

Inside: Brian Van Bower on Moving Water

WATER SHAPES

Design • Engineering • Construction

Volume 2
Number 1
January 2000
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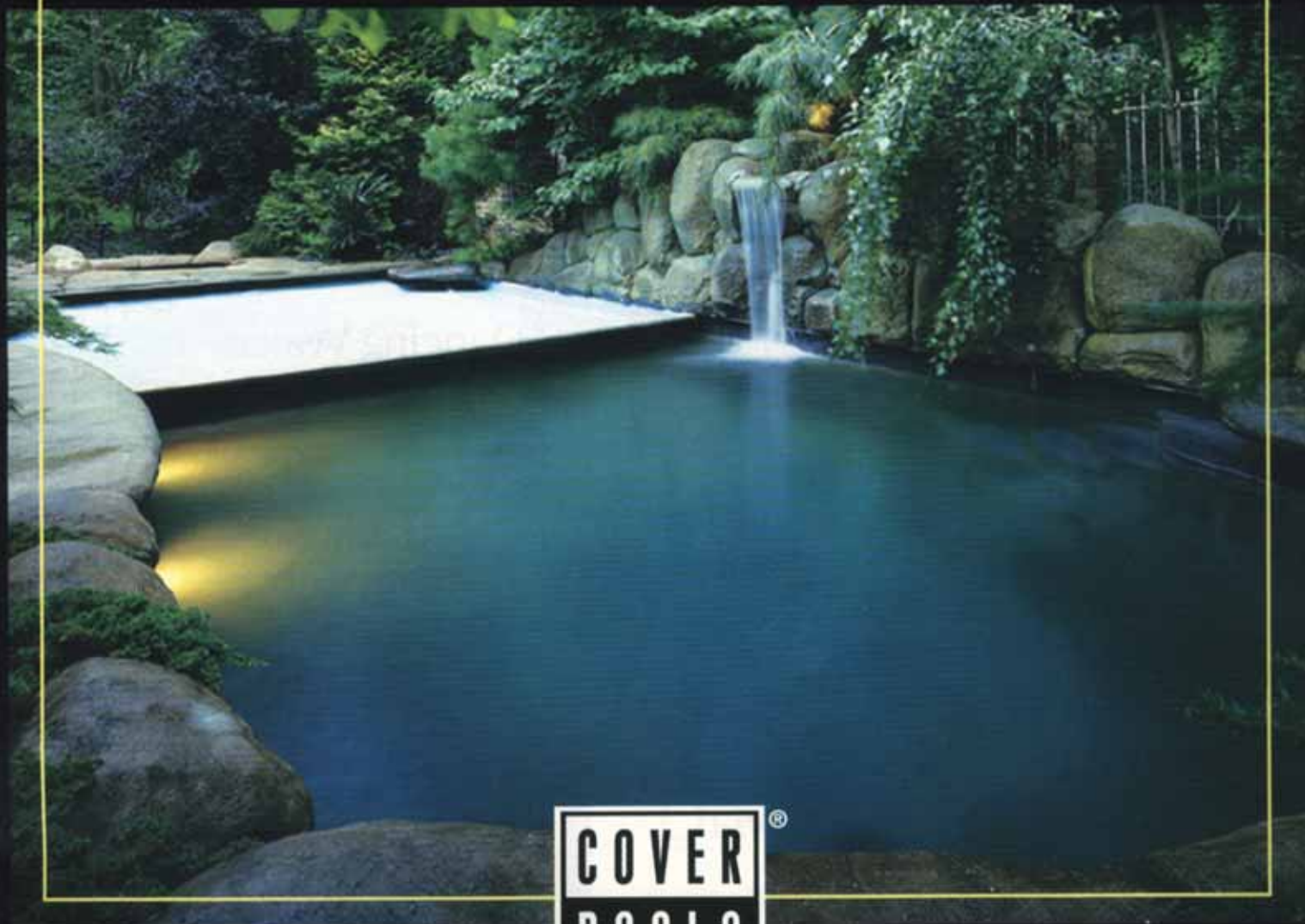


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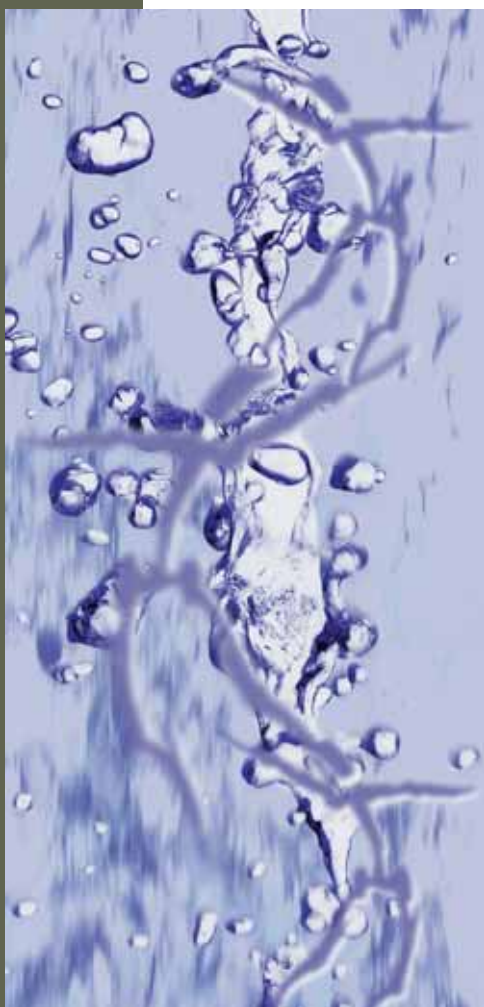
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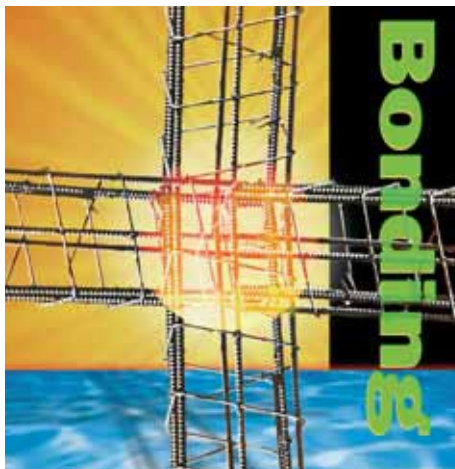
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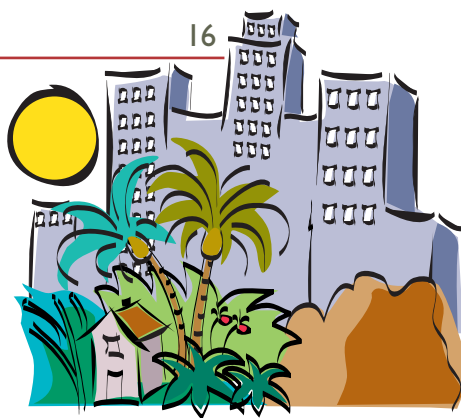
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Photo courtesy

Bruce Zaretsky, Bruce Zaretsky Landscaping, Penfield, N.Y.

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The Future is Now

In the year since we launched this “new magazine for a new era,” many of you have called or written to tell us that you like what we’re doing and that you share the magazine’s fundamental vision: that the future of pools, spas, fountains, streams, ponds, interactive water and all other things we now call “watershapes” is about looking beyond traditional boundaries, design parameters and modes of getting the job done.

“Working outside the box,” as several of you expressed what you are now doing, is all about integrating recreational and decorative water with an entire array of exterior-design elements. That’s something we meant to explore in our pages – but it’s a controlling theme that has emerged far more often and with far greater force and energy than we ever hoped.

In working to define this exterior-design revolution and bring it into a clear, practical focus, *WaterShapes* has indeed become a forum, a place for thorough discussion of trends, close examination of techniques and detailed celebration of the inventiveness of the watershapers who’ve stepped up to share their work with you.

From the exploration of ancient principles embodied in Japanese gardens to grand and distinctly modern linking of public pool facilities and waterpark features, this revolutionary spirit has reverberated and echoed through everything we’ve done. Whether it’s an elevated discussion of the sound of moving water or a gritty dissection of forming a perfect shell, everything about *WaterShapes* is dedicated to the pursuit of *better*: better design, better engineering, better construction.

Our current issue is a case in point:

q In “Making Models Super,” builder Ken Hart reports on a massive project in which his firm installed more than 20 vessels, from a small fountain to a FINA-sanctioned competitive pool, that were components of exterior designs created by three high-end landscape architects for a decidedly upscale set of model homes.

q In “Dancing Waters,” fountain manufacturer Jeff Horvath offers an in-depth look at interactive waterfeatures and why and how public institutions and private facilities are using them to get people wet and to add interest, beauty and excitement to outdoor areas. Along the way, he defines a key design element within reach of countless watershapers.

q In “The Making of a Great Wall,” landscape contractor Bruce Zaretsky discusses the fundamentals of proper design and construction of retaining walls – an indispensable element of countless projects on sloped sites and a feature that deserves the attention of any watershaper interested in integrating form and function.

q Finally, in “Subtle at the Surface,” surface specialist Kirk Chapman expands the palette of interior finishes with thoughtful permutations and combinations of traditional plaster, pebbles, ceramic aggregates, glass beads and colored glass. Even using what’s available, he breaks outside the box in a constant effort to give his clients more of what they want.

Of course, this is only the beginning of great things to come as we expand *WaterShapes* from 1999’s six issues to 2000’s nine, beginning with four consecutive monthly issues to start the year. To say that everyone involved with the magazine is excited to delve further into this broad spectrum of ideas is an understatement: There’s so very much to cover, and more than ever, we have the sense the future is *now*.



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IN THIS ISSUE

JANUARY'S WRITERS

Ken Hart owns and operates Aquatic Technologies, a watershape-construction firm based in San Juan Capistrano, Calif. A pool-industry veteran with more than 20 years' experience, he began his career with Fafco, a manufacturer of solar-heating equipment. After 10 years with the firm as sales manager, he left in 1987 to join Mission Pools of Escondido, Calif., where he served as manager of the firm's commercial division and as a senior project manager. He founded his own company in 1997. A regular instructor for pool construction seminars at trade shows, Hart has taught classes on the subject at the California Polytechnical Institute at Pomona.

Jeff Horvath has been part of the watershaping industry since 1979, when he purchased Venice Sprinkler and Irrigation, a Venice, Fla.-based manufacturer of irrigation systems. The firm soon moved into fountain design and engineering and was renamed Wesco Fountains. The company now designs and manufactures systems for high-end architectural fountains for shopping malls, resort properties, condominium complexes and other institutional clients as well as systems suited for use in smaller commercial and residential applications.

Bruce Zaretsky has worked in the landscape design and construction industry for 20 years and has owned and operated his own firm, Bruce Zaretsky Landscaping, in Penfield, N.Y., since 1989. His design/build firm focuses on projects that include waterfeatures, plantings, walkways, patios, lighting and retaining walls. He has become a frequent teacher and writer, sharing his expertise with others in seminar rooms, on the pages of magazines and at his website, www.bzli.com.



McNICOL

Kirk Chapman got his start in the pool construction trade in 1974, right after graduating high school. He worked for a local pool builder for four years before going to work as a plastering subcontractor and founding his own company, Poolscape Unlimited, in El Cajon, Calif., in 1983. In 1987, he became the first licensed applicator of pebble finishes in Southern California and has since gone on to supply products on his own. Chapman has been an active member of the National Plasterers Council since its inception in 1988.

James R. McNicol is a technical consultant to the swimming pool, jetted bath and spa industries from his base in Tustin, Calif. Before joining the pool and spa industry, he spent 16 years in the aerospace industry, mainly on development of large-scale telecommunications systems. He started in

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

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

Stephanie Rose runs Stephanie Rose Landscape Design in Encino, Calif. A former New York stockbroker, she gave up Wall Street ten years ago to pursue a career in landscape design – and has never looked back. Her firm specializes in residential gardens for upscale clients in the Los Angeles area, where the lengthy planting season and mild climate provide tremendous creative freedom and year-round work. Her projects frequently include collaboration with custom pool builders, a cross-disciplinary blending of perspectives and skills she sees as having profound potential for professionals on both sides of the relationship. Rose can be seen this season in four episodes of "The Surprise Gardener," airing Tuesday evenings on HGTV.

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



ROSE



BOWER

The Wonder of Moving Water

By Brian Van Bower

Throughout my entire working life, I've never moved too far away from the water. From my early days as a pool manager (beach bum) at a resort hotel in Miami Beach through many years in pool service and still today, I've always worked and played in and around water.

Whatever it is about bodies of water that infects people's spirits and pushes their internal fun buttons, I have it bad: I love to sail, fish and snorkel, I like living near bodies of water and I just love to look at water. On top of all that, I'm a Pisces.

