maintenance.

We agree that coordinated materials selection, proper design techniques and good maintenance produce water-

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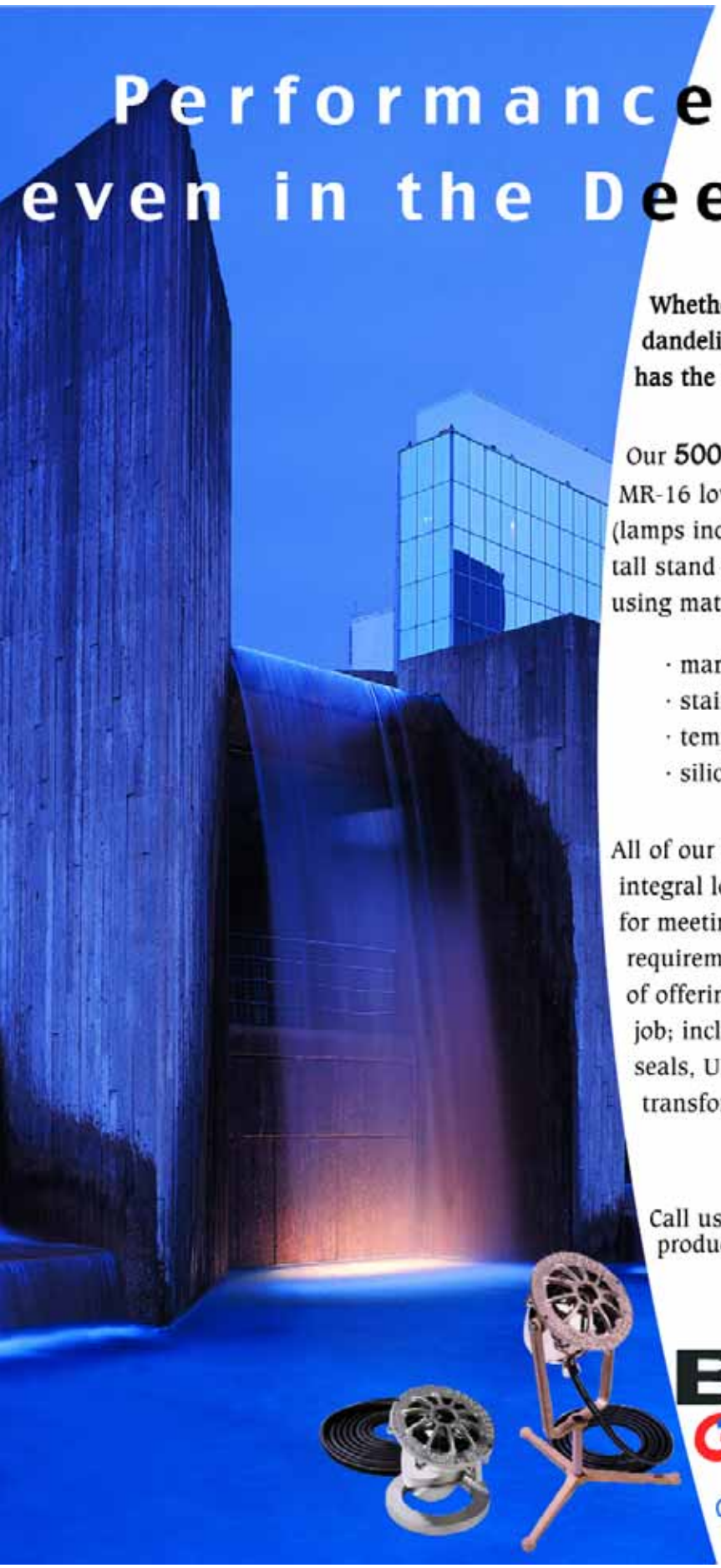

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features able to withstand the ravages of time. We think that Mr. Roth's narrow selection criteria for construction materials are far too restrictive to limit any designer's creativity.

William A. Johnson
Firestone Building Products Co.
Carmel, Ind.

And more:

In what may come as a major shock to many who know me, I fully agree with Douglas Roth about the pitfalls of rubber liners. I believe his assertions that liners will not last as long as a properly constructed concrete pond. I also agree that they are subject to failure due to punctures or improper installation. And I stand behind his desire to see a project last centuries, not merely decades. But that's where he and I part ways.

What Mr. Roth fails to recognize or state is that many of the projects that he touts as timeless works of art were created with the lack of one thing: a budget. Many of the best-known gardens in the world were built long ago with cheap labor, and the owners were extraordinarily wealthy people who did not say to the architect or builder, "Well, I only can spend $20,000 this year." Financial resources were limitless and labor was cheap and abundant, which allowed the builder to work with the top-of-the-line products for the time and spend years on construction.

What Mr. Roth fails to recognize or state is that many of the projects that he touts as timeless works of art were created with the lack of one thing: a budget.

The vast majority of swimming pool and landscape contractors today are not involved in projects on the scale of those Mr. Roth features in his magazine, *The Journal of Japanese Gardening*, or even in *Watershapes*. Not all of us have the budgets needed to create million-dollar pools or multi-acre Japanese gardens. We work within the limits of our clients' budgets to create the highest-quality, best-possible outcome, and we are bound by time constraints, site access, financial considerations and labor laws.

Many times in the last two decades, I have tried to get a client to go with a more "permanent" product, whether it was a gunite pond or a higher-end light fixture. This is a hard sell when the average homeowner stays put for about seven years and could care less about what happens to our work when they move on. I'm not saying that I sympathize with this attitude, but I consider that most contractors cannot be idealists. If I told my clients through the years that it was my way or the highway, I probably would not have survived in business.

For the most part, homeowners will opt

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for a less-expensive product. Does that mean the contractor can do a lesser-quality job? I would hope not, and I for one still do the absolute best I can given the materials chosen by the client. Where compromise is necessary, I make clients aware of the pitfalls. We can educate them all we want about the longevity of various products, but in the end, we can only do what they want and do it the best we can.

In the last 20 years, I've personally removed two gunite pools and two concrete ponds as a result of product failure and poor installation. This tells me it's not just the product, but the installer who sets up the longevity of a project. I suggest that Mr. Roth needs to tone down his "My way is the only way" attitude and understand that most of the builders out there do not live in his world.

Bruce Zaretsky
Zaretsky & Associates, Inc.
Rochester, N.Y

.

On a different note:

Bravo! Running "The Trouble with Liners" was a brave step.

Give me an engineered, reinforced-concrete vessel any day. I use many one- and two-ton stones when creating my naturalistic ponds and streambeds. Edging stones often require support of smaller stones to set them in place. There's no way I could set stone using a tripod without a concrete base: The stones simply penetrate the rubber liner.

I've talked to too many pond builders who have been burned by the first and last rubber liners they were talked into using by a client. The catalogs that the lined-pond suppliers put out are filled with photos of low-quality stone and unnatural-looking stonework.

If Mr. Roth's article begins an open and honest debate on what constitutes a strong vessel and quality workmanship, your subscribers will benefit greatly. Keep up the good work.

Tim Hansken
Occidental, Calif.

And finally . . .

"The Trouble with Liners" by Douglas Roth was one of the most eloquent arguments I've ever read against rubber liners. It was refreshing to hear someone talk some sense on the subject.

I specialize in the construction and maintenance of high-quality gardens and have often heard the opinion that rubber liners are a good alternative to gunite pools. For all of the reasons that Roth states in his article (and maybe a few more), I believe that this is simply not true. Gunite ponds are the best choice for high-quality gardens.

Tim Brown
Zen Associates
Boston

January's Writers

Kevin Ruddy is president of Omega Pool Structures, a Toms River, N.J.-based firm that specializes in the design, engineering and construction of indoor swimming pools. Ruddy's career in watershaping began 18 years ago, after he spent some time in the home-building industry and decided to apply what he'd learned to building entire backyard spaces that included pools, spas, landscaping and associated structures. Before long, he saw the need in his area for a company focused on the indoor-pool market and established Omega Pool Structures in 1987. The company now works on indoor pools nationwide and established a pool-construction division in 1993 so it could build many of the pools it designs. Ruddy is an active member of both the National Spa & Pool Institute and the National Homebuilders Association.

John Copley is founder and owner of Copley Wolff Design Group, a landscape architecture firm in Boston. With extensive experience in site planning, design and implementation of projects throughout New England, he has been responsible for a wide variety of award-winning spaces, including streetscapes and urban design projects noted for a special sensitivity to design and detailing consistent with historical contexts. He is actively involved in all phases of the business, from office management and community involvement to project management, design and construction. **Lynn Wolff** has more than 20 years' experience in plan-

ning and designing for public and private clients and is a registered landscape architect in Massachusetts and New York. Her speciality is complex urban projects requiring expertise in management for multi-disciplinary project teams, multiple clients and extensive cultural, historical, public-art and public-participation components. She often collaborates with outside design professionals, artists, government agencies and non-profit neighborhood groups to design public spaces that successfully reflect the diversity and cultural richness of their surroundings.

Ron Lacher is president of Pool Engineering Inc., in Anaheim, Calif. A licensed civil engineer, he spent the first ten years of his career managing large-scale construction projects for a variety of governmental agencies before becoming a pool builder in Southern California. In 1992, Lacher founded Pool Engineering, which specializes in developing structural and engineering plans. Since then, the firm has provided structural documents and details for thousands of residential and commercial swimming pools. He regularly serves as a field expert for California's Contractor State License Board, insurance companies, homeowners and pool-construction companies.

FORNI

George Forni is president of Aquatic Environments, an Alamo, Calif.-based design, installation and service firm specializing in lakes,

BOWER

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.

ROSE

Brian Van Bower runs Aquatic Consultants in Miami and is a co-founder of the Genesis 3 Design Group. With more than 30 years' experience in the swimming pool and spa industry, he now specializes in the design and construction of swimming pools, recreational areas and hydrotherapy clinics. As a consultant, he also conducts training and inspections and serves as an expert witness in insurance investigations. From his start with pools in 1967, he's been a pool manager, service technician and contractor, operating Van Bower Pool, Patio & Spas from 1971 until 1991. He began consulting in 1989 and co-founded Van Bower & Wiren in 1995 to specialize in high-end pool-construction projects. He's been active in the National Spa & Pool Institute throughout his career at the local, regional and national levels, has won numerous design awards and has been inducted into the Swimming Pool Hall of Fame.

Stephanie Rose runs Stephanie Rose Landscape Design in Encino, Calif. A former New York securities analyst, she gave up Wall Street ten years ago to pursue a career in landscape design – and has never looked back. Her firm specializes in residential gardens for upscale clients in the Los Angeles

area, where the lengthy planting season and mild climate provide tremendous creative freedom and year-round work. Her projects frequently include collaboration with custom pool builders, a cross-disciplinary blending of perspectives and skills she sees as having profound potential for professionals on both sides of the relationship. Rose can be seen this season in several episodes of "The Surprise Gardener," airing Tuesday evenings on HGTV.

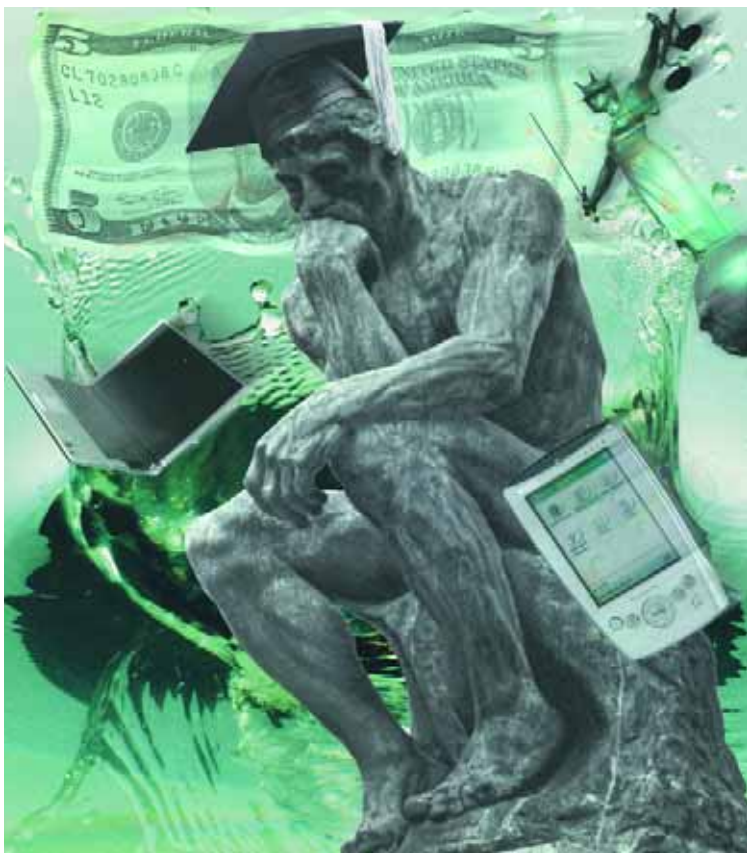
David Tisherman owns and operates David Tisherman's Visuals in Manhattan Beach, Calif., and Liquid Assets in Marlton, N.J. A designer and builder of high-end custom swimming pools since 1979, he is widely known in the pool and spa industry as an advocate for the highest possible standards of design, engineering and construction. He has degrees and credentials in industrial design, scientific illustration and architectural drawing from Harvard University and Art Center School of Design and has taught architectural rendering and presentation at UCLA. An award-winning designer, he serves as an industry expert for California's Contractor State License Board and has been a member of NSPI's Builders Council since 1994. Tisherman is a co-founder of and principal instructor for the Genesis 3 Design Group.

TISHERMAN

Mike Farley is a landscape architect with 20 years of experience and is currently a design/project manager for Leisure Living Pools of Frisco, Texas. After receiving his degree in landscape architecture from Texas Tech University, he began his career in California with a high-end landscape-design firm through which he became involved in several pool-remodeling projects. He later joined Geremia Pools in Sacramento, Calif., where he worked for six years before joining Leisure Living Pools in 1998.

By Brian Van Bower

Clear Reflections



Finding time to step back, take stock and think about what's happening on a fairly regular basis is a critical activity for any business owner or manager.

Some might say we're enduring the curse of living in interesting times; others might opine that the planet's just plain gone crazy. However you look at it, when you stop to consider what's been going on in the world, in our country and in the economy and how all of that relates to our watershaping corner of the universe, it's easy to see that important trends and even greater forces are constantly sweeping around us.

So much is happening that it's often difficult to figure things out, but the most important observation I can make is that not all the news is gloomy – far from it. For a great many watershapers, in fact, business has thrived in recent times and expanded in new and exciting directions. That's so true for some that it's fair to say that there's been little or no time left for reflection.

But I would argue that finding time to step back, take stock and think about what's happening on a fairly regular basis is a critical activity for any business owner or manager, and even more so in dynamic, volatile times such as those we're now experiencing. As I've written before in this column, these exercises in reflecting on your personal life, business life and the world around you are both valuable and necessary.

