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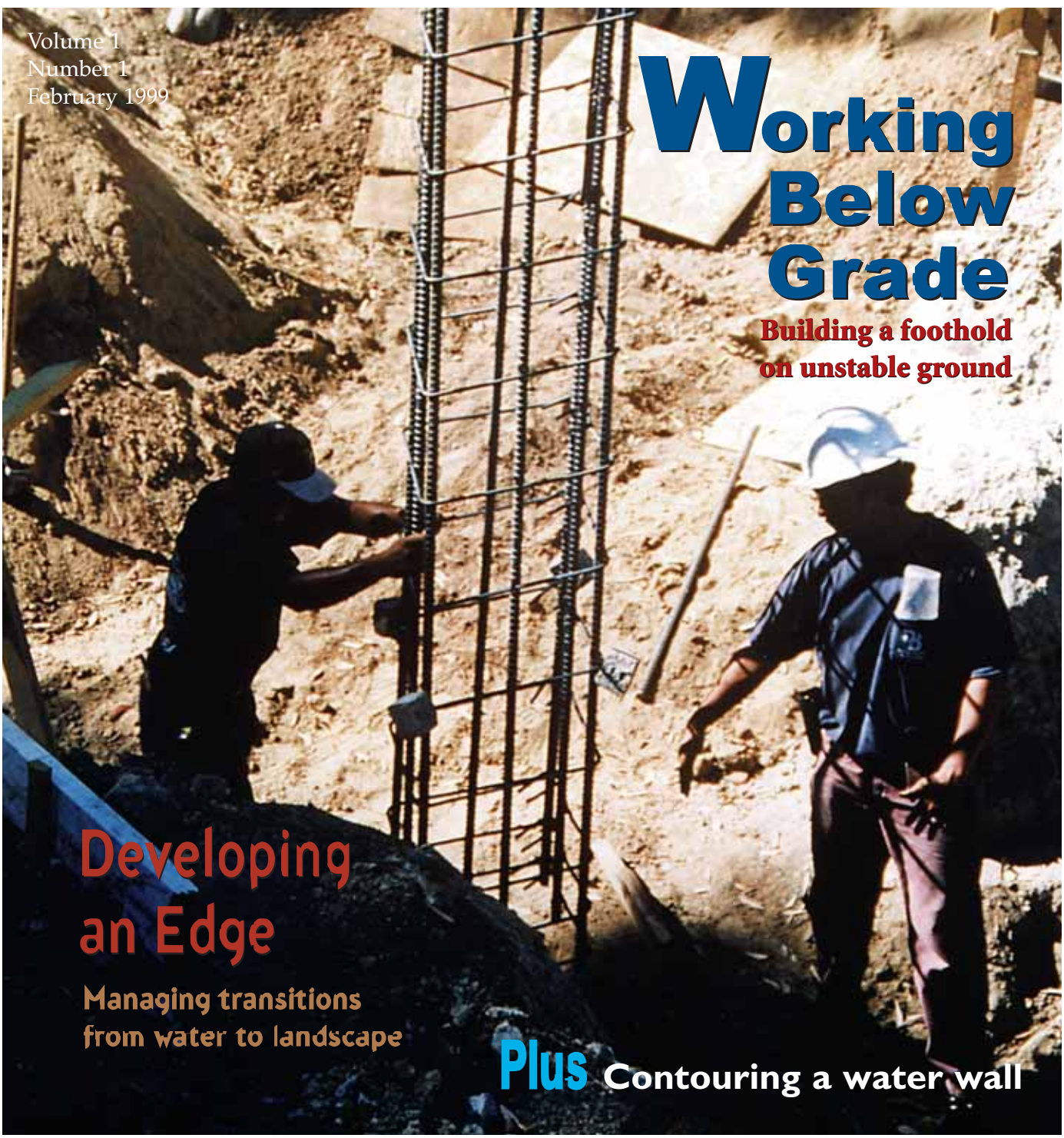
WaterShapes

Design • Engineering • Construction

Volume 1
Number 1
February 1999



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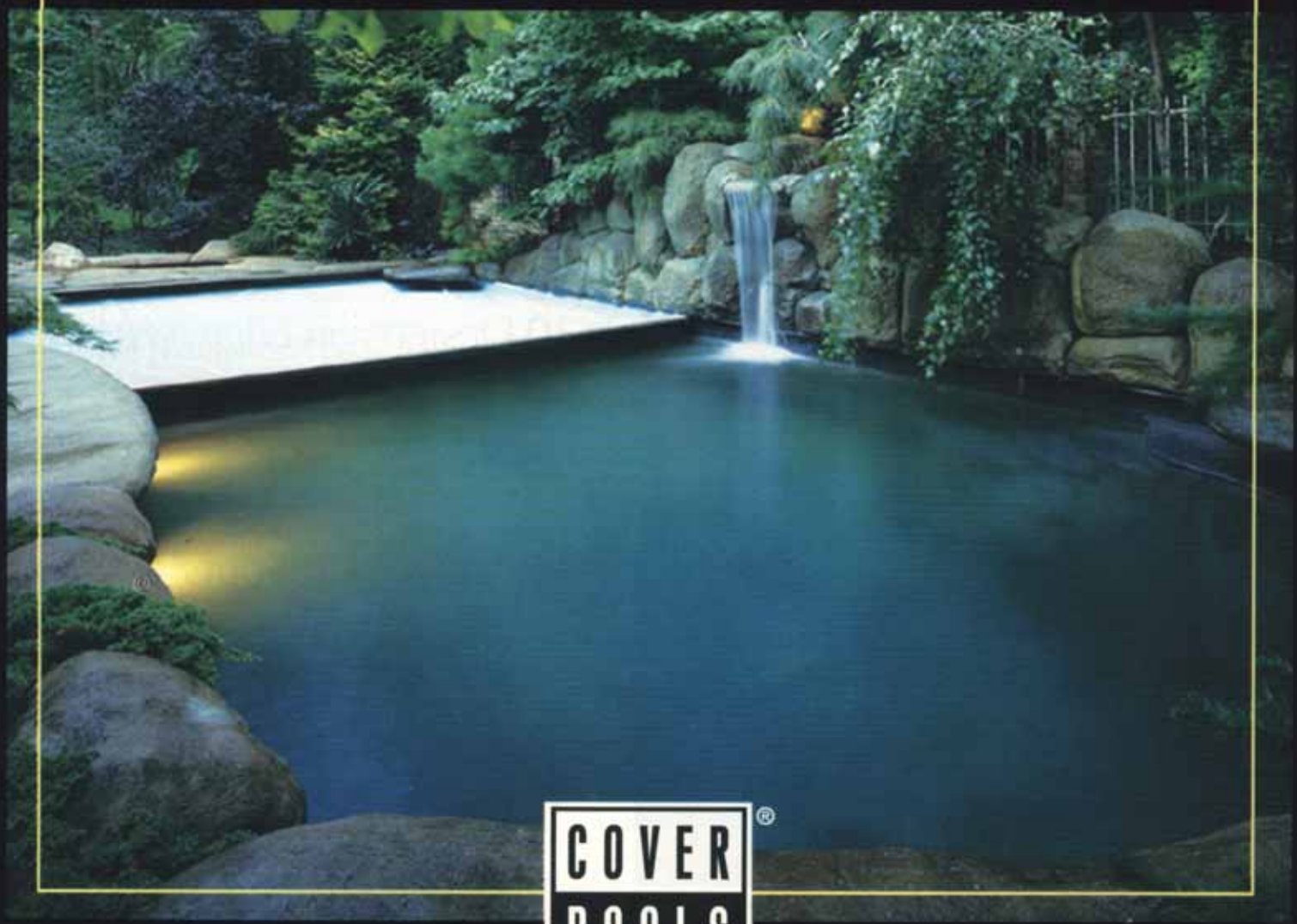

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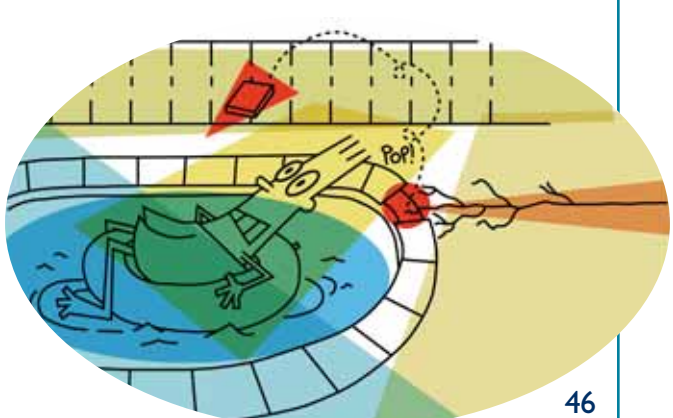

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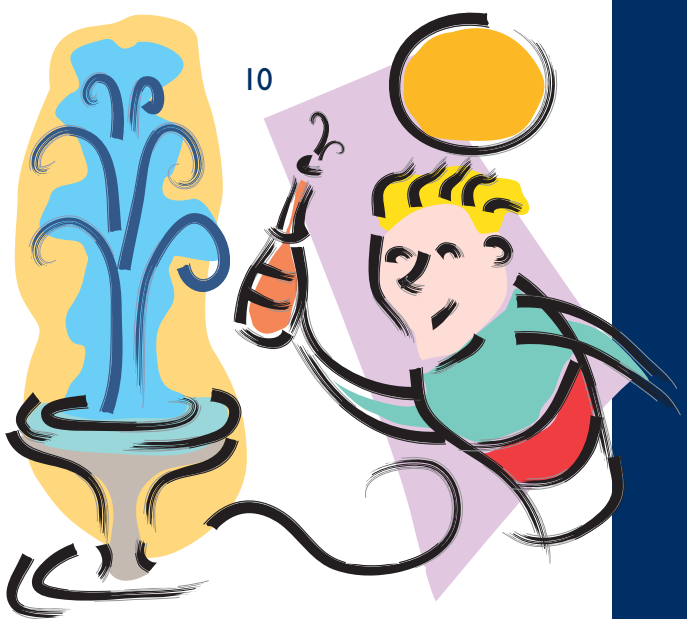

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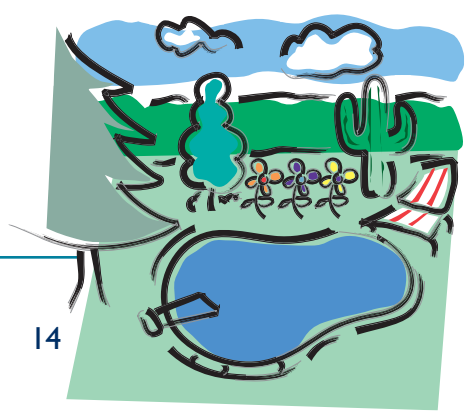

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On the cover:
Photo courtesy
David Tisherman

WATERSHAPES (ISSN 1522-6581) is published bimonthly 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.
Periodical postage rates paid at Woodland Hills, CA 91365 and additional mailing offices.

By Eric Herman

New Words for a New Era

Dear Mr. Webster,

I have a pair of new words I'd like you to consider for the next edition of your dictionary.

watershape, *n.* 1. Any engineered, fabricated vessel that contains and controls water. 2. Any representative of a class of engineered, fabricated vessels that includes swimming pools, spas, fountains, waterfalls, streams, waterfeatures and other man-made installations containing and controlling water for either recreational or ornamental use in residential, commercial and institutional settings. 3. A class of custom water-containing installations, generally characterized by the presence of concrete shells.

watershaper, *n.* 1. Any designer, engineer, builder or subcontractor involved in the production of a watershape.

These two terms are desperately needed to describe the broad range of structures that contain water for either recreational or decorative purposes – and to identify the professionals who design, engineer and build them.

I'm well aware that these terms may take some getting used to, as do most new words and phrases. But there are undeniable economies of expression here. For example, without the word watershape, we've been forced to wrestle with an unwieldy set of terms to describe the broad array of structures used to *shape water* – a list that includes swimming pools, spas, fountains, ponds, waterfeatures, streams and waterfalls – just to name a few.

Likewise, we are often compelled to rattle off an even more impressive list to encompass those who work this aquatic magic. Sure, we can keep on calling them architects, designers, engineers, builders, subcontractors and landscape specialists – or, for the future, we can simply describe them all as watershapers.

Frankly, we've found the wordy option to be a messy way of communicating. It's also confusing because it essentially forces us to subdivide these people at a time when we're trying to bring them all together using the common professional thread that binds them. And what a wonderful thread that is: the creative use of water!

These are professionals whose installations lighten our moods, renew our spirits, exercise our bodies, rid ourselves of stress and unite families and communities. This is exciting stuff, Mr. Webster, and I trust you'll agree with me that these charming words belong in our common vocabulary.

I think the definitions offered above speak for themselves, but if you need more information to go on, you need do nothing more than look closely at the pages of the magazine you now have in hand. You'll find information on construction techniques, design principles and engineering approaches as well as profiles of major projects down to the smallest details.

It's all here: everything you'll need to know about water and the magnificent ways it can be shaped to improve our lives.

Thanks for your consideration!

WATERSHAPES

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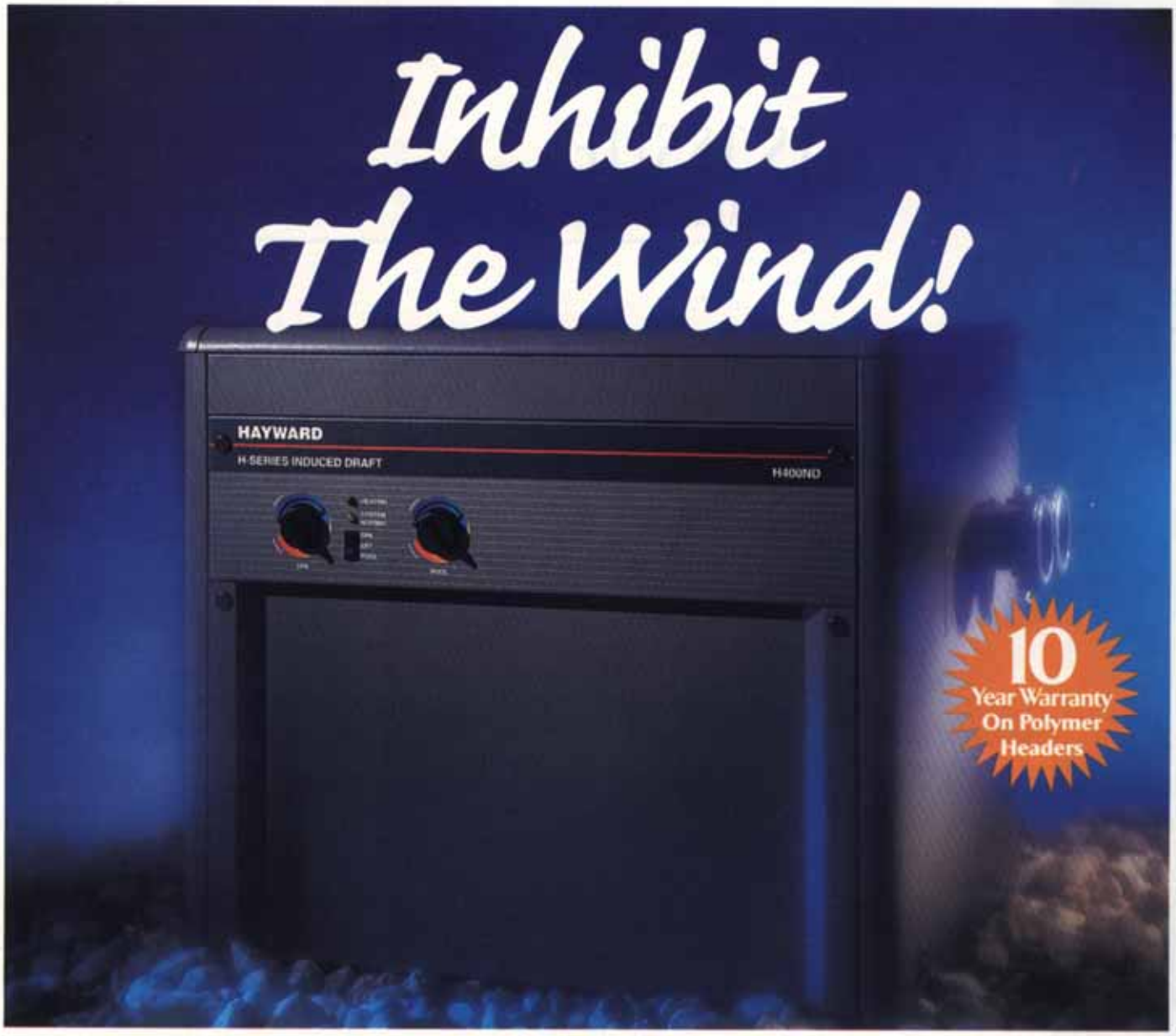
Inhibit The Wind!



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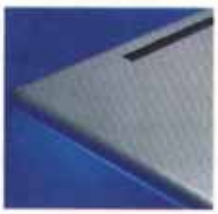

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IN THIS ISSUE

FEBRUARY'S WRITERS

TISHERMAN

DAVID TISHERMAN is the founder and principal of David Tisherman's Visuals in Manhattan Beach, Calif. 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 – an approach fostered by his extensive studies in a variety of technical disciplines. He has degrees in industrial design and history from California State University at Northridge and pursued advanced degrees in design and architectural rendering at Art Center College of Design and Harvard University's Graduate School of Design. He serves on the adjunct faculty at UCLA and chairs the university's extension courses on drawing and presentation. He also has won several awards for his designs in the United States and internationally, and his work has been featured in several magazines, including *Architectural Digest*. Tisherman serves as an industry expert for California's Contractor State License Board and has been a member of the National Spa & Pool Institute's Builders Council since 1994, recently serving as its chairman. He is a co-founder of and principal instructor for the Genesis 3 Design Group.

PETER WHITE is senior landscape architect for Zen Associates of Sudbury, Mass. An award-winning designer with 11 years' experience, he works on projects at all levels for large institutional and commercial customers as well as residential clients. White joined Zen Associates in 1990 and now specializes in the planning and development of large residential estates, intimate water gardens and city parks. His work often combines design elements of traditional Japanese gardens with features drawn from native forests found in the Northeastern United States.

BOWER

BEN DIXON is co-founder of Florida Falls of Spring Hill, Fla. – since August 1998 a division of Polaris Pool Systems. A former university instructor, he left the classroom behind in 1981 when he co-founded The Spa Shop in Gainesville, Fla., to design, install and service inground and portable spas for customers throughout the Southeastern United States. In 1991, his hot-water experience behind him, Dixon and Doug Rutherford founded Florida Falls to manufacture components for residential and commercial waterfeatures. He now routinely consults with pool designers and builders on high-end custom projects throughout the United States.

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 – more than 5,000 in 1997 alone. He regularly serves as a field expert for California's Contractor State License Board, insurance companies, homeowners and pool-construction companies.