If there's one thing I find that I tend to have in common with my customers, it's this passion for things aquatic and the pleasures that come along with them. This is powerful stuff, and I've come to believe that our innate fascination rises to an even higher level of drama and interest when we're in the presence of *moving* water.

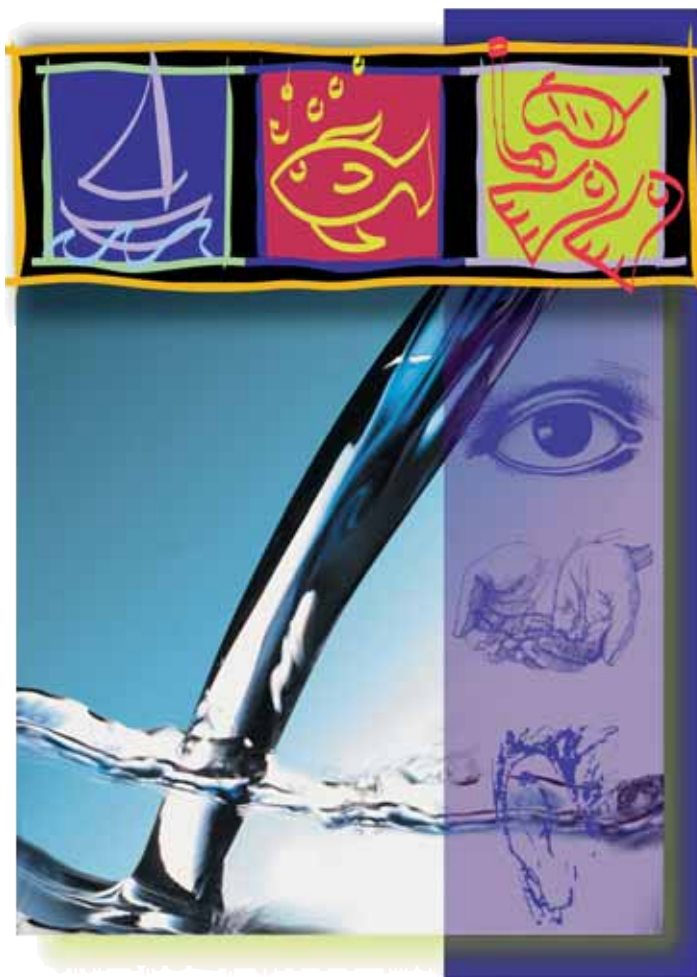
Through the years in which I've explored the art and craft of watershaping, I've steadily increased my use of moving water in ever expanding and more creative ways. These days, in fact, probably 70% to 80% of the projects I design and/or build contain some form of moving water – and only seldom do any two of these projects resemble one another.

CREATING A FOCUS

Much of this high percentage of inclusion comes from my enthusiasm about waterfeatures – and the fact that, without fail, I bring it up in some way with every client I meet. The number of people who come to the initial meeting with ideas of their own about including moving water is still pretty small – and when I bring it up, it's still a real attention-getter.

It works this way because most people have sharp memories of moving water they've seen on vacation or in public places, so it's not much of a reach for them to visualize elaborate rock waterfalls or cascading fountains.

Often, of course, any instant desire they might develop for moving water is immediately struck down by the



Whatever it is about bodies of water that infects people's spirits and pushes their internal fun buttons, I have it bad.

almighty dollar (or the lack thereof). As good as the notion might sound, many customers know intuitively and immediately that the cost of elaborate watershapes is sure to break the budget.

To me, this is where the real magic of moving water as a sales/design tool really comes into play: Fact is, there's a feature to fit even the slimmest of budgets. If you open your thinking on this, you'll immediately find that there

are all sorts of fun, creative ways to add small touches of moving water to any proposal – for very little money.

On the other end of the scale, of course, there is no limit in terms of how far you can go – but I've found often that the small, simple touches are what pushes clients over the edge in their purchasing decisions. As often, it's those same small features that provide the customer with the greatest sense of satisfaction down the line.

Large or small, moving water adds three basic design elements to the work: visual, aural and tactile. Simply put, you can see, hear and touch moving water, and human beings are undeniably drawn to those sensory experiences. How you as the designer or builder choose to employ these impressions depends on the type of feature you're including and the effect you're after. Just the same, the important thing to remember is that this sensory triple play is at work in every waterfeature, great and small.

Aeration, Anyone?

You need to go a long way to test the boundaries when it comes to moving water, but I've found myself stretching the envelope on a few occasions by incorporating air and light into the package. You can really manipulate texture, color and the reflective qualities of water in this way to create an array of effects ranging from the subtle to the dramatic.

Just aerating still water creates an interesting effect. In a couple of cases, I've installed small blowers on pools to push air through aeration lines installed at strategic points around the pool. As with the deck-mounted nozzles, these features are invisible when not in use, but they create subtle (and affordable) effects when activated.

And the effects get pretty interesting. I once installed an art-deco-style water wall, for example, where a sheet of water flowed out of a trough and into the pool. To create the impression that the sheet fell all the way to the bottom of the pool, I installed a small aeration line with holes in it within the shell. When I trained some light on the aerated area, the effect became really dramatic.

On other jobs, I've aerated fountain fixtures by setting up Venturis. One of those effects is the familiar white, foamy spout that falls back on itself. I really like this look because it tends to be wind resistant and makes for intriguing visual effects, especially when you direct a light into the spout.

– B.V.B

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BRASS TACKS

Let's get specific – and start small.

One of my personal favorites here is the simplest of all waterfeatures: just a single brass nozzle installed adjacent to the pool. All it takes is a water line and a nozzle installed level with the deck – in effect, a tiny “dry deck” fountain.

These nozzles are often adjustable and can be aimed in any direction at any angle. I often install them so they'll send a single stream of water arcing into the pool. Or I may install a row of nozzles down the side of a watershape for a linear effect or on converging angles or in any pattern the customer wants. For many pools, I use a single jet as a focal point to add a little spark to the setting.

One of the best things about these flush-mounted nozzles is that they have absolutely zero visual impact when they're not in use. You aren't left with some sort of inert monstrosity when the system's off – but when it's doing its thing, this small deck-level nozzle is the star of

I believe that anyone whose job it is to design watershapes should take a hike now and then: It'll be good for your health, your eye and your imagination.

the show. And because they're inconspicuous, you can put them anywhere: in the deck, in the coping, in some other adjacent structure or off in the landscape somewhere. However you choose to do it, the customer gets sight, sound and touch for just a few hundred bucks.

In some cases, I don't even aim the flow into the pool. I'll set things up, for example, so that the water falls onto the deck and drains into the pool. In fact, this represents a whole set of options I've been borrowing from a restaurant in Napa Valley, Calif. In the center of its outdoor dining area was an iron table

with a vase on it that looked as if it had just tipped over. They'd plumbed this thing so that the water ran up one of the legs and continuously poured out of the vase, right onto the decking and into a basin for recirculation.

It wasn't much water – just a fraction of what comes out of a garden hose – but it created an impressively elegant effect – and I've been working on variations of that theme ever since. Sometimes, for instance, I'll set up little statues with spouts that send water onto the deck; I'll just put in some type

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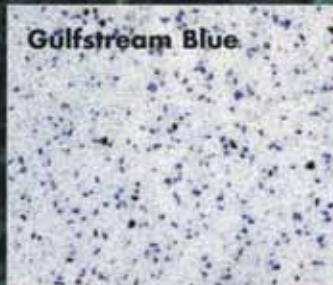
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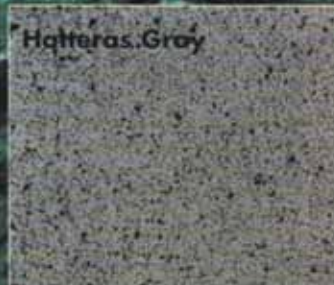
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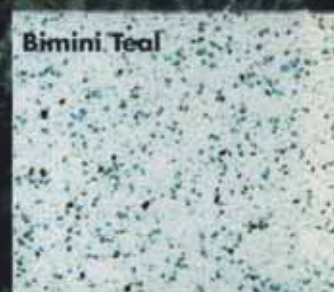
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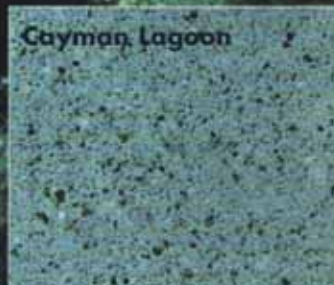
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Continued from page 12

of grate and create a little gravity line running into the pool. Again, this is a fairly inexpensive feature, but one that exercises the senses, creates a unique sound and captures lots of attention.

FINDING INSPIRATION

I do more and more of this creative sort of borrowing all the time. I used to pass by waterfeatures and take them in at a glance, but now I stop and study them, picking up all I can for use in my own projects.

Some of this stuff can even be picked up in books. If you can't get to Rome or Turkey or Spain or Japan to see great watershapes in person, you can study these architectural and design traditions at a library table or in the relative comfort of your office.

Another great source of inspiration is nature. In fact, I believe that anyone whose job it is to design watershapes should take a hike now and then: It'll be good for your health, your eye and your imagination. Use the opportunity to look at the way water moves in streams, rivers and waterfalls. Use your camera and study the pictures later, or make drawings or take notes or use your memory. For one thing, it's a great way to write off a vacation; for another, it gives you an opportunity to study the often surprising ways nature gets things done.

On one hike, for example, I saw this really unusual effect where a very low volume of water was trickling over a large stack of round river rocks. It's something that I would never have considered doing – nor would I have thought that nature worked that way – but there it was, and I ended up including a very similar structure in one of my pools. (It turned out great, by the way.)

On a recent trip to Southeastern Ohio, I went on a walking tour of this deep canyon that had been carved by glaciers and water – a truly amazing place. One thing that stood out was a spot where a tiny, late-summer stream of water was barely trickling down for a distance of about 20 feet. It was unexpected, and it demonstrated that you don't have to set up a flood to create a dramatic water effect.



CULTURAL INFLUENCES

You see a lot of this “sensitivity to the small” in Japanese gardens, where a trickle of water is often used to create specific visual, aural and tactile effects. Just about everything in Japan's incredible design tradition is there to mimic some natural form, and huge effects are often achieved on a small scale. I've incorporated some of these ideas in my projects. Even with big, elaborate waterfalls, for example, I'll include small “trickle rocks” to add elements of surprise, contrast and texture to the installation.

In more formal settings, where I'm af-

ter a Greek or Roman look, the “trickle” may come from a single deck-mounted nozzle, or I'll line up a half dozen or so of these jets to create a line of arcs flowing into the pool. It's not tremendously costly – and it nicely complements the more rectilinear styles of architecture many of my clients prefer these days.

These more formal settings have given me plenty of opportunities to work with off-the-shelf waterfeatures, such as the sheer cascades or waterwall nozzles. I was particularly happy in one case in which I mounted a cascade system in a length of deck cantilevered out over the



water. I've also set them up in archways or atop columns so the water falls from a good height and creates a curtain effect under which people can swim or play.

As I mentioned at the outset, there are no real limits to what can be designed and accomplished with moving water – and the concepts work with any style from the naturalistic to the most formal. (I haven't focused on it here, but they also work for practical reasons – for instance, to mask traffic noise.)

And of course, there will always be those customers for whom only the biggest and most spectacular will do. Projects where you install a rock grotto with seating behind the falls and elaborate cascading waterfalls and maybe even a slide provide a real opportunity to be creative. Or you may have a client who wants a river effect that will carry

about the big-ticket vanishing edge!

Truth is, you never know for sure how moving water will influence the look and feel of a job or how the client will perceive it. Again and again, however, I've found that the net effect is very, very positive. We live in a time when the influence of things like Zen and Feng Shui

abound. We also work in a medium that embodies very strong aesthetics.

When we fully understand and appreciate the power and beauty of moving water, we're able to give our customers the level of wonder and fascination they crave. On that level, imagination is truly the only limit.

**There are no real
limits to what can be
designed and
accomplished with
moving water.**

bathers around the pool on a stream of moving water.

These jobs get expensive, but they, too, benefit from the sort of subtle touches described above. It's all in the details – and the details are where the strongest impressions are often made.

DIFFERENT STROKES

It doesn't happen too often, but I've run into occasions where moving water produced great responses that I hadn't even anticipated.

I installed a vanishing edge pool not too long ago, right on the waterfront. I'd added some small streams of water that were intended to create little surface waves that would help the pool surface blend into the water in the distance. As it turns out, my client is thrilled by a couple hundred dollars' worth of arcing spouts and doesn't care much at all

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A Tropical Oasis

By Stephanie Rose

When we think of water, much of the time we think of a tropical scene – Hawaii, the

Caribbean or some other exotic island somewhere – a place we'd all like to go.