And when you stop to consider the nature of these times in which we live as 2004 begins, it's immediately apparent that there's much to chew on.

tracking the trends

What follows here is the first of two discussions of key trends as I see them, broken down by topic. This time, I'll cover where we've been during the past few years and what we're seeing today as a result. Next time, we'll take off from the present and look at where we should or might be going.

This is contemplation of a very subjective, personal sort, so I invite you to partake of these observations with whatever grains of salt you deem necessary. I also invite you to let me know what you think and help me expand my own frame of reference as I march into the year to come.

Signs of the times: There's no dodging the fact that events of the past few years have dramatically affected the way our clients live and how we conduct business. The dawn of the Information Age, the bursting of the technology bubble, September 11, the war on terrorism and more have composed chapters in our history that likely will be discussed and debated for centuries.

In the here and now – and much more specifically as these events pertain to watershaping – we know that many of our clients and potential clients are feeling somewhat skittish and reluctant these days, especially when it comes to travel. That's certainly a change in the way a great many people plan to spend resources for recreation and relaxation.

This has led to an increased need for home comfort as people have pulled back into their shells. We all remember discussions of the Baby Boomers and a trend toward "cocooning," but none of us could have guessed that world events would serve to amplify this trend and send it so far beyond anyone's expectations.

On the flip side of consumer fears, I also see an impulse to seize the day – a sort of "damn the torpedoes" attitude that's just as honest a reaction to world events as withdrawing into a shell. To be sure, many people are responding with cau-

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tion, but in times when things are happening that seem unfathomable and horrible, other people have responded by deciding it's not such a bad idea to spend resources on things that make them happy in the here and now, and large purchases are often the result.

t **Money lines:** For several years now, we've witnessed a paradoxical situation in which interest rates have remained exceedingly low at the same time investment income has declined substantially. You don't need to be an expert to observe that money is cheap to borrow while, at the same time, many people have lost substantial percentages of their nest eggs in the stock market and elsewhere.

Low interest rates have the effect of encouraging spending, even large purchases, because borrowers have the sense that they can afford to meet their loan payments. That's been good for our business in lots of ways, as has the strong real estate market – also largely a function of historical lows in interest rates.

Mortgage refinancing has boomed, and so much of that money is finding its way into home improvements that watershaping has benefited greatly. But again there's a flip side: Middle- and upper-middle-class consumers who've been broadsided by declining investment performance have tended in many cases to pull back and resist any inclination to spend their remaining resources on non-essential items.

In other words, for all the seeming volatility, these times are not so different from most: Consumers at the upper range of the market – folks who own nice homes and have secure, good-paying jobs – are likeliest to have the desire and resources to improve their surroundings, where those who are feeling a pinch are far less secure as a function of economic uncertainty.

t **Tort torture:** Another big trend that has had a significant (and usually negative) effect on our industry is the proliferation of high-profile lawsuits and the awarding of judgments of incomprehensible size. The situation is, in my view, completely out of control, and I hope every day that some form of tort reform will be enacted.

Without naming names, there was a recent case where a well-known equipment manufacturer was held liable for an accident that involved an unsupervised child

entering a pool, dismantling the drain and getting entrapped – a serious accident that resulted in severe injury. The award in this case was in the millions.

I'm the first to say that people injured as a result of true negligence on the part of others are entitled to seek financial reparations. In today's world, however, it seems that businesses are hauled into court simply because they have the ability to pay rather than because they've done anything wrong. That's bad for our entire society over the long haul.

In direct terms, unfair and excessive judgments lead to an increase in the cost of doing business in the form of inflated insurance premiums and, consequently, in greater product costs. In less direct terms, the situation has a dampening effect on creativity, as more and more professionals grow fearful of unintended and unforeseeable consequences of their decisions. What will happen if, every time someone comes up with a new design feature, we all have to look at it *first* from the standpoint of our potential liability?

Yes, water can be hazardous and, of course, we have an obligation to follow the applicable building and safety codes. In the case of swimming pools, I therefore believe that working to spread aquatic safety information as well as information about the benefits of aquatic activities is a good thing. That said, watershapes should not be stigmatized as being inordinately hazardous.

People deal with the risks involved in interacting with water in oceans, lakes and rivers by being responsible because they are aware that they can be injured or even killed. But as an industry, we watershapers are reluctant to talk about legitimate hazards and the drowning issue publicly because no one wants to seem indifferent to those who are suffering. This has made it exceedingly difficult to argue that responsibility for avoiding accidents resides not with us, but instead with those who use our products.

This fact, combined with the litigious nature of modern society, puts all watershapers in an extremely difficult position that only a good dose of tort reform can cure.

Border crossings: One major trend I've been watching that exists exclusively among the watershaping trades has to do with accelerating integration within the ranks of the outdoor design/construction professions. As has often been discussed in this column and elsewhere in this mag-

information ages

Even though the so-called "technology bubble" has burst, it doesn't change the fact that the Information Age is still rolling along.

The spread of personal computers to all segments of the population and the omnipresence of cell phones, PDAs and other information/communication technologies has changed the way we do business as well as how we live our lives. We all know that kids seem to have a native proficiency with these technologies, but we can't overlook the huge percentage of people in their 60s and older who now rely on consumer electronics to conduct business and streamline their personal lives.

I think this distribution of technology is all to the good for the watershaping trades. We have an unprecedented ability to access product information, incredible opportunities for networking and marketing, a unique capacity to design environments and associated technologies and a general enhancement of the ways we work, communicate and learn. Our clients are sharpening up as well and are embracing all of the new control systems, programmable effects and remote communication systems we can throw at them.

For all that, however, we should remember that watershapes and the environments that surround them largely exist apart from the world of whiz-bang electronics and to a great extent still provide a 20th-century-style physical, emotional and even spiritual respite from the rigors of life in the 21st. No matter how modernized we become, our appreciation for the beauty of water and all that surrounds it resides in a more timeless place.

– B.V.B.

azine, the level of interaction among landscape architects, landscape designers, architects, pool designers and contractors, fountain companies, pond specialists, fine artists, horticulturists, engineers and product suppliers has become a defining factor in the way many of us do business.

The focus now is less on components of an environment than on the whole package, as seen in the intense interest many of us have in outdoor kitchens, shade structures, hardscapes, pathways, landscaping and lighting. In addition, we now find as never before the adaptation of fountain and interactive effects to pool environments – effects that would until just a few years ago have been seen only at theme parks.

This trend sees people crossing lines and getting into new areas of the business, with the landscape architects and contractors who've gotten into pool design and construction being one big example. My own firm once worked exclusively with shells and their contents and equipment, but now we offer landscape design as part of our packages and are now pursuing projects that don't involve watershapes at all.

One way to sum up this trend might be to say, "The blinders are off." At this point, those who are comfortable with and willing to embrace change – and this seems to be landscape-sector firms more than pool-sector firms – are faring better and better in this competitive environment.

Stale associations: This integration of the watershaping trades has happened largely without any direction from trade associations that serve one sector or another. This magazine has had more than a little to do with defining and accelerating this trend, but the current associations have been slow to react and move into this uncharted common ground.

To be sure, the existing organizations have their missions and their memberships to consider, but the trend really seems to be toward some form of amalgamation under a watershaping umbrella. Does it make sense for them to stand on the sidelines, let things happen that are redefining the boundaries of the trade and leave us who are engaged on the lead-

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ing edge to move forward without organized (or organizing) support?

Education edges: My personal orientation toward education has been with me for a long time and was developed in close observation of the undignified, insiders-only way things have been done in the pool and spa sector, where one hears lots of talking but sees relatively little action.

Perhaps the pool sector should be proud of the fact that most everyone acknowledges that education is a good thing, but I get the sense that there's too much satisfaction with simply banging the drum and too little movement toward getting anything accomplished when it comes to things like rigorous certification and establishment of credentialed, dignified educational programs.

I say this knowing that education is part and parcel of what landscape architecture is all about – but I also say it knowing that there are gray areas in the landscape sector, too, so far as landscape designers and contractors are concerned. As professionals involved in the still-emerging watershaping industry, I think we have an opportunity to break away from past practice and think about things in all-new ways.

It's time, in other words, to stop quibbling and to spend some time sizing up the educational shortcomings that confront everyone in the watershaping trades and dedicate ourselves to building systems that will forever root out the bad or incomplete information that plagues us all and replace it with an educational system that fosters professionalism and that attracts talented young people to our industry instead of repelling them.

Yes, it's wonderful that we say we care about educating ourselves, but we still have miles to go before that means anything in the real world of design, engineering and construction. WS

Next time: Taking our collective pulse in light of where we find ourselves – and figuring out where we can and should be heading in the future.

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. He can be reached at bvanbower@aol.com.

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By Stephanie Rose

Hard Choices

If I were to ask the average watershaper to name the most versatile element in any landscape, he or she would probably reply by talking about water or plants or some other equally prominent component. If you asked *me* the same question, however, I'd almost always say *rocks*.

Some of you might be thinking I have a few too many of them rolling around loose in my head, but there's a good explanation for my response. First, rocks come in an infinite number of forms, shapes, compositions, colors, textures and sizes. Second, they can be used to sit on, walk on, retain hillsides or create small mounds. Third, they add dimension to designs and contribute in countless other ways to the overall aesthetics and beauty of a watershape setting.

And let's face it, whether you notice them or not, they're part of just about every landscape you see in one form or another.

break it down

If I thought about it for a bit, I'm sure I could think of a way in which rocks have been used in every landscape I've ever designed. After all, they work in every style from ultra-contemporary to completely natural cottage gardens, and they do so in many different ways:

If I thought about it for a bit, I'm sure I could think of a way in which rocks have been used in every landscape I've ever designed. They work in every style from ultra-contemporary to completely natural cottage gardens.

t**As a background:** One of my clients had a concrete-block wall that was a serious detriment to his landscaping. It would have been possible in time to mask the wall with vines and larger shrubs, but we decided instead to reface the wall with stone.

In this case, we had no intention of making the stone a focal point, but rather used it as a backdrop to set off the plants we planned to place in front of it. As a result, choosing the right stone with respect to color, texture and subtlety of appearance was critical. (In this case, the soft colors of Bouquet Canyon stone worked perfectly.)

This transformation from block to stone works on any stable masonry wall, low or high. And unless the goal is for the plants and wall to blend or for the wall to be the focal point, I'd suggest selecting the stone after the planting design is complete: That way – and depending on the overall look you and your clients are trying to achieve – your choice can be used to maximize the visual impact of the plants.

t**To add dimension:** Unless you've planned grade changes or have used mounding in your design – or you're lucky enough to be working with natural grade changes and slopes – many landscapes will tend to look quite flat. Placing a boulder in an expanse of lawn, as part of a border or within a planting area can "lift up" the design and lend it more interest, depth and dimension.

I like to create groupings of boulders, using specimens of varying sizes (but complementary tones). And when I place them in a lawn or on the edge of a planting bed, I do all I can to set up the stone in such a way that

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visitors can sit on it – a great way to draw people out into the landscape. (For more on placing boulders, see the sidebar on this page.)

To add texture: Rocks offer endless possibilities when it comes to texture – and similarly endless options when it comes to achieving the looks we want.

The natural textures range from the amazingly rough (lava rocks) to the reassuringly smooth (river rocks), with just about everything in between. Rock suppliers have also developed ingenious ways to alter textures and polish stones to varying levels of smoothness, which makes it possible for us to obtain rock of almost every variety in a wide range of textures and finished appearances.

I like to vary the textures in my landscape according to function and design need, using, for example, semi-smooth stones for stepping pads (for added safety), very smooth stones for contemporary landscapes and rough ones in more natural designs. The idea, always, is to avoid random choices or placements and to use the stones deliberately to create visual interest and add to the overall appeal of the design.

To retain soil: Whether you're work-

boulder positions

Incorporating boulders into landscapes is an art unto itself: Just as the way a boulder is placed within a stream, pond or waterfall influences the sound of the falling water, the way a boulder is placed within a landscape determines whether it looks natural or artificial.

I am by no means an expert in this field, but I have assimilated great advice through the years from artists who are quite knowledgeable about boulder placement:

- First, they say, boulders need to be buried to create a natural appearance. In nature, most boulders are buried to at least half of their overall volume. When plopped on the surface of a lawn or planting area, they look unnatural and unfinished.
- Second, every boulder has a "face." This is an instinctive kind of thing, but when you examine a boulder, you don't need too much experience to find a side of it that has greater visual appeal (or more "character") than any other. The point is, some thought and effort at this stage can make a big difference.
- Third, the experts have taught me that, as with plants, boulders tend to look more natural in groups of uneven numbers (3, 5, 7 and so on) and in asymmetrical arrangements.
- Fourth, placing plants directly behind the boulders helps them to stand out: The boulders become a focal point, while the plants provide the backdrop.

– S.R.

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ing with a small mound of soil or a large slope, boulders and smaller rocks can be used to establish and maintain either subtle or significant grade changes.

Rocks used in this way can also play subtler roles. Recently, for example, I designed a garden from which we removed a hot tub that had been sunk into a space between two patios – one about two feet higher than the other. I had the contractor fill in the hole with soil and then placed 8- to 12-inch cobbles throughout the space to create level areas while conjuring the appearance of a dry river bed.

Without the stones, the soil between the decks would eventually have washed away because we were using succulents rather than slope-retaining plants. In this

Where such a large expanse of brick would be monotonous, the addition of rocks here adds texture, depth and con-

Rock suppliers have developed ingenious ways to alter textures and polish stones to varying levels of smoothness, which makes it possible for us to obtain rock of almost every variety.

The rocks seen here soften the visual border between the landscape and the structure, while their round forms contrast with the linear forms all around them

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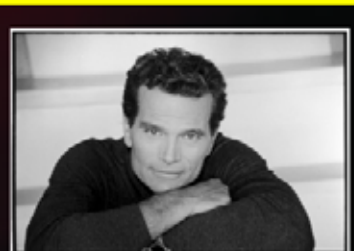

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case, the rocks supported the grade change and allowed us to use plants that otherwise might not have survived the sloping conditions.

To hide eyesores: There is no simpler way to hide a metal pipe, a sprinkler valve or some other unsightly mechanical element in any landscape than with an appropriately placed boulder. And they work better than plants, because, once placed, the stone will never shrink or die off.

I have even used (forgive me) "fake" rocks to hide electrical conduits and transformers left in the middle of patios from previous installations. These faux stones can be purchased through many catalogs and really can look like the real thing. (I'm often surprised by how well they fool people.)

These rocks appear to have been strewn along the course of some sort of waterway – an effect achieved by burying at least half of each rock in the landscape.

There are many other uses for rocks beyond the few I've covered here, but the functions listed above represent some of the most common uses and suggest many other ways to go with respect to incorporating them into designs.

Next time: more detail on the way rocks can be used to fit particular styles – and suggestions on plants that work particularly well with rocks in various situations. WS

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 in episodes of "The Surprise Gardener," airing Tuesday evenings on HGTV.

