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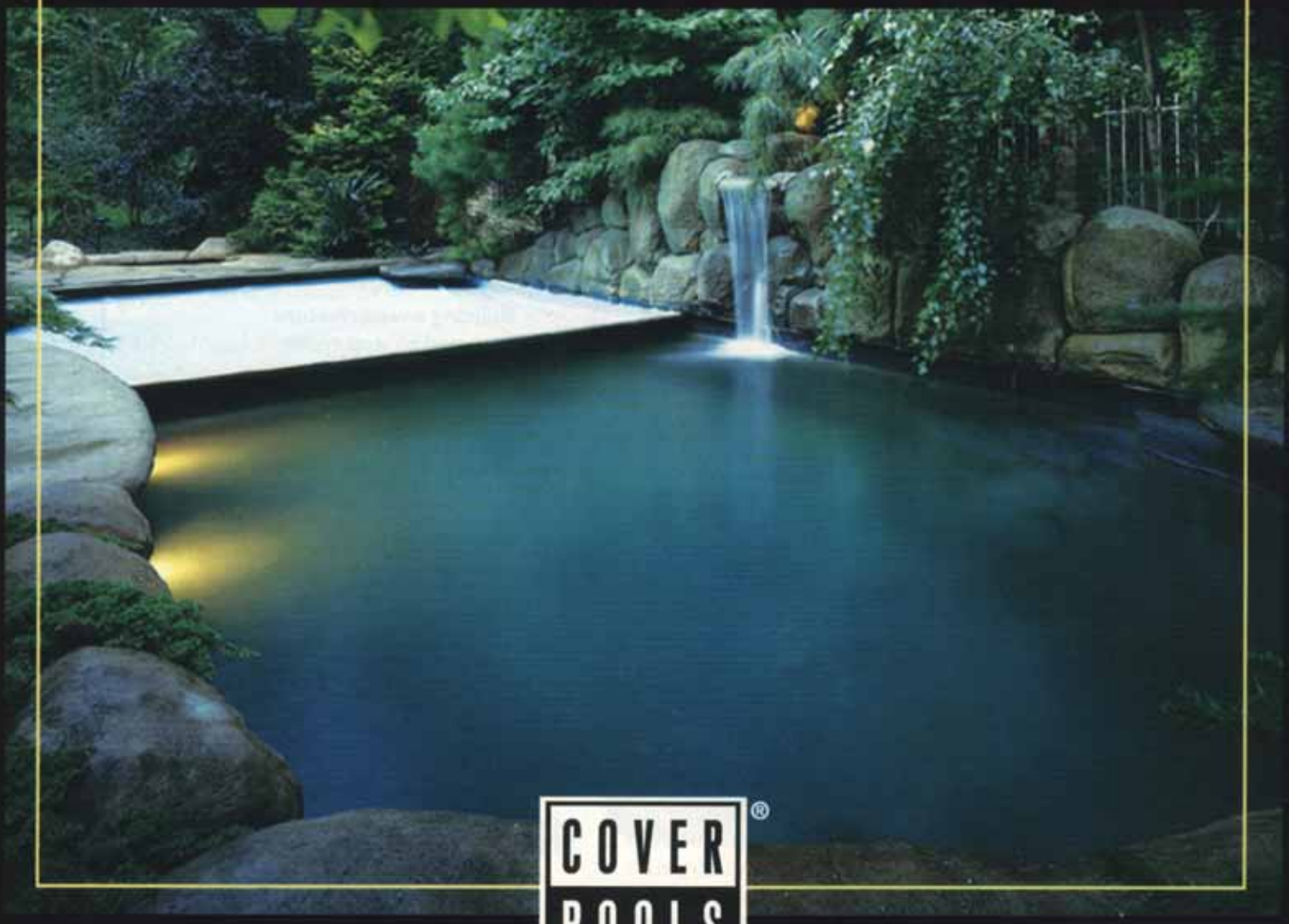

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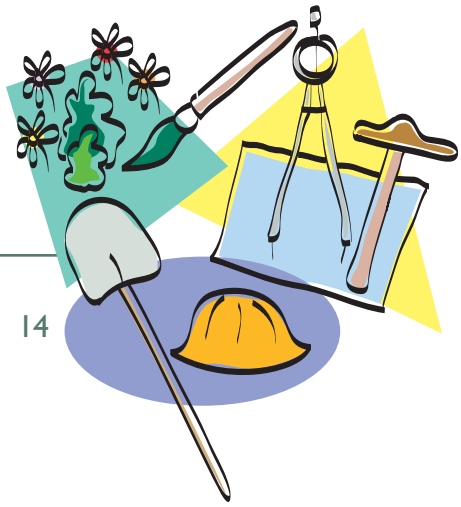

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DEPARTMENTS

On the cover:
Photo courtesy
Elite Concepts by Michael Nantz, Dallas

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By Eric Herman

The Power of the First Person

There's something very special about the people who write for *WaterShapes*. If you haven't noticed already, let me point out that this magazine is written by people in the trade – folks who, like you, spend their working lives designing, engineering and installing high-end, custom-crafted pools, spas and waterfeatures.

These are the ones we chose to turn to for the content that fills the magazine you now hold in your hands.

One and all, these professionals have taken time out from their schedules and put pen to page with the hope that sharing their experience and expertise will benefit watershapers coast to coast. And it bears stating that this magazine simply would not exist without these insightful and generous contributors.

These writers have helped us organize *WaterShapes* as a direct, open forum in which excellence within the trade can be explained, dissected and shared by all who take the time to read the magazine and participate in the forum, however they choose to do so. In other words, this is *your* magazine, written by and for you and your peers.

Some of you have already commented that a publication "by the trade, for the trade" is basically a new approach, especially for pool-industry readers. As innovative as this approach may seem, it's important to note that this is nothing new in other trades that have for years enjoyed this sort of straight-talking, on-the-level brand of communication.

In going directly to people who do the work – designers, engineers, builders, specialty contractors and suppliers – we intend to bring our content a giant step closer to the intricate challenges you face in the field every single day. It's an inescapable fact that to know a subject best, you need to live with it, work at it and, most crucial of all, try and make a living at it. The detail and sense of immediacy gained through this real-world experience cannot be captured nearly as well in the third person.

By writing in the first person about what they do, our writers offer compelling, timely and useful testimony about what really goes on in their various specialties and fields of endeavor. They do so in the hope that reflections and discussions conjured by their words and illustrations will raise the bar for professionals participating in the forum – or at least that their words will provoke thoughtful responses and substantial exploration of issues crucial to the success of watershapers everywhere.

As we worked to develop *WaterShapes* and spoke with more and more of you, we recognized clearly that a trade-driven forum of the kind we've now opened has long been overdue. I'm certainly biased, but I think its advantages are already apparent.

Does our magazine replace other resources available to you? Of course not. We do believe, however, that *WaterShapes* fills a space that has been treated mainly to silence for far too long. Now that we're here, the silence has been broken and is being replaced by voices and images gathered directly from the good people of the trade. As you tell each other your stories and share your thoughts and insights, at long last the art and craft of watershaping will be explored, first hand, in the first person.

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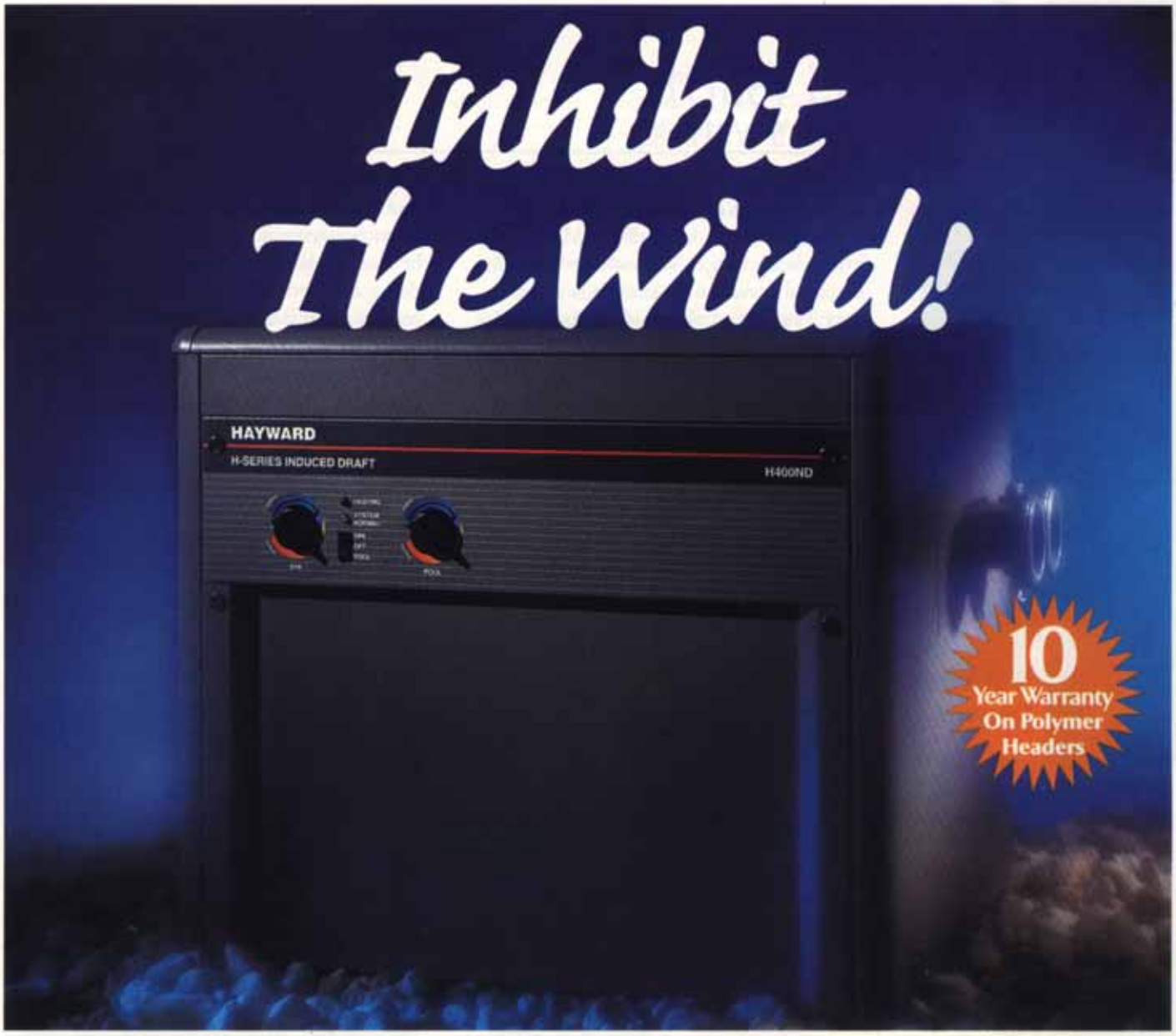

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IN THIS ISSUE

APRIL'S WRITERS

NANTZ

TISHERMAN

ROGER HOPKINS is founder and owner of Naturalistic Gardens, a Sudbury, Mass.-based firm dedicated since 1971 to the creative use of natural stone in high-end landscape designs. Hopkins' work includes elaborate rock installations for pools, spas and waterfeatures as well as pavings, stone walls and settings for sculpture. A self-styled "landscape artist," Hopkins' work has been featured on public television's *This Old House* and *Victory Garden* and in *Smithsonian* and *This Old House* magazines. Recently, he participated in a series of documentaries for the award-winning PBS series *Nova* in which he demonstrated techniques he believed were used to build Stonehenge and the pyramids and obelisks of ancient Egypt.

MICHAEL NANTZ owns and operates Elite Concepts by Michael Nantz, a Dallas-based design/build firm for swimming pools, spas and waterfeatures. Educated in construction management and architectural design, he is often called upon by architects to offer design and consulting services for elaborate watershape installations in the United States and abroad. Nantz joined the pool industry in 1988. Previously, he'd spent several years as a project manager for large commercial construction projects, including several high-rise buildings that grace the Dallas skyline. Nantz currently chairs the National Spa & Pool Institute's Builders Council, of which he has been a member since 1994; he's also served on NSPI's Design Awards Committee and his work has won design awards in the United States and Mexico.

FRED HARE, a 34-year veteran of the pool/spa industry, is director of training for Sta-Rite Industries of Delevan, Wis. After working for Swimquip and Aquality, he joined Sta-Rite 18

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

years ago, taking on his current role as training director after seven years with the company. Known and regarded throughout the pool/spa industry for his seminars on hydraulics and system design and engineering, Hare also teaches hydraulics at Sacramento City College in California.

Curt Straub has been active in the pool industry since 1962, when he joined his family's construction company as a laborer. By 1970, he had stepped up to head the company's design and sales teams, positions he held until 1990, when he founded Aquatic Consultants. A specialist in pool and spa design, he offers mediation and conflict-resolution services along with his emphasis on structural evaluation. Straub is a longtime member of the American Concrete Institute and past chairman of ACI's swimming pool committee. He is also a past board member of the Master Pools Guild.

David Tisherman is the principal and founder 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. He has degrees and credentials in industrial design, scientific illustration and architectural drawing from Harvard University and Art Center School of Design and has taught architectural rendering and presentation at UCLA. He also has won several awards for his designs. Tisherman serves as an industry expert for California's Contractor State License Board and has been a member of NSPI's Builders Council since 1994. He is a co-founder of and principal instructor for the Genesis 3 Design Group.

Straub

The Power of Your Mindset

By Brian Van Bower

Several years ago, at a time when I was still pretty wet behind the ears, a young, attractive woman invited me to join our local Chamber of Commerce and attend a meeting with her.

"Sure," I said. "I'll give it a shot." I showed up for the event and met a bunch of banker types, and it seemed like everyone was a vice president of something or other. I was just starting to get comfortable when the woman who had invited me explained that it was customary for new members to stand up and tell everyone about his or her business.

As luck would have it, I didn't go first. Another guy stood up before me and talked for a few minutes about his carpet-cleaning business – a trade he obviously found to be less than stimulating. He spoke in a monotone voice and made carpet cleaning sound like, well, *carpet cleaning*. Inspired by his lack of enthusiasm, I decided to try a more positive approach.

When my turn came, I stood up and told this group of experienced business leaders that I did much more than dig holes and fill them with steel, concrete and water. "In fact," I told them, "I make a product that provides health, fitness and relaxation, extends people's lives, improves their quality of life, keeps families together, cools them off when it's hot, relieves stress when they're weary, creates visual art and beautifies their homes."

In other words, I really got into it – and they stood and applauded when I finished. Later on, I received a number of positive comments and was warmly welcomed into the group.

The Moral of the Story

It didn't take much brainpower to realize that the reason I'd made a connection with these people – right after the gentleman with the carpet-cleaning service had almost put them to sleep – was that I had a *positive mindset*. Because I was proud of what I did for a living and was eager to tell them about it, the audience responded in a positive way.

It was a powerful lesson. It showed me that mindset has a huge effect on the things you say and how you say them, on the way you act and therefore on the impressions you make on other people. In the time since that meeting, I've come to appreciate how critical a positive mindset is to business success, because *everyone* you meet is either a potential customer or a potential referral. You just never know how the things you say today (and to whom) may influence whether or not you get a sale later on.

I've found since then that I tend to gravitate toward people who share this positive mindset, both in the industry and in my community. I'm at my best with people who represent their businesses with enthusiasm and confidence.

In my own case, this positive approach to watershaping means I won't ruin the good moods customers have when they call me; rather, I reinforce them and build upon them in every way I can by being upbeat. And I see a big difference between *knowing* this and *practicing* it: In other words, having the right outlook and saying and believing positive things won't do much good unless you take the attitude out for a spin.

After my Chamber of Commerce experience, I began to work systematically in my community at stacking the deck in my favor. I became involved with a variety of organizations that let me rub elbows with professional (and generally upscale) people. In marketing terms, I made these folks my "target demographic group" – a set of people who feel good about what they do and are likely to have money and enjoy the good life.

One big step I took in this direction was joining the American Institute of Food & Wine. For one thing, I really enjoy food and wine. For another, my involvement in this organization puts me in an atmosphere where I'm selling all the time, although it never really seems like that's what I'm doing. I get to know people; when the time comes for installing a pool or spa, they start with me – and so selling becomes an easy, natural extension of an activity I enjoy.

Horns of Plenty

The great thing about this kind of "community prospecting" is that there are so many different types of organizations that fill the bill.

For starters, I strongly recommend joining your local Chamber of Commerce. You should also look into local service organizations like the Rotary Club or the Kiwanis; if that's not your thing, get involved with your local Little League or some other type of family-oriented organization.

As long as you have that positive mindset in joining and participating, the networking and prospecting will come naturally. You'll find yourself building alliances with other business people, increasing your credibility and your standing among your peers. You'll also make friends, do business with friends and get referrals to *their* friends. Hands down, it's an easier way to go than making cold calls.

In fact, this networking is my total advertising program: I don't run print ads or radio or television ads; instead, I make customer satisfaction my marketing approach.

To do so, I always try to do something in the process of the job that makes the customer happy. I'll get more specific about this in future columns, but if I have to spend an extra $300 on some special feature that isn't in the contract, I don't make a fuss about it: I just figure that *this* is my "marketing budget." In other words, I even look in a positive way at the problems you inevitably run into in the course of installing any sort of watershape.

As you take this mindset out for regular spins, you'll find that something great will start happening. Before long, in fact, you'll find that everything comes together – that the positive mindset supports the personal prospecting you follow up with personal service – and then with service to the referral business that flows your way. What happens is that the sales-and-marketing aspect of your business becomes a part of your everyday life; you don't *ever* feel like you need to force it.

There are enough of you out there who know me well enough to know that I practice what I preach. To me, a positive mindset, appropriately applied, is the difference between the suede-shoe/aluminum-siding, mercenary type of sales and selling by participating in your local economy.

When the Phone Rings

Let's pull all of this grandiose stuff into focus with a look at what I do with the initial phone call and see how a positive mindset influences things from the first "hello."