Why not create that "somewhere else" in your clients' backyards? They'll thank you for all the money you'll save them on that cruise that probably would have been less than perfect anyway. And this tropical scene will be one they can enjoy not only this week, but for as long as they want.

Imagine palm trees swaying in the wind, the sweet smell of plumeria, hula dancers. Okay, maybe I'm getting carried away here, but the imagination's a powerful thing. And you can create this tropical paradise for your clients even if you live and work in a climate that makes growing this type of plant difficult. All you need is a little understanding of what gives a garden this feel and how to put it together.

WHAT IS TROPICAL?

Strictly speaking, tropical plants grow in latitudes closer to the equator than any in which most of us live. Southern Florida and Hawaii are probably the only places in the United States located where they enjoy this climate naturally.

Although purists might argue with me, my Southern California version of a "tropical landscape" ranges far be-



yond plants that grow only in the tropics. In fact, I'll use any plants that have large and/or coarse leaves. (By *coarse*, I mean leaves that have more defined shapes and lines, such as philodendrons and palms, as opposed to fine leaves that appear feathery, wispy or soft.)

This opens us to lots of possibilities, and there are many plants I would recommend for your tropical landscapes. The important thing is to set the "bones" of the yard by beginning with specimens that strongly set the tone for what surrounds them. Palms, large leafed plants, strappy leafed plants, and ferns all work well in this environment.

Of course, the clients' sense of what's "tropical" plays a role here, too, and you have to find out what they're thinking when you say that word. They may tell you that they hate palm trees, but love ferns. They may say anything goes, even roses. As you ask questions, you also should determine if they want lots

of color, low or high maintenance, full and lush or more of a desert oasis.

As always, your primary job is to try and understand the vision they have. Gather as much information as you can from them, and then narrow down your choices for plants, taking your climate into consideration. Your best resource in finding the plants you need is the edition of the *Sunset* magazine's gardening guide that goes with your area. The drawings alongside each plant description will help you determine how well your selections will fit into this plan.

These books also have sections on good plants to use near swimming pools, focusing on those that are as litter-free as possible and have smooth textures. (They don't particularly like using roses near pools as much as I do, but everyone is entitled to an opinion.) As a rule, using their suggestions will keep you safe with your clients.

BALANCE IS CRUCIAL

Many tropical plants, due to their sheer size, can make a very dramatic statement. Although this may be what your clients want, it may also overshadow the beautiful watershape you have created for them.

Remember that one of the keys to a great landscape (or even a good one) is *balance*. If a specimen plant becomes too dominant in the landscape, it can really detract from everything else you're trying to achieve.

It is also important to find out if they want a dramatic or subtle look. If it's to be dramatic, your eye should instantly be drawn to the planting when you look at the yard. If it's to be subtle, everything should blend well together, with no one dominant feature.

There are many ways to achieve these looks. Here are some suggestions:

□ **Dramatic:** If you are trying to create a dramatic statement with the plants, start by choosing a striking spec-

imen. This would be one plant that draws visitor's eyes directly to the place where it is planted.

For example, you might want to use a large queen palm. These are typically purchased according to trunk height. Start with one that is in proportion with the size of your watershape. A palm with a 6- to 8-foot trunk, for instance, would fit well next to a 15-foot-diameter pond. If your watershape is smaller, you'll probably want to choose a smaller variety of palm, such as a pygmy date palm.

Once you have chosen your specimen, surround it with complementary plants that enhance its appearance while framing it. Use some smaller palm varieties, for example, or some philodendrons, microlepis ferns, agapanthus and calla lilies. All of the plants, of course, need to be to your client's liking. Just make sure ones you choose as surrounding plants do not dominate or create visu-

al competition: This can completely detract from your original plan.

To make sure they blend, use at least three of each complementary plant. They tend to blend better when repeated throughout the design. Also factor in the mature size of the plant when making your selections. After all, a 20-foot palm would look completely out of proportion standing next to a 5-foot-wide pond.

If you absolutely have to put in a larger plant, consider placing it further away from the watershape so it won't overshadow the pond or pool as it matures. And be sure the rest of the plants also have the proper scale and proportion.

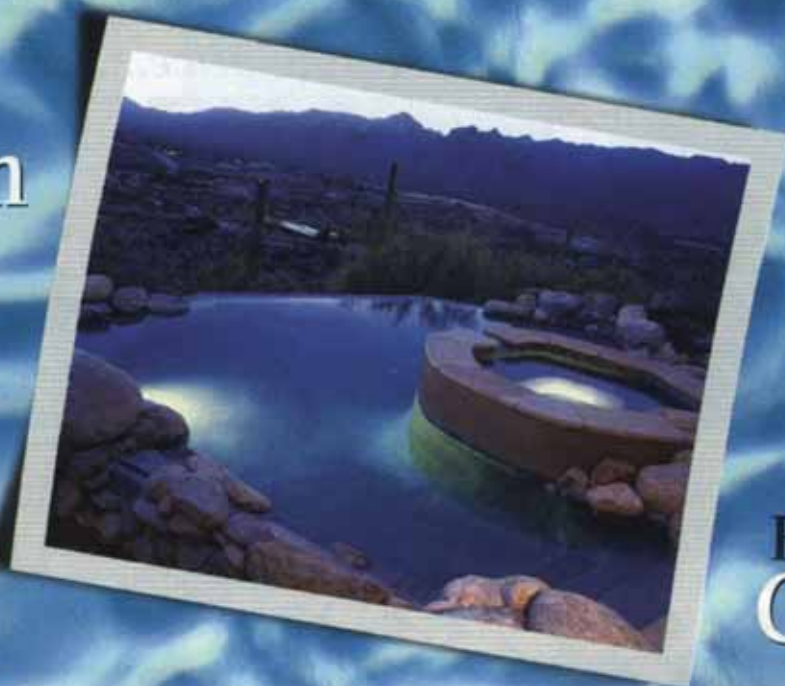
□ **Subtle:** To create a more softened tropical landscape, you'll need to blend plants with coarse textures (as discussed above) with those that soften.

The objective here is to keep plantings flowing by making smooth transitions between them. For instance, you might

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want to place a microlepidia fern next to a 3-foot high sego palm. Their slight variance in size will cause your eyes to settle on both plants, instead of leaving one to stand out – and the microlepidia fern will soften the coarse look of the sego palm. Also, placing these and other plants close together will give a more natural feel.

Height, depth, scale and color all need to be blended smoothly to be sure you have a settling, soothing landscape. If any one of these design elements is too dominant, you'll end up with a dramatic look or one that doesn't feel as comfortable when you look at it.

INHOSPITABLE CLIMATES

Of course, many tropical-style plants require humidity to look their best.

If you live in a region that is dry, you'll need to install an irrigation system that mists the leaves of your plants. The best way to do this is with a drip system that has misters set to go off every hour during the hottest hours of

A Tropical Palette

Here are some plants that are quite popular and easy to grow in moderate climates. Get creative with unusual specimens, and remember that most of them can be placed right next to a watershape without disturbing the integrity of the structure over time. (Ficus is the one exception: These plants have invasive root systems and should never be placed next to a watershape.)



Palms – Queen or King, Sego, Pygmy Date
Canna Lilies*
Zantedeschia aethiopica - Calla Lilies
Alocasia – Elephant's Ear
Colocasia – Taro*
Agapanthus – Lily of the Nile
Clivia miniata – Kaffir Lily
Ferns
Ficus – many varieties work well
Bromeliads
Baby tears
Bulbs – particularly Lilies and Amaryllis*
Pachysandra*
Fatsia japonica – Japanese Aralia
Iris
Hemerocallis – Daylilies*
Strelitzia reginae – Bird of Paradise
Orchids

* denotes plants that will survive in Zone 1 (coldest climates)

—S.R.

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the day. This can make all the difference in the plants' appearance.

Unfortunately, not every climate can easily accommodate tender tropical plants. If you happen to work in one of those areas that isn't kind to humidity-loving plants year 'round, you have two choices: Use plants that are hardy in your area that are also large and/or coarse leaved, or use plants that can be planted in containers and brought inside during harsh weather periods (including bromeliads, ficus trees or small palms).

Many of the potted plants can be cut back to the ground during winter, making them easier to carry and move. This kind of seasonal rotation requires a lot of time and effort not to mention storage space, but for a small area, it may be worth it.

You and your clients also have to be realistic. If you live in Maine or Minnesota or Alaska, this type of landscape may prove difficult to attain. But if you choose something manageable, anything is possible. Imagine your clients sending out their Christmas cards next year with a picture of them seated in their lounge chairs next to a watershape surrounded by tropical-looking plants with the message "Greetings from Alaska." It won't be easy, but it is possible.

If you are uncertain which plants will thrive in your area, go to the local wholesale nursery and ask them for a list of tropical-style plants that will do well. Other great places for ideas are botanical gardens, which grow their tropical plants in greenhouses even in the coldest climates. The curators and gardeners who work there tend to be quite knowledgeable about how you can grow these plants in your situation. They may even be able to suggest specialty nurseries or sources for plants that you might not otherwise have known about.

Remember, if you stick with large- or coarse-leaved plants, you should be able to achieve the kind of look you desire.

If you're still not sure how to tackle this type of garden setting, e-mail me at sroseld@earthlink.net. I'll be more than happy to make suggestions.

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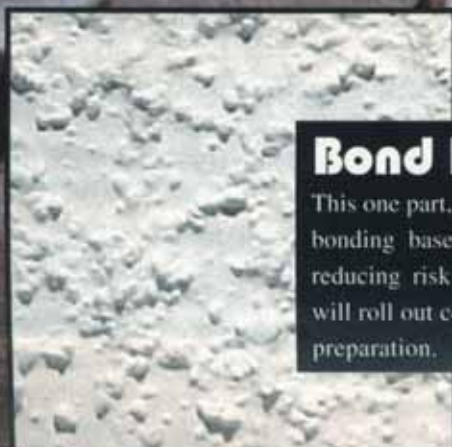
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Making Models Super

By Ken Hart

The project was massive:

Four sets of spectacular model homes for a gated community set in the rolling hills above Newport Beach, Calif. – designed by three different landscape architects and each featuring its own creative use of water. By the time he left the site, says pool builder Kent Hart, he had installed more than 20 vessels of various types, shapes and sizes at the One Ford Road development – and found unique challenges in executing the architects’ divergent visions.



Not every upscale pool contractor has to be working with his or her own designs to be successful in building beautiful pools. Our company, for instance, has established its reputation by excelling at making the ideas of others come to life.

Examples of this can be found in the work we did at One Ford Road, a development where we were asked to follow through on designs prepared by three of Southern California’s best-known landscape architects. We’ve found here and elsewhere that when you work with highly creative people (including those who designed the pools, spas and waterfeatures pictured on these pages), the process can be truly rewarding, exciting and even fun.

Of course, working at the highest levels of commercial and residential pool construction means you need to have your act together. These watershapes, for instance, were clearly critical to the overall impression the designers were looking to make – but where they had control of the aesthetics, it was left completely to us to make them work structurally and hydraulically.

It was a rare opportunity for our firm, Aquatic Technologies of San Juan Capistrano, Calif. – one that has consumed a huge portion of our time and energy through the past two years. For us, the results you see here more or less speak for themselves: Once the watershapes were completed, the landscaping installed and these spectacular model homes fully appointed, each of the model homes repre-

sented the magnificent potential that can be realized when the design of the water-shape is integrated into the overall scheme of things.

LIVING LARGE

Everything about this project is impressive. Developed by Pacific Bay Homes, the plan called for construction of nearly 400 homes ranging in selling price from \$750,000 to \$1,500,000. The architects came up with seven distinct styles and 22 floor plans and worked in conjunction with the landscape architects to make certain there were special features that made each home unique.

In spirit, the developers were after the elegant diversity of classic California communities. According to landscape architect Julie Brinkerhoff-Jacobs of Lifescapes International, a Newport Beach firm whose work is featured at One Ford Road, the pattern-setters included the great residential neighborhoods of Pasadena and San Marino in Southern California and Hillsborough and San Jose's Rose Garden District in Northern California.

Our firm became involved largely because of our background in commercial pool construction. This gave us the right sort of experience in managing large-scale projects and preparing complete bids based on complex designs.

We were also in our element because the development was to include a community pool. In fact, if there was a key to our getting the job, it was our familiarity with building competitive pools. This was where we placed our initial bid, then progressively moved into offers on other pools and waterfeatures being installed with the model homes.