Interested in writing for WaterShapes *on design, engineering or construction topics? Contact Eric Herman at (714) 528-9757!*

Brian Van Bower is a partner in the pool-construction firm of Van Bower & Wiren in Miami, where he also runs Aquatic Consultants. With nearly 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 and 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. Bower is also a co-founder of the Genesis 3 Design Group.

McNicol

Jim McNicol is a technical consultant to the swimming pool, jetted bath and spa industries from his base in Tustin, Calif. Before joining the pool and spa industry, he spent 16 years in the aerospace industry, mainly on development of large-scale telecommunications systems. He started in the pool industry as a retail/service manager, moving on to become director of engineering for a leading pool-equipment manufacturer. In 1982, he co-founded Brett Aqualine, a supplier of electro-mechanical equipment for spas. In 1984, McNicol became a charter member of Underwriters Laboratories' Industry Advisory Group on Standards for Safety of Electric Spas, Equipment Assemblies and Associated Equipment (UL 1563) and has been a member of the Industry Advisory Group for UL 1081 on Swimming Pool Pumps, Filters and Chlorinators. From 1979 to 1996, he represented the National Spa & Pool Institute as a member of the panel responsible for all aspects of Article 680 of the National Electrical Code governing swimming pools, fountains and similar installations. He was the 1987 recipient of NSPI's John Holcomb Silver Award in recognition of his technical contributions to the industry; in 1994, McNicol received NSPI's Eagle Award for his overall contributions to the industry – the only person to have been honored with both of these awards.

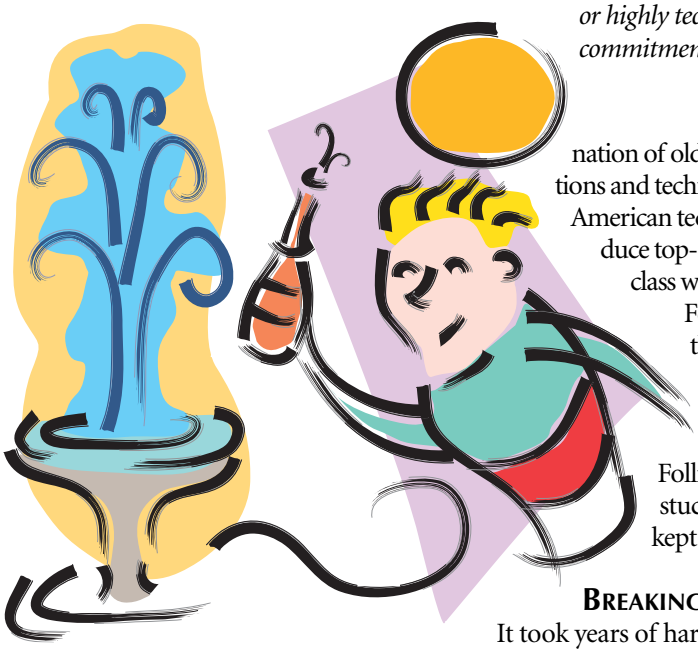
Rose

Stephanie Rose runs Stephanie Rose Landscape Design in Encino, Calif. A former New York securities analyst, she gave up Wall Street nine 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.

A Call for Ambassadors

By Brian Van Bower

"To succeed in business or in life, I don't think you need fancy schooling or highly technical experience. What I think you need is common sense, a commitment to hard work and the courage to go your own way."
– Robert Mondavi



That statement in Robert Mondavi's autobiography truly inspires me. As I've prepared myself to write this column, I've been even more conscious of how this and other things he says about his career in the wine industry apply not only to *my* life and career, but also to what we all do in shaping a different kind of liquid for our customers.

Mondavi single-handedly transformed the U.S. wine industry. He founded his company in the mid-'60s at a point when growers here were producing high-volume, largely mediocre products and selling them cheap. The U.S. wine industry was totally overshadowed by the European chateaux.

Mondavi decided to step into the sun. He came along and said, "We're going to produce world-class wines," challenging his industry and the marketplace with the crazy idea that he could take a combination of old principles, traditions and techniques, then apply American technology to produce top-quality, world-class wines.

For years, people in the industry thought he was crazy, muttering about "Bob's Follies." But Mondavi stuck to his plan and kept his focus.

Breaking Through

It took years of hard work, but ultimately Mondavi's winery became wildly successful, and he watched as his nay-saying competitors followed suit or fell by the wayside. Today, U.S. wineries produce top-flight, world-class products and have indeed become world-class competitors.

More significant, Mondavi demonstrated to his peers that a re-orientation toward quality and value could open the market to a whole new set of players. Now, just 30 years after my hero blazed his trail, the industry is packed with highly individualized companies, both large and small, producing a variety of amazing products sold at healthy margins and consumed by a public that now expects and demands quality and value.

I dwell on this because we are in much the same position as an industry of watershapers that the wine industry was when Mondavi started shaking off the cobwebs in the '60s.

For the most part, we currently deal in products of reasonable to poor quality being sold in volume and marketed primarily on price. Surely, we too could benefit from expanding on the notion that selling quality and value is a way to elevate pricing and increase margins – and, at the same time, increase customer satisfaction. Surely, a broader focus on custom, quality pools, spas, fountains and assorted other waterfeatures would open up our industry, fire up a whole new class of creative designers and builders and elevate our products and consumer demand for them.

There's another key similarity between Mondavi's story and ours – one that, I believe, shines a light on prevailing attitudes in our marketplace. That parallel is this: Pools and other waterfeatures, like fine wines, are pleasure-oriented products. People want to have a good time with (and around) our products and, in fact, they come to us looking for fun, relaxation and enhanced lifestyles.

Think about it: When customers buy from us, they absolutely aren't looking for a negative experience. They absolutely do not want to be persuaded away from the upbeat feelings that led them to us in the first place. Nor do they come to us because they want to hear a rap sheet on other contractors or learn all about the inner workings of the motors your competitor uses.

The Name Of The Game

Truth be told, I don't think most of our customers want to be involved *at all* with the nuts and bolts of the product, despite the fact they've been conditioned by contractors to feel obliged to ask about them.

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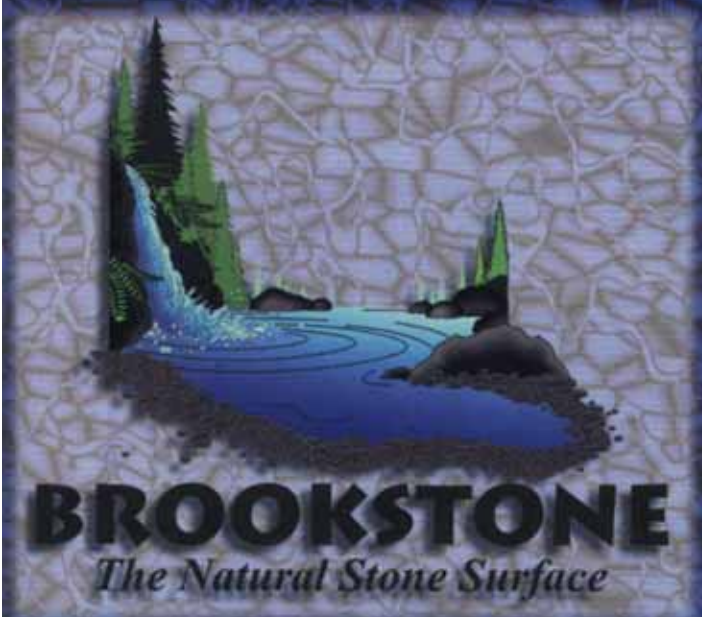

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Rather, they want enjoyment. They want the whole process to be fun and uplifting, from the instant you walk into their home to the time they take their first dip in their new pool or spend their first quiet afternoon at pond's edge, watching minnows ducking under lily pads.

Doctors take a vow: "First, do no harm." As a designer and builder, I have my own version of that oath: "First, do not foul up a good mood," to which I add, "Second, work to *enhance* that good mood." To put this into practice, I need to have a positive outlook about myself, my business and the products I sell.

We need to be confident and proud of our work, excited to help customers realize their dreams. We need to make a commitment to do the right thing, to follow through on promises, to be credible, honest and open. We need to break down the barriers of design, habit and practice to show that we're flexible and not locked into doing things in just one "cookie cutter" way.

Just as Mondavi took farming techniques and distilling processes from Europe and made them work in America, we can take things such as Roman fountains, vanishing edges (which we've borrowed from the French) and Japanese gardens and introduce those value-added design concepts into our customers' personal visions. We also should incorporate a broader range of high-end materials for decking, interior finishes, tile, lighting and landscaping – all with the idea of expanding on customers' positive impulses and enhancing their good moods.

In short, we have to work on letting our customers have a pleasurable experience. Building a pool should be an adventure, not a form of paranoid drudgery. But this principle is foreign to a lot of people I know, this idea that you can build a pool or waterfeature and that everyone can end up actually *enjoying* the process.

If my experience in applying this principle is any indication, there's real power at work when product and contractor exceed expectations, giving customers more than they thought they were going to get and, as important, making it happen in a way that's both upbeat and enjoyable.

Up From The Dumps

Applying this pleasure principle to pools, spas and waterfeatures in a Mondavian sort of way also has the genuine benefit of separating the contractor from the negative perception many consumers cling to. We see manifestations of this negativity in price-driven marketing, in competitive bad-mouthing and in a volume-over-quality attitude toward design and engineering. In other words, we all too often live down to negative expectations.

And yes, this negative perception is all around us, just as it was when Mondavi began his crusade to get the wine-drinking public to think about California as more than a place where jug wines were made. We have to accept the fact that

the public has been programmed by one too many hole-in-the-ground horror stories; although they are perhaps out-dated and unfair, those stories still shape our public image and our own self-esteem (or lack thereof).

Recognizing that the challenge exists, we need to move on. You need to uproot all the negativity and supplant it with the positive. In fact, you can use those negative stereotypes to your advantage by blowing them away in the customer's eyes. When you do, then the customer becomes your ambassador and will start selling your products for you.

You'll look better in the customer's eyes, and that will reflect positively and directly on our products and who we are as professional water-shapers. Just like Mondavi, who became an ambassador for the U.S. wine industry, each one of us can become an ambassador for our own businesses and for our industry.

"Ambassador of all things positive." That has a great ring to it.

Robert Mondavi's Seeds of Success

❑ **Confidence:** First and foremost, you must have confidence and faith in yourself.

❑ **Passion:** Interest is not enough. You must be passionate about what you do if you want to succeed and have a happy life. Find a job you love and you'll never have to work another day in your life.

❑ **Commitment:** Be completely honest and open, making only promises and commitments you know you can keep. A broken promise can damage your credibility and reputation beyond repair.

❑ **Positivity:** One of the most interesting things I've found in reviewing my life is the way the nay-sayers were always telling me that I could not accomplish what I set out to do. Whenever they said, "You can't," my answer always was, "Oh yes, I can!"

❑ **Understanding:** You must understand that you cannot change people. You might be able to influence them a little, but you can't change anyone but yourself. Accept that people are the way they are.

❑ **Flexibility:** In both life and work, stay flexible. Dictatorship and rigidity rarely work; freedom and elasticity do.

❑ **Generosity:** Learn to initiate giving. What you give will enrich your life and come back to you many times over.

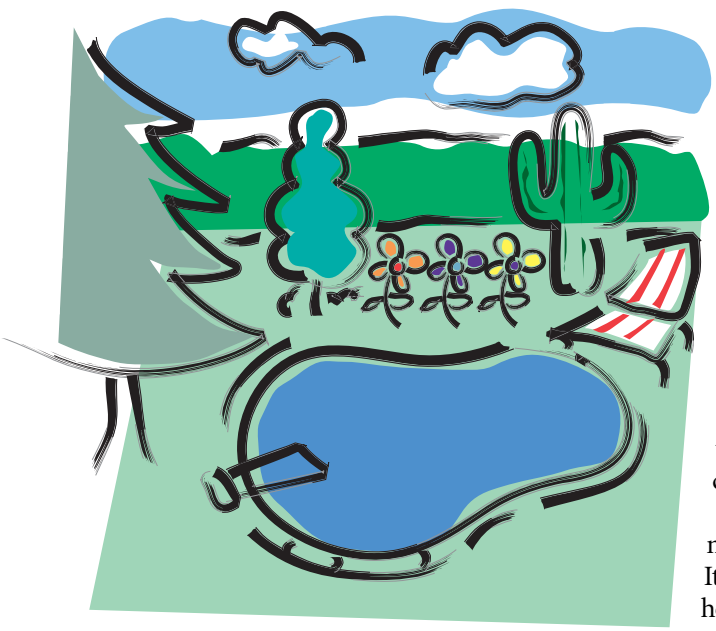
❑ **Harmony:** Live and work in harmony with others. Don't be judgmental; instead, cultivate tolerance, empathy and compassion. As I've learned, if you want to teach someone to fly, you don't start by clipping his or her wings.

❑ **Inspiration:** Out of the rigidities and mistakes of my past, I've learned one final lesson, and I'd like to see it engraved on the desk of every business leader, teacher and parent in America: The greatest leaders don't rule. They inspire!

Source: Robert Mondavi, Harvests of Joy.

Bridging the Gaps

By Stephanie Rose



Take a quick look at the area surrounding almost any pool, spa or waterfeature and you're sure to see living proof that plants and man-made bodies of water go hand in hand. No matter what form the greenery takes – grass, hedges, trees, shrubs, flowers, even cacti – the fact is that plant life is seen virtually everywhere decorative or recreational water is found.

For all of this close physical proximity, however, landscape designers and the installers of pools, spas, fountains and other watershapes have generally tended to operate in completely separate worlds.

As a landscape designer who finds some of my most challenging and exciting projects in conjunction with custom pools and spas, I'm one who firmly believes that there needs to be far more interaction between these two companion trades. There's a lot to be gained in both directions – and defining those benefits and some of the practicalities involved is what this column is all about.

Why You Need To Know

As the installer of pools, spas, fountains, waterfalls and the like, you may feel that planting decisions are best left to a landscape architect or designer – and nearly all of these professionals would clearly second that motion.

That's a good thing in many (if not most) cases. It has long been my belief, however, that basic knowledge about planting and the range of considerations that go with it can help improve a hardscape installer's results, just as my working knowledge of swimming pools and waterfeatures has helped mine.

(From here on, I'll use the term "watershaper" in referring to those who design and install water-containing projects, which I'll generally call "watershapes." It'll make my editor happy; it will also save me having to use lots of words I think this new term encompasses quite well.)

Understanding the aesthetic and technical issues of landscaping sets a watershaper in a unique position within the industry and in the client's eyes. Attention to planting increases your value to your clients both as consultant and designer by helping you avoid mistakes in the field (thereby saving time and money). Even more important, this knowledge positions you to work effectively with and build goodwill between trades that can really help each other produce outstanding results for customers.

This approach, I believe, leads not only to more referrals but, ultimately, to better designs and installations.

That's why I signed on to write this column. I see "Natural Companions" as a way to define basic planting considerations and offer suggestions that will help watershapers design and build projects that work together with landscapes, accommodate basic landscape requirements and generally take into account landscape features the customer wants.

My desire in all of this is a simple one: I want everyone who reads this magazine to start thinking about landscaping – *really* thinking about landscaping – from the very first stages of any given project.

Here's an example: I've seen situations where customers know they want a particular sort of planting in their yard, but they don't tell the watershaper about it "because that's a landscaper's job." Likewise, the watershaper lets it slide because he or she isn't accustomed to giving landscaping more than superficial thought in the design phase. But if the desired planting is large – a mature weeping willow, say – and the space allotted in the design is small, the hardscape may not physically or visually accommodate the presence of the tree.

Trying to shoehorn a big tree into inadequate space can lead to a variety of problems, ranging from too many leaves on and in the water for the circulation system to handle, to structural damage resulting from the tree's root system. Whatever the resulting difficulties, they could've easily been avoided had the designer asked the owner about plantings up front.

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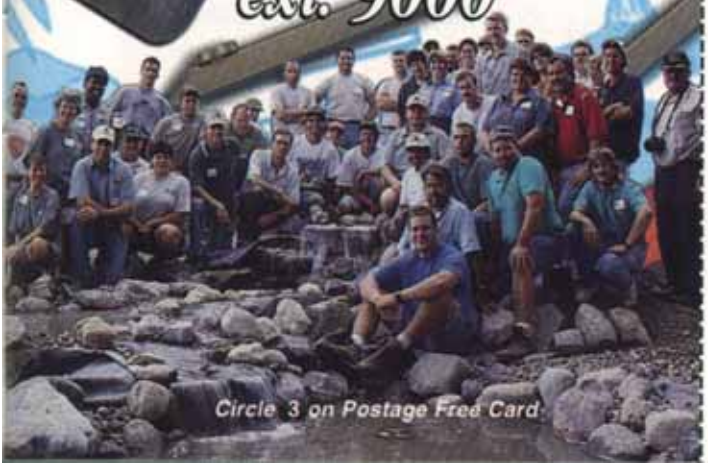

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From The Start

As a landscape designer, I constantly come across backyards in which the watershapes are complete – and it is only now that homeowners start to talk about what kind of plants they want around their pool, spa or pond.

Perhaps the installer thought to plumb some irrigation lines, but that's about it. And sometimes that *is* enough, and the landscaping can be fit into and around the existing installation and everything will work out well enough. Other times, however, there are legitimate planting issues that should've been considered but were not.

This is when trouble starts: Homeowners get angry and go after the watershaper, asking why plantings weren't taken into consideration. At that point, the lamest possible excuse is that "nobody ever mentioned it" during the planning phase or, nearly as bad, that "the architect never told me."

My point is, nobody comes out ahead when things get missed. And I've found that, where the customer is concerned, pleading ignorance doesn't really cut it as an excuse. Odds are, no one gets referrals from customers who find themselves in the middle of frustrating rounds of finger pointing – or digging out thousands of dollars' worth of dead plants from their backyard.

And if I may be allowed a second basic point, it doesn't take much to add a few questions to the design/planning stage to avoid this kind of trouble completely. Ask these questions, and your customers will be happy, the project will benefit from fuller integration of landscape and watershape – and everyone walks away a winner.

There are several factors to consider, but the checklist I propose below is a good start. When planning a project, make sure you know:

- ❑ the style and types of desired plants
- ❑ the size of the desired plants (mature or young?)
- ❑ the irrigation needs in all planting zones
- ❑ the drainage requirements for the plants
- ❑ the planting function (shade, ground cover, wind protection?)
- ❑ the basic climate requirements for the planting
- ❑ the toxicity of the plants and the effect of that factor on your design
- ❑ the water's depth (for a pond or other "living" system).

Another important thing to do at this stage is check local building codes: In some cases, these may lead a fountain or pond to be considered by inspectors as being the same as a swimming pool, in which case you'll run into all sorts of rules defining setbacks and decking or safety requirements.

There are other points to be covered, of course, depending on the individual requirements of the customer, the site and the overall budget. But if you keep this basic checklist in mind, you're giving yourself and your customer an opportunity to integrate landscape and watershape in a practical and even creative way.