When I'm contacted by a prospective client, the first thing I do is pull out a folder, put his or her name on it and grab a pad of paper for taking notes. The second thing I do is remind myself – and even at this stage I still need this – that my job here is to gather information rather than make a sale. (I like to think of myself as a de-

tective and the folder as my case file.)

From the first seconds of the conversation, I take notes on anything the customer says with the thought I may be able to use it later on. If the prospective customer has a good grip on the process, I don't have to say much and can get away with asking a few key questions. If he or she isn't so forthcoming, I use the questions to build the conversation – taking notes on everything they say.

Ultimately, these pages of notes and details inform everything I do, from the initial design of the pool to the small courtesies I'll extend as the job progresses.

This isn't easy, by any means. It's hard to be quiet when you want to sell yourself and your skills, and it can be even harder to resist the temptation to run out ahead of the customer and start making assumptions that will get you in trouble later on (or even right away). To keep myself in line, I always bear in mind that way too many people have been programmed to be afraid of our industry and are conditioned to ask about cost right up front.

So I hold back and try not to think about how nice it would be if this or that client would just pick up a pen and sign on the dotted line. What I do instead is really try to figure out what the customer is after in general terms before I even begin to think about the specifics of the design. That way, when I talk about dollars later on, I'm representing a project that is customized for the client's needs and desires.

I'm always after a few key facts about the customer and his or her family. Who lives at home? How many kids? What ages? (This fact alone is huge: If the customer has small children, for example, I know I'll need to deal with safety. If there are teenagers, it's likely the pool will see a lot of use and will lead me to define a whole set of possibilities from diving wells to slides.) And it impresses the customer later on in the process when I remember details such as the children's names – all from asking, "Do you have kids?"

Setting a Checklist

The family question is just the tip of the iceberg. As the customer loosens up, I work in a whole set of questions that will assist me in defining and meeting needs and desires. And mind you, this is *before* I've even met the customer and his or her family or seen the backyard in which the pool ultimately will be installed!

❑ *What prompted consideration of the project?* We know from industry marketing studies that the decision to buy a pool can take years. How a customer answers this question gives me insight into how long they've been considering buying a pool or spa and who is driving the decision – husband, wife or both.

❑ *How did you come to me?* It's very important to keep track of referrals for a variety of reasons: You can tell, for instance, how well your prospecting efforts are working, and it *never* hurts to follow up with the person who actually gave the new client the referral if for no other reason than to say "Thanks!"

❑ *Who will be using the pool?* This tells you more about the family (which in this day and age of divorces, remarriages and mixed families can fit any number of profiles) and gives you an idea of how the pool will be used. If exercise comes up, for example, file the thought "lap pool" in the back of your mind. If relaxation comes up, think "spa." Or if it's all about aesthetics, you'll eventually want to draw in waterfeatures and decorative options. I generally don't even mention these specifics so early in the process, but early questions about usage often point me in the right direction.

❑ *Do you swim?* A question like this might seem frivolous, but I've actually met a number of non-swimming customers. If the client doesn't know how to swim, you can bet I'll be sure later on to refer them to a place where they can get lessons!

❑ *What other kinds of physical activities do you enjoy?* I want to know if I' m dealing with physically active people or more sedentary people, so I'll ask if they jog, ride bikes or ski. This is where I might find out about a back problem or some other physical problem, or I might be told that getting a pool is part of the client's plan to pursue a more healthy, active lifestyle. Either way, I can use the benefits of pool ownership to sell the project later on.

❑ *Have you had a pool before?* This is a biggie. Here I get the customer to talk about past experiences and let me in on any of his or her preconceptions about pool ownership. It can clue me into what types of aquatic experience have positive

associations in the client's mind – and isolate negative impressions. If he or she has had repair or maintenance headaches in the past, I can be sure to address those concerns later on.

❑ *How do you see yourself using the pool when it's complete?* This is another question designed to get at intended use. If they can't navigate this question, then I know I'll have to keep looking, because I really do need to know whether I'm dealing with true swimmers or with sip and dippers.

❑ *How much entertaining do you do?* I need to know if the pool is intended as a centerpiece (or backdrop), whether for family fun or business. If people will be getting wet during parties, I may end up suggesting things like swim-up bars, a barbecue area or even a cabana beside the pool. This also gives me a sense of direction when it comes to lighting or landscaping, including a nice, shaded area in and around the pool.

Just the Beginning

The important thing to point out here is that these are all just over-the-phone preliminaries and really shouldn't take up more than a few minutes.

If the conversation leads us to agree to continue the discussion in person later on, I know I'll have a chance to get much more specific about details from benches and entrances to lighting and waterfeatures. I'll get to features that create the sound of moving water, then I'll get to heating, chemical treatment, safety, therapy features and more. I'll ask about who will be doing the landscaping and will find out if I'll need to interface with an architect or landscape designer. This *second* checklist, which we'll cover in a future column, goes on and on.

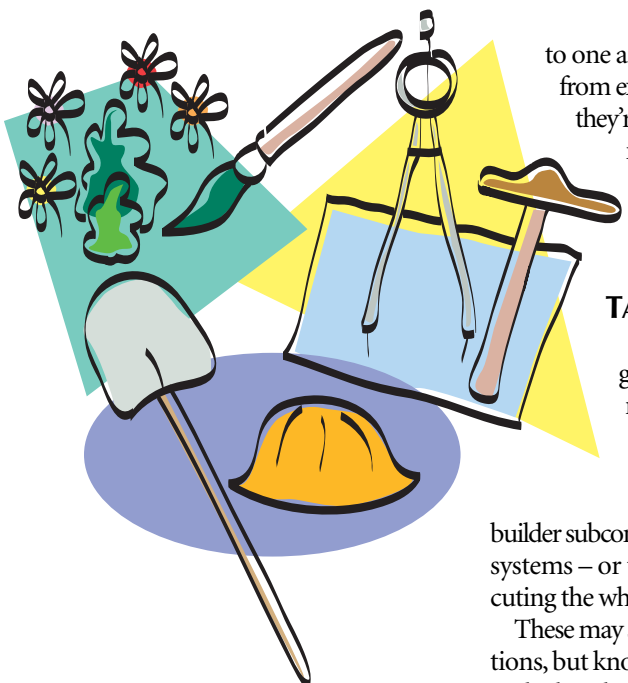
Ultimately, I see this initial phone conversation as a simple selling tool – and a way of impressing the customer with my positive mindset about what I do for a living. And the fact that I take extensive notes means that if the in-person visit or a second call comes weeks or even months later, I can impress the customer with my command of the basics and show that I cared enough the first time to pay attention.

Probably the best thing about approaching prospecting and sales this way is that it never seems like selling in the way that most of us think about selling. In fact, I've had more than one client laugh at the suggestion that I'm a salesman, and I always take pride in this kind of response. I'll laugh it off, all the while thinking "You just spent $150,000 with my company, but I'm not a salesman." *That's* when I know I'm doing it right.

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

Defining Roles

By Stephanie Rose



Before we dive into discussions of plantings or the various components of landscaping work, I think it's important to define roles and talk about relationships among the trades involved in watershaping projects – in other words, to take a basic look at who does what.

We can all save time and money by knowing from the beginning of the job who is going to handle each phase and detail as well as who is qualified, trained or licensed to perform the various tasks needed to get the job done. Planning this up front might even result in greater profits, and it definitely will make your job easier.

I know it's the goal of this magazine to build a greater "watershaping community" where both landscape professionals and those who build pools, spas and waterfeatures all participate with natural coordination. For the moment, however, pool builders and their counterparts in the landscaping business tend to give little thought to one another. In fact, I've learned from experience that the only time they're certain to interact (and not necessarily in a positive way) is when problems arise. Typically, that's not good for anyone's business.

Talking Shop

Consider drainage and irrigation as an example: Who's responsible? Will the landscape contractor install the drainage and irrigation systems, or will the pool builder subcontract the installation of these systems – or take responsibility for executing the whole project?

These may seem like insignificant questions, but knowing who will do the work and what their qualifications are for designing and engineering these systems has a lot to do with whether or not a landscape professional will be able to install plants according to the design and whether or not the drainage and irrigation system will be compatible with the pool, spa or waterfeature.

I've found that many pool professionals believe it is a landscape contractor's job to install the irrigation and drainage systems. That seems logical, but is the landscape contractor qualified to do this type of plumbing work, or even licensed to do it?

Let me address these questions from a landscaping perspective by defining what our roles tend to be. (Remember, these are general guidelines. In any situation in which you're unsure or concerned about your own liability, it's always a good idea to check applicable regulations in your area and seek the advice of local building and safety departments or state contractors license boards.)

With that in mind, landscape professionals fall into three basic categories: landscape architect, landscape designer and landscape contractor.

❑ **Landscape architects** are trained to design both hardscape and planting and to draw architectural plans. They are licensed to do all types of retaining work and hardscape planning and construction, which gets them involved in designing pools and other watershapes.

Most have college degrees in landscape architecture and are required to have worked for another landscape architect or contractor before passing rigorous tests to obtain their licenses. Once licensed, landscape architects can operate essentially as contractors, hiring crews and paying other contractors and subcontractors directly.

When should landscape architects be involved? Often, these are the best people to handle entire landscaping projects, from concept to finished product. They will hire and pay subcontractors under the auspices of their contract, and in many cases landscape architects hire pool professionals to build a watershape that they have designed. In other cases, pool builders are hired as consultants for specific design elements of a given pool, spa or waterfeature.

❑ **Landscape designers** generally focus on plant and hardscape design. These professionals may or may not have the same formal training as landscape architects. They're not licensed to do architectural drawings and may have to rely on architects and engineers for structural work, but when it comes to planting and design work, they are often every bit as (or even more) capable than landscape architects.

Without a contractor's license, however, they are limited to designing the job and must use a licensed contractor for installation. Landscape designers can only

collect their own fees.

When would you most need a landscape designer? If you already have an overall watershape design but still need a planting plan, this is the area where landscape designers are often the true specialists: Most make their sole income from planting plans and so they usually have very creative planting ideas.

❑ **Landscape contractors** do the physical work of landscaping: They generally handle installation of the irrigation and drainage systems, plantings and maintenance. Most do not draw planting plans nor do any other kind of design. They must be licensed.

The work they do might stretch beyond planting, irrigation and drainage to encompass functions like tree trimming and masonry work, but most stick to the basics (particularly in states where there are separate licenses for masons and tree trimmers). Personally, I prefer working with companies that specialize rather than those that claim to do it all.

Landscape contractors are trained and must pass licensing programs and tests administered by the states in which they work. When hiring a landscape contractor, I strongly suggest checking on both license and insurance: You don't want to assume liability for their work unless you know they are legitimate operators.

Plan Well

So how do you know who should be doing the rough grading on the site, installing the irrigation or drainage system, designing the planting plan, or stubbing out electrical for landscape lighting? There is no hard and fast rule and the situation can vary depending on the job, the client, the watershaper and the landscape professional involved in the project.

Given the potential for overlapping roles, the most important thing to do before a project begins is to be clear, right from the start, about who is doing what. To get this done, I suggest asking some key questions.

❑ *Get the lay of the land.* Ask your client if he or she has already contacted or selected a landscape architect or designer. It's amazing how many potential problems can be avoided simply by knowing that there's a design professional in the mix already. And if the customer doesn't have anyone in mind, now is the time to make some recommendations. (This is a big point that I'll come back to again and again in these columns: Watershapers of all sorts should always think in terms of networking!)

❑ *Know who you're dealing with.* If the customer asks you to farm out landscape work as part of your job, check the qualifications, education and references of all contractors or designers involved with the project – and don't forget to check liability and other insurances! This is certainly standard operating procedure with subs in the trades you usually hire, and the same care should be applied on the landscape side. (Frankly, I highly recommend making these calls even if you don't have any doubts about a particular sub. Why take chances?)

❑ *Think about the next steps.* You and the client should begin thinking about what will happen after the pool or spa is done – whether it's executing a planting plan or another hardscape feature, such as a barbecue or entertainment area. It's in your best interest (and the client's) to determine who is going to do these designs and who is going to do the installation: It gives you and the client an opportunity to integrate the design of the various elements from the start – everything from tile selection and ordering to determining how expansion joints should be arranged.

❑ *Define some roles.* Who's going to do the rough grading: you or the landscape contractor? Have the planting areas been planned? Will soil be needed? Questions like these will save you the time and expense of trucking off dirt from the excavation of a pool or pond only to have to bring it back when the landscape contractor needs it. It can also help you determine when to schedule installation of irrigation and drainage systems and coordinate those activities (if possible) with trenching for pool plumbing. This simple coordination makes everyone look good in the client's eyes.

❑ *Settle the access issues.* This is another area where coordination can really help. The time to think about the kind of access necessary for delivery of plants and trees or bringing in heavy equipment is before the pool-equipment pad is set up right in the way, for instance, or before walls, gates or fences are put back up.

❑ *Discuss electrical needs.* This is a big one that too often gets missed. Early on, ask the client, "Are you planning on having landscape lighting?" If so, you need to determine who's going to design the system, run the conduits and install the lights. In my book, this is a job best left to a professional who specializes in landscape lighting: There's a definite art to it. Subs who install your pool lights certainly can "do the job," but will they give you the best results in terms of aesthetics? A personal check-up is helpful here: Drive by at night to see their work in action.

Now Do It!

Obviously, there are many ways pool builders, landscape professionals and all watershapers may be asked to interact with each other, and it's impossible to define a specific set of rules governing who does what. The key is knowing what type of company you're dealing with and defining the process as early as possible.

When you do, the chances of a misstep or misunderstanding down the line are greatly reduced. Best of all, when you have planned well and integrated all the various trades, you can do your work with less worry and let your own expertise take over. Now it's time to jump in and watch it all take shape!

Stephanie Rose runs Stephanie Rose Landscape Design in Encino, Calif. A specialist in residential garden design, her projects often include collaboration with custom pool builders.

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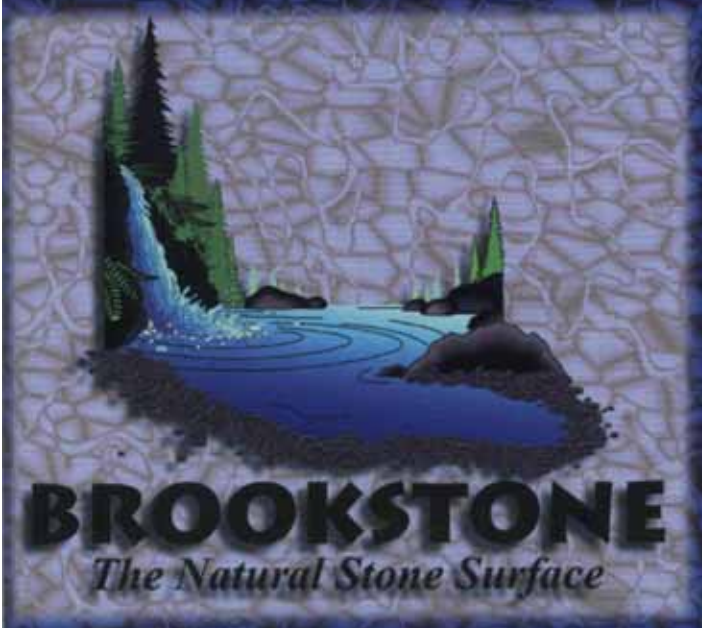

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Classic Rock

Artificial rock may have its place, but the real thing is still king when it comes to adding beauty, value and prestige to natural-style pools, spas and waterfeatures. Here, a natural-rock specialist defines some of the ways he uses rock by the ton to turn common waterscapes into truly dazzling works of naturalistic art.

By Roger Hopkins

If you love rock, New England is a great place to work. A special combination of geology and the glaciers of the last Ice Age left behind a spectacular legacy of granite formations and scattered countless tons of boulders of all types and descriptions across the landscape from Maine through Massachusetts.

It's the indigenous rock, so it's not too surprising that affluent New Englanders have long chosen granite and other local species to accent their landscaping. And this is especially true in upscale pool, spa and waterfeature projects, where in so many cases a "natural look" is high on customer priority lists.

There's a lot to love about granite in particular. In appearance, the effects range from subtle to dramatic – or encompass both at the same time. In compatibility, it's superb in combination with plants of all sorts. In versatility, its capacity to be woven into structures either decorative or recreational (everything from sunning and diving platforms to bridges, pathways and decks) simply can't be matched. And in nature, granite and water participate endlessly in the geological dance that has created the majority of surface features on our planet.

Mostly, though, I think natural rock just looks great. I've chosen the following project photos to give you an idea of what I do with granite and other rock types in my work and how I've used them on projects both large and small to create man-made environments that truly look and feel natural.

A Texas Road Trip

Right from the start, I'd like to point out that using granite in large quantities has caught on across the nation. This installation, for example, involved placing approximately 100 tons of granite beside a large pool in an exclusive Houston neighborhood.

To get things rolling, we selected and shipped 14 truckloads of rock from Massachusetts to the Lone Star State. On site, the stones were to be set on an 8- by 45-foot slab, 8 inches thick, that had been poured atop the bond beam. After the boulders were off-loaded, I spent a day or so visualizing how things would fit together and selecting the pieces I'd use. As is often the case with glacial granite such as this, we had a nice mix of large boulders.

Once I had a plan in mind, it took me just two days to place the boulders using a Bobcat 975 with chain-and-fork rigging. The builder had previously stubbed up plumbing behind the slab, and we completed lines to three strategic points of origin nestled in the upper boulders.

Given the massiveness of some of the stones, I did very little structural work beyond placement. We simply sealed the waterways with concrete and, in a few places, tied some of the rocks together with rebar; for the most part, however, this job is a typical example of a rock structure that will stand up on its own.

In all, we set up seven waterfalls with a combined flow of about 300 gpm. The largest waterfall flows at about 100 gpm – a classic example of how you use two vertical stones and a recessed weir stone to create a waterfall.

Back in Massachusetts

This massive project covers several acres on Nantucket Island, just off the coast of Cape Cod. In preparation, more than 700 tons of granite boulders were ferried to the island for an installation that eventually featured more than a million gallons of water flowing over dozens of waterfalls and cascades.