The work began in the summer of 1997, at which point we received a pile of plans and specs prepared with varying degrees of detail. The first few months were consumed in dealing with the bureaucracy: estimating, bidding and submitting proposals. Although it was intimidating at first because of the sheer volume of the work, once the process began in earnest and I started getting answers to my questions and could nail down the particulars, each separate installation began to look manageable.

DISTINCT ADVANTAGES

We soon discovered that working on new construction in this manner can be a real pleasure.

First of all, the designs were as beautiful as anything we'd ever seen – and the work went forward without the emotions and tribulations that can characterize working with high-end residential customers on an individual basis. There was no changing of minds or balking at price, no arguing about options: We had sets of well-conceived plans and simply made them happen.

Access and scheduling were trouble-free, and we quickly discovered that there are efficiencies and economies in working on sets of pools, all next to each other, on lots where fences (and even the homes, in some cases) have not yet been built. This made our work with subcontractors extremely cost effective: When you're building on sites right next to each other, it's no problem to have a crew come and plumb three or four pools all at once or plaster three pools, all in a day.

In addition, we didn't have to worry about tearing down and rebuilding walls, disturbing neighbors, running over anyone's dog or traipsing through anyone's prized daisies. The grading had all been done, trash and clean-up were non-issues, and we didn't have to re-sod any lawns or re-pour any slabs. I caught myself more than once thinking that this was the only way to build residential pools – maybe a bit *too* easy, in fact.

Best of all, the work we were asked to do at One Ford Road was truly beautiful and completely rewarding in a professional sense. These designs incorporated a variety of interesting materials and a slew of fine decorative touches. As you'll see in the photographs, we were working with design values and aesthetics that make these models *truly* super.

The author and WaterShapes gratefully acknowledge the participation of Bob Borthwick of Borthwick, Guy, Bettenhausen Landscape Architects, Irvine, Calif.; Larry Sheehan of Burton & Associates, San Diego, Calif.; and Julie Brinkerhoff-Jacobs of Lifescapes International, Newport Beach, Calif.

Continued on page 24



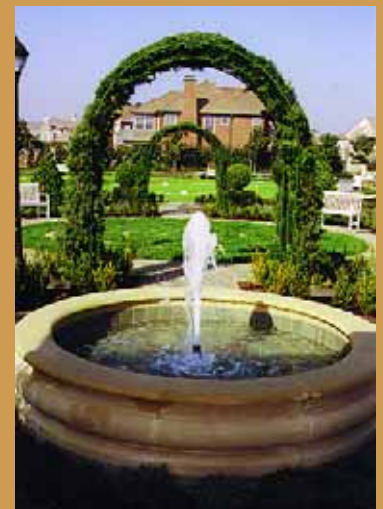
A Broad Range

The development at One Ford Road has enabled our firm to stretch itself in a variety of ways.

In addition to the model home pools, spas and waterfeatures pictured in the accompanying article, Aquatic Technologies also won contracts for two of the three community pools associated with the development, the first of which is currently under construction (above). That pool will be a FINA-compliant competition pool with custom grated coping stones and a precision rim-flow system.

At the other end of the complexity spectrum, we also installed a simple, circular fountain in the complex's meditation garden/putting green area (below). We just kept changing gears in terms of scale and moving as methodically as we needed to in getting a big job done.

– K.H.



A photograph of a backyard swimming pool. The pool is filled with clear blue water. In the background, there is a low brick wall with a planter box on top containing various plants and flowers. To the right, a waterfall feature cascades down into the pool. The overall scene is bright and sunny.

A Taste of Carmel

*Designed by Borthwick, Guy, Bettenhausen
Landscape Architects, Irvine, Calif.*

One set of models for the One Ford Road development is known as the "Carmel Series" and is based thematically on coastal California living in the era of Craftsman/Cottage-style homes built during the first half of the 20th Century. Comfort, intimacy and touches of upscale elegance and grace are achieved through designs that include casual architectural and landscaping elements juxtaposed with clean, modernist lines.



The pool/spa combination (A & B) is designed to echo the design of classic cottage-style homes found in California's upscale coastal regions. The brick details around the rectilinear pool and raised spa and the casual use of plant materials combine to create a comfortable, intimate outdoor environment.



A more formal approach to the coastal California ideal is expressed in this home's "art collector" theme (C). A dramatically abstract "arc-fall" spills into a raised concrete spa, set off by the geometric paving and tile details and supported by stylized modern landscaping.

A photograph of a curved stone waterfall pool. The water flows over a dark, textured stone wall into a pool below. In the background, there is a white fence with vertical posts and some greenery. A large potted plant with red flowers sits on a stone ledge to the right.

Natural Charm and **Elegance**



*Designed by Lifescapes International,
Newport Beach, Calif.*

Models in the “Stonybrook Series” were designed as mature garden settings featuring beautiful pools, spas, fountains and exterior entertainment areas. The focus here is on presenting prospective buyers with a full array of exterior design and garden possibilities, including amenities such as barbecues, shade structures and intimate garden retreats.



With its used brick and ceramic vases, the look of this pool/spa combination complements the mature pines, magnolias and assorted specimen trees that dot the yard (D & E). Grays and reds in the plaster and tile details give the design an understated sense of elegance and warmth.



This dramatic, curving water wall sounds as beautiful as it looks (F). The subtle symmetry of the pools is articulated by the cantilevered paving stones and tile details, while the potted flowers and small specimen trees work in harmony with the water elements to create an intimate and restful setting.

Whimsical Touches



G

Designed by Burton and Associates, San Diego, Calif.

The idea behind the designs included in the development's "Summerhouse" and "Providence" models was to inspire people with details and help them envision the sorts of custom, personal features they could include in decorating their exterior spaces. Whimsical sculptures (spouting cats, dancing frogs and steaming teapots, among others) are used to create visual focal points that make a genuine impression.



J





In all three of these projects, the pools are set back against low walls faced with tile and faux-ledger rockwork and topped by lush landscaping (G, H & I). This provides for efficient use of available space while creating intimate settings rich with water, stone, tile and greenery – not to mention the occasional spitting amphibian (J).

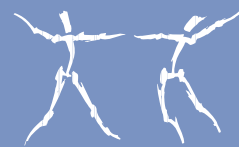
Teapots in nooks of rough-hewn stone, complete with special mist emitters, create a steamy impression in a small courtyard waterfeature (K & L). Given its position in a model home, this is less an aesthetic recommendation than it is a prod to the imagination – one intended to broaden the viewer's perspective on what can be accomplished in modern exterior design.



Dancing Waters

Interactive waterfeatures are hot these days. Hotel chains, resorts, theme parks and even municipalities have jumped on what Jeff Horvath describes as an 'interactive bandwagon' to kick up interest among locals and tourists alike. It's a simple formula: By attracting children and their families with a combination of design appeal, flexibility and fun, these innovative watershapes boost traffic – and revenues.

By Jeff Horvath



In conceptual terms, interactive fountains are really nothing new. In fact, fountains have featured water effects and sequencing lights since the turn of the 20th Century.

What's emerged lately is a perception that these "dancing" waters are great sources of *fun* – a means for children to get soaked and for adults to stay dry and enjoy the show. This resurgence of interest has led designers and manufacturers to apply the knowledge and mechanics of the past in creating effects that delight the eye, capture the imagination and bring fun to just about any setting.

Another factor in the resurgence is the fact that building an interactive fountain is really no different than building a commercial pool: It's a matter of layout, design, excavation, construction and finish details – all pretty basic and within reach. The functional side of interactive fountains is pretty straightforward as well: They consist of an array of vertical spouts of water that can be arranged in an infinite range of patterns. In effect, they can be made to "dance" in any way the owner/operator chooses and can stand alone or be integrated into designs of swimming pools, waterfalls or waterparks.

What does it take to design and install one? Well, attention to detail is a must, as is precision in both design and construction. These fountains *can* get fairly complicated, so there's also usually a need for tight project management. Beyond that, however, it's the kind of work most quality-minded contractors can tackle. To illustrate that point, let's take a look at two recent fountain projects and talk about how they came together.

DOWN BY THE RIVERS

The basic idea with interactive fountains is to get people wet, and there aren't many limitations on the ways it can be



IN CONSTRUCTION TERMS, building an interactive fountain isn't much different from installing a standard pool. All it takes is a focus on precision and some high-caliber project management.

ONCE INSTALLED, even a simple line of interactive-fountain nozzles bring drama and fun to open spaces, as is the case in Fort Wayne's Headwaters Park in Indiana.





done – a creative license truly appreciated by architects and planners who compete with designs that are becoming increasingly complex and innovative. Literally, anything that can be imagined can be created: There are no design standards – and no limits beyond the guidelines imposed by local health departments and other authorities governing public and semi-public installations.

Fortunately, the process of providing these interactive fountains is greatly simplified by vendors who supply turnkey systems – complete with pre-plumbed, pre-wired equipment vaults and programmable logic control (PLC) devices along with detailed plumbing plans. These “packages” (in this case, one designed and manufactured by our staff at Wesco Fountains of Venice, Fla.), enable contractors to focus on construction fundamentals knowing they will have technical support at every step of the way.

Often the scope and design of these projects arise from a need to draw people to specific spaces. That was the motivator

for the Headwaters Park Commission in Fort Wayne, Ind. After evaluating options for a new park, they decided that an interactive fountain was just the ticket in turning the park into a magnet for families – and using it to key a much larger revitalization plan for the downtown area.

Headwaters Park is a 30-acre downtown peninsula bordered by the confluence of the St. Mary’s and St. Joseph’s rivers, which then become the 150-mile long Maumee River. The low-lying site is subject to periodic flooding; with all the concrete and asphalt common to downtown areas, the floodwaters were not absorbed into the ground, creating bigger flood problems for the area.

To mitigate these costly disasters (floods in 1978, 1982 and 1991, for example, caused the downtown district alone a combined \$10 million in damage), the park commission was formed to reshape the district and come up with a plan that would take this 30-acre slice of downtown and restore it as a flat, natural greenway.

As part of that master plan, existing

buildings and parking lots were demolished and replaced with trees, flowerbeds and native grasses. The aim here was to use the park as a buffer that would soak up some of the floodwaters and lessen property damage for local businesses. The happy result was a green gathering place for local residents and tourists alike.

MAXIMIZING BENEFITS

To make the most of the space, the commission was determined to include an interactive fountain they started calling the “Fontenelle.” And as it turns out, they were right in assuming that an interactive watershape would draw children and families to the dancing waters.

What they couldn’t really anticipate was how great a magnet it would become: The Fontenelle has become the centerpiece of the park, and on any given spring or summer day, the area overflows with children playing in the jets of water that spring up from its grates and concrete pavers. Nozzles are set flush with the surface, and low water pressures are applied to ensure the safe-



THE FONTENELLE is interesting sculpture on its own (A), but when bathers are added (B), the composition takes on drama, added dimension and a spirit that can only be described as “fun.” And in the evening, an altogether different effect is achieved with the addition of colored lights (C).



ty of small-scale revelers. The design also incorporates underground troughs to collect the water and avoid the slip/fall hazards that come with any standing water.

As installed, the big fountain is divided into six zones, each served by a central control pump station pre-constructed with all control valves (both manual and automatic) and an automatic bypass system. The automatically controlled valves govern the height of the spouts, while electronic valves activate the jets themselves and are controlled by a PLC system specifically designed for the Fontenelle.

Interactive jets, stainless-steel control valves and a pressure-regulating valve round out the primary components of a skid-mounted assembly. The hydraulics are engineered in such a way that the plumbing is never “dead headed” – that is, where water pressure remains in the pipes with no release.

Although the pump motor is constantly running, a pressure regulator at the far end of the system releases any built-up water and directs it to the col-





IT MAY NOT be a water effect found in nature, but the cascades flowing from this massive outcropping certainly are fun – and a real drawing card for the pool complex at Orlando's Vistana Resort.

FROM SIMPLE TO COMPLEX

The value of this kind of performance isn't lost on other commercial clients. In fact, hotel chains and resort-condominium complexes across the country recognize that making their facilities more family-friendly enhances image as well as revenues.

So let's take a look at a second project, this one at the Vistana Resort in Orlando, Fla., where an interactive fountain eventually became the focal point for a recent phase of development: Known as Cascades Village, this enclave of 386 units (mostly time shares) features a recreational commons and a pool complex.

Along with the developer, the facility's sales and management staff identified a need to develop the pool complex as a magnet for kids – and an engaging visual draw for their parents as a sort of one-two punch aimed at potential buyers.

The result is a massive installation that serves as a recreational centerpiece for the resort. The main pool, with an 8,900-square-foot surface area, has a free-form shape that establishes a number of special spaces for interactive experiences. The decks surrounding the pools, made with interlocking pavers, offer 16,000 square feet of space for sunbathers. As a backdrop for the pool and recreation center, the developer wanted a large, man-made rock formation.