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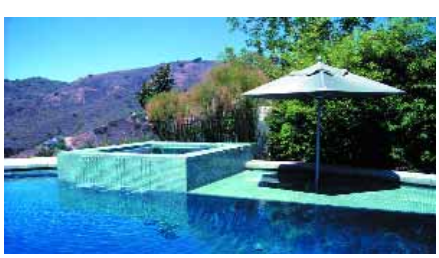

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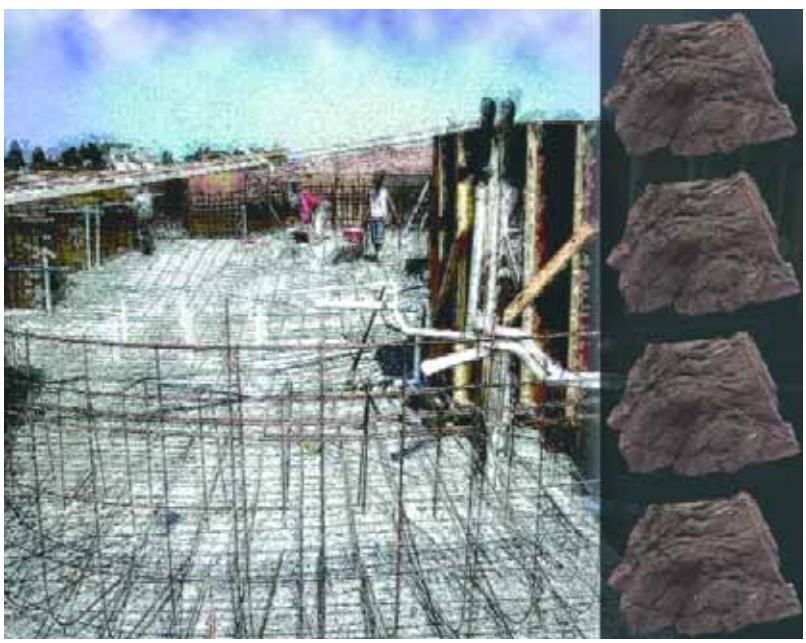


Back in November, I described the background of a project on a sprawling estate in the hills near Hanover, Pa. – a spectacular setting for an enormous swimming pool, an island spa, a cascading waterfeature and big expanses of rockwork and stone decking.

As was mentioned, our first task was to remove a brand-new system of retaining walls that had been built adjacent to the planned location for the swimming pool. We did so because the wall's large footings reached into a space needed to support a cascade that will appear to tumble into the pool. To ensure long-term integrity, we wanted *all* of the pool-related structures to be an integral unit with no cold joints – shell, foundations, structural decks and all associated construction – which meant the walls just had to go.

The project team (and the client) needed little convincing on this point. All it took was my explanation of the sorts of problems that could result from soil expansion and contraction and differential settlement between the existing walls and the new structures we were going to build around them.

Ultimately, the client, the general contractor (C.E. Wheeler of Glyndon, Md.) and I all landed on the same page. Crucial in this discussion was the fact that we had detailed soils and geology reports and structural engineering that had been developed according to their criteria.

shards of shale

With those issues settled, we completed demolition and began to dig.

We knew going in that one corner of the site was fill, but much more of the area was made up of a thin layer of topsoil over a shale material that had to be broken and ripped out of the ground using massive backhoes. It was really something to behold: Once the crust was penetrated and sections gave way, the shale came out in jagged (and often quite large) shards.

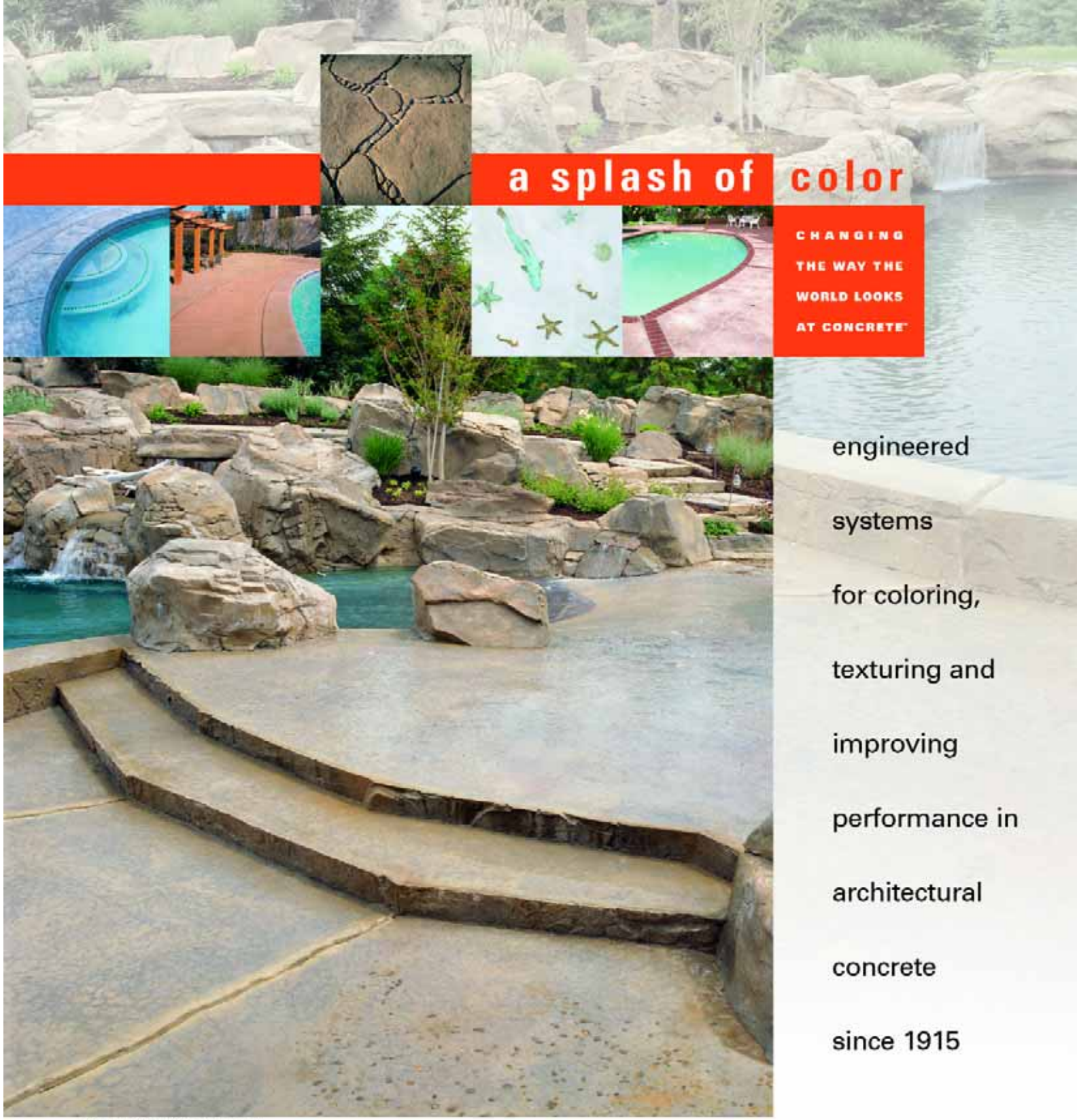
Shale's a wonderful material in terms of its stability as a foundation for structures once they are built, but it's a nightmare through the excavation and forming stages.

It's a wonderful material in terms of its stability as a foundation for structures once they are built, but it's a nightmare through the excavation and forming stages. In fact, the material was so unyielding and brittle that it was impossible to dig the hole in such a way that the "soil" could be used as a form for the shell, as is the case with most swimming pools. Instead, we had to over-excavate the pool by five or six feet all the way around to enable us to form the entire system as a freestanding structure.

As the framers found, it's almost impossible to drive stakes into shale, even using jackhammers. At that point, my partner Kevin Fleming and I met with a framing specialist, Matt Steich of M. Steich Contractors in Williamstown, N.J., to help us devise an appropriate form-assembly system.

My goal was always to use the sort of two-by-four stud construction I swear by in my work, which was no problem. I also insist on using plywood rather than the local favorite, pegboard, which lacks the structural integrity needed to withstand gunite application. I also prefer to line my forms with tempered Masonite as a stripping aid, but this material proved incredibly difficult to find in sufficient supply in rural Pennsylvania. Through Kevin's persistence, we eventually found enough Masonite to make it work – but it was a foreshadowing of more supply problems to come.

With Steach's help and by following detailed engineering plans, we set up a system that relied on transferring loads using two-by-fours anchored at a handful of key locations around the dig. In some locations, we established anchors using plates bolted into the shale with metal stakes; in others, we drove stakes into the thin layer of topsoil; in still others, we butted



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kickers against the shale "walls." It was a tricky business, but through careful use of cross braces we were able to transfer loads from the relatively few points we were able to set up with good anchors and built forms that would not move during gunite application.

Kevin Fleming deserves immense credit for keeping the project on track through the forming phase. He worked side by side with the carpenters; more important, he supervised the process every step of the way, and I know from my own experience with "big construction" that without his vigilance, there would be no chance that this project could have proved so successful.

up from the pit

With the forms in place, we laid down a two-foot layer of 3/4-inch crushed gravel, per the structural plan. Once that material had been repeatedly rolled and tamped into place, we were ready for the plumbers.

We braced the forms for this watershape against the retaining wall, against the shale, within the structure itself and in a variety of other ways – all to ensure rigidity when it comes time to apply gunite.

This is where we encountered the most extreme of all our supply problems. Apparently, three-inch-diameter schedule 40 PVC piping is not used in great quantities in this part of the country, which gave us further headaches in locating the hundreds of couplings, bushing, reducers and other bits and pieces we needed to plumb our pool.

Kudos once again to Kevin Fleming, who came through in a big way by bird-dogging every supplier in the area to come up with all the materials we needed. Ultimately, we used more than 800 feet of three-inch pipe, more than 600 feet of 2-1/2-inch pipe and assorted smaller pipes along with hundreds of fittings.

While Kevin was busy shaking loose the plumbing supplies, I was in Los Angeles, where I spent two full days going over the plumbing plans with my favorite (and only) plumber, Johnny Rodriguez, whom I've mentioned several times in these pages as a professional of the highest order.

In this case, Johnny was preparing to fly across the country to install a complex network of plumbing for a multi-faceted set of systems – one of them a 16-jet spa that would have to be plumbed a full eight feet out of the ground. The need for precision on this project was, to the say the least, *extreme*. And I don't know of too many plumbers who could reliably get it

lake management

Well into the project described in the accompanying article, the homeowners decided to add a 1,500-square-foot pond to a flat area just above the pool.

Adjacent to the pond, we're going to set up a shabby-chic fashion statement, moving an old weathered barn and its ancient grinding wheel from another part of the property. The plan is to disassemble the barn and rebuild it near the pond's edge, where it will be surrounded by greenery and reflected in the still water.

One end of the pond will feature a visual transition to the cascade that will flow down to the swimming pool through a series of boulders, planting areas, channels and pools. The pond and the waterfeature will not be connected, but I'm currently designing a detail that will give the impression that water moving from the pond to the cascade is turning the millstone.

We landed this new part of what was already a huge project because I wasn't the only one who was impressed by the way the pool had been framed and plumbed and had its steel structure installed: The general contractor was also an admirer – and our work gave him the confidence to call on us when he, the architect and the client expanded the project.

– D.T.

all right the first time through.

The entire plumbing scheme runs back to a vault that houses equipment from Jandy (Petaluma, Calif.), including four Hi-E heaters, four D.E. filters, three cartridge filters and more than a dozen pumps of varying sizes along with an array of valves and control systems. We set up four separate circulation systems (three for the pool, one for the spa) as well as numerous systems for all of the waterfeatures, and with Johnny's skill and Kevin's supervision, even the equipment room is a marvel of organization.

Suffice it to say that this was a plumbing project of monumental proportions, and Johnny and his son, Pancho, nailed it right on the head.

the steel deal

Once the plumbing had been placed, we turned our attention to the structural steel – another rigorous project phase.

In all, we had five pages of structural details just for the steel, and it was a case

With four separate circulation systems for the pool and spa and additional runs for various other waterfeatures, the plumbing system for this project is unusually complex. Making certain all of the big pipes and fittings were set up properly was a monster of a job.

A watershape of this size involves bending and tying a whole lot of steel – in this case several tons of #3, #4 and #5 rebar that had to fit with and around all of the pipes we'd laid out. It was grueling work, but it's a project phase that's the key to everything that follows.

where there was absolutely no room for compromise. We brought in another southern Californian, Jim Pope of Mission Steel in Chatsworth, Calif., to work with Chris Williams and his crew from Tri-State Steel of Warminster, Pa., and once again Kevin worked his magic with local suppliers in securing more than two tons of #3 rebar, a couple tons of #4s and a big pile of #5s.

As one who's seen and worked with hundreds of heavy-duty steel structures, I'm not easily impressed, but what I saw take shape on this project really blew me away: The effort and muscle needed to move, place and tie all of those bars was staggering, and this project in particular was not for the timid or weak of back. The number of nicks, scrapes and small lacerations even our veteran steel crew sustained in the course of this project bore testimony to its complexity.

With everything said and done, the forms, plumbing and steel, all set in the most rugged earth I've ever scratched, were things of beauty befitting a magnificent project.

Next time, I'll return to the vintage pool I'm restoring in Los Angeles. When we return to this project in a few months, we'll pick up with the gunite phase. WS

David Tisherman *is the principal in two design/construction firms: David Tisherman's Visuals of Manhattan Beach, Calif., and Liquid Design of Cherry Hill, N.J. He is also co-founder and principal instructor for Genesis 3, A Design Group, which offers education aimed at top-of-the-line performance in aquatic design and construction.*

super vision

I've written many times in this column that my personal willingness to provide direct, on-site supervision of all project phases is absolutely essential to the success of my high-end watershape projects. The project described in the accompanying text is no exception.

But I live and work in California and spend just a few days each month on the east coast, which has left day-to-day management and supervision of this Pennsylvania project to Kevin Fleming, my partner in Liquid Design of Marlton, N.J.

This is no small responsibility for him, because it's no understatement that I'm a demanding collaborator. I'm so uncompromising in the way things must be done that this arrangement would never work if it weren't for Kevin's unyielding dedication to quality, passion for excellence and unwillingness to tolerate substandard work anywhere along the way.

I feel lucky and proud to work with him – a true professional and a real friend.

– D.T.

Interior Dynam

A room that encloses an indoor swimming pool and does it well – by staying comfortable throughout the year, for starters, while also being easy on the eye – is something truly marvelous, says interior-watershape designer Kevin Ruddy. He addressed the basics of indoor comfort in a recent article; this time, he discusses materials of construction, finishes and what it takes to make pool enclosures stand up to moisture as well as the scrutiny of today's design-conscious clients.

By Kevin Ruddy

nics

Designing structures to surround indoor pools offers the watershaper the fundamental challenge of creating an interior space that needs all the functional characteristics of an exterior one. That's so mainly because ordinary residential structures aren't made to enclose anything that even remotely approaches the moisture levels encountered when an indoor pool is surrounded and separated from the open air.

This leads to consideration of the air-handling, temperature-control and humidity-related issues covered in my first article on this subject (*WaterShapes*, September 2003, page 40), but it almost always leads as well to a need to balance those practicalities with a natural desire on the part of clients to have a room that is aesthetically pleasing and fits into its architectural context.