In this case, the pools have vinyl liners and the stones are set directly in or on the sandy soil. We sealed the watercourses with hydraulic cement, but we knew going in that, without a concrete foundation, these massive rocks would move a little bit from year to year. What this means is that, every year, a maintenance crew comes in to reseal any joints that may have opened during the annual freeze/thaw cycles.

(Admittedly, this is an unusual approach. But given the size and scope of this project, it actually will prove to be more cost effective and practical than attempting to build a concrete structure capable of containing these many tons of boulders!)

When you use rock in this quantity, you're sure to find some interesting pieces. The flat granite stone that crosses over the cascades pictured here is a good example of how the stone itself can dictate its use. When I saw this piece, I thought that it would make a great bridge, so I set up this section of the feature to create a footpath over the cascading stream. Here and elsewhere, I was able to juxtapose angular stones with rounded boulders as a way to create visual contrast and interest.

Placement of the rock took three weeks of constant work using both 80- and 100-ton cranes. The overall installation process took the entire summer.

A Landscaper's Showcase

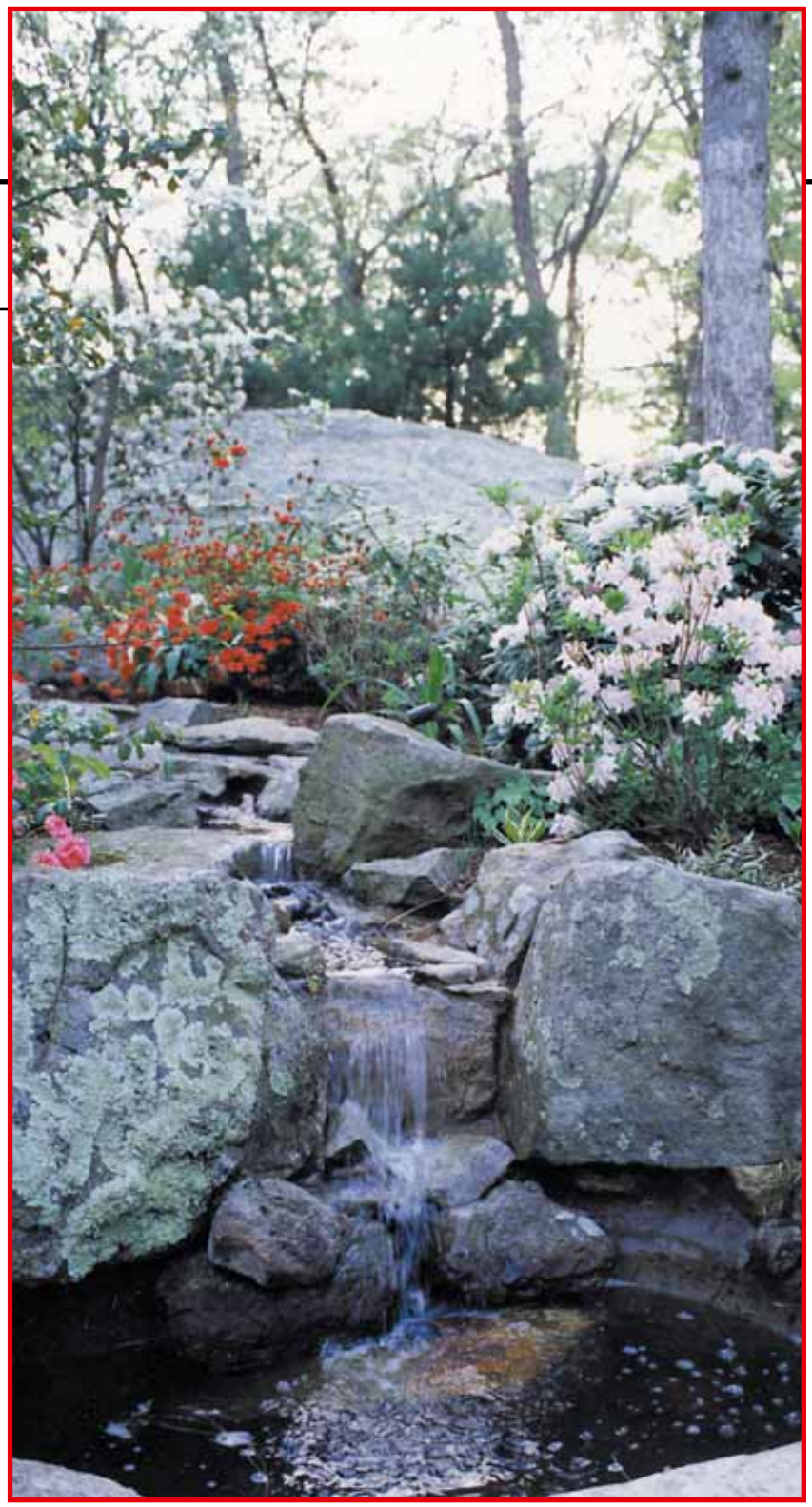
By way of contrast to the Cape Cod project, where the boulders were placed directly in the soil, all of the boulders in this job rest inside a gunite shell. I prefer working this way: Among other things, you don't need to worry too much about sealing the waterways because all the water will flow into the vessel.

This project was located next to a busy highway in front of a landscape designer's facility. Working together, we created a feature that does a nice job (I believe) of balancing the elements of water, rock and plants.

Again, the rock itself actually dictated the design of the structure. The upright boulder rising in the center has beautiful angular surfaces and clean edges, and we set things up so that water flows across two horizontal weir stones placed around this natural centerpiece.

Taking off from this central feature, the broad boulders fan out to the sides and provide a nice, natural transition to a grassy slope we created during grading. We left several spaces for plantings in and around the boulders: As the plants have grown, the whole thing has taken on a highly natural appearance.

Ready and Waiting



The beautiful lichen-covered blue granite stones used in this job were already on the property when we arrived. This really kept costs down on what was to be a fairly small job anyway.

Our task was to select several small boulders and scatter them along a small stream that feeds into the waterfall. By using indigenous plants and stones, we were able to create a natural-looking streambed.

The key here is placement of the large boulder in the background, behind both stream and waterfall. I like to do this whenever possible to set off smaller features in the foreground: It's a great way to hide the water's point of origin and it makes the whole structure look as though it's part of a natural system – even with a small project such as this one.

This brings me to a bit of advice for anyone who wants to work well with natural rock: Take the time to go on hikes near local rivers and streams. Not only is this great exercise and a nice way to spend the day, but it also gives you a chance to observe the random way in which nature distributes rock and how water interacts with it.

The more you take in of how natural settings and systems "work," the more success you'll have in translating a sense of the natural into man-made structures. Much of this cannot be explained in words, but when I select and place boulders, I let my mind's eye do most of the work based on what I've seen in natural settings.

On the Flats

Sometimes you have to make the most of limited options. For this job, we came onto the scene after the pool had been built, and all we had to work with was a 4- by 4-foot slab. Happily, the customer also wanted us to install a granite deck to be made up of 9- by 4-1/2-foot sheets of granite. (At 2-1/2 inches thick, each of these sheets weighed in at about 1,500 pounds!)

Because anything upright would really stick out like a sore thumb, I decided to go with a low-profile water-feature. The resulting flat surfaces and straight channel don't look all that natural, but they work nicely with the deck. In practical terms, the two broad boulders also offer good spots for sitting or sunbathing.

I use this example to raise an important issue: Among clients and designers alike, there's a tendency to want to create elaborate structures – the busier the better. I find that when I'm working in a situation like this where you can't really avoid revealing the hand of man, the less you do, the better off you'll be.

That was certainly the case here, where the only way to use natural rock without completely disrupting the pool's appearance was to go with clean lines and smooth, broad surfaces.

A Tight Spot

For some reason, this little waterfall has really grabbed a lot of attention: It's been featured on several garden tours, won a couple of local design awards and has always drawn positive comments from many of those who've seen it.

It can be tough to tell why some of these jobs really grab people and others don't, but in this case I think the key is intimacy. The entire system is located within a 14- by 15-foot space at the foot of a natural slope in a small backyard. The entire system contains just 1,500 gallons of water, and the shell is so small and located in such a tight space that we actually poured and troweled it into place on a frame of wire mesh and steel.

Because we had to contain the grade behind the waterfall, the whole installation took on a vertical orientation and we ended up placing some of the boulders

at fairly steep angles. The kitchen window looks directly out onto the waterfall; from that special perspective, the whole project feels particularly natural and comfortable.

Putting Rock to Work

For all the beauty of natural rock, it's important to remember that trying to mimic nature can prove frustrating – and ultimately futile.

The Earth has a lot more rock and water to work with in creating its designs than do landscape designers and pool builders. As a result, I always recognize the practical limitations of manmade structures. The idea is to create an effect, a feeling of a natural environment rather than a recreation of nature.

Beyond that basic aesthetic consideration, I hold to a few basic principles of working with natural rock:

• Natural rock of all kinds is heavy, and many of the jobs I've done can be measured in tons and sometimes in hundreds of tons. This means that you have to be prepared to undertake a painstaking process of selecting, transporting, off-loading and placing heavy objects, which involves time, money and equipment. Placement of large stones in fact demands that you be very handy with heavy equipment. I do most of my installations using a large Bobcat, but for larger jobs I would never hesitate to call in an 80- or 100-ton crane.

• It takes more than being able to push big rocks around: Knowing how to "handle" stones on site is critical to your ability to create desired formations. Having spent a good chunk of my career lifting, moving and placing stones with a Bobcat, I've come to regard the equipment as an extension of my hands. This fluency with material and machine is crucial, because working with natural rock means you're always dealing with the hand that nature deals you. Unlike artificial rock, which can be specified and sized to exact dimensions, natural rock has unique shapes and other characteristics that cannot be mimicked by man.

• Proper selection of rock at the source, be it a quarry or a masonry supply house, is very important. Here I look for rocks in a variety of shapes and sizes. For instance, I'm after boulders that can be placed vertically to create "headstones" for waterfalls and for others that have flat surfaces I can use as spillways or weir stones. I also hunt for round boulders, flat boulders and for rocks that have unique characteristics of shape or color. And I'm always on the lookout for rocks that have been home to lichen, which shows itself in some awesome colors and patterns.

• It's important to have a good supplier, one that can provide you with large quantities of rock in a variety of shapes and sizes. Depending on the geographic reach of your company, you may need to find several reliable sources.

• On site, you take the raw materials you've assembled and begin a careful, creative process of setting them up into working rock formations. Always working within the basic confines of what the customer wants and what the design calls for, I spend a good amount of time examining the stones, visualizing how I will use them to create the various structures and waterfeatures.

• As I move selected stones into place, I try to the greatest extent possible to place them so their own weight and shape will hold them in place. I do use rock chinks to support the large boulders where necessary, and I will occasionally drill into the boulders and install rebar support to hold things together when necessary, but I try always to work with nature and physics rather than against them. This makes for an easier installation – and a stronger structure.

• Finally, I want to stress the importance of using large stones whenever possible. Personally, I operate by a "fewer and larger the better" principle: When you use large stones, I believe the effect is far more natural than when you're working with stones that look as though they could be placed by hand. Nature moves massive stones randomly, and I want the rocks I place to look as though nature put them there!

– R.H.

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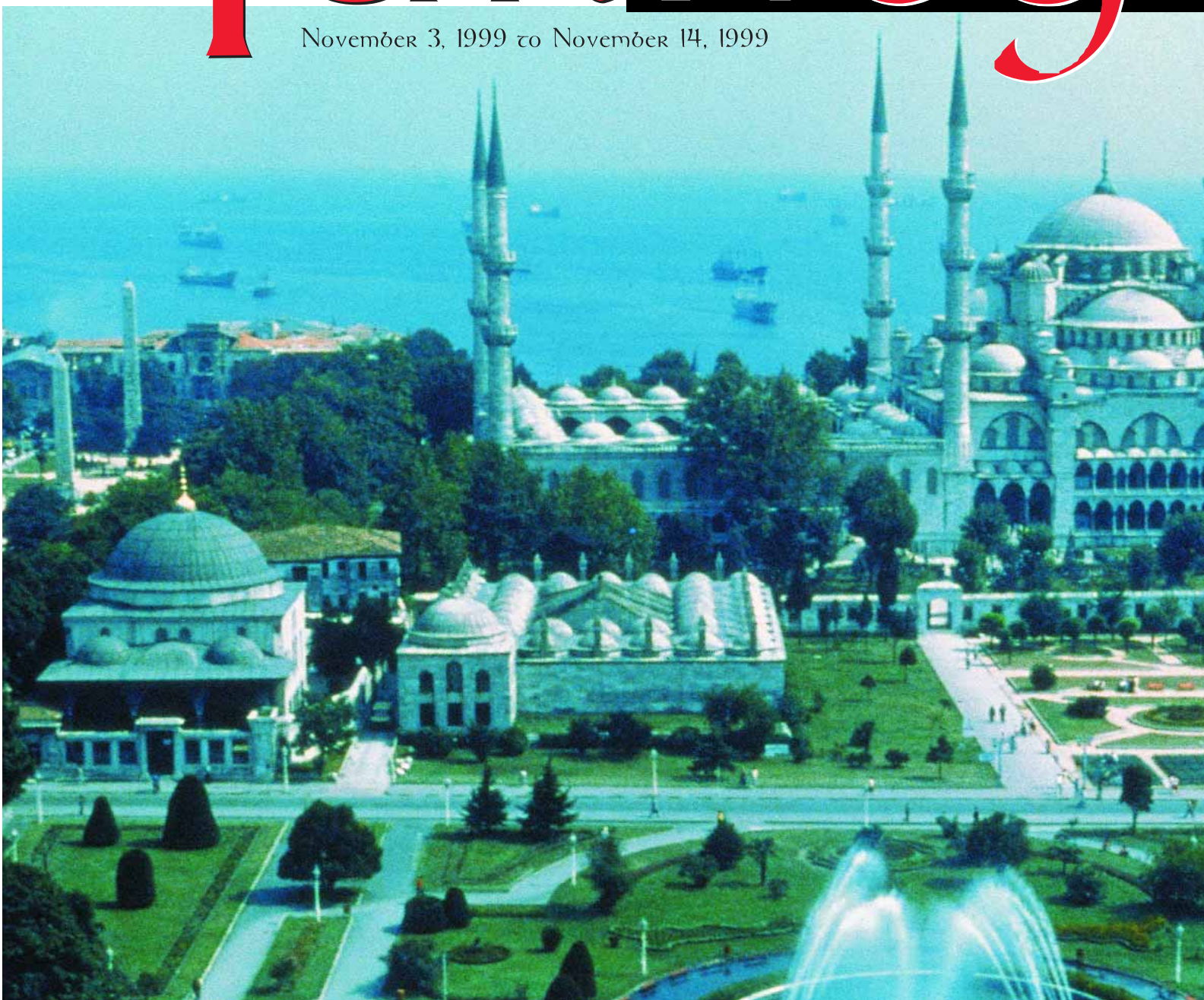

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Roadside

Attraction

The owner wanted something unique, something spectacular to mark the entrance to a new development of upscale homes. Michael Nantz dove into the project with enthusiasm and a head full of ideas – but soon found that the flat terrain and the site's immediate proximity to a busy highway presented special challenges.

By Michael Nantz

Some projects grab you right from the start, and this was definitely one of those cases.

As the principals at Herzog Development Corp. explained in our initial meeting, their new development was to be a "golf course community with a rustic feel, but *refined*." To embody that refinement, Don Herzog and his son, Daryl, wanted some sort of elaborate waterfeature – something that would break the monotony of the stark, flat terrain of northeast Dallas County and welcome prospective homeowners and guests to a new planned community.

My Dallas-based company, Elite Concepts, specializes in design and construction of just this sort of high-end water environment. We had worked with this developer before on some interesting projects, and we were in on the ground floor for this one. I like it that way: Being involved from the concept stage forward familiarizes me with *all* project parameters (rather than just my small part of it) and allows me to come up with a fully integrated finished product.

That involvement was particularly helpful in this case, because the desired watershape was to convey not only a specific message about the aesthetic values of the development, but also about the quality and sophistication of the developer.

FOUR-LANE SCALE

The main entrance where the signage and waterfeature now stand is located along a well-traveled highway. The Herzogs saw their highway frontage as prime space for promoting the special qualities of the development – if presented properly, that is.

Farmland bordered the road for several miles in both directions, so the waterfeature would have to be visible from great distance if it wasn't to pass by in the blink of an eye. Proposed access to the

community was to come by way of a pair of two-lane streets (one an entrance, the other an exit) separated by a median. The waterfeature, we agreed, would front the existing highway and straddle the access roads as three ponds – including one on the median.

Obviously we were talking large – but just *how* large was something I didn't completely grasp in my initial drawings. That initial plan featured a mere 300 square feet of water surface – which quickly evolved in a second meeting to a project that included *3,800* square feet of water surface over nine elevations.

Suffice it to say that this new design was larger in just about every other dimension as well: three separate bodies of water, each with several separate basins on different elevations, the largest on the entrance side, the smallest in the median and the other on the exit side. Together, they give passers-by the illusion that they are connected to one another, as if by a natural stream.

The key word here is "natural." The community was to be called Woodbridge to reflect its rustic sensibility. Appropriately, a faux-wooden bridge with a rough, cedar railing was to be incorporated with the access roads and signage – a project that kept a concrete-stamping crew busy for quite a while.

Elevation and highway department restrictions wouldn't let us install a true wooden bridge, but we knew we'd have to suggest that a stream connecting the ponds flowed beneath the timbers. Real or not, what better way to complement a wood bridge?

CLOSE WORK, WIDE-OPEN SPACES

Once I'd gotten a fuller sense of the scale of the project, drawing up the plans and then selling the idea were easy – particularly because the developers had a good notion of what they were after and had conveyed it to me clearly. Now it was time to deal with the details – including the site itself.

This is where we ran into our first surprise: As we shot the grade, we realized that the site-topography plan we'd been provided was a bit inaccurate. There was simply not as much change in grade as we'd been led to expect.