Working with that concept, the landscape architect wanted to create the illusion that the pool had been dug around an existing rock formation. In one area, the formed rock projects out over the pool, where a column supports it. The idea is to create an impression that the rock had to be supported to avoid having it fall into the water.

This mild sense of "danger" is reinforced in the waterfeature integrated with the rockwork: It emerges from a large fissure in the rock, suggesting the rock has been sheared by forces of nature to enable water to fall as a cascade across the cantilevered stone. The source of the water is concealed in an 18-foot-long trough inside the rock.

That strong visual element is balanced in the pool's shallow end by a unique interactive waterfeature. In concept, the area

Continued on page 36

lector tank for recirculation. The pressure regulator also eliminates any "water hammer" phenomenon that might damage the fountain equipment.

All in all, it's a system designed and engineered for steady, long-term use – but is fully adjustable so that it can't become predictable, boring or old hat.

GOOD COORDINATION

To build a project such as the "Fontenelle," it's imperative that all contractors and subcontractors be on the same page. In this case, the project started off in perfect stride: The overall plan was a collaborative effort by the planner/architect, installing contractor and fountain-equipment supplier, and it was agreed to approach the construction of the fountain as a simple, three-step process.

- **Excavation and site preparation:** The general contractor took care of everything here, including the equipment vault, the vessel and all necessary trenching.

- **Plumbing and electrical:** The contractor and equipment vendor worked together here, making certain all underground work was complete.

- **Concrete work and fountain fixtures:** Once the contractor's crews poured and finished the concrete, the mechanical contractor moved in to install the nozzles and

grates.

This oversimplifies the process, of course, but the point is that the construction end of the work was all fairly ordinary. The key to smooth sailing in this case was the fact that the vendor packaged the fountain equipment as sub-assemblies for easy field installation. To make the system work, the plumbing contractor simply set the skid in place and made the necessary connections.

Once the pressure testing was done and the finishing touches had been applied, the Fontenelle came on line. Since its installation in 1997, it has become one of the most popular attractions in all of Fort Wayne – a gathering place for families and a source of entertainment and relaxation for all who come to participate – or observe the scene from a safe, dry distance.

In June 1999, Headwaters Park earned its mayor, Paul Helmke, a City Livability Award. This program honors mayors for leadership in developing and implementing community projects or programs that improve the lives of the community. More than 500,000 people already visit the park each summer; with added publicity and awards, park officials say that those numbers are sure to rise – much to the benefit of the city and especially its downtown district.

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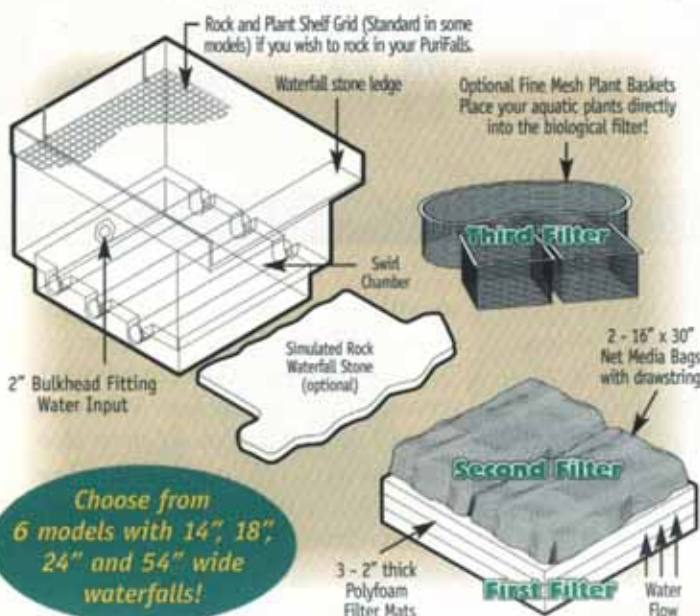
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is like a zero-depth entry – but in reverse.

Here, visitors step into shallow water (12 inches deep) and then slowly move up at a 10:1 gradient to one of three islands toward the center of the pool. Each island rises approximately four inches above the water line and is covered with a cushion of Saf-Deck selected as a blend of three light-beige colors. Into the mix was added a 5% measure of red, blue, and yellow aggregates, giving the illusion that the islands are dotted with precious stones: rubies, sapphires and topaz.

COMPLETING THE PACKAGE

The interactive touch comes with a series of flush-mounted spray nozzles set in each island, plumbed in such a way by Orlando-based contractor Weller Pools that an infinite variety of spray patterns could be created.

Again, this was a turnkey system. We at Wesco set things up with electric valves and a programmable computer to create more than 50 basic combinations of fountain action on a rotating schedule. The timing sequence allows children and adults to anticipate patterns as they jump through, sit on or lay in the spray from the fountains' nozzles.

At the opposite end of the pool, a large free-form perimeter allows for a quieter, more-adult pool experience; even at a distance, however, they still visually experience the water dynamics taking place at the other end of the pool.

This particular project illustrates the variety and creativity that can go into interactive waterfeatures as well as the effectiveness of collaborations among owners, contractors and design/manufacturing firms.

Weller Pool Constructors, a local operation with a national reputation for large-scale projects such as this one, consulted with us regularly to ensure a smooth installation process. This project was no match in scale to the work Weller did on the Olympic pool complex in Atlanta, but the work at Vistana Resort nonetheless called for careful attention to detail and rigorous adherence to the blueprints and schematics drawn up for the pool area.

We assembled the pump skid to meet the specific requirements of the project:

All the contractor had to do was put it in place and install the electrical and water connections. Between some quality work by the contractor and good preparation on the vendor side, installation was easy and the waterfeature bound for success.

Bringing a level of interactivity and excitement that was formerly reserved for waterparks to resorts and municipal parks is a relatively new concept, but it's one that never should be set aside because of any concerns about design or installation. Given current technology, these effects

are within reasonable reach of any quality-oriented watershape contractor.

In fact, imagination is the only boundary on interactive fountains. When you consider possibilities beyond those illustrated by the two projects described here – things like motion detectors as system triggers, lighting effects to enhance visual features and night-time enjoyment, and the creative use of landscaping to add texture and additional visual features to the setting – and the sky is literally the limit.

What's more, this sort of interactivity is just plain *fun*.



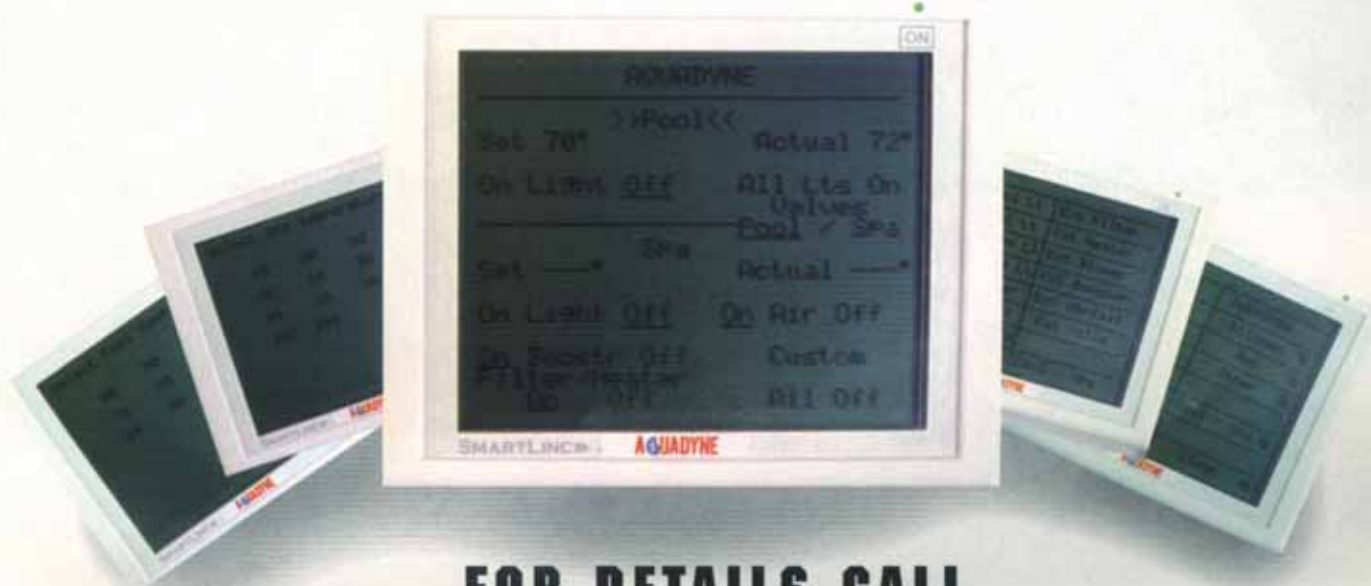
BATHERS APPROACH these small islands in the shallow end of the pool at the Vistana Resort by stepping into 12 inches of water and then climbing upslope to one of three sections of dry land (A) – where the unsuspecting get a surprise when the fountain system starts up (B).





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Retaining walls are made to do an awesome job: High or low, long or short, upslope or downslope, they're called on to keep earth movement from wreaking havoc on watershapes or any other 'permanent' fixtures installed on hillsides. Keeping these walls from failing, says landscape design/build contractor Bruce Zaretsky, is a matter of good planning, design and engineering – much easier said than done, as he explains in this feature on making them work.



The Making of a

Retaining walls are used for one simple reason: to hold something back. Whether you need to terrace down to a lower yard, hold up a house on a hillside lot or provide a level area for watershape installation, these walls are indispensable when you lack the room needed to grade a sloped area gradually.

Of course, this notion of holding back the forces of ground movement is no small challenge, and proper engineering and construction are critical. Do the job well, and a retaining wall will hold up indefinitely. But if you cut corners or don't take prevailing soil conditions and geology into account, chances are better than good that you'll be called back to the site, this time to deal with a disaster.

The key to success is working with each site on its own merits and making decisions appropriate to its unique characteristics. Once those practical decisions are made, retaining walls themselves come in an infinite variety of shapes and sizes – and can become a significant design element within the overall project. However you treat a given wall – strictly for support or as a thing of beauty – your goal is always the same: Build it to stand the test of time!

KNOW YOUR GROUND

The way you build your retaining walls depends entirely on your area's prevailing soil conditions.

Absolutely, you need to understand what you're dealing with in terms of soils and geology before you can even begin to engineer and build adequate walls. Yes, you can work with your knowledge and experience if you're *certain* of the soils composition of the slope you're holding back, but in many cases, you just can't do the job right without a detailed soils report.

Great Wall

By Bruce Zaretsky with Eric Herman

At least half of my projects involve a wall of some kind. These vary from critical load-bearing walls or terraces that provide access to doorways all the way through to free-standing stone walls. I'm careful even with the free-standing walls, because my area of operations in upstate New York offers a range of conditions from silty sand up near Lake Ontario to hard clay or gravel-rich soils in glacial deposit areas south of Rochester. We even encounter slate in the area around the Finger Lakes.

Given this spectrum of soils, we are cautious about making *any* assumptions – even though we probably have the knowledge and experience to tackle virtually any circumstance we might encounter: Often, it just makes sense to involve another set of eyes, and the knowledge that a soils engineer brings to a site evaluation far outweighs the cost of bringing one aboard and any delays his or her involvement might cause.

For my projects, I end up calling in an engineering service whenever I am the least bit unsure of soil stability. (I've also found that calling in an expert helps in cases in which my clients may think I'm suggesting extraordinary measures sim-

ply to pad my bill rather than to serve their best interests!)

As a last step before we begin designing the wall, we consider what the engineers call *angle of repose* – that is, the angle from the horizontal at which a pile of soil will settle if left on its own. Each different soil type has its own angle of repose and its own influence on wall design.