Running With A Trend

An awareness of how this process of integration works is truly an advantage in today's marketplace. Where once there were pools, there are now designs and installations that weave together several waterfeatures and landscape elements – and you gain immeasurably by working *with* this trend rather than against it.

Ponds, for instance, are gaining in popularity. If your customer wants one – and wants it set up in such a way that a defined "edge" is obliterated by mature plants for a truly "natural" look – what would you do? Although you may not ultimately be responsible for putting in the plantings, knowing something about their characteristics may help you in designing the pond itself.

For one thing, most ponds require as much direct sunlight as possible. This may influence where you place the pond in the yard. For another, many water plants will die if the water dips below a certain temperature.

gest installing a heater and incorporating it into your bid and plans.

Or maybe your customers want lilies, the most popular of all water plants. You should know going in that lilies prefer still water and require direct sunlight – factors that influence placement and push you toward a design that keeps the water quiet. This bit of information enables you to point out that vigorously moving water isn't a lily's best friend and maybe they'll opt for a waterfall and forget about the lilies – or vice versa.

Either way, you've brought these issues to their attention long before you have lilies dying in a shaded pond with lots of active waterfeatures.

Consider again that weeping willow, or some other large plant. In this case, you need to leave room for large planting containers. If there's only room for a one-gallon plant or smaller and the soil is shallow, this conflicts with the needs of the large plants; besides, there are few one-gallon plants destined to attain "large plant status." By the same token, if only ground cover will be planted, six inches of soil is probably sufficient over a space of almost any size.

Another key benefit to developing this basic understanding of plantings is knowing with some certainty where your expertise ends and the landscape specialist's begins. Knowing when to defer is a sign of a true professional.

Remember, we're dealing with nature here, and nature doesn't obey principles of hydraulics, structural engineering or electricity. Plants tend instead to have minds of their own and can't always be shaped the way other materials can. One plant that grows well in one spot may grow differently in other spots in the same yard, and it takes years of experience to be able to "predict" their behavior and know their idiosyncrasies. This is where the expertise of a landscape architect or designer comes into play.

Point Of Departure

As I mentioned above, I want to use this column to help bridge gaps between the watershaping and landscaping trades. As a landscape designer, I want to share the tools of my trade and help people who work primarily in steel and concrete to understand planting plans and be of more service to clients as a result.

This is a two-way street (or garden path, if you prefer): I'll offer what I know in every issue of *WaterShapes*, and I want your feedback, comments and questions in return. I'd love to talk to you about existing projects and discuss what was done right as well as what could have been done better. Once we all open these pathways of communication, I believe we'll soon find that we truly are natural companions!

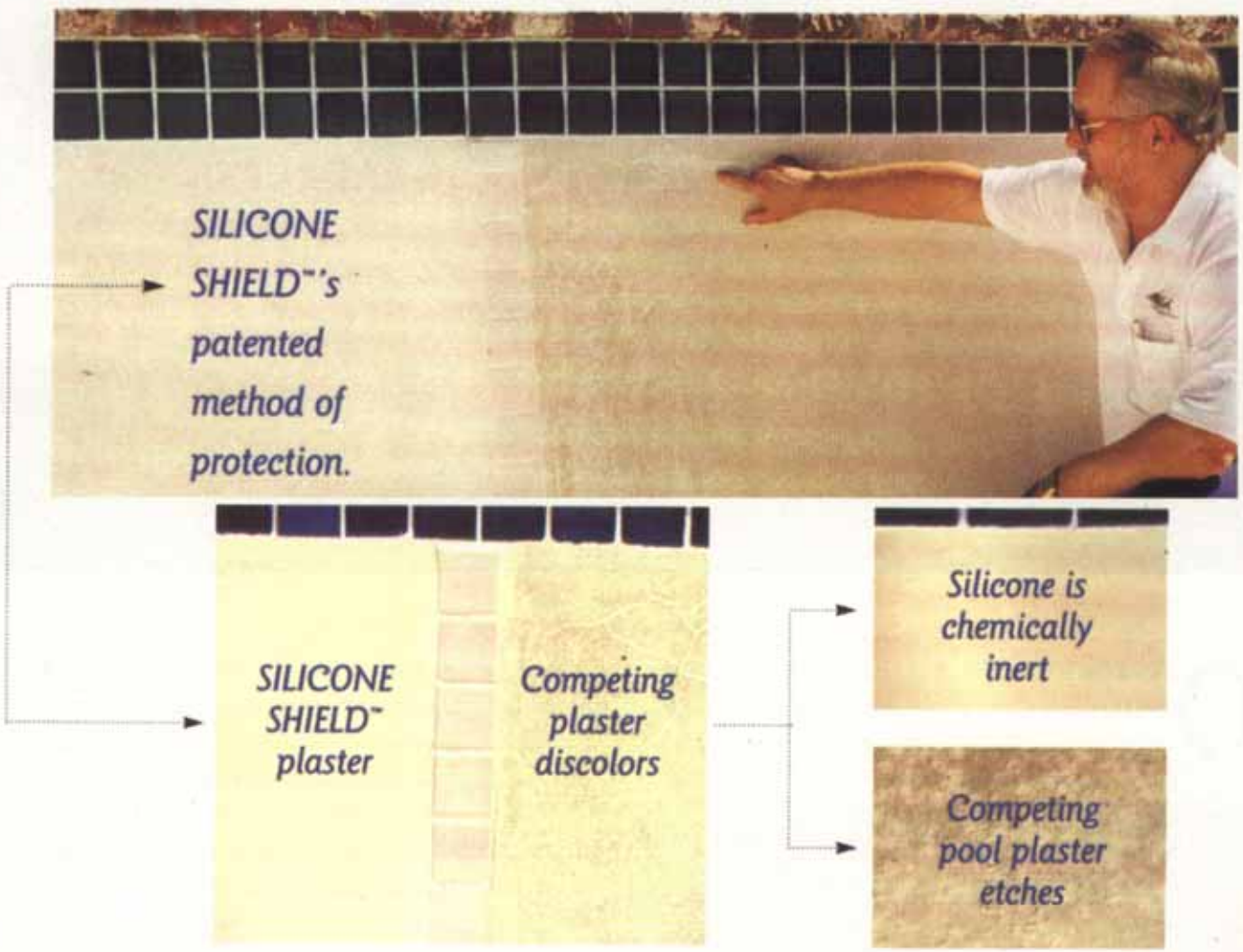
Please feel free to address your comments and questions to me via the internet at *sroseld@aol.com*. I look forward to hearing from you soon!

& Custom Manufacturing

People who install pools professionally will tell you the secret to a great-looking, long-lasting swimming pool lies in the quality of the plaster finish. Brilliant white, silky smooth pool plaster is absolutely beautiful when it is new. However, over the years, your beautiful pool plaster will etch and corrode, **unless it's protected with SILICONE SHIELD™.**

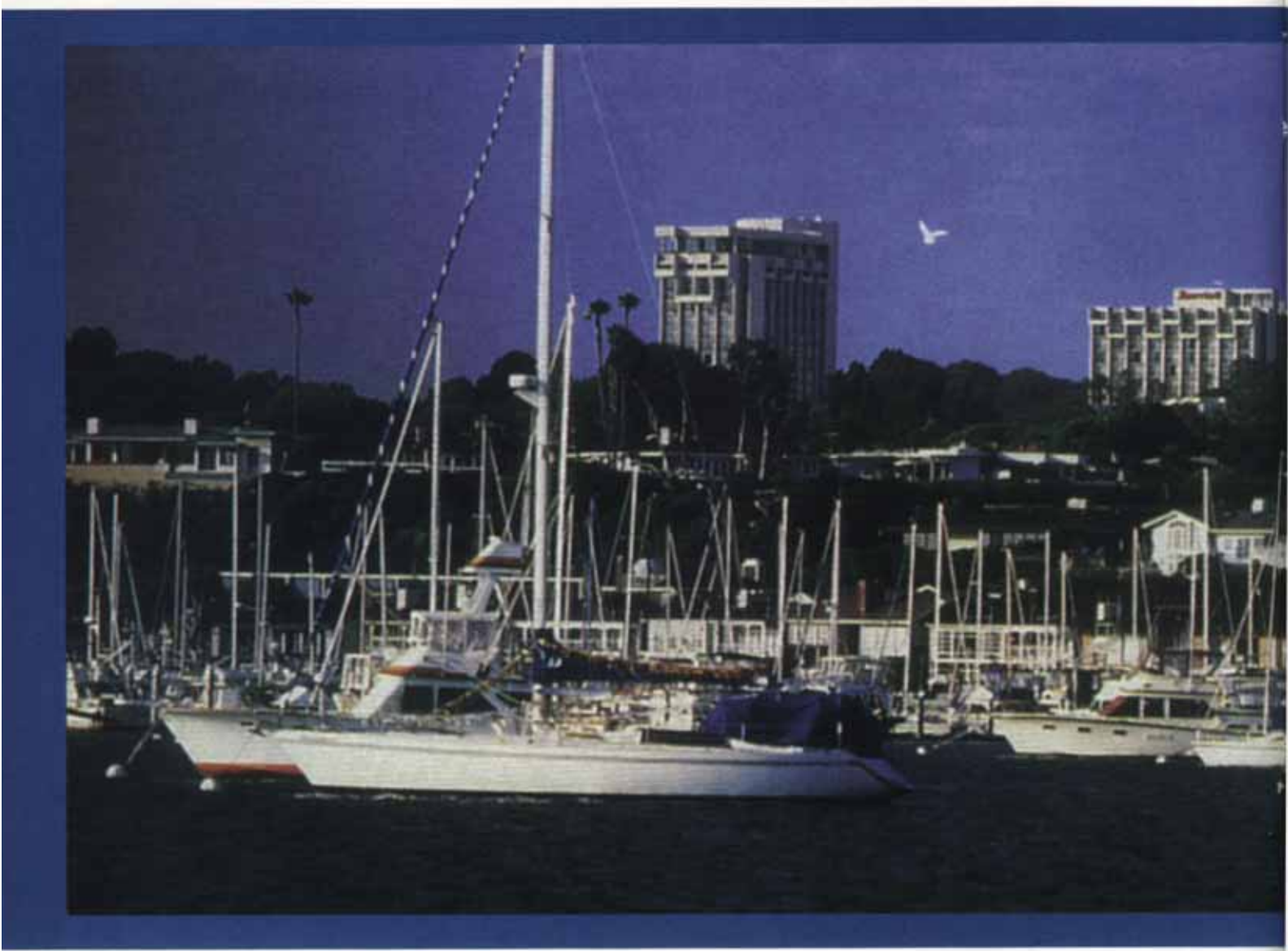
SILICONE SHIELD™ is the most effective system you can buy to protect your valuable investment. In recent years, the study of cement-based pool plaster materials has yielded some significant improvements – none more significant that than the SILICONE SHIELD™ plaster additive. The SILICONE SHIELD™ modified plaster mix is a patented formula that is outperforming all other pool finishes. On the market for 10 years, today SILICONE SHIELD™ plaster is the recognized leader in swimming pool finishes.

How Silicone Shield Works



CRS Systems also offer a complete line of swimming pool plaster finishes including: ***Coulor Shield*** pigment packs which are premeasured water solouble plastic bags filled with 100% inorganic, non-fading, quick dispersion pigments that come in nine beautiful colors. ***Mother of Pearl*** premixed pebble finishes do away with the need for jobsite formulating and come in five striking natural stone finishes. And new for 1999, ***Maui Gem*** admixes six unique pool plaster mix designs combining 3M colorquartz, color pigments, and the ***Silicone Shield Protection System*** that is added to your Type I White Portland Cement and marble aggregate mix, cutting your material and freight costs. All of these materials are stocked nationwide and sample boards are available upon request.

Plasterers head to Newport Beach



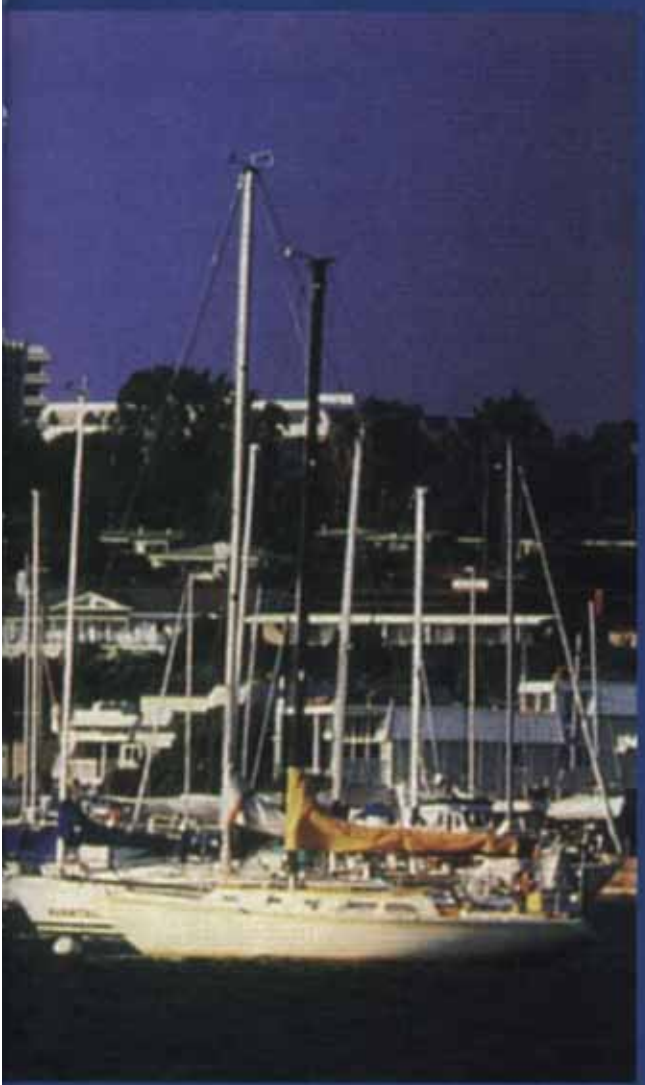
One of the pearl cities of the Pacific Coast will play host to the 10th annual Plasterers Conference – the only event on the annual calendar aimed exclusively at the pool plasterer and those interested in this classic pool finish.

This exciting and productive three-day event has been set for February 18-20 at the Marriott Hotel in Newport Beach, Calif. The program features some brand-new wrinkles while retaining the flavor and most popular features from previous years.

On Thursday, February 18, the conference opens after a morning golf tournament with a panel discussion on the service industry. Next comes the opening night party, complete with live entertainment sponsored by Mason Mart.

The conference program resumes Friday morning with a breakfast sponsored by Aquavations, research presentations, a panel discussion on white cement and a hands-on plaster-finishing workshop. (It's suggested that you bring old clothes and a towel if you plan on participating in this event.) The day's work wraps up with a Vendor Display Reception – big-

National Plasterers Council



THURSDAY, FEBRUARY 18

2:30 pm	Registration
3:00 pm	Welcome & Opening Session: Service Industry Panel Discussion
5:30 pm	Opening Night Party (entertainment sponsored by Mason Mart)

FRIDAY, FEBRUARY 19

8:00 am	Product Demonstration Breakfast (hosted by Aquavations)
9:30 am	Registration
10:00 am	Research Presentations
11:00 am	Panel Discussion: Why We Love White Cement
12:15 pm	Luncheon/Council Business
2:00 pm	Hands-On Workshop: Plaster Finishes
5:30 pm	Vendor Reception & Displays

SATURDAY, FEBRUARY 20

8:00 am	Product Demonstration Breakfast (hosted by Mason Mart)
9:30 am	Registration/Information
10:00 am	Workshop: Tile
Noon	Luncheon & Benefit Auction
2:00 pm	Builder Panel Discussion
4:00 pm	Conference Wrap-Up

ger and better than ever.

Conferees will gather once again on Saturday morning for breakfast sponsored by Mason Mart, a workshop on tile, then a Luncheon and Benefit Auction and a builder panel discussion.

The attendance fee of $180 for members of the National Plasterers Council and $280 for non-members includes admittance to all conference sessions, conference materials, refreshment breaks, two breakfasts, two luncheons and two hosted receptions. The fees are per person; if you wish to bring a guest to the luncheons, additional tickets are available for $25 per person for the Friday event, $20 per person for the Saturday event.

Registration forms and information on accommodations are available directly from the National Plasterers Council, 30575 Trabuco Canyon Road, Suite 104, Trabuco Canyon, CA 92678 – (949) 459-8053.

Integrity Below Grade

When he was brought in to replace a pool that had failed because of improper construction for the existing soil conditions, David Tisherman knew he'd have to dig deep to come up with a solution – literally. The resulting structural design defines an approach to building in which at least as much thought and care goes into what's installed beneath a pool or spa as into how the project ultimately will look to the client.

By David Tisherman

Some projects are doomed from the start, and it was pretty obvious when I first laid eyes on what was left of the existing pool that this was one of those cases: Light-duty construction coupled with a complete lack of consideration of existing soil conditions had resulted in a nightmare for the homeowner – and costly litigation for the contractor.

But with every failure comes a chance to succeed, and that's what we're working toward in this project, which is about 50% complete as this chapter of the story is being written.

Our goal: taking an utter catastrophe and transforming it to a world-class, elegant backyard environment, a process that so far has involved arbitration, negotiation, demolition and application of sound engineering principles to ensure that what goes on in the soil around them will no longer affect the pool, spa, fountain, barbecue and decks we're installing.

AN INSIDE VIEW

The original pool had suffered much during its wretched six-year history. The problems had started with a hinge effect at the location of a small waterfall near the transition from the shallow to deep end. Once that weakness was exposed, the subsurface shifting ultimately shattered the entire structure. As Figure 1 shows, by now the shell was shot through with cracks a quarter- to a half-inch wide.

There were two main problems with the soil: an uplift problem created by its expansiveness along with a creep factor. The whole site was set on compacted fill, which is where the lift originated, while the creep was due to the area's dominant alluvial conditions.

The soils and geology reports clarified the extent of these unfavorable conditions, but after demolition even a quick glance at the soil surrounding the pool made the situation obvious: You could see three dramatic transitions in the type of soil, and the pathways by which the ground was moving were right there in plain sight. In brief, there was no integrity to the ground at all. There was no load-bearing capability, and it was little wonder that the original pool had failed as badly as it did.

The new pool and waterfeatures had to be designed to accommodate these hostile conditions. We knew that, no matter what we did, the material directly beneath and around the pool would continue to move. As a result, we knew we'd have to build a foundation that reached to an acceptable load-bearing material.