Theoretically, the plan would still work, but the existing grade fall of just 18 inches from one side of the access road to the other meant we'd need to tuck some of the water effects into a relatively small grade change – and deal with things like curbs as part of the bargain. Yes, it was a "grade change" and it went in the right direction, but the final plan called for a 9-foot drop from one side of the feature to the other, and we hadn't counted on such a gradual transition across the median strip.

At a minimum, we knew we were in for a bit more preparatory work than we had originally thought.

At first glance, the site, which spans more than 220 feet from side to side, seemed to give ample distance to achieve the proposed grade change. But the access road filled about 100 feet of that span and was, with just an 18-inch drop from side to side, painfully level for our purposes. What this meant is that we would have to pack the 9-foot grade change into a fairly short distance without making any part of the structure seem as though it shot abruptly out of the ground.

Pushing the task at hand back into focus, we moved to the 10-foot median and set up a spot as our elevation benchmark. This served a dual purpose: The slope across the median was basically level and would contain a single median pond; with this constant elevation set, we could do a bit of playing with the elevations above and below the median mark to get the effects we wanted.

The developers were very much involved at this point, because they needed to decide how to set up their signage with the most advantageous exposures to the highway. That in mind, we decided to put the high side of the waterfeature on the entrance side of the access road and drew up plans for the berm that would carry both the signage and our "natural spring" and its small pond. The low point would be near the center of the exit-side pond, backed up by a second sign.

(Decisions about the berm also factored in the planned construction of a convenience store on the highway just down from the entrance side of the access road. We all saw that a good-sized berm would hide the store from anyone turning onto the access road. It's also interesting to note that the berm helped establish the visual proportions of the installation with respect to the surrounding area: The expanse of the surrounding flatland could easily have dwarfed even our massive waterfeature!)

Being involved from the concept stage forward familiarizes me with *all* project parameters (rather than just my small part of it) and allows me to come up with a fully integrated finished Product.

A TIME TO BUILD

Once we finalized our site plan and basic design, grade stakes were driven and excavation began on the entrance side. We piled the spoils – that is, the clean, usable soil – in the berm area and compacted it in six-inch lifts at the location of the water-origination pond.

The access road had been set up well before we arrived on site, but enough was known about the waterfeature ahead of time that we were able to set up sleeves beneath the roadway to accommodate

Continued on page 32

We didn't think much of it going in, but working around (and under) the existing access roads without damaging their concrete stampings or curbs offered some special challenges. First, it meant we had to place our track hoe on the 10-foot median rather than on the roadway (A) – a less-than-ideal situation for the operator, who let us know exactly what he thought about his 'perch.' Second, to preserve the sense that the median pond was actually a streambed linking the two larger ponds, we ended up doing some tight curves and tricky forming in the 10-foot gap (B). Fortunately, everything we did here was helped by a bit of preplanning – and the laying of sleeves and equalizing lines beneath the roadways before our phase of the project began (C).

Continued from page 30

our planned plumbing runs. The sleeves were set at a 4-foot depth to prevent any damage during road stabilization and construction.

This is an instance in which preplanning (and even a bit of overplanning) was essential. Thinking ahead, we set an 8-inch equalizer line underneath the entrance side of the access road between the lowest pond basin on that side and the median pond's first basin, again at a depth of 4 feet but with 90-degree turns at each end.

We also planned on placing drains in each basin and setting up each with its own plumbing; this would help us balance the various water levels and simplify maintenance. In addition, we set up for strategic placement of returns and bypasses that would enable us to enhance the waterfall effects, if desired.

In all, there are nine different water elevations on this project, six on the entrance side (and median) and three on the exit side. To dig the pond on the median, we had initially thought to stage the track hoe on the access road and load from there. We were worried, however, that the tracks might damage the newly stamped faux-wood road surface, not to mention the possibility of damaging the inside of the curbs. Ultimately, we decided to unload the machine onto the median itself and work from there, making the perch a bit precarious for our cautious operator.

The entrance pond, at an elevation of 514.00 feet on the plat, sits just below the origination pond at 518.00 feet. Even though the upper pond is only six feet in diameter, we set it on a pier anchored in the same bearing strata as the lower pond because the smaller structure was cantilevered over the larger one and we wanted to prevent any possibility of a hinging effect or a differential in movement.

We did this despite the fact that geotechnical inspections showed soil at the site to be only slightly sensitive to changes in moisture and to have a low potential-of-vertical-rise value. Although the piers were an expensive precaution, the good soils report enabled us to limit other costs by installing standard gunite shells. The cages used 60 #4 bars, 10 inches on center in each direction, with four-bar bond beams around the perimeters of all the ponds.

MAKING READY

Woven within the pond cages are more than 1,800 feet of 1-1/2-, 2- and 2-1/2-inch schedule 40 PVC pipe. The circulation system runs off two full equipment sets, one for the entrance side and the other for the exit side. There are sand filters for each side, with two 3-horsepower pumps on the entrance side and one on the exit side. The equipment sets are located behind the signage on either side of the road.

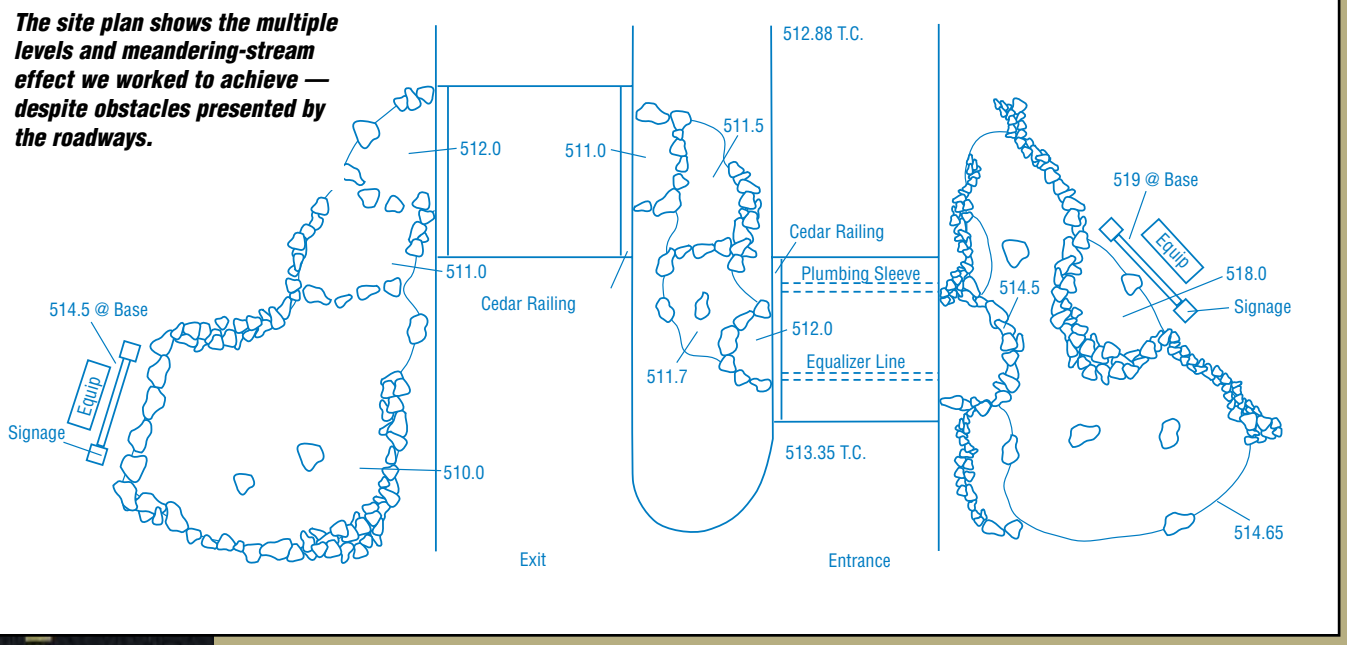
Even with the nine-foot elevation change and the 3,800 square feet of water surface, all we needed to do to manage the waterfalls was set up 42 total feet in weirs. We used the weirs to amplify the flow over the falls at specific points without the need for very large pumps.

As it turns out – and again despite all the changes in elevation – the check-valve requirements proved to be simple because the systems are designed to run 24 hours a day.

A single 2-1/2-inch flapper valve with a union was placed before the pump (and after the manifold). We also installed brass gate valves on each of the common lines; when closed, these prevent water-level equalizing during maintenance.

In the event of a power failure, there will be some equalizing on the common lines. This shouldn't pose a serious problem, however, because in normal operating mode only two gate valves – those controlling basins on the lower levels of the system – are left open, so flooding will be minimized and contained in the overflow system.

True, additional check valves could have been installed to avoid any potential flooding problems. But beyond being what I consider an unnecessary hassle, the addition of more check valves



The site plan shows the multiple levels and meandering-stream effect we worked to achieve — despite obstacles presented by the roadways.

would only invite line blockages, especially on the smaller pipes on the suction side.

We shot 8-inch-thick gunite floors along with 7-inch walls and 12-inch beams. We also shot two 6-inch-thick gunite retaining walls atop the beams. These walls were set up to deal with low-level lateral pressures we expected from the soil as a result of the extensive grade modifications made during excavation. No further structural work was called for, given the shallow depths prescribed for the ponds. These depth parameters *greatly* simplified the structural demands of the site and helped us keep down overall costs.

After the gunite was shot, we water-cured the entire pond complex for two weeks. A waterproofing agent was then applied to the stone ledges and surfaces below the proposed water line. Any gunite surface that was to be veneered in rock was covered with three coats of Thoroseal. After the final 24-hour drying period passed, our stonemason went to work.

I didn't have a helicopter to work with, and I'll admit to a certain amount of frustration with trying to photograph this project at ground level. Nonetheless, closer looks at the components of the installation offer evidence of the upscale, refined impression we were asked to make for the developers and their property despite its dusty, flatland setting. (Note, by the way, the flagstones – stacked and secured with no visible mortar!)

OFF-ROAD ROCK

Pursuing our plan, we managed the transitions between pond levels by feathering out our stone walls. This tactic masked any sharp elevation changes across the relatively flat terrain.

The big challenge here was to set all this naturalistic rockwork without any visible mortar lines. The mason on the job – Charles Hetmer of Hetmer Contracting – was familiar with "chinking," a method passed to me by friend (and sometimes partner) David Tisherman of David Tisherman's Visuals in Manhattan Beach, Calif.

In this technique, stone is stacked with mortar on only the back three-fourths of the stacked surface, revealing the flagstones' cleft edges and fissures but no telltale mortar. Chinking just about quadruples the time involved in fitting and setting the stones, but the results are worth it for projects such as this.

By the time we finished, 20 tons of boulders and 50 tons of flagstone had been used in and around the waterfeature.

We detailed the pond's edges by using the coping to retain the soil rather than cover the top of the beam. And where retainment wasn't needed, we rolled back the beam to expose only a minimum amount of gunite and allow the landscape to push right up to water's edge. We then painted any exposed gunite a dark gray to camouflage it.

Inside the ponds, we used Thoroseal tinted a dark gray for waterproofing – and to achieve a natural look. There are few (if any) rock pools or lakes in the Dallas area, so we took our cue from the mud-bottomed local waterways – but without their characteristic murkiness. A dark gray Thoroseal with some black dye added for good measure gave us the look we wanted. Three coats later, the basins were good to go.

As a final touch, we set up low-voltage, underwater Hadco fixtures to shed light on the vertical stone surfaces. The idea here was not to burn holes in the rock, but rather to gently wash shimmering moonlight onto the stone. The signage is also lit from the water in a similar (but more illuminating) fashion.

AN EXCITING MIX

In many respects, design and installation of this waterfeature were fairly simple and called for nothing more than standard techniques once we were ready to go. But as work progressed on the project and the visual elements of grade, stone, water and landscaping began to come together, I had a sense that we were operating on a higher plane.

Naturally, there were those tense moments leading up to initializing the pumps and starting the waterfalls, but once the water started flowing and our watershape came to life amid the bleakness of the surrounding plain, I knew we'd done ourselves and the developers proud: Nature at its best – with a little help from Elite Concepts!

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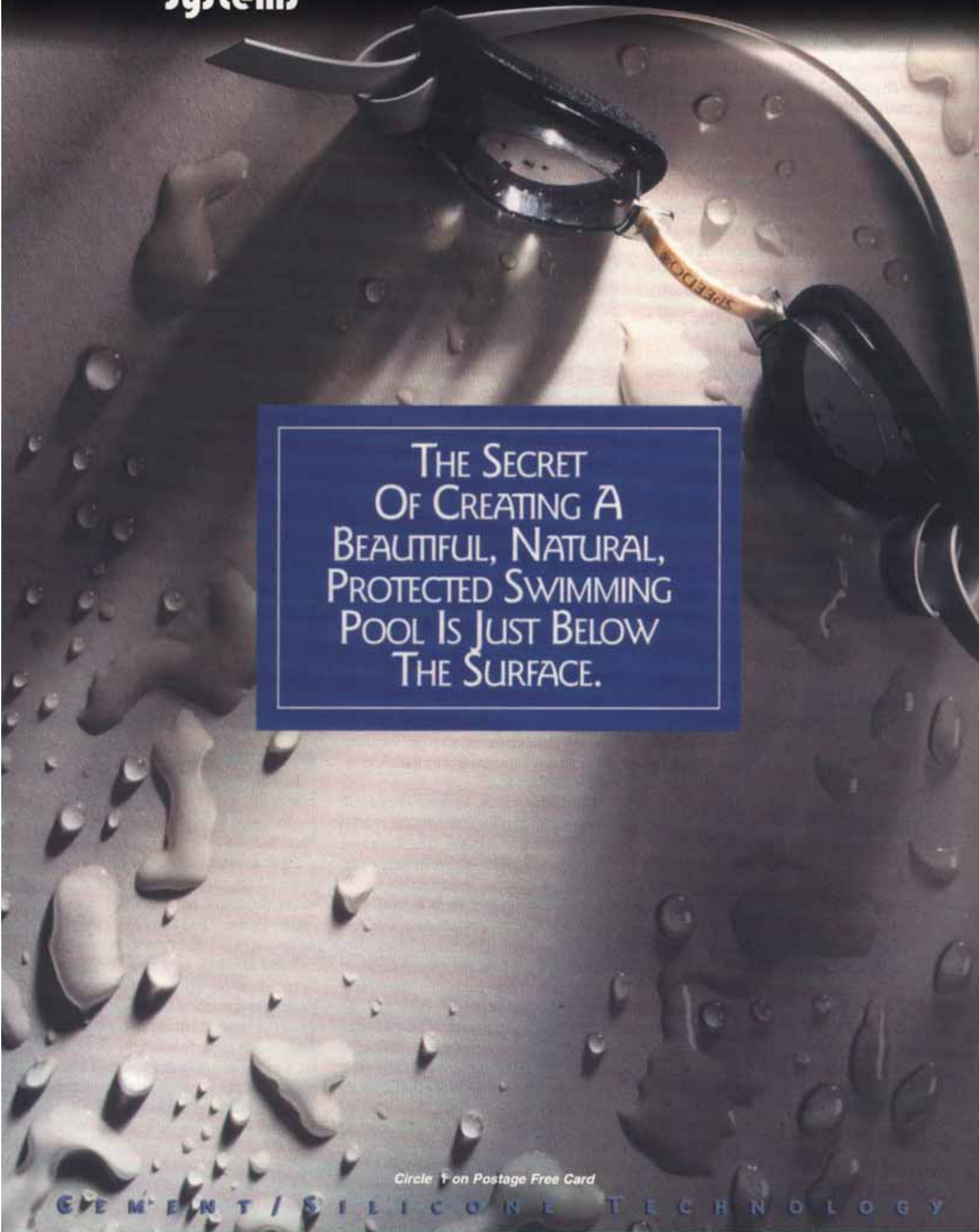

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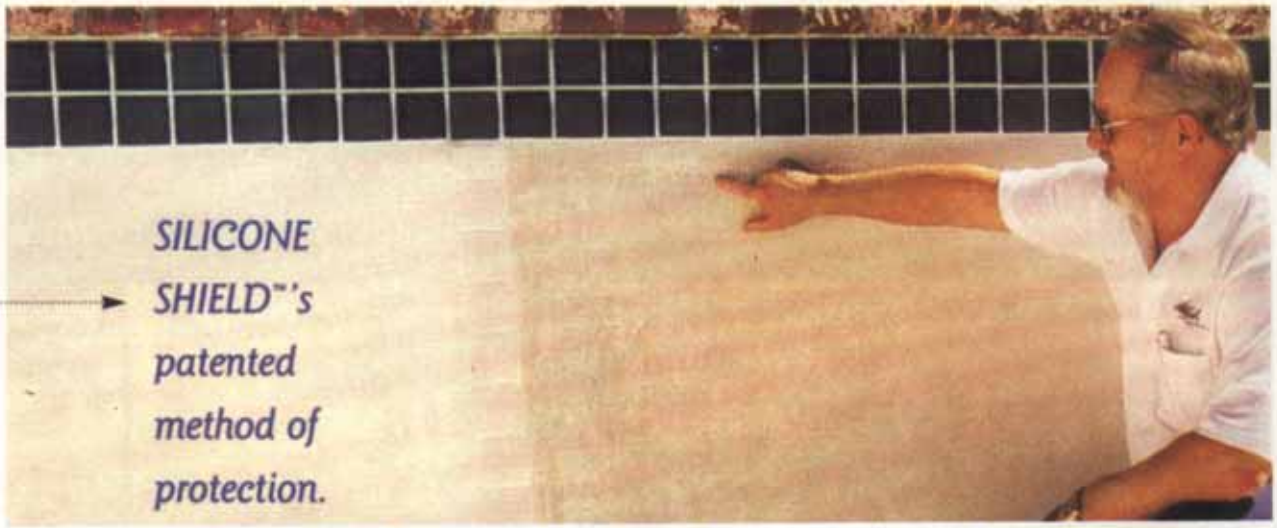

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As Good as it Looks?