This balancing act sounds simple enough, but the truth is that getting it right often leads you to unusual solutions involving building materials – and especially surface materials – that are almost always reserved for outdoor use. Taking the pool inside, in other words, means thinking about stucco, pressure-treated lumber, exposed-aggregate decking, stamped concrete, stone, brickwork and a host of other possible materials in what are atypical situations for the average designer or builder.

And believe me, client demands for these surrounding structures run the range from the traditional and formal straight through to the sleek and modern, hitting on every possible style in between. In each case, you need to anticipate and accommodate the burdens those choices place on specific systems and set things up in such a way that the moist air in the room doesn't attack the structure meant to contain it.

Comfort Zones

In my first article on the construction of indoor pools, we defined the physical challenge in terms of technology and the equipment needed to control temperature, humidity and air quality. Let's give that discussion a sharper focus by considering the case of clients who wanted to put a grand piano in the same room with their pool.

At first, that seems like a crazy request: The mere thought of placing a delicate, highly sensitive musical instrument near an indoor pool was like asking for trouble with respect to humidity alone, not to mention temperature. But as we thought about it, we knew that we could create a suitable environment because we know how to control all of the primary variables the piano would be encountering.

We knew, for instance, that we could set air temperature at a level higher than the water temperature to control humidity and avoid damaging condensation (albeit those temperatures would *both* be a bit lower than they would be in a typical pool room). We knew that use of an automatic pool cover would reduce evaporation. Finally, we knew that we could set up the interior space in such a way that air would move through it efficiently and that everything about the space could be carefully controlled.

In other words, as tough as it might sound to set things up in such a way that you could have a piano alongside a pool in an indoor space, it's not all that different from the challenges posed by using standard two-by-four stud construction or materials such as dry wall or paint inside a pool enclosure. All of them, after all, are highly susceptible to damage by moisture.

We also know and have been forcefully reminded through the years that, given the opportunity, airborne moisture will find its way into *anything* exposed to it – walls, attics, plenums and any other aperture, space, structure

or material to which it has access. There's nothing like the thought of dealing with rotting or warped wooden structural members at some future date to focus your attention on getting things right from the start.

One critical area of concern, for starters, is lighting fixtures that are not specifically designed for use in high-moisture environments or properly sealed. Another is in the upper reaches of large, tunneling skylights, which, if not properly and thoroughly vented, become moisture traps that can lead to all sorts of aesthetic problems and larger issues of the sustainability of the enclosure and even nearby structures.

But getting back to the initial point: If a client asks you to set up a grand piano alongside an indoor swimming pool, it can be done with all the style you'd find in a Georgian music room – but only if you know all the factors you need to balance and can keep them straight as you set up the environmental systems. It comes a bit closer to rocket science than many designers or contractors are comfortable with, but it's not beyond reach.

What to Use

Our focus this time is on aesthetics and on how you can choose and array materials to create a functional space that will stand up to the critical eyes of your most discerning clients.

I raised the story of the piano to make the point that you can use just about *any* material and *any* style in the space surrounding an indoor pool. For a variety of other practical reasons, however, it's advisable to stick with materials that are better at withstanding the elements than are most materials commonly used in indoor spaces.

Ceilings are a particular concern and will tend to take the brunt of the beating moisture can inflict if there's any lapse in environmental control. For that reason, we make sure that both the basic construction and finishes are going to stand up to the amount of moisture that can be present in the room.

While it might seem odd, this doesn't necessarily rule out classic wood construction. In fact, exposed post-and-beam construction or wood ceilings finished with tongue-in-groove cedar panels (back-sealed with a vapor barrier of some kind, as described in the sidebar on page 44) are among the most desirable of all types of construction for indoor-pool enclosures.

The range of possibilities for the exteriors of pool enclosures are truly limitless – everything from familiar glass-type structures all the way to architectural additions that can't be recognized as pool enclosures until someone peeks through a window.

Open-beam construction works well primarily because the openness of the structure benefits from free movement of air. If you're able to expose the wood members to the outdoors with some sort of open skylight, for example, and finish them with a good, moisture-resisting lacquer, varnish, tung oil or polyurethane finish, they will prove to be not only durable but also quite aesthetically pleas-

ing. (The sealer or finish should be applied in four or five coats – and just how durable it must be will be determined by whether the pool will be covered or open all the time.)

For the most part, however, indoor pools are enclosed in structures made using aluminum frames and glazing – much more moisture-resistant and, done well, quite easy on the eye. These buildings, which can easily be attached to a new or existing home or set up as standalone structures, have mostly been designed with swimming pools in mind and feature windows, doors and framing designed specifically for challenging environments.

Many of these structures have lots of glass, which lets in a great deal of light and efficiently ties the indoor space into its outdoor surroundings simply by virtue of being transparent. Also, many of the prefabricated structures feature retractable panels in the roofs that open the pool area to the outside air during the warmer months – a substantial operational and aesthetic plus.

Completing the Package

Whatever material you select for the structure, one of the most important points in construction is avoiding penetrations that give moisture any access through the interior surface to the structural members.

As mentioned above, lighting fixtures are a particular concern and must be UL-approved for applications in moist conditions. These sorts of fixtures are designed so that the unit is completely enclosed from behind. Often, however, contractors will use alternative fixtures: Particularly popular are the familiar "high hats," which offer nothing to resist the migration of moisture to points behind the fixture.

What happens when inappropriate fixtures are used can be grim. I've seen cases where moisture has gotten behind a high hat and cause the wood framing of the ceiling to rot. Such problems often aren't detected until the ceiling starts to sag and fail structurally, and once that level of destruction is reached there are few options beyond wholesale replacement.

If the materials are chosen appropriately and the systems are set up in such a way that temperature and humidity are controlled, there's really no limit to the design possibilities with indoor aquatic structures – nor to the sorts of features and details (even tapestries) that can be included within the space.

There's a drama to these prime interior spaces that can't be denied, and the fact that just about any building material that will stand up to (or that can be finished

Containing Vapors

The term "vapor barrier" refers to a membrane that is placed between a finished interior surface and the structural supports of the building behind it. By design, it creates a border between the materials you see and those you don't.

If, for example, you use standard batted insulation under tongue-and-groove paneling but fail to use a highly efficient vapor barrier, moisture will get to that insulating material and saturate it over time. Eventually, the moisture behind the paneling will destroy it and do significant damage to roof timbers as well.

There are all sorts of vapor barriers out there, and they're made from a variety of materials. Most are quite effective if properly installed, which means using special nails and staples that won't corrode, careful taping and, usually, application of some form of silicon sealant.

– K.R.

The right lights have closed canopies and a very small number of openings for screws or electrical wires – each of which must be sealed with silicon or some other recommended sealant. We also use a large number of flush-mounted fixtures that involve no significant penetration of the interior surface at all.

Doors and windows are also critical features – and of even greater concern than lighting fixtures because they are, of themselves, structurally significant components. Once you get beyond pre-fabricated structures designed specifically as pool enclosures, however, the unfortunate truth is that major manufacturers of doors and windows do not think much in terms of moisture-ready products. In fact, it isn't unusual for a client to select a door or window for aesthetic reasons only to discover that using the product in a moist-environment application will void the warranty.

Where we must work with commercial doors and windows, we do the best we can to seal and finish components such as windowsills or door jambs and run into problems only rarely. The important point here is to communicate with the client, prepare them for what might happen and inform them of the need for regular maintenance and upkeep of the woodwork – that is, refinishing and resealing every five years or so.

Transparent Appeal

In most of our projects, we usually end up installing some system of retractable roofing or skylighting – and my sense is that this happens because we do such a thorough job of explaining the way indoor-pool environments work.

We tell our prospects and clients right up front that, whether part of a pre-fabricated structure or installed in conjunction with standard post-and-beam construction, all of the mechanical and air-handling issues that come with indoor pools are eliminated when the roof is pulled back or the skylights are open. The thought of lower operating costs through the summer is, it seems, quite persuasive.

Most of the savings have to do with not having to air condition the space through the warm season. Indeed, those savings are often significant enough to pay back the added cost of a retractable roof, for example, in just a few years.

to endure) outdoor conditions can be used to make them beautiful is a key advantage that should be recognized and exploited by more designers.

Our discussions of skylights and retractable roofs often lead to questions about what happens when it rains. Yes, there are rain sensors designed for use in these applications, but in most systems the client must push a button – and if they're not home when the rains come, the pool area can be drenched.

That's not a problem, we say, when and if the rain is falling on a stone, concrete or exposed-aggregate decking or hitting stucco walls – thus opening helpful discussion of the finish materials we recommend for use around the pool and our focus on materials suited for exterior applications. And we explain their advantages with respect not only to cloudbursts but also as related to obvious issues of splash-out, pool entry and exit and more.

We're also big advocates of having operating windows on vertical walls. They aren't as efficient as skylights or retractable roofs in addressing moisture issues at upper room elevations, but they go a long way toward making indoor pool environments more pleasant all year long.

The more light and exterior views that you bring into the space, the better. In fact, indoor pool areas that lack much by way of fenestration can be distinctly claustrophobic because clients anticipate a connection to the great outdoors when they're around water. The use of windows at eye level and of glass roofing or skylights overhead effectively opens the space, makes an enclosure (of whatever style) both light and airy and generally makes the room a more attractive place to visit.

Ultimately, our goal as designers and installers of enclosures for swimming pools is to create spaces that invite and excite our clients just as much as outdoor watershapes. When you remove the distractions – excessive moisture, contained odors, any sense of claustrophobia – clients get a positive "vibe" from the design, will use the pool more, probably will take care of it more effectively and will be much happier with your efforts in the long run.

You might even end up being invited to the occasional poolside piano recital.

The author and WaterShapes *are grateful for the support and assistance of Jeff Bova of Omega Pool Structures in assembling this article.*

It's a Wonderful Pool

The most advanced designs for indoor-pool enclosures focus on creating multi-functional spaces. We at Omega Pool Structures have worked on several projects in which the pool could be completely covered with a hard surface that made the space perfect for hosting large social gatherings.

A few companies manufacture aluminum trusses that can be mounted on the coping of a swimming pool to support a platform floor. There are also mechanical floor lifts and retractable floors (don't forget the classic film "It's a Wonderful Life," in which James Stewart dances with Donna Reed before taking an unexpected dip). We've also worked with a facility that serve the needs of handicapped children in wheelchairs, installing a floor that rises from the bottom of the pool to a level flush with the decking: The kids are wheeled on the floor and then lowered into the pool.

Such systems are available, but they are typically quite expensive and require a great deal of structural and mechanical engineering – the subject, perhaps, of another article.

– K.R.

Little Amphibians

By Lynn Wolff & John Copley

When it was decided to upgrade the children's play area in Boston Common, Copley Wolff Design Group was called in to reshape a space that not only needed to serve the needs of a diverse population, but also had to fit within historic surroundings. This was no small challenge, say landscape architects Lynn Wolff and John Copley, but the resulting Tadpole Playground now charms children (and their parents) with whimsy, art and water.

Founded in 1634, Boston Common is the oldest public park in America – a significant and historic public place. It is familiar to us as Bostonians, of course, but we've also been privileged as a firm to have worked there before, when we renovated the park's main watershape, the Frog Pond, to serve as a splash pool in summer and as an ice-skating rink in winter.

During the pond renovation, we learned that tackling projects in such storied surroundings can be a tall order. For example, we had to place all of the pond's chillers and pumping equipment underground to mask any obvious intrusion on the 17th-century space. As we approached a second major project – this time the renovation of the park's playground – we knew going in that those who hired us were keenly sensitive to the nature of the place and came armed with preconceptions about colors, images and what would be "appropriate" for the setting.

To keep things moving, we worked very closely with the city's Historic Commission in establishing the color palette, procuring artwork and developing an overall plan that would result in a space that was attractive and safe for children and suited to the surroundings. To be sure, the negotiations were intense as we expressed our desire to deviate somewhat from convention with, for example, fencing that included playful bubbles of color rather than the traditional wrought-iron Victorian-style bars.

That's just one example of how we stretched the boundaries of their playground concept and how it would fit into the context of the park. It wasn't always easy, but the outcome has made the hours of discussion both worthwhile and rewarding.

Playing with History

The playground area had been part of the park for many years but had fallen into disrepair. The concept of renovation had in fact been circulating for years, but nothing took flight until early 2002, when an anonymous donor stepped forward and funded the project with a contribution of close to a million dollars.

(The donor's identity will remain a mystery to all but those who worked on the project; we can say, however, that the monies came from a well-known local family that has devoted a great deal of its resources to education and programs for inner-city children.)

This generous gift enabled the city not only to begin renovation of the playground, but also to pursue much more ambitious plans for the 5,800-square-foot space than would have been possible with a more-limited budget. In addition to the usual array of playground amenities, for example, the plan expanded to include

bronze statuary, a modern play structure, a special rubber play surface, tile mosaics, the above-mentioned colorful fencing, a main gate and three small waterfeatures.

At the donor's urging, the project was placed on a fairly fast track and was completed in the nine months after we came on board in preparation for dedication ceremonies in November 2002.

The playground stands just a few steps away from the edge of the Frog Pond, and we saw from the outset the opportunity to tie the renovated area to the pond, both aesthetically and thematically. The Frog Pond itself has become a magnet for families in the city and surrounding areas – and particularly for teens. In some ways, in fact, the presence of the pond has shifted the chemistry of the park from that of a stodgy Yankee sanctuary to one of a higher-energy, family-oriented fun spot.

With all of us seeing this transformation take place, we were able to persuade the Historic Commission to develop a much more contemporary design for the playground.

When we worked on the Frog Pond, we'd envisioned using frogs as water-spray elements. At that time, the Historic Commission had resisted using anything so whimsical in the historic landscape. But now, with the space being used by many more families and children than ever before, the commission expanded its interpretation of the park's potential to a point that allowed us to consider some fresh approaches.