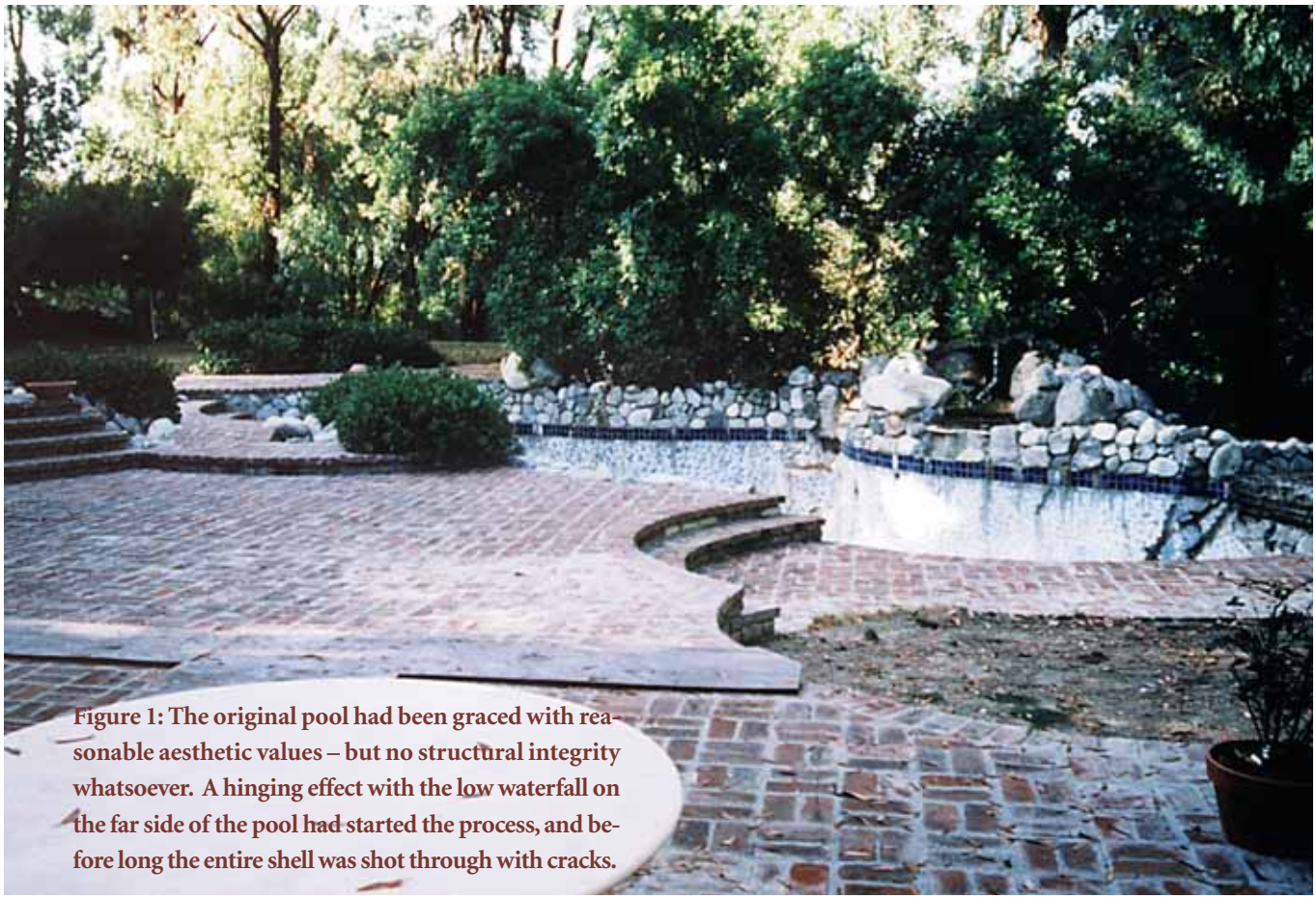


Figure 1: The original pool had been graced with reasonable aesthetic values – but no structural integrity whatsoever. A hinging effect with the low waterfall on the far side of the pool had started the process, and before long the entire shell was shot through with cracks.

As it turns out, about 20% of the new pool overlapped the old pool's location. Using soil excavated for the new pool, we filled and compacted about 40% of the void where the old pool had been. The city requires 90% compaction and further requires that a geologist be on site to verify that the soil has been properly placed and compacted in two-foot lifts.

As this work progressed, we began excavating holes and trenches for a huge system of friction piles and grade beams that would serve as a support for the swimming pool and spa and the reservoir for the vanishing edge.

This is where we get into some very fundamental elements of structural design on a grander (and much more secure) scale: All piles had to be anchored to a depth of eight feet or better in competent, load-bearing material. In geologists' terms, this doesn't necessarily mean bedrock, but rather material that will adequately and permanently support the

Dealing with Disaster

The original pool was only about six years old and had been the subject of litigation for a while by the time I saw it.

Its owner had become a regular visitor to an extensive remodel we were doing in his neighborhood, curious about everything we were doing. He watched the way we graded the lot, saw the amount and type of steel we were using, observed the way we laid out the deck. From the start, it was obvious that our design involved a far different type of construction than had been used in his backyard the first time around.

One day, he asked me to come over for a look at his pool, which he'd told me had cracked. What an understatement that turned out to be. As Figure 1 in the accompanying text shows, it was a horrendous mess.

The problem, obviously, was improper construction for the existing soil conditions, but I told him that I'd need the soils reports and any original plans for the pool to render a more informed opinion. Except for a set of rough plans, however, neither the owner nor, presumably, the contractor had anything of the kind. At that point, I was retained as his expert in the litigation.

There was no real question about liability. In fact, the only question was how much the contractor would have to pony up for the pool's replacement. His attorneys came in with an extremely low number; our side came back with a price based on the way I'd rebuild the backyard, a much higher number.

To make a long story short, the attorneys reached a settlement figure well in excess of $300,000. That's a significant amount of money, but it's all been going back into transforming the homeowner's nightmare into a much more pleasant reality.

– D.T.

Figure2: We were fortunate that this site offered good access for construction equipment. The drilling rig made reasonably short work of holes for the piles, which reached down more than 40 feet into suitable bearing material.

weight of the pool. At the surface, the piles must be tied together by grade beams that run in at least two different directions.

HIGHER STANDARDS

I don't believe in fooling around when it comes to the structural integrity of my projects – and that's never truer than when I know I'm dealing with bad soil conditions.

What we're using for this project is very similar to the type of construction you see underneath elevated portions of freeways. When you look at those big pillars – the ones that look like toilet paper rolls – that's essentially what we've set up beneath the pool. The horizontal members connecting the pillars and supporting the freeway deck are the grade beams; pushing the analogy along, the cars are

Coming to Terms

Once the owner settled with the original contractor, he decided he really did want a pool – and that he really wanted me to do the job.

The site problems were clearly major, we had no new design and there were dozens of variables involved. Before I'd commit, I let the homeowner know that we needed to make several key decisions together and zero in much more closely on the actual scope of the reinstallation. Most important of all, I let him know that I had to be the one to design the pool.

So we talked about positioning, adjusting the grade, dealing with architectural and homeowners' committees and the need for extensive soils-and-geology testing and subsequent structural engineering. We also needed to design the backyard, so we discussed water effects and finish materials and how we could work them into an overall program that would visually tie what we were doing into his aesthetic sense and the overall impression given by his home. We talked about the auditory factors, too, and how all of this should be worked into one integrated design.

We planned and revised, finally landing on a design and a set of materials to be used. When all was said and done, the owner commissioned an elegant environment that included a raised spa, a vanishing edge with a waterfall feature, a fountain, new decks, a barbecue area and a totally redesigned landscape. Perhaps most im-

driving in the bottom of the pool. You add walls and water and you've got a swimming pool – or a flooded freeway.

So we had these big concrete toilet-paper rolls going down into the ground, all the way into the load-bearing material. On this job, we had to dig through about 35 feet of fill below grade, which meant that the piles we built were generally about 43 feet tall. We drilled the holes with an auger on a track-mounted drilling machine (Figure 2).

Using an auger, piles can be drilled to a diameter of 24 to 36 inches. The specific diameter of a pile is based on several factors: the type of soil, its coefficient of friction and load-bearing value, the size and grade of steel to be used, the concrete mixture, the physical location of the pool

portant of all, he wanted all of the various elements to be built to last this time around.

Now we needed to discuss money. I let him know that I had no way of knowing exactly what it would cost and I still don't know, several months into the project: There are just too many variables. So what I laid out for him was an arrangement that calls for a tremendous amount of trust between contractor and client – one in which the job itself determines the price.

I can do this because I've spent a career building a reputation for reliability and integrity. And it's a legitimate approach, too, when you consider that nature works over thousands of miles: A matter of a few feet isn't anything to the hillside you're building on, but if the ground conditions require you to build a pile that runs ten feet deeper than you thought, who pays for it? Taken the other way, if we're planning for piles that are 27 feet deep and they come up at 20, who gets the savings?

The fairest way in a large job, especially when you're dealing with difficult soil conditions, is to bill everything as time and materials. In this case, the owner accepted and we went forward. It's important to note that this works only if both the contractor and homeowner have complete trust in each other and a great deal of personal integrity!

– D.T.

Figure 3: Setting up 40-foot-plus piles on site and in the holes would have been difficult, to say the least. We were relieved to be able to prefabricate the cages and simply guide them into the holes with the help of a crane we brought on site.

Figure 4: We use lots of steel throughout our projects to ensure structural integrity, and that includes all the work of properly setting up the grade beams and securing them adequately to the piles below.

Defining the Space

Beyond the structural distinctions between the new pool and the old one, the most important difference between the original and its replacement has to do with positioning – in my book, a decision of great significance.

In fact, I consider the relationship of a pool and waterfeatures to a backyard and the site's overall environment to be of paramount importance. This is a set of decisions that has a profound influence on the way the entire installation will be integrated with the lot, the home and, indeed, the lives of the residents.

Too often, designers and builders put the pool right up against the house so that when someone walks out back, all they see is swimming pool – and that's not necessarily the right approach, no matter what conventional thinking about convenient access might tell us.

The idea with an "elegant" installation is to make it as beautiful as you can – and to make it flow as part of the environment. A pool is certainly a defining feature of that environment, but often it is only one among many and exists in a visual context. Not to get overly philosophical, but it's my belief that when you walk out of the home, you shouldn't feel you're in the presence of a swimming pool so much as you should feel that you've entered a beautiful environment that includes a swimming pool.

That was our goal here. And when we pushed the pool back and away from the house and shifted it several feet toward the far side of the property, it opened the setting to all sorts of potentials that had never before been clear.

– D.T.

and, of course, the recommendations of the geologist and soils engineer and local code requirements. As a rule, however, it's generally safe to assume that the shallower the pile, the thicker it should be.

For this project, our long piles had 24-inch diameters. At a depth of 43 feet, that means a lot of concrete – 14 cubic yards for each pile and a total of 112 yards of concrete in the piles alone. And that total doesn't cover the grade beams, which typically require about as much concrete as the piles. In other words, this is literally heavy-duty construction. Most pools in the United States contain, in total, between 30 and 40 yards of concrete. By the time it's finished, this pool easily will have 10 to 15 times that amount.

After we dug all of the holes for our piles, we called in a geologist to verify the depth of each hole and to ascertain that we had indeed hit load-bearing materi-

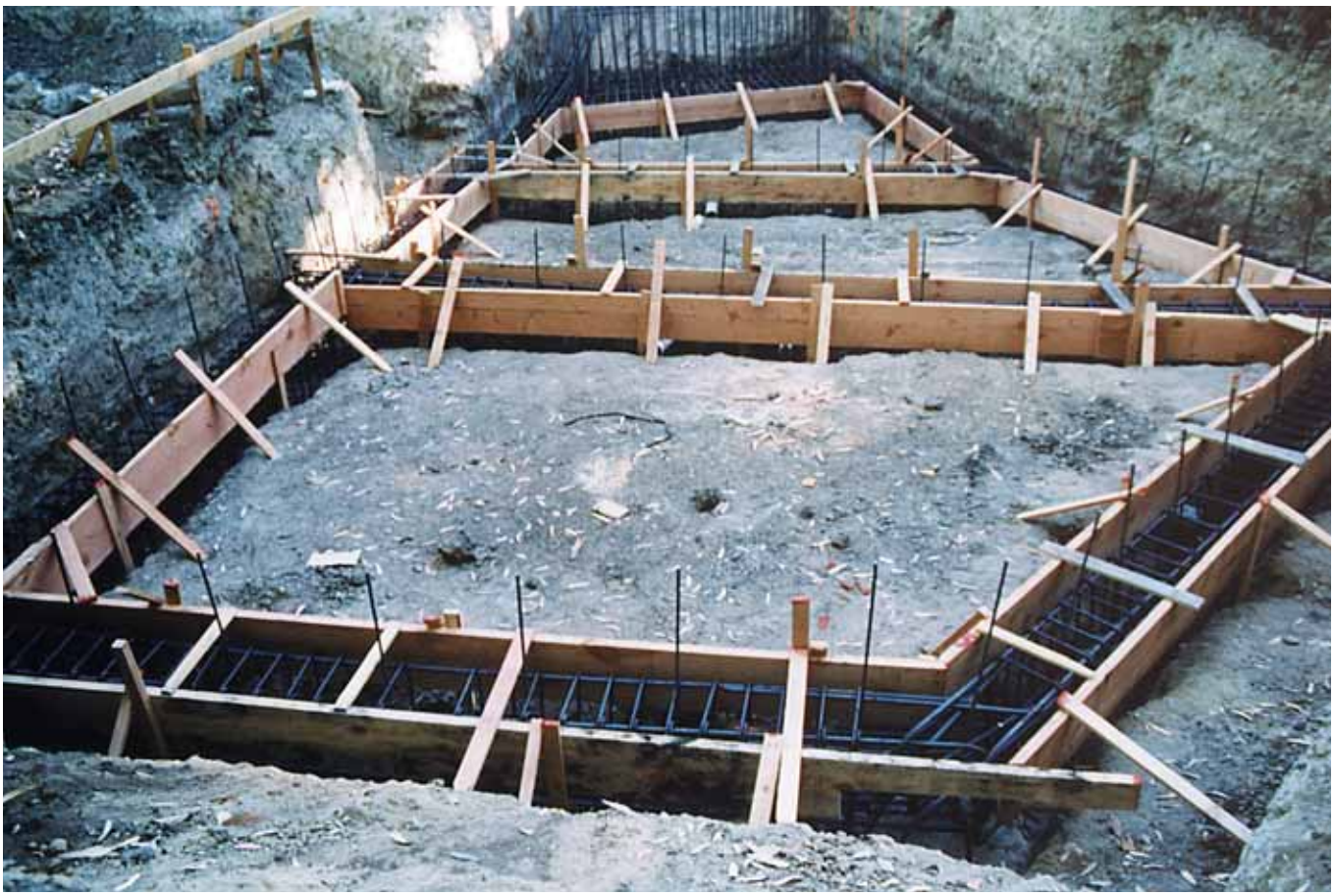


Figure 5: Once the cages are all established and we've made certain we'll be able to tie this massive substructure into the pool, spa and decking that will top it, we set forms and get ready to pour concrete. In all, the substructure for this project cost $45,000 — more than the total cost of the original pool.

al at each location. The geologist left us with a "sign off" letter for the city inspector, who came by shortly thereafter. The inspector confirmed the geologist's findings then ran through a long checklist of other factors before he signed off and we moved on to the next stage of the process.

I see this as an important point: Many builders despise inspectors as the enemy and consider their work as nothing more than red tape that drives up a project's cost. To my way of thinking, however, they're another set of eyes, professionals whose work will help me ensure my own success. For that reason, I want as many inspections as I can get on a job, and I want the toughest inspectors available.

And this is true for every single job I do – doubly so on hillside projects like this one where I know the soil conditions are unfavorable.

Most pools in the United States contain, in total, between 30 and 40 yards of concrete. By the time it's finished, this pool easily will have 10 to 15 times that amount.

STEEL AND CONCRETE

Next, with all the holes dug, it was time to drop in the steel cages.

Sometimes we'll tie the steel for the piles together inside the hole, but that's no fun at all – believe me. If you have access, as we did on this site, it's always better to bring in a crane and drop prefabricated cages into the holes (Figure 3 on page 25). In this case, the cages were made of eight #8 60-grade rebars on the vertical, with #3 ties at ten inches. The ties increased to every five inches at the bottom and top of the pile. The dowels coming up into the grade beam are #6s.

The piles were poured using a minimum 3,000-psi concrete. After a seven-day break, we sent concrete samples to the American Standards Laboratory for compression testing. In this particular case, the readings came up to 3,800 psi. Some may question the need to go the extent (and expense) of this type of testing, but I wouldn't have it any other way: It's no fun at all, and really bad for business, to have to go back and rebuild a pool or pay for someone else to do the work.

We used a backhoe to dig the trenches between the piles to accommodate the grade beams. Large steel was placed and blocked up to the piles in two directions

Continued on page 29

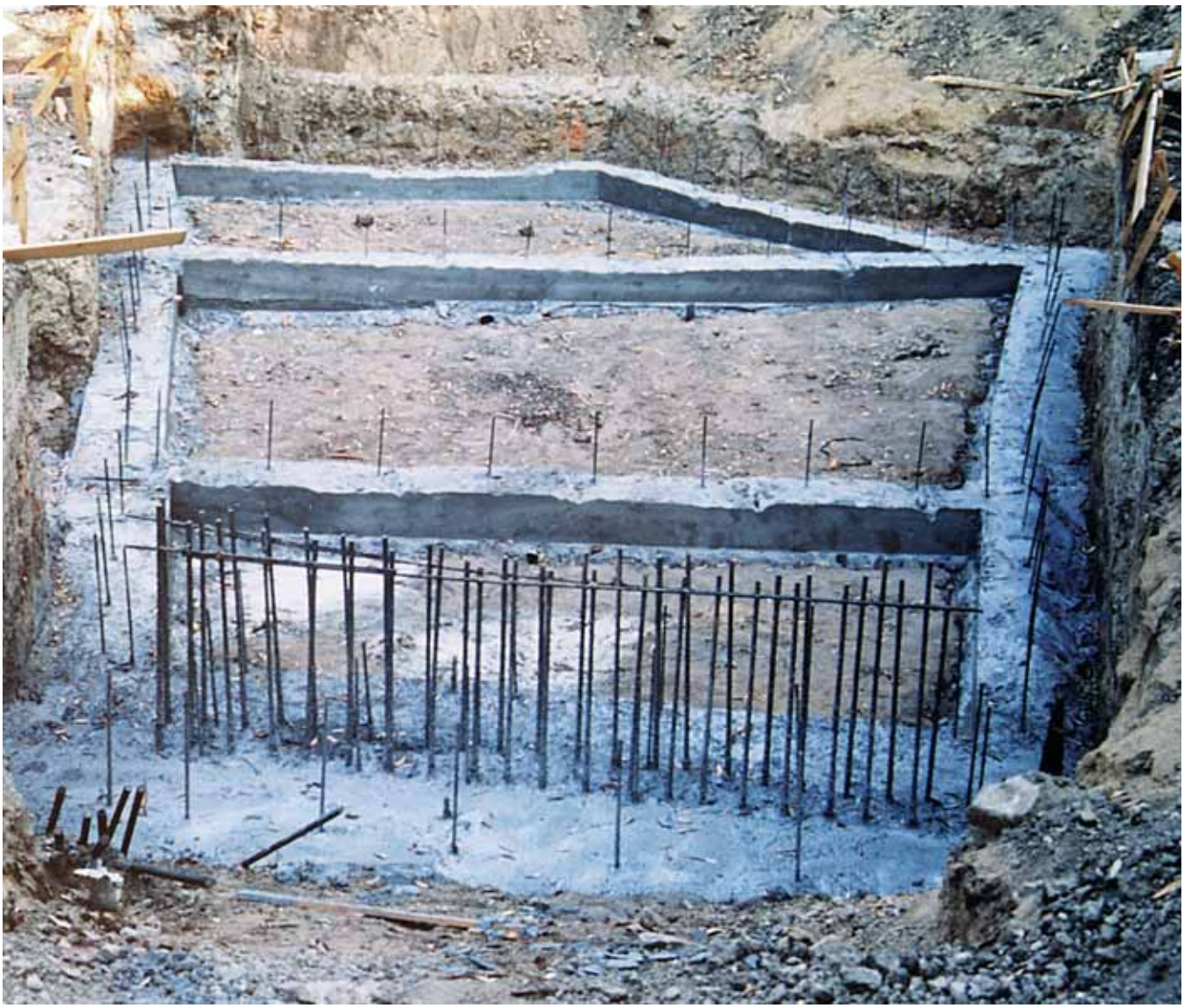


Figure 6: One of the challenges we had in implementing the substructure design involved setting up cantilevered beams to support the spa and the structural deck that is to surround it.