Today's swimming pools have a great and wonderful tendency toward beauty, but the plain and unhappy fact, says Fred Hare, is that many of them are not as sound in design, engineering and construction as they should be – and this is particularly true when it comes to their hydraulics. To find out why, this engineer and educator asks a pointed question: 'Are your pools as good as they look?'

By Fred Hare

How far we've come since the days of the lazy L, the kidney and the rectangle!

During the more than 30 years I've been part of the pool industry, I've witnessed mind-boggling advances in the designs of swimming pools, spas and watershapes of all types. Especially in the past 10 years, the ideas, creativity and workmanship found in residential backyards far surpasses what we saw or even dreamed of 20 or 30 years ago. Back then, you'd have to go to a movie set or Las Vegas to see the exotic designs we are seeing today.

I'd even say that today's designers are turning backyard pool environments into an art form. We see water surfaces that vanish into surrounding vistas, fiberoptic lighting that accentuates free-form curves, waterfalls cascading from brilliant rock structures, fountains adding motion and sound, beach entries, swim jets and countless other innovations that have transformed the common backyard pool into waterparks and full-tilt family fun centers.

In some cases, these installations can literally take your breath away. I've been privileged to visit many of these aquatic wonders, and I'm sure I look silly with my mouth wide open, as though I'm Balboa seeing the Pacific Ocean for the first time.

And that awesome impression usually sticks – unless and until I visit the equipment pad, that is. It's another world "back there," and I catch myself looking from the pool to the pad and wondering how in the world the same contractor could be responsible for both.

UGLY DUCKLINGS

It's really too bad, because for all of the stunning beauty and considerable design talent brought to bear in making the sizzle, the steak is often sadly lacking.

Pumps scream because of poor plumbing configurations, excessive horsepower and improperly sized piping. I see valves stuck everywhere – valves to correct defects in sizing and cover for improper application and installation of pumps, filters, heaters and sanitizing systems. And all too often, I find filter pressures in excess of 25 psi, driving dirt right through the filter and back into the pool.

And this filter pressure isn't just an aesthetic or maintenance issue: Some of these tanks are just waiting for the sloppy replacement of a clamp, and if you've ever seen a filter tank blow, you know the sort of hazard I'm thinking about.

So there I stand, getting more depressed by the minute. As I do, it occurs to me that the contracting company has worked for weeks, or even months, building this beautiful creation and, as an afterthought, has thrown the equipment pad together just to get the whole thing going.

Is it because they've used 1-1/2- or 2-inch plumbing all their lives that they won't use 2-1/2-inch or 3-inch pipes – even if the manufacture of the pump recommends it? Is it because they were simply in a hurry, or because job costs had crept over budget? Or is it that they just don't know any better?

Don't get me wrong: There are many contractors who do take hydraulics, filtration, heating and sanitization of the pool as seriously as they do the design and construction of the pool itself. I see them in schools and seminars every year. Frankly, it's the ones that don't attend who are usually the ones who won't take the time to get things right or simply don't know any better. Theirs are the pools I get to visit the most, usually because of a problem with plumbing, sizing or installation.

I shake my head as I walk away from these projects, wondering how much these basic mistakes cost the watershaping industry every year – not just in terms of dollars, but in terms of reputation, growth and customer satisfaction. It's an ugly situation – and the saddest thing is that these problems shouldn't have arisen in the first place.

HOW TO KNOW?

That's right. The majority of the most troubling plumbing, sizing and installation mistakes can easily be remedied – although it's obviously far easier if you take care of them ahead of time rather than after the fact! All it takes to rise to the occasion is observance of some simple guidelines.

I don't intend this as criticism for every installer out there, but I do intend this exercise in determining how your hydraulic systems line up with a set of uniformly high standards as a test for everyone who designs, engineers and builds watershapes. The goal is simple: to help you avoid substandard circulation systems on all your future projects, no exceptions.

To see where you stand, read the five following questions and honestly select the option that best applies to the way you approach things. These aren't all "yes" or "no" kinds of issues, but the differences in answers are illuminating, as we'll see below.

1) *Does your company (or your sales staff) sell horsepower?*

- ❑ All the time
- ❑ Only to get the job
- ❑ Yes, it's a great sales tool
- ❑ Never

2) *Do you start up filters at pressures greater than 20 pounds?*

- ❑ About 75% of the time
- ❑ About half the time
- ❑ Almost never

It occurs to me that the contracting company has worked for weeks, or even months, building this beautiful creation and, as an afterthought, has thrown the equipment pad together just to get the whole thing going.

Getting a watershape like this one to perform at peak efficiency requires thought and care in setting up the circulation system — and observance of some basic principles of hydraulics.

A mess at the equipment pad is an all-too-common consequence of poor hydraulic planning. Each of those extra (and unnecessary) twists and turns puts a burden on the system, lowering efficiency and raising operational costs for what otherwise may be a beautiful installation.

3) *What size piping do you use in your pools?*

❑ We use 1-1/2-inch pipes
❑ We use 2-inch pipes
❑ We use both in combination

4) *Do you use the same pump for pool/spa filtration that you use for the spa jets?*

❑ If at all possible
❑ Once in a while
❑ Only on residential pools

5) *Do you supply your plumber with a plumbing schematic?*

❑ Yes
❑ No

How can answering this handful of simple questions tell you whether or not you're taking care of business on the equipment pad? Let me start by conceding that it can't, really, because there are so many variables at play in the range of systems installed these days. But your answers might just reveal a thing or two about your approach in these five very important areas.

FIVE HYDRAULIC KEYS

As you reflect on your answers and what they say about the way you do things, consider these specifics:

❑ **Selling horsepower:** If you or your people are selling horsepower, you're doing yourself and your customer a disservice. In fact, I'd like to stress here something I say to pool and spa professionals all the time: Bigger is not better when it comes to horsepower.

With the cost of energy going through the roof, we owe it to our customers to put the right size pump/motor combination on the pool. In a large part of the country, the difference between a 3/4-hp pump and a 2-hp pump is about $500 a year in operating cost on a pool operated eight hours a day, 365 days a year.

Please bear in mind that most 3/4-hp pumps on the market today can easily circulate a 30,000-gallon residential pool in eight hours and a 23,000-gallon commercial pool in six. So why on earth would you want to oversize the pump? When you go to the trouble of building a stunning backyard environment for your client, why spoil their positive experience by driving up their energy costs?

❑ **Overpowering filters:** A high initial filter pressure indicates you haven't done well in designing a hydraulic system. This pressure reading indicates the resistance of the system, which means a high reading here indicates high resistance – which is simply not good, because it can only go higher as the filter cycle wears on.

Filters work best at a starting pressure of 5 to 15 pounds. If yours start out at higher than 20 psi, it's time to rethink the way you're doing things. An oversized pump, undersized piping, too many fittings and poor plumbing configurations invite high pressure. The resulting flow through the filter is at a much higher initial velocity than the filter was designed to pass. This often results in poorer water clarity than your customer will accept – not to mention the fact that higher pressure will also shorten the life of the filter internals and the filter itself.

Of course, I could offer a host of other reasons why filter efficiency should be important to you, but let's focus on clarity. If you go to the trouble and the client goes to the expense of installing a beautiful exposed-aggregate finish or an underwater mosaic or any of the host of impressive visual features now available to designers, why cloud the water and obstruct the view?

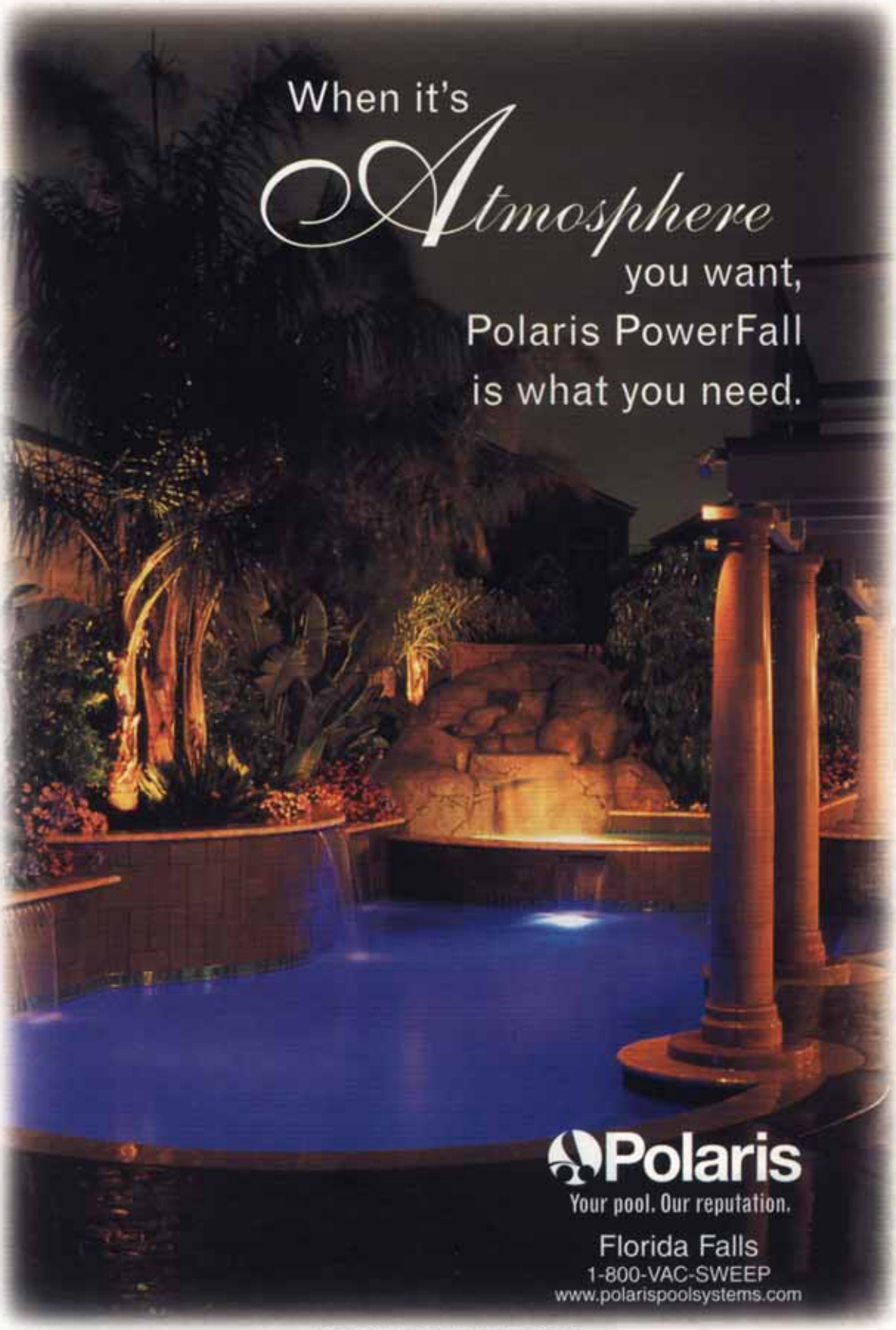
❑ **Sizing pipe:** The best flow through a 1-1/2-inch, schedule-40 PVC pipe is approximately 45 gallons per minute. At full flow, pipes of this size can handle nothing more on residential pools than 22,000 gallons or, on commercial pools, more than 16,000 gallons. Given those limitations, the biggest pump you should use on 1-1/2-inch plumbing is a full-rated 1/2-hp pump or an up-rated 3/4-hp pump – although you can fudge upward to 3/4-hp full-rated pump or a 1-hp up-rated pump if the equipment pad is within 25 feet of the pool.

The best flow through a 2-inch, schedule 40 PVC pipe is approximately 75 gpm, which is suitable for use on residential pools up to 36,000 gallons and commercial pools up to 27,000 gallons. The biggest pump you should use on 2-inch piping is a 1-hp full-rated model, or a 1-1/2-hp up-rated pump. Anything over that will actually decrease your flow due to excessive friction in the pipe due to high velocity.

Again, just as with an oversized pump, undersized plumbing wastes energy and doesn't lend itself to optimum circulation and filtration.

❑ **Double duty:** If your residential pool is under 22,000 gallons and there are only four jets in the spa, you might get by

Continued on page 40



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Continued from page 38

using just one 3/4-hp pump for both the pool and spa – provided everything is set up just right. The drawback is a big one: When you're heating the spa, you're heating it through the spa jets, which means you must turn off the air to the jets or the heat-up time will be much longer, wasting energy.

Generally, however, spas have more than four jets these days, and it takes a larger single pump – a 2- or 3-hp unit – to power the system. Because the spa is only operated an average of five percent of the time, 95% of the time you waste energy by using so large a pump on the circulation system, for which you might have otherwise have gotten by with a 3/4-hp pump.

Some installers try to get around this obvious problem by plumbing the spa with 2-inch pipes and the pool with 1-1/2-inch plumbing. The problem here is that when the big pump is switched from the spa jets to the pool, the pressure on the filter goes way up. The big question at this point is, why not use two pumps to get the job done the right way?

❑ **Plumbing with a plan:** Some of the best plumbing jobs I've ever seen are in commercial equipment rooms installed by a true "craftsmen" – a word you don't associate all that often with residential equipment pads. These accomplished professionals have two things going for them: an engineering plumbing plan and the desire to create a work of art.

If contractors would take the time to provide their plumbers with a schematic showing pipe sizing and the desired layout, I have the suspicion that hydraulic problems would become a thing of the past. And why this doesn't happen is a mystery to me, because a proper plumbing arrangement plays the most critical role in making a watershape perform as advertised.

We can change pumps, filters and some bits of piping at the pad, but if the piping under the ground and in the walls is not the right size or is routed incorrectly, it's too late. A plumbing schematic changes all that: It enables everyone involved with the project – and especially the plumber – to know where the plumbing runs go, how they connect and where and what the pipe sizing should be.

Drawing this schematic is also a great mental exercise: Quite simply, doing so forces you to think through the overall layout and the hydraulic principles at work.

FOOD FOR THOUGHT

Absolutely, these are painfully fundamental issues, and one might think that designers, engineers and builders would be way past these basics – and indeed, many are. But there are many others who do not take these five principles of hydraulic design into consideration when they do their work. And frankly, some of the worst offenders are among those breaking new ground when it comes to creativity and design inspiration.

My advice is simple: To make your visual masterpieces into hydraulic ones as well, take time to grace your installations with a circulation system worthy of their good looks. When you do, you can walk away knowing that the beauty you've given your customer is much more than skin deep!

Many commercial installations (such as this one) are set up with the aid of a detailed plumbing plan that's part of the project from the outset rather than an afterthought on the equipment pad. This sort of precision impresses owners — and de- lights maintenance crews.

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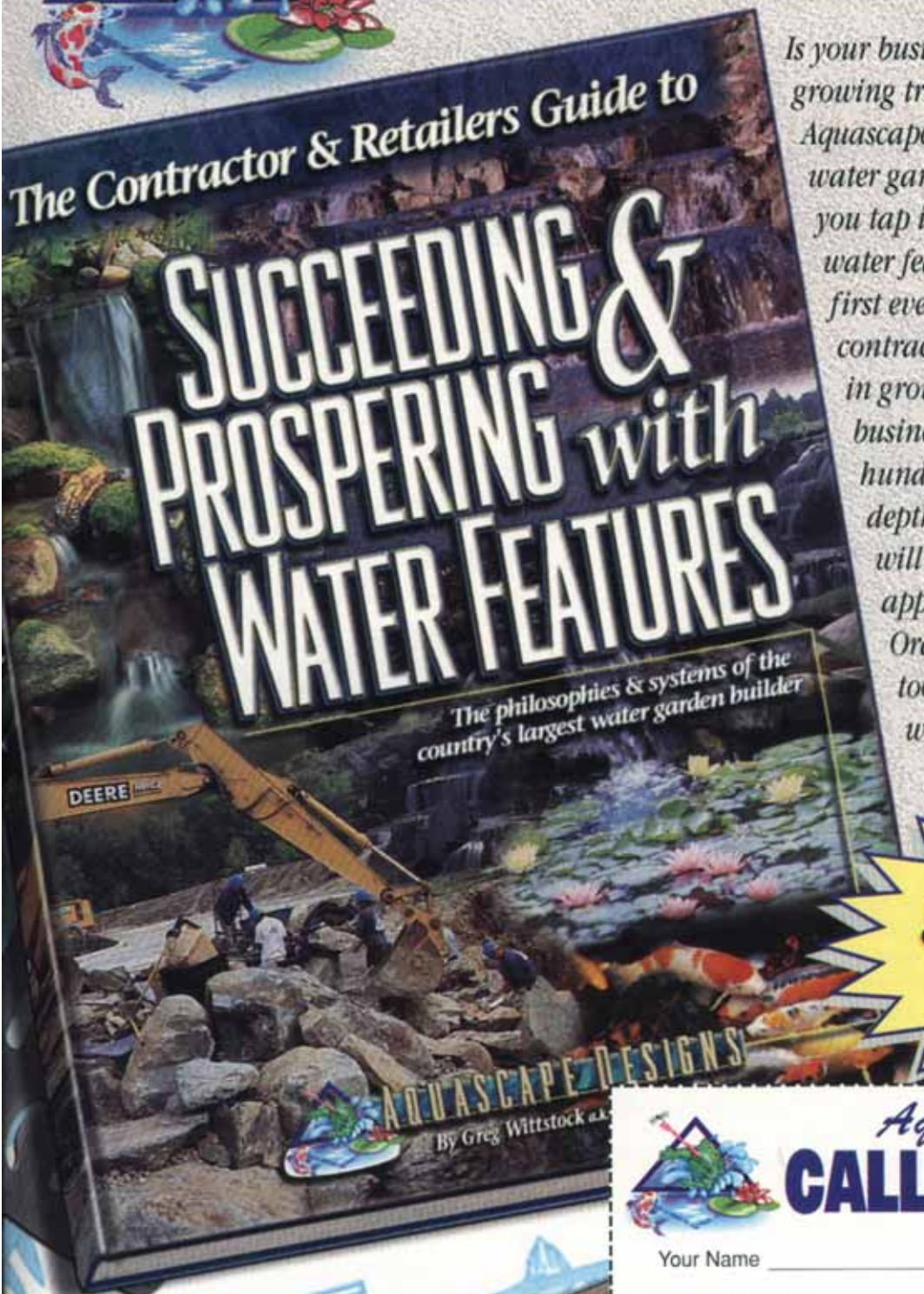