Choosing a Material

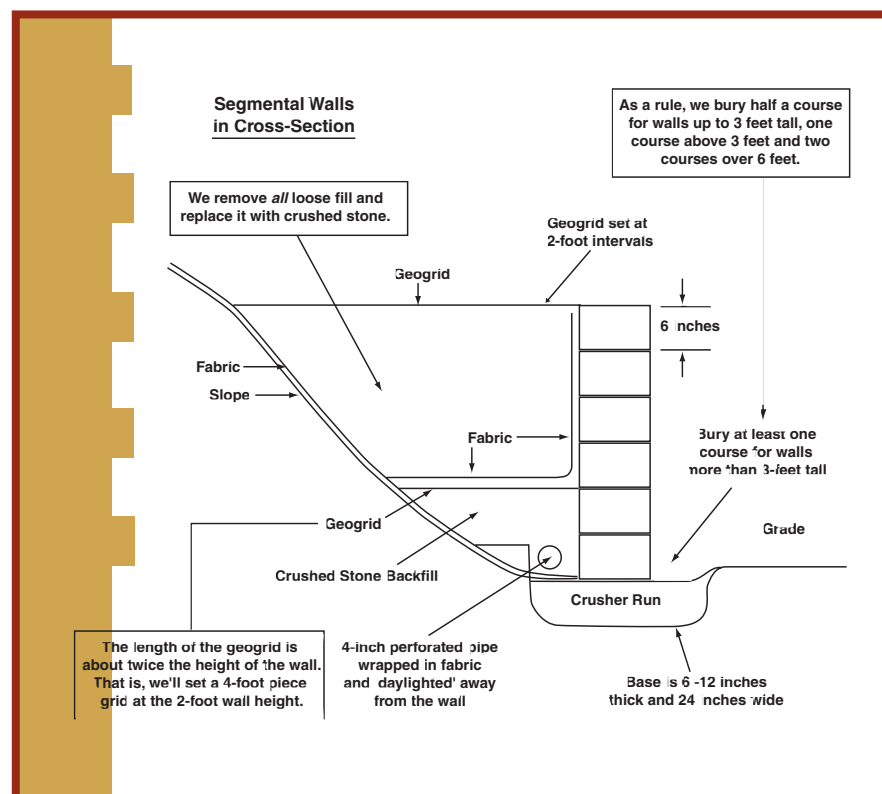
Retaining walls can be made successfully with a broad range of materials. From wooden timbers or pre-cast interlocking systems to steel-reinforced cinder-block walls or walls made of natural stone, just about any construction material can be used so long as the fundamentals of wall design are observed.

As I mention in the accompanying article, I prefer working with natural stone, mostly because I find it the most aesthetically pleasing of the options. That's not to say I don't work with interlocking materials, because I frequently do and find they can result in beautiful wall systems.

Cinder blocks work well, but can be unusually labor intensive, so I work with other options first. Many customers like the idea of retaining walls made of timber for their cost and ease of construction, but I generally advise against this material because it deteriorates faster than any concrete or stone material.

It's important to note, however, that a timber retaining wall properly engineered and installed will last far longer than a concrete or rock wall that's not engineered for the soil conditions!

–B.Z.



We always design our walls so they are retaining only the material we back-fill. In other words, we don't cut into the angled "pile" of soil, so the only material the wall is supporting is our back-fill material (mostly crushed stone), which has almost no moisture-retention capacity nor any potential for movement.

Once we've studied the angles and all the soil specifications are known, then we can begin drawing up plans based on what we've learned along the way. Soil conditions have a lot to say about how we proceed: If we're faced with pure clay, for instance, we'll go to great lengths to make sure we have an adequate base and a good drainage plan; we'll also worry about frost-heave, which can do an incredible amount of damage in this sort of soil.

Things are different if we're working in gravel-rich soil: They carry almost no water, so drainage isn't generally an issue and they do not experience frost-heave so much – our most pressing concern in the Frost Belt. The point is, we have to know what we're working with to make these decisions with confidence!

BASIC ELEMENTS

Once you know your soil conditions, it's time to focus on the fundamentals and the three main factors of building a wall:

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❑ **Base preparation:** There's one thing you can always count on: If its base is not properly prepared, just about any wall will settle.

To avoid this problem, you must dig down to solid, undisturbed soil, then add a base material and tamp it to a 95% compaction level. (We use what is known as "crusher run" here in New York; this stone material is so stable when compacted that it's used under drive-ways and concrete slabs.)

Adequate compaction is crucial: This base is what keeps the wall level as it withstands the stresses and strains of the pressure behind it. Once we reach solid, undisturbed soil, we'll dig down another six inches or so and set our pad, working

The key to success is working with each site on its own merits and making decisions appropriate to its unique characteristics.

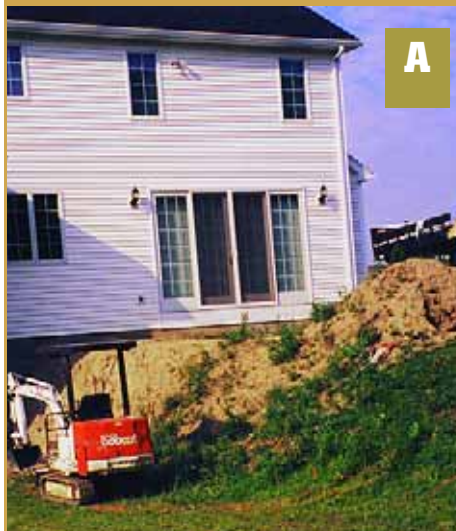
in 4-inch lifts and tamping each layer with a walk-behind plate tamper. (In clay soils, we generally remove more soil, with gravel, a bit less.)

Also, we bury at least one course (and sometimes two or three) of whatever material we're using – block, stone or treated timber. We do so knowing that most of the weight of the backfill is applied to the lower sections of the wall and that the wall will have a tendency to "blow out" from the bottom if this step is not taken.

We're also aware of what's happened on site before we get there: I've seen deck crews come in and dig their standard 42-inch-deep footings right after home builders have backfilled around a foundation with 15 feet of soil – and then wonder why the deck eventually settles!

❑ **Drainage:** The single most important thing that you can do to ensure

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A site like this has a clear need for a retaining wall **(A)** – and the potential to benefit from a *beautiful* one.

Once on site, we used a Bobcat to cut a trench for the wall's base **(B)**. In the meantime, we brought out everything we needed to get the job done, including 4-inch perforated pipe to place behind the wall **(C)**.

We set the crusher run, then laid the first course below grade **(D)**. At this point, we were ready to cover the undisturbed soil on the slope with fabric before beginning to back-fill the new wall with crushed stone **(E)**.

The wall rises, course after course **(F)**. You can just see the fabric on the slope and the tamper we use to compact the crushed rock.

Afterwards **(G)**, the homeowners have a retaining-wall system that is both functional and an asset to the property.



the success of a retaining wall is to make certain it has adequate drainage. Water can destroy a wall with hydrostatic pressure in any region – or with frost heave here in New York and elsewhere up north.

In our area, we know that it's absolutely essential to keep water from collecting behind the wall, so we backfill excavated areas upslope of the wall with

crushed stone after laying in a perforated pipe to channel away any water flowing down the slope.

We place 4-inch perforated pipes wrapped in fabric sleeves at the base of the wall. We then bury the pipe and backfill the whole area with #2 crushed stone all the way to the top – unless, of course, there are to be plantings at the top of the wall, in which case we'll place

about a foot of topsoil on the crushed stone.

❑ **Proper tiebacks:** We always work with wall systems that are tied into the slopes they're holding. Where the base keeps the wall level, *tiebacks* keep the wall plumb and true.

When we build a wooden retaining wall, for example, we set up timbers known as *dead men* perpendicular to the wall and extending back into the slope. With precast concrete walls or walls made of natural stone, we use a product known as *geogrid* for this purpose. This is a woven plastic that extends into the slope anywhere from 4 to 50 feet, depending on the height and application of the wall.

The weight of the backfill on the grid helps to hold up the wall. In addition, by placing geogrid at various levels as a wall is stacked up, you're also using the material to "separate" the soil behind the wall into horizontal components, thereby stabilizing it and minimizing the chance of slumping. Typically, geogrid is placed every two feet vertically in a segmental wall.

If a wall is built without any one of these elements adequately in place, it will fail: Poor base preparation will cause the wall to settle, poor drainage will cause the wall to blow out as a result of hydrostatic pressure or frost heave, and insufficient tiebacks will cause the wall to fall over because of the sheer weight of the soil behind it.

Often, wall failure takes time, with damage occurring gradually over a period of months or even years. Other times, however, it happens in a matter of days. (For a case study in wall failure, see the sidebar on this page.)

FUNCTIONAL BEAUTY

Once you get past the planning and engineering that enable a retaining wall to do its job, you have almost limitless options when it comes to making them beautiful as well – truly an integrated element of your exterior design.

Yes, walls serve a purpose in holding up a slope or a driveway or a swimming pool, but that's no reason to make them stout, plain and featureless. In fact, we go out of our way to make them as at-

Anatomy of a Wall Failure

If there's any doubt about the importance of sound engineering, proper base preparation, adequate drainage and the presence of an effective tieback system, all you need to do is take a good look at a failed wall.

It's never a pretty picture, but sometimes the damage is merely unsightly – cracks and the like. Often, however, the damage can be devastating: Structures are destroyed, watershapes cracked and broken, the overall stability of the site severely compromised.

No matter the initial appearances, it takes a bit of doing to figure out exactly what's happened. To illustrate this point, let me relate the story of a site where we found a failed wall – and a variety of critical errors in design and execution.

Our firm was called in to bid on replacing an old railroad-tie retaining wall. The job went to the low bidder; we were then hired to replace what they'd installed – and the client ended up paying nearly twice what they would have spent had they hired us the first time around.

The failed installation was a double-wall system featuring a 4-foot exposed lower wall backed up by a 4-foot exposed upper wall. When we examined the site, we found that the previous contractor had made critical mistakes in all major areas of wall construction.

For starters, the base of the lower wall was set directly atop the crusher run and had not been buried beneath the ground. Also, the backfill was "blow sand," a cheap fill material, rather than gravel. It had a moisture-retention factor of about 19% – not good in the face of freeze/thaw conditions. For its part, the upper wall had been placed on sand and had settled before falling over. As we progressed through demolition, we also found that the system had been installed without tiebacks or geogrid behind a huge, failed section of the upper wall.

Finally – and to our amazement – we discovered that the previous contractor had routed the runoff from four downspouts from the roof gutters directly into the area behind the lower wall. In other words, a good portion of the roof's drainage was being added to any usual drainage in the critical area behind the wall. Disastrous!

Working with an engineering consultant we brought in, we rebuilt the wall with a proper base (crusher run a full 28 inches below grade and two courses of blocks buried below grade). We also laid lengths of geogrid at specified elevations for both the upper and lower walls. Most important of all, we carefully tamped the crushed rock behind the lower wall to provide proper support for the base of the upper wall.

Each wall now has two buried runs of drainpipe to carry away water. And, of course, we redirected the down spouts to carry the water *far* away from the base or back of the wall!

– B. Z.

Once you get past the planning and engineering that enable a retaining wall to do its job, you have almost limitless options when it comes to making them beautiful as well — truly an integrated element of your exterior design.

tractive as possible, which means designing them to fit into the site just like any other architectural element. An old home, for example, probably deserves a stone retaining wall to support a rustic effect. By contrast, a modern home might call for a wall with a bright, seamless plaster or stucco finish.

Given my preferences, I most enjoy working with natural stone. We've kept up with the times, riding the wave of pressure-treated timbers through the '80s and the fashion for segmented wall systems through the early '90s — but to my mind, nothing beats the timeless, adaptable look of natural stone, espe-

cially when we're working on or around naturalistic watershapes. Our aim here is to use indigenous materials and make our new work look as though it's been around forever.

We also use retaining walls to define and separate zones in our designs, often associating them with steps that provide access from one level to another or setting them up at the end of pathways as seating areas. They can also be set up as extensions of raised bond beams — or serve as substructures for rock and waterfall features. Tall walls can be an aesthetic challenge to the designer, but they can be adorned with

decorative materials to provide dimensionality, break up the expansive surface and provide a dramatic framework or backdrop.

However you choose to incorporate them in your work, it is critical to do everything you can to keep your eye on the ball and make sure your retaining walls are able to do the job of holding back the slope — and thus forever avoiding the day when you receive a distress call from your clients complaining that their backyard is falling down around them.

In that context, *any* wall built so that it does its job is truly a *great* one.

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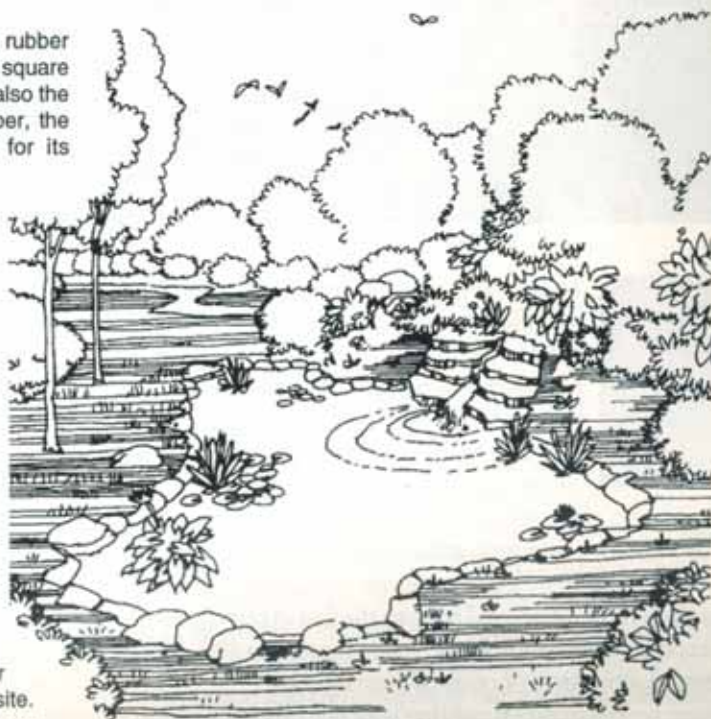
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Subtle at the Surface

The procession started more than 20 years ago, when those who apply interior finishes to pools, spas and other watershapes began looking beyond white plaster: First came the colored plasters, then pebbles and colored aggregates and, more recently, the polished aggregates. Now, says Kirk Chapman, more new materials and the advent of hybrid approaches are carrying surface specialists to new possibilities limited only by their imaginations.