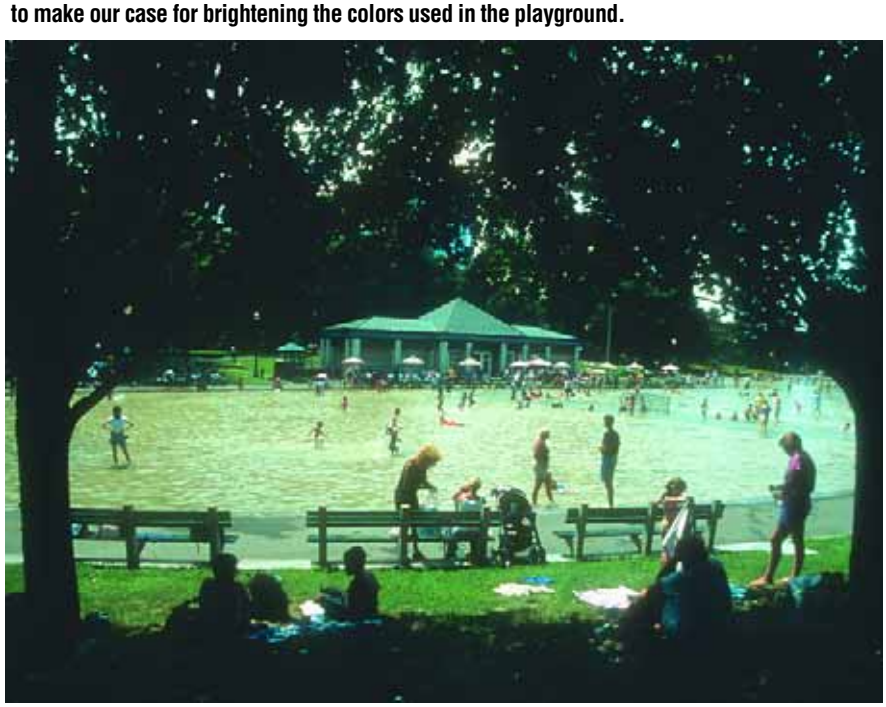
Urban Sophistication

We were quite happy to revisit our previous ideas and resurrect the frogs – and this time the Historic Commission agreed. We were pleased to confirm that we'd been on the right track all along, with the result that the park – and especially this area within the park – has become an even more compelling attraction for children and families from all over the city.

The fact that the park is drawing visitors from a larger area is an important point: Before the pond renovation, Boston Common was generally a very local attraction mostly of use to those who lived within easy walking distance or traversed the park on their ways to and from work. Now, however, the park has city-wide appeal and has begun to live up to its full potential as a gathering place in the heart of the city.

Indeed, the combination of the renovated Frog Pond with the Tadpole Playground has changed the "diagram" of how and why people move within the city. On any given day, there's tremendous diversity among park users,

Beyond suggesting an obvious theme for the Tadpole Playground, our previous work on the adjacent Frog Pond at historic Boston Common gave us insights into ways of making the playground project come together. The time between projects also gave us the opportunity to observe the increased (and increasingly diverse) use of the renovated pond – just the leverage we needed to make our case for brightening the colors used in the playground.



and because people are there to have fun, it has served in many ways to bring the city's far-flung neighborhoods closer together.

In developing the playground, we worked in anything but a vacuum. We sought input from a wide variety of community sources and devoted a vast amount of time and energy to synthesizing that feedback into a design vision that could be realized in direct, physical forms.

From the start, however, colors were a sticking point. The notion that bright colors could be integrated with the Commons' classic black fencing and majestic Sycamore trees didn't instantly capture the imaginations (or approval) of the Historic Commission. We urged them to keep open minds and to watch the project unfold; as they did, they gradually became more comfortable with the idea of a lively color palette.

The base color is "Boston Common Green," with which we were familiar through our work on the Frog Pond's structures and ironwork. We accented it with vibrant primary colors throughout the fencing and on the rubber surface, tile mosaics and play structure. Although the brighter colors are prominent, they were not overused and are mainly there to add a little "sparkle." The result is an upbeat, lively space that fits well within relatively serious surroundings.

On any given day, there's tremendous diversity among park users, and because people are there to have fun, it has served in many ways to bring the city's far-flung neighborhoods closer together.

The frog sitting sentinel atop the Tadpole Playground's brightly colored gate sets the tone for the experience kids will have inside the park, which is now a big draw within historic Boston Common.

Civic Arts

The generosity of the donor made possible the defining features of the playground – the aesthetic elements that lend the playground much of its idiosyncratic character.

During the artist-selection process, we worked with a Boston-area organization called Urban Arts, which maintains a registry of slide photographs of works from a variety of artists. Before we began, we identified the various media we wanted to see and, in all, reviewed about 100 artists' works before selecting ten finalists for meetings with us and various city officials.

As it would turn out, the painted iron fencing and gateway were designed in-house by our staff. Beyond that, however, a stellar trio of artists were brought into the project: Scattered all around the space are bronze frogs created by local sculptor David Phillips as well as beautiful tile mosaics from artist Lilli Ann Rosenberg. There are also three froggishly illustrated panels mounted on the fences that resulted from the collaboration of artist Mark Cooper and children at Citizens Elementary School in Dorchester, Mass.

The frog sculptures display a range of personalities: A fishing frog and a thinker frog sit just outside the playground near the Frog Pond, for example, and you'll see a snorkeling frog, a lifeguard frog and a sunbathing frog in the waterfeature area. There's also a gatekeeper frog who keeps watch atop the gateway arch.

The artist has been quoted as saying that each frog displays a certain "comic sophistication," but whatever it may be, the frogs have been a smash hit with children and already show the special patina that could only come with kids climbing all over them.

Each frog displays a certain 'comic sophistication,' but whatever it may be, the frogs have been a smash hit with children and already show the special patina that could only come with kids climbing all over them.

The bronze frogs are placed around the space, some spouting small streams of water that seem irresistible to the children who play in the park. They lend a whimsical character to the setting that's at considerable variance from Boston Common's staid nature. (In a couple of these images, you can see the color spots we campaigned to add to the playground's traditionally dark fencing.)

Phillips was also responsible for a series of bronze lily pads mounted in the decking in the fountain area, while the ceramic-tile mosaics by Lilli Ann Rosenberg include colorful images of tadpoles, frogs, plants and insects that might easily be associated with a pond environment.

In addition to the artworks, we carefully reviewed and selected the play structures and resilient rubber flooring system for the play space. GameTime of Fort Payne, Ala., provided the play structures. We felt comfortable with their ability to design, fabricate and install a large, interactive play structure for kids in the 5-to-12-year-old range. The play surface was provided by Amityville, N.Y.-based Child Safe Products, which proved to be similarly responsive and helpful. Both companies made key contributions related to safety and aesthetics.

And There's Water!

In keeping with the Frog Pond and the space's generally amphibious theming, water is a key feature in the Tadpole Playground. But the waterfeatures have deliberately been kept small, a design decision that stemmed mainly from the fact that we wanted them to be fully accessible to the smallest of the park's users.

As a result, the water flows are quite small and understated. The skin-diver frog, for instance, shoots a stream of water out of his snorkel, while the sunbathing frog spits water from his mouth. There's also a small, interactive deck-level sprayer controlled by a push-button valve mounted nearby: It covers just 385 square feet, but it's become a beehive of activity during the summer months. Again, the water flow is low here – so low, in fact, that city codes allow us to use city water and existing water pressure to drive the fountains.

There's no recirculation system or filtration of any kind: Water flows into the fountain through a control box that contains back-flow controls, then on to the fountain nozzles. There's a circular drain at the center of the exposed-aggregate decking, and the fountain's wa-

The playground's benefactor enabled us to commission several artistic touches for the playground that would probably not have been possible without so substantial a gift. The mosaic medallion beautifully reinforces the park's aquatic themes, while the dancing bronze frogs appear as smaller reflections of the character frogs set around the space.

ter simply flows away.

These modest waterfeatures and their low flow rates contrast dramatically with the large vertical spray at the center of the Frog Pond, where the jets can reach 85 feet into the air if so desired. The contrast has a purpose: The big spray draws off larger kids and playful adults who want to cool off, but it's not so attractive to smaller kids. In other words, while the waterfeatures of the Tadpole Playground are modest, they are deliberately so to enable younger kids to get in on the "action."

The results have all been positive. Most days, and even when the weather's cool, scores of children are seen taking advantage of the space and happily interacting with the permanent amphibious bronzes and other elements. As Bostonians ourselves, we're thrilled that the playground meets an important need of the city's children while staying true to the historic setting of Boston Common.

The modest waterfeatures and deck sprays in the playground area are meant to delight the smaller users of the playground – and to be tame enough that older children will be diverted to the more active jets found in the Frog Pond nearby.

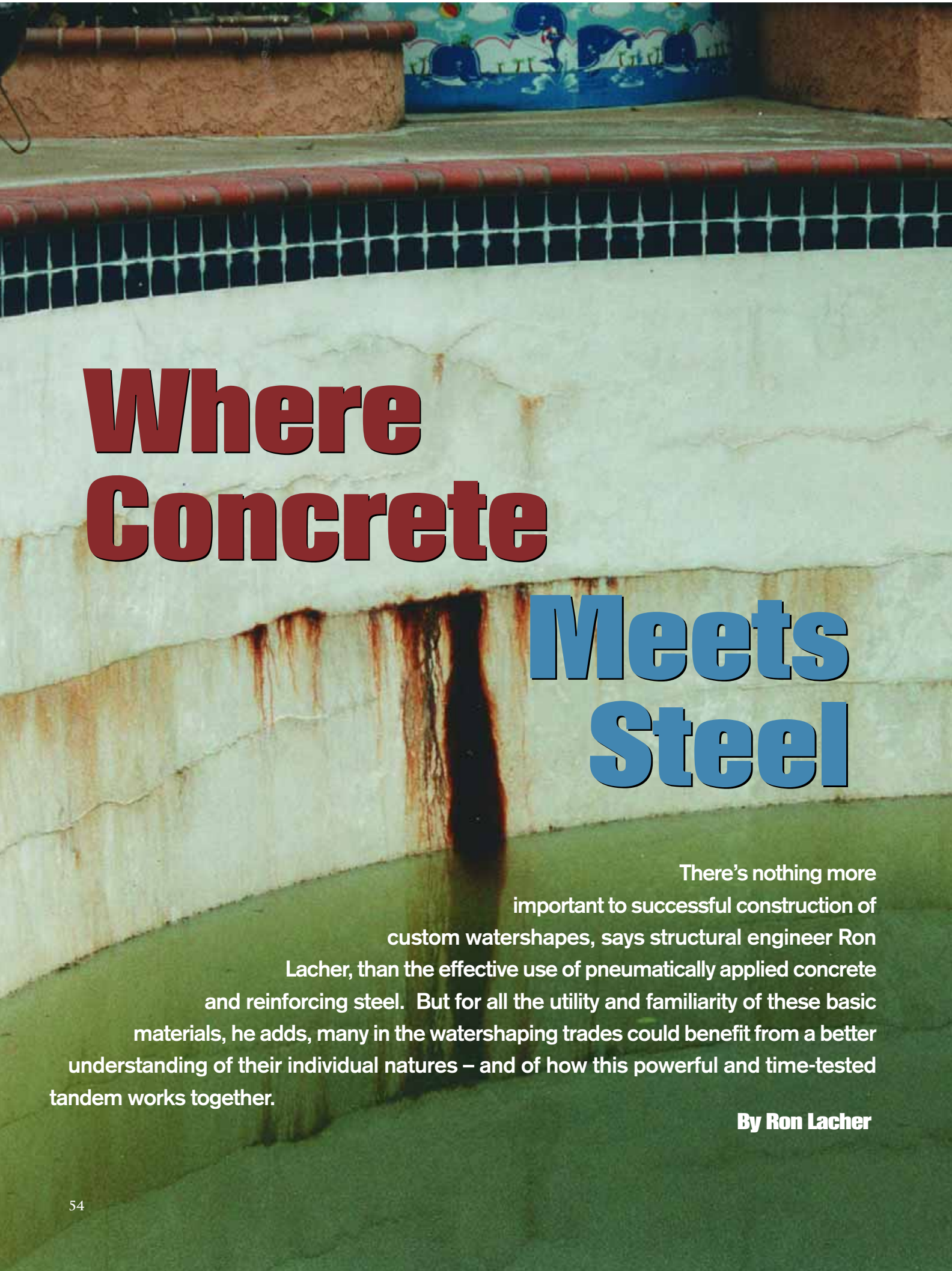
Surface Considerations

One of the improvements we made in the Tadpole Playground involved evening out the grade of the 5,800-square-foot space. The original playground was draped over a gentle slope in Boston Common and had several curbs and elevation changes that rendered it inaccessible and even somewhat hazardous to small children.

Once the original play area had been stripped, we made the space flat and added a small retaining wall along one side of the space.

We also created a visual link between the playground and the Frog Pond, setting up granite cobbles in a curvilinear running bond that mimics a stream flowing from the playground and ending where the thinker and fishing frogs sit along the pond's edge.

– L.W. & J.C



Where Concrete Meets Steel

There's nothing more important to successful construction of custom watershapes, says structural engineer Ron Lacher, than the effective use of pneumatically applied concrete and reinforcing steel. But for all the utility and familiarity of these basic materials, he adds, many in the watershaping trades could benefit from a better understanding of their individual natures – and of how this powerful and time-tested tandem works together.

By Ron Lacher

By Ron Lacher

The combination of concrete and steel is the currency of most modern construction, and there's a simple economic explanation for that fact: The affordability and availability of the basic ingredients of cement, aggregate, water and rebar have made their combination viable for use in countries the world over.

Used together, especially when the cementitious product comes in the form of pneumatically applied concrete, reinforced concrete is incredibly flexible and can be used to create almost any shape we might imagine. And in the case of pneumatic application, those shapes can largely be created without the use of traditional concrete forms.

Indeed, it's a construction matrix that can be used in such a way that the contours of the soil dictate the shape of the structure, giving the watershaper almost unlimited flexibility. It's even fair to say that pneumatically applied concrete, properly reinforced with steel, has made the true art of watershaping possible – especially when we're discussing inground pools and spas.

For all that flexibility and myriad other advantages, however, problems and even structural failures can occur with concrete structures. That's why it's keenly important for all watershapers to understand the physical nature of these materials and, more to the point, how these characteristics relate to the science and mathematics that underlie building codes and why they are so crucial to achieving reliable project results.

Tracing a Revolution

Let's begin with an important distinction: As far as building codes are concerned these days, pneumatically applied concrete is known as "shotcrete," a designation established by the American Concrete Institute in the early 1970s. This has caused considerable confusion, because we all know that concrete is pneumatically applied using two techniques, one known as shotcreting, the other as guniting.

By common definition, the term *shotcrete* is used when the cement and aggregate are premixed with water, pumped through the system as a slurry and then sprayed into place. The term *gunite*, by contrast, is used when the mix is pumped through the system dry and water is added at the nozzle. Both methods achieve much the same results – and each has its advocates and advantages, as we'll see below.

Gunite came first, appearing early in the 20th Century as part of the explosive development of concrete-construction technology through that era. The first rig was invented by engineer Carl E. Akely for The Cement Gun Co. and made its debut in 1910 at the Cement Show in New York.

By 1915, gunite had taken the building trades by storm and found use in projects as diverse as the construction of New York's Grand Central Station, the lining of industrial furnaces and the revamping of water- and sewage-transport systems. Indeed, the technology saw expanding growth and seemingly limitless applicability right through the end of World War II.

At that point, the material underwent what some historians of the subject call its mid-life crisis: The necessity of using small aggregates that could easily be pumped dry began running up against the desire to use larger aggregates. This led to new rounds of experimentation and development and, ultimately, to the

Both shotcrete and gunite have distinct advantages over poured-in-place concrete because they hold their shapes once **applied**.

emergence of various forms of shotcrete as alternatives to gunite.

No one knows for certain who was first to see the potential of pneumatically applied concrete in the construction of swimming pools and other watershapes or exactly when it occurred. I've heard claims and counterclaims through the years and won't step into these disputations here, but what I do know is that once gunite and shotcrete began to be used in shaping swimming pool shells, the industry was revolutionized and pools truly became available to the masses.