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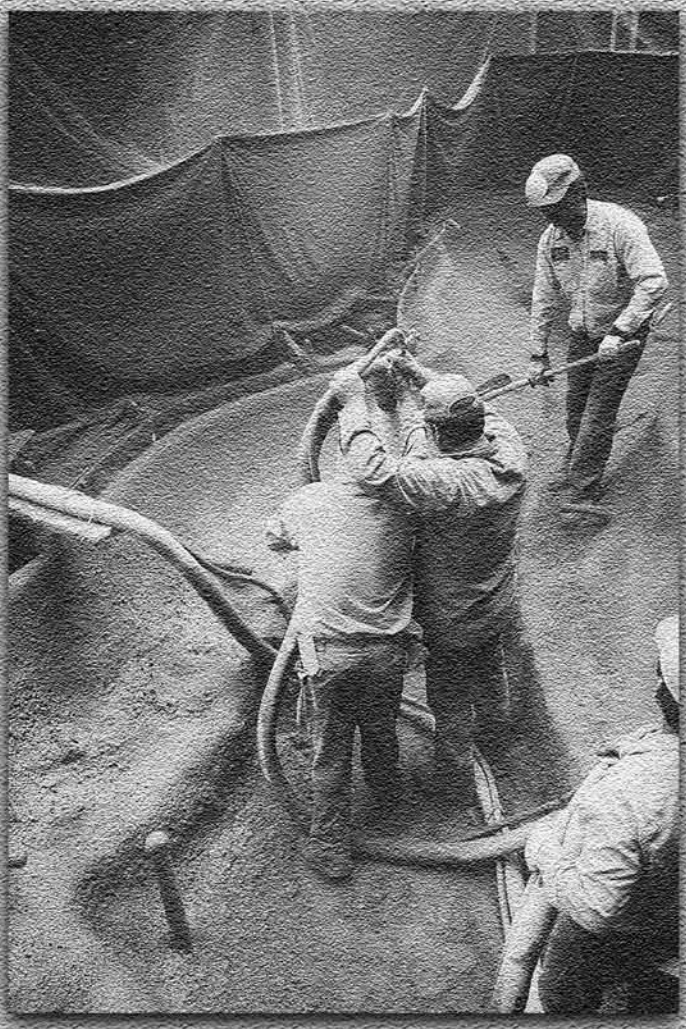
Finding the Cure

Pneumatically applied concrete – better known to all the world as 'shotcrete' or 'gunite' – is so pervasive in watershape construction and so structurally dependable in most cases that a great many builders forget one of the primary steps in its application: proper curing. The result, says consultant Curt Straub, is a rash of hairline cracking in plaster surfaces that might easily be avoided.

By Curt Straub



As a former shotcrete builder myself, I believe you can't find a better method of building a pool, spa, pond or waterfeature of any type than by using pneumatically placed concrete, or "shotcrete." The method and the material offer the designer and builder great and often incredible design flexibility, and the resulting watershapes will last several lifetimes.

Given that the vast majority of watershapers around the world depend on shotcrete as their primary construction material, it only makes sense that we should know as much as possible about putting this amazing product to its best possible use. Unfortunately, however, that's not always the case.

There's little argument that the process of shotcrete construction is laborious and demanding, that it requires a major logistical and physical effort and that fairly precise timing is necessary. For all the focus it takes to apply it and shape it just so, however, I have observed a couple of critical steps many builders overlook in the press of getting the job done – the most important of them being the proper curing of the concrete shell.

NO EXCUSES

The contractor is the expert – the owner's hired gun, as it were. As the professional called in to do the work, he or she is wholly responsible for the installation of a quality product, meaning the builder is responsible for properly completing each and every step of the construction process – and that includes curing the shell.

If everyone were doing just what they're supposed to, we'd never hear the statement, "Shrinkage cracks occur naturally; that's just what concrete does." But we *do* hear it, time and time again.

The simple fact is that if you don't cure the shell, moisture exits the concrete too quickly, making the material lose mass and shrink. The result is unsightly cracks in the plaster finish, and this is not "just something that concrete does." It is, in fact, entirely the result of skipping a key step in the application process. And the sad thing is that curing involves nothing more than keeping the shell moist for a few days. That's all there is to it.

As you can probably tell, this is a pet peeve of mine. I've said over and over that, as an industry, we need to step up and take responsibility for what we do through our carelessness. It's simply not good enough to blame shrinkage cracks on Mother Nature. Nor is it sufficient to leave the curing process up to the customer. Look at it this way: When highways and bridge decks are being built, taxpayers don't stay on site wetting down the concrete. That task belongs to the contractor, not the owner.

Pool builders have exactly that same obligation in their performance of construction tasks. And all it takes during hot and dry periods of the year is wetting the surface. There *are* other ways to do it, and there obviously *are* local climatic conditions that come into play – including temperature, humidity, winds and more – that may force you to adjust the process a bit.

But we're not talking about a great deal of technical sophistication here. In fact, I'd say that all of this really just boils down to plain old common sense: One way or another, you've got to keep the freshly placed shotcrete wet!

KEEPING IT WET

Basically, "wetting" means keeping the concrete moist enough so that the mix doesn't set too quickly. In other words, you're trying to slow down the hydration and evaporation processes.

In essence, when the concrete sets (or dries), moisture exits the mix and, as was mentioned above, the mass of the concrete is reduced. When this happens too quickly, cracks

Much Ado About Something

The importance of curing is real. In fact, the necessity for taking all the time needed for effective curing has long been recognized by people who study concrete in all its forms. As the Portland Cement Assoc-iation's guidebook, *Design and Control of Concrete Mixtures*, clearly states, "Since all the desirable properties of concrete are improved by curing, the curing period should be as long as practical."

Proper protection of freshly placed concrete must occur during cold-weather shotcreting as well as hot-weather shotcreting and is paramount to providing quality control and assurance. The American Concrete Institute's *Specifi-cation for Shotcrete* (ACI 506.2-95) is clear on this point: "Cure immediately after finishing," it says.

Beyond that, the ACI offers additional guidance:

❑ Cure shotcrete continuously by maintaining it in a moist condition for seven days or until the specified strength is attained or until succeeding shotcrete layers are placed.

❑ Cure by one of the following methods: ponding, continuous sprinkling or covering with impervious sheet material, moist canvas or burlap.

❑ Natural curing shall be permitted if the ambient relative humidity is maintained above 95 percent.

– C.S.

form in the shell and likely will transfer to the plaster surface you'll apply later.

The simplest method for moisture curing is to set up oscillating sprinklers on a tripod, aligned in such a way that water is broadcast over the entire surface of the shell. Another method is to place a drip/weep hose around the full circumference of the bond beam, then allow the water to run down the walls.

(You can use a submersible pump with either method. Once you have a reserve water supply in the bowl of the shell, you can recirculate and conserve the water with ease.)

However you choose to dispense the water, it's absolutely imperative that the entire surface receives water for a *minimum* of three days, and preferably seven days. This will achieve complete hydration and dramatically reduce any drying shrinkage.

And if you've forgotten what drying shrinkage looks like, take a look at the larger masses of concrete in shells, particularly around steps and benches. Because there's more concrete in these areas, the effects of improper curing are seen there to a greater degree, hence the common problem of shrinkage cracks around steps.

The ideal time to start moisture curing and avoid shrinkage cracks is as soon possible after shooting and finishing. Your timing here is definitely important, but you don't have to be over-zealous about this and dilute the shotcrete at the surface of the shell. Basically, you want to slow the hydration/drying process to allow the concrete to achieve its greatest strength. Your purpose is keeping the concrete damp, not flooding the shell.

HOT AND COLD

In some cases, shrinkage cracking is less a product of skipping the curing step than it is of trying to apply shotcrete under adverse conditions – that is, conditions hostile to proper curing.

To be sure, placing a shell in weather that is either too hot or too cold will have effects similar to those you see when you ignore curing altogether. Fortunately, researchers at the American Concrete Institute offer advice on these issues.

❑ *Hot weather shotcreting*: Do not apply shotcrete when the material temperature is above 90 degrees Fahrenheit for wet mix shotcrete or 100 degrees for the dry mix often referred to as *gunite*. (See the sidebar on this page to learn more about the terms "shotcrete" and "gunite.") It's important to note that ACI is referring here to *material* temperature rather than *ambient* temperature. Fortunately, it's somewhat easier to control the temperature of the concrete than it is to master the weather.

❑ *Cold weather shotcreting:* Shooting may proceed when *ambient* temperature is 40 degrees Fahrenheit and rising, or 50 degrees and rising for latex-modified shotcrete. Shooting should *not* proceed, says ACI, when ambient temperature is 40 degrees and falling.

❑ *Material temperature:* At time of application, the material temperature of the shotcrete should not be less than 50 degrees or more than 90 degrees. And under no circumstances, says ACI, should shotcrete be applied to frozen surfaces.

❑ *Protective measures:* There are many methods of protecting the shell after it has been shot during cold weather. One of the simplest and most effective, according to ACI, is placing a heater in the deep end then covering the pool with a vinyl air structure. (Sheet vinyl and lumber also work well in fabricating an enclosure that will maintain air temperatures in the desired 50 to 70 degree range.)

ACI advises that you should expect to lose moisture during this process and that you should anticipate dampening the surface even though the humidity in any enclosure may increase. The enclosure must also be properly ventilated, depending on the type of fuel used by the heater. Exposing freshly placed shotcrete to exhaust gases, for example, may cause dusting as a result of rapid carbonation. Under such circumstances, it may be beneficial to pressure wash the surface prior to applying a finish.

WE BUILD TO LAST

Most of the concrete pools I evaluate in my consulting business will probably outlast us all. But I have also seen pools in which the concrete was abused after application. It simply amazes me to think about all the effort that goes into excavating, forming, placing the steel, installing the plumbing, doing the electrical work and shooting the shell – and then to see that the builder has cut a corner or two and exposed the shell to conditions that will do it harm.

Along the way, it also exposes the builder to the possibility of expensive litigation.

As covered here, this failure on the part

Continued on page 46

In Concrete Terms

I've heard many explanations about the differences between shotcrete and gunite, the latter being a term that's commonly been used in the pool industry for the better part of the 20th Century.

Unfortunately, most of the definitions offered up in the pool industry are wrong, at least according to the American Concrete Institute. Paraphrasing a bit, here's the way the ACI breaks it all down:

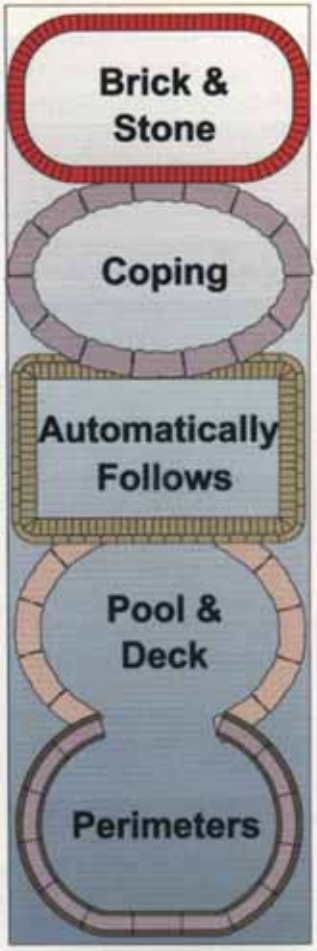
• *Shotcrete* is the term used to describe all forms of "pneumatically placed concrete." In other words, it's *all* shotcrete, no matter whether the water is mixed with the concrete at the nozzle or if it comes out as a wet mix. The two methods are appropriately known as the "dry-mix method" and the "wet-mix method."

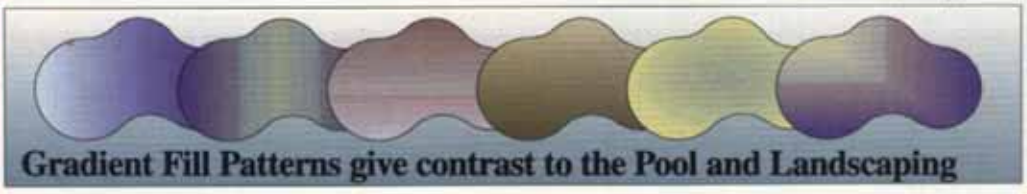
• *Gunite*, perhaps the most familiar term used to describe pneumatically placed concrete, has no official meaning in ACI documentation. The term first emerged as a trade name coined in the 1930s by the Allentown Gun Company of Allentown, Pa. It was used to describe the company's proprietary method for applying pneumatically placed concrete.

One of the first applications of "Gunite" was in repairing airstrips damaged in battle during World War II. As time passed and Allentown Gun's method became popular for placing swimming pool shells, the term caught on as a generic name for the process of applying a material that is more properly called shotcrete.

– C.S.

PoolDraw 5 *Draw like an Artist...*





Gradient Fill Patterns give contrast to the Pool and Landscaping

Estimate like an Accountant ...

Drawing objects like pool panels, equipment, and pipe contain information which is automatically sent to an Excel spreadsheet. From there, it can be imported into PoolOffice for complete Estimating and Job Management.

PO ID	SKU	Manufacturer	Description	Units	Quantity	Lb	Unit Cost	Total Cost
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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Continued from page 44

of any builder is inexcusable. In fact, it probably takes more time to pull a permit than it does to set up a curing system that really works. And if the liability issues aren't enough to motivate better curing practices, consider the fact that you sacrifice as much as 50% of the strength of the mix design through improper curing.

No matter what the weather conditions, the builder is responsible for the structure during the entire course of construction and on into the warranty period. In our litigious society, contractors who fall short in any way should expect to defend themselves in a courtroom if they are not doing the job – the *whole* job – according to standards set forth not by the pool industry, but rather by ACI and the reinforced-concrete industry.

The effort required to address this issue is minimal, and I can't see it being worth going to court or even having to answer the same question over and over again: "What's up with all those little cracks?"

A Good Mix

Wet-mix shotcrete has caught in recent years for many reasons, not the least of which is the fact that by mixing the water and cement before it's pumped out of the nozzle, the nozzleman can focus a greater degree of attention on forming the shell. In addition, wet-mix shotcrete can contain some coarse aggregate, which adds to its strength.

Because it has a higher water content, however, wet-mix shotcrete presents a greater potential for shrinkage – a potential you can counterbalance by proper curing and through use of water-reducing admixtures as part of the mix.

These admixtures help maintain a low water-to-cement ratio. As an example of what this means, here's a recipe I recommend for wet-mix shotcrete for many jobs in the Midwest:

Material	Batch	Quantity per Cubic Yard
Cement		705 lb
Class C fly ash		100 lb
Mixing water	320 lb	
Sand	1,970 lb	
Pea Gravel	850 lb	
Water-reducing admixture		28 fl oz
Air-entraining admixture		enough to produce 6-8% air
Polypropylene fibers	3 lb	

– C.S.

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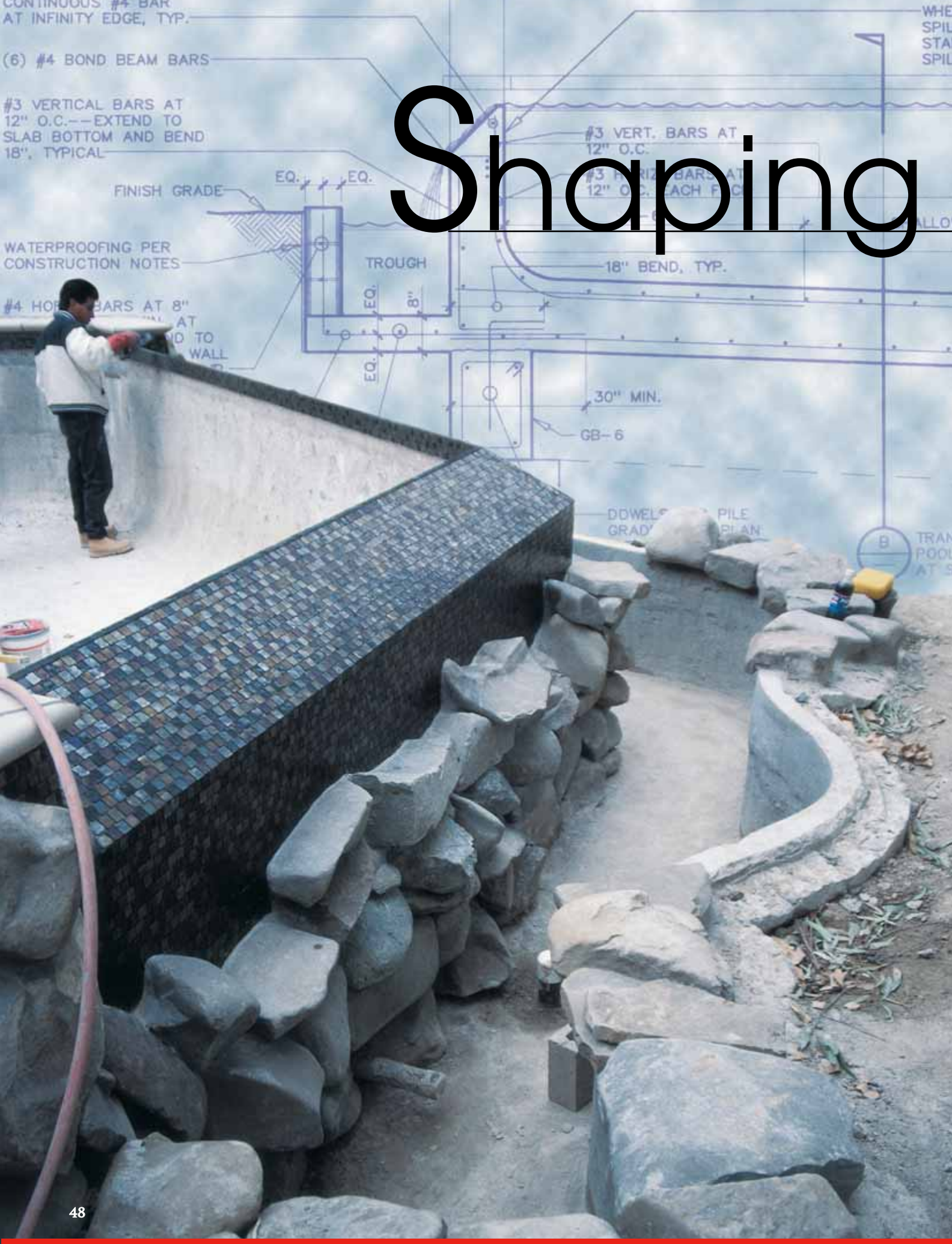
Shaping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SLAB BOTTOM AND BEND
18", TYPICAL
FINISH GRADE
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EQ.
WATERPROOFING PER
CONSTRUCTION NOTES
TROUGH
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12" O.C.
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Perfection

Why spend tens of thousands of dollars for a freeway-strong substructure if you're not going to put a beautifully designed and well-constructed pool on top of all that stabilizing steel and concrete? In this second article detailing the evolution of a spectacular installation on a fragile hillside, builder/designer David Tisherman describes what it takes to craft a shell worthy of so spectacular a setting.