Waiting Out El Niño

We signed papers to tackle this renovation project in the Spring of 1998 and all were anxious to get started. As luck would have it, however, this was the start of a record year for pool construction as well as rain, which resulted in many contractors having to dig their pools more than once.

We took a different tack: To my mind, there are enough problems in construction without having nature come and create more, so we waited for the rains to stop. And waited. And waited.

But we also turned the storms to our advantage, using the opportunity to observe the way water moved across the property and correcting for the fact that the original pool and decks were six inches above grade – a fact that explained why so much of the rainwater headed right for the house.

We spent nearly three weeks and $10,000 just setting the backyard up to handle the rain. We cut channels in the existing decks, set up new drains and made sure all of the water had places to go.

Sure enough, the rains continued with a vengeance, just as they already had done for weeks and months. But the site was now stabilized, and all we had to do was wait out the storms, which finally let us get to work in June.

– D.T

Continued from page 27

to prevent tortion or twisting (Figure 4 on page 26). Wooden forms then were placed at the appropriate grade to hold the concrete as it was poured to make the beams (Figure 5 on page 27).

After the concrete was poured and the beams had set, we removed the wooden forms and brought in dirt to backfill up to the height of the beams. This dirt didn't need to be compacted: It was only a form for the floor of the pool and the gunite shot against it.

In all, this project includes 13 grade beams of various spans and diameters with varying rebar schedules, mostly #6s and #8s. As mentioned above, we built a section of cantilevered beams extending out to support a structural deck surrounding the spa (Figure 6).

WHAT IT TAKES

Obviously, the first thing you need to be sure of in any job is that the structure won't fail, and that was certainly true for this project. No matter the job, however, the soil dictates the type of construction used: Based on my experience, I may decide to increase the amount of steel I use in any given structure – but I'll never decrease it.

Of course, the use of all that rebar requires a lot of work in bending, laying and tying the steel. We use a hydraulic bender on site for everything up to #6s; beyond that, everything needs to be prefabricated.

With everything dug, tied and formed, we pumped 3,000 psi concrete into all of the grade beam forms (Figure 7). In all, this foundation cost $45,000 – which is more than the entire pool cost the first time around. That's a lot of money for steel and concrete, but I sleep easy knowing that if the entire hillside washed away from beneath it, the pool it would still be there, right where I put it.

And because we focused on setting up suitable transitions from this substructure to the pool, spa, decking and fountain (Figure 8), we knew we were ready, once the inspectors had their say, to move on to the next phase of the project.

Next: Completing the hardscape, from forming the shell and pouring the decks to applying an array of finishing touches.

Figure 7: This is probably the last anyone will see of the substructure we've set up to support the new pool, spa and decking. We built it to last – even if the entire hillside decides to wash away in the next round of El Niño storms.

Figure 8: Their underpinnings set and ready to support the load, the pool, spa, fountain and deck are now under construction and will be completed early in 1999. Once landscaping is completed shortly thereafter, the homeowner will be able to enjoy an elegant, fully integrated dreamscape.

Designs on Edge

From standard coping and cantilevered decks to boulders and plants and rock veneers, watershapers are using an ever-broadening palette of edge treatments to accentuate and refine their designs. In this photo-essay, a veteran landscape architect illustrates the boundless possibilities that present themselves when it comes to setting up boundaries at water's edge.

By Peter White

To my way of thinking, one of the most fundamental considerations in any landscape design has to do with understanding how the major elements blend visually with each other and their immediate surroundings. When that design includes water – be it a pond, stream, fountain, pool or spa – the key to effective visual blending depends to an overwhelming degree on how you define the internal boundaries within the design.

This is so because of a couple of crucial visual concepts: First, we all know that bodies of water command our attention – big or small, active or still, when we're near water we *all* take notice. Second, our eyes tend to look for edges. Whether standing on the beach, in a park, on a city street or in a small courtyard, our eyes instinctively look for boundaries where major visual elements come together.

To use the biggest example possible, the horizon is the most arresting visual element when you look at the ocean. Places at which that element is divided or broken, whether by a land mass, clouds or even ships, become powerful points of visual interest. In the context of observing a landscape design, we run through the same mental processes we do with the horizon: We look at the water, the stonework and the plantings and at how they interact.

That's why the construction details often known as "edge treatments" are so important: *They* are our points of transition, the places we find interaction and from which we capture our strongest visual impressions.

Planning Your Lines

These boundaries are so important that the edge treatments you place between the water and its surroundings can either make or break a project.

In a fully naturalistic design, for example, if the observer can identify how the pond or waterfeature was built – especially at the edge – it disrupts his or her enjoyment of the peacefulness of the surroundings. By the same token, in a more architectonic design, natural elements such as boulders or plants can thoroughly disrupt clean lines and compromise the visual effect.

In almost all cases, this play of contrasts between natural and man-made elements at water's edge serves to accentuate certain visual characteristics – for good or ill. The key to success here rests in knowing what you want to achieve and in planning the type and nature of your edge treatments from the very start.

As the accompanying illustrations show, these design decisions tend to have something to do with whether your desire is to conceal the shell of your watershape – or accentuate it and draw attention to it. At that level, these decisions influence not only the aesthetics of the project, but also its engineering.

One more point: As you look over these projects, please keep in mind that although these designs are fairly complex, the elements used are all very simple and can be applied in all sorts of projects ranging from those at the very highest end to much simpler installations where just a small detail or two can really make a difference.

A Thin Lip

For this Japanese strolling garden, the pond's chamfered lip allows sod to grow right up to the water, very nearly concealing the edge.

To achieve this effect, you bring the wall up just an inch or two above the water's surface and then cut it back at a 45-degree down angle with the short side away from the water. (It's the same concept used in vanishing-edge pools.) In this case, the grass growing up on the edge visually blends with the water's surface.

A caution: In this type of treatment, you need to seal the exposed concrete on the chamfer by carrying plaster, pebbles or another surface material over the entire surface of the beveled edge and down the backside. (This is especially important in the northeast and other areas with freeze/thaw conditions.) This is a fairly low-tolerance edge, and you don't want it cracking or to have the plaster spalling off the face of the chamfer!

Super Natural

Here's a case in which we've used the natural features of the site to conceal the edge. Even though the slope pictured here was entirely wooded when we came on site, the topography suggested there was a ledge underneath – and that's just what we found when we took out all the soil and trees.

To hold the water, we pinned and shot a concrete shell right at the bottom of the ledge. After guniting, we blended the concrete with the granite visually by applying a mix of concrete and dyes to mimic the color of the granite, then used trowels to carry some of the ledge's lines just below the water's surface.

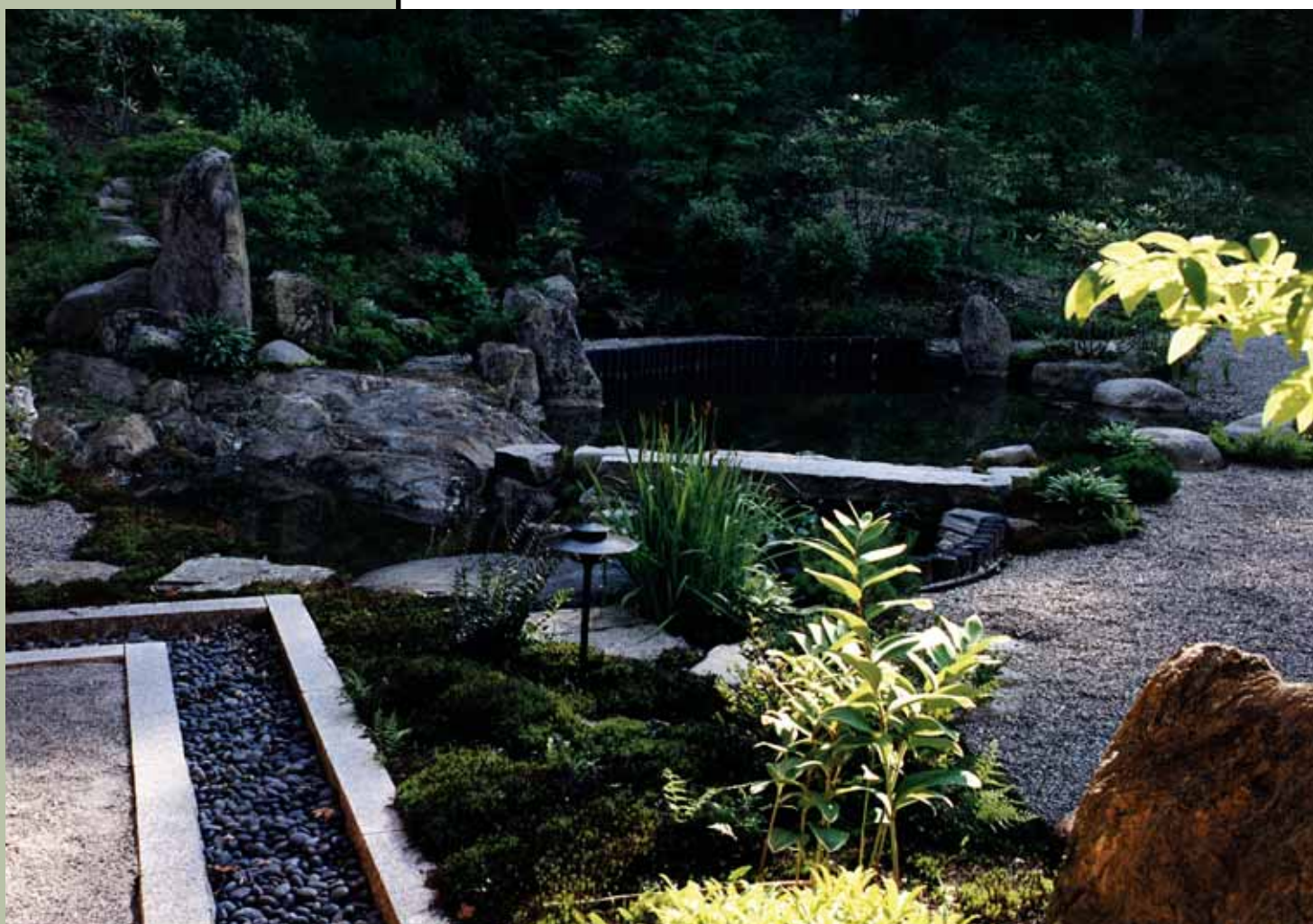
On the opposite edge, beach pebbles follow the soft slope of the concrete shell down into the water. The solid-granite bridge adds to the rough-hewn appearance of the design.

Sharp Contrasts

This is an example in which we used the angles of a house as a point of departure in designing a small pond as part of an unusual courtyard garden.

It's generally tough to design a "natural" pond to sit next to a structure, because the lines of these (usually) free-form watershapes tend to conflict visually with the angularity of a building. We overcame that problem in this case by making the pond an angular extension of the house and eliminating its "natural" edge.

Around the pond, we used the sharp angles of the bluestone decking (set at 45-degree angles to the pond's edge) to provide an extended boundary between the linearity of the pond and the more natural contours of the plantings and lawn. Within the pond itself, we used rocks to blunt the angles and draw more attention to the architectural design of the waterfeature.



A Natural Blend

It's a classic touch in Japanese design: take natural elements and use a detail to show man's influence – or use definite patterns to contrast with the general asymmetry of natural elements.

In this project, we applied that principle by using cedar *ranjui* posts to provide a contrast to the rocks, plants and river stone – an intrusion that shows man's influence without disrupting the overall design. (A caution: Although cedar doesn't easily rot, the posts will need to be replaced every three to five years – a fact that must be considered in installation!)

The channel seen at left is bordered by granite beams. The use of native material is critical in easing transitions between an architectural feature (in this case as in the previous one, the owner's home) and its straight lines and right angles together with the naturalistic pond and its features.

Sculpted Effects

This project combines several natural elements to bridge architectural elements and the lush surroundings. The chamfered pond edge carries the grass right to the water, creating a clean, free-form line. The edge is then softened and disrupted by the stones, which stand outside, near and in the water.

This installation was influenced in part by the sculptures the owner wanted us to include in the design. We found out what they were, considered their proportions and discussed their overall impact on the design. The result is a soothing environment in which the natural elements gently invade the geometry of nearby structures – like the cranes strolling the deck, for example.

A Pathway Glade

The edge treatments here were driven by a set of complex transitions from the architecture of the house and deck to the natural design of the garden and its waterfeatures.

To achieve the desired effects, we blended several approaches (including beach pebbles, natural rock and landscaping) to create natural touches that interact with stone walls, terraces and pathways and create an interplay of architectural geometry and natural textures.

The stone pathway through the garden serves to focus attention: It leads visitors through a small wooded garden to a tablet-shaped terrace where all of the elements – plants, rocks and water – come together and surround them in tranquility.

Expanding the Base

Through the years, we've found that masking or hiding an edge often involves an extra bit of construction: We expand our bond beams two or three feet back from the waterline, thus giving ourselves the flexibility to top the edge with a variety of treatments that include anything from large boulders or small stones to flower beds of grassy areas. This structural approach also lets us integrate the shell with walkways or bridges.

Consider the use of large boulders as an example: If you put a large stone ten feet away from the water, this will dictate the size of the stone you need to complement it in the water. If you don't have the flexibility that comes with a wider bond beam, then you're stuck with smaller-size boulders as your mediating edge treatment.

There are endless ways this can play out, but we prefer working with expanded shells because they let us be more flexible – and creative.

Another example of how the edge treatment influences construction is found in designs where you want to bring grass right to the water's edge. Here, the bond beam should be as narrow as possible while retaining integrity. In still other cases, you may want to show off construction details, which means you may want to raise the bond beam to accommodate stone or tile facings that clearly show man's influence over the environment.

– P.W

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On paper, the design fired everyone's imagination by taking a garden-variety, linear waterfall and enhancing the visual effect with a set of serpentine twists and turns. But making that effect work on site was a different matter – one that called for ingenuity on the part of the construction crew as well as the waterfall system's supplier.

Custom Cor

By Ben Dixon

This waterfall could've been built in either of two ways: A system of internal reservoirs and a long, narrow nozzle could've been formed as part of the structure itself, a task that would've placed huge burdens on the forming crew and the person shooting the gunite; or a manufactured fixture could be used to create the desired effect.

Sensibly, the folks at Tango Pools in Las Vegas chose to pursue the latter option, deciding it would be better to set up the effect before the structure was shot rather than try to engineer the effect and then sculpt the design with gunite. Unfortunately, however, they discovered that no supplier offered an off-the-shelf fixture with the sorts of curves they were after.

We at Florida Falls were among the companies contacted. The builder sent us sketches illustrating a continuous water wall as well as a set of plans for their engineered-on-site option. The design called for a 39-foot span with concave and convex curves and a slow-moving, somewhat coarse wall of water falling more or less straight down from a protruding ledge.

As was the case with other suppliers, our stock items are all linear. But we were intrigued enough by the look of this project that we jumped right in (despite the fact we weren't

Continued on page 40

This graceful waterfall welcomes residents in an upscale Las Vegas condominium complex. The curves were created using standard linear waterfall fixtures manufactured and then modified on site by a crew from Florida Falls of Spring Hill, Fla.

tours

Continued from page 38

quite certain how to pull off the effect) and started improvising with fixtures we had on hand.

Staging the Flow

To get things going, we treated the system as though it were to be an ordinary, linear waterfall – one we knew we'd have to play with on site to make it work the way the designer wanted it to.

To get as close to the contour as possible without trying to bend or modify larger units, we shipped out a dozen 3-foot "base units" we ultimately linked at the nozzle to form a unified flow. These units have their own reservoirs, complete with internal baffles that can handle a large amount of water and disperse it evenly across a straight nozzle. The nozzle can be narrowed or widened to create different sheeting effects. Each unit is fed by a 2-inch riser connected to a 4-inch plumbing line at the base of the structure.

The pump room for the waterfall was

Figure 1 The waterfall's structural steel, plumbing and electrical conduits are being prepared for insertion of the waterfall's twelve 3-foot base units. In the process, we leveled the cage to a tolerance of 1/16th of an inch across the 39-foot span of the fixture.

70 feet away, so we set up the circulation system with a pair of 5-hp pumps feeding separate 4-inch lines. Each line feeds six base units. Two large, grated main drains were to provide the return flow.

Accurate flow calculations are critical for this kind of job and for achieving this sort of effect. We specified the 4-inch pipe to hit a flow rate of about 10 feet per second, which is good for 390 gallons per minute on each line. This all fit nicely with our fixtures: Each base unit puts out about 24 gpm per linear foot at the nozzle. The net result is that this 39-foot feature drops just under 800 gpm into the trough – just what we needed with a 5/8-inch nozzle aperture to create a thick wall of water that would fall nearly straight down.

Because the plans called for the fall to emerge from beneath an outcropping of gunite, we installed the base units in the structural steel along with the rest of the plumbing, electrical and

Figure 2 Once the cage was ready, we inserted the base units and secured them to the cage using small flanges we fabricated and attached on site. We worked with three-foot sections to come as close as we could to the curving contours with the linear units. The first step after insertion involved attaching ABS sheeting to the bottom side of the nozzle.

Figure 3: After we trimmed the sheeting to follow the contour defined by the cage, we set spacers to hold the nozzle at a 5/8-inch aperture and to break the flow of water out of the nozzle at the desired intervals.

Figure 4: The last step in modification involved attaching ABS sheeting to the top of the nozzle and trimming it to the proper contour – thus completing a transformation from the linear originals to this curved wave form. Note that the fixture now will serve as a support and form for the upper portion of the gunite structure.

lighting conduits. This meant we had to hang the base units, connect the plumbing and secure them so they'd stay in position until the structure was shot.