Made to Order

One of the keys to the success and acceptance of gunite and shotcrete is that they contain relatively little moisture when compared to some poured-in-place forms of concrete. That's important, because it is generally true that the more water there is in the mix, the lower will be the grade of the concrete. So when compared to poured-in-place concrete, gunite and shotcrete can be made to be relatively strong and comparatively durable.

This is so because the evaporation of moisture from the concrete matrix leaves voids – and the greater the number of voids, the lower the structural integrity and strength. In addition, the voids make the concrete subject to chemical attack and less resistant to physical stress. (None of this alters the fact that the exposed surfaces of *all* setting concrete materials – poured-in-place, shotcrete or gunite – must be bathed in water to allow for proper curing!)

Beyond their competitive edges with respect to strength and durability, both shotcrete and gunite have distinct advantages over poured-in-place concrete because they hold their shapes once applied – and once again those advantages are related to moisture content. This shape-holding potential is there because pneumatically applied materials exhibit very little *slump*, which is defined as the distance concrete will fall when placed while wet in the shape of a cone.

(Anyone who's been in the watershaping business for any length of time knows that if the nozzle operator applies too much water in a gunite application, the wall can fall down, often a costly, time-

Steel does a fantastic job of reinforcing when it is set up and tied to allow for proper pneumatic application of concrete. In these two cases, however, steel's ability is severely compromised by improper lapping that very often results in the creation of voids as the concrete is applied.

consuming and frustrating mistake – and one caused by the tendency of over-wetted materials to slump to greater degrees.)

Another big advantage for shotcrete and gunite has to do with affordability. Other materials require an often tremendous amount of what is known as "false work," that is, the construction of supports and forms needed to contain concrete as it is poured in place and sets. This false work requires its own engineering – often a huge percentage of the cost of the structure.

With swimming pools, of course, there are many cases in which some false work is required – for structures elevated out of the ground, for instance. As a rule, these will be among the most expensive of watershapes when it comes to cost of basic construction.

Taken all together, the advantages of affordability, flexibility, durability and strength make for shotcrete and gunite structures reinforced with steel that are capable of withstanding the forces arrayed against them by the surrounding environment in the form of expansive soils, settlement and other forms of ground movement as well as loads imposed by associated structures, seismic activity and, in the case of watershapes, the weight of the water itself.

Happy Together

The importance of reinforcing steel in all of this cannot be overstated, nor is it stretching a point to say that concrete and steel are made for each other in functional terms.

First of all, they bond well to each other – on the one hand with a strong mechanical bond related to the surface area of the steel that comes in contact with the concrete. This is why rebar is made with the familiar ridges on its surface: They dramatically increase the surface area available to create the mechanical bond.

On the other hand is a chemical bond that develops where the concrete attaches to the surface of the steel – not to mention the important point that encasement in concrete protects the steel from corrosion.

Beyond all that, however, the biggest reason concrete and steel are such a potent combination extends from the fact

Frequently Asked Questions

In working with inspectors and contractors through the years, I've run into a number of questions that come up time and time again that have less to do with the mathematics of the structural design than they do with basic workmanship and construction issues:

q **Is rust a problem?**

When it rains on a steel cage set in place in preparation for concrete application, the material often will show signs of rust shortly thereafter.

Inspectors often point this out and require contractors to replace the rusted bars, but it's often a judgment call: The only standard that applies to rust states that the bar cannot be so far gone as to reduce the all-important cross-section area, and there are those who say that a small amount of rust has been shown to actually *increase* the bonding characteristics between metal and concrete.

When it comes to *other* materials covering the metal, such as mud or oil, that's a different story. If anything that limits the bonding action is left on the rebar, the structure will be weakened.

q **What is proper coverage for rebar?**

According to the Uniform Building Code (UBC), when casting concrete against permanently exposed earth there must be a minimum of three inches of concrete between the steel and the dirt. If, by contrast, the concrete is being cast against a wooden form (such as is the case with a retaining wall that will be backfilled after it's been poured), then the clearance need only be 1-1/2 inches.

The reason for the difference is that, when casting directly against dirt, the actual thickness of the concrete is certain to vary because of the imprecise contouring of the earth. Thus, the three-inch standard is there as a safety margin. When working a wooden form, the thought is that you have much tighter control over the thickness of the concrete.

q **Why is shotcrete used in some areas and gunite in others?**

This is a tough one and has many different answers. Based on my own experience, however, I believe the reasons boil down to economics.

In areas where quality raw materials are more immediately available, you see gunite as the more common choice because it's less of an issue to haul the basic ingredients separately to the site for on-the-spot mixing. In areas where the economics are not so favorable to moving large quantities of raw materials – because, for example, of the distances they must travel – then you will see more material mixed at the plant and shipped to job sites as a premix. Such conditions favor shotcrete.

Certainly, this is a broad generalization, and you will find both methods used to differing degrees around the country.

q **What happens when structural work can't be finished in one day?**

The UBC permits work to stop and start if some basic guidelines are observed: The code states that if the material is allowed to sit for 30 minutes, all edges where new concrete will later be applied must be sloped to a thin edge before placing additional material. That edge must be cleaned and wetted.

The reason for the slope is actually very simple, although I've found that most people aren't aware of it: The code is written this way so that there is no build-up of rebound against the existing edge when you resume with concrete application.

For both shotcrete and gunite, the material will achieve a good bond with previously applied concrete, mostly as a result of the force of application but also because of chemical bonding. As the particles of aggregate strike the existing surface, however, some of sand or rock is thrown out of the mix in the form of rebound. Because the cement in effect comes off those pieces of aggregate, the zone of the cold joint is coated with an extremely rich cement mixture. Between the richer surface and the pneumatic application, you end up with a good bond.

– R.L.

that these two materials, when combined, take advantage of each other's strengths while offsetting each other's weaknesses. For its part, concrete is wonderful at resisting pressure in the form of *compression*, but conversely is weak in tension. Reinforcing steel, by contrast, is great at resisting loads present in the form of *tension* but, because of its typically narrow profile, has a tendency to buckle in the presence of compressive forces (and is therefore said to be limited with respect to compression).

When you combine the good characteristics of each, you have a material that provides great strength in both areas. This is why, when you look at a structural plan for a concrete structure, it will invariably include specifics for both the diameter of the reinforcing steel (as indicated by its number designation) and the thickness of the gunite encasing it.

A typical steel specification for a reinforced-concrete inground pool, for example, will call for "grade 40 deformed bars conforming to ASTM Standard A-615." The *grade* of the steel is a measure of its yield strength: If you place the bar in a machine and pull on it, the *yield point* represents the pressure required to stretch the bar and change its shape.

This is a point at which the material is no longer in an *elastic* state in which it stretches but then returns to its original shape when the pressure is removed. When you pass the yield point, the material instead becomes *plastic* and will *not* return to its original shape. That is considered failure of the material. The yield point for grade 40 steel is 40,000 psi; for grade 60, it's 60,000 psi; and for grade 75, it's 75,000 psi. These are the most commonly used grades of steel.

What gives steel its strength is not so much its diameter as it is the area of a cross-section – and it is this area upon which building officials rely in developing their codes. Thus, if you have rebar with a yield strength of 40,000 psi and a working stress of 20,000 psi (as dictated by building codes), you multiply that capacity by the area of the bar, which in #3 rebar is 0.11 inches. This calculation gives you a load-carrying capacity of about 2,000 pounds of working stress.

Table I

Varying the ratios of sand to cement in shotcrete mixtures will yield materials with different psi strengths.

Shotcrete Strength	Ratio of Sand to Cement
3,000 psi	1 to 4.5
4,000 psi	1 to 4
5,000 psi	1 to 3.5
6,000 psi	1 to 3

Cracking the Code

This is where things get complicated, but it's also where a little patience and curiosity can help you understand why the codes are written the way they are and why engineering specifications for load-bearing structures – which includes every water-containing vessel – are so important to their structural integrity and long-term success.

The first point to consider is that codes are written with significant safety margins, which is why steel schedules for all structures are set at about half the yield point for the steel in the given structure. Arriving at that determination for in-ground vessels is the result of calculating the "working stress" mentioned just above.

This "working stress" method of calculation is a more conservative approach than the "ultimate strength" model, which is commonly used in structural calculations for buildings and actually allows you to come closer to predicting the true yield strength of a structure. For water-containing vessels, however, code enforcers have taken the more conservative working-stress path, basically because it secures a greater level of assurance and safety against failure.

This conservatism is desirable in structures that hold water for two reasons: First, the load applied against the structure by the body of water is constant (that is, the earth pressure and the water are always there) and, second, even the most minor cracking can lead to leaks.

Using these calculations, codes call out the sizing and spacing of bars used in shotcrete or gunite structures. Absent special variations, most shells will contain bars no larger than #5s spaced no closer than 2-1/2 inches. This is important, because it ensures that no spaces will be so tight that pneumatically applied concrete cannot completely fill in the spaces *behind* the rebar. This is why inspectors are so concerned about spots where multiple bars are lapped together: They can easily lead to voids or "shadows" behind the steel that will seriously weaken the structure.

In poured-concrete structures, such as grade beams or friction piles where larger rebar is used, this is not a problem because the concrete is often subjected to vibration while still in a liquid state to cause the material to fill in all voids around the rebar. You can't do that in a swimming pool or other gunite or shotcrete structure. Instead, you must rely on the material's self-compacting characteristics to fill the spaces behind the bars.

The upshot of these working-stress-based calculations (and as required by the building codes used throughout the United States) is that most properly designed and constructed swimming pools should be able to support at least twice the load that will actually be placed on them by the weight of the water and the stresses generated by the surrounding soil. Ultimately, the building-code-required safety factors result in good, safe places to be – and offer a very good reason to observe and follow engineering specifications in setting up a steel cage and applying an adequate thickness of concrete to it.

Strength in Numbers

There's one other factor of concrete construction that bears discussion here:

It has to do with achieving a certain "psi" of concrete.

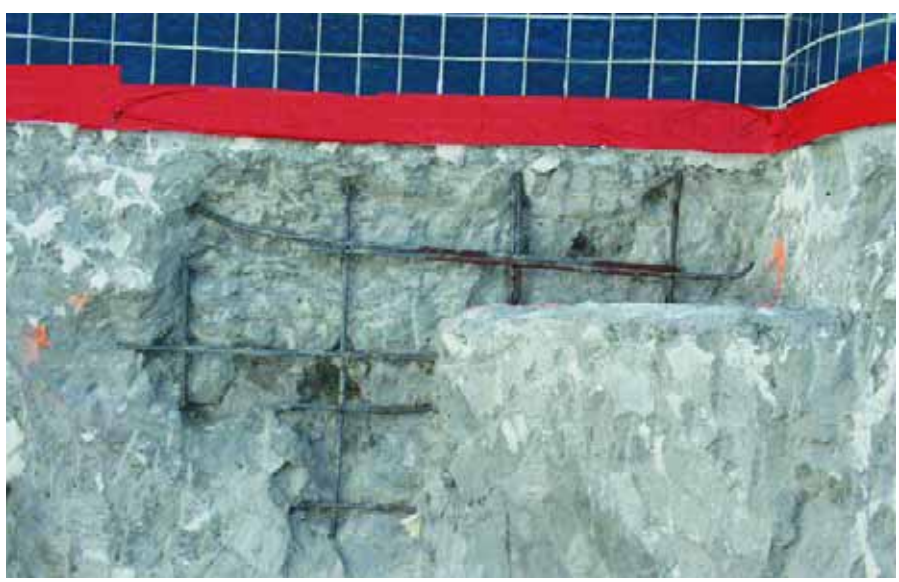
What we're considering here is the material's ability to withstand compression as measured in pounds per square inch (psi). If you were to take a core out of a swimming pool's wall, put it in a test stand and press it until it broke, the strength of the material would be a function of the area being pressed (measured in square inches) divided by the pressure required to produce the breakage.

For concrete "rated" at 2,000 psi, for example, a core measuring four square inches in surface area should support 8,000 pounds of pressure before breaking. (In effect, this is the "yield strength" of the concrete.) In designing structures, engineers are permitted by code to exploit only 45% of that strength – again ensuring a wide margin of safety against structural failure. That means with 2,000 psi concrete we're designing around a load of just 900 psi.

As mentioned above, the strength of the concrete is determined by the proportion of the cement to aggregate and by the cement-to-water ratio. Thus (to simplify a very complex topic), the more cement and the less water, the higher the strength of the concrete is said to be (see Table I on page 58).

The 2,000-psi minimum-strength requirement commonly found in swimming pools and other watershapes is not a high standard compared to some other concrete applications. In high rises, for example, where load-bearing capacity is critical relative to the weight of the concrete, the mixes become very precise and so sophisticated so that they can achieve levels upwards of 10,000 psi. (In these very-high-end applications, a variety of plasticizers and admixtures are used to achieve the required strength.)

Even so, some gunite vessels built in accordance with the 2,000-psi specification will fail, despite the relative ease of achieving that rating. Often, subsequent testing reveals that the gunite did not rise to that standard, in which case the logical conclusion is that, to save money, the applicators failed to use enough cement relative to the amount of water and aggregate needed to achieve the required strength.



It is extremely important to encase reinforcing steel in adequately thick layers of concrete. As the photo that opens this article shows (page 54), steel set in shallow concrete will fail in dramatic ways. When such vessels are stripped for repairs, the true extent of the disaster is plainly seen.

This is one reason that some contractors prefer shotcrete to gunite, because it's easier to achieve proper ratios in a factory-mixed product. With gunite, by contrast, the operator can create a mix that will not have the required strength – inadvertently or not. By the same token, gunite offers the advantage of enabling a skilled nozzle operator to *reduce* the amount of water in the mix, which can result in concrete that easily exceeds the 2,000-psi standard.

The bottom line with all of this is that if you follow a structural plan written to meet or exceed code requirements, the result will be a reliable concrete structure. If you stray from the path, you undercut decades of careful study and engineering – and can rest assured that what you save in time and money on the front end will almost certainly come back to haunt you (and your customers) at some point down the line.

But if your goal is to create a sound structure that will hold water for the long haul, there's no sense in guessing about the size and spacing of steel or the thickness and strength of the concrete: It's all right there for you, in the plans.

Free and Clear

Along with an increasing demand for large, naturalistic watershapes in both residential and commercial settings has come an unprecedented desire for exceptional water quality in those watershapes, says George Forni, a specialist in the design, construction and maintenance of lakes, ponds and streams. Here, using several of his projects in northern California as examples, he discusses just what it takes to meet both the demand *and* the desire.

By George Forni

Photos by John Ramez, Aquatic Environments, Danville, Calif.

Clear, polished water in well-designed, well-built lakes, ponds and streams: What better way to communicate a powerful message about the value of the properties that surround them?

In a commercial setting, for example, clear water in a meandering string of ponds will readily translate into office space filled with happy tenants, while the murky-water alternative could be just the eyesore that holds down the image and limits the facility's financial success.