By David Tisherman

When I talk with prospective customers about hillside installations, more often than not I'll find myself saying "A good foundation deserves a great pool" at some point during our conversations.

In fact, I view all of my pools as works of art, whether they're installed on a hillside or on flat land. The design can be a simple rectangle (which in my opinion are some of the most beautiful pools built) or an elaborate oceanscape with all sorts of bells and whistles. Regardless of location, style or complexity, I build my pools with first-rate foundations engineered for the specific soil conditions, and I give my clients the best pool I possibly can.

As I explained in the first part of this series (see "Integrity Below Grade" in the February 1999 issue), on this project we set up a massive substructure while replacing a pool that had failed because of severe soil instability. In this article, we'll cover what was involved in forming, caging, plumbing and guniting with the same sort of above-standard construction principles we applied to the substructure of piles and grade beams.

Some might question whether this sort of high-end, upgraded construction is necessarily the way to go. I'd argue that it is, on both practical and philosophical terms: I want my installations to look good when I'm done, and I also want them to last for decades, perhaps even centuries to come. This is the only way I feel comfortable doing things, so that's the only way I do them, each and every time I put my stamp on a pool, spa or waterfeature.

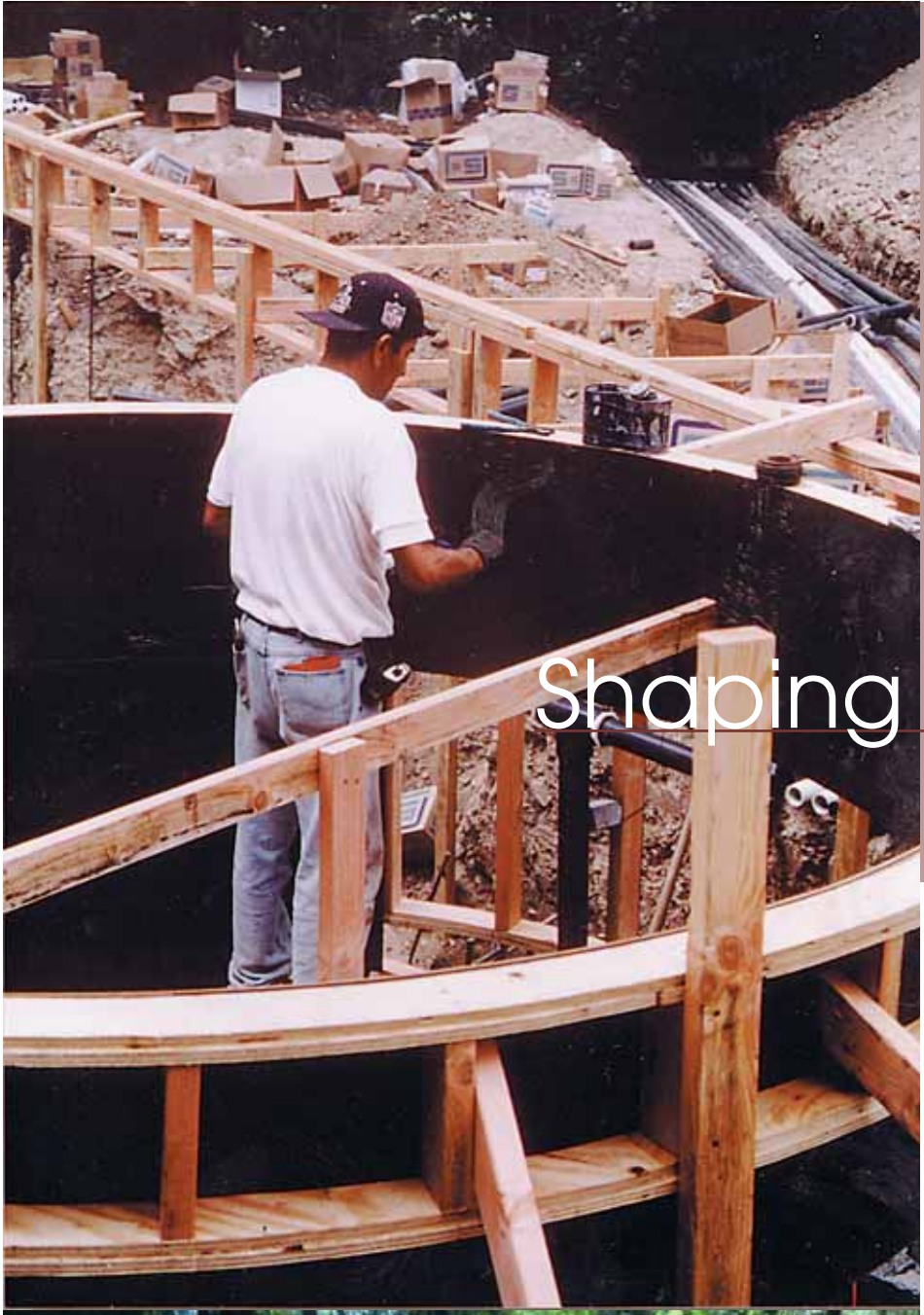
Setting the Forms

Before we began setting up forms for the shell, we backfilled around and between the grade beams knowing that the soil would act as no more than a form for the gunite we'd eventually apply. In fact, the soil has no structural bearing at all: Everything above will be anchored and supported solely by the beams and piles.

In forming, we use only two-by-fours in setting the dimensions, with kickers every 24 inches to keep the forms from moving. Sticking with our principles of high-grade construction, we use no one-by-threes or bender board in our forms; they are simply too flexible to ensure our tight tolerances.

This is a critical construction step: To me, in fact, the second biggest error people consistently make in building pools is failing to adhere to proper dimensions and geometry in laying out pools. (The biggest, by the way, is failing to understand a site's soil conditions.) As a result of accepting "close enough" as a standard, radiuses are wrong, shells are out of square – and these mistakes are only amplified when the forms swell, contort and move as the other construction phases continue.

We focus on complete precision, strength and stability at this stage: We know that the forms determine the actual dimensions of the vessel – that is, the thickness and positioning of the walls and beams – so we work to tolerances of just plus or minus 1/16th of an inch. Once the framework is up, we line it entirely with tempered Masonite, which makes stripping the forms easy.



We formed the spa using plywood we'd cut into two radiuses to ensure the exact dimensions. And because we knew we'd be working with a precast coping that had to align perfectly on both the inside and outside edges, we tightened our tolerances for the spa-wall dimensions to plus or minus 1/32nd of an inch.

What you see here is a 10-1/2-foot diameter that is absolutely dead on. You also can see the tempered Masonite we use for ease of stripping.

Shaping the **Spa**

Along with the substructure for the pool and spa, we also set up a cantilevered extension of the grade-beam system between the spa and the house to support a structural deck. As with the grade beams for the rest of the project, these were poured in place with (minimum) 3,000-psi concrete.

We used this approach at our engineer's recommendation to avoid any problems related to a hinging effect or any ground movement. As a result, the deck sits over its own pile and grade beams cantilevered to the substructure for the pool and spa – and we have no concern at all about cracks in this critical portion of the overall installation.

The pool, spa and structural deck are in turn isolated from surrounding deckwork by expansion joints that will allow the deck to move (if it moves at all!) independent of the pool, thus preventing any cracking of the pool. And we leave nothing to chance: The location of all the joints was carefully planned in consultation with our engineer long before we started building the deck.

Laying the Structural **Deck**

Within the Walls and Floors

With the pool formed and the steel in place, we moved on to plumbing. Everything is schedule 80, both white and gray, to a maximum of 2-1/2 inches. All the fittings are schedule 80 as well (A). I insist on this upgraded piping to gain the advantages of schedule 80's superior strength and durability compared to the usual schedule 40 piping used in most pools. It raises costs considerably (as much as four to five times), but I believe what you gain in reliability over the life of the pool makes it worth every penny.

There are five return lines, a separate pump system for the water effects in the spa and a separate system for the vanishing edge. We installed split main drains to avoid any chance of suction entrapment. We also set up three hydrostatic relief valves in the pool. Given the weight of the shell, popping is unlikely – but I never take chances.

A lot of that weight is inside the shell, where we tied nearly nine tons of steel, including a double mat of #5 steel rebar in the floor (B). The verticals are all #5s with #3s at three inches on center. Note the six-bar bond beam: I always treat walls as though they were to be free-standing and therefore must withstand lateral pressure of 87 psi. I've seen pools built with three bars in the beam and others with four, but I go for strength and rigidity in the face of expansive soils and won't compromise inside my bond beams.

All walls are 12 inches thick rather than the standard 6 inches, and the floor is 10 inches thick. Just for the pool, we shot approximately 140 tons of 3,000 psi gunite (C).


A


B


C

Stepwise Certainty

A brief note on steps:

Many pool contractors use rebound or overspray to form the steps; after all, they aren't a structural part of the pool in most installations – and I figure this saves between $200 and $1,000 on most jobs.

By contrast, we build the steps so that they are a structural part of the pool: All of the rebound is removed, the steps are formed with steel and shot under pressure, just like the rest of the shell. It's another step I take to build the best pool I possibly can.

– D.T.

Working on Surfaces

With the major structural components of the pool in place, we began working on many of the finish elements including the decks, the tile and rock on the vanishing edge – not to mention the tile in the spa and the barbecue area.

The decks are Jerusalem stone, a type of limestone; each piece has been tumbled to soften the edges, which adds considerably to the cost but which also enhances the warm appearance of the decking. The upper edge of the pool is finished with a precast, dry-cast coping, while the spa will be lined with 1-inch-square glass tiles and its radiuses tiled with glass quarter rounds.

Isolating the Decking

As mentioned previously, only part of the project's deckwork is structural. That meant we had to isolate much of the deckwork from the pool/spa structure – something we accomplished by setting foam in the narrow boundary area.

Once the deck sections were poured, we removed the foam, filled the void with mastic, then covered it before it dried with a silica sand that matched the grout used with the tile. That way, you can't see transitions. And because the deck was all laid out in the plans, we could pour in individual sections, confident that the expansion joints were right where they needed to be.

The deck itself is built for strength, complete with #3 rebar installed 12 inches on center in both directions. We also used a 6x6-10x10 welded wire fabric (wire mesh) that we tied to the top of the rebar. We then set small blocks beneath the rebar and wire fabric in order to raise it up a couple inches so that the reinforcing steel would be in the center of the concrete when it was poured. We then set footings around the entire deck perimeters to keep dirt from moving from beneath the deck, knowing that such movement could create voids and cause structural problems.

Building a deck this way adds considerably to the cost – as much as $1 or $1.50 or more per square foot – but the advantages in terms of strength and durability through years of trouble-free performance generally lead my customers to make the investment.

Continued on page 54

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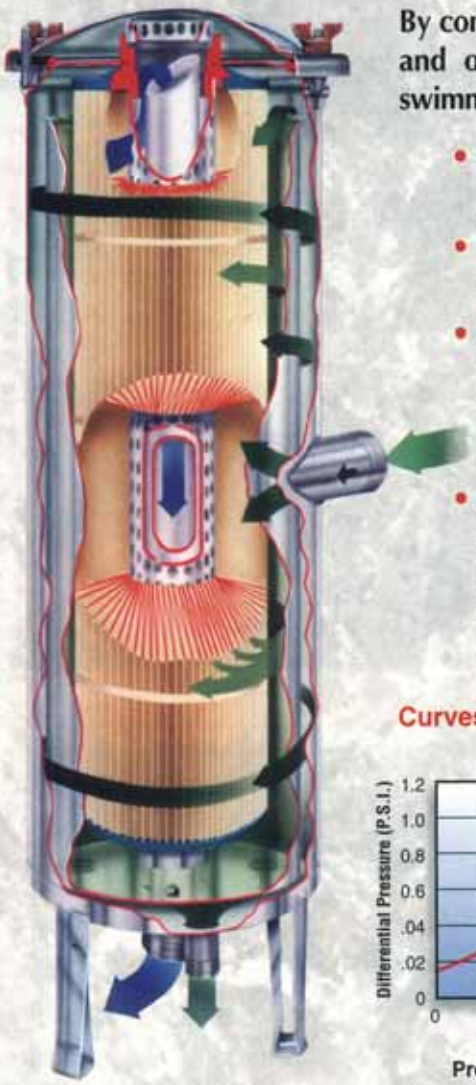

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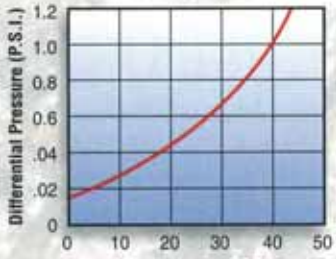
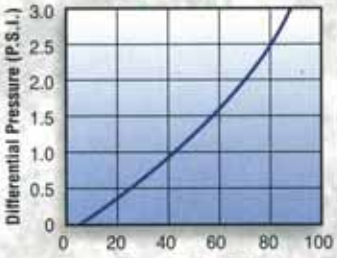


Pressure drop HUR-40



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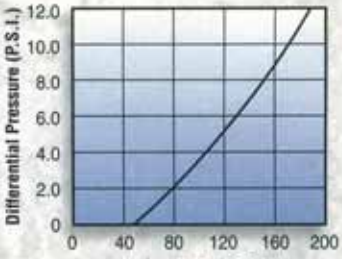

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A

B

Continued from page 52

Vanishing Edge as Waterfeature

C

The vanishing edge in this installation serves two distinct aesthetic functions. From the house (A), all you'll see is water falling over the edge, cutting a clean visual line at the water's surface. This is the classic vanishing-edge detail that has become so popular in the past ten years or so. By contrast, downslope from the pool, you'll see a beautiful waterfall flowing into a freeform reservoir (B).

There's a great detail here where tile meets stone: The glass tile beautifully reflects light under all sorts of conditions and in all sorts of ways and also provides a visual transition frown the dark plaster to the more rustic stones that cap the reservoir for the vanishing edge.

We also cut notches on the undersides of the stones we selected so they'd straddle the wall (C). This put the inside edge of the rockwork below the waterline, adding to the natural appearance of this free-form waterfeature. And all of this rustic splendor will be visible from a pathway that eventually will lead down past the pool to another small deck.

Continued on page 56

Investing in Quality

Ernest Hemingway said something that sums up my philosophy about a great many things – pool design, engineering and construction among them. He said, "Anything that was ever any good, you pay for."

Amen!

A number of the construction details highlighted in the accompanying text are built well beyond any standard accepted within the pool and spa industry. From two-by-four form construction and the amount of steel in the pool to the thickness of the walls and the schedule 80 plumbing, this pool is built to be the best pool that I can build, period, in terms both of durability and appearance.

A lot of people have asked me why I build this way. After all, it drives up the cost, requires more effort in working with engineers and inspectors, and involves me in much closer project management than might otherwise be the case. Frankly, I don't think I'm smart enough to do it any other way.

And let me be clear about something: I didn't build this particular pool so far beyond industry standards because the poor soil conditions left me no choice. Rather, I build all of my pools, spas and waterfeatures to the high standards my customers enable me to build them. Yes, if this pool had been located in more stable soil, the foundation would have a different design that was appropriate to the prevailing soil conditions – but the quality, strength and stability would be exactly the same.

I build every project to last, and I build the bent best pool I can every time, no exceptions. I rest easy at night knowing that when I leave a site, my pool will not crack, break or leak. I'm also proud that my pools don't deviate from the plans I draw, that they're shaped properly when it comes to details like steps and dam walls, that the coping and tile will stay put and that the pool will function well hydraulically.