We started by leveling the steel cage using a laser leveling system. Although this wasn't a case where we really needed dead-on tolerances, we leveled the structure to within 1/16th of an inch across the entire 39-foot span (Figure 1 on page 40). Then we inserted the base units and glued small plastic flanges onto the base units, extending both vertically and horizontally, so we could tie off to the steel in both directions.

Fitting In

With the units in place and level, it was time to begin the contouring.

We began by attaching ABS sheets to the bottom of the base units' existing nozzles (Figure 2 on page 41). Once these pieces had been fitted, we measured out two inches from the front of the steel, checking our progress every couple of inches along the face of the structure so the nozzle would follow the curve created by the cage.

Next, we installed spacers every three inches to support the upper sheet of plastic and maintain an even 5/8-inch opening at the nozzle (Figure 3). Now we glued on the top sheet of plastic (Figure 4).

In order to make this water come straight down, we made the upper lip of the nozzle slightly longer than the lower lip to create a small space in front of the nozzle. Because of the flow rate and nozzle width, there's very little forward motion – no more than about an inch beyond the nozzle. (That's not very far and certainly not all the distance of which these nozzles are capable: We've done projects in which the water projects seven or eight feet from these base units!)

We were now ready for the gunite crew, which shot the structure in two stages. In the first phase, they worked up to the underside of the base units and let that set. This structure gave the base units the support they needed to hold up the weight of the big beam that was shot next

Continued on page 44

Continued from page 42

(Figure 5). We protected the nozzle with tape and made certain the subs took care not to disturb our handiwork.

Soon we were able to fire up the system and watch as the waterfall emerged as a perfect, rough-edged sheet from the hidden nozzle.

The remarkable thing about this project was how simple it turned out to be to achieve a nonstandard effect using perfectly standard components. Yes, it took some ingenuity and concentration, but once we actually started working instead of thinking about the difficulties involved, the project went forward smoothly – and, as it turns out, very successfully.

All that remained was the finish work: Marble veneers on the vertical faces, gray pebbles in the trough, fiberoptic spots at one-foot intervals across the bottom ledge and the project was complete – and we had a whole new approach to waterfalls we've translated many times since to other custom contours.

Figure 5

Figure 5: The shell has been shot and the fixtures are now encased in the gunite, ready to produce a glorious visual effect. The structure being framed in the background houses the waterfall's pumps as well as all of the equipment for the swimming pool sheltered by the waterfall.

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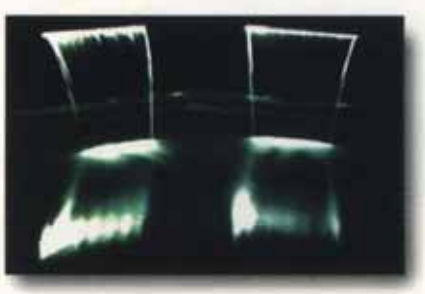

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Expansion Solutions

When the soil expands beneath a concrete swimming-pool deck, the pressure can turn the finest slab work into an unsightly clash of cracked planes and angles. There are ways to overcome this soil expansiveness, says a veteran structural engineer, but it takes knowing what you're up against – and a fair degree of patience.

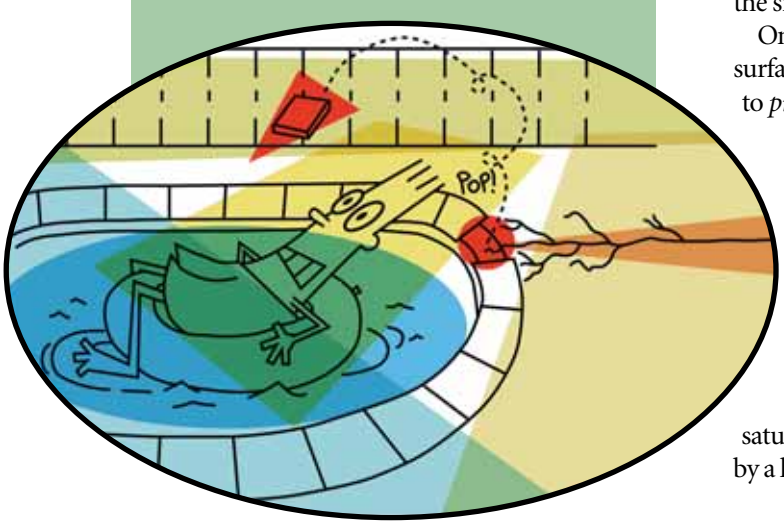
By Ron Lacher

Put yourself in your customer's swim suit for a moment:

You're floating in a lounge chair in your pool, taking in the surroundings and proud of what you and your family now enjoy. As you scan the perimeter of the pool, you spot something you're certain wasn't there the last time you looked. Yes, you're sure of it: A portion of the deck seems to be rising above the backside of the coping.

Instead of continuing to enjoy a lazy afternoon's float, you now start to wonder how long it will be before the coping cracks and the tile will pop off the water line. You paid untold thousands for this slice of backyard beauty, and now the deck is falling apart.

You are not happy.



This sort of experience reflects a fact of nature: When expansive soil absorbs moisture, it expands and ultimately will lift a deck. And despite the fact we're talking about a compromised appearance rather than structural failure, this phenomenon of soil expansion is responsible for more deck repairs and replacements than any other type of problem commonly occurring with slabs set on grade around swimming pools and other waterfeatures.

Happily, there are some simple ways of avoiding (or at least minimizing) this unsightly problem, basic preventive measures that might someday mean the difference between a customer lounging quietly in the sun – or calling you on the phone with an unpleasant edge in his or her voice.

The Saturation Solution

The first step in the process involves knowing what you're getting yourself into as you start a project. Certain regions are notorious for expansive soils and you can almost take adverse conditions for granted, but there are pockets of expansive soil in just about any setting, coast to coast (see the sidebar on p. 48 for some quick identification tips).

Once you've determined that you're standing on a liftable surface, the most important remedial step you can take is to *pre-saturate* the ground.

This step is too often overlooked, basically because it can mean adding days to the schedule, but the principle is very simple: Before you build the deck, you introduce water to the soil and cause it to swell to its full volume. Then you build the deck knowing with a reasonable degree of certainty that the ground won't rise any further, even if more water is introduced to it later on down the line.

Decking contractors often make a mistake here: Presaturation is not just a matter of wetting the ground, not by a long shot. Clay may blow up like a sponge once it ab-

sorbs water, but it tends to do so rather slowly. What this means is that you really have to flood the soil to get the water to penetrate and do its job.

Of course, flooding a construction site is a bother for a variety of reasons. This is why many decking contractors lay down a layer of crushed rock before flooding: This allows them to flood the yard and still walk around without getting mud all over everything. Better yet, once the deck is down and life goes on, the soil may continue to expand a little bit; the crushed rock, with its large voids between individual rocks, will give the soil a place to go. (Sand doesn't offer this advantage!)

In general, a four- to six-inch layer of 3/4-inch crushed rock will get the job done. If this isn't a step you take as a matter of routine, you probably should think about it. The one thing to bear in mind is that you need to drop the grade to accommodate the depth of the rock. After the pool or waterfeature has been gunited, you can put in your crushed rock, form it and flood it.

How long the ground needs to soak before you lay the deck depends on factors such as temperature and humidity. As a rule, you're looking at a week to ten days, but if that's simply too much time, you can speed things up a bit by spreading some inexpensive powdered detergent on top of the rock before you hit it with the water. The detergent will act as a wetting agent and help the water penetrate the soil.

The saturated soil will probably blow up a half to three-quarters of an inch, so you may need to do some final grade work before you lay the slab.

Decking Joinery

No matter whether you're dealing with expansive soils or not, some degree of cracking in concrete flat work is unavoidable as a result of natural shrinkage that occurs as the slab dries over time. Expansion and contraction that come with temperature changes are also factors here.

To limit this sort of cracking and, as important, to control the locations of cracks, decking contractors install joints of two basic types. Although this is standard procedure for *all* deck installations, the use of proper joints is especially critical when building on expansive soil.

❑ **Control Joints.** Also known as contraction or expansion joints, control joints are placed within the slab itself to enable you, as the name implies, to control crack locations. As a slab shrinks, it tends to curl. Control joints open slightly, allowing cracks to appear at predetermined locations instead of randomly over the slab.

The key here is proper layout of the joints. The simplest rule of thumb calls for segmenting the deck in panels of approximately ten feet square, always dividing the deck into as many even squares as possible. Another way to calculate the frequency of control joints is to arrange them at intervals determined by slab thickness. For this method and

The lifting caused by expansive soil manifests itself as a range of problems, from noticeable elevation differences between coping and deck (A) to rapid deterioration of mastic joints (B) or cracking away from control joints (C). In most cases, these problems are preventable with proper site preparation, engineering and installation practices.

The Lowdown on Dirt

The first thing you need to know about expansive soils is that they are exceedingly common. They predominate in places like California, Texas and the upper Midwest, but pockets of the stuff can be found just about anywhere.

Expansive soils come in a broad range of types and compositions; in fact, a truly detailed discussion would fill a whole series of books. To narrow our discussion here to manageable length, let's talk about "clay" – soils that are so sticky that when you walk through the mud, you come out about three inches taller for your trouble.

This stickiness is one obvious signal to the decking crew that expansiveness is an issue. Another indicator is the telltale cracks you see when expansive soil is dry: The clay has absorbed water, expanded, and then lost the moisture – retaining its overall volume but forming voids as the water leaves. (The cracks themselves don't really pose a structural problem for a deck, but you wouldn't want to set a footing of any kind on soil this unstable.)

The difference between clay soil and regular soil boils down to particle size. The particles in clay soils are extremely small, where non-expansive soils tend to have much coarser particles. When thoroughly wetted, clays "blow up" because water actually gets sucked between the soil particles by a capillary action. The water molecules are drawn in and actually push the minute soil particles apart, thereby causing what is often a dramatic expansion.

When this happens under a deck, the expanding soil will lift the slab, usually very slowly, and ultimately cause the sort of eyesore that catches a homeowner's eye. So whenever you spot sticky mud or evaporative cracking, it's time to call for a soils report and to think about taking some basic problem-preventive measures!

– R.L.

other guidance on joint placement in specific applications, see the American Concrete Institute's manual, *Slabs on Grade*.

That manual is helpful in pointing out certain deck configurations that are bound to give you trouble. L-shaped panels, for instance, tend to have exaggerated cracking problems, and extended rectangles can be so crack-prone that it's generally advised that you should never make the long side more than 1.5 times the length of the short side.

As for the joints themselves, there are three common methods for making them:

- *Before the pour*, by placing a thin wooden or plastic form between sections of slab
- *While the slab sets*, by slicing grooves into the slab while it's still wet and soft
- *After drying*, by cutting the slab with a saw blade.

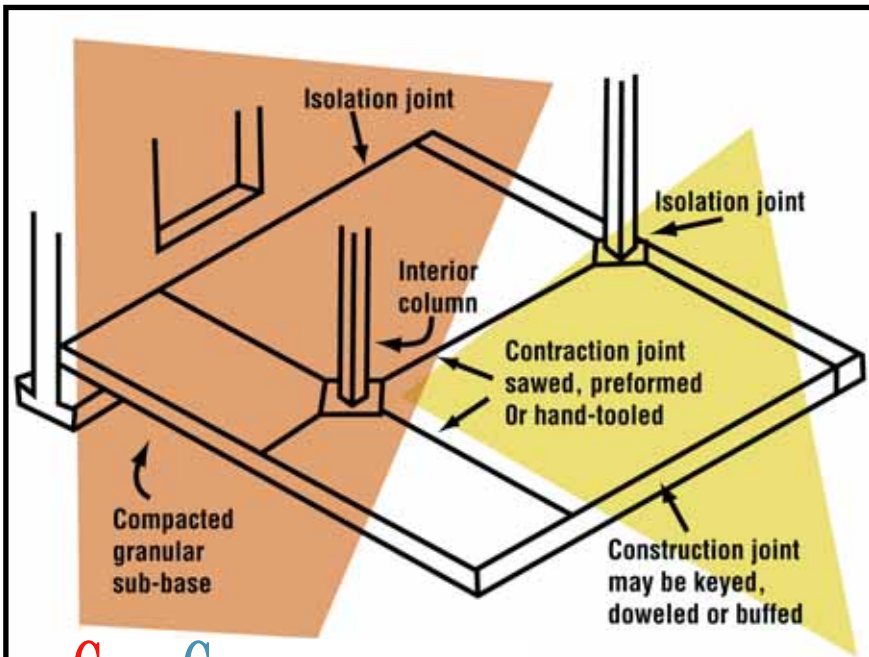
❑ **Isolation Joints.** These joints are used where a slab runs up to walls, columns, equipment pads, drain pipes, sumps and other obstacles and are intended to prevent any load stress from being transferred between the slab and the adjoining structure. (See the sidebar on this page for details on control jointing around columns.)

Around pools, the most common isolation-type joints are the mastic joints found between a deck and the vessel's coping. This is simply a sealed space that allows the bond beam and deck to move independently.

Again, use of isolation joints is common to virtually all deck installations, but it's especially important when building on expansive soil to be certain that you've got a good one, from 1/2- to 3/4-inch wide, extending the full depth of the deck. And you should double check to make certain the void is completely sealed: If you hurry and don't do a good job of sealing – a common misstep – a portion of the joint will allow water to penetrate and your chances of experiencing lift in that area will greatly increase.

Rules of Thumb?

Slab thickness is a complicated issue,



Crafty Control

In pouring decks up to posts, it's important to isolate each of the posts from the surrounding concrete. The drawing here illustrates a simple means of laying out the necessary control joints.

– R.L.

but it's another factor that comes into sharp focus when you're working with expansive soil.

There's a natural tendency to think that building thick decks loaded with steel is the way to prevent lift, but this is a misconception: The thickness of the slab actually relates to how much differential expansive force the deck can take without cracking; it *won't* stop it from lifting.

The only way you can hold a slab down over lifting soil is to set the deck up to have so much weight that it overmatches the expansive force pushing up beneath it. That's not impossible, but it is difficult – and, frankly, economic realities usually get in the way of this kind of heavy-duty construction. In other words, it's generally best to use pre-saturation and proper joints rather than sheer mass to hold the soil down.

So what's the thickness standard? That's a common question to engineers, and the best answer is that there is no set rule. Think about it this way: If you have a 100-foot slab of concrete and the far end lifts, the deck will crack no matter how thick it is. By the same token, if you have a three-foot width and one side lifts, you would only need minimal thickness to prevent cracking (away from the control joints, that is).

Steel won't eliminate cracks, either. Yes, the more steel you have the less likely the slab is to crack, and when the concrete *does* crack, the steel will hold it together better. But again, saying how much steel you'd need to prevent the cracking depends on lots of factors, including the size of the slab and the amount of lift – and once more, there's no set answer.

That said, it's also perfectly true that the decking contractor needs to think about crack prevention and providing a slab with a measure of crack resistance. This typi-

Cantilevered Decks

Cantilevered pool decking can be used to beautiful visual effect – but expansive soils below (not to mention simple temperature-related expansion and contraction) can ruin the impression in rapid order. The key here, beyond the preventive measures described in the accompanying article, is proper leveling of the top of the bond beam and installation of a "bond breaker" or slip joint on the top of the leveled beam before the deck is poured.

Without this joint, the waterline tile may become partially attached to the deck and will crack and/or fall off when the deck moves. Deck movement may also shear off the leveling mortar you place atop the bond beam.

As you install cantilevered decks, also beware a fatal error made all too often: Do *not* extend any reinforcing steel from the bond beam into the deck. There should be no contact whatsoever between these two structures!

– R.L.

cally means laying down a deck three and a half to four inches thick with #3 rebar on 12-inch centers (or #4s at 18 inches) in both directions. Wire fabric (6-by-6 inches or 3-by-9 inches) also does the job.

Keep in mind that the list of preventive measures includes more than thickness and steel, particularly on expansive soils.

❑ Proper drainage is extremely important. Poor drainage results in standing water, which can penetrate into the ground and cause various problems to decking and structures alike. This is a huge topic unto itself and will be covered in future articles; for this discussion, suffice it to say that you have to make certain that rain and irrigation water have a place to go!

❑ Concrete deck footings should be used at slab edges near a descending slope.

❑ Weep screeds should be separated from the top of the deck where it abuts a stucco wall. The weep screed is installed at the base of these walls to give moisture that condenses on the inside of the walls some-

Here's a caution: In some situations, tamping can force decking concrete beneath a mastic joint, thereby negating that joint's benefits. In this case, the lifting of the deck yanked the coping out of its bed; shortly after this photo was taken, some of the coping stones broke free!

---

where to go. All too often, when a slab is poured against a house or other structure adjoining a deck, the contractor inadvertently blocks the weep screed – and that can have grim consequences. (Building codes now specify that any exterior concrete work be two inches under the weep screed.)

❑ Concrete strength of the decking should be about 2,000 psi. Keep in mind that the strength of the concrete depends on the amount of water in the mix: The greater the water content, the weaker the concrete. The general rule is that you want as little water as possible and still properly hydrate the cement. If there's too much water in the deck and it comes to the surface as curing progresses, you'll get surface checking, spalling and a whole array of finish problems.

Prudence And Responsbility

Beyond the aesthetic issues involved in lifting decks, there are obvious issues of liability that enter into this discussion of laying decks that will stand up to expansive soil. Although most code-writing bodies acknowledge that a contractor is not a soils engineer, you are expected to recognize expansive soil conditions and proceed accordingly. In California, for example, the rules require "prudent action" on the part of the contractor.

If you take the necessary preventive steps (pre-saturation, control joints, adequate thickness, sufficient reinforcement) and the deck lifts despite your best efforts, then you will not be held legally responsible. If you don't take these prudent actions, you're likely to find yourself on the losing end of a courtroom battle.

Happily, none of the steps outlined here is either expensive or unusual. The key to minimizing future problems with expansive soil is to be aware and take the necessary preventive steps. There are no guarantees, but these basic measures definitely will stack the deck in your favor!

Movement in the Trenches

Pool-plumbing and drain-line trenches frequently run under concrete pool decking, and there's an unfortunate tendency not to compact the soil adequately *beyond the deck* after those lines are installed.

The resulting voids give surface water a perfect place to accumulate. Once that soil is saturated, the water will follow the piping and move under the deck where it can penetrate expansive soil and, ultimately, lift the deck.

A "cut-off wall" consisting of properly compacted expansive soil should be placed at the point where these trenches extend under decking. This barrier will stop surface water and give another measure of protection to the slab.

Finally, pay careful attention to sealing drain lines extending under a deck: Leaks here can undermine all your best efforts elsewhere!

– R.L.