The same principle works for watershapes at apartment complexes, where unseemly streams will almost certainly draw complaints from unhappy residents while cool, translucent water will become a point of pride and source of relaxation for tenants who otherwise might reflexively hold their noses as they pass by. Or consider the private estate where ponds are meant for swimming: Without question, these waters must have a crystalline clarity that attests to the water's safety and potential for recreation.

Delivering this level of water quality is more and more a part of what we at Aquatic Environments are asked to do these days for the large, naturalistic watershapes we're called upon to design, install and/or maintain. In response, we've focused on systems that get the job done in efficient, effective, trouble-free ways.

Polished Perfection

Our interest in developing such systems flows directly from what we've seen happening in our local market through the past few years – a time in which more and more architects and landscape designers are using "big water" in their residential and commercial designs.

The popularity of planned waterfront communities in particular has become a fixture in the high-end residential market hereabouts, and much the same can be said of the in-demand amenities for high-tech office complexes and hillside estate homes in northern California. Even the wineries of Napa Valley, which is right near our headquarters in Danville, Calif., are getting in on the act.

Across the board, we've also run into a strong desire on the parts of our clients to step away from the use of *any* chemicals in maintaining their streams, ponds

and lakes. In the past, such concerns were expressed mainly for living systems intended for fish and plants, but more and more we're finding clients who simply do not want us to use algaecides, clarifiers and sanitizers to maintain their water.

That trend, coupled with the fact that the government has, in recent years, banned the use of certain powerful and effective algaecides, adds up to a market that demands clear water without the aid of several chemicals that were once the cornerstones of effective pond and lake maintenance.

This has led us and others working on the design/build end of naturalistic and architectural bodies of water – as well as those on the maintenance end – to rethink the way we do things. In our firm, for example, we now achieve quality water by breaking the challenge down into a handful of basic areas and then doing everything within our power to create situations in which these key areas operate in balance with each other.

This involves us, first and foremost and on a case-by-case basis, in resolving important sets of hydraulic and filtration issues.

Dual Approaches

In many cases, the result of our explorations involves an unconventional combination of two common types of filtration.

The first type is a form of bio-filtration in which we hide grids of suction manifolds beneath layers of rock and crushed gravel in the bottom of a pond or lake. Beneficial bacteria and micro-organisms colonize the layers of gravel and rock and biologically filter the water as it is pulled through the matrix – much as it would be in a separate bio-filter component of the sort used on smaller-scale systems. In our case, by stepping away from off-the-shelf solutions and spreading the filtering action out over a large area, we greatly increase filtering efficiency and effectiveness.

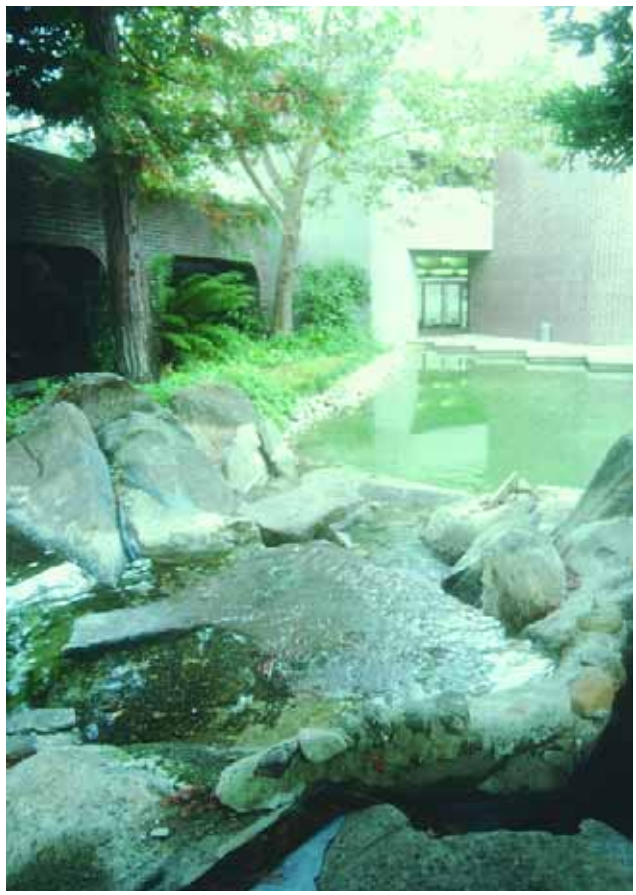
The second system we use on many of our projects involves us in setting

Complex Revival

This system of ponds has wended its way through an office complex in Santa Rosa, Calif., since the 1980s but had seen better days by the time we were brought in to clean things up and convert it to chemical-free operation.

Water is indeed an integral part of the entire property, from the lake at the main entrance to the large number of offices set up with pond views, and it was clear before we arrived that a general murkiness had cast a pall over the entire complex.

We relined the pond, relocated the skimmers, and set up the two-stage bio-filtration/sand-filter system described in the accompanying article using a residential pump. The result is a set of watershapes that is now a source of pride and a true aesthetic asset.



Residential Bliss

This small watershape is the distinguishing feature of an apartment/condominium complex in Pleasant Hill, Calif., that would look like scores of other developments in the area without it.

The owners clearly sensed the importance of that distinction, but the pond quickly became an unbalanced, unsightly and odiferous mess by the time we were called in to renovate it with a new filter system featuring a commercial Pentair Triton sand filter and two residential-type pumps. The work also included a complete tear-out and reconstruction of the watershape and associated plumbing.

up a bypass plumbing loop that sends portions of the bio-filtered water through large, swimming-pool-type sand filters. This removes far finer levels of particulates from the water, giving it a brilliant polish.

At this point, we've used this dual approach on many projects and have found that the pairing of biological filtration with pool-filter technology works exceptionally well.

Typically, we'll use a single pump to run both the bio-filter system and the sand filters. In most applications, this entails setting up a small equipment pad or a sub-grade vault, with the vault approach keeping the equipment out of sight, thereby preserving the naturalistic feel of the setting and also creating an efficient, flooded-pump operating condition. In almost all cases, the equipment will run constantly, which puts premiums on efficient hydraulics, system reliability and basic serviceability.

Products of quality pool-equipment manufacturers can be called on for these applications. In our case, we work closely with Pentair Pool Products (Sanford, N.C.) and its Triton sand filters in various sizes. We also use that company's WhisperFlo pumps (designed for residential pools), or, for our larger projects, its commercial-grade C Series pumps. We've found these components to be reliable, easy to maintain and, perhaps most important, flexible when it comes to applying them in what some might consider unusual arrangements.

Proper plumbing sizing and flow rates are important in *any* watershape system, but in our case, the calculations must accommodate the additional stresses that come with supporting plants and animals. As a result, we tend to work with piping systems that run from three-inch diameters on up and find that we're usually upsizing our lines to manage flow rates and increase the flow to ensure smooth and efficient operation.

Plant Matters

Once we've set up our two-stage filtering system, we plan for managing

Underpinnings for Clarity

Set on a hillside above Santa Rosa, the lakes under construction for this 100+-acre estate will be used for swimming, with the main bodies of water linked by spectacular cascading waterfalls.

Each lake will have its own water-maintenance system consisting of bio-filtration manifolds of the sort seen here backed up by a vaulted Pentair Triton 140 sand filter and two C Series pumps at 5 and 10 horsepower on 220-volt circuits. This will do well in providing swimming-pool-quality water throughout a system that will, in all, cover nearly an acre.

Plants, Plants Everywhere

Where plants are allowed to go unchecked, pond water will generally take a distinct turn for the worst.

In this case, a winery owner's passion for lotus flowers overwhelmed the planters and the boundaries of pond sustainability – so early in 2004, we will be removing the majority of the plant material and reworking the circulation system along lines discussed in the accompanying text to bring the site back into line.

– G.F.

a variety of other key factors, including the organic load that will be introduced by surrounding trees, plants and animals as well as proper aeration via underwater diffusion systems or waterfalls.

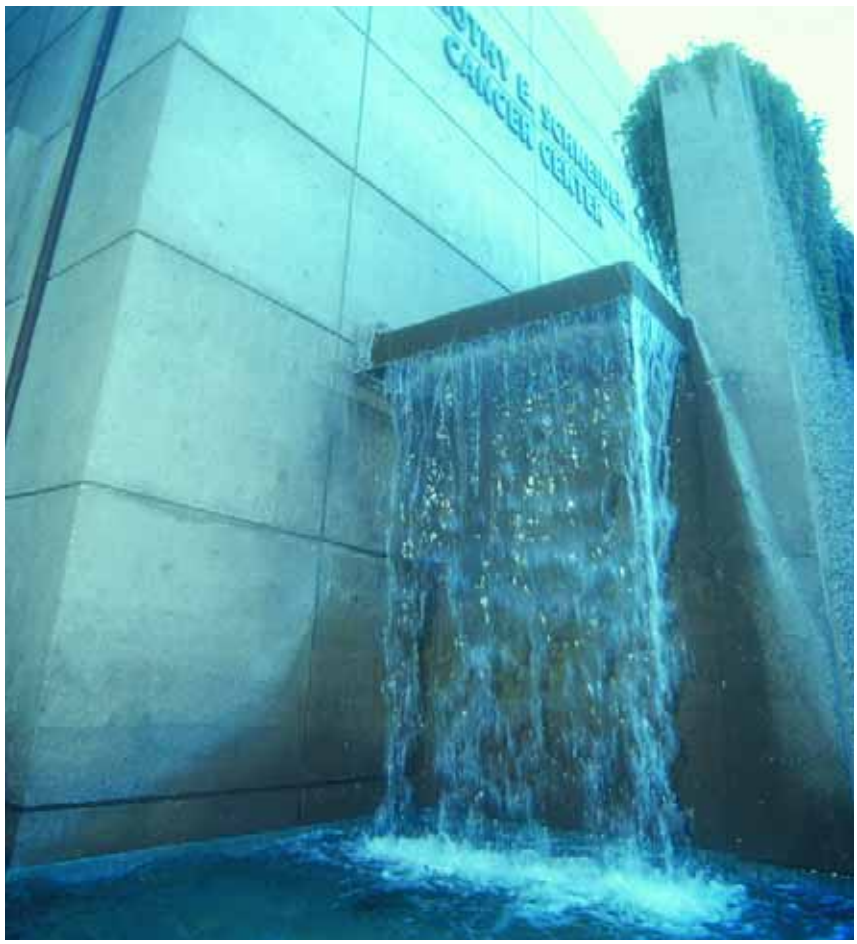
Anticipating and accommodating the biological load is particularly important, but it's somewhat tricky where plant life is concerned: Where falling and decomposing leaves add to the system burden, the plants' roots also work to lighten the load by removing nutrients from the water and using them to foster their own growth. Indeed, proper plant selection is a crucial part of the overall water-quality equation.

That said, we usually create shallow planting shelves near the edges of our ponds or lakes and plant a variety of sedges, lilies, emergents and other aquatic plants that are high in nutrient absorption. We're always mindful that there are limits to how much to plant, basically because a lot of our work in maintenance involves "harvesting" plant material that has taken over a pond or lake and encouraged algae growth, turbidity and stagnant, unsightly conditions.

Striking the right balance is the key, but the problem is that each system is unique, so there's no magic formula or specific ratio of plant life to water volume. Less tends to be more, however, so we typically start with smallish planting areas and focus first on setting up visual accents.

Of course, this conservative approach often runs counter to client desires, which tend to run toward bountiful, immediate lushness. Where we relent and compromise, we are almost certain to be called back at some future date to thin or remove the forest and, in some extreme situations, to drain, clean and refill the pond to set things back on the right track.

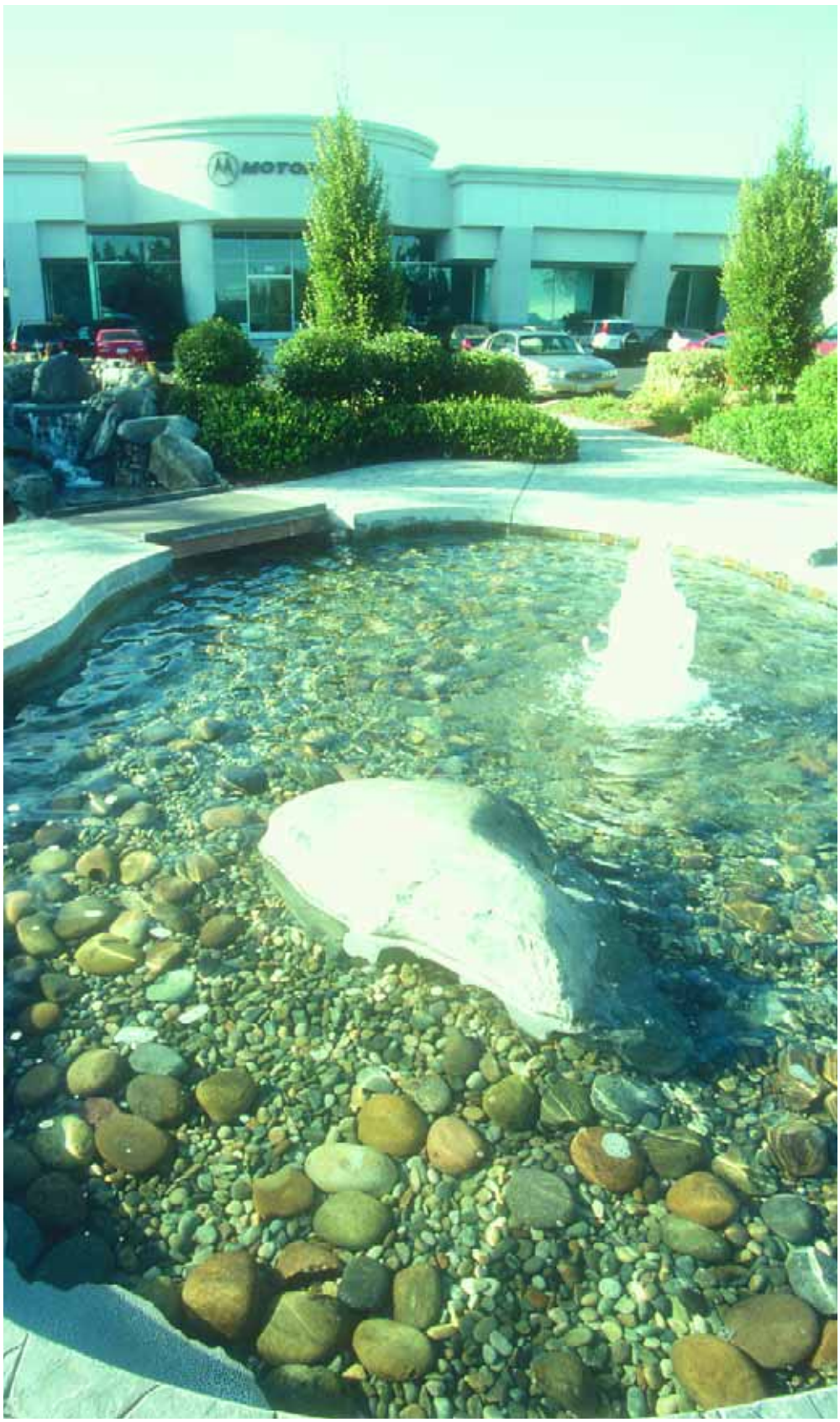
Beyond the watershapes, many of our clients express a strong desire to run grass (turf) or ground cover right up to the water's edge. This presents a challenge in that these plants not only add organic material to the water, but



Architectural Respite

We installed this complex fountain as part of the new Cancer Center at Mills Hospital in San Mateo, Calif., in 1999 and 2000 specifically to serve as a place where cancer patients could spend time resting and reflecting.