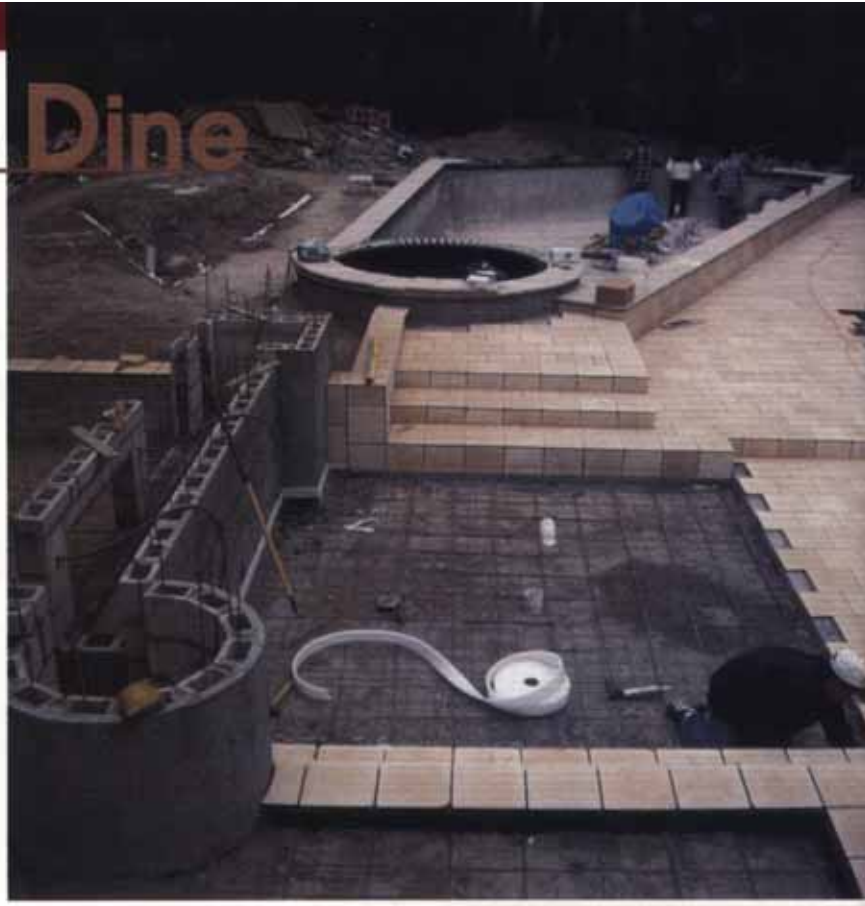
To my mind, it's the only way to go. When you build a pool to lesser standards, you always face the possibility that you'll need to defend your construction practices. Rather than go that route, I avoid worry and save my customer the anguish and expense of having to fix any mistakes later on. It's that simple.

Yes, I'm proud to say that my pools are good, very good. And I make no bones about the fact that I categorically refuse to do substandard or minimum anything. My customers know it, and they're willing to pay accordingly.

– D.T.

Continued from page 54

A Time to Dine



One of the driving ideas with this project was to set the pool back in the yard as a distinctly separate recreation area (and thereby avoid the cliché of having the pool confront you the second you walked outdoors). This also gave us space to design and install a dining and entertaining area.

As planned, the area closest to the house will have massive overhangs that will shade the large patio and lead the eye first to a dining area and barbecue off to one side of the pool before you take in the water-recreation sections of the yard.

The 19-foot barbecue seen under construction here will have an overhang coming directly out of it that will tie overhang, deck and barbecue together. The barbecue itself will have a wet bar, grilles, refrigerator, warming tray – the works.

And there are two levels here, one a rounded seating area you'll step up to and the other a lower seating area in the front that will act like a bar. Again, the barbecue will structurally isolated from the deck by way of foam-formed expansion joints. (You can see the roll of foam in the photograph.) Note also that before the deck is poured, all of the steel will be raised off the soil to ensure that the steel will be fully encased in gunite.

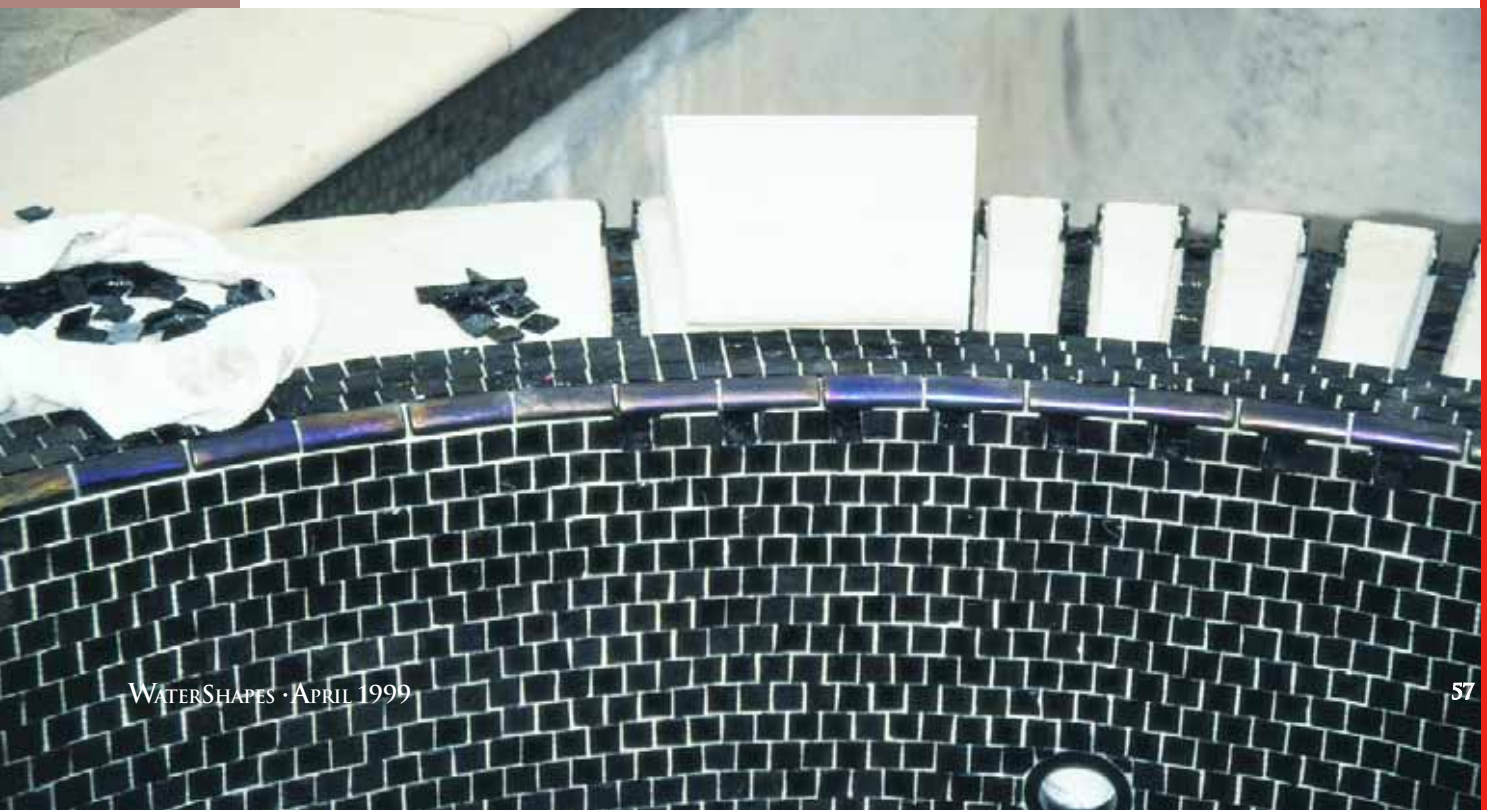
Spa Notches

One of the most arresting visual features of this project is the notched dam wall. We cut 21 notches in all, each lined with glass tile to create streams as the water cascades into the pool below.

The notches then will be solidly covered with the same precast, dry-cast coping stones used around the rest of the perimeter. We also installed a 3-inch tile detail between the water line and the rear of the coping on the inside of the spa, creating a smooth ledge between the bather and the coping. This is a detail I use often for the comfort of those sitting in the spa.

From inside the spa, the holes feeding the notches are located below the waterline, giving a momentary sense of wonder at where the spouts originate. Of all the special touches we've added to this pool spa complex, this is perhaps my favorite. I can only imagine how much satisfaction my customer will find in sharing this visual and auditory pleasure with his or her family and friends.

Next: all the finish details for this project, from installation of the tile and coping to setting up the equipment pad and completing the decking, barbecue and fountain.



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New system lowers pool water temperature

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Large fountain now available

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Catalog highlights variety of pond kits

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AQUASCAPE DESIGNS' "Professional Pond Kits" catalog features 24 full-color pages of pond kits, including components, bacteria/algae control, mechanical and biological filters, pumps, liners and underlayment, plumbing, installation tools and more. Also included in the catalog is an estimating sheet for waterfeature construction projects. **Aquascape Designs Inc.**, Batavia, IL.

Details on pool-building products

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MORTEX MFG. CO. offers its fourth edition catalog, a four-color, 72-page booklet detailing products for pool builders, including tools and accessories; repair kits; *Protect-A-Deck*; commercial cleaners; cantilever deck forms such as the *Keystone*, *Poly*, *French Curve*, *Commercial* and *Key-Lock* forms; aluminum *Key-lock* liner forms; designer forms and more. Also included in the catalog is a listing of Mortex marketing aids, from brochures to product samples. **Mortex Mfg. Co.**, Tucson, AZ.

Transformers and control panels available

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INTERMATIC's safety transformers and control panels are now also available in stainless-steel housings. The transformers are made using a unique, two-bobbin process with a safety shield between the two windings. Features include choice of enclosures, removable covers for easy installation, eight combination knockouts, field-interchangeable wiring compartments, auto reset overload protection and more. **Intermatic Inc.**, Spring Grove, IL.

Metering pumps made for reliability

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PULSAFEEDER's *Chem-Tech Series CTP* peristaltic metering pumps offer a new look in reliability and value. Key features include self-priming against pressures up to 125 psi; simple operation, including a priming push button; and automatic de-gassing, ideal for sodium hypochlorite or hydrogen peroxide applications. The *Series CTP* is available with three control options: *Series CTP-A* includes a percentage dial for reliable operation and adjustable feed rates in 30-second increments; *Series CTP-AE* is a fixed-rate economy model with an on-off dial for applications requiring constant feed and easy use; and *Series CTP-D* offers digital control from 10% to 100% up to 56 gpd. **Pulsafeeder, a Unit of Idex Corp.**, Punta Gorda, FL.

New heater offers digital control

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TELEDYNE LAARS/ JANDY PRODUCTS introduces the *Laars LX*, a revolutionary design that gives the user complete control over every facet of pool and spa heating. It starts with the digital control and user-friendly graphic interface – a sophisticated yet simple system that lets users perform complete diagnostics, set precise temperatures or switch from pool to spa mode at the touch of a button. In other words, there's no more guesswork to get the right temperature. New features include fan-assisted, controlled combustion that virtually eliminates downdraft and corrosion-resistant polymer headers designed for a greater flow capacity, resulting in longer heater life. **Teledyne Laars/Jandy Products**, Novato, CA.

CONCRETE PUMPS MADE TO BE RUGGED

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REED introduces its *B Series* trailer-mounted concrete pumps. The rugged pumps come in 10-, 20-, 30-, 45- and 50-yard per hour outputs with pressures up to 1,664 psi. All pumps feature open-loop hydraulic systems, solid-state pump-cycle control, large-capacity hydraulic and fuel tanks and 36-in.-long-stroke chromed concrete cylinders. The wide output and pressure ranges make the new *B series* pumps ideal for shotcrete, concrete pumping, pressure grouting, foundations, backfilling and other applications. The pumps are designed for ease of operation and service, and they incorporate Reed's *S-valve* and solid-state *Black Box* for smooth, fast pump cycling with *Rexroth Hydromatik* variable-displacement piston pumps. **Reed Mfg.**, Chino, CA.

FLOW SWITCH FEATURES JUST ONE MOVING PART

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AQUALARM announces the availability of a flow switch with unique capabilities: The *Series 300* switches have only one moving part and no screws, gaskets or springs. Immune to cavitation and chattering, the reliable straight-through flow scheme results in a non-clogging, self-cleaning action, while an integrally sealed 30-in. cable eliminates secondary connections in most installations. Developed around a standard 1-1/2-in. nipple, the switch is available in PVC, CPVC, brass and 316 stainless steel. The standard *#306* switches at 9 gpm, but flows of 40 gpm create only a 2-psi pressure drop. The *#306-LF* switches at 1 gpm with only a 2-psi drop at 25 gpm. The *#306-SLF* is a low-flow version identical to the *#306-LF* – except for switching at 1/2 gpm. **Aqualarm**, Chula Vista, CA.

New water purifying system available

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FOUNTAINHEAD TECHNOLOGIES introduces *Nature²*, a purifier system that uses a self-contained, replaceable cartridge and a special combination of minerals designed to naturally purify pool water. Inside the *Nature²* cartridge, a patented process serves to control bacteria, algae and viruses. The purifier also releases traces of completely natural, non-toxic minerals back into pools to prevent the growth of algae and bacteria. **Fountainhead Technolgies Inc.**, Fort Lauderdale, FL.

Catalog covers full line of fountain nozzles

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FLORIDA FALLS' "Fountain Nozzle & Water Feature" catalog #1 details a variety of fountain nozzles, including the *Comet*, *Cascade*, *Ballerina* and *Fan Jet* styles and more. Also available through the catalog are *Jumping Jets*, laser-like streams of water that shoot from place to place; these systems are equipped with a low voltage light that follows the stream and illuminates the spot where it lands. Also highlighted is *Jumping Jewels*, a system that shoots aerated balls of water straight up into the air at random or under program control, producing large and interestingly shaped globules of water that hover for a moment before falling back to the surface. **Florida Falls**, Spring Hills, FL.

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French term, *Systeme International.*

The Customary System includes such familiar terms as acres, ounces and pounds, feet and miles, quarts and gallons, pecks and bushels. We're comfortable with these old friends, and they serve us well in our everyday lives. For their part, SI units include all of the technical terms used worldwide – kilogram, meter, ampere, second, volt, ohm, watt, joule, coulomb, lumen, degrees Celsius and several others.

This is the modernized system that most people are referring to when they say "the metric system." In its current form, it is the most accurate and versatile system of measurements ever devised.

MEASURING UP

Before we use the tools the SI system provides us to define, describe, measure and compare all things electric, we need to back up and take a look at electricity itself.

Electricity is a lot like gravity: We know it's there, we can see and feel its effects, we can describe and label its various aspects – but we're really not sure what it is. Only in this century, in fact, have scientists recognized that there are four fundamental natural forces: gravity, electromagnetism, the strong nuclear force and the weak nuclear force. By calling them "fundamental forces," we can stop worrying so much about what causes them to exist and direct our efforts toward making them work for us.

Along those same lines, a closer look at electricity forces us to look at *atoms*, and inside the atoms to *electrons*.

Atoms are the smallest unit of any element, consisting mainly of empty space with a positively charged nucleus at the center and one or more negatively charged electrons orbiting some distance away.

All of the electrons are basically the same. In fact, the primary difference between one element and another is not that the electrons are different from each other; rather, it is a matter of the *number* of electrons it has that makes each element unique. An atom of the element hydrogen has one electron, for instance, while a chlorine atom has 17 electrons and an atom of lead has 82.

The smallest particles known to have an electrical charge, electrons are about as small as things get. If you could line up about 125,000,000 atoms – any atoms, it doesn't matter which ones – and pack them tightly, side by side, the group would measure about an inch long. Now, zoom in on a single one of those atoms until it appears to be the size of a football field: The nucleus would be the size of a small grape sitting on the 50-yard line and, as small as *that* grid might be, the grape/nucleus is about 2,000 times larger than the electrons orbiting around the stadium.

In other words, electrons are *small*, and they are very plentiful.

The SI unit "coulomb" provides us with a convenient way to get rid of some of the very large numbers involved. A coulomb is the basic unit of electric charge, containing 6.24 billion billion electrons. (It's much more impressive written out as 6,240,000,000,000,000,000.)

If you like the water flow/electric-current flow analogy, think of electrons as the equivalent to molecules of water and the coulomb as the equivalent of a gallon and then inject *time* into the equation: Gallons per minute is well understood for water flow; the analogous unit on the electrical side would be coulombs per second. Conveniently, that already has a name of its own: *ampere.* (Thank you, Andy.)

So when we talk about current flowing in a circuit, we're talking about the flow of electrons, and we measure the quantity of that flow in amperes, just as we use gallons per minute to describe water flow.

Why does the current flow? We'll tackle that in the next issue, and also learn more about Count Al, Georg and wee Jimmy Watt.

Jim McNicol is a technical consultant to the swimming pool, jetted bath and spa industries. He works from a base in Tustin, Calif.

Terms in Currency

By Jim McNicol

You don't have to be a football expert to sit in the stands on a nice fall day and watch the locals bash the visitors. But to get the most from the festivities, it helps to know the difference between a two-point conversion and an on-side kick. Being able to converse with your seatmates about the nickel defense and the single-wing offense surging back and forth before your eyes makes it even better. The jargon isn't just for the players and sportscasters.

Electricity is a bit like that. Most of us are users, and most of us know some of the jargon despite the fact we don't work at a power plant. We know that we have 12-*volt* batteries in our cars and that the porch light takes a 60-*watt* light bulb. And for many folks, that's enough.

I believe, however, that those of us who work with things electric on a larger scale can benefit from knowing a little more. And I find that many people gain a better understanding of even the most technical concepts when they are given some background information on the bits and pieces – the jargon that makes it all happen.

Name Games

Four of the biggest bits and pieces in electricity are *volt*, *ampere*, *ohm* and *watt*. Take a moment and just look at those four words: If they weren't familiar to us on some level, they might appear to be made up. Play words. In fact, each is derived from the name of a person – and it's quite a group:

❑ **Count Alessandro Guiseppe Antonio Anastasio Volta** (1745-1827). An Italian physicist, he's famous for his work with static electricity and various means of storing electric charges. Along the way, he invented the battery.

❑ **Andre Marie Ampere** (1775-1836). A French physicist and mathematician, he was known primarily for his contributions to electrodynamics and his research into the relationship between electricity and magnetism. He formulated the basic law of electromagnetism, commonly called *Ampere's Law*.

❑ **Georg Simon Ohm** (1787-1854). A German physicist, his studies of electric current led to the formulation of *Ohm's Law*, which defines the mathematical relationships between the various elements of current flow.

❑ **James Watt** (1736-1819). A Scottish inventor, he had absolutely nothing to do with electricity. He was, however, a mechanical genius responsible for improving the steam engines of his time and had a significant role in the industrialization of the world.

Over the years, various scientific and government committees have honored these men by assigning their names to units of measurement. In the United States, we use two major systems of measurement, side by side: the U.S. Customary System, which is based upon the British Imperial System; and the International System of Units, referred to as "SI," from the

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