By Kirk Chapman

Back in 1987 and particularly in California and Florida, the surfacing industry found itself in the middle of an unfortunate wave of plaster failures. Some people blamed the material, others blamed application techniques – and traces of the debate continue to this day.

The situation was truly desperate in some areas, so much so that it drove many plasterers to seek new materials and techniques – *anything* to escape the cycle of negativity. Our firm in San Diego, for example, moved early and became the first in our county to apply exposed-aggregate finishes. Today, more than 80% of our jobs involve some form or other of these finishes.

In time, we began experimenting with our mixtures, formulations and application techniques and now produce our own line of products. We still primarily support our own needs, but we eventually expanded our offerings and began supplying a lim-

ited number of other finish companies. We also started looking to the future and to new materials and formulations that would meet the demand for increasingly subtle visual effects.

We're not alone, of course: Several companies are following the same track and have developed new finishes that are essentially hybrids based on materials and approaches that have emerged in the past two decades. And it's clear that the future will see even more changes – as you'll see in the following story and the photographs that accompany it.

MORE TO THE MIX

To get started, let's quickly survey the components that are available for use in these new hybrid finishes.

There is, of course, the plaster matrix itself. The range of available colors continues to expand, with hues from black, French gray, aquamarine and sand to slate, bright blue, sandstone and various greens. Used in conjunction with various



CROSSING A DIVIDE

In this pool, we used a combination of teal glass (supplied by TXI) combined with soft, neutral-colored pebbles and cement to bridge the chromatic gap between the blue tiles and the natural rockwork and sandstone-colored decking around the pool. Those materials offer sharp contrasts indeed, but the speckled blue-and-beige finish softens the overall impression.

aggregates, these basic plaster colors – all achieved by adding dyes to the mix – serve as backgrounds that blend or contrast with or otherwise accentuate the aggregate's colors.

As for aggregates, the familiar exposed pebble surfaces have caught on in a big way, bringing any number of colors and combinations of colors to watershape interiors. Also available are the ceramic-coated sand aggregates made by 3M and sold through a number of premix suppliers.

For several years now, this trio of colored plaster, pebbles and coated sand have been the finisher's core set of options (tile, fiberglass and epoxy surfaces notwithstanding). To these familiar materials, we've added two new aggregate types: glass beads and small pieces of colored glass.

We use these new materials in combination with the more familiar aggregates – and use the established aggregates in new ways – to open ourselves to a whole new set of hybrid possibilities. In our own work, for instance, we use the glass ag-

gregates along with colored plaster, pebbles or coated sand to add sheen, translucence and a high degree of reflectivity to the surface.

We also have used these glass aggregates as part of polished finishes and find that they bring new texture and subtlety to the surface along with a special sheen. For good measure, our experience in working with hybrids also has led us to be more innovative when it comes to using straight pebble, plaster or coated-sand finishes. Indeed, our experience to date shows us that the sky is truly the limit when it comes to ways materials can be used and combined with familiar ones to create finish effects from the subtle to the dazzling.

No photograph can completely capture the visual effects I've been trying to suggest here, but the images that follow offer a glimpse of what this new approach has to offer – and will, I hope, open the door to further experimentation and exploration of what we see as a limitless range of possibilities.

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INSIDE AND OUT

As pool designs become more elaborate, the need sometimes arises for different looks in different sections of the project. In this pool, for instance, we used a black pebble and glass surface for the pool interior and a highly polished gold pearl finish in the trough for the vanishing edge.





Polished at the Waterline

One of the knocks against exposed aggregate surfaces of all kinds is the difficulty of dealing with scale at the waterline. In our work, we've taken to polishing the surface just at the waterline in order to provide a smooth, easier-to-clean surface.

—K.C.

A STRAIGHT BLEND

With all of the increased possibilities these days, you don't always have to go to a hybrid finish or a combination of finishes to get the job done. Here, pink pebbles and a neutral tan cement are used to blend agreeably with the hues of the natural granite rock formations.





CHOING GREEN

We're truly in our element when customers want us to make the most of the greenery around a watershape. On this project, we used a buff adobe cement color, gold and red pebbles and green glass aggregate to capture and reflect the green tile and surrounding landscaping. Although the surface doesn't look "green" up close, when seen against the red brick coping and reflections of the landscaping, the effect is one of a very soft and elegant green.



Continued on page 52



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STARK CONTRASTS

Sometimes, the customer is after an eye-jarring contrast – something that truly jumps out at you. In this case, a gold and pearl finish on the chalice-shaped spa is offset by the stark gray of a blue granite pebble finish. (For the pool, by the way, we polished the tops of the barstools to reduce abrasion.)

Continued on page 54

IS THERE A POND GUY IN YOU?

**I love turtles, fish, and frogs!
So much so that when my hobby
outgrew my parents house I dug up
the backyard to build a water garden.**

**The ultimate fish tank I thought would be
a thousand-gallon pond where my critters
could live just like they would in nature.
That simple concrete pond built in 1982
became my passion and sparked what
would ultimately be a lifelong odyssey.**

In 1991, my hobby became my profession with the launch of Aquascape Designs a residential and commercial water feature design/build firm.

Aquascape Designs still builds ponds, waterfalls, and streams so others too can enjoy the beauty of nature where they live and work. In fact building water features is the backbone of our business and acts as a continuous R & D department. Our focus however has expanded from just building water features though. Today we have a company wide mission of "Changing the Way the World Builds Ponds." Far too many contractors experience frustrations constructing water features. Green water, leaks, over complicated filters and confusing pumps and plumbing have plagued water feature design and construction for years.

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N O FEAR

This is a straight pebble finish that blends the natural blue granite that surrounds the pool with the greens and blues of the distant view. The finish combines gold, white, black and red pebbles in a subtle brew – and is a direct result of the kind of color experimentation we've been led to by our work with glass and hybrid finishes. When combined with the tiles seen on the vanishing edge detail, the effect is vivid, yet nicely balanced with the spectacular setting.



Measures of Control

One of the application challenges for those who work with exposed aggregate finishes has always been the variations in color that come with different levels of exposure of the aggregate over the full expanse of a watershape. Basically, because it's tough to control *exactly* how far the pebbles or other aggregates will stick out of the cement matrix, these surfaces have tended to reveal slight gradations in appearance.

This phenomenon is intensified when the background cement color and the aggregate color have been selected for their contrast, as in combinations such as blue cement and gold rock, for example. Because the basic contrast is so dramatic, variations in color resulting from changes in exposure levels become noticeable.

Our effort to gain control of the overall appearance of our finishes led us to soften the contrasts and work with more neutral cement colors. This reduced the contrast while it preserved the color accents of the aggregates we were using, but it put certain limits on what we could do – and led us to our initial experiments with glass aggregates.

We started using glass beads and aggregates in pools where the background color was subdued – and especially where the pebbles or ceramic-coated sand also was neutral. We began by linking the color of the glass to the color of the tile or some other architectural or landscape element we found around the watershape.

To my mind, that's the key to these hybrid finishes: You have a greater ability to create a look that is part of an overall design. From vivid or even gaudy to subtle or elegant, by opening up the set of possibilities in terms of color and texture, the surfacing contractor can tie the reflective color of the water into whatever elements of the setting the customer wants to highlight.

– K.C.

S OFT REFLECTIONS

Here, we faced a familiar challenge of blending the blue tile with the soft look of the tumbled limestone coping and artificial rock. Again, we used a neutral background color with a light sprinkling of teal-colored glass beads. This created a lighter, somewhat more reflective look that pulls tile and stone together. Here and elsewhere, you don't really see the effect up close or when the surface is dry – but when you look at the surface through the water, you can see how the subtle blend creates a reflective quality that ties all of the visual elements together.





A SUBTLE BLEND

With this project, the warmth and subtlety of the flagstone, adobe red stucco and creams of the pillars are softly reflected in the water's surface through use of a soft gold pearl pebble finish – another case where working without limits truly helped.



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IMERY'S/GEORGIA MARBLE offers Pool Mix as a finish for new installations and renovation work. The product is a mix of white cement with a high-quality marble and a special particle-size aggregate – the key to a long-lasting white pool finish. The product also comes in colored versions: green and the popular black finish. All Pool Mix products are made using the highest quality standards. **Imerys/Georgia Marble Consumer Product Sales**, Roswell, GA.

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COMPOOL offers controls for today's pools and spas. Emphasizing simplicity, the company's indoor control panels provide fingertip operation of filtration, heating, lighting and waterfeatures. Programming is done by means of color-coded buttons that are hidden when the unit is not in use. The controls also allow programming for light dimming, spa-side temperature control, auto-backwash, telephone remote control and other special features. **Compool**, Mountain View, CA



Continued on page 62

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BOOK ON LOW-VOLTAGE LIGHTING

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NIGHTHAWK has published *Low Voltage Landscape Lighting*, a book intended to help designers create effective illumination, save costs, reduce waste and produce great results. The text covers a wide range of subjects, from planning and design to equipment selection, installation and maintenance. Sections on troubleshooting and pond lighting are also included. The focus is on simple explanations rather than technical detail. Drawings and charts highlight key points on safety, transformer selection and voltage-drop calculations. **Nighthawk**, Miami, FL.

WATER STREAMS WITH FIBEROPTICS

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POLARIS/FLORIDA FALLS offers Fiber Jet, which produces a laminar stream of water that, when combined with fiberoptics, will carry brilliant light from the tip of the nozzle for two or three feet to the surface of a pool of water. The kit includes an ABS plastic niche, a nozzle assembly and a precision brass nozzle. The niche has four bars for attachment to structural steel before gunite or shotcrete application and two ports on the back – one for a 1/2-inch plumbing line, the other for a 1-inch fiber optic conduit. **Polaris/Florida Falls**, Vista, CA.



NEW BOOM PUMP FOR CONCRETE

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PUTZMEISTER'S new 32Z truck-mounted concrete boom pump delivers both high-volume 210 cu. yd. outputs and high pressure – 1,233 psi on the rod side – with its .16H pump. It also features free-flow hydraulics, radio and cable remotes, and a high performance S-valve. The 32-Z-Meter doesn't have to be fully unfolded to begin a pour, allowing concrete to be placed right next to the truck. When a longer reach is needed, the boom extends to 105 ft. vertically and 92 ft. horizontally.

Putzmeister Inc., Sturtevant, WI.

NEWSLETTER ON WATERFEATURES

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WESCO FOUNTAINS produces a quarterly newsletter called *Fountain Art* to highlight a selection of projects that use the company's fountain products. Typical coverage includes details on programmable waterfeatures, floating fountains and buried equipment vaults. Also included are tips on keeping waterfeatures operating at peak levels. **Wesco Fountains**, Venice, FL.



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INGROUND-POOL CLEANERS

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KREEPY KRAULY offers two ways to keep in-ground pools clean: The Kreepy Krauly model has a 15-year warranty on its flapper – its one moving part – and installs in minutes without tools. The Kreepy Kadeet is a value-priced cleaner that comes with a five-year limited warranty. It also features just one moving part for dependable performance and ease of maintenance. Both models work with the circulation pump; they have no wheels or gears to jam, diaphragms to replace or bags to empty. **Kreepy Krauly**, Sanford, NC.



NEW CONCRETE PUMP

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SCHWING AMERICA offers its new WP 301X concrete pump, designed with capabilities for shotcrete application. In addition to handling a wide range of mixes with aggregate sizes to 1 in., the unit offers surge-free shotcreting through an easy-to-handle hose. Designed for low maintenance and trouble-free operation, the WP 301X is an all-hydraulic, twin-cylinder piston pump equipped with Schwing's Rock Valve. With 1,100 psi applied to the concrete, contractors can expect pumping distances to 1,160 ft. horizontally or 330 ft. vertically. **Schwing America**, White Bear, MN.