This is a case where water quality in an architectural fountain was an extremely high priority – a space where the water would constantly be seen and there was absolutely no option other than complete clarity. So despite the relatively small water volume, we used a commercial-grade pump and filtration equipment to leave nothing to chance.



High-Tech Statement

Set at the entrance to the headquarters of a high-profile electronics manufacturer, this watershape combines elements of both a pond and an architectural feature.

Crystalline water was a priority, but there were two large challenges: First, the area was environmentally sensitive and regulations prohibited the use of chemicals in maintaining water quality. Second, the water surface proved mightily attractive to ducks, who lent a special nutient burden to the system.

This is another case where a bio-filter/sand-filter combination – along with a rigorous maintenance routine – has produced near-perfect water quality.

also do nothing to remove it, unlike aquatic plants. In addition, runoff rich in fertilizers can cause big problems with water quality, so much so that in cases where we don't control the entire project, we have difficulty delivering a product consistent with the owner's desires.

If the edges are *not* properly set up, we will spend a considerable amount of time and effort working with landscape contractors to set up perimeter drains to capture some or all of that flow. In these cases, education of maintenance staff is key, as uncollected grass clippings or debris can overload system balance.

In the Water

There's one last factor in establishing good water quality that bears mention before we start looking at specific projects: Skimmer location is critical and deserves serious thought and planning. We tend to use large pond skimmers and go to great lengths to place them where they will catch the prevailing flows of leaves and organic debris. (This step is particularly important in establishing good water quality in renovations, which will be the subject of a future article.)

When all of these elements – filtration design, equipment selection and layout, planting plan, drainage needs, make-up water and skimmer placement among others – are handled properly, you've effectively stacked the deck in favor of good water quality. In my view, it all extends from opening the door between the pond and pool worlds and welcoming cross-disciplinary solutions to clear, common challenges.

To be sure, ponds and lakes are unlike swimming pools and architectural fountains in respects chiefly having to do with the variables involved in managing water quality in environments designed for fish and plants without basic chemical assistance. By looking across the conventional boundaries in the cases seen here, however, we develop solutions that use all the available tools and bear in mind our constant goal: *perfect water.*

Wine Country Reflections

A swimming pond fronts this multi-acre estate in the hills of Napa Valley. The driving idea here was to create a crystal-clear pond, suitable for swimming, with a simple design that wouldn't get in the way of enjoying reflections of the surrounding greenery and home.

A small stream feeds the pond at one end, providing a source of aeration and sound. Once complete, the filtration system for the pond worked so well the homeowner actually asked us to come back and "green up" the water a bit so the setting would look more realistic. We allowed a willow tree on one end to grow over the water and reduced the filtration system's operating time to create a slightly less clear water column.

Of Interest

The following information has been provided to WaterShapes by product suppliers. To find out how to contact these companies, look for the Product Information Card located on page 72.

Pond Vent/Light

Circle 135 on Reader Service Card

CAL PUMP has introduced Pond Vent, a pond-venting system complete with a 10-watt EggLite Kit – an all-season system that ensures adequate pond venting through the icy winter months and can be used for gentle pond and landscape illumination through the summer months. The versatile product comes equipped with a floater ring that can be used for convenient, year-round feeding access. **Cal Pump**, Valencia, CA.

Sand Filters

Circle 136 on Reader Service Card

NEPTUNE-BENSON offers the Legacy line of sand filters. Designed for commercial aquatic facilities, the small-diameter fiberglass tanks come with heavy-duty components for dependability and easy servicing. Available with two- and three-inch connections in four diameters from 30 to 48 inches, the tanks feature easy-access lids and can be set up for manual or automatic backwashing. **Neptune-Benson**, West Warwick, RI.

Filtration Products

Circle 137 on Reader Service Card

NORTHERN FILTER MEDIA offers filtration media for swimming pools and backyard ponds. Included are Zeobest, a natural zeolite filter medium that has a greater surface area than typical filter sands – hence longer filter cycles – and Zeobest Ultra, an antimicrobial medium that removes almost all viruses, bacteria, algae and cryptosporidium from pond or pool water. **Northern Filter Media**, Muscatine, IA.

Ladder-Tread Modification

Circle 138 on Reader Service Card

SPECTRUM AQUATICS has modified the heavy-duty ABS injection-molded ladder treads used on all of the company's diving towers and lifeguard platforms. The 22- and 26-inch, 15-degree ladder treads are easier to install, service and maintain by virtue of an enlargement of the tread's underside box sections. In addition, the tread's non-slip surface area has been increased. **Spectrum Aquatics**, Missoula, MT

Controller Upgrades

Circle 139 on Reader Service Card

CHEMTROL has made two upgrades available for its controllers: a new sensor that detects free chlorine levels using a selective membrane that prevents interference from cyanurates or oxidizers; and Version 4.0 of the system's PC-based program, which now allows for display of all stored data logs on screen without the need for downloads on laptops. Both upgrades are included in all new systems. **Chemtrol**, Santa Barbara, CA.

Decorative Concrete Surfaces

Circle 140 on Reader Service Card

SOUTHERN GROUTS & MORTARS offers Southcrete Spray Deck, a durable, mildew-resistant, easy-maintenance deck-surfacing system designed to restore worn or cracked concrete patios or pool decks and add years of life to such surfaces when first installed. Available in 14 earth-tone colors, the applied surface is slip-resistant and stays cool and comfortable to the touch. **Southern Grouts & Mortars**, Pompano Beach, FL. Continued on page 74

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VALTERRA PRODUCTS offers two- and three-way valves designed for maintenance-free operation. Constructed of chemical-resistant, high-temperature PVC to withstand pressure up to 240 psi, the valves operate with recommended working pressures of 60 psi and positive-seal back pressure of 50 psi and are ideal for installations where higher pressures may be encountered. **Valterra Products**, Mission Hills, CA.

Starting-Platform Finish

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PARAGON AQUATICS has introduced new tops for its line of starting platforms. Molded from 1-1/4-inch-thick, UV-inhibited polypropylene with cross-groove features, the non-slip surface is designed to provide added stability for fast, secure takeoffs. Almost any requested color can be matched, and existing starting platforms can be retrofitted with new tops at modest cost. **Paragon Aquatics**, LaGrangeville, NY.

Electrical/Irrigation Products

Circle 143 on Reader Service Card

KING INNOVATION announces the release of a new, full-color catalog on the company's electrical connectors, irrigation products and electrical accessories. Included are silicone-filled wire connectors designed for splicing where moisture exists, as with outdoor lighting, landscaping or direct-bury applications. The catalog also has specification sheets, conversion factors and code information. **King Innovation**, St. Charles, MO.

Video Pool-Safety System

Circle 144 on Reader Service Card

SWIMGUARD introduces an underwater video-monitoring system that gives lifeguards and pool managers access to live coverage of what's going on in their pools. Multiple modular camera units are placed around the facility both above and below the waterline and eliminate observers' problems with glare, surface disruptions, water toys and blind spots throughout a facility. **Swimguard**, Lincoln, England.

High-Power Landscape Lighting

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SPACE CANNON offers Color Art, a color-changing architectural luminaire available in 1,000-, 1,600-, 2,000-, 2,500-, 3,000-, 4,000- and 7,000-watt versions. The fixture has a non-corroding, cast-aluminum housing, zoom and electronic dimming and a dichroic color-changing system. An on-board computer allows for pre-set displays, programming and multiple operating options. **Space Cannon**, Edmonton, Alberta, Canada.

Pre-Cast Concrete Panels

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FABCON offers VersaCore panels as an attractive, cost-effective, durable insulation system. Designed for moisture control in buildings in which humidity must be tightly regulated – as with indoor swimming pools – the wall panels have low permeability and replace the usual hollow cores with insulating foam with an R value of 16.4, which eases the process of maintaining strict temperature and humidity control. **Fabcon**, Savage, MN.

Continued on page 76

CONCRETE SPRAY PUMP

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RFI CONSTRUCTION PRODUCTS has introduced the Model RSP-200 rotor/stator spray pump for use in pool repairs or in rock formation. Designed to handle fine-grain mortars, plaster, GFRC, grouts and textured paints, the unit is powered by a variable speed air-on-electric motor and has a pumping capacity of 3 gpm through a 1-inch-diameter material hose. **RFI Construction Products**, Farmingdale, NY.

CONTROL SYSTEMS

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PENTAIR POOL PRODUCTS has expanded its line of IntelliTouch control systems with two new models: i9+3S automates a single body of water, such as a pool or custom spa, with an indoor control panel for easy user interface; i10+3D controls a pool and spa with separate equipment sets, with allowance for operation of up to 10 circuits, two heaters and up to five valve actuators. **Pentair Pool Products**, Sanford, NC.

POND-SUPPLY CATALOG

Circle 149 on Reader Service Card

INTERNATIONAL POND SUPPLY has published a catalog that covers its comprehensive line of pond-related products and accessories. Products include filters, filter media, pumps, plumbing, fittings, valves and decorative items (including fountains), and there's information on maintenance, fish care and aquatic plants as well as a detailed guide to pond installation. **International Pond Supply**, Santa Fe, NM.

INTERLOCKING PAVER SYSTEM

Circle 150 on Reader Service Card

PAVERART has developed a process that allows for translating virtually any design onto a field of interlocking pavers. Intended for use on everything from residential pool decks to commercial plazas, the system works up complex images and intricate designs through use of concrete pavers made using pigments that concentrate colors through the wear layer for a long, durable service life. **Paverart**, Swedesboro, NJ.

Waterpark Guidebook

Circle 151 on Reader Service Card

WHITEWATER WEST INDUSTRIES has published a catalog covering its line of waterpark amenities, including body slides, inner-tube rides, rafting systems, speed slides, wave equipment, interactive spray and play systems and more. The full-color, 28-page, heavily illustrated booklet offers capsule specifications and ample views of each product in use. **Whitewater West Industries**, Richmond, British Columbia, Canada.

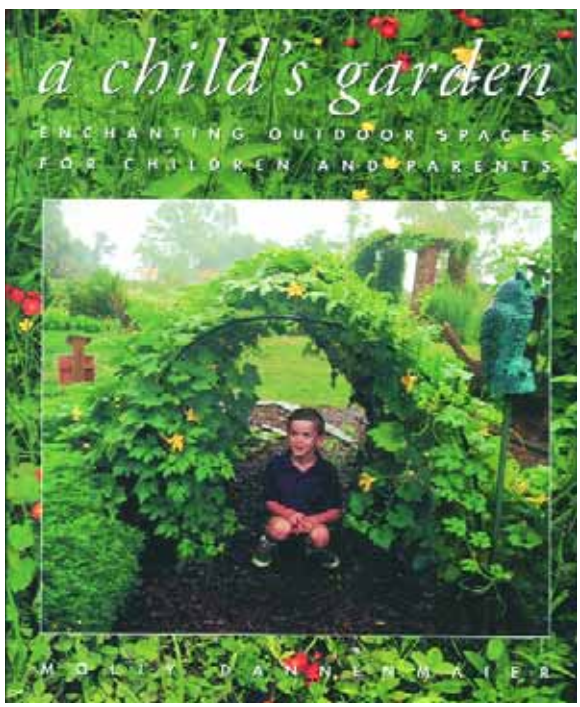
Ceramic-Coated Aggregate

Circle 152 on Reader Service Card

REPLICATIONS UNLIMITED has introduced a new line of medium- to large-sized artificial rock waterfeatures. Manufactured in standard and custom designs as modular sections for ease in shipping and installation, the waterfeatures are pre-plimbed and pre-colore to allow a contractor to install finished products on site in just a few hours in sizes up to 20 feet wide by 8 feet high. **Replications Unlimited,** St. Louis, MO.

By Mike Farley

A Playful Art



When clients call me in to design their backyards, one of the main things many of them want is a safe environment for their children. I've always thought of myself as a big kid at heart and also look at things as a father, so I've always felt confident and fully prepared meet my clients' desires while creating spaces that really work for kids.

How little we sometimes know!

After reading *A Child's Garden: Enchanting Outdoor Spaces for Children and Parents* by Molly Dannennaier (Simon & Schuster, 1998), it's now clear to me just how much more can be done in watershape and garden spaces to engage children of all ages. Indeed, this book showed me that there's much, much more to designing for children than setting up the occasional slide, thermal ledge or diving rock.

Dannennaier spent time as editor at three magazines – *Garden Design, Landscape Architecture* and *Parent & Child* – and came away from the experience with a cross-disciplinary perspective that's truly valuable to designers. Throughout the book's beautifully illustrated 190 pages, she demonstrates an understanding of her topic that goes well beyond a survey of the usual interactive garden features designed for children.

Instead, she writes from a more psychological standpoint, breaking down into categories the things that children look for in a place to play. She argues convincingly that kids should be given stimulating environments that engage them in ways that invite creativity, ingenuity and imagination – places where kids themselves can conjure activities based upon certain features they find within the garden or yard.

Number one on her list of features children need for this rich experience is water, and Dannennaier comes out fully in favor not just of swimming pools, but also streams, ponds and fountains – all of which, she says, have the ability to capture the interest of children. She astutely addresses safety concerns, but points out that even a tiny waterfeature, thoughtfully designed, can benefit even the smallest of children – not to mention how great any watershape can be for older kids.

Second on her list are creatures, and she goes into great detail in suggesting that garden spaces should attract desirable insects, such as butterflies and moths, in addition to birds or even worms. It gives kids a chance to observe nature at close quarters, she says, and adds to the fun of the entire garden experience.

She also discusses children's near-universal desire for refuge in the form of hiding places and recognizes the value of outfitting those places with windows or look-out points. She urges designers to think in terms of providing safe means for kids to play with raw materials, including sand, soil, plant material and rocks, and advises designers to consider heights and the value of scaling garden features to small users. And she embraces the old standards, such as swings and other play amenities.

In each area, she offers numerous examples of specific design features that fill the bill. In most cases, not only are the resulting spaces highly functional on all counts, but they're also attractive, engaging and anything but sterile or forced.

This wonderful book is must reading for anyone who takes seriously the art of child's play and has inspired me to think about designing for kids in a whole new way. Rather than relying solely on the tried-and-true features we normally associate with child's play, I see a broad array of new ideas I can use to make children (and their parents) even more happy.

Mike Farley *is a landscape architect with more than 20 years of experience and is currently a designer/project manager for Gohlke Pools in Denton, Texas. A graduate of Genesis 3's Level I Design School, he holds a degree in landscape architecture from Texas Tech University and has worked as a watershaper in both California and Texas.*

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