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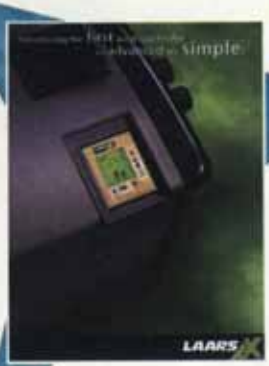

TELEDYNE LAARS/JANDY introduces the *Laars LX*, redesigned to offer complete control over every facet of pool and spa heating. New features include fan-assisted, controlled combustion that virtually eliminates downdraft and corrosion-resistant polymer headers designed for greater flow capacity, resulting in longer heater life. In addition, the new design's 29-in. profile, small footprint and tileless construction make it light and easy to install. It also features quick-connect pipe fittings, a convenient gas valve location and reversible connections you can switch from right to left to suit your particular plumbing configuration. **Teledyne Laars/Jandy Products,** Novato, CA.

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Circle 101 on Reader Service Card

AQUAVAC introduces the *AquaVac TigerShark*, an advanced portable pool cleaner made for those who insist on the very best. *TigerShark* calculates the size of the pool and programs itself into the most time and energy efficient pattern for a spotless pool. Cleaning times are preset at five and ten hours. The cleaner's powerful on-board pump sucks up dirt and debris while roving both the bottom and walls for a pool that sparkles from rim to rim. *TigerShark* features an easy cartridge filter: Simply rinse and clean it with a garden hose. This long-lasting unit features one of the best warranties in its category. **Aqua Vac Systems Inc.**, West Palm Beach, FL.

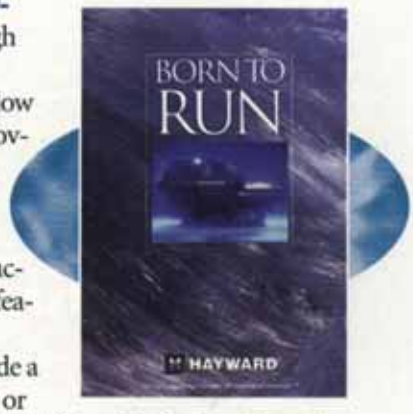
Rugged chlorinator with various capacities

Circle 102 on Reader Service Card

CHLORINATORS INC. offers *Regal* gas chlorinators, safe because their all-vacuum operation eliminates the possibility of a chlorine gas leak throughout the chlorinating system and because the units are direct-mounted with a heavy duty, vise-type yoke. These reliable devices are made of rugged chlorine- and corrosion-resistant materials and have a simple design. *Regal* chlorinators are available in capacity ranges from four to 2,000 pounds per day. **Chlorinators Inc.**, Palm City, FL.

Pump line offers advanced features

Circle 103 on Reader Service Card



HAYWARD POOL PRODUCTS INC.'s *NorthStar* high performance pump series comes complete with full flow ports, *ClearView* strainer cover, CPVC union connections, high-profile base, *QuadLock* for simple access, non-corrosive construction and more. *NorthStar* features a proprietary motor design engineered to provide a minimum of 35,000 hours or 10 years of extended use. In addition, this design allows the motor to run up to 20% cooler and at a low decibel level. Each motor is power coated with *Perma-Coat*, making it resistant to salt air environments. **Hayward Pool Products Inc.**, Elizabeth, NJ.

Of Interest

Waterfall effects in varied configurations

Circle 104 on Reader Service Card

RAYPAK's RP100 digital heater features a digital control unit with liquid crystal display (LCD) for temperature selection and heater settings. The heater's *Capron* resin headers prevent rust stains from harming the pool surface, and its microprocessor controls diagnostic read-outs and continuously monitors operating status. It is completely field servicable , efficient and reliable in wind. **Raypak**, Westlake Village, CA.

Mosaics featured in new catalog

Circle 107 on Reader Service Card

INLAYS' "Create Adventure" catalog details a variety of mosaics, including its *Oceanic Series* and *Oceanic Series Groupings*. Included in the product line are items such as crabs, angelfish, divers, dolphins, seahorses, trigger fish, turtles, sea lions and more. **Inlays Inc.**, Green Bay, WI.

Special spa-lighting system introduced

Circle 105 on Reader Service Card

FIBERSTARS' *FS2 Spa Illuminator* is a compact, quiet light source for use with its fiberoptic lighting systems. The illuminator uses a 75W quartz halogen lamp with a 3,000 degree K color temperature. The *FS2* is UL listed for dry and concealed locations and has a high-output cooling fan for high-heat environments. It is available with a four-color wheel for dramatic color changes in the spa. A 400-fiber capacity port allows for a wide variety of fiber combinations. The unit is designed specifically for use in spas and spa peripherals. It works well with point-to-point lighting applications or for perimeter strip lighting, and it is engineered to be adaptable to virtually all spa pack and cord configurations. The illuminator is available with white light only or with your choice of two color wheels. **Fiberstars**, Fremont, CA.

Durable laser-leveler now offered

Circle 108 on Reader Service Card

LASER ALIGNMENT offers its *LB-10 series Laser Beacon 4900* model, an outdoor-level unit designed to provide years of reliable and accurate leveling performance. Covering a 2,000 ft. diameter with a complete range of construction accessories, the unit is simple to set up and use by any construction crew. The bright, visible beam of the interior version *LB-10* provides levels for all types of indoor and outdoor construction applications. Additional head speeds and scanning features add to the visibility and useful function of the *LB-10*. Also available from the manufacturer are accessories for productivity, including the *Rod Eye-6* and *Rod Eye-4*. **Laser Alignment Inc.**, Grand Rapids, MI.

New catalog highlights pumps and parts

Circle 106 on Reader Service Card

AQUA-FLO's 44-page "1999 Product Catalog" includes its full line of pumps and replacement parts, including: "A" and "AC" series, *Dominator*, *Flo-Master* and *Tub-Master*. Also included in the catalog are replacement motors, fittings and more. **Aqua-Flo**, Chino, CA.

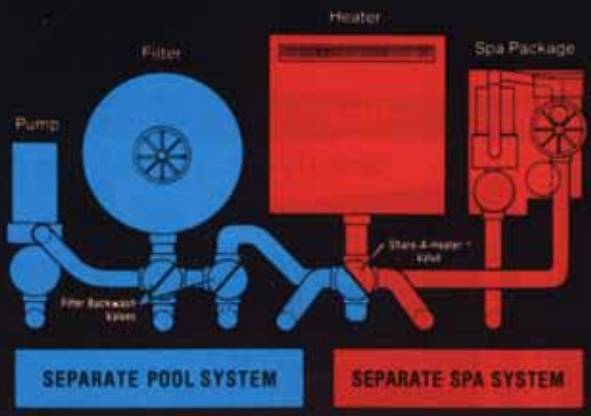
Full-featured concrete pump

Circle 109 on Reader Service Card

MAYCO's *ST-70* mid-range concrete pump is made to place 1-1/2-in. aggregate concrete pump mixes. The unit features hydraulic pressure options, versatility, an easily removed hopper, volume control, reverse pumping, hydraulic surge brakes and more. Available options include an engine cover, a remixer/agitator hopper, air or electric vibrators and high-pressure water. **Mayco**, Carson, CA.

Continued on page 56

Actually, the Share-A-Heater Valve™ doesn't make a revolution —it is one. A very simple 90°, one-quarter turn revolution, either manually or automatically, enables separate Pool and Spa Systems to economically *share* one (1) common Heater System (Fossil Fuel/Solar/Heat Pump) with two (2) totally independent Pump/Filter Recirculation Systems; one for Pool and one for Spa. *Both* Systems can be operated *simultaneously;* while one is heating the other is filtering and vice versa. Simple and Easy.



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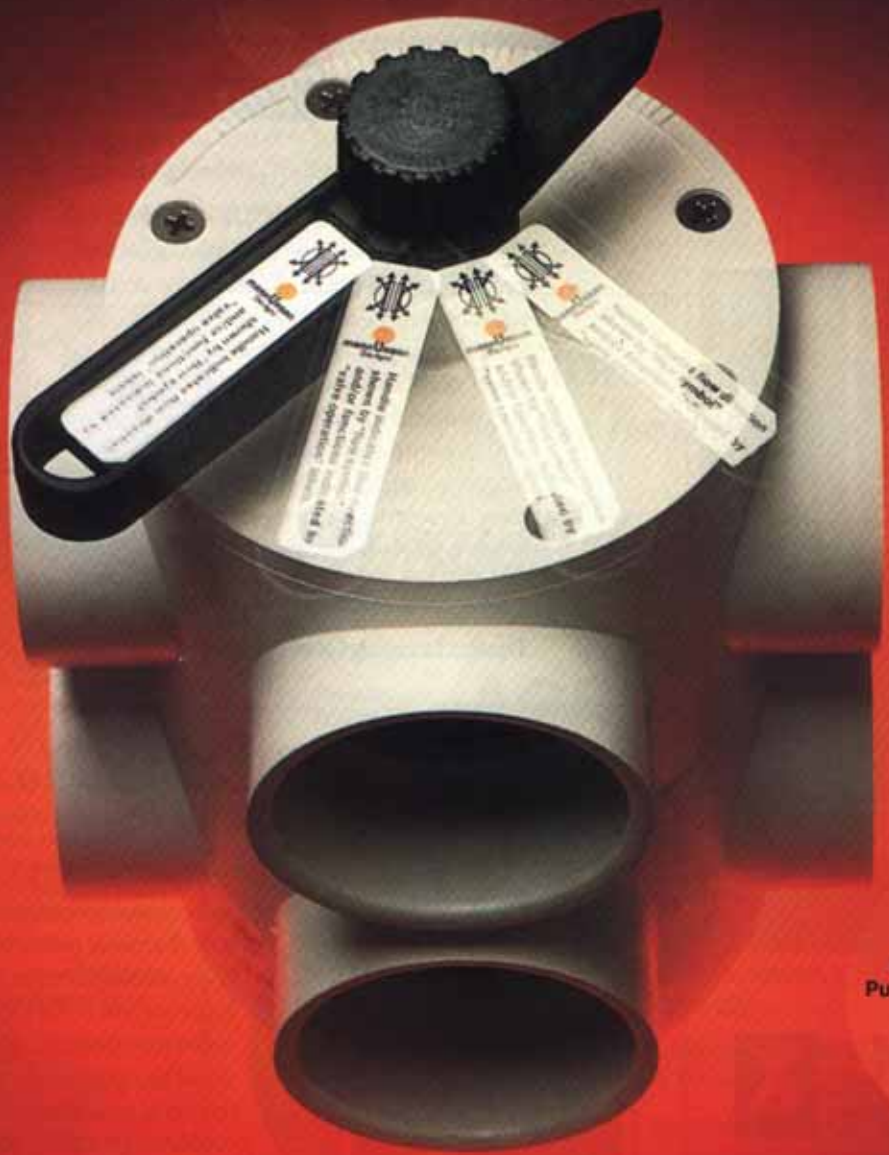

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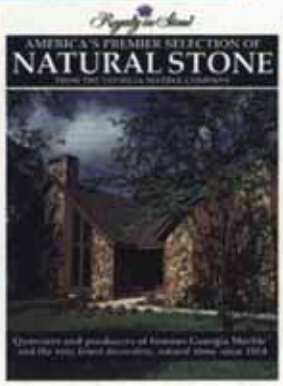
BROCHURE DETAILS NATURAL STONE PRODUCTS

Circle 110 on Reader Service Card



GEORGIA MARBLE CO.'s four-color "Royalty in Stone" leaflet describes its line of natural stone: natural building stone, boulders and marble flagging. Available stone designs include New York White, Tiger Stripe, Wyoming White, Pine Green, Charcoal, River Slicks, Smoky Mountain Flagstone, Rustic Pine Log, Pecan Chunks and more. Also included in the booklet are specifications sheets. **Georgia Marble Co.**, Kennesaw, GA.

SOFTWARE PACKAGES ASSIST DESIGN PROCESS

Circle 111 on Reader Service Card

DESIGN IMAGING GROUP offers four software packages designed to increase sales and profits – and save time. *Splash!* pool-design software is a PC-windows based computer-aided drafting (CAD) software program specifically developed for pool contractors and designed for ease-of-use. *Splash!* will help you quickly design a pool, give you the calculations for an estimate and print out a site plan. *DesignWare* allows pool designers to create a photo-realistic image of the pool design concept, sell higher value projects, and provide full-color pictures that show real color, textures and forms. **Design Imaging Group**, Holtsville, NY.

CONCRETE PUMP FOR PRECISE WORK

Circle 112 on Reader Service Card

SCHWING AMERICA's *BPA 450-10* specialty pump achieves its controlled output through small-diameter pumping cylinders and a 39-in. stroke for maximum 20 yds. per hour output – the ideal combination for refractory material, shotcrete repairs and small line pours that require low output for precision placement. Schwing's *Rock Valve* provides high sealing efficiency while minimizing wear within the housing, benefiting in reliability and low cost per yard for maintenance. **Schwing America Inc.**, St. Paul, MN.

Deck-draining system introduced

Circle 113 on Reader Service Card

GRATE TECHNOLOGIES introduces its *Drain The Deck* system, which consists of two components. The first is an extruded, UV-stabilized PVC trench-drain base. This base unit commences at 4-in. wide to accept the 1-in. deep grate, then shifts to a 2-1/2-in. width and a further 2-1/2 -in. depth. These areas have a rounded bottom for smooth water flow and an overall depth of 3-1/2-in. The system is easy to install and to clean. The second component is a 4 in. wide, 1-in. deep grate and offers interlocking T-bar construction that runs perpendicular to the drain – and with the open space for water flow being 35%, it drains the deck. By using this deck-drain system, you can aesthetically balance the pool and deck drainage grate. Standard colors include beige, white, gray and black. It has slots to enable fastening down by using stainless steel clips and comes in 10-ft. lengths with joiner sections, corners, end and down sections and adapters. **Grate Technologies Inc.**, Naples, FL.

Poster highlights waterfeature systems

Circle 114 on Reader Service Card

NATURESCAPES offers its "Ultimate Environments" pull-out poster leaflet, which highlights its new *Castart* rock and waterfeatures such as *Sandstone* series, featuring planter pockets and versatile layered components – all of which can be installed in less than one day. Also included in the leaflet are its *Classics*, *Custom* and *Fossils* product lines. **Naturescapes**, Tucson, AZ.

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heaters, lights, controls, sanitizer generators, etc.

NEW Four new definitions have been added to Article 680 for 1999. Article 100 of the NEC provides definitions of terms common to all sections of the code, while definitions specific to a particular subject, such as these four, are found in the individual articles.

680-6. Receptacles, Lighting Fixtures, Lighting Outlets, Switching Devices, and Ceiling-Suspended (Paddle) Fans

(a) Receptacles.

(1) A receptacle(s) that provides power for a water-pump motor(s) for, ***or other loads directly related to the circulation and sanitation system,*** a permanently installed pool or fountain, as permitted in Section 680-7, shall be permitted between 5 ft and 10 ft (1.52 m and 3.05 m) from the inside walls of the pool or fountain, and, where so located, shall be single and of the locking and grounding types and shall be protected by a ground-fault circuit interrupter(s).

Other receptacles on the property shall be located at least 10 ft (3.05 m) from the inside walls of a pool or fountain

(2) Where a permanently installed pool is installed at a dwelling unit(s), at least one 125-volt ***15- or 20-ampere*** receptacle ***on a general-purpose branch circuit*** shall be located a minimum of 10 ft (3.05 m) from and not more than 20 ft (6.08 m) from the inside wall of the pool. This receptacle shall be located not more than 6 ft 6 in. (1.98 m) above the floor, platform, or grade level serving the pool.

MODIFIED The additional words in (1) indicate that the receptacles in question are any and all receptacles that may be providing power to pool or spa equipment, not just the receptacles providing power to pumps. Item (2) references a different receptacle – the one that must be in every yard with a permanently installed pool. The added words in (2) nail down the specifics of that receptacle.

(d) Motors in Other than Dwelling Units. Wiring supplying pool pump motors rated 15 and 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

NEW First off, I must point out that this item was poorly written. It should read: *Pump motors connected to 15 or 20 ampere, 120 volt or 240 volt single phase circuits, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.* This applies to all installations at duplexes, apartments and commercial establishments – everywhere other than a single-family residence. The code writers were convinced that this action was warranted because of the generally sub-standard level of electrical maintenance found at many multi-family and commercial pools.

680-12 Disconnecting Means. A disconnecting means shall be ***provided and be*** accessible, located within sight from all pools, spas, and hot tub equipment, and shall be located at least 5 ft (1.52 m) from the inside walls of the pool, spa, or hot tub.

MODIFIED The added words correct an oversight in the 1996 NEC: The disconnect is now mandatory in all installations.

680-20. Underwater lighting fixtures.

(b) Wet niche Fixtures

(1) Forming shells shall be installed for the mounting of all wet-niche underwater fixtures and shall be equipped with provisions for conduit entries. Conduit shall extend from the forming shell to a suitable junctions box or other enclosure located as provided in Section 680-21. Conduit shall be rigid metal, intermediate metal, liquidtight flexible nonmetallic, or rigid nonmetallic. Metal conduit shall be of brass or other approved corrosion-resistant metal. Where a nonmetallic conduit is used, a No. 8 insulated copper conductor shall be installed in this conduit with provisions for terminating in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure ***unless a listed low-voltage lighting system is used, not requiring grounding.*** The termination of the No. 8 conductor in the forming shell shall be covered with, or encapsulated in, a listed potting compound to protect such connection from the possible deteriorating effect of pool water. Metal parts of the fixture and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal

(3) The fixture shall be bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to remove the fixture from the forming shell. ***Bonding is not required for fixtures listed for the application, having no noncurrent-carrying metal parts.***

NEW There are two new items here: the indicated wording in (b)(l) regarding grounding and the wording in (b)(3) regarding bonding both apply to the recently introduced, listed light fixtures that do not have any metallic components.

680-21. Junction Boxes and Enclosures for Transformers or Ground-Fault Circuit Inter-rupters.

(a) Junction Boxes

(1) Listed and labeled for the purpose.

&

(b) Other Enclosures

(1) Listed and labeled for the purpose.

NEW Listed and labeled products meeting this requirement have been available for a long time, and this change makes their use mandatory. The Listed products include the required terminal bars for properly connecting the bonding and grounding wires entering and leaving the boxes and enclosures.

680-22. Bonding.

(a) Bonded Parts

(1) All metallic parts of the pool structure, including the reinforcing metal of the pool shell, coping stones, and deck. The usual steel tie wires shall be considered suitable for bonding the reinforcing steel together, and welding or special clamping shall not be required. These tie wires shall be made tight. ***Where reinforcing steel is effectively insulated by a listed encapsulating nonconductive compound, at the time of manufacture and installation, it shall not be required to be bonded.***

(2) All forming shells and mounting brackets of a no-niche fixture ***unless a listed low-voltage lighting system is used, not requiring bonding.***

(b) Common Bonding Grid. The parts specified in (a) shall be connected to a common bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than No. 8. Connection shall be made by ***exothermic welding or by*** pressure connectors or clamps ***that are labeled as being suitable for the purpose and are*** of the following material: stainless steel, brass, copper, or copper alloy. The common bonding grid shall be permitted to be any of the following:

(4) Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal conduit.