SOLAR-HEATING NEWSLETTER

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AQUATHERM INDUSTRIES publishes *The Solstice*, a newsletter about the company and its line of solar-heating systems. Issues include project information, company news, survey information and a calendar of important solar-related events. **Aquatherm Industries**, Lakewood, NJ.

BROCHURE ON STAIN-REMOVAL PRODUCTS

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JACK'S MAGIC has prepared a four-page, full-color brochure defining its complete line of products for the prevention and removal of a variety of metal stains from swimming pools and spas. Also included in the brochure is information on stain-testing kits, water clarifiers, filter aids, non-chlorine shock and water-test kits designed for use by professionals. **Jack's Magic**, Clearwater, FL.

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The best bet for a long and less-strenuous life is to take a lead from the many electrical-savvy technicians who never touch a motor (or any electrical appliance, for that matter) without first using their meters to ensure they are not placing themselves in harm's way.

Bare, energized internal wiring can now come in contact with the metal motor housing. A voltage of anywhere up to 120 volts might be found applied to the motor housing.

There are also insects and vermin that simply eat the insulation off of electrical wiring. They gnaw away until the exposed conductor contacts the motor housing. These same conditions can be caused by a number of mechanical problems common to electric motors – bearing failure, corrosion, starting-switch failure, and the like – any of these can cause the internal temperatures within the motor to rise to the point of causing insulation failure.

The results are almost always the same: The non-current-carrying metal parts of the motor become energized and current-carrying.

DEFINITE DANGERS

Let us assume for a moment that one of these failures has occurred in a pump motor that did *not* have a green grounding conductor properly connected. The motor might be mounted on a concrete pad, which is somewhat conductive to the earth below, but not good enough; or the pump might have a non-metallic mounting bracket under the motor, effectively insulating the defective motor from the earth below.

This is a life-threatening situation! A person touching the outside of the metal motor housing while in contact with any earth ground in the area will be allowing his or her body to complete an electrical circuit. This can result in anything from a tingle to a lethal electrical shock, depending upon the conductivity of the soil in the immediate area of this defective pump motor.

Remember that in all things electric, any time there is a difference in voltage between two points, the higher voltage will push huge amounts of electric cur-

rent through any path it finds in an attempt to get back to zero/ground/earth. Humans never, ever want to be a part of that path!

Now, let's examine the same scenario, but with a properly connected green grounding conductor. The length of No. 12 AWG copper wire connected between the non-current-carrying metal parts of the motor housing and the system grounding bus in the electrical service panel has a very, very low resistance – less than 0.2 ohms for a 100-foot run. That is a much easier path for current to flow through as opposed to the path through a person's body to a local earth ground.

We must not forget another very significant benefit of an effectively connected grounding conductor: The low-resistance path from the energized metal motor housing back to the system grounding bus will probably allow enough current to flow to cause the pump's circuit breaker in the electrical distribution panel to trip, thus removing the hazard. The fact that the motor will no longer run will generally alert someone to the fact that something is wrong.

Unfortunately, we don't live in a perfect world, and things can go wrong with grounding conductors and their connections. Screws can become loose, careless technicians can remove a ground conductor to replace a component and forget to reconnect it, and modifications may be made to the electrical system on the property that destroy the grounding conductor's earth ground connection.

The best bet for a long and less-strenuous life is to take a lead from the many electrical-savvy technicians who never touch a motor (or any electrical appliance, for that matter) without first using their meters to ensure they are not placing themselves in harm's way. With the meter set to the "AC Volts" scale, touch one probe to the nearest earth ground

and touch the other probe to the metal housing of the device in question. *Any reading is cause for caution.* Find the circuit breaker controlling the flow of electricity to the device – turn it *off* – then check the grounding conductor connections at both ends before proceeding.

BONDED FOR SAFETY

With all the foregoing in mind, I think it would be worthwhile at this point to repeat the NEC definition of "effectively grounded":

□ **Effectively Grounded.** Intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the buildup of voltages that may result in undue hazards to connected equipment or to persons.

Compared to grounding, *bonding* is relatively simple. There is no hidden meaning in the NEC definition:

□ **Bonding.** The permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct safe-

Doubled Up

There are double-insulated pump assemblies available with no provision for bonding. The bonding grid on a pool employing such a pump would not be connected to the system grounding bus, and that's all right. Article 680 has an explanatory item covering this:

□ 680-22. Bonding. It shall not be the intent of this section to require that the No. 8 or larger solid copper bonding conductor be extended or attached to any remote panel board, service equipment, or any electrode, but only that it shall be employed to eliminate voltage gradients in the pool area as described.

– J.Mc.

ly any current likely to be imposed.

Article 680 specifies the various items that must be bonded. Using a swimming pool as an example, all metal parts within five feet of the inside walls of the pool and all metal parts of electrical equipment associated with the pool must be bonded together.

This includes the rebar in the pool wall, floor or deck; any diving stands, handrails, ladders, lighting fixtures, transformer enclosures, pumps and other electrical items associated with the pool circulation system; metal parts of pool cover mechanisms; and any incidental conduits, metal plumbing or fittings within the five-foot-reach path.

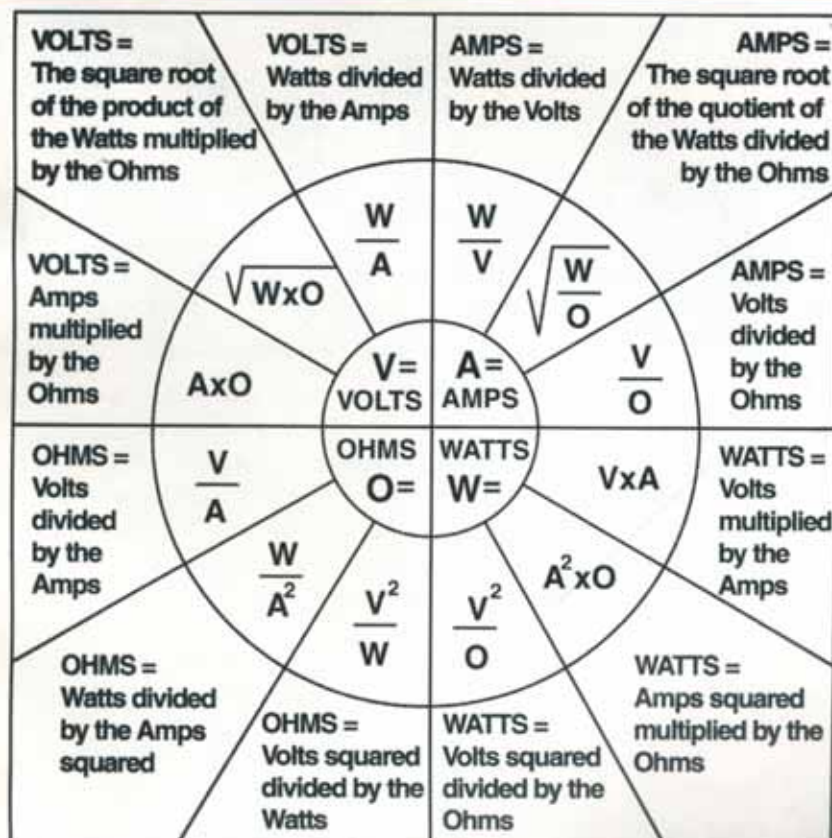
These items are connected together and to a "common bonding grid" by means of a No. 8 AWG solid-copper bonding conductor – insulated, covered or bare – fastened by connectors or clamps approved for the purpose. The rebar in the shell or the brass conduit associated with some light fixtures can

serve as the common bonding grid, as can the walls of a bolted or welded metal pool. Or, a common bonding grid can be created simply by connecting all of the bonding conductors to a single piece of No. 8 AWG solid copper wire.

The bonding conductors are not necessarily grounded. One of the items requiring bonding, however, is the pump motor, which also is grounded. With a green grounding conductor connected to the motor housing *inside* of the motor's wiring compartment and a bonding conductor connected to the motor's bonding lug on the *outside* of the motor, the entire bonding grid becomes grounded.

The objective is to get all of these metal objects to the same electrical level, eliminating the possibility of any voltage differences. That's *bonding*.

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



We've been asked to reproduce the electrical-equations chart from Jim McNicol's October column (page 68) to make photocopying possible. Here you are!



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WATER SHAPES

Well Grounded

By Jim McNicol

Last month we covered the “hows” of grounding pretty well. Using the definitions from the National Electrical Code (NEC) for guidance, we saw that in order to be considered effectively grounded, the non-current-carrying metal parts of all equipment associated with a watershape must be connected to the system grounding bus at the electrical service panel.

This is accomplished by installing a green-colored (or green with a yellow stripe), minimum No. 12 AWG insulated copper conductor between the equipment’s grounding terminal and the system grounding bus. This conductor is properly called an *equipment-grounding conductor*, and the piece of equipment to which it is connected can be called *effectively grounded*.

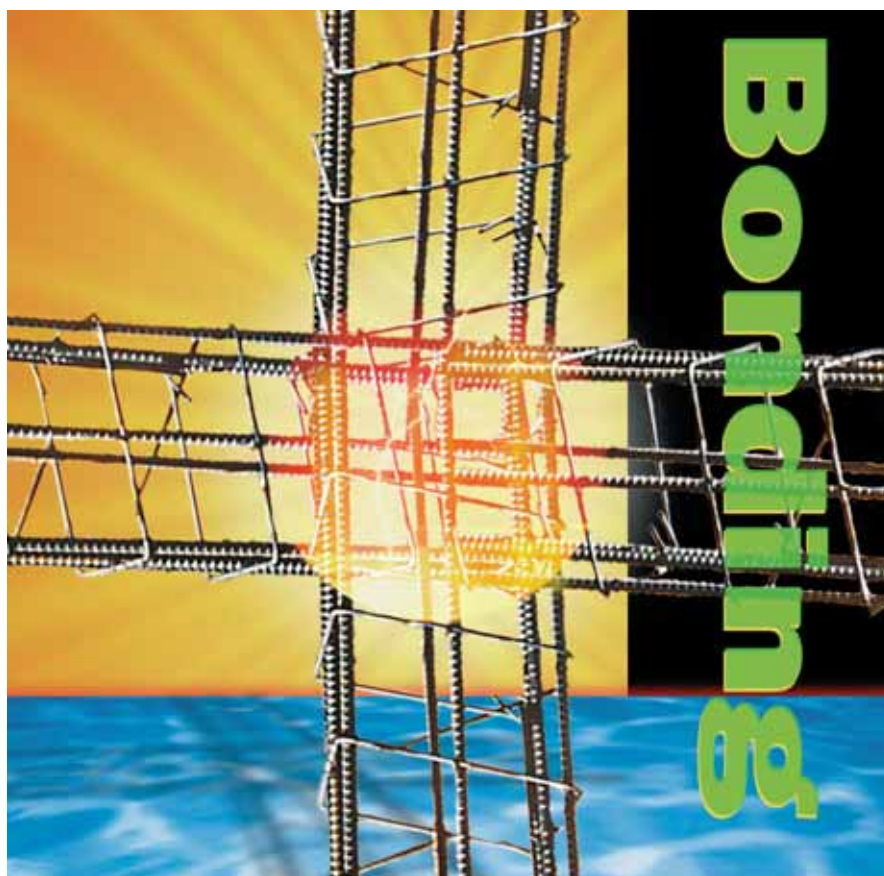
Now for the “whys.”

MAKING CONNECTIONS

Let us once again use the main water-circulation pump as an example. Specifically, let us use one of the most common configurations of these pumps in current use – a metal-housed motor bolted to a molded, polymeric pump case.

The pump design is probably such that the polymeric impeller covers the metal motor shaft, thereby isolating the metal motor and keeping it from coming in contact with the water. Let’s assume this to be a 240-volt unit, drawing 8 or 9 amps. That means there will be three conductors connecting this pump to the electrical service equipment – two “hot” lines connected to a dual 15-amp circuit breaker in the service panel, and our green grounding conductor connected to the grounding bus in the panel.

As I mentioned last month, the green ground-



ing conductor has absolutely nothing to do with the operation of this pump – or any other grounded appliance, for that matter. The pump motor needs only the two *line conductors* to operate. The green conductor does not connect to any energized electrical component within the motor – only to the non-current-carrying metal parts such as the motor’s outer housing and frame.

This low-resistance conductor provides an easy path to “drain off” any fault current that might result from some electrical breakdown or failure within the motor. Let’s look at some common failures and how an effectively grounded system can prevent injury or worse.

Ask motor technicians anywhere in the world about the things that can crawl, fly, slither, leap and creep into the ventilation opening of motors and you’ll end up with a catalog of critters that build nests, lay copious quantities of eggs and, generally, plug things up to the point where the internal temperatures of the motor will cause the insulation on the internal wiring to fail.

Continued on page 64



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