NEW & MODIFIED There are five additions and modifications here: in (a)(1), the use of epoxy-coated rebar is finally recognized. With this addition, the requirement to scrape off the coating at each tie-wire point is gone forever. In (a)(2), the new words acknowledge the existence of listed, transformer-isolated light assemblies now available that do not contain any metallic components to which a bonding connection could be made. In (b), we find two changes: the permission to use exothermic welding for making connections to a common bonding grid and the requirement that clamps and connectors be specifically labeled for the purpose. In (4), we find a totally new item: This wording permits

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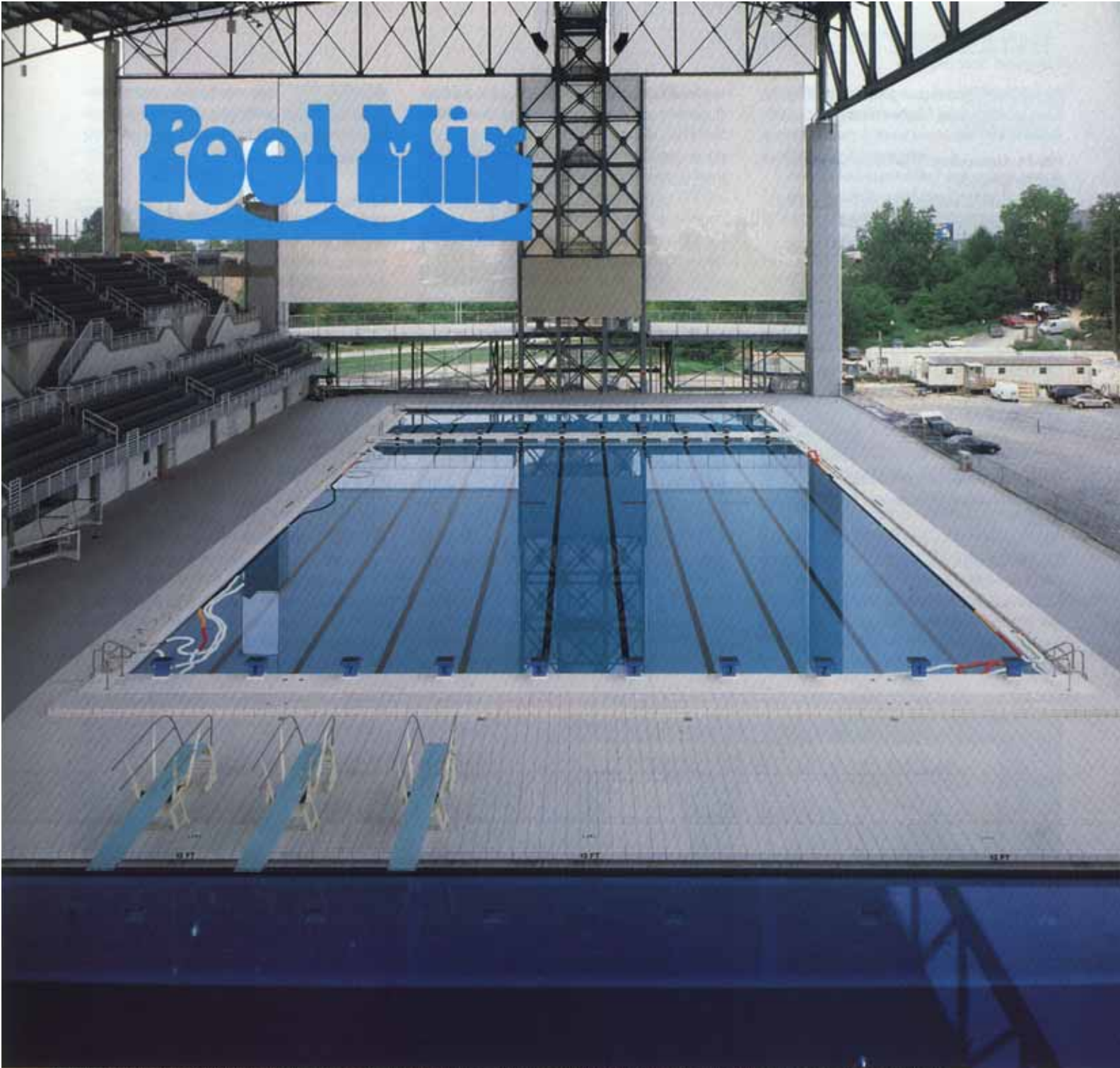
Pool Mix



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the red brass conduit connected to a pool light to be considered as the "common bonding grid."

680-24. Grounding. The following equipment shall be grounded:

(1) Wet-niche and no-niche underwater lighting fixtures, other than those low-voltage systems listed for the application without a grounding conductor.

NEW This item was added to the list of equipment requiring grounding to acknowledge the fact that listed, transformer-isolated light assemblies are now available that do not contain any metallic components to which a grounding connection could be made.

680-25. Methods of Grounding.

(b) Pool Lighting Fixtures and Related Equipment

(2) The equipment grounding conductor shall be an insulated copper conductor and shall be installed with the circuit conductors in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit.

(3) Where installed on buildings, electrical metallic tubing shall be permitted to be used to protect conductors. Where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted to be used to protect conductors.

(FPN) For requirements of electrical nonmetallic tubing, see Article 331

Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight, flexible non-metallic conduit shall be permitted to be used when installed in accordance with Article 351 and does not exceed 6 ft (1.83 m) for any one length or 10 ft (3.05 m) of total length used.

NEW Items (2) & (3) are not new; rather, only minor editorial changes were made for 1999. I include them here to clarify the *Exception*, which is new. The intent of this exception is not only to make the initial installation of a light transformer easier, but also to facilitate the replacement of a defective transformer in the future. The use of short runs of flex conduit eliminates the struggle of trying to get rigid conduit to align with the conduit holes in a new transformer.

A hint: when reading items (2) & (3), it helps to realize there are four types *of conduit* referenced in (2) for general use, one type of *tubing* referenced in (3) that may be used when the installation is *on* a building, and two types of *tubing* referenced in (3) that may be used when the installation is *in* a building.

(d) Panelboards

(2) A panelboard at a separate building shall be permitted to supply swimming pool equipment if the feeder meets the requirements for grounding in Section 250-32. Where installed, an equipment grounding conductor shall be an insulated conductor.

NEW Prior to inclusion of this item, the grounding wire feeding the pool equipment had to start at the electrical service panel at the primary building on the property. This new item (2) permits connecting the pool equipment to a panelboard located in a separate building that may be available closer to the pool, provided that the original ground connection to that panelboard has been installed correctly.

D. Spas and Hot Tubs

680-38. Emergency Switch for Spas and Hot Tubs. A clearly labeled emergency shutoff or control switch for the purpose of stopping the motor(s) that provide power to the recircula-

tion system and jet system shall be installed readily accessible to the users and at least 5 ft (1.52 m) away, adjacent to, and within sight of the spa or hot tub. This requirement shall not apply to single-family dwellings.

NEW I'm sure everyone is aware of the tragic happenings that prompted the creation of this new requirement. In most commercial environments, the whereabouts of the switches for the equipment are not readily apparent to users; this change serves as a remedy. Single-family dwellings are not included because it is assumed that the power switch is never far away and that the user is likely to know how to turn off the equipment. Note that this is for the circulation and jets pumps on spas and hot tubs only; if, however, a spa is operating from the same pump as a pool, this requirement applies to that pump as well.

680-41. Indoor Installations.

(a) Receptacles. At least one ***125-volt, 15- or 20-ampere*** receptacle ***on a general-purpose branch circuit*** shall be located a minimum of 5 ft (1.52 m) from and not more than 10 ft (3.05 m) from the inside wall of the spa or hot tub.

(1) Receptacles on the property shall be located at least 5 ft (1.52 m) measured ***horizontally*** from the inside walls of the spa or hot tub.

MODIFIED In (a), this is the same modification, for the same reason, as was made to 680-6(a)(2). In (1), the addition of the word *horizontally* clarifies the requirement. Without it, a receptacle mounted in a wall immediately adjacent to a spa and 5 feet *above* the water would be permitted – and dangerous.

680-42. Protection. The outlet(s) that supplies:

(a) a self-contained spa or hot tub, or

(b) a packaged spa or hot tub equipment assembly, or

(c) a field assembled spa or hot tub with a heater load of 50 amperes or less,

shall be protected by a ground-fault circuit-interrupter.

A listed self-contained unit or listed packaged equipment assembly marked to indicate that integral ground-fault circuit-interrupter protection is provided for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall not require that the outlet supply be protected by a ground-fault circuit interrupter.

A field assembled spa or hot tub rated greater than 250 volts or rated 3 phase shall not require the supply to be protected by a ground-fault circuit interrupter.

A combination pool/hot tub or spa assembly commonly bonded need not be protected by a ground-fault circuit interrupter.

(FPN): See Section 680-4 for definitions of self-contained spa or hot tub and for packaged spa or hot tub equipment assembly.

MODIFIED When this item was written into Article 680 in the 1996 NEC, it neglected to reference field-assembled spas. Item (c) corrects that oversight, but it also recognizes that some field-assembled spas – large commercial systems, for instance – might use 3-phase pumps and large electric heaters for which Class A GFCIs are not available.

SPECIAL NOTE Due to an administrative glitch, the first printing of the 1999 NEC *does not include* the changes shown above. The National Fire Protection Association, which publishes the NEC, will be acknowledging this by publishing an errata document in the near future. I recommend that you go with the changes as shown here. I will report anything different in future issues of *WaterShapes*.

E. Fountains

680-57. Signs.

(a) General. Includes only fixed, stationary electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention.

(b) Ground-Fault Circuit-Interrupter Protection for Personnel. All circuits supplying the sign shall have ground-fault circuit-interrupter protection for personnel.

(c) Location. Any sign installed inside a fountain shall be at least 5 ft (1.52 m) inside the fountain measured from the outside edges of the fountain.

(d) Disconnect. Shall comply with Section 600-6.

(e) Bonding. Shall comply with Section 600-7.

(f) Grounding. Any equipment associated with the sign shall be grounded as per Article 250.

NEW Article 600 covers signs in general, while this new article is specific to signs installed inside of fountains and is intended to meet the increasing demand for advertising signs built into fountains.

680-62. Therapeutic Tubs (Hydrotherapeutic Tanks)

(a) Protection. The outlet(s) that supplies the following shall be protected by a ground-fault circuit interrupter:

(1) A self-contained therapeutic tub or hydrotherapeutic tank, or

(2) A packaged therapeutic tub or hydrotherapeutic tank, or

(3) A field-assembled therapeutic tub or hydrotherapeutic tank with a heater load of 50 amperes or less

A listed self-contained unit or listed packaged equipment assembly marked to indicate that integral ground-fault circuit-interrupter protection is provided for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall not require that the outlet supply be protected by a ground-fault circuit interrupter.

A field-assembled therapeutic tub or hydrotherapeutic tank rated greater than 250 volts or rated 3 phase shall not require the supply to be protected by a ground-fault circuit interrupter.

NEW This section is intended to align the GFCI protection requirements for therapeutic tubs with the similar requirements for spas and hot tubs, per 680-42.

G. HydroMassage Bathtubs

680-72. Accessibility. Hydromasssage bathtub electrical equipment shall be accessible without damaging the building structure or building finish.

NEW 680-72 is intended to prevent tub installers, carpenters, plumbers, masons and tile setters from forgetting that an inspector will insist on being able to inspect the equipment and that, someday, the equipment might need servicing.

680-73. Bonding. All metal piping systems, metal parts of electrical equipment, and pump motors associated with the hydromassage tub shall be bonded together using a copper bonding jumper, insulated, covered, or bare, not smaller than No. 8 solid.

Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded.

NEW 680-73 provides the same bonding criteria for tubs as is found in pools and spas.

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539	STA-10-402	Sta-Rite	2 HP Max-E- Glas Pump High SF	1	1		367.27	367.27
558	STA-05-228	Sta-Rite	System 3 Repl. Module, 259 Sq Ft	1	1		175.83	175.83
572	LAR-15-319	Teledyne Laars	400 K BTU Propane Heater, Electronic	1	1		1194.15	1194.15
592	RAI-45-915	Rainbow	In-Line Chlorinator #320C, Amber	1	1		42.41	42.41
221	004-009-3221	Paramount	Pool Valet Body, White	1	12		13.95	167.4
230	004-009-2183	Paramount	Pool Valet Nozzle 2 Hole, White	1	12		24.95	299.4
242	001-009-2079	Paramount	Pool Valet Retainer Ring, White	1	12		1.7	20.4
257	006-009-3145	Paramount	2 1/2" P.V. Insider Stub-Up	1	1		58.8	58.8
260	006-009-3500	Paramount	Leaf Canister with Beige Deck Lid	1	1		169	169
286	004-009-2215	Paramount	Water Valve, 6+1, Standard Module	1	1		194	194
312	02-2201-1	Kafko	Curved Plain Panel 9R--6'	1	4	352	398	1592
313	02-2201-2	Kafko	Curved Inlet Panel 9R--6'	1	1	88	398	398
318	02-2511-3	Kafko	Skimmer Panel 9TSK--5' 5"	1	1	81	349	349

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Inside the NEC

By Jim McNicol

The triennial publication of the *National Electrical Code* is an event of critical importance to any contractor or subcontractor performing electrical installations or repairs. First published in 1897 and produced since 1911 by the National Fire Protection Association, the NEC is now enforced in all 50 states and also serves as the basis for codes in several foreign nations.

As has been the case with all editions published to date, the 1999 edition of the code is designed to ensure "the practical safeguarding of persons and property from the hazards arising from the use of electricity." Keeping up with changes in both thinking and technology, the latest version of the code carries several new items as well as modifications of interest and substance.

After an introduction, the first four chapters cover the general requirements for wiring, materials and equipment. Chapters 5 to 7 then cover special occupancies, equipment and conditions, while Chapter 8 covers communication systems and Chapter 9 contains tables. Swimming pools, spas and related items are considered as Special Equipment and are covered in Chapter 6 as "Article 680: Swimming Pools, Fountains and Similar Installations."

Covering this information makes for a long first column on "Things Electric," but I can think of no more valuable place to start, given the influence the NEC has on the way pools, spas and other water-features are installed.

To clarify what's happening with the 1999 NEC, I have included the text of each of the new paragraphs of Article 680 as well as the most significant modifications to existing paragraphs, with changes noted as ***bold-faced italics***. In each case, I have inserted a box with my comments and observations. Please note: This is *not* a complete copy of Article 680, nor are my comments intended to substitute for your own thorough examination and evaluation of the full document. Note also that throughout Article 680 are references to other sections of the NEC; in other words, the document is truly meaningful *only* when viewed in its entirety.

In future columns, I plan on getting much more specific with certain areas of the code. In the meantime, don't hesitate to comment or ask specific questions!

Article 680 – Swimming Pools, Fountains, and Similar Installations
General
A. 680-3. Other articles.

(b) The installation and wiring of audio equipment adjacent to pools and fountains shall comply with the applicable requirements of Article 640. Underwater loudspeakers shall be installed in accordance with Section 680-23.

NEW Article 640 was greatly expanded for 1999 and now provides guidance for all forms of audio equipment and the installation thereof. As noted, however, the installation of *underwater* loudspeakers in a pool or spa is still covered in 680-23.

680-4. Definitions

Fountain. As used in this article, the term includes fountains, ornamental pools, display pools, and reflection pools. It does not include drinking fountains.

Packaged Therapeutic Tub or Hydrotherapeutic Tank Equipment Assembly. A factory-fabricated unit consisting of water circulating, heating, and control equipment mounted on a common base, intended to operate a therapeutic tub or hydrotherapeutic tank. Equipment may include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Pool. As used in this article, the term includes swimming, wading, and permanently installed therapeutic pools.

Self-Contained Therapeutic Tubs or Hydrotherapeutic Tanks. A factory-fabricated unit consisting of a therapeutic tub or hydrotherapeutic tank with all water circulating, heating, and control equipment integral to the unit. Equipment may include pumps, air blowers,

Continued on page 60

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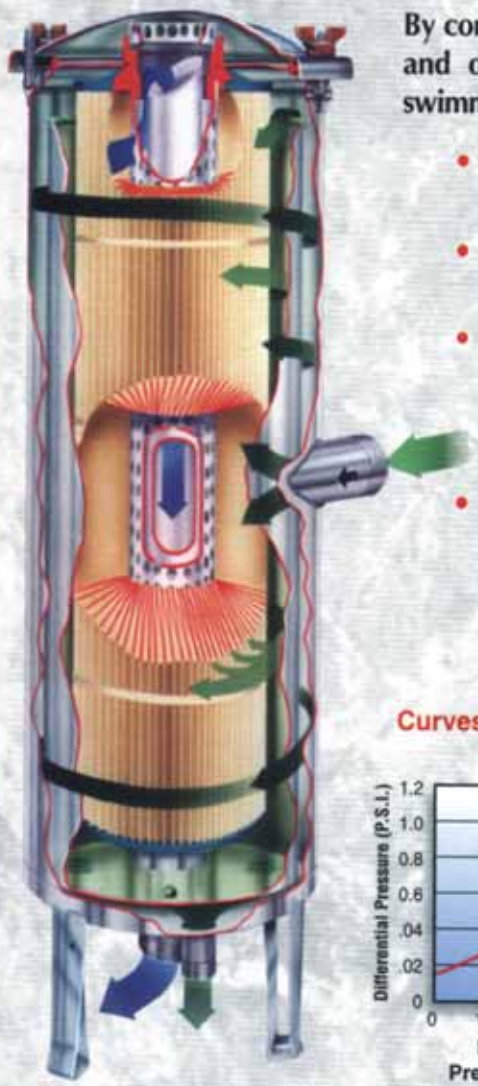

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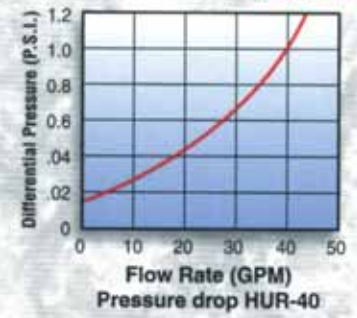
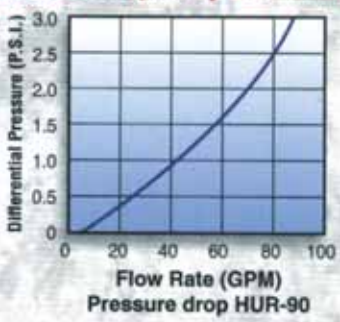
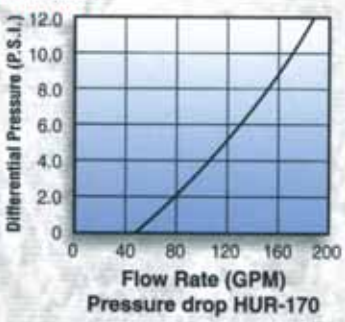


Pressure drop HUR-40



Pressure drop HUR-90



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